Abstracts

Abdo, A., Fermi LAT Collaboration, A. Neronov, M. Chernyakova, D. Parent, M. S. Roberts, S. Johnston

George Mason University/Naval Research Laboratory

Poster
OtherGal S2.N1

MW OBSERVATIONS OF PSR B1259-63 AROUND THE 2010-2011 PERIASTRON PASSAGE

PSR B1259-63/SS 2883 is a unique binary system consisting of a 47.7 ms radio pulsar orbiting a massive Be companion star. The interaction between the pulsar's relativistic wind and the Be star's stellar wind around and photon field around periastron is believed to give rise to the unpulsed radio, X-ray, and gamma-ray emissions observed near periastron. Despite designated 3-weeks of observations by EGRET around periastron no GeV gamma-ray emission was observed. We have observed the system in radio, IR, optical, X-ray, and GeV gamma-ray during the 2010/2011 periastron passage. Our observations of the system in the 0.1-10 GeV energy range around periastron with Fermi showed an unexpected behavior of the system that is not seen at any other wavelength. Our upper limits on GeV emission from this source when it was far from periastron gives a very low gamma-ray efficiency of the pulsar which is an order of magnitude lower than that expected for it's age and distance. We will present results from our MW campaign on the emphasizes on the new findings with Fermi.

Ackermann, M., Atwood, W. B., Rando, R.

UCSC

Poster
Instr S2.N1

PASS 7: AN UPGRADE TO THE FERMI-LAT ANALYSIS

To date the LAT data has been analyzed using an analysis developed before launch, Pass 6. Not surprisingly, the real flight data had unanticipated features which needed to be accommodated. This was done via after-the fact patches to the analyzed data. Pass 7 is the first re-work of the LAT event level analysis in which these observed effects were both incorporated in the simulations and used to develop and optimize photon event selection and charge particle background rejection criteria. In addition, the utilization of the preconceived event classes has been reassessed to conform to the current usage both within the LAT collaboration and the user community. We describe here both the changes made to the simulated data used to develop the event level analysis as well as the modifications and additions to the event classes. Also the checks using real data of this about to be released Pass 7 are summarized

Agudo, I.,
S. G. Jorstad; A. P. Marscher; V. M. Larionov; J. L. Gómez; A. Lähteenmäki; M. Gurwell; P. S. Smith; H. Wiesemeyer; C. Thum; J. Heidt

Instituto de Astrofísica de Andalucía (CSIC) & Boston University

Poster
AGN S1.N1

GAMMA-RAY FLARING EMISSION IN THE BLAZAR OJ287 LOCATED IN THE JET >14PC FROM THE BLACK HOLE

We combine the Fermi-LAT light curve of the BL Lacertae type blazar OJ287 with time-dependent multi-waveband flux and linear polarization observations and submilliarcsecond-scale polarimetric images at lambda = 7 mm to locate the gamma-ray emission in prominent flares in the jet of the source > 14 pc from the central engine. We demonstrate a highly significant correlation between the strongest gamma-ray and millimeter-wave flares through Monte Carlo simulations. The two reported gamma–ray peaks occurred near the beginning of two major millimeter-wave outbursts, each of which is associated with a linear polarization maximum at millimeter wavelengths. Our very long baseline array observations indicate that the two millimeter-wave flares originated in the second of two features in the jet that are separated by > 14 pc. The simultaneity of the peak of the higher-amplitude gamma-ray flare and the maximum in polarization of the second jet feature implies that the gamma-ray and millimeter-wave flares are cospatial and occur > 14 pc from the central engine. We also associate two optical flares, accompanied by sharp polarization peaks, with the two gamma–ray events. The multi-waveband behavior is most easily explained if the gamma-rays arise from synchrotron self Compton scattering of optical photons from the flares. We propose that flares are triggered by interaction of moving plasma blobs with a standing shock. The gamma-ray and optical emission is quenched by inverse Compton losses as synchrotron photons from the newly shocked plasma cross the emission region. The millimeter-wave polarization is high at the onset of a flare, but decreases as the electrons emitting at these wavelengths penetrate less polarized regions. This work has been recently published in Agudo et al. (2011, ApJL, 726, L13).

Ajello, M.,
M. Romani, M. Shaw, L. Costamante, J. Chiang on behalf of the Fermi-LAT Collaboration

SLAC/KIPAC

Invited

ON THE EXTRAGALACTIC GAMMA-RAY BACKGROUND, ITS ORIGIN AND COMPONENTS AND THE EVOLUTION AND GROWTH OF FSRQS

Fermi-LAT, with its unprecedented sensitivity, has detected over a thousand point-like sources most of which are blazars detected over a wide range in redshift and luminosity. We will review the properties of the source populations detected by Fermi-LAT focusing in particular on the statistical properties of blazars. New results on the cosmological evolution and growth of FSRQs will be presented. Fermi data provide the first indications for the anti-hierarchical growth of FSRQs where more luminous objects form earlier in the history of the Universe while the less luminous, and bulk of the population, are more abundant at later epochs. At the far end of the spectrum and only ~2 Gyr from the Big Bang lie the FSRQs detected by Swift, among the most powerful objects ever observed. Powered by super-massive black holes with masses often in excess of 10 billion solar masses these objects pose a question on the mechanisms of formation of massive black holes in the high redshift Universe. Finally our current effort and future plans to understand and constrain the origin of Isotropic Diffuse Gamma-ray Background will be reviewed.

Ali, M.

University of Leeds

Poster
AGN S1.N2

FERMI-LAT OBSERVATIONS OF HYDRA A

Galaxy clusters are the largest virialized structures in the Universe. The detection of diffuse-radio emission from galaxy clusters indicates populations of relativistic leptons interacting with the intracluster medium. Gamma-ray emission from galaxy clusters, arising from these energetic leptons and the decay of neutral pions produced in hadronic interactions, may be detectable with the Fermi-LAT. Using data from the Fermi-LAT, we will present upper limits on gamma-ray emission from Hydra A, which hosts a cluster scale AGN outburst with extraordinary energetics. These upper limits are then used to constrain the energetics of hadronic and leptonic cosmic rays in Hydra A.

Aliu, E.,
for the VERITAS Collaboration

Barnard College/ Columbia University

Poster
SNR/PWNe S2.N1

TEV OBSERVATIONS IN THE VICINITY OF THE CYG OB1 ASSOCIATION WITH VERITAS

The Cygnus region is one of the more active regions of creation and destruction of massive stars in the Galaxy, containing several OB associations, considered as the tracers of young pulsars. The discovery of MGRO J2019+37 by Milagro, the largest and brightest source known to emit gamma-rays above 12 TeV, is located within the Cyg OB1 association, at the edge of the Cygnus region. An analysis of the Fermi data indicates the presence of at least two young gamma-ray pulsars. None of these or other known sources positionally consistent with this TeV emission, such as the young stellar cluster Ber 87, can power the entire TeV source and its origin remains unknown. Using VERITAS, a TeV instrument with an order of magnitude better angular resolution than Milagro, we have performed deep observations of this region above 400 GeV and we will present here the results along with a broadband study at different wavelengths including radio, X-rays, gamma-rays, TeV and multi-TeV.

Aller, M. F., Hughes, P. A., Aller, H.D., Jorstad, S. G., Marscher, A. P., Hovatta, T., Aller, M.C.

University of Michigan

Poster
AGN S1.N3

EVIDENCE FOR SHOCKS AS THE ORIGIN OF RADIO TO GAMMA-RAY FLARES IN BLAZARS

To test whether shocks play a role in the production of gamma ray flares and to identify conditions in the jet during gamma ray flaring, we have been monitoring the total flux density and linear polarization of gamma-ray-flaring blazars with the University of Michigan 26-meter telescope at 4.8, 8.0, and 14.5 GHz. New radiative transfer calculations allowing for shocks propagating at an arbitrary direction relative to the jet axis can explain the observed spectral evolution in several radio outbursts temporally associated with gamma ray flares. This supports a shock-in-jet origin for at least some radio-to-gamma-ray activity. A comparison of results from simulations incorporating a purely ordered magnetic field (helical), random field, or a mix of the two with these observations shows that the data are best explained if the magnetic field within the density enhancement is predominantly random before it passes through the shock. This work was supported by NASA Fermi grants NNX09AU16G, NNX10AP16G, and NSF grant AST-0607523 (MIchigan); NNX08AV65G, NNX08AV61G, NNX08AJ64G, NNX09AT99G, NNX10AU15G, and NSF grant AST-0907893 (BU); and NNX08AV67G and NSF grant AST-0807860 (Purdue). The operation of UMRAO is funded by the University of Michigan.

Amaldi, U.

University Milano Bicocca and Tera Foundation

Invited

INFLUENCE OF FERMI AND HIS ROMAN GROUP ON NUCLEAR AND MEDICAL PHYSICS

Amati, L., Dichiara, S., Frontera, F., Guidorzi, C.

INAF - IASF Bologna

Poster
GRB S2.N1

INVESTIGATING AND TESTING GRB SPECTRUM-ENERGY CORRELATIONS WITH FERMI.

The correlation between the spectral peak photon energy, Ep, and the radiated energy or luminosity (i.e., the "Amati relation" and other correlations derived from it) is one of the central and most debated topics in GRB astrophysics, with relevant implications for the the physics and geometry of the prompt emission, the indentification and understanding of different classes of GRBs (short/long, XRFs, sub-energetic), GRB cosmology. Fermi is exceptionally suited to provide, also in conjunction with Swift observations, a significant step forward in this field of research. Indeed, one of the main goals of the Fermi/GBM is the accurate measurement of Ep, by exploiting its unprecedented broad energy band from ~8 keV to ~30 MeV; in addition, for a small fraction of GRBs the LAT can extend the spectral measurements up to the GeV energy range, thus allowing a reliable estimate of the bolometric radiated energy / luminosity. I provide a review, update and discussion of the impact of Fermi observations in the investigation, understanding and testing of the Ep-Eiso ("Amati")relation and of the other spectrum-energy correlations.

Anderson, B., On behalf of the Fermi Collaboration.

University of California - Santa Cruz

Poster
DMNP S1.N1

CONSTRAINTS ON DARK MATTER EMISSION FROM THE GALACTIC HALO

Modeling the diffuse gamma-ray emission from the Milky Way is a rich and complex subject. Searching for faint signals, such as from WIMP annihilation, requires an exhaustive study of this background. We report on continued progress setting limits on WIMP annihilation using a profile likelihood method to account for the full uncertainty in the diffuse gamma-ray background modeling.

Angelakis, E., L. Fuhrmann, I. Nestoras, C. M. Fromm, J. A. Zensus, N. Marchili, T. P. Krichbaum, M. Perucho-Pla, H. Ungerechts, A. Sievers, D. Riquelme, A. C. S. Readhead, V. Pavlidou, J. Richards, W. Max-Moerberck, T. Pearson

Max-Planck-Institut für Radioastronomie

Poster
AGN S1.N4

PHENOMENOLOGICAL CLASSIFICATION OF CONTINUUM RADIO SPECTRA VARIABILITY PATTERN OF FERMI BLAZARS

The F-GAMMA program aims at understanding the physics at work in AGN via a multi-frequency monitoring approach. A number of roughly 65 Fermi-GST detectable blazars are being monitored monthly since January 2007 chiefly at radio wavelengths in order to fully benefit from the unprecedented sampling characteristics of the LAT instrument. The core program relies on the 100-m Effelsberg telescope operating at 8 frequencies between 2.6 and 43 GHz, the 30-m IRAM telescope observing at 86, 145 and 240 GHz and the APEX 12-m telescope at 345 GHz. Here we show that, on the basis of their variability pattern, the observed quasi-simultaneous broad-band spectra can be classified to merely 9 classes. The variability for the first 7 is clearly dominated by spectral-evolution while sources of the last 2 classes vary self-similarly with almost no apparent shift of the peak frequency. It is shown that those first 7 classes can be attributed to exactly the same two-component principal system made of (a) a quiescent optically thin spectrum and (b) a super-imposed flaring event; whereas the other 2 must interpreted in terms of a completely different mechanism. The apparent differences among the former 7 classes are explained in terms of a redshift modulus and an intrinsic-source/flare parameters modulus. Numerical simulations shown that a shock-in-jet model can very well describe the former 7 classes while no claim is made about the latter 2. It is concluded therefore that only two mechanisms seem to be producing variability. None of the almost 90 sources used for this study show a switch of class indicating that the variability mechanism is either (a) a finger-print of the source, or (b) that the parameters it may depend on vary at timescales far longer than the monitoring period of almost 4 years.

Arshakian, T.G., et al.

MPI fuer Radiastronomie (Bonn, Germany)

Poster
AGN S1.N5

RADIO–OPTICAL–GAMMA-RAY PROPERTIES OF RADIO-SELECTED AGN

We study the relations between radio, optical, and gamma-ray measurements for a sample of 83 blazars selected from the MOJAVE (Monitoring of Jets in AGN with VLBA Experiments) sample and detected with the Fermi Large Area Telescope (LAT). We perform a multi-band statistical analysis to investigate the relations between the emission in dïï¬€erent bands and radio- and gamma-loudness. We found a signiï¬cant correlation between the gamma-ray luminosity and the optical nuclear and radio (15 GHz) luminosities of blazars. We report a well deï¬ned positive correlation between the gamma-ray luminosity and the radio-loudness for quasars and BL Lacertae type ob jects (BL Lacs). We reproduce these relations by modeling of the spectral energy distributions of blazars with a simple leptonic jet model for blazars. Variations of the accretion disk luminosity (and hence the jet power) in blazars is able to reproduce the basic trends. Combination of variations of other jet parameters, such as the jet viewing angle, Lorentz factor, and the magnetic ï¬eld of the jet, is needed to fit all observed correlations.

Asano, K., K. Murase, P. Meszaros, T. Terasawa, S. Inoue

Tokyo Institute of Technology

Oral

LEPTONIC AND HADRONIC MODELS FOR THE EXTRA COMPONENTS IN FERMI-LAT GRBS

Fermi satellite has detected extra spectral components in GeV energy range in sveral GRBs. Those components have power-law shapes, which may contribute to also X-ray band. The poor photon statistics make it difficult to determine the origin of GeV photons, namely internal or external shocks. We try to explain the extra components with our numerical simulations based on internal shock picture. The classical internal shock model may reproduce the spectra with inverse Compton emissions from accelerated electrons. On the other hand, the keV-GeV flat spectra detected in GRB 090902B is well explained with hadronic cascades. Finally, we discuss both advantages and weaknesses for leptonic and hadronic models, respectively.

Balbo, M., R. Walter, C. Ferrigno and P. Bordas

ISDC, University of Geneva, Switzerland

Poster
SNR/PWNe S2.N2

TWELVE-HOUR SPIKES FROM THE CRAB PEVATRON

The Crab nebula displayed 3 gamma-ray spikes on September 2010. To more closely understand the origin of this phenomenon, we analyze the INTEGRAL (20-500 keV) and FERMI (0.1-300 GeV) data collected almost simultaneously during the flare. We divide the available data into three different sets, corresponding to the pre-flare period, the flare, and the subsequent post-flare. For each period, we perform timing and spectral analyses to differentiate between the contributions of the pulsar and from the surrounding nebula to the gamma-ray luminosity. No significant variations in the pulse profile and spectral characteristics are detected in the hard X-ray domain. In contrast, we identify three separate enhancements in the gamma-ray flux lasting for about 12 hours and separated by an interval of about two days from each other. The flare duration is of the order of the synchrotron cooling time scale for electrons at an energy larger than 10^15 eV, the highest electron energy ever measured in a cosmic accelerator. The spectral analysis shows that the flux enhancement, confined below ~1GeV, can be modeled by a power-law with a high energy exponential cut-off, where either the cut-off energy or the model normalization increased by a factor of ~5 relative to the pre-flare emission. We also confirm that the gamma-ray flare is not pulsed. The timing and spectral analysis indicate that the gamma-ray flare is due to synchrotron emission from a very compact Pevatron located in the region of interaction between the pulsar wind and the surrounding nebula. The spectral properties of the flare are interpreted in the framework of a relativistically moving emitter and/or a harder emitting electron population.

Balbo, M., P. Saouter, R. Walter, L. Pavan, A. Tramacere, M. Pohl, and J.-A. Zurita-Heras,

ISDC, University of Geneva, Switzerland

Poster
SNR/PWNe S2.N3

RECENT RESULTS ON HESS J1632-478

HESS J1632-478 is an extended and still unidentified TeV source in the galactic plane. In order to identify the source of the very high energy emission and to constrain its spectral energy distribution, we used a deep observation of the field obtained with XMM-Newton together with data from Molonglo, Spitzer and Fermi to detect counterparts at other wavelengths. The flux density emitted by HESS J1632-478 peaks at very high energies and is more than 20 times weaker at all other wavelengths probed. The source spectrum features two large prominent bumps with the synchrotron emission peaking in the ultraviolet and the external inverse Compton emission peaking in the TeV. HESS J1632-478 is an energetic pulsar wind nebula with an age of the order of 10^4 years. Its bolometric (mostly GeV-TeV) luminosity reaches 10% of the current pulsar spin down power. The synchrotron nebula has a size of ~1 pc and contains an unresolved point-like X-ray source, probably the pulsar with its wind termination shock.

Baldini, L.

INFN-Pisa

Poster
Instr S2.N2

PASS 8: A COMPREHENSIVE REVISION OF THE FERMI LAT EVENT-LEVEL ANALYSIS

The event simulation and reconstruction framework developed for the Fermi Large Area Telescope before the launch performed beyond the expectations and proved to be adequate for the science of the first two years. This framework is being updated regularly to reflect the constantly improving knowledge of the detector and the environment in which it operates. In parallel, a coherent long-term effort is ongoing, aimed at a radical revision of the entire event level analysis based on the experience gained in the first phase of the mission. The basic ingredients of the new event simulation and reconstruction are in place and ready to serve as input into the new background rejection chain which is now being developed. The potential improvements include (and are not limited to) greatly reducing the backgrounds, increasing the effective area, a better understanding of the systematic uncertainties and the extension of the energy reach for the photon analysis below 100 MeV and above 100 GeV. We shall give an overview of the work that has been done or is ongoing and the prospects for the near future. Many of the aspects outlined here will be thoroughly described in separate poster contributions.

Baldini, L., Atwood, W. B. and Bregeon, J. E.

INFN-Pisa

Poster
Instr S2.N3

THE FERMI LAT CALORIMETER AS A GAMMA-RAY TELESCOPE

Roughly a half of the high-energy events recorded by the Fermi Large Area telescope are currently discarded for the standard scientific analysis because either they have no track in the Tracker or the signal in the Tracker is so compromised by the Calorimeter back-splash that it is impossible to extract a reliable direction information for the event. Above a few GeV the LAT hodoscopic Calorimeter is able to image the photon shower development and reconstruct the direction of the impinging gamma-ray with a typical angular resolution of the order of one degree without any use of the Tracker information. Further improvements in the direction reconstruction and the development of a dedicated Point Spread Function analysis (along the lines of the one in place for the Tracker) can potentially open the exciting perspective of recovering the "CAL-only" events to the scientific analysis. The achievement of the necessary background rejection power will be one of the main challenges in this attempt. We present the basic figures of merit of the LAT Calorimeter as a gamma-ray telescope and the first demonstrations of its imaging capabilities with flight data.

Baring, M. G., Errol J. Summerlin

Rice University

Poster
AGN S1.N6

FERMI PROBES OF RELATIVISTIC SHOCK ENVIRONS IN BLAZARS

An important aspect of the Fermi legacy for blazar science is the ability of the LAT to pin down the power-law index of the high energy portion of emission in these sources, and therefore also the index of the underlying non-thermal particle population. This was not possible before when data was limited to the highly-absorbed TeV band. This provides, for the first time, clean diagnostics on the shock acceleration environment in the jets/outflows in these extragalactic sources. This paper highlights how such broadband Fermi spectra can be used to probe diffusive acceleration in relativistic, oblique, MHD shocks in blazars. The key characteristics of relativistic shock acceleration are outlined, in both subluminal and superluminal regimes, including a discussion of an interesting regime of flat distribution generation due to shock drift acceleration that is relevant to flat spectrum blazars. Palpable constraints on the frequency of particle scattering and the level of field turbulence, important environmental quantities for relativistic shock studies, are identified using the Fermi observations of selected energetic blazars such as Mrk 421, Mrk 501 and PKS 2155-304 with TeV-band detections.

Baring, M. G.,
Sarah A. Story

Rice University

Poster
PSR S2.N1

MAGNETIC PAIR CREATION BOUNDS TO GAMMA-RAY PULSAR EMISSION ALTITUDES

The Fermi gamma-ray pulsar legacy database now exceeds 70 sources and has defined an important part of Fermi's science legacy, providing rich information for the interpretation of young energetic pulsars and old millisecond pulsars. Among the well-established population characteristics is the common occurrence of exponential turnovers in the 1-10 GeV range. These turnovers are too gradual to arise from magnetic pair creation in the strong magnetic fields of pulsar inner magnetospheres, so their energy can be used to provide lower bounds to the typical altitude of GeV band emission. This paper explores such constraints due to single-photon pair creation transparency below the turnover energy. It updates early computations that have been deployed in numerous Fermi pulsar papers, to span low altitude domains when general relativistic influences are important to higher altitude locales where flat spacetime photon propagation is modified by rotational aberration effects. Our work clearly demonstrates that including near-threshold physics in the pair creation rate is essential to deriving accurate attenuation lengths. The altitude bounds, typically in the range of 2-6 stellar radii, are applied to the Fermi pulsar population, and provide key information on the emission altitude in radio quiet pulsars that do not possess double-peaked pulse profiles.

Barnacka, A.,
J.-F. Glicenstein , and
Y. Moudden

Nicolaus Copernicus Astronomical Center in Warszawa and DSM/ IRFU, CEA/Saclay,

Oral

FIRST EVIDENCE OF A GRAVITATIONAL LENSING-INDUCED ECHO IN GAMMA RAYS WITH FERMI LAT

The distant quasar PKS 1830-211 is known to be lensed by a z=0.89 foreground galaxy, and it is split into radio in two images with an Einstein ring. Intrinsic flux variations of the quasar are seen in the two images with a time delay caused by the different optical paths in the two images. The multiple images of a gravitational lensed AGN cannot be directly observed with high energy gamma-ray instruments, owing to their limited angular resolutions, thus the observed light curve is the superposition of individual image light curves. Traditional methods for estimating time delays in gravitational lensing systems rely on the cross-correlation of the light curves from individual images. We used the 300 MeV - 30 GeV photons detected by the Fermi-LAT instrument. The long time series observed has allowed the time delay to be determined by the autocorrelation and "double power spectrum" methods. It is found to be 27.1 +/- 0.5 days, consistent with radio results. This shows the first evidence ever of gravitational lensing phenomena in high energy gamma-rays.

Bednarek, W.,
J. Pabich

University of Lodz

Poster
OtherGal S2.N2

GAMMA-RAYS AND NEUTRINOS FROM BINARY SYSTEM ETA CARINAE

We investigate different scenarios for the acceleration of particles (both electrons and hadrons) and production of high energy radiation in the model of stellar wind collisions within the binary system Eta Carinae. Our aim is to explain the gamma-ray observations and predict behaviour of the source at very high gamma-ray energies. We calculate the gamma-ray spectra in the case of the particle acceleration on both sides of the double shock structure and compare them with the observations of Eta Carinae. The neutrino spectra produced in hadronic models are confronted with the atmospheric neutrino background and sensitivity of 1 km^2 neutrino telescope.

Bednarek, W., W. Idec

University of Lodz

Oral

ON THE GAMMA-RAY EMISSION FROM THE CRAB NEBULA

The gamma-ray emission above 100 MeV from the direction of the Crab Nebula has been recently reported to vary on a time scale of a few days. We propose that such variable gamma-ray emission originate in the region behind the shock when the electrons can be accelerated as a result of the reconnection of the magnetic field compressed by the decelerating pulsar wind. The natural consequence of such interpretation is the prediction that the Crab Nebula gamma-ray spectrum produced by electrons as a result of the inverse Compton scattering of soft radiation to multi-TeV energies should also show synchronous variability on the time scales as observed at GeV energies by the AGILE and Fermi-LAT telescopes. We calculate how the end of the IC component of the Crab Nebula gamma-ray spectrum should look like during the quiescent and the flare GeV gamma-ray emission. We conclude that the variability of the multi-TeV gamma-ray spectrum from the Crab Nebula is expected on the lower level than observed in GeV energies.

Beilicke, M., Dowkontt, P., Garson, A., Guo, Q., Lee, K., Tueller, J., Krawczynski, H.

Washington University in St.Louis, Physics Department and McDonnell Center for the Space Sciences

Poster
Instr S2.N4

DESIGN AND TESTS OF THE HARD X-RAY POLARIMETER X-CALIBUR

X-ray polarimetry promises to give qualitatively new information about high-energy sources, such as binary black hole systems, rotation and accretion powered neutron stars, Microquasars, Active Galactic Nuclei and Gamma-Ray Bursts. Furthermore, hard X-ray polarimetric observations of galactic sources can place uniquely sensitive constrains on Lorentz Invariance violations. We designed, built and tested a hard X-ray polarimeter X-Calibur to be used in the focal plane of the InFOCuS grazing incidence hard X-ray telescope. The polarimeter combines a low-Z Compton scatterer with a high-Z Cadmium Zinc Telluride (CZT) detector assembly to measure the polarization of 10-80 keV X-rays. X-Calibur makes use of the fact that polarized photons Compton scatter preferentially perpendicular to the electric field orientation. In contrast to competing designs, which use only a small fraction of the incoming X-rays, X-Calibur achieves a high detection efficiency of order unity. We report on the technical design of X-Calibur, the X-Calibur and InFOCuS sensitivity on short and long duration balloon flights, and present detailed laboratory calibration measurements.

Beilicke, M., for the VERITAS Collaboration

Washington University in St.Louis, Physics Department and McDonnell Center for the Space Sciences

Oral

THE GALACTIC CENTER REGION IMAGED BY VERITAS

The galactic center (GC) has long been a region of interest for high-energy and very-high-energy (VHE) observations. Many potential sources of GeV/TeV gamma-ray emission are located in the GC region, e.g. the accretion of matter onto the black hole, cosmic rays from a near-by shell-type super nova remnant, or the annihilation of dark matter. The GC has been detected at MeV/GeV energies by EGRET and recently by Fermi/LAT. At TeV energies, the GC was detected at the level of 4 standard deviations with the Whipple 10 m telescope and with one order of magnitude better sensitivity with H.E.S.S.. We present the results from 15 hrs of VERITAS GC observations conducted at large-zenith angles, resulting in a >10 sigma detection. The sky map is shown and the combined Fermi/HESS and VERITAS results are compared to dark matter and astrophysical models.

Belfiore, A., den Hartog P., Dormody M., Parent D., Razzano M., Saz Parkinson P., Ziegler M., for the Fermi-LAT Collaboration

UCSC SCIPP - INAF IASF - University of Pavia

Oral

TIMING AND CHARACTERIZATION OF PULSAR GLITCHES WITH FERMI LAT

The LAT has detected almost 100 gamma-ray pulsars, many of which show an irregular timing behavior, with large timing noise and glitches. About a third of the pulsars detected by the LAT are not seen in radio, while others have very low radio flux, requiring the timing to be performed directly in gamma rays. The continuous coverage of the sky and the high sensitivity of the LAT allow for continuous monitoring of all LAT pulsars, including the timing and characterisation of the glitches. The peculiarities of the gamma-ray band, like the discreteness of the signal and the relatively broad PSF, make all timing operations challenging and interesting. Updated results about all of the glitches detected by the LAT will be presented. In addition to the timing, the variability of the pulsar emission across the glitches will be addressed. An analysis of the capabilities of the LAT to detect glitches will also be discussed.

Berger, K., Paneque, D., Giavitto, G., Takala, L., Lindfors, E., Stamerra, A., on behalf of the MAGIC Collaboration

Instituto de Astrofisica de Canarias & Universidad de La Laguna

Poster
AGN S1.N7

EXPLORING THE VERY HIGH ENERGY GAMMA-RAY EMISSION (E>100GEV) OF THE HARD SPECTRUM FERMI SOURCES 1FGL J2001.1+4351 AND B3-2247+381 WITH MAGIC

MAGIC, a stereoscopic cherenkov telescope array, sensitive to gamma-rays between 50 GeV and several tens of TeV, is ideally suited to observe promising Fermi LAT sources with a hard gamma-ray spectrum. Here we discuss the discovery of very high energy gamma-ray (E > 100 GeV) emission from the Fermi LAT sources 1FGL J2001.1+4351 and B3-2247+381 with MAGIC. 1FGL J2001.1+4351, recently identified as MG4 J200112+4352 (Bassani et al. 2010), is most likely a high peaked BL Lacertae object. The red shift of this source is still unknown, though the identification of the optical host galaxy suggests z<0.2. MAGIC observations indicate short term variability, since the source showed a strong emission of 20% of the Crab Nebula flux above 90 GeV during the 16th of July 2010 and none of the other observation nights yielded a detection. B3-2247+381 is classified as a BL Lac object at z = 0.1187 (Veron-Cetty & Veron Catalogue of known AGN). In July 2010 it showed increased optical activity in the Tuorla blazar monitoring program, which subsequently activated target of opportunity observations by MAGIC. Within 18 hours of observation time extended over 13 days between September and October 2010, a strong signal was found above an energy threshold of 150 GeV. The flux (4% of the Crab Nebula) is consistent with being constant over the entire observation campaign. We compute the light curves, model the spectral energy distributions of these new very high energy gamma-ray emitters and discuss the physical properties of the very high energy gamma-ray emission region.

Berger, K., Lindfors, E., Tavecchio, F., Becerra Gonzales, J., Bonnoli, G., Maraschi, L., Dominguez, A., Stamerra, A., on behalf of the MAGIC Collaboration

Instituto de Astrofisica de Canarias & Universidad de La Laguna

Poster
AGN S1.N8

REVIEW OF CANONICAL SCENARIOS OF GAMMA-RAY JET EMISSION FROM RECENT HE-VHE OBSERVATIONS OF 3C279 WITH MAGIC

In 2006 the stand-alone MAGIC-I telescope discovered very high energy gamma-ray emission from 3C279. Additional observations were triggered when the source entered an exceptionally bright optical state in January 2007 and the Fermi space telescope measured a bright GeV gamma-ray flare in December 2008 until April 2009. While the complete January 2007 dataset does not show a significant signal, a short flare (of one day duration) has been detected on January 16th with a significance of 5.3 sigma (trial-corrected). The flux corresponds to F(> 150 GeV) (3.8 \pm 0.8) \cdot 10^-11 ph cm^-2 s^-1. The December 2008 - April 2009 observations did not detect the source. We collected quasi-simultaneous data at optical and X-ray frequencies and for 2009 also gamma-ray data from Fermi, which we use to determine the spectral energy distributions and the light curves. The hard gamma-ray spectrum is a challenge for standard one-zone models, which are based on relativistic electrons in a jet scattering broad line region photons. We study additionally a two zone model and a lepto-hadronic model, which fit the observed spectral energy distribution more satisfactorily.

Bhattacharya, D., M. Boettcher, P. Coppi, M. Errando, R. Mukherjee, P. Sreekumar

Indian Institute of Science, Bangalore, India

Poster
AGN S1.N9

RADIO LOUD AGN CONTRIBUTION TO THE EXTRAGALACTIC GAMMA-RAY BACKGROUND (EGRB)

The origin of extragalactic gamma-ray background (EGRB) detected by Fermi remains poorly understood even today. Unresolved point sources are potential contributors to this emission. Since most of the identified sources in the Fermi Catalog are blazars, a significant contribution to the EGRB could come from unresolved blazars. In addition, Fermi has now detected several radio galaxies. According to the unification scenario, radio galaxies can be considered as misaligned blazars. Though jet emission falls rapidly with increasing jet inclination angle, considering the larger population of misaligned blazars compared to nearly-aligned ones, these sources are expected to contribute significantly to EGRB. We analyzed Fermi data to date on radio galaxies and modeled it to derive jet parameters. We derive the dependency of jet luminosity on inclination angle. Incorporating these, we present the calculated contribution of radio loud AGN (aligned and misaligned) to the extragalactic diffuse emission.

Bissaldi, E.

Institute of Astro and Particle Physics, University Innsbruck

Oral

BRIGHT HIGH-ENERGY GRBS DETECTED WITH THE GAMMA RAY BURST MONITOR ON FERMI

We present the analysis of a sample of 50 bright Gamma-Ray Bursts detected up to more than 1 MeV, which were collected during the first year of Fermi GBM operations. For each burst, time-integrated burst spectra are fitted with different models. We also explore in detail the evolution of GRB duration with energy across a large energy range (10 keV - 10 MeV) for the first time. The temporal and spectral parameter distributions are presented and discussed in the framework of earlier results.

Blanchet, S.

Universidad Autonoma Madrid

Poster
DMNP S1.N2

SENSITIVITY OF FERMI-LAT TO DARK MATTER WITH THE ISOTROPIC DIFFUSE GAMMA-RAY BACKGROUND

We study the ultimate sensitivity of Fermi-LAT to photons from dark matter annihilation or decay, focussing on the isotropic diffuse gamma-ray component. We show that the possible resolution of a large number of blazars making up this component can improve the current bounds by a factor 2-3, making it a prime target for dark matter indirect detection.

Bloom, E. D., Yvonne Edmonds on behalf of the Fermi LAT collaboration

KIPAC-SLAC, Stanford University

Poster
Instr S2.N5

COMPARING THE CURRENT PUBLIC DATA CLEAN DATA TO A FUTURE FERMI RELEASE, PASS7V6 DIFFUSE, FOR THE INCLUSIVE PHOTON SPECTRUM USED IN THE 2 YEAR LINE SEA

In performing the gamma line search for two years of Fermi LAT data we not only doubled the data sample, we also lowered the energy of the search to 4.8 GeV from 20 GeV compared to the previously published results of 2010. In both the published and latest searches, which used currently public data (P6V3) variants, the use of the standard publicly released gamma energy measure, was shown to be problematic and so the profile energy was used (not publically available). The profile energy uses a gamma shower model with cylindrical symmetry via a fit to the gamma shower data in the LAT event to determine the energy of the gamma in that event. Why we chose to use only the profile energy for the line analysis will be discussed in this paper. Also, for energies below ~10 GeV P6V3 Fermi data was shown to have instrument response induced variations that are not well reproduced in the Fermi Collaboration Monte Carlo. These variations produce a photon line like structure at about 6.5 GeV that is clearly a systematic effect as shown by comparison with control samples. By removing certain P6V3 data cuts on the original line analysis data sample that are used to improve the LAT PSF (not required for the line analysis) the apparent line is greatly reduced. Soon to be released by the Fermi LAT Collaboration, the P7V6 data release greatly moderates most of these instrument response distortions, and also uses a gamma energy measure that is well behaved for line searches. We show a reanalysis of the line search using this new data release (P7V6) that indicates it has much smaller systematic errors on local line like instrument response variations, and does not show the line like structures in gamma energy that appear at many energies for the currently public data (P6V3) from 4.8 GeV to 264 GeV.

Bloom, E. D., Yvonne Edmonds, Reuven Essig on behalf of the Fermi LAT collaboration

KIPAC-SLAC, Stanford University

Oral

A SEARCH FOR SPECTRAL LINES FROM WIMP ANNIHILATION IN THE MILKY WAY USING THE FERMI LARGE AREA TELESCOPE

The most popular class of dark matter candidates is the class of weakly-interacting massive particles (WIMPs). The Fermi Large Area Telescope (Fermi-LAT) has the possibility of indirectly detecting WIMPs by the flux from their annihilation/decay products. When a WIMP annihilates or decays directly into a photon and another particle Y (g-neutrino, gg, gZ, gH0...) the photons are expected to be monochromatic. Detection of the resulting spectral line(s) would provide convincing evidence for particulate dark matter and could provide the WIMP mass within the Fermi error on the energy. In the case of no detection, knowledge of the dark matter distribution can be used to place limits on the annihilation cross section (_Yg) and lifetime (tau_Yg) for the WIMP(s) to Yg channel. In this paper we present the inclusive spectrum from 4.8 to 264 GeV, and the spectral line upper limits obtained from this spectrum from 7 to 200 GeV for two years of LAT data. The spatial region of the dataset covers a large portion of the sky, the high latitudes (|b|>10°) plus a 20°×20° square at the Galactic Center. We use the P6V3 dataclean IRFs and find cut related structures below ~10 GeV. Systematic errors are discussed. We report upper limits on the WIMP cross sections for annihilation to gg and Zg and lower limits on the WIMP lifetime for decay to neutrino-g. We compare the inclusive spectrum and line flux limits to several dark matter models with optimistic branching ratios to photon channels.

Bongiorno, S.D., S.D., Falcone, A.D., Stroh, M., Gehrels, N., Grube, J., Hinton, J., Holder, J., Skilton, J.

Penn State University

Poster
OtherGal S2.N3

DETECTION OF PERIODIC X-RAY FLUX MODULATION IN THE UNIDENTIFIED TEV GAMMA-RAY SOURCE HESS J0632+057 WITH SWIFT: A LIKELY NEW TEV BINARY

HESS J0632+057 is a variable, point-like source of Very High Energy gamma-rays located in the galactic plane. It is positionally coincident with a Be star, it is a variable radio and X-ray source, has a hard X-ray spectrum, and low radio flux. These properties imply that the object may be a member of the rare class of TeV/X-ray binary systems. The definitive confirmation of this would be the detection of a periodic orbital modulation of the flux. We have obtained Swift X-ray telescope observations of the source from MJD 54857 to 55641 to test the hypothesis that HESS J0632+057 is an X-ray/TeV binary. We show that these data exhibit flux modulation with a period of 320 pm 5 days and we evaluate the significance of this period by calculating the null hypothesis probability in the case of both white noise and stochastic flaring. This periodicity establishes the likely binary nature of HESS J0632+057.

Bottacini, E.

Stanford University

Poster
AGN S1.N10

PKS 0537-286, CARRYING THE INFORMATION OF THE ENVIRONMENT OF SMBHS IN THE EARLY UNIVERSE

High-redshift blazars are important tracers of the evolution of super massive black holes (SMBH) in the early Universe. Their spectra carry the information about the accretion and the circum-nuclear environment, hence on the evolution of the environment of SMBHs over cosmic time. A general characteristic of radio-loud quasars at high-redshift is an apparent absorption in excess to the Galactic value. The nature of this X-ray spectral feature is still controversial. PKS 0537-286, at z = 3.104, is one of the most luminous known high-redshift blazars. An INTEGRAL-ISGRI detection triggered a simultaneous multifrequency campaign over 5 epochs (from 2006 to 2008) ranging from near-IR frequencies to gamma-ray energies. This allows us to study the overall spectral energy distribution (SED) of the source and its variability over the observation epochs and to infer the parameters associated to the source. Our precisely sampled SEDs allow to put constrains on the origin of the excess absorption and the hard spectral index of the X-ray spectra.

Bottacini, E.

Stanford University

Poster
AGN S1.N11

THE TRANSITION BETWEEN THE SYNCHROTRON AND INVERSE-COMPTON SPECTRAL COMPONENTS OF 1ES 1959+650

1ES 1959+650 is one of the most remarkable high-peaked BL Lacertae objects (HBL). In 2002 it exhibited a TeV gamma–ray flare without a similar brightening of the synchrotron component at lower energies. Models trying to explain this flare suffer from rather extreme energy requirements. This "orphan" TeV-flare remained a mystery. I present the results of a multifrequency campaign on 1ES 1959+650, that pivots around the first and only detection by INTEGRAL-ISGRI. The data range from the optical to hard X-ray energies, thus covering the synchrotron and inverse-Compton components simultaneously. The source is observed with INTEGRAL, Swift/XRT, and UV-Optical Telescope, and nearly simultaneously with ground-based optical telescope. This is the first clear measurement of a concave X-ray – soft gamma-ray spectrum for an HBL. The results are discussed in the view of the overall SED requiring an unusual very hard electron spectral index.

Bottacini, E., Ajello Marco

Stanford University

Poster
AGN S1.N12

THE COMBINED SWIFT-INTEGRAL HARD X-RAY (SIX) SURVEY

Swift/BAT and INTEGRAL-ISGRI are detecting hundreds of AGN at energies >15 keV. However, the low-redshift and low-luminosity AGN are sparsely sampled due to the lack in sensitivity of the current flying hard X-ray instruments. The most absorbed AGN are therefore escaping the detection and the AGN population in the local Universe is so far poorly understood. The SIX survey allows to overcome these limits. This survey is obtained merging the sky observed by Swift/BAT and by INTEGRAL-ISGRI for selected extragalactic sky areas . By sampling fluxes of the order of 10^(-12) erg cm^-2 s^-1, the SIX survey is able to detect the weak radiation piercing through the absorbing matter surrounding the AGN. In the SIX survey we detect 130 sources over a limited sky area. We compare our updated sample of Seyferts and blazars to predictions of population synthesis models, discussing their evolution and their circum-nuclear environment. The impact of the SIX survey to current flying and future missions is discussed as well.

Bouchet, L., Strong, A., Porter, T., Moskalenko, I., Jourdain, E., Roques, J. P., Diehl, R.

IRAP, UPS/CNRS, Toulouse, France

Oral

HARD X-RAY/SOFT GAMMA-RAY OBSERVATIONS OF THE GALACTIC DIFFUSE EMISSION WITH INTEGRAL/SPI

The spectrometer SPI, onboard the INTEGRAL observatory, gives us a unique opportunity to study the hard X-ray/soft gamma-ray diffuse emission. Based on a total observation time of ~10^8 s performed in more than 6 years of operation, we have measured a detailed ridge spectrum and constrained the spatial distribution of the emission from 20 keV to 2.5 MeV. The interstellar part of the ridge emission can be explained by inverse-Compton scattering from relativistic electrons on the cosmic microwave background and the Galactic infrared/optical radiation fields. The spectrum and its spatial distribution is compared with predictions from GALPROP modelling. We show also the potential of SPI data for determining the electron spectrum at low GeV energy where the solar modulation makes any direct measures of the electron spectrum difficult to interpret.

Brandt, T. J., on behalf of the Fermi-LAT collaboration

IRAP

Poster
SNR/PWNe S2.N4

SUPERNOVA REMNANTS IN THE FERMI-LAT ERA - THE CASE OF CTB 37A

The association with Supernova Remnants (SNRs) of over 7 sources observed by the Fermi-LAT telescope has permitted an exploration of populations and emission mechanisms not previously available for these objects. Studies such as that of SNR CTB 37A, combined with multiwavelength observations, have permitted us to constrain, among other things, particle populations and environmental conditions, such as the magnetic field strength. Hadrons likely dominate the GeV emission from CTB 37A, as for many Fermi-LAT SNRs. We have bounded the magnetic field strength to better than an order of magnitude below its previous value, within the constraints of our model. For the first time for this source, we also provide the minimum magnetic field strength necessary to self-consistently produce the multiwavelength emission. By assembling populations of SNRs such as those coincident with radio emission or molecular clouds, we will be able to better understand SNRs both as objects and as objects influencing their surroundings. This improved understanding will provide in particular an important clue to the possibility of SNRs as the origin of galactic cosmic rays.

Bregeon, J.,
Toma, K.

Istituto Nazionale di Fisica Nucleare, Sez. di Pisa

Poster
GRB S2.N2

DETECTION OF A SPECTRAL BREAK IN THE EXTRA-HARD COMPONENT OF GRB 090926A

We report on the observation of the bright, long gamma-ray burst, GRB~090926A, by the Gamma-ray Burst Monitor (GBM) and Large Area Telescope (LAT) instruments on board the \Fermi\ Gamma-ray Space Telescope.GRB~090926A clearly shows a short spike in the light curve that is present in all detectors that see the burst,suggesting that there is a common region of emission across the entire Fermi energy range. In addition, we report here for the first time the detection with good significance of a high-energy spectral break (or cutoff) in the extra power-law component around 1.4~GeV in the time-integrated spectrum. If the spectral break is caused by opacity to electron-positron pair production within the source, then this observation allows us to compute the bulk Lorentz factor for the outflow, rather than a lower limit.

Bregeon, J.,
Charles, E., Monzani, M.E.

Istituto Nazionale di Fisica Nucleare, Sez. di Pisa

Poster
Instr S2.N6

CALIBRATION FLIGHT DATA SETS FOR THE FERMI LAT DATA ANALYSIS

From its conception to high level source analysis, the Fermi-LAT has relied heavily, and almost exclusively, on Monte-Carlo simulations. The high quality data produced since the first light sky map taken one month after launch validated this choice. However, the two and a half years of flight data should now help us to understand better the instrument response over the entire phase space. Many specific calibration data sets may be extracted from the huge amount of data sent to ground, and may be used to constrain systematic uncertainties, validate Monte-Carlo simulations and develop a new better low-level event reconstruction. This poster reports about the calibration data sets used within the LAT collaboration and gives an overview about the methodology developed to use them. We encourage scientists both within and outside the LAT collaboration to use or reproduce our calibrations data sets to better constrain the systematic uncertainties specific to their favourite analysis.

Brigida, M.,
N.Giglietto

Bari University

Poster
SolarSystem S2.N1

LUNAR GAMMA RAY EMISSION AS SEEN BY FERMI

We report the Fermi-LAT observations of the lunar emission during the extended period of low solar activity. During this period the CR-induced emission was the brightest. While the Moon was detected by the EGRET instrument on the CGRO with low statistics, Fermi is the only gamma-ray mission capable of detecting the Moon and monitoring it over the full 24th solar cycle. We present the gamma-ray images of the Moon, its spectrum, and flux measurements in comparison with models and previous EGRET results.

Browne, I. W. A.,
Jenny Gupta

University of Manchester

Poster
AGN S1.N13

FERMI AND THE SEQUENCE

The Fermi LAT survey provides, for the first time, a large sample of blazars selected on the strength of their inverse Compton emission. Using the 8.4~GHz flux densities of their compact radio cores as a proxy for their jet power, we calculate their Compton Efficiency parameters; i.e. measures of the ability of jets to convert power in the form of ultra-relativistic electrons into Compton gamma-rays. We compare the Compton efficiencies of BL Lacs and FSRQs and discuss these results in terms of the relative importance of internal and external scattering photons. We find no clear differences in Compton efficiencies between BL Lac objects and FSRQs. Within the FSRQ population itself Compton efficiency does not correlate with optical luminosity. We also consider the results in the context of the Blazar Sequence.

**Brun, F.,
de Naurois, M.,
Hofmann, W., Carrigan, S., Djannati-Ataï, A., Ohm, S.**

Laboratoire Leprince-Ringuet, Ecole Polytechnique, CNRS/IN2P3, Palaiseau, France

**Poster
SNR/PWNe S2.N5**

DISCOVERY OF VHE GAMMA-RAY EMISSION FROM THE W49 REGION WITH H.E.S.S.

The W49 region is a prime target for ground-based Cherenkov imaging telescopes such as H.E.S.S. since it hosts a star forming region (W49A) and a supernova remnant interacting with molecular clouds (W49B). The 10^6 M_{\odot} Giant Molecular Cloud W49A is one of the most luminous giant radio H {\sc ii} regions in our Galaxy and hosts several active, high-mass star formation sites. The mixed-morphology supernova remnant W49B has one of the highest radio surface brightness of all the SNRs of this class in our Galaxy and is one of the brightest ejecta-dominated SNRs in X-rays. Infrared observations evidenced that W49B is interacting with molecular clouds and Fermi recently reported the detection of a coincident bright, high-energy gamma-ray source. Observations by the H.E.S.S. telescope array resulted in the significant detection of VHE gamma-ray emission from the W49 region, compatible with gamma-ray emission from the SNR W49B. The results, the morphology and the origin of the VHE gamma-ray emission will be presented in the multi-wavelength context and the implications on the origin of the signal will be discussed.

**Buehler, R.,
M. Ajello, A. Allafort, S. Funk for the LAT collaboration**

SLAC/KIPC

**Poster
Instr S2.N7**

FERMI ALL-SKY VARIABILITY ANALYSIS

After more than two years of Fermi-LAT observations the average gamma-ray flux from every point in the sky has been measured with good accuracy. Our All-sky Variability Analysis (FAVA) searches for flux variations from the average value at every position in the sky, providing light curves and statistical significance of the relative flux variation for each position. The main strength of this approach of measuring source variability by comparing to the average flux expectation is its independence from the Galactic diffuse model. FAVA is therefore specially suited to detect transients in the Galactic plane. Additionally, it allows a uniform characterization of the variability of the Fermi-LAT sky.

**Buehler, R.,
Roger Blandford, Stefan Funk for the LAT collaboration**

SLAC/KIPAC

Oral

GAMMA-RAY FLARES FROM THE CRAB NEBULA

We report two gamma-ray (photon energy >100 MeV) flares from the Crab Nebula detected by the Large Area Telescope on board the Fermi Gamma-ray Space Telescope. The first flare occurred in February 2009 and lasted approximately sixteen days. The second flare was detected in September 2010 and lasted approximately four days. During these two outbursts the gamma-ray flux from the nebula increased by factors of four and six, respectively. The brevity of the flares implies that the gamma rays are emitted via synchrotron radiation from PeV electrons in a small region in the inner nebula, and this poses special challenges to particle acceleration theory.

**Bulgarelli, A.,
on behalf of the AGILE Team**

INAF/IASF Section of Bologna (Italy)

**Poster
Catalog S1.N1**

THE SECOND AGILE CATALOG OF GAMMA-RAY SOURCES

We present a preliminary overview of the Second AGILE Catalog of Gamma-Ray sources. AGILE detects hundreds of high-significance sources both a high and low Galactic latitudes. We focus in particular on the correspondence between the sources detected by AGILE vs. those detected by Fermi-LAT. A class of AGILE-only sources is identified.

Burgess, M., Rob Preece, Matthew Baring and the Fermi GBM team

The University of Alabama in Huntsville

Oral

FITTING GBM GAMMA-RAY BURST SPECTRA WITH PHYSICAL EMISSION MODELS

Model comparisons of gamma-ray burst (GRB) prompt emission via spectral analysis have historically relied on extrapolations of fit values from empirical fitting functions. The most ubiquitous of these functions is Band's GRB function with low and high energy power-law indices that have been used to infer properties of the environs and various emission mechanisms in the GRB prompt emission. However, when many of these models predict similar power-law indices it becomes difficult to discern between them through extrapolation alone. To break this degeneracy we have implemented the popular synchrotron emission model into the forward-folding spectral analysis software, RMFIT. We have used this physical model, both for uncooled and cooled synchrotron scenarios, and thermal and non-thermal populations, to fit GBM burst spectra directly and constrain their parameter values. The fits include backbody components that model photospheric emission contributions. We detail our method and present preliminary fits to a sample of GRB prompt emission spectra, demonstrating that non-thermal contributions to synchrotron signals often dominate. It is also found that few GRB spectra in our sample can be modeled with cooled non-thermal synchrotron scenarios.

Cameron, R. A., Thayer, J. B., Thayer, J.G.

KIPAC/SLAC

Poster
Instr S2.N8

ON-ORBIT OPERATION AND PERFORMANCE OF THE LAT IN THE FIRST 3 YEARS

The Fermi Large Area Telescope has been operating in orbit almost continuously since its initial turn-on on 24 June 2008. We describe some key events in the operation of the LAT since its activation on orbit, and describe the related status and performance of the ground-based control, monitoring and data processing for the LAT at the Instrument Science Operations Center (ISOC) at the SLAC National Accelerator Laboratory. We also summarize the performance of the LAT sub-systems over almost 3 years in orbit.

Canadas, B., A.Morselli, V.Vitale and the Inner Galaxy group

INFN - Roma Tor Vergata

Poster
DMNP S1.N3

UNCERTAINTIES IN THE STUDY OF THE INNER GALAXY WITH FERMI DATA

The inner region of the Milky Way Galaxy is one of the most interesting and complicated regions of the gamma ray sky because of the many point sources and potential confusion, the uncertainties associated with the diffuse gamma-ray emission, together with the potential for dark matter detection. In this poster, we report on the Fermi LAT team analysis of a 10 degree region around the direction of the galactic center using over 2 years of data and we will discuss the technical aspects of the proposed Fermi's view of the Inner Galaxy talk.

Caprioli, D.

INAF - Osservatorio Astrofisico di Arcetri, Firenze

Poster
SNR/PWNe S2.N6

UNDERSTANDING HADRONIC GAMMA-RAY EMISSION FROM SUPERNOVA REMNANTS

We aim to test the plausibility of a theoretical framework in which the gamma-ray emission detected from supernova remnants may be of hadronic origin, i.e., due to the decay of neutral pions produced in nuclear collisions involving relativistic nuclei. In particular, we investigate how the nature of the circumstellar medium affects the evolution of a remnant and of its gamma-ray emission, stressing the role of magnetic field amplification in the prediction of expected particle spectra. A phenomenological scenario consistent with both the underlying Physics and the larger and larger amount of observational data provided by the present generation of gamma experiments is finally outlined and critically discussed.

Carosi, A.,
on behalf of the MAGIC collaboration

INAF - ASDC

Poster
GRB S2.N3

MAGIC GRB OBSERVATIONS

The new generation of Cherenkov observatories and in particular the MAGIC telescopes are opening the possibility to fill the energy gap between space-based gamma-ray detectors and ground-based measurements. This new scenario is particularly promising for GRB science since recent Fermi results have shown that the comprehension of GRB physics is still unsatisfactory. Both leptonic and hadronic processes have been suggested to be responsible for GeV counterpart observed in some events. The detection of a component at very high energy (>80-100 GeV) would play a key role in discriminating among different proposed emission mechanisms which are barely distinguishable at lower energies. We report some results of the MAGIC telescopes at energies above about 50 GeV to evaluate the perspective for afterglow observations with ground based GeV/TeV telescopes. Although we could not yet set firm constraints on the main theoretical scenarios, our results clearly show that the MAGIC telescopes have already reached the required sensitivity to detect GeV/TeV emission from GRBs at moderate redshift ($z<2$).

Casandjian, J.-M.,
on behalf of the Fermi LAT collaboration

Service d'Astrophysique, CEA Saclay

Invited

GALACTIC DIFFUSE EMISSION: MODELS AND INTERPRETATION

Most of the photons detected by the LAT at GeV energies originate from the interstellar processes in the Galaxy during which cosmic-ray electrons and protons interact with the interstellar medium and radiation field. The LAT, with its large effective area and field of view as well as its survey-mode observation strategy and stable response, is particularly well suited for studying this emission and for providing information on the cosmic rays and the distribution of gas and radiation in the Milky Way. We provide an overview of the methods used by the Fermi collaboration to model the Galactic diffuse emission and of the derived information on the interstellar medium and cosmic ray propagation.

Casanova, S.

Ruhr Universitaet Bochum

Poster
Diffuse S1.N1

DIFFUSE GAMMA RAY EMISSION FROM MOLECULAR CLOUDS

Cosmic rays up to at least PeV are believed to be emitted by Galactic sources, such as supernova remnants. However, no conclusive evidence of their acceleration has been found yet. A trace of ongoing cosmic ray acceleration is the gamma-ray emission produced by these highly energetic particles when they scatter off the interstellar medium gas, mainly atomic and molecular hydrogen. Whereas the atomic hydrogen is uniformly distributed in the Galaxy, the molecular hydrogen is usually aggregated in dense clouds, and the gamma-ray emission from such clouds is particularly intense and localised. A multi-frequency approach, which combines the data from the upcoming and future gamma-ray missions with the data from the submillimeter and milli-meter surveys of the molecular hydrogen, is therefore crucial to probe the Galactic cosmic ray flux. In order to fully exploit this multi-frequency approach, one needs to develop predictions of the expected emission. We will here discuss the GeV to TeV emission from runaway CRs penetrating molecular clouds close to the young supernova remnant RX~J1713-3946 and in molecular clouds illuminated by the background cosmic ray flux.

Case, G. L., Cherry, M. L.; Baldridge, S.; Wilson-Hodge, C. A.; Camero-Arranz, A.; Chaplin, V.;Jenke, P.

Louisiana State University

Poster
OtherGal S2.N4

GBM MONITORING OF CYG X-1 DURING THE RECENT STATE TRANSITION

Cygnus X-1 is a high-mass x-ray binary with a black hole compact object. It is normally extremely bright in hard x-rays and low energy gamma rays and resides in the canonical hard spectral state. Recently, however, Cyg X-1 made a transition to the canonical soft state, with a rise in the soft x-ray flux and a decrease in the flux in the hard x-ray and low energy gamma-ray energy bands. We have been using the Gamma-Ray Burst Monitor on Fermi to monitor the fluxes of a number of sources in the 8-1000 keV energy range, including Cyg X-1. We present light curves showing the decrease in the hard x-ray and low energy gamma-ray energy range during the state transition as well as the several broad flares observed in these higher energies during the soft state. We also present preliminary spectra based on GBM, as well as other instruments, for the pre-transition state, showing the spectral evolution to the soft state, and the post-transition state. The implication of these results on the physical processes responsible for the hard x-ray and low energy gamma-ray emission will be discussed.

Castro, D., Slane, P.

Harvard-Smithsonian Center for Astrophysics

Poster
SNR/PWNe S2.N7

SUPERNOVA REMNANTS INTERACTING WITH MOLECULAR CLOUDS: NEW OBSERVATIONS WITH THE FERMI-LAT

Supernova remnant (SNR) shocks are expected to be sites of cosmic rays acceleration, and clouds of dense material can provide effective targets for production of gamma-rays from pion decay. MSH 17-39, G337.0-0.1 and G9.7-0.0 are supernova remnants known to be interacting with molecular clouds, as evidenced by observations of hydroxyl (OH) maser emission at 1720 MHz in their directions. The radio and X-ray emission of SNR W41 is coincident with the TeV source HESS J1834-087, and the remnant been associated with a giant molecular cloud detected using CO observations. We report on a study of the gamma-ray emission coincident with these supernova remnants using data from the Large Area Telescope on board the Fermi Gamma-ray Space Telescope. Detailed spatial and spectral analysis of the Fermi LAT observations in the regions of these SNRs provides constraints on the origin of the gamma-ray emission.

Cavadini, M., Salvaterra, R., Haardt F.

Insubria University

Poster
Diffuse S1.N2

A NEW MODEL FOR THE EXTRAGALACTIC GAMMA-RAY BACKGROUND

We study the Extragalactic Gamma-Ray Background (EGRB) in the 0.1-100 GeV range as measured by $\Fermi$ telescope. We proposed that EGRB can be explained as the sum of three components: AGNs, star-forming galaxies and blazars. The AGNs fully account for the EGRB in the low ($<$0.1 GeV) energy range, whereas blazars dominate at energy $>$ 5 GeV. Cosmic rays from star-forming galaxies are needed to fully explain the EGRB at intermediate energies. In this contenxt we discuss the possible contribution of decaying dark matter to the EGRB.

Cavazzuti, E., on behalf of the LAT collaboration

Italian Space Agency

Poster
AGN S1.N14

THE SECOND AGN CATALOGUE OF THE LARGE AREA TELESCOPE

We present the second Catalog of AGN detected by the LAT, corresponding to 24 months of data. Various properties, such as gamma-ray fluxes, photon power-law spectral indices, redshifts, gamma-ray luminosities, variability and their correlations are presented and discussed for the different blazar classes. We compare 2LAC with previous LAT Catalogs as 1LAC and 1FGL and with Catalogs from instruments at other frequencies, such as AGILE and TeV. Furthermore we present non-blazar objects detected in these first 2 years of operative mission.

Cavazzuti, E., on behalf of the LAT collaboration

Italian Space Agency

invited

FERMI-LAT BLAZARS IN THE FIRST 2 YEARS OF SCIENTIFIC OPERATIONS

What have we learned about blazars after the first 2 years of Fermi-LAT science operations? Before launch, we thought we had a basic understanding of the main processes underlying these objects, and hoped to put some constraints on a few possible interpretations. However, having now spent two years probing the many different behaviors exhibited by these sources, we realize that we understand them much less than previously thought. I will review main results from the first two years, trying to identify what we should look for within the next few years to improve our knowledge.

Celik, O., Tyrel Johnson

NASA-Goddard Space Flight Center / CRESST-UMBC

Poster
PSR S2.N2

POPULATION OF GAMMA-RAY MILLISECOND PULSARS DETECTED WITH FERMI LAT

Two years of observations with the Fermi Large Area Telescope (LAT) have revolutionized pulsar research with detection of a high number of gamma-ray pulsars, including detections of millisecond pulsars (MSPs) as a new sub-class. The discovery of 31 new radio MSPs following the unassociated Fermi gamma-ray sources has increased the number of known field MSPs by approximately one third. Using the radio timing solutions for these new MSPs and for the previously known MSPs, pulsations from 27 MSPs were detected significantly in gamma-rays for the first time with Fermi LAT. With this large number of gamma-ray MSPs, it is now possible to study their gamma-ray properties as a population. We will present some results of this study, focusing on the observed spectral properties of the MSPs as a new sub-class of pulsars and comparing them to the established trends of young pulsars.

Chang, C. S., Ros, E., Kadler, M. et al.

Institut de Radioastronomie Millimétrique, France

Poster
AGN S1.N15

THE CONNECTIONS BETWEEN THE BROADBAND SED AND THE VLBI PROPERTIES OF THE MOJAVE SAMPLE

To investigate the relationship between broadband SED properties (e.g., SED peak positions) and the VLBI properties (e.g., apparent speed, Doppler factor, Lorentz factor) of blazars, we constructed SEDs for the members of the MOJAVE sample, a radio-selected,statistically-complete sample containing 135 radio-loud sources (101 quasars, 22 BL Lac objects, 8 radio galaxies, and 4 unidentified AGN).We applied polynomial fits to the double-hump profile of each of the MOJAVE SEDs, and derived the SED peak positions. We compared SED properties with the VLBI properties, as well as with the X-ray properties of the MOJAVE sample, by dividing the sample into differentcategories of AGN. We find hints for a connection between the apparent jet speed and the peak frequency of the higher-energy hump, which implies that AGN with faster jets tend to upscatter photons to higher energies. We will present our findings and discuss potential correlations between the parameters observed in our sample.

Charles, E., Ackermann M., Bruel P., Buehler R., Johnson T., Rando R. on behalf of the Fermi-LAT collaboration

SLAC

Poster
Instr S2.N9

VALIDATION AND CALIBRATION OF THE LARGE AREA TELESCOPE EFFECTIVE AREA USING TWO YEARS OF FLIGHT DATA

After two years of observations the LAT flight data set itself is by far the best source of calibration data available. The LAT team has used a variety of techniques and calibration sources to derive in-flight calibrations of the LAT effective area. In particular, we have used phase-gated selections of photons from bright pulsars, as well as other bright sources such as AGNs, the Earth's Limb, and the Galactic plane to show that the efficiency of our photons selections on flight data closely matches the efficiencies we derived from detailed Monte Carlo simulations of photon interactions with the LAT. In the few cases where we found significant disagreement between simulations and flight data we quantified the discrepancies and used them to derive corrected effective area tables.

Charles, E., Rando R. on behalf of the Fermi-LAT Collaboration

SLAC

Oral

VALIDATION AND CALIBRATION OF THE FERMI LARGE AREA TELESCOPE INSTRUMENT PERFORMANCE

We describe the Fermi LAT instrument performance, both for the event selection developed just before launch (pass 6), as well as for an updated event selection (pass 7) the LAT team developed in light of experience gained from on-orbit observations. Furthermore, we will describe both the Instrument Response Functions (IRFs) derived solely from Monte Carlo simulations of photon interaction with the LAT as well as corrections to those IRFs which were motivated by discrepancies we observed between flight and simulated data. We also give details of the numerous validations we have preformed using flight data and quantify the residual uncertainties in the IRFs. Finally, we describe some techniques the LAT team has developed to propagate those uncertainties into estimates of the systematic errors on high level science measurements such as fluxes and spectral indices.

Chen, A. W., on behalf of the AGILE Galactic Sources Working Group

INAF - IASF Milano

Poster
PSR S2.N3

AGILE STUDIES OF THE GAMMA-CYGNI SOURCE

We present long-term AGILE observations of 1AGLJ2022+4032, a gamma-ray source coincident with Fermi-LAT pulsar J2021+4026. Taking into account observations prior to the launch of Fermi, we show evidence for flux variability greater than the level predicted from statistical and systematic effects. Variable emission may be due to the superposition of two or more point sources, including both the gamma-ray pulsar which provides the bulk of the emission, and either an X-ray quiet microquasar or a pulsar wind nebula.

Cherry, M.L., S. Baldridge, G.L. Case, J. Rodi, C. Camero-Arranz, V. Chaplin, P. Jenke, C. Wilson-Hodge

Louisiana State University

Poster
OtherGal S2.N5

EARTH OCCULTATION MONITORING OF THE HARD X-RAY/LOW-ENERGY GAMMA-RAY SKY WITH GBM

The hard X-ray/low-energy gamma ray sky is highly variable, and therefore it is important to have an all-sky monitor observing in this energy regime. By utilizing the Earth occultation technique (EOT), the Gamma-Ray Burst Monitor (GBM) instrument aboard Fermi can be used to make nearly continuous measurements in the 8-1000 keV energy range. The GBM EOT analysis program currently monitors an input Catalog containing ~95 sources. We will present the GBM Catalog of sources observed in the first ~2.5 years of the EOT monitoring program, with special emphasis on the high energy (>100 keV) and transient sources, in particular the Crab and Cyg X-1. We will also describe the initial results of an all-sky imaging analysis of the EOT data, with comparisons to the Swift, INTEGRAL, and Fermi LAT Catalogs.

Cheung, C.C., Hill, A.B., Jean, P., Razzaque, S. Wood, K.S., on behalf of the Fermi-LAT collaboration

NRC, resident at NRL

Poster
OtherGal S2.N6

FERMI-LAT DISCOVERY OF GAMMA-RAY EMISSION CONCURRENT WITH THE NOVA IN THE SYMBIOTIC BINARY V407 CYGNI

We report the Fermi-LAT discovery of variable >100 MeV gamma-ray emission from the optical nova of the symbiotic star V407 Cygni in March 2010. The spectrum and light curve of the gamma-ray emission can be understood broadly as consequences of shock acceleration in the nova shell as it interacts with the dense ambient medium of the red giant companion. Viable gamma-ray production mechanisms via pi-0 decay from proton-proton interactions and inverse Compton scattering of electrons with the radiation from the red giant are outlined.

Cheung, C.C., on behalf of the Fermi-LAT collaboration

NRC, resident at NRL

invited

FERMI AND NON-BLAZAR AGN

I will present an overview of Fermi-LAT gamma-ray observations of non-blazar AGN. This includes results on radio galaxies, candidate young radio sources, and radio-quiet/Seyfert galaxies. Insight into the gamma-ray emission mechanism and possible production sites will be discussed as well as future prospects for such studies.

Chiang, J., on behalf of the Fermi LAT Collaboration

KIPAC / SLAC

Poster
AGN S1.N16

STACKING ANALYSIS OF FERMI-LAT DATA OF TEV BLAZAR CANDIDATES

The Large Area Telescope (LAT) on board Fermi has observed hundreds of blazars that were previously not detected at GeV energies. Several of the hardest of these blazars have also been detected by Air Cerenkov Telescopes (ACTs) in follow-up observations, thereby greatly expanding the list of known TeV blazars. Because of their much greater sensitivity, ACTs require significantly less integration time to detect a typical TeV blazar (e.g., an high-peaked BL Lac object) than the LAT. However, in contrast to the LAT, ACTs are limited by much smaller fields-of-view and so must make dedicated (and perhaps fruitless) efforts to observe specific sources. In an effort to bridge this mismatch in capabilities, we perform a "stacking" analysis of the LAT data of undetected TeV blazar candidates using the LAT data accumulated over the first 30 months of operations. We consider various subsets of blazars (e.g., LBLs, IBLs, HBLs) based on their properties at radio, IR, optical, UV, and X-ray energies. These analyses yield estimates of the average spectral properties of these sub-populations at much deeper flux levels than are possible for single sources. As a result, this work should provide guidance to ACTs for promising sub-populations to observe. It also further constrains the characteristic SED properties for the different blazar classes, which have previously been largely determined by the brightest sources.

Chiang, J., Racusin, J. and on behalf of the Fermi-LAT Collaboration

KIPAC / SLAC

Poster
GRB S2.N4

THE SEARCH FOR GEV EXTENDED EMISSION FROM SWIFT-LOCALIZED GAMMA-RAY BURSTS

The brighter Fermi-LAT bursts have exhibited emission at energies >0.1 GeV that persists as late as ~2 ks after the prompt phase has nominally ended. This so-called "extended emission'' could arise from continued activity of the prompt burst mechanism or it could be the start of a high energy afterglow component. The high energy extended emission seen by the LAT has typically followed a $t^{-\gamma}$ power-law temporal decay where $\gamma \approx 1.2$-1.7 and has shown no strong indication of spectral evolution. In contrast, the prompt burst emission generally displays strong spectral variability and more complex temporal changes in the LAT band. This differing behavior suggests that the extended emission likely corresponds to an early afterglow phase produced by an external shock. In this study, we look for evidence of high energy extended emission from >155 Swift-localized GRBs that have occurred since the launch of Fermi. A majority of these bursts were either outside of the LAT field-of-view or were otherwise not detected by the LAT during the prompt phase. However, because of the scanning operation of the Fermi satellite, the long-lived extended emission of these bursts may be detectable in the LAT data on the ~few ks time scale. We will look for emission from individual bursts and will perform a stacking analysis in order to set bounds on this emission for the sample as a whole. The detection of such emission would have implications for afterglow models and for the overall energy budget of GRBs.

Cholis, I.,
G. Dobler, N. Weiner

SISSA

Poster
DMNP S1.N4

THE FERMI HAZE FROM DARK MATTER AND ANISOTROPIC DIFFUSION

Recent full-sky maps of the Galaxy from the Fermi LAT have revealed a diffuse component of emission towards the Galactic center and extending up to roughly $\pm$50 degrees in latitude. This Fermi "haze'' is the inverse Compton emission generated by the same population of electrons which generate the microwave synchrotron haze at WMAP wavelengths. Its two distinct characteristics, are its significantly harder spectrum than the emission elsewhere in the Galaxy and the morphology that is elongated in latitude with respect to longitude with an axis ratio ~2. If these electrons are generated via dark matter annihilation, in the Galactic halo, the morphology of the signal is difficult to realize with a standard spherical halo and isotropic cosmic-ray diffusion. However, anisotropic diffusion along ordered magnetic field lines towards the center of the Galaxy coupled with a prolate dark matter halo can easily yield the required morphology without making unrealistic assumptions about diffusion parameters and also being consistent with local cosmic-ray measurements as well as CMB constraints. A Sommerfeld enhancement to the annihilation cross-section of ~30 yields a good fit to the morphology, amplitude, and spectrum of both the gamma-ray and microwave haze.

Ciprini, S.,
D. Gasparrini (on behalf of the Fermi-LAT Flare Advocates and the Fermi-LAT Collaboration)

ASI Science Data Center, Frascati, Roma

Poster
AGN S1.N17

FERMI LAT FLARE ADVOCATE ACTIVITY

The Flare Advocate/Gamma-ray Sky Watcher (FA-GSW) program, part of the Fermi LAT Science Operations, provides for a prompt review of the quick-look Automatic Science Processing (ASP) products by a LAT-affiliated scientist. The FA-GSW provides alerts of potentially interesting seeds for LAT science and to the different LAT science groups, outlooking the gamma-ray sky day by day, and communicates relevant news to the external astrophysical community. This is important to increase the rate of multi-frequency observations and follow-ups that could maximize science return. During the first about 30 months of the Fermi mission, FA-GSWs discovered, for example, many gamma-ray flares and longer-term brightening from blazars, unidentified transients near the Galactic plane, confirmed the quiet sun gamma-ray emission, compiled many Astronomical Telegrams, pointed out possible new gamma-ray sources, and provided starting seeds for more than a dozen LAT papers on single sources and follow-up multifrequency campaigns. Some highlights of this service-activity are summarized in this poster.

Ciprini, S.,
the Fermi-LAT Collaboration

ASI Science Data Center, Frascati, Roma

Poster
AGN S1.N18

GAMMA-RAY AND MULTIFREQUENCY VARIABILITY OF BLAZARS

Gamma-ray light curves and the gamma-ray variability properties of bright Fermi blazars are highlighted, and two examples of multifrequency campaigns led by Fermi are described: the first devoted to the new high-energy blazar PKS 1502+106 and the second to the eponymous blazar BL Lacertae. Variable blazars have weekly binned light curves that can be described by 1/f power density spectra (PDS) and show two kinds of gamma-ray variability: a rather constant baseline with sporadic flaring activity characterized by flatter PDS slopes resembling flickering and red noise with occasional intermittent activity, and, measured for a few blazars, strong activity-complex and structured temporal profiles characterized by long-term memory and steeper PDS slopes, reflecting a random walk mechanism. The two Fermi campaigns on single blazars reported here represent complementary studies. The first one is an example of a Target of Opportunity multifrequency campaign following the discovery and identification of a new gamma-ray flaring blazar (PKS 1502+106). The second one is an example of a planned multifrequency campaign catching, for the first time in gamma-rays, a well known source (BL Lacertae) in a non-flaring and rather low activity state.

Collins-Hughes, E., The VERITAS Collaboration

SAO

Poster
AGN S1.N19

WHIPPLE 10M BLAZAR MONITORING CAMPAIGN

It is notoriously difficult to organize simultaneous observations from space and from the ground. This is particularly so at GeV-TeV energies where the space observations from all sky telescopes and the ground-based observations (mostly using the atmospheric Cherenkov technique). Because of observing constraints the latter observations are limited to "snap-shots" of sources with short exposure times. For the past several years the observing program with the Whipple Observatory 10m Gamma-ray Telescope has been devoted to the observation of several bright TeV-emitting AGN (including Markarian 421 and Markarian 501) to provide as continuous a record as possible for use in multiwavelength campaigns. The preliminary results of the nightly observations are posted each morning on the public VERITAS Webpage to facilitate comparison with observation at other wavelengths. The telescope is also used as a trigger for VERITAS and other VHE observatories where flaring activity is detected. The poster will present a status update of the current Blazar Monitoring campaign at the telescope, a summary of the most recent results obtained from November 2010 up to April 2011, which contribute to the 14-year data set representing continuous observation of Markarian 421. The Whipple 10m public webpage, which show's continuously updated lightcurves for all monitored sources will also be highlighted. The publicly available Fermi observations that cover the same days will also be shown.

Corbet, R.H.D., on behalf of the Fermi-LAT collaboration, M.J. Coe, P.G. Edwards, M.D. Filipovic, J.L. Payne, J. Stevens, M.A.P. Torres

UMBC/NASA GSFC

Oral

DISCOVERY OF THE NEW GAMMA-RAY BINARY 1FGL J1018.6-5856

We present the discovery of a new gamma-ray binary system from the search for periodic modulation in the 100 MeV to 200 GeV Fermi LAT light curves of all sources in the first Fermi-LAT Catalog. 1FGL J1018.6-5856 was found to have a 16.6 day modulation in its gamma-ray light curve that is accompanied by spectral variability. We also identify counterparts in the X-ray, radio and optical wavebands using data from the Swift XRT, ATCA, and telescopes at SAAO and LCO. The X-ray and radio counterparts are highly variable - the X-ray flux appears to be modulated on the orbital period with maximum X-ray flux coinciding with the phase of maximum gamma-ray flux. The optical counterpart has a spectral type of approximately O6V((f)) and shows little variability in a series of Swift UVOT observations. The overall properties of 1FGL J1018.6-5856 indicate that it is a member of the rare gamma-ray binary class of objects, and that it shares several properties with LS 5039. However, there are also several differences from LS 5039, including the relative phasing of the gamma-ray flux and spectral modulation and the shape of the X-ray light curve. The similarities and differences are expected to allow us to more fully develop our understanding of the astrophysics involved in these enigmatic objects.

Costamante, L., tbd

Stanford University

Poster
AGN S1.N20

A WARNING ON THE GEV-TEV CONNECTION IN BLAZARS

Recently, the well-determined Fermi-LAT spectra in the MeV-GeV band for several TeV blazars have been used to "improve" the constraints on the extragalactic background light (EBL). The main assumption of these studies is that the extrapolation of the Fermi spectrum to the VHE band is either a good estimate or an upper limit for the intrinsic VHE spectrum of the source. However, this assumption seems not well justified neither theoretically nor observationally. Based on the blazars results obtained in the last 10 years, we collect and discuss the observational and logical evidence which indicates that VHE spectra harder than the HE ones are possible and even likely (though not common). It seems only a matter of time (and statistics) before upturns in the overall 100 MeV -- 1 TeV band are directly and significantly detected in the simultaneous gamma-ray spectrum of some objects.

Costamante, L., tbd

Stanford University

Poster
AGN S1.N21

ON THE INTRINSIC VHE PROPERTIES OF THE BLLAC H 2356-309

The high-energy-peaked BL Lac H 2356-309 (z=0.165) has been detected at very high energies (VHE, >100 GeV) by HESS with high significance in the period 2004-2007, allowing a precise determination of its gamma-ray spectrum. Though not as hard as other BL Lacs, once corrected for absorption due to interactions with the extragalactic background light its gamma-ray emission is characterized by a flat spectrum of $Gamma~2$ over a decade in energy, which is difficult to reconcile with the steep slopes expected from conventional SSC modeling of its SED. We will discuss the overall GeV-TeV gamma-ray and SED properties of this object, which looks intermediate between the TeV-peaked (Fermi-faint) and 100GeV-peaked (Fermi-bright) HBLs.

Costamante, L., Tramacere A., Tosti G., on behalf of the Fermi-LAT Collaboration

Stanford University

Oral

CHALLENGES TO THE STANDARD MODELS FROM GAMMA-RAY SPECTRA OF BLAZARS AT THE TWO ENDS OF THE BLAZAR SEQUENCE

In the standard scenarios for blazars, the large and intense thermal radiation fields external to the jet observed in Flat Spectrum Radio Quasars (FSRQ) are used as targets for the inverse Compton (IC) emission mechanism and to explain the large gamma-ray dominance in their spectral energy distribution (SED). However, Fermi-LAT spectra are now showing the absence of the consequent gamma-gamma absorption features even in some powerful objects, in principle characterized by a large size of the Broad Line Region. Furthermore, the recent VHE detections could be problematic even for the alternative scenario of Comptonization of IR radiation from dust. At the other end of the blazar sequence, a new class of BL Lac objects is emerging, characterized by hard TeV spectra even with the lowest level of diffuse extragalactic background light.This constrains their SED peak to be above several TeV, and represents a problem for conventional synchrotron self-Compton models of the overall SED. We will present and discuss the new observational results in the context of SED modeling, and of new targets selection allowed by Fermi.

Cuoco, A.

Stockholm University - Oskar Klein Center

Poster
Diffuse S1.N3

UNRESOLVED POINT SOURCES AND ANISOTROPIES IN THE DIFFUSE GAMMA-RAY BACKGROUND

A population of unresolved point sources contributing to the Diffuse Gamma-ray Background (DGB) is generally expected to be accompanied by a related anisotropy. This anisotropy can be calculated starting from the statistical properties of the known resolved point sources. Here we present various predictions of the expected anisotropy and compare it with the recent preliminary measurements of the DGB anisotropy from the Fermi-Lat collaboration.

Cusumano, G. , La Parola V., Segreto A., Maselli A., Romano P.

INAF - IASF PAlermo

Poster
Catalog S1.N2

66 MONTHS OF SKY SURVEY WITH SWIFT-BAT: THE 3RD PALERMO BAT CATALOGUE.

The Burst Alert Telescope (BAT: 14-150 keV) on board of Swift is providing the opportunity for a substantial gain of our knowledge of the Galactic and extragalactic sky in the hard X-ray domain, thanks to its continuous monitoring of the sky (50%-80% per day). Here we present the third Palermo Swift-BAT hard X-ray Catalogue obtained from the analysis of the data relative to the first 66 months of the Swift mission and including about 1600 high-energy sources. With a program of soft X-ray follow-up observations and by using archival data we were able to associate a counterpart to most of these high energy emitters: 59% are extragalactic objects, 20% are Galactic objects and 9% are known soft X-ray emitters whose nature has not been determined yet. We compare our Catalogue with those obtained from the INTEGRAL-ISGRI data and with the gamma-ray sky as seen by Fermi.

Cutini, S., Cavazzuti, Gasparrini and Giommi on behalf of Fermi-LAT collaboration

Agenzia Spaziale Italiana

Poster
Catalog S1.N3

SECOND FERMI-LAT AGN CATALOGUE LIKELIHOOD RATIO METHOD RESULTS

The study of the multi-wavelength characteristics of the counterparts associated to the second Fermi-LAT Source Catalogue (2FGL, Abdo et al in prep.) is fundamental to improving our knowledge of these gamma-ray objects. In order to select the radio and X-ray counterparts of the 2FGL sources, we developed a procedure using a robust likelihood-ratio technique. This general method has frequently been used to assess identification probabilities for radio and optical sources (Masci et al 2001). The likelihood ratio is simply the ratio of the probability of an identification with the probability of a chance of association and it is strongly dependent on the distance of the counterparts and on the "expected density surface" of the different classes of objects, which we evaluate within a 1-sigma error ellipse of each Fermi source. In this poster we present this method applied to Second Fermi-LAT AGN catalogue (2LAC, Abdo et al in prep.) sources focusing on blazars-type counterparts and compared to Bayesian method implemented in the 2FGL paper.

Dainotti, M. G., Ostrowski, M., Willingale, R.

Jagellonian University

Poster
GRB S2.N5

TOWARD A STANDARD GAMMA RAY BURST: TIGHT CORRELATIONS BETWEEN THE PROMPT AND THE AFTERGLOW PLATEAU PHASE EMISSION

To reveal astrophysical processes responsible for Gamma Ray Burst (GRB), it is crucial to discover and understand relations between their observational properties. The presented study is performed in the GRB rest frames and it uses a sample of 62 long Swift GRBs with known redshifts. Following the earlier analysis of the afterglow, luminosity L^*_a -- break time T^*_a correlation \cite{Dainotti2010}, we extend it to correlations between the afterglow and the prompt emission GRB physical parameters. We reveal a tight physical scaling between the mentioned afterglow luminosity $ L^*_a$ and the prompt emission mean luminosity $_{45} \equiv E_{iso}/T^*_{45}$. The distribution, with the Spearman correlation coefficient reaching 0.95 for the data subsample with most regular light curves, can be fitted with $L^*_a \propto {_{45}}^{0.7}$. We also analyzed correlations of L^*_a with several prompt emission parameters, including the isotropic energy E_{iso}, the peak energy in the νF_{ν} spectrum, E_{peak}. As a result, we reveal significant correlations also between these quantities discovering that the highest correlated GRB subsample in the afterglow analysis, for the GRBs with canonical X\,-\,ray light curves, leads also to the highest prompt-afterglow correlations. Such events can be considered to form a sample of standard GRBs for astrophysics and cosmology.

de Cea, E.,
on behalf of the MAGIC Collaboration

IEEC - CSIC

Poster
SNR/PWNe S2.N8

MAGIC UPPER LIMITS FOR TWO MILAGRO-DETECTED, BRIGHT FERMI SOURCES IN THE REGION OF SNR G65.1+0.6

We report on the observation of the region around the supernova remnant G65.1+0.6 with the stand-alone MAGIC-I telescope. This region hosts the two bright GeV gamma-ray sources 1FGL J1954.3+2836 and 1FGL J1958.6+2845. They are identified as GeV pulsars and both have a possible counterpart detected at about 35 TeV with about 20% of the Crab Nebula flux by the Milagro observatory. MAGIC collected 25.5 hours of good quality data, and found no significant emission in the range around 1 TeV. We therefore report differential flux upper limits, assuming the emission to be point-like < 0.1 degrees or within a radius of 0.3 degrees. In the point-like scenario, the flux limits around 1 TeV are at the level of 3% and 2% of the Crab Nebula flux, for the two sources respectively. This implies that the Milagro emission is either extended over a much larger area than our point spread function, or it must be peaked at energies beyond $1\eh{TeV}$, resulting in a photon index harder than 2.2 in the TeV band.

De Luca, A.,
Marelli, M., Caraveo, P.A., Saz Parkinson, P., Belfiore, A.

Istituto Universitario di Studi Superiori, Pavia

Oral

X-RAY OBSERVATIONS OF GAMMA-RAY ONLY PULSARS UNVEIL PECULIAR DIFFUSE EMISSION STRUCTURES.

The Large Area Telescope (LAT) onboard the Fermi mission opened a new era for pulsar astronomy, detecting pulsations from more than 70 gamma-ray pulsars, 30% of which are not seen at radio wavelengths, yielding a new view of the Galactic population of isolated neutron stars. Using both archival and freshly acquired XMM-Newton and Chandra data, we will discuss the peculiar X-ray phenomenology of a few selected, interesting radio-silent Fermi-LAT pulsars, including the most recent entry in the family. We will focus on the detection of very unusual diffuse emission structures surrounding our targets, which could teach us a lot about pulsar particle outflows.

DeCesar, M. E.,
Alice K. Harding, M. Coleman Miller, Damien Parent

University of Maryland/ CRESST

Poster
PSR S2.N4

PROBING PULSAR EMISSION WITH LIGHT CURVE MODELING AND PHASE-RESOLVED SPECTROSCOPY

The high-quality Fermi LAT observations of isolated gamma-ray pulsars have opened a new window to understanding the generation mechanisms of high-energy emission from these systems. The high statistics allow for careful modeling of the light curve features as well as for phase-resolved spectral modeling. We model the LAT light curves of the three brightest gamma-ray pulsars, Vela, Crab, and Geminga, using simulated high-energy light curves. The model light curves and radii of curvature are generated using geometrical representations of the outer gap and slot gap/two-pole caustic emission models, within the context of both the vacuum retarded dipole and force-free magnetosphere models. These simulated light curves are compared with observed LAT light curves, and a function of the radius of curvature with measured spectral cutoff energies, via maximum likelihood using the Markov Chain Monte Carlo method to explore the phase space of fitted parameters such as magnetic inclination, viewing angle, maximum emission radius and gap width. We have also used the measured spectral cutoff energies to estimate the accelerating parallel electric field dependence on radius, under the assumptions that the high-energy emission is dominated by curvature radiation and the geometry (radius of emission and minimum radius of curvature of the magnetic field lines) is determined by the best fitting light curves for each model.

DeCesar, M. E., Scott M. Ransom, Paul S. Ray, Paul B. Demorest

University of Maryland

Poster
PSR S2.N5

DISCOVERY OF A MILLISECOND PULSAR IN THE DIRECTION OF THE LAT-DETECTED GLOBULAR CLUSTER NGC 6652

We have searched two globular clusters (GCs) detected at GeV energies by the Fermi LAT for radio millisecond pulsars (MSPs). These clusters contained no known MSPs prior to their detection in gamma-rays. The discovery of gamma-ray emission from many MSPs and the prevalence of MSPs in GCs points to cluster MSPs as a likely source of the detected GeV emission, therefore directing our search for new MSPs in GCs. We observed NGC 6652 and NGC 6388 at 2 GHz with the GUPPI pulsar backend at the Green Bank Telescope using the coherent dedispersion mode. We have discovered one MSP coincident with the location of NGC 6652. This pulsar is interesting because, while positionally coincident with the GC, it has a much lower DM than expected from NE2001 -- the MSP has DM=63.3 pc cm^3, while the cluster is estimated to have DM~200 pc cm^-3 (although it is not out of the question that the NE2001 estimate is off by this amount). It is therefore unclear whether the MSP is a foreground pulsar (unlikely but possible) or a cluster member, and whether this MSP or the cluster is responsible for the gamma-ray emission. Future observations are planned to time the MSP, which will give the pulsar position and a solid identification of the pulsar as a cluster member if it is within a few core radii of the cluster center. This will also give an opportunity to search for gamma-ray pulsations and determine the origin of the GeV emission.

Digel, S. W., Giordano, F. on behalf of the Fermi LAT Collaboration

KIPAC/SLAC

Poster
Diffuse S1.N4

ASSESSING 2FGL SOURCES TOWARD LOCAL INTERSTELLAR CLOUDS

Modeling the spatial and intensity distributions of the interstellar diffuse gamma-ray emission with sufficient accuracy for the statistics and angular resolution provided by the Fermi LAT has proven to be challenging. In the 1FGL Catalog, a number of sources have been flagged as suspect owing to clear or suspected association with inaccuracies in the diffuse emission model. Part of the challenge has been accurately accounting for column densities of interstellar gas, quantifying the contributions from `dark gas' and the effects of self-absorption and optical depth variations in interstellar atomic hydrogen. For the 2FGL analysis a number of improvements were made to the model; here we illustrate the changes and assess the performance toward nearby interstellar clouds with an eye toward future refinements of the model.

Dobler, G.

Kavli Institute for Theoretical Physics (UCSB)

Oral

DARK DISKS AND FERMI: THE GOOD, THE BAD, AND THE UGLY

I will discuss the impact of a potential dark disk in the Milky Way on indirect searches for dark matter annihilation products. Recently it has been shown that dark disks arise naturally in N-body simulations when the effects of baryon cooling are included in the dynamics. This dark disk may have importance for direct dark matter detection as it can boost the scattering rate and indirect detection as it can boost locally observed cosmic-rays. Here I will show that a significant dark disk in the Milky Way can also adversely impact indirect searches for dark matter annihilation in gammas with Fermi. In particular, the prompt and inverse Compton (after taking into account either isotropic or anisotropic diffusion effects) gammas from dark matter annihilations have a morphology and spectrum that is sufficiently similar to gammas from the baryonic disk that separation of the dark matter signal is very difficult. I will asses the level of difficulty for various dark disk contributions.

Dogiel, V. A., K.-S. Cheng, D. O. Chernyshov, C.-M. Ko, W.-H. Ip

P.N.Lebedev Insitute of Physics

Poster
Diffuse S1.N5

FERMI BUBBLES AS A RESULT OF STAR CAPTURE IN THE GALACTIC CENTER

Fermi has discovered two giant gamma-ray-emitting bubbles that extend nearly 10 kpc in diameter. We propose that periodic star capture processes by the galactic supermassive black hole, Sgr A*, with a capture rate <10^-5 yr^-1 and energy release ~10^52 erg per one capture can produce shocks in the halo, which accelerate electrons to the enery ~ 1 TeV. These electrons generate radio emission via synchrotron radiation, and gamma-rays via inverse Compton scattering with the relic and the galactic soft photons. Estimates of the diffusion coefficient from the observed gamma-ray flux explains consistently the necessary maximum energy of electrons and sharp edges of the bubble.

Donnarumma, I., De Rosa, A., Vittorini, V. on behalf of the AGILE Team

INAF/IASF Rome

Poster
AGN S1.N22

THE REMARKABLE GAMMA-RAY ACTIVITY OF THE GRAVITATIONALLY LENSED BLAZAR PKS 1830-211

We will report on the extraordinary gamma-ray activity (E>100 MeV) of the gravitationally lensed blazar PKS 1830-211 (z=2.507) detected by AGILE between October and November 2010. The source experienced on October 14 a flux increase of a factor of about 12 with respect to its average value and kept brightest at this flux level for about 4 days. The 1-month gamma-ray light curve across the flare showed a mean flux F(E>100 MeV)= 200x 10^{-8 } ph cm^-2 s^-1, which resulted in an enhancement by a factor of 4 with respect to the average value. A multifrequency campaign covering NIR/optical (Cerro Tololo Inter-American Observatory) and X-ray (Swift, INTEGRAL) energy bands was carried out to follow the remarkable gamma-ray activity of this source. The main result of these multifrequency observations is that the large variability observed in gamma-rays has not a significant counterpart at lower frequencies which led us to identify PKS 1830-211 as a "gamma-ray only flaring" blazar. We will discuss these emission properties and present a possible interpretation of the variation of the spectral energy distribution of PKS 1830-211 from the average to the brightest gamma-ray activity.

Dormody, M., on behalf of the Fermi-LAT Collaboration

University of California, Santa Cruz

Poster
PSR S2.N6

ESTIMATING THE GAMMA-RAY PULSAR POPULATION WITH THE BLIND SEARCH SENSITIVITY

The number of gamma-ray pulsars discovered in blind frequency searches of Fermi-LAT photon data raises the question of how many pulsars are in our Galaxy, as well as the pulsars' underlying energy and spatial distribution. By using a Galactic pulsar distribution (Fauche-Giguere et al. 2006) and assuming a pulse profile and spectrum similar to those previously detected in blind searches, along with an understanding of the sensitivity of the instrument to blind searches (Dormody et al. 2011), we can estimate the underlying birth characteristics of pulsars. We present results on this detailed pulsar population study, including estimations of population size and initial spin-down energy distribution.

Dormody, M., on behalf of the Fermi-LAT Collaboration

University of California, Santa Cruz

Poster
PSR S2.N7

SENSITIVITY OF FERMI-LAT BLIND PULSAR SEARCHES

There have been over two dozen gamma-ray pulsars discovered in blind frequency searches of Fermi-LAT photon data. While there is a general idea of the blind search sensitivity when compared to the radio-loud pulsar sensitivity, it has not been well established quantitatively. We detail a sensitivity study of the blind search “differencing” code and source Catalog localizations used to discover the new gamma-ray pulsars using a large scale simulation of gamma-ray pulsars and LAT source locations. We establish detection limits on blind pulsar searches, including integrated pulse fraction limits, signal-to-noise limits, and create threshold flux maps assuming a spectral model.

Dornic, D.

IFIC

Poster
AGN S1.N23

SEARCH FOR NEUTRINO EMISSION OF GAMMA-RAY FLARING BLAZARS WITH THE ANTARES TELESCOPE

The ANTARES telescope is well suited to detect neutrinos produced in astrophysical transient sources as it can observe a full hemisphere of the sky at all the times with a duty cycle close to unity. The background and point-source sensitivity can be drastically reduced by selecting a narrow time window around the assumed neutrino production period. Radio-loud active galactic nuclei with their jets pointing almost directly towards the observer, the so-called blazars, are particularly attractive potential neutrino point sources, since they are among the most likely sources of the observed ultra high energy cosmic rays and therefore, neutrinos and gamma-rays may be produced in hadronic interactions with the surround medium. The gamma-ray light curves of blazars measured by the LAT instrument on-board the Fermi satellite reveal important time variability information. A strong correlation between the gamma-ray and the neutrino fluxes is expected in this scenario. An unbinned method based on the minimization of a likelihood ratio was applied to a subsample data collected in 2008 (~60 days live time). By looking for neutrinos detected in the high state period of the AGN light curve, the sensitivity to these sources has been improved by a factor 2-3 with respect to a standard time-integrated point source search. The assumed neutrino time distribution is directly extracted from the gamma-ray light curve. The typical width for a flare ranges from 1 to 20 days depending on the source. First results on the search for nine bright and variable Fermi sources will be presented.

Dotson, A., Markos Georganopoulos

University of Maryland Baltimore County

Poster
AGN S1.N24

DETERMINING THE LOCATION OF THE GEV EMISSION IN BLAZARS USING FERMI VARIABILITY

The dominant location of high-energy emission in extragalactic relativistic jets is a matter of active debate. Here we present a clear diagnostic tool for using Fermi variability data to test whether the GeV blazar emission is located within the sub-pc broad emission line region. If the blazar emission takes place inside the broad line region (BLR), the GeV emission detected by Fermi results from inverse Compton (IC) scattering of BLR photons. We show that because this scattering takes place at the onset of the Klein-Nishina regime, the electron cooling time becomes practically energy-independent and the variation of high-energy emission is expected to be achromatic. Conversely, if the blazar emission takes place outside of the BLR, the GeV emission results from IC scattering of IR photons from the molecular torus. In this scenario, the scattering takes place within the Thomson regime, and the subsequent electron cooling time and high-energy variation is heavily energy dependent. By observing gamma-ray flares at multiple Fermi energies, the energy dependence (or lack thereof) of the variability can be used to determine the source of seed photons of the IC upscattering, and thus the location of the GeV emission.

Drlica Wagner, A., Bloom, E. D., Wang, P., Strigari, L.., Representing the LAT Collaboration

KIPAC-SLAC, Stanford University

Poster
DMNP S1.N5

THE FERMI LAT SEARCH FOR WIMP DARK MATTER CONTINUUM GAMMA-RAY EMISSION FROM DARK MATTER SATELLITES OF THE MILKY WAY

This paper presents the search for unseen dark matter (DM) satellites of the Milky Way using the Fermi Large Area Space Telescope (LAT). The Fermi Gamma-ray Space Telescope (Fermi) is a next generation space observatory, which was successfully launched on June 11th, 2008. Its unprecedented angular resolution and sensitivity in the 100 MeV to > 300 GeV energy range makes it an excellent instrument for probing the sky for DM satellites. Current N-body simulations based on LambdCDM cosmology predict a large number of as yet unobserved DM satellites in our galaxy; some satellites are predicted to be extended sources (> 1o extension) as seen by the LAT. Our work assumes that a significant component of DM is a ~100 GeV Weakly Interacting Massive Particle (WIMP). The annihilation of WIMPs results in many high energy g rays that can be well measured by the LAT. The WIMP produced g-ray spectrum from the putative DM satellites is considerably harder than most astrophysical sources, and is not a power law. Also, DM satellites are expected to have no astronomical counterparts in the X-ray and radio bands, and the g emission has no time variability. This paper will focus on a blind analysis in the search for unseen DM satellites using one year of LAT data based on extension and spectral properties of candidate sources. We set constraints on some DM models based on the results of our analysis in which we find no candidates.

Drlica-Wagner, A., Charles, E., on behalf of the Fermi-LAT Collaboration

Stanford University - SLAC National Accelerator Laboratory

Poster
Instr S2.N10

USING TMINE FOR THE FERMI-LAT EVENT ANALYSIS

The Fermi LAT event analysis is the final stage in the creation of high-level science variables (e.g. event energy, incident direction, particle type, etc.). We discuss the development of TMine, a powerful new tool for designing and implementing event classification analyses (i.e. distinguishing photons from charged particles). TMine is structured on ROOT, a data analysis framework that is the de-facto standard for the current high-energy physics experiments, and thus fits naturally into the ROOT-based data processing pipeline of the LAT. TMine utilizes the advanced multivariate classification algorithms implemented in ROOT, and allows for the visual development of the LAT event analysis. We discuss the implementation of TMine in the current event analysis (Pass 7) and improvements that TMine can offer for developing the next iteration of the event analysis (Pass 8).

Dubus, G.

IPAG, Grenoble

Invited

VARIABLE SOURCES IN THE GALAXY: BINARIES AND ?

I will review the current status on variable Galactic gamma-ray sources. The presentation will be mostly devoted to binaries in their different guise, as these are the main identified population of such sources (the Crab will be discussed elsewhere). I will highlight how and why these sources have been surprising, what we have (un)learned and where the next two years may take us.

Ellison, D. C., Andrei M. Bykov, Daniel J. Patnaude and Patrick Slane

North Carolina State University

Oral

CORE-COLLAPSE MODEL OF BROADBAND EMISSION FROM SNR J1713

We present a spherically symmetric, core-collapse model of SNR RX J1713.7-3946 that includes a hydrodynamic simulation of the remnant evolution coupled to the efficient production of cosmic rays (CRs) by nonlinear diffusive shock acceleration (DSA). High-energy CRs that escape from the forward shock (FS) are propagated into surrounding dense material that simulates either a swept-up, pre-supernova shell or a nearby molecular cloud. The continuum emission from trapped and escaping CRs, along with the thermal X-ray emission from the shock-heated circumstellar material behind the FS, is compared against broadband observations. Our results show conclusively that the GeV-TeV emission is dominated by inverse-Compton radiation from CR leptons if the supernova is isolated, i.e., not interacting with a >>100 Msun cloud. If the SNR is interacting with a large mass, pion-decay from the trapped and escaping CRs may dominate the GeV-TeV emission, although a precise fit to the high-energy observations will depend on the still uncertain details of how the highest energy CRs are accelerated by, and escape from, the supernova remnant blast wave.

Errando, M., the VERITAS collaboration

Barnard College / Columbia University

Poster
AGN S1.N25

VHE OBSERVATIONS OF FERMI MOTIVATED TARGETS WITH VERITAS

The Fermi Gamma-ray Space Telescope regularly surveys the entire sky in the energy range between 0.3 and 100 GeV with homogeneous coverage. This makes Fermi a very useful guide for ground-based Cherenkov-telescope like VERITAS, that are sensitive at energies above 100 GeV. Since its launch, the VERITAS collaboration has used information from Fermi-LAT to select potential targets and identify flaring objects in the GeV band. We will present the results from VERITAS observations of sources motivated by Fermi, including the TeV detection and subsequent identification of 1FGL J0521.7+2114 and 1FGL J0648.8+1516 as blazars behind the galactic plane. Additionally, results for hard-spectrum Fermi sources observed with VERITAS will be shown. We will also discuss the analysis of Fermi-LAT data done to select TeV candidates as well as our monitoring program to identify GeV flares of potential TeV sources.

Falletti, L., J.Cohen-Tanugi and E.Nuss on behalf of the Fermi LAT Collaboration.

LUPM, Montpellier 2 University

Poster
OtherGal S2.N7

OBSERVATION OF THE MOUSE PULSAR VICINITY WITH THE FERMI-LAT TELESCOPE

The Fermi Large Area Telescope (LAT), with its unprecedented sensitivity, has collected a high-statistics sample of gamma rays in the 20 MeV to >300 GeV energy range from the vicinity of PSR J1747-2958, the mouse pulsar. This region, located in projection ~1 deg from the Galactic center, is a complex region for GeV gamma-ray astronomy, dominated by intense diffuse Galactic emission background and densly populated with potential emission candidates like dense molecular clouds, supernova remnants, X-ray binaries and pulsars. In this study, we will review the Fermi-LAT observations of this region and discuss its relation with the TeV extended source HESS J1745-303. The interpretation of the GeV/TeV observations in terms of multi-counterpart Very High Energy contributions from supernova-remnant-molecular cloud associations and/or high-spin-down flux pulsars will be discussed.

Fargion, D., Daniele D'Armiento,Paolo Paggi, Paolo Desiati

Physics Depart and INFN

Poster
CR S2.N1

UHECR AND TAU NEUTRINO ASTRONOMY CONNECTION

UHECR are painting the sky with first possible astrophysical anisotropies. The GZK cut off may also be source of cosmogenic UHE neutrinos whose EeV tail may rise in AUGER and TA fluorescence telescopes. The UHE tau neutrino may escape the Earth with UHE tau, whose decay in flight explode loudly as tau airshowers. The UHECR composition reflects in the UHE neutrino spectra. We estimated their rate and shapes both at PeVs (for nuclei) and EeV (for UHECR nucleons) energy range.

Fargion, D., Daniele D'Armiento,Paolo Paggi, Paolo Desiati

Physics Depart and INFN

Poster
Instr S2.N11

A 20 GEV NEUTRINO ASTRONOMY AT DEEP CORE

Solar Flare, GRB and AGN may shine, at tens GeV energy, neutrinos whose signal is usually drawn in a noisy atmospheric backgrounds. However a peculiar energy distance windows occurs for upward muons by neutrinos (crossing the Earth) often converted into tau flavor. Therefore the atmospheric noise is suppressed by nearly a factor ten. Then Deep Core may be better tuned to solar flares, GRB and AGN flares at that 20 GeV energy with eventual exciting detection and discoveries.

Fargion, Dr. D., D'Armiento Daniele, Paolo Paggi

Phys Depart Rome Univ 1,INFN

Poster
GRB S2.N6

GRBS AND SGRS AS THIN SPINNING AND PRECESSING BLAZING JETS

Supernova may power a inner jets whose blazing may be source of GRBs and its long life spreading beam may reappear as an afterglow in all its behaviours. The late stages of such a jets may reappear in galactic spaces as SGRs as well as anomalous XRPulsars. The connection with X-gamma pulsar is exciting and somehow tested. The apparent evolution in time of GRBs are an artefact of the geometry and the statistics.

Fargion, Dr. D., D'Armiento Daniele, Paolo Paggi

Phys Depart Rome Univ 1,INFN

Poster
Instr S2.N12

TWENTY GEV NEUTRINO ASTRONOMY IN DEEP CORE: NOISE AND SIGNALS

The Twenty GeVs muon neutrino upgoing in Deep Core may suffer of tau conversion leading to a quite atmospheric neutrino noise. This low background noise offer a better view of muon neutrino astronomy. Present Deep Core set up may read only zenith angle of such muons , but higher density array (a double one) may trace both zenith and azimuth leading to real source pointing. Such an enhanced detector may also reveal eventual CPT violation and be able to reveal solar flare neutrino most powerful signals.

Farnier, C.,
Walter, R., Leyder, J.C.

ISDC Data Centre for Astrophysics, Geneva

Poster
OtherGal S2.N8

ETA CARINAE: A VERY LARGE HADRON COLLIDER

One of the most outstanding stellar object in our Galaxy, eta Carinae, a colliding wind binary with the largest mass loss rate observed, presents a hard X-ray emission and is therefore a primary candidate to search for particle acceleration by probing its gamma-ray emission. We analyzed the first 21 months of Fermi/LAT data (0.2-100 GeV) around eta Carinae and detected a bright gamma-ray source in coincidence. We also derived lightcurve and spectra that we combined with multi-wavelength observations. The non-thermal spectral energy distribution modeling obtained features an inverse Compton scattering of UV photons by electrons and a pi0 decay of accelerated hadrons arising from the colliding wind region. In such model, the colliding wind binaries would be as effective source of hadronic galactic cosmic rays as supernova remnants.

Federici, S.,
Martin Pohl

University of Potsdam and DESY Zeuthen

Poster
Diffuse S1.N6

TESTING COSMIC-RAY ACCELERATION IN THE GALACTIC HALO

We use gamma-ray emission from HI high-velocity clouds as probes of the cosmic-ray spectrum in the Galactic halo. While conventional cosmic-ray propagation models predict a negligible gamma-ray flux, alternative scenarios such as large-scale acceleration at the Galactic-wind termination shock (e.g. Medvedev & Melott 2007) suggest a significant irradiation of high-velocity clouds with particles at energies exceeding 100 GeV, resulting in very hard gamma-ray emission that may be detectable with Fermi. We report on a search for such emission from the high-velocity cloud complex A, and discuss the implications of our findings.

Fegan, S.,
Chiang, J., Charles, E., Omodei, N., for the Fermi-LAT collaboration

LLR, Ecole Polytechnique, CNRS/ IN2P3

Poster
Instr S2.N13

ESTIMATING THE EFFECTS OF SYSTEMATIC ERRORS IN FERMI-LAT DATA

The Fermi LAT detects cosmic gamma-rays in the E>20MeV energy regime. The Fermi science tools allow users to fit the LAT data with a model for the spatial and spectral emission, using a maximum likelihood approach to optimize the values of the model parameters and estimate the covariance matrix. The link between the model and data is provided by the instrument response functions describing the point-spread function, effective area, and energy dispersion of the LAT. However, uncertainties in these functions, and certain approximations made in applying them to the LAT data, will produce systematic errors in the parameters of fitted spectra. For bright gamma-ray emitters on long timescales, these systematic effects may be larger than the statistical errors. We present methods for evaluating the size of the systematic errors which arise from uncertainties in the effective area curve.

Ferrara, E.C.

GSFC/UMCP/CRESST

Poster
UNID S1.N1

INVESTIGATING THE UNASSOCIATED FRACTION IN THE SECOND FERMI-LAT SOURCE CATALOG

A significant fraction of gamma-ray sources detected by the Fermi Large Area Telescope are not associated with any known gamma-ray emitting object. These sources represent discovery space for new source classes, or new members of existing source classes. We discuss the spatial, spectral and temporal characteristics of the unassociated sources in the second Fermi-LAT source Catalog (2FGL). We compare these distributions with the characteristics of the primary source classes (extragalactic vs. galactic sources) to provide likely source classifications, and compare our results against the total predicted numbers of each source population. We also review the 1FGL unassociated source population, and discuss how changes in the Catalog analysis have affected the resulting unassociated source sample.

Finke, J.,
Charles Dermer

US Naval Research Laboratory

Poster
SNR/PWNe S2.N9

NONTHERMAL ELECTRON EVOLUTION IN SUPERNOVA REMNANTS

We use a simple formalism to describe the acceleration and evolution of electrons in supernova remnants (SNRs). The variation in the rate of electron injection can create a dropoff in the electron distribution between the cooled and uncooled particles. This dropoff can lead to observable signatures in the synchrotron and Compton-scattered spectrum. We apply this simple model to the SNR RX J1713.7-3946.

Finnegan, G.,
for the VERITAS Collaboration

University of Utah

Poster
Instr S2.N14

ORBIT MODE OBSERVATION TECHNIQUE DEVELOPED FOR VERITAS

Gamma-ray observations using the VERITAS telescopes are normally taken in a reflected offset mode around the target with four discrete pointings in the cardinal directions. Typically the duration of the observation at each discrete pointing lasts for twenty minutes and has an offset of 0.5 to 0.7 degrees from the camera center. During January/February of 2011, VERITAS tested a new "orbit" observation mode, where the camera center is continuously rotated around the target at a fixed radial offset and constant angular velocity. Orbit mode observations were taken on the Crab Nebula and Mrk 421. In this talk I will present the analysis of the observations taken in orbit mode, and examine the possible benefits of using orbit mode for GRB and diffuse (extended) source observations.

Fitzpatrick, G.,
McBreen, S.,
Connaughton, V.,
Tierney, D.

University College Dublin

Poster
Instr S2.N15

UNCOVERING LOW-LEVEL GBM EMISSION USING ORBITAL BACKGROUND SUBTRACTION

The secondary instrument onboard Fermi, the Gamma-ray Burst Monitor (GBM) is an all sky monitor consisting of 14 scintillation detectors. In analysing transient events such as Gamma-Ray Bursts (GRBs) and Solar Flares (SFs) the background is usually modelled as a polynomial (order 0-4). However for long events the background may vary more than can be accounted for with a simple polynomial. In these cases a more accurate knowledge of GBM's background rates is required. Additionally, smoother emission is harder to detect in a background-limited instrument such as GBM. Here we present an alternative method of both determining the background and distinguishing low-level emission. This method is based on the similarity in rates measured in orbits from adjacent days.

Foley, S.,
Bhat, P. N., McBreen, S., Gruber, D., Tierney, D.

Max-Planck-Institut für extraterrestrische Physik

Poster
GRB S2.N7

ENERGY-DEPENDENT SPECTRAL LAGS OF FERMI-GBM GRBS

The Fermi Gamma-ray Burst Monitor (GBM) has detected over 650 GRBs since its launch in June 2008. Many GRBs exhibit a spectral lag up to ~1 MeV which is seen as high-energy gamma-ray emission arriving earlier than photons in a low-energy band. There is also evidence that the high-energy emission in the GeV energy range, as detected by the Large Area Telescope, is delayed relative to that in the <1 MeV range for some short and long bursts. Here we present the spectral lags of a sample of bright and hard GRBs detected by GBM, utilising data from the 12 NaI detectors and 2 BGO detectors on board. The wide energy coverage of GBM (8 keV - 40 MeV) allows the dependence of the spectral lag on energies up to the MeV range to be investigated for the first time for bursts with sufficient signal in the BGO detectors.

**Foley, S.,
Briggs, M. S.,
Connaughton, V.,
Fishman, G. J.**

Max-Planck-Institut für extraterrestrische Physik

**Talk, Poster
TGF S2.N1**

TEMPORAL PROPERTIES OF FERMI TGFS

The Fermi Gamma-ray Burst Monitor (GBM) has detected ~150 Terrestrial Gamma-ray Flashes (TGFs) in over two years of observations. With 14 detectors, including two large BGO detectors, GBM collects a large number of counts per TGF, enabling unprecedented studies of the time profiles of TGFs. Here we present the temporal properties of the GBM sample of TGFs, including the distributions of the rise times and fall times of the pulses. The TGF pulses may be symmetrical or have faster rise times than fall times and are well fit with simple Gaussian or log-normal functions. The fast rise times of some TGFs can be used to constrain the radius of the emission region. A variety of time profiles are observed including TGFs with multiple pulses separated in time and some clear cases of TGFs consisting of partially overlapping pulses. The multiple TGF pulses may be signatures of multiple lightning discharges.

**Fornasa, M.,
Cañadas B., Cuoco A.,
Gomez-Vargas G. A.,
Latronico L., Tinden T.,
Morselli A., Prada F.,
Sanchez-Conde M. A.,
Siegal-Gaskins J.,
Vitale V., Vogelsberger M., Zandanel F. and
Zavala J. F.**

Instituto de Astrofisica de Andalucia (IAA-CSIC)

**Poster
DMNP S1.N6**

DARK MATTER IMPLICATIONS OF THE FERMI-LAT MEASUREMENT OF ANISOTROPIES IN THE DIFFUSE GAMMA-RAY BACKGROUND

For the first time, the Fermi-LAT measured the angular power spectrum (APS) of anisotropies in the diffuse gamma-ray background. The data is found to be broadly compatible with a model with contributions from the point sources in the 1-year Catalog, the Galactic diffuse background, and the extragalactic isotropic emission; however deviations are present at both large and small angular scales. In this study we complement the model with a contribution from Dark Matter (DM) whose distribution is modeled exploiting the results of the most recent N-body simulations, considering both the contribution of extragalactic halos and subhalos (from Millenium-II) and of Galactic substructures (from Aquarius). With the use of the Fermi Science Tools, these simulations serve as templates to produce mock gamma-ray count maps for DM gamma-ray emission, both in the case of an annihilating and a decaying DM candidate. The APS will then be computed and compared with the Fermi-LAT results to derive constraints on the DM particle physics properties. The possible systematic due to an imperfect model of the Galactic foreground is also studied and take into account properly.

**Foschini, L.,
G. Ghisellini, F. Tavecchio, G. Bonnoli,
A. Stamerra**

INAF Osservatorio Astronomico di Brera

**Poster
AGN S1.N26**

SHORT TIME SCALE VARIABILITY AT GAMMA RAYS IN FSRQ AND IMPLICATIONS ON THE CURRENT MODELS

We performed a systematic search for shortest variability in the high-energy gamma-ray energy band of the three flat-spectrum radio quasars (3C 454.3, 3C 273, PKS B1222+216), with the greatest flux in the MeV-GeV band (>10^-5 ph/cm^2/s on daily basis). We set tight upper limits on the observed doubling time scale (< 2-3 hours), the smallest measured to date at MeV-GeV energies, which can constrain the size of the gamma-ray emitting region. The results obtained in the present work favor the hypothesis that gamma rays are generated inside the broad-line region.

Foschini, L., G. Ghisellini, Y.Y. Kovalev, M.L. Lister, F. D'Ammando, D.J. Thompson, A. Tramacere, E. Angelakis, D. Donato, A. Falcone, L. Fuhrmann, M. Hauser, Yu.A. Kovalev, K. Mannheim, L. Maraschi, W. Max-Moerbeck, I. Nestoras, V. Pavlidou, T.J. Pearson, A.B. Pushkarev, A.C.S. Readhead, J.L. Richards, M.A. Stevenson, G. Tagliaferri, O. Tibolla, F. Tavecchio, S. Wagner

INAF Osservatorio Astronomico di Brera

Oral

THE JULY 2010 OUTBURST OF THE NLS1 PMN J0948+0022

We report about the multiwavelength campaign on the Narrow-Line Seyfert 1 (NLS1) Galaxy PMN J0948+0022 (z = 0.5846) performed in 2010 July-September and triggered by high activity as measured by Fermi/LAT. The peak luminosity in the 0.1-100 GeV energy band exceeded, for the first time in this type of source, the value of 10^48 erg/s, a level comparable to the most powerful blazars. The comparison of the spectral energy distribution of the NLS1 PMN J0948+0022 with that of a typical blazar - like 3C 273 - shows that the power emitted at gamma rays is extreme.

Fossati, G., Meyer, E. T., Georganopoulos, M

Rice University, Houston, TX

Oral

FROM BLAZAR SEQUENCE TO BLAZAR ENVELOPE: STRONG AND WEAK JETS AND A PARADIGM SHIFT IN THE UNIFICATION OF RADIO-LOUD AGNS

We present our recent advances on blazar population studies extending the current "sequence" unifying paradigm towards a more comprehensive picture. We discuss results of study extending the characterization of radio-loud AGNs deeper in the synchrotron peak frequency-luminosity space, i.e. into the envelope bounded at the top by the "blazar sequence". We confirm that properties of the "blazar envelope" are consistent with progressive mis-alignment of jets with respect to the line of sight, connecting to radio galaxies. This result is accompanied by two major developments. We find population-based evidence of velocity gradients in jets at low kinetic powers, corresponding to FR1 radio galaxies and most BL Lacs. We hypothesize that these `weak' jets are separated from a population of non-decelerating, low synchrotron-peaking (LSP) blazars and FR2 radio galaxies (`strong' jets). Moreover, these initial results suggest a shift away from the continuous blazar sequence interpretation, namely it is not clear that there is a continuum of SED types with jet power, which does not appear to determine uniquely the placement of a source along the aligned sequence. It appears that below a certain jet kinetic power, sources can either have strong or weak jets, suggesting another parameter besides kinetic power is responsible for the jet structure. A prediction of this scenario is that most intermediate synchrotron peak (ISP) sources are not intermediate in intrinsic jet power between LSP and high synchrotron-peaking (HSP) as in the original blazar sequence, but are more misaligned versions of HSP sources.

Fraija, N.I., Gonzalez, M. M. and Lee, W. H.

Instituto de Astronomía, UNAM

Poster
GRB S2.N8

A GAMMA RAY AFTERGLOW OBSERVED IN GRB980923

GRB 980923 was one of the brightest bursts observed by the Burst and Transient Source Experiment (BATSE). Previous studies have detected two distinct components in addition to the main prompt episode, which is well described by a Band function. The ï¬rst of these is a tail with a duration of 400s, while the second is a high-energy component lasting 2s. After summarizing the observations, we have modeled this event and conclude that the tail can be understood as the early gamma-ray afterglow from forward shock synchrotron emission, while the high-energy component is described by the SSC emission from the reverse shock. The main assumption is that of a thick-shell case from highly magnetized ejecta. The calculated ï¬,uxes, break energies, start times and spectral index are all consistent with the observed values.

Franckowiak, A., for the IceCube collaboration

Universität Bonn

Poster
GRB S2.N9

SEARCH FOR TRANSIENT NEUTRINO SOURCES WITH ICECUBE

The IceCube detector, which is embedded in the glacial ice at the geographic South Pole, is the first neutrino telescope to comprise a volume of one cubic kilometer. The search for neutrinos of astrophysical origin is among the primary goals of IceCube. Point source candidates include galactic objects such as supernova remnants (SNRs) as well as extragalactic objects such as Active Galactic Nuclei (AGN) and Gamma-Ray Bursts (GRBs). Offline and online searches for transient sources like flaring AGNs, GRBs and supernovae (SNe) are presented. Triggered searches use satellite measurements from Fermi, SWIFT and Konus. Complementary to the triggered offline search, an online neutrino multiplet selection allows IceCube to trigger a network of optical telescopes, which can then identify a possible electromagnetic counterpart. This allows to probe for mildly relativistic jets in SNe and hence to reveal the connection between GRBs, SNe and relativistic jets. Results from IceCube's triggered GRB search and a first limit on relativistic jets in SNe from the optical follow-up program are presented.

Fuhrmann, L., on behalf of the Fermi/ LAT collaboration and MW collaborators

Max-Planck-Institut für Radioastronomie, Bonn

Poster
AGN S1.N27

THE FERMI/LAT MULTI-WAVELENGTH CAMPAIGN OF 3C 454.3 DURING THE 2008-2009 OUTBURST PERIOD

During the early phase of Fermi/LAT operations in July 2008, the quasar 3C 454.3 was detected in outburst showing highly variable gamma-ray emission for a period of about 130 days. A large LAT multi-wavelength campaign was organized during July 2008 and March 2009 providing a unique, detailed data base with nearly complete frequency coverage: radio cm/mm/sub-mm, IR, optical, Swift UV and X-ray bands including optical polarization, Spitzer near-IR and multi-frequency VLBI observations. Here, we present the analysis and results of this intensive campaign comparing the Fermi/LAT gamma-ray behavior of 3C 454.3 with its simultaneous multi-wavelength total intensity, optical polarization and broad band spectral behavior as well as VLBI kinematics. A detailed time series and cross-band analysis is presented revealing a correlated, quasi-periodic pattern at nearly all bands. Combining VLBI structural information and broad band SEDs with shock-in-jet/standing shock/helical jet modeling provides detailed insight into the physical processes which caused the outburst of 2008. The different scenarios and their physical implications are discussed.

Fuschino, F., Marisaldi, M., Labanti, C., Tavani, M., Longo, F., Barbiellini, G., Argan, A., Bulgarelli, A., Del Monte, E., Galli, M., Gianotti, F., Giuliani, A., Trifoglio, M., Trois, A.

INAF-IASF Bologna

Poster
TGF S2.N2

CORRELATION OF AGILE TGFS AND GLOBAL LIGHTNING ACTIVITY ACROSS THE EQUATORIAL BELT

The AGILE satellite is one of the three currently active space missions detecting Terrestrial Gamma-ray Flashes (TGFs). Using the Mini-Calorimeter (MCAL) instrument, sensitive in the 0.35-100 MeV energy range, AGILE records an average detection rate of 10 TGFs/month. Thanks to its Low Equatorial Orbit with only 2.5 degree inclination, AGILE guarantees an unprecedented exposure above the equator, where both lightning activity and TGF peak, with a total of 228 TGFs detected in two years of observation. Here we dicuss the comparison between AGILE TGFs and LIS/OTD annual average global lightining distributions. Based on bi-dimentional cross-correlation analysis, we show that AGILE TGFs in the equatorial area are well compatible with the lightining distribution. This result, which is complementary to the one-to-one TGF/ lightning correlations by ground-based sferics measurements, further supports the scenario of TGF production by lightning leader channels.

Gaggero, D., Giuseppe Di Bernardo, Carmelo Evoli, Dario Grasso, Luca Maccione

University of Pisa

Poster
Diffuse S1.N7

AN ALTERNATIVE SOLUTION TO THE CR GRADIENT PROBLEM

We present updated Cosmic Ray diffusion models which account for recent Fermi-LAT data on gamma-rays diffusion emission of the Galaxy and the CR emissivity gradient derived from Fermi-LAT observation of 2nd and 3rd Galactic quadrant. We show that, using our diffusion code, DRAGON, and considering a spatially varying diffusion coefficient, we are able to reproduce the observed flat emissivity gradient in the outer Galaxy with no need to change the source term, the diffusion halo height, or the CO-H2 conversion factor (X_CO) with respect to their observationally determined preferred values/distributions. We also show that our models are compatible with gamma-ray longitudinal and latitudinal profiles measured by Fermi-LAT, and still provide a satisfactory fit of all observed secondary-to-primary ratios, such as B/C and antiprotons/protons.

Galante, N., for the VERITAS Collaboration

Harvard-Smithsonian Center for Astrophysics

Poster
AGN S1.N28

THE VERITAS EXTRAGALACTIC SCIENCE PROGRAM

VERITAS is an array of four 12-m diameter imaging atmospheric-Cherenkov telescopes located in southern Arizona. Its aim is to study the very high energy (VHE: E>100 GeV) gamma-ray emission from astrophysical objects. VERITAS is currently the most sensitive VHE gamma-ray observatory in the world, and is committed to the study of extragalactic sources and related physics. The study of Active Galactic Nuclei (AGN) is intensely pursued through the VERITAS blazar key science project, but also through the large multi-wavelength observational campaigns on radio galaxies. The successful VERITAS AGN research program has provided insights to the jet inner structures and the underlying mechanisms giving rise to different classifications. Moreover, the synergy between Fermi and VERITAS on blazar observations results in important constraints on the extragalactic background light (EBL) through gamma-ray observations, and on the Cataloguing of the several AGN sub-classes. Finally, the discovery of gamma-ray emission from the starburst galaxy M 82 by VERITAS and Fermi provides important clues on possible mechanisms for accelerating cosmic rays. The VERITAS extragalactic research program and its related results are presented.

Galante, N., for the VERITAS Collaboration

Harvard-Smithsonian Center for Astrophysics

Poster
AGN S1.N29

VERITAS RECENT RESULTS ON THE FLARING ACTIVITY OF M 87

The giant radio galaxy M 87 is located at a distance of ~16 Mpc and harbours a supermassive black hole in its center. The structure of its relativistic plasma jet is resolved at radio, optical and X-ray wavelengths. M 87 belongs to the class of active galactic nuclei (AGN) and is one of the few extragalactic TeV gamma-ray source not belonging to the class of blazars. M 87 is also detected by Fermi in the GeV energy range. This makes it a unique laboratory to study jet substructures and the morphology of the non-thermal emission processes. In spring 2010 a major flare was observed at TeV energies, being sampled by VERITAS and Fermi in unprecedented accuracy. The results of the VERITAS observations will be discussed.

Gasparrini, D., Giommi P., Monte C., Raino' S., Cutini S. on behalf of the Fermi LAT collaboration and Leon Tavares J., Polenta G. on behalf of the Planck Collaboration.

ASI Science Data Center

Poster
AGN S1.N30

STUDY OF FLUX CORRELATIONS IN PLANCK-FERMI-SWIFT SAMPLE OF BLAZARS

Blazars are the dominating population on the newly explored microwave and gamma-ray skies. Combining the recent observations of Planck, Fermi and Swift, we have an unprecedented simultaneous coverage of a very large sample of blazars. In this work we present the correlations between fluxes and spectral indexes of blazars belonging to 4 flux-limited samples: radio, soft X-ray, hard X-ray and gamma-ray energies among the bands covered by the 3 instruments. Despite the fact that our data are strictly simultaneous, we find that the fluxes in the different parts of the electromagnetic spectrum are not so tightly correlated as expected from previous works. This can be either due to a different variability timescale among bands or an effect of the low number of detections, especially in the gamma-ray band. To improve the statistics we also make comparison with different periods of Fermi Integration

Georganopoulos, M.

University of Maryland, Baltimore County

Poster
AGN S1.N31

UNIFYING RADIO LOUD AGN IN THE ERA OF FERMI

Using recent ideas and observations, I synthesize a new framework for the unification of radio loud AGN. I show how this new framework is in agreement with current observations, it resolves several open issues with the blazar sequence, and makes solid predictions, so that it can be confirmed or falsified observationally.

Gérard, L., Henri, G. ; Pita, S. ; Punch M.

APC, University Paris 7

Poster
AGN S1.N32

BL LAC POPULATION STUDY USING FERMI'S 11 MONTHS CATALOGUE.

In the framework of AGN unification, BL Lac and their parent population would share the same intrinsic characteristics, the observational differences being due to the orientation of the jet compared to our line of sight. BL Lac would be the objects whose jet is oriented towards us, Doppler boosting the emission. The growing number of BL Lac detected at HE (> 100MeV) and VHE (>100GeV) is a challenge for this association, for the high values of Doppler factor needed to explain the emission of these sources imply a large density for the parent population. Here we use the results presented in Fermi's 11 months Catalogue to constrain some of the intrinsic characteristics of the BL Lac population detected by the instrument, like the distribution of intrinsic luminosities and that of Lorentz factors. The compatibility of a parent population with FRI objects -- usually associated with BL Lac -- is then investigated by comparison with Monte Carlo simulations in which these constraints are applied.

Ghirlanda, G.

INAF-Osservatorio Astronomico di Brera

Poster
GRB S2.N10

THE PHYSICAL NATURE OF THE GRB SPECTRAL-ENERGY CORRELATIONS REVEALED BY FERMI BURSTS

The correlation between the luminosity (L) and the peak spectral energy (Ep) in GRBs represents a fundamental hint for understanding the physics of these sources and possibly to use them as cosmological probes. The time resolved spectral analysis of bursts detected by Fermi/GBM offers the opportunity to deepen into the physical nature of this correlation. In both short and long GRBs we find a robust correlation between the luminosity and the peak energy. Its origin should be ascribed to the radiation mechanism, similar in short and long GRBs, rather than to their (different) progenitors. The finding of a time resolved L-Ep correlation within individual GRBs indicates that the spectral--energy correlation found considering the time integrated spectra of different bursts is real, and not the result of instrumental selection effects. The possible physical origin of the L-Ep correlation is discussed within different kinematic and radiative models proposed to explain the GRB observed spectral properties with the aid of these new results obtained from the analysis of Fermi/GBM data for both long and short GRBs.

Giommi, P., G. Polenta, A Lähteenmäki, D.J. Thompson, S. Cutini, D. Gasparrini on behalf of Fermi-LAT, Planck and Swift collaborations

Agenzia Spaziale Italiana

Oral

PLANCK, SWIFT, AND FERMI SIMULTANEOUS OBSERVATIONS OF BLAZARS

We present simultaneous Planck, Swift, Fermi and ground-based data of 105 blazars belonging to three samples with flux limits in the soft X-ray, hard X-ray and Gamma-ray bands and we compare our results to those of a companion paper presenting simultaneous Planck and multi-frequency observations of 104 radio-loud AGN selected at radio frequencies. While almost all the BL Lacs (~95%) have been detected by Fermi-LAT, only 60-70% of the FSRQs in the radio, soft X-ray and hard X-ray selected samples have been found above the detection limit even integrating over the entire 27 month Fermi-LAT data set available at the time of writing. The radio to sub-millimeter spectral slope of blazars is quite flat with ~ 0 up to about 70 GHz, above which it steepens to ~ -0.65. BL Lacs may be somewhat flatter at high-frequencies. Correcting for the contamination from the host galaxy and from the accretion disk, which has been detected in a fair number of sources, we find that a) the distribution of synchrotron peak energy in the Spectral energy Distribution (SED) of FSRQs is the same in all blazars samples with nu_peak_syn ~ 10^13.1+/-0.1 Hz, while their mean inverse Compton peak energy nu_peak_ic ranges between 10^21 and 10^22Hz with a larger dispersion then nu_peak_s b) the distributions of nu_peak_syn and nu_peak_ic of BL Lacs are shifted to higher energies, are much broader than those of FSRQs with a shape that strongly depends on the selection method. Despite our data being strictly simultaneous we find that fluxes in different parts of the electromagnetic spectrum are not tightly correlated but rather show a large scatter. The ratio between the power in the inverse Compton and synchrotron bumps, known as Compton Dominance, ranges between ~0.2 to nearly 100 with only FSRQs reaching values larger than ~3. The distribution is broad and strongly depends on the selection method, with Fermi bright blazars peaking at ~ 7 and non-Gamma-ray selected blazars at values close to 1, thus implying that the common assumption that the blazar power budget is largely dominated by high energy emission is just a selection effect. A comparison of our results with the predictions of the blazar sequence shows that, once the biases induced by the selection criteria and the lack of redshift knowledge in a large fraction of BL Lacs are taken into account, there is no evidence for such a relationship in our samples.

**Giordano, F.,
T. Brandt, M. Brigida,
Y. Uchiyama,**

University and INFN Bari

**Poster
SNR/PWNe S2.N10**

GEV SURVEY OF RADIO SNRS WITH FERMI-LAT

After two years of data taking, Fermi-LAT has collected firm evidence of GeV emission from many radio SNRs, and some others are under investigation. A possible correlation between radio luminosity and GeV flux will be presented, with the focus on possible explanations behind the emission mechanisms. For some cases, a closer look at possible interactions with dense environment has been carried out and results will be presented.

**Giroletti, M.,
Massaro, E., Tosti G.,
on behalf of the Fermi-LAT collaboration;
Giovannini, G.,
Tamburri, S., Casadio, C, Liuzzo, E.**

INAF Istituto di Radioastronomia

**Poster
AGN S1.N33**

REVEALING THE JET PROPERTIES IN THE BULK OF THE BL LAC POPULATION

Thanks to its sensitivity and broad energy range extending up to several GeV, Fermi has dramatically improved our knowledge of the gamma-ray properties of BL Lacs. The LAT has in fact discovered and characterized about 300 BL Lacs after 1 year, and they are now the most abundant population of extragalactic gamma-ray emitters. By contrast, little progress has been made in our understanding of the properties of BL Lacs in the radio. Most BL Lacs are just too weak in radio to reach the flux density threshold for inclusion in the ongoing main VLBI monitoring projects. A large fraction of BL Lacs in the 1FGL have not been observed with VLBI. We present here dual frequency (8 and 15 GHz) VLBA observations for a complete sample of 42 low redshift BL Lacs, in which high-energy peaked sources (HSPs) are well represented. 29 (68%) of the sources in the sample had never been observed at milliarcsecond resolution. The majority of the sources (over 80%) are detected, some at a flux level of a few mJy. We discuss the morphology, brightness temperature, and spectral index of the detected sources. We also discuss the gamma-ray properties of the sources detected in the 2FGL Catalog, and provide a combined look of the VLBA and Fermi properties. Finally, we highlight a few peculiar cases, including some possible misclassifications.

**Giroletti, M.,
D'Ammando, F. on behalf of the Fermi-LAT collaboration, S. Trippe**

INAF Istituto di Radioastronomia

**Poster
AGN S1.N34**

THE AGN RADIO-GAMMA CONNECTION MONITORING OF GAMMA-RAY ACTIVITY AND MM POLARIZATION IN THE FERMI ERA

The surveying capabilities of the Fermi-LAT observatory have triggered several multi wavelength campaigns aimed at constraining the physical properties of gamma-ray AGNs (typically blazars) with coordinated low frequency observations. The results of such campaigns suggested that the high energy variability has a deep relation with the emission at mm wavelengths and the core polarization. We have therefore explored the rich database of calibrators observed at the IRAM Plateau de Bure intereferometer (PdBI), which are by definition bright and compact radio sources, i.e., typically blazars. The PdBI data provide a continuous - though somewhat irregular - monitoring of the millimeter polarization properties of 95 sources. We focus on the mm-wavelength and gamma-ray data taken since June 2008, and we present three lines of research, which are promising for an insight on the physical conditions in blazar jets: (1) a study of a sample of moderately bright gamma-ray sources (>~5x10^-9 ph/cm^2/s above 1GeV), with a relatively high number of polarization detections (>=6); (2) a study of all the sources with a large number of polarization observations and detected in gamma rays, independently on their gamma-ray flux; (3) a statistical study of the polarization properties of the populations of gamma-ray detected and undetected sources in the whole sample of IRAM calibrators.

Giuliani, A., on behalf of the AGILE Team

INAF/IASF- Milano

Poster
SNR/PWNe S2.N11

AGILE OBSERVATIONS OF SNRS

We will review the crucial AGILE gamma-ray observations of SNRs focusing on the evidence of hadronic cosmic-ray acceleration that has been obtained so far. We will discuss data on SNR IC443, W28, W44. We show that in all cases a consistent model of hadronic acceleration and interaction with gaseous surroundings can be used to successfully explain the quite complex morphology and spectral characteristics. AGILE, with its crucially important sensitivity near 100 MeV is ideally equipped to prove the existence of pi-zero emission. We discuss several cases that clearly show such an emission.

Glanzman, T., Dubois, Richard

SLAC National Accelerator Laboratory, Stanford University

Poster
Binaries S2.N1

HIGHLIGHTS FROM MONITORING CANDIDATE GAMMA-RAY BINARY SYSTEMS WITH RSP

Ninety-four candidate gamma-ray emitting binary systems are automatically monitored on a weekly and monthly basis by a Routine Science Processing (RSP) task using data from the Fermi Gamma-ray Space Telescope. This task executes a generic analysis which dynamically creates a source model based on the First Fermi Catalog (1FGL), performs a spectral fit, creates counts maps, light curves and various plots in addition to a summary report. Analysis customization is allowed on a system-by-system basis, e.g., changes to the spectral model, and removal of nearby pulsar influence. This poster will summarize the current state of the analysis mechanism, discuss planned enhancements, and present selected highlights from this analysis.

Goldstein, A., Preece, R.D.

University of Alabama in Huntsville

Poster
GRB S2.N11

DERIVING THE JET OPENING ANGLE OF GRBS FROM THE PROMPT GAMMA-RAY EMISSION

We present a new method to derive jet opening angles from the prompt spectra of Gamma-Ray Bursts. We show how this method can be applied and present the results using a large sample of BATSE and GBM bursts. In addition, we find consistency between the newly derived jet opening angles for GRBs detected by GBM and those reported in literature using the afterglow jet break method. The derived jet opening angles can then be used to calculate the collimation-corrected energy release in gamma-rays in the rest-frame, as well as test the correlation between the energy release and the rest-frame Epeak. This correlation using GBM-detected GRBs contains bursts from a large range of measured redshifts (up to ~8.2) and places long and short GRBs onto a single empirical power law.

Goodman, J., for the HAWC Collaboration

University of Maryland

Poster
Instr S2.N16

THE HAWC OBSERVATORY

The High Altitude Water Cherenkov (HAWC) Observatory is a TeV gamma ray detector currently under construction at Sierra Negra in Mexico. HAWC will utilize the wide-angle, high duty cycle water Cherenkov technique developed by Milagro, but use new technology, a larger detection area, and higher altitude to improve sensitivity by an order of magnitude. HAWC will survey the TeV gamma ray sky, measure spectra of galactic sources up to and beyond 100 TeV, and map galactic diffuse gamma ray emission. With its wide field of view and continuous operation, HAWC will also be a powerful instrument with which to study transient phenomena. In this talk we will describe the science reach and performance of HAWC as well as how these overlap with space and ground-based detectors.

Grandi, P., Migliori G., Torresi, E., Aversa on behalf of the Fermi-LAT collaboration

INAF/IASF Bologna

Poster
AGN S1.N35

GAMMA-RAY COUNTERPARTS OF MISALIGNED AGNS

We study the Misaligned AGNs (MAGNs) belonging to different radio Catalogues which are associated with Fermi-LAT gamma-ray sources detected during 24 months of sky survey.We extend our previous 15 month gamma-ray study of low radio frequency Catalogues (3CR, 3CRR and MS4) reported in Abdo et al. (2010, ApJ, 720, 912) and, in addition, we include new results based on the investigation of the complete 2 Jy sample (Wall & Peacock 1985, MNRAS, 216, 173). Being selected at high radio frequency (2.7 GHz), the 2Jy sample contains a mix of Blazars and MAGNs. The investigation of their gamma-ray counterparts allows then a direct comparison of MeV-GeV properties of objects (i.e. jets) seen at different inclination angles. We review the high energy properties of MAGNs following two different approaches: i) a comparative study of gamma-ray emitters as a function of orientation; ii) an analysis of the Spectral Energy Distributions (SED) of single MAGN using the most recent leptonic models proposed for jets.

Grasso, D., Giuseppe DI Bernardo, Carmelo Evoli, Daniele Gaggero, Luca Maccione

INFN, Pisa

Poster
CR S2.N2

CONSISTENCY OF FERMI-LAT AND PAMELA COSMIC RAY LEPTON MEASUREMENTS

This year the Fermi-LAT collaboration published the $e^- + e^+$ spectrum measured between 7 GeV and 1 TeV. Very recently, the PAMELA collaboration, which already measured the positron fraction between 1 and 100 GeV, published the e^- spectrum between 1 and 625 GeV. Noticeably, all these measurements have been performed during near time intervals which allows to reduce the uncertainties due to solar modulation. We discuss under which conditions those experimental results can consistently be interpreted.

Grondin, M.-H., Lemoine-Goumard, Marianne on behalf of the Fermi-LAT Collaboration and the Pulsar Timing Consortium

Institut für Astronomie und Astrophysik - Universität Tübingen (Germany)

Oral

RECENT DETECTIONS OF TEV PULSAR WIND NEBULAE WITH THE FERMI-LARGE AREA TELESCOPE

Prior to the Fermi Gamma-ray Space Telescope, only six pulsars and one associated Pulsar Wind Nebula, the Crab Nebula, had been detected in gamma-rays by the CGRO-EGRET experiment. Since then, the Large Area Telescope (LAT) aboard Fermi has significantly increased the number of detected pulsars in the 100 MeV to 30 GeV energy range. These gamma-ray pulsars can power Pulsar Wind Nebulae potentially detectable by the LAT, as has already been done for the Crab and Vela-X. However, the emission from a PWN can usually only be observed in the off-pulse windows of the pulsar light curves, due to the dominating pulsed emission in the total phase interval. A systematic analysis was performed using 15 months of Fermi-LAT data to detect these weak and steady sources. When no significant detection was observed, flux upper limits were derived to constrain model parameters and provide a first population study of gamma-ray pulsar wind nebulae. This led to the detection of an off-pulse source spatially coincident with a TeV source located in the region of the young stellar cluster Westerlund 2 and its likely identification as a Pulsar Wind Nebula. In addition, high energy emission spatially coincident and spectrally correlated with famous TeV Pulsar Wind Nebulae such as HESS J1825-137 was recently detected using 20 months of Fermi-LAT data in survey mode. In this presentation, we will review the recent results obtained with the Fermi-LAT on TeV Pulsar Wind Nebulae, including the Crab Nebula, Vela-X and MSH 15-52, HESS J1825-137, and give a general overview of the constraints provided by Fermi-LAT non-detections.

Grossan, B.,
The UFFO Team

Univ. of California, Berkeley and Ewha Womans University

Poster
GRB S2.N12

THE X-RAY AND IR GRB SCIENCE INSTRUMENTS (XIGI) FOR THE ULTRA-FAST FLASH OBSERVATORY (UFFO) - 100

MEMS mirror arrays fabricated at the Research Center for MEMS Space Telescopes (RCMST) of Ewha Woman's University, Seoul, can point over >60 degree fields within milliseconds. Such devices can therefore steer the beam of a conventional optical telescope with much faster response to GRB triggers than ever before. The Ultra-Fast Flash Observatory (UFFO) concept uses an X-ray coded mask camera to trigger a MEMS mirror array to point a UV/optical/IR telescope to observe GRB and other transients. The UFFO- Pathfinder, a small version of the observatory, with a 10 cm telescope mirror, and 191 cm^2 of X-ray detector area, will be launched by Jan 2012 on the Lomonosov Spacecraft. Even this small pathfinder will detect dozens of GRB. In 2015, we plan to launch the UFFO-100, a much larger instrument with a 30 cm mirror and more than 1000 cm^2 of CZT collecting area for the X-ray camera. Two cameras simultaneously measure emission in the UV to V band, and separately, in the R to near-IR band. In this talk, we give details of the instrument designs, the science plan, and updates on the program. The UFFO-100 will detect GRB nearly as often as Swift in the V band, but it will start observing them much earlier. The near-IR camera will be able to detect most obscured GRB, for a boost of about 30% in rate. These advances in response time and instrumentation will enable UFFO to do a large, systematic study of the rise shape of GRB for the first time.

Grove, J. E.,
A. Chekhtman, J. McEnery, N. Omodei, F. Longo on behalf of the Fermi LAT collaboration; M. Briggs, G. Fishman, V. Connaughton on behalf of the Fermi GBM collaboration

Naval Research Laboratory

Poster
TGF S2.N3

SEARCH FOR TERRESTRIAL GAMMA-RAY FLASHES WITH FERMI LAT

Terrestrial Gamma-ray Flashes (TGFs) are millisecond bursts of high energy photons, electrons, and positrons originating in Earth's atmosphere and associated with powerful thunderstorms. The Fermi GBM has detected over 100 TGFs, some with energies up to 40 MeV. Recent AGILE observations of photons up to ~100 MeV in TGFs pose a significant challenge to the relativistic runaway electron avalanche mechanism that is generally believed to be responsible for these bremsstrahlung gamma rays. Here we present the search for high energy events in the LAT coincident with the large sample of TGFs detected by the GBM.

Guillemot, L.,
Pletsch, H., Fermi Collaboration

Max Planck Institute fuer Radioastronomie

Poster
PSR S2.N8

A BLIND SEARCH FOR ISOLATED MILLISECOND PULSARS IN THE FERMI LAT DATA

The Large Area Telescope (LAT) on the Fermi satellite has opened a new era in the study of pulsars by detecting nearly 100 pulsars in gamma rays, by detecting high-energy pulsations from millisecond pulsars (MSPs) for the first time, and by being the first gamma-ray telescope to discover new pulsars. Nevertheless, none of the pulsars discovered so far in blind searches of the data recorded by the LAT are MSPs. Most MSPs indeed have binary orbits, making the parameter space to be searched overwhelmingly vast. For isolated MSPs, the number of trial sky positions, frequencies and frequency derivatives needed to detect a pulsed signal still makes searches very challenging. We present a semi-coherent search technique that, coupled with large computational power, will be used to search for unknown isolated MSPs. Discovering the unseen population of radio-quiet MSPs would open a completely new window on the study of pulsars.

Guiriec, S.,
on behalf of the Fermi/ GBM collaboration

Nasa Marshall Space Flight Center / University of Alabama in Huntsville

Poster
GRB S2.N13

MULTI-COMPONENT SPECTRAL ANALYSIS OF BRIGHT GAMMA RAY BURSTS OBSERVED WITH THE FERMI GAMMA RAY SPACE TELESCOPE

The recent observations of Gamma-Ray Bursts (GRBs) with the Gamma-ray Burst Monitor (GBM) and the Large Area Telescope (LAT) onboard the Fermi Gamma Ray Space Telescope, open a new window in the understanding of their prompt emission. With data sets from instruments prior to Fermi, GRB prompt emission spectra in the keV-MeV energy range were adequately fit with the empirical Band function, which consists of two power laws (PLs) smoothly connected at a break energy. The Band function is usually associated to non-thermal emission processes. Spectral analysis over the broad energy range of GBM shows deviations from this function. These deviations are sometimes adequatelly fit with an additional PL extending from the lowest energy in GBM up to few tens of GeV in the LAT. We also recently clearly identified, for the first time, a physical thermal spectral component together with the non-thermal one. We present here the identification of multiple spectral components in the GBM prompt emission spectra of some bright GRBs: a photospheric thermal component, a broken PL most likely associated with synchrotron emission from electrons propagating in the GRB jet, and an additional PL. Using time integrated and detailed time-resolved spectroscopy of GBM data, we show the temporal evolution of the various spectral components and their relative contributions. We will see that it is possible to associate the various spectral components with light curve structures in various energy bands in GBM and LAT. Multi-component fits allow better constraints on the GRB prompt emission spectral shape. Therefore, this new approach can reconcile the observations with the models which were challenging the spectral parameters of the Band function. We will discuss the interpretation of the various components in terms of emission mechanisms and acceleration processes, and we will examine the consequences on the central engine and jet properties.

Hadasch, D.,
on behalf of the Fermi LAT collaboration

Institut de Ciències de l'Espai (IEEC-CSIC)

Oral

EXPECTED AND UNEXPECTED RESULTS FROM 2 YEARS FERMI/LAT MONITORING OF THE TWO GAMMA RAY BINARIES LS I +61 303 AND LS5039

The Large Area Telescope (LAT) on the Fermi Gamma-ray Space Telescope has been observing the sky in gamma rays since August 2008. The LAT scans the entire sky above 20 MeV every 3 hours with unprecedented sensitivity in the high energy range, making it an ideal monitor for binary systems, one interesting class of sources in our Galaxy. LS I +61 303 and LS5039 are two particularly interesting binary systems, detected in all energy ranges from radio to TeV. Two years of observations at GeV energies of these bright sources brought up new insights into their behavior. For LS I +61 303, a significant change in flux level in March 2009 and changes in its orbital modulation were detected. In this talk we will present LAT results on the binaries, also in context of the multiwavelength picture of these sources, and we will discuss the implications of the results for understanding the nature of the systems.

Harding, A., Megan DeCesar and M. Coleman Miller

NASA Goddard Space Flight Center

Oral

GAMMA-RAY PULSAR LIGHT CURVES IN OFFSET POLAR CAP GEOMETRY

Recent studies have shown that gamma-ray pulsar light curves are very sensitive to the geometry of the pulsar magnetic field. Pulsar magnetic field geometries, such as the retarded vacuum dipole and force-free magnetospheres, used to model high-energy light curves have distorted polar caps that are offset from the magnetic axis in the direction opposite to rotation. Since this effect is due to the sweepback of field lines near the light cylinder, offset polar caps are a generic property of pulsar magnetospheres and their effects should be included in gamma-ray pulsar light curve modeling. In slot gap models (having two-pole caustic geometry), the offset polar caps cause a strong azimuthal asymmetry of the particle acceleration around the magnetic axis. We have studied the effect of the offset polar caps in both retarded vacuum dipole and force-free geometry on the model high-energy pulse profiles. We find that, compared to the profiles derived from symmetric caps, the flux in the pulse peaks, which are caustics formed along the trailing magnetic field lines, increases significantly relative to the off-peak emission, formed along leading field lines. The enhanced contrast produces greatly improved slot gap model fits to Fermi pulsar light curves like Vela, which show very little off-peak emission.

Hascoët, R., Daigne F., Mochkovitch R.

Institut d'Astrophysique de Paris

Oral

DO FERMI-LAT OBSERVATIONS REALLY IMPLY VERY LARGE LORENTZ FACTORS IN GRB OUTFLOWS ?

Recent detections of GeV photons in a few GRBs by Fermi-LAT have led to strong constraints on the bulk Lorentz factor in GRB outflows. To avoid a large gamma-gamma optical depth, minimum values of the Lorentz factor have been estimated to be as high as 800-1200 in some bursts. Here we present a detailed calculation of the gamma-gamma optical depth taking into account both the geometry and the dynamics of the jet. We compute lightcurves in different energy bands and the corresponding spectrum and we show how the minimum Lorentz factor (or the Lorentz factor if a cutoff in the spectrum can be identified as an effect of the gamma-gamma attenuation, e.g. GRB 090926A) can be significantly lowered compared to previous estimates. Our detailed model of the propagation of high energy photons in GRB outflows is also appropriate to study many other consequences of gamma-gamma annihilation in GRBs. The gamma-gamma cutoff transition in a time-integrated spectrum is expected to be closer to a power-law steepening of the spectrum than to a sharp exponential decay. The temporal evolution of the gamma-gamma opacity during a burst could also favor a delay between the MeV and GeV light curves. We show that for complex GRBs, the gamma-gamma opacity suppress the shortest time-scale features in high energy light curves (above 100 MeV). Finally we also consider GRB scenarii where MeV and GeV photons are not produced at the same location, showing that the gamma-gamma opacity could be further lowered, reducing even more the constraint on the minimum Lorentz factor.

Hayashida, M., Greg Madejski for the Fermi-LAT Collaboration

SLAC-KIPAC

Poster
AGN S1.N36

THE PICTURE OF RELATIVISTIC JET FROM FERMI-LAT AND MULTI-BAND OBSERVATIONS OF BLAZAR 3C 279

Flat Spectrum Radio Quasar 3C 279 has been one of the brightest gamma-ray blazars in the sky. Since the successful launch of the Fermi Gamma-ray Space Telescope in 2008, we have organized extensive multi-band campaigns on 3C 279 from radio to gamma-ray bands including intensive satellite observations (such as Spitzer, Suzaku and XMM-Newton) and optical polarimetric observations. The gamma-ray flux variations and spectral measurements by Fermi-LAT together with the multi-band data provide us with new insights about the relativistic jet of this blazar. Here, we present the results of the multi-band campaign of 3C 279 for 2 years including the discovery of a gamma-ray flare event associated with a dramatic change of the optical polarization. The result indicates the emission region is located far from the black hole, which would be important in considering the dominant source of seed photons for inverse-Compton emission in the gamma-ray band. Based on those results, the implications on the structure of relativistic jets and broad-band emission models of radiation from the jet are discussed.

Hayashida, M., Keith Bechtol, Lukasz Stawarz and Greg Madejski for the Fermi-LAT Collaboration

SLAC-KIPAC

Poster
AGN S1.N37

SEARCH FOR GAMMA-RAY EMISSION FROM RADIO-QUIET SEYFERT OBJECTS

Seyferts are identified in the optical regime as AGN hosted by late-type galaxies with particularly bright unresolved nuclei. They are also bright in X-rays, and both the optical and the X-ray emission components are well understood as being produced by the matter accreting onto central supermassive black holes. Apart from some Seyfert objects with luminous relativistic jets which are also known as radio galaxies, radio emission from Seyferts is generally quite weak and typically dominated by the diffuse emission of the interstellar medium. For some Seyferts, low-power radio-emitting outflows have been resolved, but not much is known about the gamma-ray emission of Seyfert galaxies. Here, we report on a first systematical investigation of the properties of Seyferts at MeV-GeV photon energies, utilizing the two-year accumulation of Fermi-LAT data, and a uniform and numerous sample of objects selected from the Swift-BAT 58 month Catalog. Our preliminary results indicate that Seyferts are `gamma-ray quiet' as a class of AGN, and that the MeV-GeV emission detected so far from few of them may be well accounted by the emission of the interstellar medium from host galaxies. The derived upper limits in the MeV-GeV domain are already low enough to exclude a presence of any non-thermal emission components in Seyferts' nuclei down to the levels of 1% of the X-ray luminosities.

Hays, E.,
on behalf of the Fermi LAT Collaboration

NASA/GSFC

Poster
SNR/PWNe S2.N12

SHORT-TERM VARIABILITY STUDIES OF THE CRAB WITH THE FERMI-LAT

Short GeV flares observed from the Crab raise interesting questions about the acceleration of electrons to surprisingly high energy in the nebula. Abdo et al. (2011, Science, 331, 739) use four-day intervals to evaluate flares detected in February 2009 and September 2010. That binning is well-suited to reliably detecting the flaring nebula in an off-pulse selection, avoiding the bright foreground of the pulsar which cannot be spatially separated. Alternatively, the combined pulsar and nebula flux can be used to search for additional structure within the flare as reported in Balbo et al. (2011, A&A, 527, L4). However, this brings in additional systematic errors due to the complexity of the combined emission and the notably soft index of the synchrotron component of the nebula. In order to accurately assess variability on shorter intervals, the systematic errors inherent in analyzing the total flux from the pulsar and nebula must be characterized. This work examines sources of systematic errors in the analysis of the combined Crab flux and their impact on variability studies using intervals shorter than four days.

Hessels, J.W.T., Roberts, M.S.E.; Ransom, S.M.; McLaughlin, M.A.; Ray, P.S.; Camilo, F.; Kerr, M.; Bangale, P.; DeCesar, M.E.; Fermi PSC

ASTRON - Netherlands Institute for Radio Astronomy

Poster
PSR S2.N9

RECENT GBT DISCOVERIES OF RADIO MILLISECOND PULSARS COINCIDENT WITH FERMI GAMMA-RAY SOURCES

We have used the Green Bank Telescope at 350MHz to search for radio pulsations from 50 faint, unidentified Fermi gamma-ray sources. With our search analysis of these data all but complete, we have discovered 10 millisecond pulsars (MSPs). Furthermore, we have recently continued GBT searches of many more unidentified Fermi sources at 820MHz. With much of this data still requiring a full analysis, 6 new MSPs have already been found. I will discuss these new sources, follow-up observations/analysis, and will place particular emphasis on the large fraction of sources which show eclipses. In general, these sources will undoubtedly shed light on the nature of Galactic gamma-ray sources and many are very interesting pulsars in their own right.

Horan, D., Fegan, S. J., Fortin, P., Giebels, B., Sanchez, D. on behalf of the Fermi-LAT Collaboration

LLR / Ecole Polytechnique / CNRS / IN2P3

Poster
AGN S1.N38

THE GEV-TEV EXTRAGALACTIC SKY AFTER TWO YEARS OF FERMI OPERATION

We report on the characteristics of GeV-TeV emitting AGN using observations made during the first two years of Fermi operation. Several TeV sources were recently discovered due in part to information derived from the Fermi data in the 100 MeV - 300 GeV energy range. We present the GeV spectral and variability properties of the GeV-TeV sources detected by Fermi and compare them with the TeV measurements in order to characterize their high-energy spectral energy distributions from 100 MeV up to TeV energies, and study the evolution of their spectra with redshift in the context of the extragalactic background light (EBL).

Hou, X.,
D. Dumora, D.A. Smith

Centre d'Etude Nuclaire de Bordeax-Gradignan, CNRS, France

Poster
PSR S2.N10

TRACKING DOWN THE HIGHEST SPINDOWN POWER GAMMA-RAY PULSARS

46 gamma-ray pulsars have been detected using the Large Area Telescope (LAT) on NASA's Fermi satellite and were reported in the 1st Fermi Pulsar Catalog. About fifty more have been seen since then. A simple but effective figure-of-merit for gamma-detectability is sqrt(Edot)/d^2, where Edot is the pulsar spindown power and d is the distance. We are tracking down the best gamma-ray candidates not yet seen. This poster presents the timing and spectral analysis results of some new high spindown power, nearby gamma-ray pulsars. We also update some population distribution plots in preparation for the 2nd Fermi Pulsar Catalog.

Humensky, T. B.,
VERITAS Collaboration

University of Chicago

Oral

HIGHLIGHTS OF GALACTIC OBSERVATIONS WITH VERITAS

The TeV sky includes many Galactic particle accelerators including supernova remnants, pulsar wind nebulae, binary systems, and numerous currently unidentified sources. Located in the northern hemisphere, VERITAS has an excellent view of the Galactic anticenter, the Cygnus region, and - at large zenith angles - the inner galaxy down to the Galactic Center. This talk will highlight recent Galactic results from VERITAS, amongst others including studies of Tycho's SNR, VER J2019+407, LS I +61 303, HESS J0632+057 and the Galactic Center.

Huppenkothen, D.,
et al. (The Magnetar GBM Collaboration)

Astronomical Institute "Anton Pannekoek", University of Amsterdam

Poster
GRB S2.N14

SEARCHING FOR QPOS IN FERMI GBM OBSERVATIONS OF SGR 0501+4516

Over the last few years the discovery of quasi-periodic oscillations (QPOs) in the tails of magnetar giant flares, and their interpretation as oscillations of the stellar crust and interior, has resulted in important constraints on theoretical neutron star models. Giant flares, however, are very rare, with an occurrence of once every ten years or so. Many soft gamma repeaters, on the other hand, show smaller flares that could in principle also excite QPOs. Here, we present first results from a search for QPOs from SGR 0501+4516 using data from Fermi GBM. We discuss the implications of our results for neutron star models.

Hurley, K., M. Briggs, V. Connaughton C. Meegan, A. von Kienlin , S. Golenetskii, R. Aptekar, E. Mazets, V. Pal'shin, D. Frederiks, T. Cline, I. G. Mitrofanov, D. Golovin, M. L. Litvak, A. B. Sanin, W. Boynton, C. Fellows, K. Harshman, R. Starr , D. M. Smith, W. Hajdas, A. Rau, K. Yamaoka, M. Ohno, Y. Fukazawa, T. Takahashi, M., Tashiro, Y. Terada, T. Murakami, K. Makishima, J. Goldsten, E. Del Monte, M. Feroci, M. Marisaldi

UC Berkeley Space Sciences Laboratory

Poster
GRB S2.N15

THE INTERPLANETARY NETWORK SUPPLEMENT TO THE FERMI GBM GAMMA-RAY BURST CATALOG

The data of the nine spacecraft Interplanetary Network are being used to refine GBM localizations of gamma-ray bursts. This effort is 1) assisting the GBM team to understand and reduce systematic uncertainties, 2) reducing the sizes of GBM and LAT localizations by one to four orders of magnitude, 3) facilitating the identification of GRB sources with objects found by ground- and space-based observatories at other wavelengths (Type Ibc supernovae are one example), and 4) facilitating searches for non-electromagnetic components of GRB emission such as neutrinos and gravitational radiation. We present the statistics of the bursts detected by the IPN during the first two years of the Fermi mission, and demonstrate the synergy between IPN, GBM, and LAT localizations.

Inoue, S., Uchiyama, Y., Renaud, M., Baek, C., Wada, K.

Kyoto University

Poster
OtherGal S2.N9

HIGH-ENERGY GAMMA RAYS FROM GALACTIC ACCRETION EVENTS AND IMPLICATIONS FOR UNIDENTIFIED GEV-TEV SOURCES

High velocity clouds (HVCs), diffuse HI gas clouds in the Galactic halo travelling at velocities of a few 100km/s relative to the Galactic disk, are likely manisfestations of ongoing gas accretion onto the disk. We address the possibility of particle acceleration in shocks that occur during collisions of HVCs with the disk, and the detectability of associated GeV-TeV gamma-ray emission. In some cases, protons may be accelerated up to ~100 TeV during the shock lifetime, and the resulting pion decay emission may be relevant to some of the unidentified GeV and/or TeV sources. Some testable predictions are discussed for future broadband observations, which may eventually offer interesting new information on the evolution of the Galaxy and the interstellar medium.

Inoue, Y.

Kyoto University

Poster
Diffuse S1.N8

CONTRIBUTION OF GAMMA-RAY LOUD RADIO GALAXIES TO THE EXTRAGALACTIC GAMMA-RAY BACKGROUND RADIATION

Fermi has recently detected gamma-ray emissions from radio galaxy cores. We first examine the correlation between the radio and gamma-ray luminosities of these gamma-ray loud radio galaxies. We find that the correlation is significant. Using this correlation and the radio luminosity function (RLF) of radio galaxies, we further explore the contribution of gamma-ray loud radio galaxies to the unresolved extragalactic gamma-ray background (EGRB). The gamma-ray luminosity function is obtained by normalizing the RLF to reproduce the source count distribution of the Fermi gamma-ray loud radio galaxies. We find that gamma-ray loud radio galaxies will explain ~25% of the unresolved Fermi EGRB flux above 100 MeV and will also make a significant contribution to the EGRB in the 1-30 MeV energy band. Since blazars explain 22% of the EGRB above 100 MeV, radio loud active galactic nuclei (AGNs) population explains ~47% of the unresolved EGRB. We further make an interpretation on the origin of the EGRB. The observed EGRB spectrum at 0.2-100 GeV does not show an absorption signature by the extragalactic background light. Thus, the dominant population of the origin of EGRB at very high energy (>30 GeV) might be nearby gamma-ray emitting sources or sources with very hard gamma-ray spectrum.

Isler, J.C., Bailyn, C., Bonning, E.W., Buxton, M., Chatterjee, R., Coppi, P., Fossati, G., Maraschi, L., Scalzo, R., Urry, C.M.

Yale University

Poster
AGN S1.N39

SMARTS OPTICAL SPECTROSCOPY OF 3C 454.3

We report ongoing spectroscopic observations of 3C 454.3 using the Small and Moderate Aperture Research Telescope System SMARTS 1.5m telescope + RC Spectrograph located at Cerro-Tololo Inter-American Observatory (CTIO). Spectra have been obtained roughly every 14 days from August 2008 through January 2011, during which 3C 454.3 has undergone several prominent optical (and gamma-ray) flares. We find that while the equivalent width (EW) of 3C 454.3 varies, the line flux remains constant. This result suggests that the Broad Line Region is photoionized by the slowly varying accretion disk rather than radiation from the relativistic jet. We find the strength of the MgII line to be consistent with a constant line flux of ~2.0x 10-14 erg s-1 cm2 A-1. This constant line flux argues against the photoionization of the BLR from the relativistic jet, as this source has undergone a number of flares during the course of observation with no corresponding change in line flux. This finding also implies that accretion disk is non-variable on timescales of at least 2.5 years.

Iuppa, R., Di Sciascio, G. on behalf of the ARGO-YBJ collaboration

University of Rome Tor Vergata, INFN - sez.ne Tor Vergata

Poster
CR S2.N3

COSMIC-RAY ANISOTROPIES OBSERVED BY THE ARGO-YBJ EXPERIMENT

The ARGO-YBJ experiment, located at the Yangbajing Cosmic Ray Laboratory (Tibet, 4300 m asl, 606 g/cm2), is an EAS-array exploiting the full coverage approach at high altitude. We analyzed the data taken since November 2007 looking for anisotropies in the arrival directions of cosmic rays on different angular scales. The results of the analysis is reported and compared with other experiments.

Iuppa, R.,
Di Sciascio, G.;
Hansen, F.K.;
Marinucci, D.;
Santonico, R.

University of Rome Tor Vergata, INFN - sez.ne Tor Vergata

Oral

A NEEDLET-BASED APPROACH TO THE FULL SKY GAMMA-RAY DATA ANALYSIS

Needlets are a new form of spherical wavelets that have recently drawn a lot of attention in the cosmological literature, especially in connection with the analysis of CMB data. Needlets enjoy a number of important statistical and numerical properties which suggest that they can be very effective in handling cosmic-ray and gamma-ray data analysis. An unprecedented application to astroparticle physics is shown here. In particular, we focus on their use for background estimation, which is expected to be optimal or nearly-optimal in a well-defined mathematical sense, and for point-source detection. This technique is applied here to simulated sky maps as observed by ground-based and satellite large field of view experiments, stressing its advantages with respect to standard methods.

Jamil, O.,
Boettcher, M.; Baring, M.

Ohio University

Poster
AGN S1.N40

MODELLING RADIATIVE TRANSFER IN BLAZAR JETS: COMBINING MONTE-CARLO SHOCK ACCELERATION SIMULATIONS WITH TIME-DEPENDENT RADIATIVE TRANSFER.

We present results from time-dependent blazar jet radiation transfer simulations. Monte-Carlo simulations for relativistic shock acceleration are conducted to solve for representative electron spectra injected in the jet shock environments; these are used as an input into our radiation transfer code. Our code is able to model arbitrary electron distributions on arbitrary spatial (cubic) grids. It evaluates self-consistently, and with full angular dependence, the synchrotron and synchrotron self-Compton emission which is particularly relevant for high-frequency-peaked BL Lac objects. With our new code, we are able to study in detail the spectral variability patterns in blazar spectra and their relation to the underlying electron acceleration and cooling mechanisms. In addition, our simulations can eventually be applied to analyze the jet timing properties in other astrophysical systems such as X-ray binaries.

Jenke, P.,
Wilson-Hodge, C. ,
Finger, M. , Camero-Arranz, A.

MSFC, NASA NPP

Poster
PSR S2.N11

SPIN EVOLUTION AND ORBITAL DECAY OF THE X-RAY BINARY PULSAR OAO 1657-415

OAO 1657-415 is an eclipsing X-ray binary wind-fed pulsar that exhibits smooth spin-up episodes and has undergone several torque reversals throughout its long history of observation. We present a frequency history spanning nearly 19 years of observations from the Burst and Transient Source Experiment (BATSE/CGRO) and from the Gamma-Ray Burst Monitor (Fermi/GBM) along with a flux history from the Fermi/GBM and BATSE/CGRO Earth Occultation Monitoring Project. The frequency history suggests three modes of accretion: one resulting in steady spin-up, one resulting in steady spin-down, and one that results in what appears to be a random walk in spin frequency. Orbital ephemerides of the pulsar system are obtained at several intervals throughout this history. With these ephemerides, statistically significant orbital decay is established suggesting a transition between wind-fed and disk-mediated accretion. Orbital decay mechanisms for OAO 1657-415 and their consequences will be discussed.

Jogler, T., Blanch, O. on behalf of the MAGIC collaboration

MPI for Physics Munich

Poster
Binaries S2.N2

DETECTION OF LS I+61 303 IN A LOW VHE GAMMA-RAY EMISSION STATE WITH THE MAGIC TELESCOPES

The gamma-ray binary system LS I+61 303 was studied in great detail in VHE gamma-rays in the last years by the MAGIC telescope. The VHE emission of the system exhibited a prominent periodic outburst in the orbital phases 0.6-0.7 between September 2005 and January 2008. In Fall 2008 the Fermi collaboration reported as well periodic emission in the MeV to GeV energy range, but with a shifted outburst in the phases 0.35-0.45. MAGIC observed again LS I+61 303 in 2009 with the twice more sensitive stereo mode to allow for detailed correlation studies between the VHE gamma-ray and Fermi/LAT energy band. Here we present for the first time our new results, which show a significant reduction in the VHE gamma-ray flux in the periodic outburst phase by a factor of about 2.5 to only 1.3% of the Crab Nebula flux. Furthermore, the 0.1-phase averaged light curve shows no significant outburst, but a rather constant flux. Similar changes in the long term behavior of the HE emission, from a clear outburst to a more constant flux, have been reported by the Fermi Collaboration in recent conferences. Here we will discuss the implications of our results for future gamma-ray studies of LS I+61 303.

Johanneson, G., for the Fermi LAT collaboration

Science Institute, University of Iceland

Poster
Diffuse S1.N9

PROBING SYSTEMATIC UNCERTAINTIES IN DIFFUSE EMISSION MODELING WITH FERMI-LAT DATA

The high energy diffuse emission originates when cosmic-rays (CRs) interact with the interstellar medium (ISM) and interstellar radiation field (ISRF). It is the dominant source of gamma-rays in the Fermi-LAT data, accounting for more than half of the photons. Observations of the diffuse emission can be used to explore CR origin and propagation in the Milky Way when combined with modeling of the diffuse emission. We utilize the GALPROP code to create a grid of models by varying within observational limits the size of the propagation halo, the CR source distribution and the interstellar gas distribution. The models are compared to 21 months of Fermi-LAT data using an all sky maximum likelihood fit where we determine the radial distribution of the X_CO factor, a normalization factor for the ISRF, the spectral shape of the sources from the first Fermi-LAT Catalog, and the spectral shape of the isotropic background, all of which have some dependence on the assumed diffuse emission model. The models are compared on their maximum likelihood ratio, as well as spectra, longitude and latitude profiles, and residual maps.

Johnson, A.S.

SLAC National Accelerator Laboratory

Poster
Instr S2.N17

EXPERIENCE AND FUTURE PLANS FOR FERMI LAT DATA PROCESSING PIPELINE, COLLABORATION DATA SERVERS AND WEB BASED DATA MONITORING TOOLS.

Reconstruction, monitoring and initial automated science processing (ASP) of Fermi LAT data is controlled by a fully automated processing pipeline running at the SLAC National Accelerator Laboratory. This pipeline allows complex graphs of parallel data processing tasks to be constructed and executed with manual intervention by operators only required in exceptional circumstances. A suite of web applications allows the state of the processing pipeline to be monitored in real-time, presents the results of data quality monitoring and ASP analysis to scientists, and makes the final data available to collaborating scientists via a set of data servers. These technologies together make it possible for scientists to contribute to the data processing, data monitoring and data analysis from anywhere with a web connection. This poster will presents lessons learned from the first 3 years of operation, recent improvements and future plans for maintaining these systems for the lifetime of the Fermi mission.

Johnson, T. J., Harding, A. K., Venter, C.

University of Maryland / NASA GSFC

Poster
PSR S2.N12

MODELING AND MAXIMUM LIKELIHOOD FITTING OF GAMMA-RAY AND RADIO LIGHT CURVES OF MILLISECOND PULSARS DETECTED WITH THE FERMI LAT

Pulsed gamma rays have been detected with the Fermi Large Area Telescope (LAT) from more than 20 millisecond pulsars (MSPs), some of which were discovered in radio observations of bright, unassociated LAT sources. We have fit the radio and gamma-ray light curves of 19 LAT-detected MSPs in the context of geometric, outer-magnetospheric emission models assuming the retarded vacuum dipole magnetic field using a Markov chain Monte Carlo maximum likelihood technique. We find that, in many cases, the models are able to reproduce the observed light curves well and provide constraints on the viewing geometries that are in agreement with those from radio polarization measurements. Additionally, for some MSPs we constrain the altitudes of both the gamma-ray and radio emission regions. The best-fit magnetic inclination angles are found to cover a broader range than those of non-recycled gamma-ray pulsars.

Jorstad, S.G., Marscher, A.P., Agudo, I., Harrison, B.

IAR, Boston University

Poster
AGN S1.N41

PARSEC-SCALE JET BEHAVIOR OF BLAZARS DURING HIGH GAMMA-RAY STATES

We present total and polarized intensity images at ultra-high resolution (0.1 milliarcseconds) of a sample of 33 gamma-ray blazars obtained monthly with the Very Long Baseline Array (VLBA) at 43~GHz, starting in Summer 2008 when the Fermi Gamma-Ray Space Telescope began to operate. The VLBA observations determine the flux and polarization of the millimeter-wave core and other components of the jet, as well as the kinematics and evolution of bright superluminal knots. We compare the gamma-ray light curves of the blazars, constructed with data provided by the Fermi Large Area Telescope, with flux and polarization variations in the VLBI core and bright superluminal knots. For all blazars in the sample that exhibit a high gamma-ray state on time scales from several weeks to several months, an increase of the total flux in the mm-wave core is contemporaneous with the gamma-ray activity (more than a third of the sample). In addition, a maximum in the degree of polarization in the core or bright superluminal knot nearest to the core occurs at the same time as the gamma-ray peak to within the accuracy of the sampling of the radio data. We discuss the locations in the jet where high gamma-ray fluxes occur, as well as the physical processes leading to luminous gamma-ray emission in blazars. This research is funded in part by NASA through Fermi Guest Investigator grants NNX08AV65G, NNX08AV61G, NNX09AT99G, and NNX10AU15G, and by the National Science Foundation through grant AST-0907893.

Joshi, M., Alan Marscher, Svetlana Jorstad, Markus Boettcher, Ivan Agudo, V. Larionov, M. Aller, M. Gurwell, A. Lahteenmaki

Boston University

Poster
AGN S1.N42

MULTIWAVELENGTH SPECTRAL STUDIES OF FERMI-LAT BLAZARS

We present multiwavelength spectral analyses of two Fermi-LAT blazars, OJ 287 and 3C 279, that are part of the Boston University multiwaveband polarization monitoring program. The data have been compiled from observations with Fermi, RXTE, the VLBA, and various ground-based optical and radio telescopes starting in August 2008. We simulate the dynamic spectral energy distributions (SEDs) within the framework of a multi-slice, time-dependent leptonic jet model for blazars, with radiation feedback, in the internal shock scenario. We use the physical jet parameters obtained from the VLBA monitoring to guide our modeling efforts. We discuss the role of intrinsic parameters and the interplay between synchrotron and inverse Compton radiation processes responsible for producing the resultant SEDs. This research was supported in part by NASA through Fermi grants NNX10AO59G, NNX08AV65G, and NNX08AV61G and ADP grant NNX08AJ64G, and by NSF grant AST-0907893.

Kadler, M., M. Böck, G. Tosti, D. Thompson on behalf of the TANAMI, MOJAVE and LAT teams

Universität Würzburg

Oral

GAMMA-RAY PROPERTIES OF EXTRAGALACTIC JETS FROM THE TANAMI AND MOJAVE SAMPLES

We discuss the gamma-ray properties of extragalactic jets from the TANAMI and MOJAVE samples. MOJAVE contains a statistically complete VLBI flux-limited subsample of 135 objects, which represent the brightest compact extragalactic jets in the Northern Sky. TANAMI covers the Southern part of the sky at declinations below -30deg. We discuss the detection statistics of radio selected quasars, BL Lac objects and galaxies and correlations between VLBI-measured jet properties like the apparent jet speed, core-dominance and sub-parsec scale polarisation and the gamma-ray properties based on the first 11 months of Fermi/LAT all-sky observations.

Kalapotharakos, K., Contopoulos, I., Kazanas, D.

NASA/Goddard Space Flight Center

Poster
PSR S2.N13

THE 3D MHD PULSAR MAGNETOSPHERE STRUCTURE OUT TO 20 R_LC

We present the first numerical computation of the non-axisymmetric pulsar magnetosphere out to radii 20 R$_{lc}$ (R$_{lc}$ is the light cylinder radius). By employing the proper outer boundary conditions (the so called Perfectly Matched Layer conditions) we compute (unencumbered by the presence of waves reflecting in our computational domain) its evolution for 6 rotation periods to determine that the structure we compute is in fact a steady state one. Emphasis is placed on the return current sheet which exhibits an undulating structure that begins at the light cylinder and covers a large fraction of the poloidal plane. Of particular interest on this structure are unexpected heretofore regions of enhanced electromagnetic density and of spiral 3D geometry. The potential effects of these structures on the observed pulsar magnetosphere are examined.

Kalapotharakos, K., Contopoulos, I., Kazanas, D., Harding, A. K

NASA/Goddard Space Flight Center

Poster
PSR S2.N14

NON-IDEAL MHD STRUCTURE OF PULSAR MAGNETOSPHERES

We present the 3D structure of pulsar magnetospheres that deviate from the Ideal MHD (IMHD) conditions employed in their modeling over the past decade. This feature allows for electric field components parallel to the pulsar magnetic field and thus provides the possibility of particle acceleration and the production of radiation, an ingredient by necessity absent in the IMHD treatments. We employ a variety of prescriptions related to the implied deviations from the IMHD electrodynamics and we present the corresponding magnetospheric field and current structures, charge densities, etc. While the overall field structure remains rather undisturbed by the presence of parallel electric fields, the corresponding charge and electric field structures and hence the expected radiation patterns are prescription dependent. We present arguments for and against the various prescriptions based on the observed radiation patterns.

Kara, E., M. Errando, E. Aliu, J. P. Halpern, R. Mukherjee

Barnard College, Columbia University

Poster
AGN S1.N43

USING VARIABILITY TO FIND COUNTERPARTS FOR UNIDENTIFIED GAMMA-RAY SOURCES IN THE GALACTIC PLANE

Previous studies in the Cygnus region proposed blazar counterparts for two EGRET gamma-ray unidentified sources: 3EG J2016+3657 and 3EG J2027+3429. Now, with 31 months of Fermi-LAT data we confirm and improve upon these earlier inferences. The Fermi Gamma-ray Space Telescope observes the entire sky in the energy range from 0.3 to 300 GeV with nearly continuous and homogeneous coverage, making it an extraordinary instrument for studying flux variability in gamma-ray sources. This is particularly true for blazars, which show their fastest and most pronounced flares in the Fermi energy range. We use this characteristic of blazars to make associations for Fermi unidentified sources, which dominate 43% of the 1-year Catalog. We present here the associations for 1FGL J2015.7+3708 and 1FGL J2027.6+335 in the Cygnus region using a cross-correlation variability technique in gamma-ray, radio and X-ray. We produce gamma-ray light curves from the LAT using the Fermi ScienceTools and obtain radio light curves at 15 GHz taken with the 40-m telescope at the Owens Valley Radio Observatory (OVRO). Simultaneous variability is seen in both bands for at least one of the blazar candidates. Additionally, the Swift data available for one blazar candidate, exhibits a high-state in X-ray around the time of a gamma-ray and radio flaring. Lastly, we resolve a third gamma-ray source in the region with similar spectral and temporal characteristics to the known LAT pulsars.

Kataoka, J, L.Stawarz, Y.Takahashi, C.C.Cheung, on behalf of the Fermi-LAT collaboration

Waseda University

Oral

BROAD LINE RADIO GALAXIES OBSERVED WITH FERMI LAT; DISENTANGLING THE JET AND THE DISK EMISSION SPECTRA

We report on a detailed investigation of the gamma-ray emission from 18 broad line radio galaxies (BLRGs) and 9 high-accretion-rate Seyfert 1 galaxies. The sources are particularly bright in X-rays and as such, their spectral properties can be well constrained from radio to gamma-ray energies. Based on the analysis of two years of accumulated data taken with the Large Area Telescope (LAT) onboard the Fermi Gamma Ray Space Telescope, we confirm the previously reported detections of BLRGs 3C 120 and 3C 111 in the GeV photon energy range. A detailed investigation of temporal variations of gamma-ray flux indicate both sources reached high statistical significance on only a few occasions with a bin integration time of 3 months, suggesting a low duty cycle of gamma-ray emission. On the other hand, no statistically significant detection of any Seyfert 1 galaxy in gamma-rays was found in the considered dataset. We found that BLRGs detected by Fermi-LAT are not characterized by either an outstanding accretion rate or black hole mass when compared with the rest of the sample, but are those characterized with the highest nuclear radio fluxes. Our study indicates therefore that, unlike Seyferts, BLRGs are, in principle, gamma-ray loud active galactic nuclei, and that their GeV radiation is due to nuclear jet emission observed at intermediate viewing angles. We also argue that the total observed luminosities of the accreting matter and of the nuclear jets in BLRGs are roughly comparable, at least within an order of magnitude. Finally we speculate that the jet-related non-thermal emissions of Seyfert galaxies within the GeV photon energy range are in general beyond the level of detectability with the Fermi-LAT.

Katsavounidis, E.

MIT

Poster
Instr S2.N18

LIGO SCIENTIFIC COLLABORATION AND VIRGO COLLABORATION

The km-scale laser interferometers LIGO and Virgo completed in 2010 their joint running in their first generation configurations. Several searches were performed including ones for gravitational-wave un-modeled transients of unknown origin (all-sky) as well as associated with Gamma Ray Bursts (GRBs), Soft Gamma Repeaters (SGRs) and neutron star glitches. Moreover, during this run, low-latency searches for gravitational-wave transients were also implemented, allowing prompt identification and sky localization of gravitational-wave candidates. These candidate events may originate from highly energetic astrophysical events like core collapse supernovae and compact binary mergers. This enabled for the first time in LIGO-Virgo an electromagnetic follow up program of gravitational-wave candidate events that aims to search for electromagnetic counterparts to gravitational-wave sources by pointing promptly to candidate source locations ground-based wide field telescopes and Swift. We will survey the searches performed and discuss their interpretation in terms of upper limits. We will also discuss the status of on-going searches within the context of multimessenger astronomy. We will also discuss its prospects when LIGO and Virgo return to coincidence running in the advanced detector regime in ~2015.

Kazanas, D., Fukumura, K., Georganopoulos, M.

NASA/Goddard Space Flight Center

Poster
AGN S1.N45

AGN UNIFICATION, ACCRETION DISK MHD WINDS AND THE BLAZAR FERMI SPECTRA

We present model blazar spectra with emphasis in their Fermi LAT band contribution. The fundamental structure underlying a blazar is a 2D extended (size ~ 1 pc) disk MHD wind with density profile $n(r, \theta) \propto n_0 (r_0/r)exp(-\theta/\theta_0) ~ (\theta_0 \simeq 10$ degrees), obtained by solving the 2D MHD equations, which: (a) Plays the role of the `molecular torus' invoked in AGN unification. (b) It provides a dynamically well defined geometric structure within which the relativistic jet propagates. We calculate the radiation field within the wind region that results from both electron scattering the AGN continuum radiation and its reprocessing into lines. Using this radiation field we can model the resulting Fermi LAT spectra as a function of the wind mass outflow rate $\dot m$ and the observer's inclination angle θ. We find that low values of the mass flow rate the spectra are consistent with those of BL Lacs while converting to those of FSRQs for larger values of this parameter, thereby relating the Fermi LAT spectra to the underlying global AGN structure.

Kerr, M, Camilo, F., Cheung, C. C., Donato, D., the Pulsar Search Consortium, the Fermi LAT Collaboration

Stanford University

Poster
PSR S2.N15

FIVE NEW MILLISECOND PULSARS FOUND IN UNASSOCIATED LAT SOURCES

Using the 64m Parkes radio telescope, we searched 14 high-Galactic latitude Fermi sources with pulsar-like spectra and no plausible counterpart at other wavelengths. We discovered five new millisecond pulsars and detected a sixth independently of a concurrent survey. We present details of the survey, including rough radio upper limits on the 8 positions searched unsuccessfully, and an overview of the five new millisecond pulsar systems, including X-ray upper limits. We give a detailed multiwavelength analysis of PSR J0101-6422, the first and gamma-ray brightest of the four new MSPs with good timing solutions, and for 3 others we present combined radio/gamma-ray light curves.

Kerr, M.,
Romani, R., Craig, H.

Stanford University

Poster
PSR S2.N16

INFERRING THE SHAPES OF THE GAMMA-RAY EMITTING REGIONS OF PULSAR MAGNETOSPHERES

Geometric models of gamma-ray emission from pulsars – such as the outer gap (OG; assuming uniform emissivity) and two-pole caustic (TPC) models – provide predictions for light curves as a function of observer and magnetic inclination to the pulsar spin axis. We use a generalized geometric model of emission from a zone along the last open field lines – OG and TPC are special cases – to determine the shape of the emitting region that best fits the observed light curve of each of the young LAT pulsars. For a given emitting volume, simplifying assumptions about the global current / potential structure also allow a direct prediction of the gamma-ray luminosity, and we test the validity of these assumptions by comparison with the observed luminosities for pulsars with distance estimates.

Kisaka, S.,
Y. Kojima

Hiroshima University

Poster
PSR S2.N17

MULTI-WAVELENGTH EMISSION REGION OF GAMMA-RAY EMITTING PULSARS

Using the outer gap model, we investigate the emission region for the multi-wavelength light curve from energetic pulsars. Following the model of Takata et al.(2008), we assume that gamma-ray and non-thermal X-ray photons are emitted from a particle acceleration region in the outer magnetosphere, and UV/optical photons originate above that region. We assume that gamma-rays are radiated only by outwardly moving particles, whereas the other photons are produced by particles moving inward and outward. We parameterize the altitude of the emission region and determine it from the observed multi-wavelength pulse profile using the observationally constrained magnetic dipole inclination angle and viewing angle of the pulsars. We find that the outer gap model can explain the multi-wavelength pulse behavior by a simple distribution of emissivity, and discuss the possibility of further improvement. From observational fitting, we also find a general tendency for the altitude of the gamma-ray emission region to depend on the inclination angle. This tendency is similarly found for the force-free magnetosphere.

Kocevski, D.,
The Fermi Collaboration

Stanford University

Oral

EXPLAINING THE LACK OF LAT DETECTED GRBS

The LAT instrument has detected roughly 7% of the GBM-triggered GRBs that have occurred within its field-of-view. This rate is far less than the predicted rate of roughly 1 GRB a month detected with more than 100 counts in the LAT above 100 MeV. We present detailed spectral fits to GBM and LAT data for a sample of GRBs that where significantly detected by the GBM's BGO detectors, but which were not detected by the LAT. By extrapolating the high energy spectral index of these GRBs, we show that a majority of these bursts require either high energy spectral breaks or intrinsically softer spectra in order to explain their non-detections by the LAT. We use a nested model comparison to show that most of these bursts are statistically consistent with having a steeper high energy spectral index, with an significant minority of our sample exhibiting intrinsic spectral breaks. We speculate on both the origin of the steeper than expected high energy spectra and on the nature of the intrinsic spectral breaks seen in our sample.

Kong, A. K. H., Huang, R. H. H., Tam, P. H. T., Cheng, K. S., Takata, J., Hui, C. Y.

National Tsing Hua University, Taiwan

Poster
PSR S2.N18

SEARCHING FOR THE FIRST "RADIO-QUIET" GAMMA-RAY EMITTING MILLISECOND PULSAR

We report multi-wavelength observations of an unidentified Fermi object in the first-year Fermi Catalog. The Fermi source has a candidate X-ray counterpart from Swift and Chandra data. We also identify a possible optical counterpart using the X-ray data. Its X-ray and gamma-ray properties are consistent with known gamma-ray millisecond pulsars. There is a possible X-ray modulation while optical/UV observations indicate that the system is likely in a low-mass X-ray binary system. No known radio source is associated with the proposed counterpart and we suggest that the source is the first "radio-quiet" gamma-ray emitting millisecond pulsar in a low-mass X-ray binary currently in quiescence. This work is supported by the National Science Council of Taiwan.

Koushippas, S. M.

Brown University

Oral

A NEW METHOD TO DISENTANGLE DIFFUSE BACKGROUND SOURCES

I will present a new statistical technique which can be used to detect the presence of space and time correlations in gamma-ray events. This formalism is able to relate the space and time event correlations with properties of contributing sources to the gamma-ray diffuse background. Applications of this formalism to the diffuse gamma-ray background include the cumulative pulsar contribution, the possible detection of a population of outer solar system bodies, as well as more speculative sources such as dark matter.

Kovalev, Y. Y., D. C. Homan (Denison U.), T. Hovatta (Purdue U.), M. L. Lister (Purdue U.), E. Ros (Valencia U.), T. Savolainen (MPIfR)

Astro Space Center of Lebedev Physical Institute

Poster
AGN S1.N44

PARSEC-SCALE EJECTIONS IN FERMI AGN JETS

The MOJAVE program (Monitoring Of Jets in Active galactic nuclei with VLBA Experiments) observes sub-parsec-scale changes in about 200 parsec-scale jets of Fermi detected active galactic nuclei at 15 GHz with the Very Long Baseline Array (VLBA). We determine the kinematics and extrapolated ejection epochs of newly born jet features during the Fermi era. Early results of a comparison between epochs of components' ejections and moments of gamma-ray flares are presented and discussed.

Kovalev, Y. Y., L. Petrov (ADNET Inc. / NASA GSFC)

Astro Space Center of Lebedev Physical Institute

Poster
AGN S1.N46

1FGL ACTIVE GALACTIC NUCLEI AT PARSEC SCALES

We performed highly sensitive VLBI observations at 8 GHz of all 1FGL AGN associations above -30 degrees declination which were not observed before at parsec scales. This sample of mostly radio weak associations was studied by an array of eleven radio telescopes -- the Very Long Baseline Array and the 100-m GBT -- in December 2010 and January 2011. We detected 169 out of 170 targets with correlated flux densities above 4 mJy. The collected data supplement results of previous less sensitive VLBI observations of other 1FGL AGNs. These observations eliminate the VLBI data bias towards strongest radio cores in the 1FGL AGN sample. In this paper we present first results of an analysis of all 1FGL AGN associations in the gamma-ray versus parsec-scale radio plane, compare properties of gamma-ray strong and gamma-ray weak AGN jets. We also discuss VLBI characteristics of the two main Fermi AGN populations -- the radio loud radio quasars and BL Lac objects. This project is part of the Fermi guest investigator Cycle 3 program (proposal number 31191).

Krause, J., Emiliano Carmona, Ignasi Reichardt, on behalf of the MAGIC collaboration

Max-Planck-Institut fuer Physik

Oral

PROBING PROTON ACCELERATION IN W51C WITH MAGIC

Located in a dense complex environment, W51C provides an excellent scenario to probe accelerated protons in SNRs and their interaction with surrounding target material. Here we report the observation of extended Very High Energy (VHE) gamma-ray emission from the W51C supernova remnant (SNR) with MAGIC. Detections of extended gamma-ray emission in the same region have already been reported by the Fermi and HESS collaborations. Fermi measured the source spectrum in the energy range between 0.1 and 50 GeV,which was found to be well fit by a hadronic (neutral-pion decay) model . The VHE observations presented here, obtained with the improved MAGIC stereo system, allow us to pinpoint the VHE gamma-ray emission in the dense shocked molecular cloud surrounding the remnant shell. The MAGIC data also allow us to measure, for the first time, the VHE emission spectrum of W51C from the highest Fermi energies up to several TeV. The spatial distribution and spectral properties of the VHE emission suggest a hadronic origin of the observed gamma-rays. Therefore W51C is a prime candidate for a cosmic-ray accelerator.

Krause, Julian, Stefan Klepser, Michele Doro, on behalf of the MAGIC collaboration

Max-Planck-Institut fuer Physik

Poster
SNR/PWNe S2.N13

MORPHOLOGICAL STUDY OF HESS J1857+026 WITH THE MAGIC TELESCOPES DOWN TO FERMI/LAT ENERGIES

We report about the unidentified source HESS J1857+026, which was reported by H.E.S.S. at energies exceeding 600 GeV. Located in the vicinity of the pulsar PSR J1856+0245 the source presents a pulsar wind nebula candidate. Furthermore the source VHE J1857+0252 reported by Neronov et al. 2010 based on 7 photons above 100 GeV detected by Fermi-LAT lies within the emitting region detected by H.E.S.S. This source is not reported in the Fermi-Catalog, i.e. at energies below 100 GeV. We observed the source in 2010 with MAGIC and present for the first a spectrum and a morphological study including skymaps at energies down to 100 GeV, connecting both previous measurements. MAGIC is a system of two imaging atmospheric Cherenkov telescopes located in the Canary island of La Palma. Stereoscopic observations improved significantly the MAGIC performance both in resolution and sensitivity. Another benefit of stereoscopy is a substantial reduction of systematic acceptance effects in the two-dimensional field of view.

Kryvdyk, V., Nikolaiuk Tetiana

Taras Shevchenko National University of Kyiv

Poster
GRB S2.N16

GENERATION OF NEUTRINO, CHARGED PARTICLES AND ELECTROMAGNETIC RADIATION FROM COLLAPSING STARS

We investigate the generation of neutrino and charged particles in magnetospheres of collapsing stars with a dipole initial magnetic field and power low, relativistic Maxwell and Boltzmann initial energy distributions of particles in the magnetosphere. The magnetized star compressed by the gravitational collapse and their magnetic field increases strongly. This variable magnetic field generates a electric field. This electric field will accelerate charged particles up to relativistic velocities. The acceleration of particles during the collapse happens in polar regions of the magnetosphere that leads to polar relativistic streams (jets) formation. When moving in a magnetic field, these particles will generate non-thermal electromagnetic radiation in a broad electromagnetic wavelength band from radio to gamma rays. Thus, in the stage of the gravitational collapse, relativistic jets are formed in stellar magnetospheres. These jets are powerful sources of the non-thermal electromagnetic radiation.

Kuiper, L.,
Hermsen, W.

SRON-Utrecht, The Netherlands

Poster
PSR S2.N19

LINKING THE SOFT GAMMA-RAY PULSAR POPULATION WITH THE FERMI LAT PULSAR POPULATION: COMPLETING THE HIGH-ENERGY PICTURE

While at high-energy gamma-rays (>100 MeV) the Fermi LAT already detected more than 60 pulsars, the number of pulsars seen at soft gamma-rays (20 keV - 30 MeV) is still very limited, though steadily growing. Namely, in recent years targeted deep radio and/or X-ray observations of HESS (TeV) and newly discovered INTEGRAL sources revealed the presence of young and energetic pulsars, surrounded by bright pulsar wind nebulae (PWN). Currently, the total number of detected soft gamma-ray pulsars counts 16 members, including new candidates. The average characteristics of these soft gamma-ray pulsars differ from those of the LAT detected pulsars, e.g. the Fermi LAT pulsar population typically reaches its peak luminosity at GeV energies, the soft gamma-ray pulsar population does so at MeV energies. In this presentation I will discuss the characteristics of this soft gamma-ray pulsar population in comparison with the Fermi LAT findings in order to obtain a complete high-energy picture of the pulsar population.

Kuiper, L.,
ter Beek, F., Hermsen, W.

SRON-Utrecht, The Netherlands

Oral

THE FERMI GBM DETECTION OF PULSED EMISSION FROM FOUR AXPS

One of the most surprising results in magnetar research is the recent detection of persistent (pulsed) hard X-ray/soft gamma-ray emission from anomalous X-ray pulsars (AXPs) and soft gamma-ray repeaters (SGRs) by INTEGRAL, RXTE and Suzaku. There is no agreed theoretical explanation for the generation of this luminous (1-3 orders of magnitude higher than the rotational energy loss) non-thermal component. Spectral breaks occur around 100 keV, but due to the limiting sensitivity of these missions at these energies the spectral shape can not be mapped. Knowledge of this spectral shape is crucial for discriminating between different interpretations. The Fermi Gamma-Ray Burst Monitor (GBM) is the only instrument currently in orbit with sufficient sensitivity above 100 keV to study the break-energy interval of AXPs. We analyzed Fermi GBM CTIME data, collected since the Fermi launch, and detected pulsed emission in the 27-295 keV energy band from four anomalous X-ray pulsars, 4U 0142+614, 1RXS J1708-4009, 1E 1841-045 and 1E 1547.0-5408. The derived flux values are consistent with INTEGRAL ISGRI (20-300 keV) and RXTE PCA/HEXTE (15-250 keV) measurements, and we found evidence for a spectral break below 1 MeV for 4U 0142+614, 1E 1841-045 and 1E1547.0-5408. The analysis and results will be presented.

Kurtanidze, O. M.,
Nikolashvili M.G.,
Kimeridze G.N. and
Sigua L.A.

Abastumani Observatory

Poster
AGN S1.N47

VARIABILITY OF FOUR X-RAY SELECTED BL LACERTAE SOURCES IN R BAND

To study optical variability of extragalactic objects a long-term campaign was conducted in Abastumani Observatory since 1997, which allowed to collect ~250 000 CCD frames during 2 600 nights. This extensive monitoring campaign of about 70 blazars was carried out during five years in BVRI bands and later on mainly in R band using the 70-cm meniscus (f/3, SBIG ST6 and Apogee Ap6E) and 125-cm Ritchey-Chretien (f/13, Apogee Ap6E) telescopes. The list of sources also includes 15 X-ray selected BL Lacertae objects from the Einstein Slew Survey Sample (Perlman et al., ApJS v.104 S251, 1996). Here we present the preliminary light curves of four X-ray selected BL Lacertae sources 1ES 0323+022, 1ES 0647+250, 1ES 1028+511 and 1ES 1517+656. Their maximum amplitude of variability is within 0.5-1.5 magnitudes in R band. The highest observed amplitude of variation was detected in the case of 1ES 0647+250 (1.50 mag., rms=0.02), while the lowest one for 1ES 0322+022 (0.56 mag., rms=0.04).

**Laffon, H.,
Bruno Khélifi, André-Claude Clapson, Jérémie Méhault, Peter Eger, Gerd Puehlhofer, Marek Jamrozy, François Brun and Arache Djannati-Atai for the H.E.S.S. collaboration**

LLR, Ecole Polytechnique

**Poster
SNR/PWNe S2.N14**

DISCOVERY OF TEV EMISSION FROM THE SNR G22.7-0.2 WITH H.E.S.S.

The imaging Cherenkov telescope array H.E.S.S has been used for an extensive study of very high energy emission from the region of the supernova remnant G22.7-0.2. There is significant overlap between the TeV emission region and a molecular cloud detected through its 13CO emission. A possible scenario to explain the TeV emission is therefore pi0 production and decay induced by high energy hadrons accelerated in the SNR. Spitzer observations of this region suggest an interaction between the remnant G22.7-0.2 and the adjacent supernova remnant W41. This offers the possibility to adopt the known distance to W41 also for G22.7-0.2 and hence to estimate the energetics implied in a hadronic emission scenario. G22.7-0.2 was also observed with several radio telescopes at different frequencies and more recently in X-rays by the XMM-Newton satellite. In this contribution, our latest results on G22.7-0.2 with the H.E.S.S. array will be presented, as well as the associated multi-wavelength information available.

**Lande, J.,
Alice Allafort, Stefan Funk, Markus Ackermann on behalf of the Fermi LAT Collaboration**

SLAC/Stanford

Oral

SEARCH FOR SPATIALLY EXTENDED SOURCES USING TWO YEARS OF FLIGHT DATA

Resolving spatially extended Fermi LAT sources is important for studying supernova remnants, pulsar wind nebulae, galaxies, and potentially dark matter or new physics. Determining spatial morphology aids in source identification as well as improving a source's spectral analysis. We describe a new analysis method that was developed to perform extension fitting of gamma-ray sources. We then present the results of a search of all two year Catalog sources for emission inconsistent with Fermi's angular resolution.

**Lanzuisi, G.,
A. De Rosa, P. Ubertini, M. Ajello, G. Ghisellini, L. Bassani, F. Panessa**

INAF/IASF-BO, Italy

**Poster
AGN S1.N48**

MODELING THE FLARING ACTIVITY OF THE HIGH Z, X-RAY SELECTED BLAZAR IGR J22517+2217

We investigate the physical properties of the high redshift (z=3.668), hard X-ray selected blazar IGR J22517+2217, through the modeling of its broad band spectral energy distribution (SED). Using new Suzaku and archival data we build two different SEDs, one for the flare occurred in 2005 and one for the following quiescent period. Both states are strongly dominated by the high energy hump, that is at least two orders of magnitude higher than the low energy (synchrotron) one, and varies by a factor 10 between the two states. In both states the high energy hump is modeled as inverse Compton emission between relativistic electrons and seed photons produced externally to the jet, by the broad line region and by an infrared torus reprocessing a substantial fraction of radiation produced by the accretion disk. The synchrotron self? Compton component is found to be negligible. The observed variability can be accounted for by a variation of the total number of emitting electrons, and by a dissipation region moving from within to outside the broad line region as the luminosity increases. In its flaring state IGR J22517+2217 shows one of the most powerful jet among the population of extreme, hard X-ray selected, high redshift blazar observed so far.

Larionov, V.M, Jorstad, S.G., Marscher, A.P. (Boston University, USA), Morozova, D.A., Troitsky, I.S., Blinov, D.A., Kopatskaya, E.N., Larionova, E.G. (Astron. Inst. of St. Petersburg University, Russia)

Astron. Inst. of St. Petersburg University, Russia

Poster
AGN S1.N49

OPTICAL OUTBURST OF THE GAMMA-RAY BLAZAR S4 0954+658 IN MARCH 2011

We present optical photopolarimetric observations of the BL Lac object S4 0954+658 obtained with the 70-cm telescope in Crimea, 40-cm telescope in St.Petersburg, and 1.8-m Perkins telescope at Lowell Observatory (Flagstaff, Az). After a faint state with a brightness level R ~ 17.6 mag registered in the first half of January 2011, the optical brightness of the source started to rise and reached ~ 14.8 mag during the middle of March, showing flare-like behavior. The most spectacular case of intranight variability was observed during the night of 2011 March 9, when the blazar brightened by ~ 0.7 mag within ~ 7 hours. During the rise of the flux the position angle of optical polarization rotated smoothly over more than 200 degrees. S4 0954+658 is a gamma-ray blazar with gamma-ray flux (0.5$\pm$0.3)x10^{-10} phot/cm^2/s according to the Fermi 11-month Catalog Extragalactic Sources. Our analysis of contemporaneous Fermi LAT data does not show any sign of increased gamma-ray activity above the detection threshold except for an elevated flux on 2011 March 5, JD2455626, coincident with the local optical maximum. The research at St.Petersburg State U. is funded in part by RFBR grant 09-02-00092 and by the Ministry of Education and Science of the Russian Federation (state contract #P123). The research at BU is funded in part by NASA Fermi Guest Investigator grant NNX08AV65G and by NSF grant AST-0907893.

Lee, S.-S., Byun, D.-Y., Sohn, B. W.

Korea Astronomy and Space Science Institute

Poster
GRB S2.N17

THE 22/43GHZ POLARIZATION MONITORING OF A FLARING GAMMA-RAY BLAZAR 3C454.3 AFTER ITS 2010 NOVEMEBR OUTBURST

We report the results of the monitoring of a flaring gamma-ray blazar, 3C454.3 in total flux density at 22 and 43GHz and in polarization at 22GHz with KVN Ulsan 21-m radio telescope every 3-4 days from 19 November 2010 to 31 January 2011. After an extraordinary 5-day gamma-ray outburst in November 2010, the radio total flux density at 22/43GHz and the linear polarization at 22GHz has been decreased with a variation of a short time scale. In this paper, we also discuss a spectral change of 3C454.3 at 22 and 43GHz after the extraordinary gamma-ray outburst.

Lemiere, A., Marandon V., Terrier R., Djannati-Atai A.

CNRS / IPN Orsay

Poster
SNR/PWNe S2.N15

AN XMM VIEW OF THE TWO PWN CANDIDATES POTENTIALLY ASSOCIATED WITH HESS J1837-069.

We report on the XMM-Newton Mos imaging observation of two pulsar wind nebulae candidates, potentially associated with the Galactic unidentified TeV gamma-ray source HESSJ1837-069. The large XMM-Newton collecting area reveals asymetric diffused emissions extending up to 6'from the pulsar PSRJ1838-0655 and up to 4.5'around AX J1837.3-0652, the second X-ray source adjacent to the TeV emission wich may also contribute to it. Based on spectra and X-ray morphologies of these two objects, together with multiwavelenght study of the field, we investigate different scenario for the origin of the TeV emission and test them by modelling the multiband emission taking into account the pulsar parameters and radiative evolution of the PWNe over time.

Lemoine-Goumard, M., Marianne Lemoine-Goumard, Marie-Hélène Grondin, Sebastian Heinz, Karl Kosack, Joshua Lande, Jérémie Méhault and Melitta Naumann-Godo for the Fermi-LAT and H.E.S.S. collaborations

CENBG, Université Bordeaux I, CNRS-IN2P3

Poster
SNR/PWNe S2.N16

TOWARDS A DEEPER UNDERSTANDING OF THE UNIDENTIFIED SOURCE HESS J1841-055 USING H.E.S.S. AND FERMI-LAT OBSERVATIONS

The survey of the Galactic plane carried out by the H.E.S.S. telescope array has resulted in the discovery of many very-high-energy (VHE; E > 100 GeV) gamma-ray sources which remain unidentified. The widely extended source HESS J1841-055 is one of these enigmatic sources. Although its extended emission suggested it is composed of multiple sources, the level of H.E.S.S. exposure at the time did not provide sufficient statistics to draw any firm conclusions with regards to its complex morphology. Since June 2008, Fermi-LAT is mapping the gamma-ray sky with unprecedented sensitivity in the complementary high-energy (20 MeV < E < 300 GeV) domain. Using more than two years of Fermi-LAT data, we have conducted a detailed study of HESS J1841-055. Two distinct gamma-ray sources are detected with high significance and could contribute to the emission observed at TeV energies, providing the first direct evidence that the H.E.S.S. source may be composed of at least two different components. In this contribution, we will describe the Fermi-LAT and H.E.S.S. measurements of this region and discuss the origin of the detected gamma-rays.

Lenain, J.-P., Walter, R.

ISDC Data Centre for Astrophysics, Observatoire de Genève, Université de Genève

Poster
AGN S1.N50

SEARCH FOR HIGH ENERGY EMISSION FROM GALAXIES OF THE LOCAL GROUP WITH FERMI/LAT

Normal galaxies begin to arise from the shadows at high energies, as can be seen with the discovery of high energy gamma-ray emission from the Andromeda galaxy (M 31) by the Fermi collaboration. We present a study on the search for high energy emission around galaxies of the Local Group. Several false alarms, significant detections are found, which could be associated to quasars in the regions of interest. Upper limits on the high energy emission of closeby normal galaxies are derived, and we discuss them in the context of gamma-ray emission from cosmic ray interactions with the local interstellar medium in these galaxies.

Leon-Tavares, J., Valtaoja, E., Tornikoski, M., Lähteenmäki A., Nieppola, E.

Aalto University Metsähovi Radio Observatory

Poster
AGN S1.N51

THE CONNECTION BETWEEN GAMMA-RAY EMISSION AND MILLIMETER FLARES IN FERMI/LAT BLAZARS.

We compare the gamma-ray photon flux density variability of northern blazars contained in the Fermi/LAT First Source Catalog with 37 GHz radio flux density curves from the Metsähovi quasar monitoring program. We find that the relationship between simultaneous millimeter (mm) and gamma-ray flux densities arises differently for different types of blazars. The flux density relation between the two bands is positively correlated for quasars and absent for BLLacs. Furthermore, we find that the levels of gamma-ray emission in high states depend on the phase of the high frequency radio flare, with the brightest gamma-ray events coinciding with the initial stages of a mm flare. The mean observed delay between the beginning of a mm flare and the peak of the gamma-ray emission is about 70 days, which places the average location of the gamma-ray production region around 7 pc downstream of the radio core. We discuss alternative scenarios for the production of gamma-rays at distances of parsecs down the jet.

Lewandowska, N., Mannheim, K. , Elsässer, D.

University of Würzburg

Poster
PSR S2.N20

GIANT RADIO PULSES AFTER THE HIGH-ENERGY FLARE OF THE CRAB PULSAR IN 2010

The Crab pulsar experienced a major flare in 2010 as observed with Fermi-LAT. Observations by the Hubble Space Telescope indicate that the flare was accompanied by a structural change in the anvil region of the Crab nebula. In the framework of a photometric analysis we reconstruct the energetics of this event. Reconnection zones near the light cylinder are expected to release energy by accelerating beams of electrons, leading to flares of varying amplitude. In this case the major flare would have reduced the magnetic energy stored in the reconnection zones, and would thus have had an impact on the properties of the giant radio flares presumably originating from these regions. We test the scenario by observing giant radio pulses with the Westerbork Synthesis Radio Telescope.

Liang, E. P., Markus Boettcher, Ian Smith, Omar Jamil

Rice University

Poster
AGN S1.N52

EMISSION FROM RELATIVISTIC SHEAR BOUNDARY LAYER AND 2-COMPONENT JETS

There is increasing evidence that many relativistic jets have multi-component structures with different Lorentz factors and magnetic fields. We have performed large scale Particle-in-Cell (PIC) kinetic simulations of the boundary layer of relativistic shear flows, and obtained very exciting and encouraging results. We find that large scale stable magnetic flux tubes are self-generated by the shear flow at the boundary layer. Local peak fields reach almost equipartition values and are sustained by the free energy of the shear flow. Electrons are efficiently accelerated to high Lorentz factors at the boundary, likely by drift-kink and other current instabilities, forming a simple power-law with low-energy turnover near the bulk Lorentz factor. Since the electrons are mainly accelerated across field lines, they radiate synchrotron radiation efficiently, thus making the shear boundary layer the brightest region of the jet. We will present the latest results from the PIC and radiation calculations, and discuss their applications to both AGN and potentially GRB jets.

Liang, E. P., Hilburn, Guy L.

Rice University

Poster
AGN S1.N53

LLAGN INVESTIGATION WITH GRMHD AND NOVEL MC TOOLS

Results fitting the broadband spectra of the cores of M87 and Sgr A* will be shown, with model parameters obtained with the HARM 2D GRMHD accretion disc evolver, then fed into our unique Monte Carlo radiation transport code. Recent modifications to the MC code take its consistent modeling capabilities for these sources to a higher level, allowing for the inclusion of anisotropic magnetic fields and relativistic plasma flow. Throughout the accretion disc region, the ratios of magnetic field and velocity components differ greatly from unity, suggesting that emission and scattering in this area will be highly anisotropic. These novel tools will allow for greater consistency in modeling these, and other, astrophysical sources, whose physical parameters are very direction dependent.

Linden, T., Dan Hooper, Farhad Yusef-Zadeh

UCSC / Fermilab

Oral

MULTI-WAVELENGTH STUDIES OF SYNCHROTRON RADIATION FROM DARK MATTER ANNIHILATION AND ASTROPHYSICAL BACKGROUNDS AT THE GALACTIC CENTER

The galactic center remains one of the most promising locations for the detection of a dark matter annihilation signal, due to its greatly enhanced dark matter density. However, the considerable astrophysical uncertainties in dark matter detection make a multi-wavelength approach paramount in understanding the implications of any residual signal detected by Fermi. Radio surveys of synchrotron radiation expected to be produced by energetic leptons is especially promising, due to the high angular resolution and sensitivity of radio telescopes. Furthermore, recent results positing a greatly enhanced magnetic field in the galactic center increase the morphological information which can be ascertained by a positive synchrotron signal. Creating models for the expected synchrotron signals from dark matter annihilation, we discuss (1) how regions of high magnetic field may set limits on the dark matter signal which may be observed by Fermi-LAT and (2) how synchrotron observations can differentiate dark matter signals from known astrophysical background such as milli-second pulsars.

Lisakov, M. M., Y. Y. Kovalev (ASC Lebedev; MPIfR)

ASC Lebedev, Moscow, Russia

Poster
AGN S1.N54

MULTIFREQUENCY VLBI FOLLOW UP STUDY OF A STRONG GAMMA-RAY FLARE IN THE BLAZAR 3C273

We present results of a five month long VLBA campaign to observe 3C273 between 5 and 43 GHz. This campaign was triggered by and started immediately after a strong gamma-ray flare detected by Fermi LAT from the blazar in August 2009. We have detected a flare in the parsec-scale radio core of 3C273. Flux density of the core at 43 GHz have increased by a factor of about 3 within several months while its radio spectrum became inverted. The observed radio flare at 43GHz peaks with a delay of 30-60 days after the gamma-ray one. A close connection between gamma-ray and parsec-scale radio emission in the blazar is supported. We discuss changes in physical properties which occurred in the apparent jet base during the flare. Evolution of linear polarization structure will also be presented. This project is part of the Fermi guest investigator Cycle 2 program (proposal number 21087).

Lister, M., on behalf of the Fermi and MOJAVE collaborations

Purdue University

Poster
AGN S1.N55

GAMMA-RAY LOUDNESS AND THE PARSEC-SCALE JET PROPERTIES OF MOJAVE BLAZARS

The MOJAVE program is regularly observing nearly 300 bright AGNs in the northern sky with the VLBA at 15 GHz in order to study the physics and evolution of parsec-scale radio jets. The monitoring list includes a complete flux-limited gamma-ray selected sample, selected on the basis of median energy flux greater than 100MeV during the first 11 months of the Fermi mission. Using a large database of radio measurements from the VLBA, U. Michigan, and Owens Valley radio telescopes, we have also constructed a sky-region matching radio survey of all AGN with 15 GHz VLBA flux density exceeding 1.5 Jy during the initial 11 month Fermi period. Within this combined set of 173 AGNs, there is only a 28% overlap in the two samples, which is reflective of a three order of magnitude range in gamma-ray to radio flux ratio in bright blazars. The latter ratio is highly dependent on the spectral energy distribution of the jet, as well as its relativistic beaming parameters. We report on how various parsec-scale radio jet properties such as opening angle, polarization, core brightness temperature, and radio variability depend on gamma-ray loudness, and discuss the resulting implications for blazar demographics and gamma-ray emission models.

Liuzzo, E., Giroletti, M., Giovannini, G.

IRA-INAF-Bologna-Italy

Poster
AGN S1.N57

THE BOLOGNA COMPLETE SAMPLE OF NEARBY RADIO SOURCES: RADIO AND GAMMA-RAY DATA.

To study a statistical properties of different classes of radio sources, we defined and observed the Bologna Complete Sample (BCS). The BCS is a complete sample of 95 objects that is unbiased with respect to the orientation of the nuclear relativistic jet being selected from low-frequency samples. Moreover, it is composed by nearby ($z<0.1$) radio galaxies that are well studied targets with literature kiloparsec data. For all of them, we collected parsec scale information asking also new VLBI observations. Statistical results on their properties in radio band are presented. From the estimates of the doppler factor and wiewing angles, we discuss the connection with the available gamma-ray data. Finally, we show how future observations with Fermi could reveal new important detections of some of the BCS sources.

Llena Garde, M., Conrad, J. , Cohen-Tanugi, J. , on behalf of the Fermi-LAT collaboration

Stockholm University

Oral

CONSTRAINING DARK MATTER SIGNAL FROM A COMBINED ANALYSIS OF MILKY WAY SATELLITES WITH THE FERMI-LAT

Dwarf spheroidal galaxies have a large mass to light ratio and low astrophysical background, and are therefore considered one of the most promising targets for dark matter searches in the gamma-ray band. By applying a combined likelihood analysis, the power of resultant limits in case of no detection can be enhanced and robust constraints on the dark matter parameter space can be obtained. We present results from a combined analysis of 10 dwarf spheroidal galaxies using Fermi-LAT data. Different annihilation channels have been analyzed and uncertainties from astrophysical properties have been taken into account.

Lombardi, S., Josefa Becerra González, Pierre Colin, Elina Lindfors and Julian Sitarek on behalf of the MAGIC Collaboration

University and INFN Padua

Poster
AGN S1.N56

OBSERVATION OF THE BL LAC OBJECTS 1ES 1215+303 AND 1ES 1218+304 WITH THE MAGIC TELESCOPES

Two BL Lac objects, 1ES 1215+303 and 1ES 1218+304 separated by 0.8 degree, were observed with the MAGIC Cherenkov telescopes in 2010-2011. The January 2011 observations resulted in the first detection above 100 GeV of 1ES 1215+303 (known also as ON-325) which has been flagged as a promising VHE source candidate by the Fermi-LAT collaboration in October 2010. The January 2011 observations were triggered by the high optical state of the source as reported by the Tuorla blazar monitoring program. Comparison with 2010 data suggests that 1ES 1215+303 was flaring also in VHE gamma-rays. In addition, the Swift ToO observations in X-rays showed that the flux was almost doubled respect to previous observations (December 2009). Instead, 1ES 1218+304 is a well known VHE gamma-ray emitter lying in the same field of view, which was then simultaneously observed with MAGIC. The overall stereo observation time of nearly 40 hours has permitted to measure the spectrum of this source with a much higher precision than previously reported by MAGIC. In this poster we present the results of the MAGIC and the multi-wavelength observations of these two VHE gamma-ray emitting AGNs.

Lombardi, S., Karsten Berger, Pierre Colin, Michele Doro, Dorothee Hildebrand, Elina Lindfors, Andrii Neronov, Serena Partini, Christoph Pfrommer, Anders Pinzke, Francisco Prada, Dmitri Semikoz, Julian Sitarek, Antonio Stamerra, Fabrizio Tavecchio and Fabio Zandanel on behalf of the MAGIC Collaboration

University and INFN Padua

Poster
AGN S1.N58

OBSERVATION OF THE PERSEUS CLUSTER OF GALAXY WITH THE MAGIC TELESCOPES

The MAGIC telescopes performed a deep observation of the central region of the Perseus galaxy cluster in stereoscopic mode between October 2009 and February 2011. The nearly 90 hours of data taken consist in the deepest observation of a cluster of galaxies at Very High Energies (VHE) ever. The survey resulted in the detection of VHE gamma-ray emission from its central galaxy NGC 1275 as well as from the head-tail radio galaxy IC 310. NGC 1275 is characterized by a steep spectrum above 100 GeV which is compatible with the spectral cut off suggested by Fermi LAT data at HE. Instead, IC 310 represents the first head-tail galaxy that is shown to emit VHE. Its spectrum results to be very flat and strong hints of variability are seen in MAGIC data. In addition, the deep survey also permits for the first time to put constraints on emission models predicting VHE gamma-rays from cosmic ray acceleration in the cluster and to put limits on dark matter annihilation and decay scenarios. Here we will report the latest MAGIC results concerning all these topics.

Lombardi, S., Michele Doro, Mattia Fornasa and Daniel Nieto, on behalf of the MAGIC Collaboration

University and INFN Padua

Poster
DMNP S1.N7

OBSERVATION OF THE MOST DARK MATTER DOMINATED DWARF GALAXY SEGUE 1 BY THE MAGIC-I TELESCOPE

Despite the interest in Dark Matter (DM) searches is currently more focused on underground experiments, a signature of DM annihilation/decay in gamma-rays from the space would constitute a smoking gun for its identification. In this poster, we present the results of the survey of Segue~1 by MAGIC-I telescope performed in 2008 and 2009. This source is considered by many as the most DM dominated Milky Way satellite galaxy known so far. The nearly 42 hours of data taken constitutes the largest survey ever made on a single dwarf galaxy by Cherenkov telescopes. No significant gamma-ray emission was found above an energy threshold of 100 GeV. We also discuss a novel analysis that fully takes into account the spectral features of the gamma-ray spectrum of specific DM models in a Super-Symmetric scenario and the prospects of detection after the Fermi observation of similar objects at lower energies.

Longo, F., L. Escande, S. Buson, S. Larsson, on behalf of the Fermi LAT Collaboration, M. Hauser, S. Wagner, for the ATOM team

University of Trieste and INFN, Trieste

Poster
AGN S1.N59

THE OPTICAL - GAMMA RAY FLARES OF PKS 1424-418 A SPECIAL CASE TO STUDY THE PHYSICS OF GAMMA-RAY BLAZARS

The Fermi LAT and ATOM observed two distinct, intense gamma-ray and optical flares from blazar PKS 1424-418. In this presentation we describe the properties of the two flaring episodes. The optical and gamma-ray emissions seem to be broadly correlated; however the interplay in spectral changes and temporal patterns is non-trivial. Flare 1 shows a time signature consistent with no lag, and even the shapes of the rising and falling branches match during the limited period where they are both measured with sufficient statistics, while the double-peaked Flare 2 (in the eV band) exhibits very significant changes in the eV/GeV ratio throughout the event. The double-peak nature suggests that an interpretation in terms of a single lag is not appropriate.

**Longo, F.,
on behalf of the AGILE collaboration**

University of Trieste and INFN, Trieste

**Poster
GRB S2.N18**

THE OBSERVATION OF GRBS WITH AGILE: UPPER LIMITS AND DETECTIONS

The AGILE satellite, in orbit since 2007, localized about 0.5 GRBs per month with the hard X-ray imager SuperAGILE (18 - 60 keV) up to October 2009. Since then the detection rate is worsened by a factor of 2-3 due to the new observation strategy. AGILE is still detecting, instead, around 1 GRB per week with the non-imaging Minicalorimeter (0.35 - 100 MeV) (MCAL). Up to now the AGILE Gamma Ray Imaging Detector (GRID) firmly detected four GRBs in the energy band between 20 MeV and few GeV. In this presentation we review the status of the GRBs observation with AGILE, we discuss the upper limits in the gamma-ray band of the non-detected events and we present the general characteristics of all the detected bursts in the high energy band (by MCAL and GRID).

**Longo, F.,
Lucarelli F., Pittori C., Rappoldi A., Verrecchia F. on behalf of the AGILE Collaboration**

University of Trieste and INFN, Trieste

Oral

TEV SOURCES ANALYSIS WITH AGILE

During its three years of operation, the gamma-ray AGILE satellite completed a full study of the gamma-ray sky. This contribution presents the results of a systematic study performed on the AGILE data to search for GeV counterparts and to derive flux upper limits of all the sources detected by TeV experiments.

**Loparco, F.,
Mazziotta M. N., Siegal-Gaskins J., and the Fermi-LAT Collaboration**

Università degli Studi di Bari

**Poster
DMNP S1.N8**

STUDY OF THE COSMIC-RAY ELECTRON FLUX FROM THE SUN WITH THE FERMI-LAT DATA

An excess of cosmic-ray electrons and positrons (CREs) from the Sun could be interpreted as a dark matter (DM) signature because in some DM models an observable flux of high-energy CREs is expected to be produced. We analyzed the CRE data sample collected by the Fermi-LAT during its first year of operation to search for a possible flux excess correlated with the Sun's direction at high energies. We implemented two different analysis techniques, both yielding no evidence of a significant CRE flux excess correlated with the Sun's direction. The implications of our results on the DM theoretical models will be illustrated.

**Lucarelli, F.,
Pittori, C., Striani, E., and Verrecchia, F., on behalf of the AGILE Collaboration**

ASI-ASDC, Via G. Galilei, I-00044 Frascati (Roma), Italy

**Poster
AGN S1.N60**

EXTRA-GALACTIC TRANSIENT SOURCES OBSERVED IN THE FIRST YEAR OF THE AGILE SATELLITE IN SPINNING MODE.

Since Nov. 2009, the AGILE satellite is observing a large portion of the sky in spinning mode. Thanks to the sophisticated "Quick Look" (QL) pipeline and AGILE Science Alert systems, a maximum likelyhood analysis of possible gamma-ray transients (E>100 MeV) detected by the AGILE-GRID instrument onboard of the AGILE satellite is provided almost in real-time. In this contribution, we will present the refined analysis of the most significative high-galactic latitude (|b|>10) gamma-ray transients appeared in the QL alerts during the AGILE first year of observations in spinning mode.

Madejski, G.,
NuSTAR Team

KIPAC/SLAC, Stanford University

Poster
Instr S2.N19

NUSTAR: THE NUCLEAR SPECTROSCOPIC TELESCOPE ARRAY

NuSTAR, the Nuclear Spectroscopic Telescope Array, a Small Explorer (SMEX) NASA mission, is currently in the integration phase, and is scheduled for launch in early 2012. NuSTAR will be the first focusing X-ray astronomy satellite sensitive in the hard X-ray (6 - 79 keV) band, and will probe the X-ray sky approximately two orders of magnitude more sensitively than currently achievable. NuSTAR will answer fundamental questions about the Universe: How are black holes distributed through the cosmos, and what is their contribution to the Cosmic X-ray Background? How were the heavy elements forged in the explosions of massive stars? What powers the relativistic jets in the most extreme active galaxies? This presentation will discuss the current status of NuSTAR and the baseline, 2-year science program.

Madejski, G.,
on behalf of the Fermi LAT collaboration

SLAC / KIPAC

Oral

MULTI-BAND OBSERVATIONS OF THE BLAZAR 3C454.3 DURING THE OUTBURST IN NOVEMBER 2010

We present the preliminary results of multi-band observations of the bright gamma-ray emitting blazar 3C454.3 during the spectacular flare at the end of 2010. In addition to the gamma-ray flare whose implied flux was the highest recorded from the source in any band, significant activity was observed in other energy bands. We show the observations in other wavelengths (X-ray, radio, and optical), present the correlations measured amongst the data available on hand, and discuss the constraints on the emission properties and structure of the source inferred from the multi-band behavior.

Maier, G.,
for the VERITAS collaboration

DESY

Poster
Binaries S2.N3

GAMMA-RAY OBSERVATIONS OF THE BINARY SYSTEMS HESS J0632+057 AND LS I +61 303 WITH VERITAS

Only a few Galactic objects are known which are point-like and variable sources of very high-energy gamma rays. These systems are mostly binaries, where variability can generally be connected to the orbital period, but particle acceleration and gamma-ray production processes are not well understood. We present here VERITAS results and their astrophysical implications for the TeV binaries LS I +61 303 and HESS J0632+057 together with contemporanous observations using Swift and Fermi at X- and Gamma-ray energies. The observations on HESS J0632+057 are discussed in the context of the recent discovery of a binary period in X-rays with Swift and the simultaneous measurement of a strong flux increase by VERITAS.

Malkov, M.A.,
Diamond, P.H.,
Sagdeev, R.Z.

University of California, San Diego

Poster
CR S2.N4

UHECR ACCELERATION IN DARK MATTER FILAMENTS

A mechanism for proton acceleration to 10^21eV is suggested. It may operate in accretion flows towards thin dark matter filaments of cosmic structure formation. The flow compresses the ambient magnetic field to strongly increase and align it with the filament. Particles begin the acceleration by an ExB drift with the accretion flow in radial direction. The energy gain in the drift regime is limited by the conservation of the first adiabatic invariant. Upon approaching the filament, the drift passes into the gyro-motion around the filament so that the particle follows the azimuthal motion electric field and the energy gain speeds up. In this 'betatron' acceleration regime the electrodynamic limit on the particle energy E=eBR in an accelerator of the orbit radius R and magnetic field B, is rapidly reached. The periodic orbit becomes unstable and the particle slings out of the filament to the region of a weak (uncompressed) magnetic field. This terminates the acceleration. To escape the filament, particles need to have gyro-radii comparable with the filament radius. Therefore, the mechanism requires pre-acceleration that is likely to occur in structure formation shocks upstream or nearby the filament accretion flow. Previous studies identify such shocks as efficient proton accelerators to a firm upper limit of ~30EeV placed by the catastrophic photo-pion losses. The suggested acceleration mechanism combines an explosive energy gain in its final (betatron) phase with the prompt particle release from the region of the strong magnetic field. This combination gives protons a chance to overcome both the photo-pion and the synchrotron-Compton losses and to get boosted to 10^21eV. As a number of acceleration mechanisms not associated with the dark matter fail to reach such high energies, the detected particles with E>50 EeV may point back to the dark matter concentrations.

Malkov, M.A.,
Diamond, P.H.,
Sagdeev, R.Z.

University of California, San Diego

Poster
SNR/PWNe S2.N17

MECHANISM FOR SPECTRAL BREAK IN COSMIC RAY PROTON SPECTRUM FROM SUPERNOVA REMNANTS W 44 AND IC 443

Recent observations of the supernova remnants W 44 and IC 443 by the FERMI spacecraft observatory strongly support the idea that the bulk of galactic cosmic rays is accelerated in such remnants by a Fermi mechanism, also known as diffusive shock acceleration. However, the remnants expand into weakly ionized dense media, and so a significant revision of the mechanism is required. We provide the necessary modifications and demonstrate that strong ion-neutral collisions in the remnant surroundings lead to the steepening of the energy spectrum of accelerated particles by exactly one power. The spectral break is caused by Alfven wave evanescence leading to the fractional particle losses. The gamma-ray spectrum generated in collisions of the accelerated protons with the ambient gas is also calculated and successfully fitted to the Fermi Observatory data. The parent proton spectrum is best represented by a classical test particle power law E^-2, steepening to E^-3 at E=E_br due to deteriorated particle confinement. The break energy depends on the parameters of ambient gas.

Malkov, M.A., Diamond, P.H., Sagdeev, R.Z.

University of California, San Diego

Poster
SNR/PWNe S2.N18

COSMIC RAY FRONTS AHEAD OF SNR SHOCKS

Strong astrophysical shocks, diffusively accelerating cosmic rays (CR) ought to develop CR precursors. The length of such precursor L_{p} is believed to be set by the ratio of the CR mean free path \lambda to the shock speed, i.e., L_{p} \sim c\lambda/V_{sh}\sim cr_{g}/V_{sh}, which is formally independent of the CR pressure P_{c}. However, the X-ray observations of supernova remnant shocks suggest that the precursor scale may be significantly shorter than L_{p} which would question the above estimate unless the magnetic field is strongly amplified and the gyroradius r_{g} is strongly reduced over a short (unresolved) spatial scale. We argue that while the CR pressure builds up ahead of the shock, the acceleration enters into a strongly nonlinear phase in which an acoustic instability, driven by the CR pressure gradient, dominates other instabilities (at least in the case of low \beta plasma). In this regime the precursor steepens into a strongly nonlinear front whose size scales with the CR pressure as L_{f}\sim L_{p}\cdot\left(L_{s}/L_{p}\right)^{2}\left(P_{c}/P_{g}\right)^{2}, where L_{s} is the scale of the developed acoustic turbulence, and P_{c}/P_{g} is the ratio of CR to gas pressure. Since L_{s}\ll L_{p}, the precursor scale reduction may be strong in the case of even a moderate gas heating by the CRs through the acoustic and (possibly also) the other instabilities driven by the CRs.

Malyshev, D.

New York University

Poster
AGN S1.N61

STATISTICAL ANALYSIS OF GAMMA-RAY POINT SOURCES BELOW FERMI DETECTION LIMIT

The number counts of gamma-ray point source are constrained by the statistics of photon counts in pixels. We find that at high latitudes (|b| > 30 degrees) and at energies E > 1 GeV the contribution of AGN-like point sources to the total gamma-ray flux is at most 20-25%. Assuming that the extragalactic emission is isotropic, a lower bound of 50% on Galactic diffuse emission is obtained by considering low angular multipoles. The remaining fraction of the gamma-ray flux (25-30%) is consistent with isotropic Poisson emission. These gamma-rays can be due to the isotropic part of Galactic emission or to an extra population of extragalactic sources, such as star forming galaxies.

Mankuzhiyil, N., Ansoldi, S., Persic, M., Tavecchio, F.

INFN Trieste and University of Udine

Poster
AGN S1.N62

BL LAC OBJECTS: LABORATORY TO STUDY THE ENVIRONMENT AND PROPERTIES OF EMITTING PARTICLES IN RELATIVISTIC JETS

We report the variation of spectral energy distribution (SED) as a function of source activity, based on all multi-wavelength (MWL) observations of BL Lac objects. We use recently implemented fully automatized chi-squared minimization procedure, instead of commonly used eye-ball fit, to model the data sets with a one zone Synchrotron-Self-Compton (SSC) model. The obtained SSC parameters from the fit is then analyzed as a function of source luminosity, and the correlation between parameters is shown. We then look into the difference between the correlation properties of different AGNs. Possibilities of improving the present observational and modelling status of BL Lac objects is also discussed based on various numerical methods. We then emphasize the unique importance of Fermi observatory in such studies.

Mantovani, F., Bondi, M., Mack, K.-H.

Istituto di Radioastronomia - INAF, Bologna, Italy

Poster
AGN S1.N63

INVESTIGATIONS ON A COMPLETE SAMPLE OF FAINT BLAZARS

The results of an extensive observing campaign on a complete sample of faint blazars, the "Deep X-ray Radio Blazar Survey" (Perlman et al. 1998, Landt et al. 2001), will be presented. The DXRBS currently is the deepest, largest sample of blazars which has nearly complete optical identifications. Blazars are an extreme class of Active Galactic Nuclei (AGN), characterized by a high luminosity, rapid variability, and high polarisation. The Fermi Gamma-ray Space Telescope has detected 1049 blazars located at |b|>10 deg (Lott 2010). It is reasonable to expect that the objects in the DXRBS will be the counterparts of gamma-ray sources detected by Fermi. About 10% of DXRBS sources have been detected by Fermi after 1 year of observing activity (Abdo et al. 2010). Evidence that AGN with observed gamma-ray flares are associated with the ejection of new superluminal components and that a gamma-ray event occurs within the jet features was reported by Jorstad et al. (2001). Parsec-scale jet kinematic properties of AGN and correlation of the gamma-ray flux in the MOJAVE sample associated with bright gamma-ray sources detected by Fermi, has been recently discussed by Lister et al. (2009b) and Kovalev et al. (2009). The DXRBS has the great advantage over the MOJAVE sample to facilitate a direct comparison between gamma-ray detected and non-detected sources in the same radio flux limited sample. We will discuss the completeness of the DXRBS Catalogue with an up-to-date spectral index classification of each source as a result of simultaneous multi-frequency Effelsberg 100-m telescope observations. 75% of sources can be classified as 'bona fide' blazars. The outcome of European VLBI Network snap-shot observations for detection and preliminary imaging of their structure at milli-arcsecond resolution will also be presented. All sources observed so far have been detected. Several show a core-jet structure.

Marelli, M., De Luca, A. ; Caraveo P.A.

IASF-INAF Milano

Poster
PSR S2.N21

A MULTIWAVELENGTH STUDY ON THE HIGH-ENERGY BEHAVIOR OF THE FERMI/LAT PULSARS

Using archival as well as freshly acquired data, we assess the X-ray behavior of the Fermi/Large Area Telescope Î³-ray pulsars listed in the First Fermi source Catalog. After revisiting the relationships between the pulsarsÂ' rotational energy losses and their X and Î³-ray luminosities, we focus on the distance-independent Î³ to X-ray flux ratios. When plotting our FÎ³/FX values as a function of the pulsarsÂ' rotational energy losses, one immediately sees that pulsars with similar energetics have FÎ³/FX spanning three decades. Such spread, most probably stemming from vastly different geometrical configurations of the X and Î³-ray emitting regions, defies any straightforward interpretation of the plot. Indeed, while energetic pulsars do have low FÎ³/FX values, little can be said for the bulk of the Fermi neutron stars. Dividing our pulsar sample into radio-loud and radio-quiet subsamples, we find that, on average, radio-quiet pulsars do have higher values of FÎ³ /FX, implying an intrinsic faintness of their X-ray emission and/or a different geometrical configuration. Moreover, despite the large spread mentioned above, statistical tests show a lower scatter in the radio-quiet data set with respect to the radio-loud one, pointing to a somewhat more constrained geometry for the radio-quiet objects with respect to the radio-loud ones.

Marisaldi, M., Fuschino, F., Labanti, C., Tavani, M., Longo, F., Barbiellini, G., Argan, A., Bulgarelli, A., Del Monte, E., Galli, M., Gianotti, F., Giuliani, A., Trifoglio, M., Trois, A.

INAF-IASF Bologna

Oral

AGILE OBSERVATIONS OF TERRESTRIAL GAMMA-RAY FLASHES

The AGILE satellite, operating since mid 2007 and primarily devoted to high-energy astrophysics, is one of the only three currently operating space instruments capable of detecting Terrestrial Gamma-Ray Flashes (TGFs), together with RHESSI and Fermi-GBM. Thanks to the AGILE Mini-Calorimeter instrument energy range extended up to 100MeV and its flexible trigger logic on sub-millisecond time scales, AGILE is detecting more than 10 TGFs/month, adding a wealth of observations which pose severe constrains on production models. The main AGILE discoveries in TGF science during two and a half years of observations are the following: 1) the TGF spectrum extends well above 40 MeV, 2) TGFs can be localized from space using high-energy photons detected by the AGILE gamma-ray imaging detector, 3) the high energy tail of the TGF spectrum is harder than expected and cannot be easily explained by previous theoretical models. In this presentation we will describe the characteristics of the 2.5-years AGILE TGF sample, focusing on the recent results concerning the TGF high-energy spectral characteristics.

Marscher, A. P., Jorstad, S. G., Joshi, M., Larionov, V. M., Agudo, I. , Lahteenmaki, A., Kurtanidze, O., Gurwell, M., Wehrle, A.E.

Boston University

Oral

OBSERVATIONS AND MODELING OF MULTI-WAVEBAND VARIATIONS OF BLAZARS DURING GAMMA-RAY OUTBURSTS

Our multi-wavelength light curves of bright gamma-ray blazars (e.g., 3C 454.3) are compared with the model proposed by Marscher and Jorstad. In this scenario, much of the optical and high-energy radiation in a blazar is emitted near the 43 GHz core of the jet as seen in VLBA images, parsecs from the central engine. The main physical features are a turbulent ambient jet plasma that passes through a standing recollimation shock in the jet. The model allows for short time-scales of optical and gamma-ray variability by restricting the highest-energy electrons radiating at these frequencies to a small fraction of the turbulent cells, perhaps those with a particular orientation of the magnetic field relative to the shock front. Because of this, the volume filling factor at high frequencies is relatively low, while that of the electrons radiating below about 10 THz is near unity. Such a model is consistent with the (1) red-noise power spectra of flux variations, (2) shorter time-scales of variability at higher frequencies, (3) frequency dependence of polarization and its variability, and (4) breaks in the synchrotron spectrum by more than the radiative loss value of 0.5. Simulated light curves are generated by a numerical code that currently includes synchrotron radiation as well as inverse Compton scattering of seed photons from both a dust torus and a Mach disk at the jet axis. The latter source of seed photons produces more pronounced variability in gamma-ray than in optical light curves, as is often observed. This research is supported in part by NASA through Fermi grants NNX08AV65G and NNX10AO59G, and by NSF grant AST-0907893.

Martí, J., Luque-Escamilla, P. L, Del Valle, M. V., and Romero, G. E.

Universidad de Jaén

Poster
UNID S1.N2

NEARBY T TAURI STARS AS POSSIBLE GAMMA-RAY SOURCES

We consider a possible physical scenario of Fermi mechanism in violent reconnection events taking place in the magnetosphere of T Tauri stars. Such events can accelerate hadrons and leptons up to relativistic energies, which produce non-thermal emission in the surroundings of these low-mass pre-main sequence stars. A simple model is developed to estimate the chances of detection with the current and future gamma-ray telescopes. A comparison of our results with the Fermi source 1FGL J1625.8-2429c is carried out. We tentatively associate it with the collective effect of several T Tauri stars inside its 95% confidence error ellipse. These young objects all belong to the Rho Ophiuchi cloud whose closeness (120 pc) strongly enhances the feasibility of detection through the proposed mechanism.

Massaro, F., A. Paggi, M. Elvis, A. Cavaliere

Smithsonian Astrophysical Observatory

Poster
AGN S1.N64

X-RAY SPECTRAL CURVATURE OF HIGH FREQUENCY PEAKED BL LACS : A PREDICTOR FOR VHE OBSERVATIONS

Most TeV detected extragalactic sources are BL Lac objects belonging to the subclass of "high frequency peaked BL Lacs" (HBLs). HBLs exhibit their a lower energy peak spectral energy distributions, lying in the X-ray band. This peak is interpreted as being due to synchrotron emission. The X-ray spectra are generally curved, and are well described in terms of a log-parabolic shape. We have carried out an extensive X-ray spectral analysis of HBLs to compare the spectral behavior of those non detected at TeV energies (NBLs) with those already known as TeV emitters (TBLs). The NBLs are clearly more curved than the TBLs, though there peak energies are the same. On the basis of these results, we have developed criteria for strong TeV emitters that are likely future TBLs. We propose three lists of a total of 15 TeV candidates, with different level of confidence of TeV detectability, based on MeV-GeV flux level and keV spectral curvature. Finally, we interpret the distributions of their spectral parameters in terms of systematic and stochastic acceleration processes.

Massaro, F., M. Ajello

Smithsonian Astrophysical Observatory

Poster
Diffuse S1.N10

THE CONTRIBUTION OF RADIO GALAXIES LOBES TO THE EXTRAGALACTIC GAMMA-RAY BACKGROUND

The recent discovery of the Gamma-ray emission from the lobes of the closest radio galaxy Centaurus A by Fermi implies the presence of high-energy electrons at least up to :Lorentz factors ~ 10^5 - 10^6. These high energy electrons are required to interpret the observed Gamma-ray radiation in terms of inverse Compton emission off the cosmic microwave background (IC/CMB); the widely accepted scenario to describe the X-ray emission of radio galaxy lobes. Here, we show that adopting the IC/CMB scenario, the giant radio lobes of FR II radio galaxies can significantly contribute to the diffuse extragalactic Gamma-ray background (EGB) in the MeV energy range. As test for our estimate of lobe contribution to the EGB could be provided by a Fermi detection of Gamma-ray emission from FRII radio galaxies. Then, we also report a list of radio galaxies, candidates for Fermi detection in the next years.

Max-Moerbeck, W., J. L. Richards, V. Pavlidou, T. J. Pearson, A. C. S. Readhead, E. Angelakis, L. Fuhrmann, J. A. Zensus

California Institute of Technology

Oral

PHYSICAL SIGNIFICANCE OF TIME LAGS IN RADIO/GAMMA-RAY CROSS-CORRELATIONS FOR FERMI-GST BLAZARS IN THE OVRO 40-M BLAZAR MONITORING PROGRAM

The OVRO 40-m telescope has been monitoring more than 1158 blazars since 2007 and now is monitoring more than 1500. Each source is observed twice per week at 15 GHz. The current sample contains all CGRaBS sources and the gamma-ray blazars detected by Fermi which are above declination -20 degrees. The availability of a large sample of sources with good cadence at radio and gamma-rays offers the opportunity to test the hypothesis of correlated variability between these two bands. A Monte Carlo method to assess the physical significance of the cross-correlations taking into account the properties of the light curves and the uneven sampling is described. We present results for 52 sources with data in both the high-confidence Fermi Large Area Telescope Bright AGN Sample and the first 2 years of our monitoring program. For this data set we find that in most cases, peaks in the estimated cross-correlation function are not significant

Mazziotta, M. N., the Fermi LAT collaboration

INFN Bari

Poster
CR S2.N5

SEARCHES FOR COSMIC RAY ELECTRON ANISOTROPIES WITH THE FERMI-LAT INSTRUMENT

The Fermi Large Area Telescope (LAT) has collected a high statistics sample of high-energy primary cosmic-ray electrons/positrons (CREs) since the beginning of its operation. The LAT Collaboration has published the first results on the arrival directions of CREs using the data collected by the Fermi observatory in the first year of operation at energies above 60 GeV. Upper limits on the degree of the anisotropy were set in several energy ranges. We report here an extension of this measurement with 29 months of data which provides important information for constraining models of the CRE origin and propagation. The approaches used in this search will be presented and results will be discussed.

Mazziotta, M. N., F. de Palma, F. Loparco and the Fermi LAT Collaboration

INFN Bari

Poster
DMNP S1.N9

STACKING ANALYSIS OF MULTIPLE GAMMA-RAY SOURCES WITH THE UNFOLDING METHOD AND APPLICATION TO THE DWARF SPHEROIDAL GALAXIES

We have developed a new technique based on analysis tools for spectral unfolding, that allows to perform a stacking analysis of a set of multiple point-like sources. Our technique yields the average energy spectrum of the sources, eventually allowing to set upper limits on the fluxes in case of faint sources. Such analysis turns out to be very useful when a set of sources, with similar spectral features have to be studied. As an example, we have applied this stacking analysis to Fermi-LAT data and searched for gamma-ray emission from dwarf spheroidal galaxies. The results of the analysis will be shown and their implications in terms of dark matter annihilation cross sections will be discussed.

McArthur, S., The VERITAS Collaboration

Washington University in St. Louis

Oral

VHE OBSERVATION OF CTA 1 WITH VERITAS

CTA 1 (G119.5+10.2) is a composite supernova remnant (SNR) with a shell-type structure in the radio band and a center filled morphology at X-ray energies. Fermi has detected a radio-quiet pulsar PSR J0007+7303 within the radio shell of CTA 1 in a blind search within its first months of operation. Located within an X-ray synchrotron pulsar wind nebula (PWN), the Fermi source is spatially coincident with the EGRET source 3EG J0010+7309. VERITAS observed CTA 1 in the the 2010-11 observation season, searching for very-high-energy (VHE) gamma-ray emission, the results of which will be presented.

McConville, W., L. Stawarz, C. C. Cheung, On Behalf of the Fermi LAT Collaboration

NASA GSFC / University of Maryland

Poster
AGN S1.N65

GAMMA-RAY EMITTING YOUNG RADIO SOURCE CANDIDATES

Compact Symmetric Objects (CSO's) are widely considered to be the young versions of present-day FR1 and FR2 radio galaxies, with characteristic sizes of < 1kpc and ages on the order of a thousand years. Prior to the launch of Fermi, young radio sources were predicted to emerge as a potential new gamma-ray emitting population that would be detected after several years of all-sky exposure by Fermi's Large Area Telescope (LAT). With over 2 years of exposure accumulated by the LAT, the majority of CSO's remain undetected, while the question of young radio sources as a gamma-ray population still remains open. Here we examine the radio through gamma-ray properties of several LAT-detected sources along with their corresponding associations and discuss the observational properties of each in the context of their possible young radio source classifications.

McSwain, M. V.

Lehigh University

Poster
Binaries S2.N4

USING H-ALPHA AS A TRACER OF THE EMISSION REGION OF LS I +61 303

The gamma-ray binary LS I +61 303 is one of the brightest Fermi sources, with orbitally modulated emission across the electromagnetic spectrum. Here we present H-alpha spectra of LS I +61 303 that exhibit a dramatic emission burst shortly before apastron, observed as a redshifted shoulder in the line profile. A correlated burst in radio, X-ray, and GeV emission is observed at the same orbital phase. We interpret the source of the emission as a compact pulsar wind nebula that forms when a tidal mass stream from the Be circumstellar disk interacts with the relativistic pulsar wind. The H-alpha emission offers an important probe of the high energy emission morphology in this system.

Mehault, J., COHEN-TANUGI, J. (Laboratoire Univers et Particules de Montpellier), RENAUD, M. (Laboratoire Univers et Particules de Montpellier), GRONDIN, M.-H. (Institut für Astronomie und Astrophysik Tübingen), LEMOINE-GOUMARD, M. (Centre d'Etudes Nucléaires de Bordeaux Gradignan)

Laboratoire Univers et Particules de Montpellier

Oral

UNVEILING THE ORIGIN OF GAMMA-RAY EMISSION TOWARDS THE W41 REGION WITH H.E.S.S. AND FERMI-LAT

Extended very high energy gamma-ray emission form the direction of the W41 supernova remnant was discovered by the H.E.S.S. Cherenkov telescopes and observed by MAGIC. The origin of this emission is still uncertain. Different scenarios such as pulsar wind nebula or interaction with a molecular cloud were proposed. Furthermore, the detected central compact object by XMM-Newton and recently Chandra, that could be the pulsar associated with W41, is surrounded by a compact X-ray emission that is supposed to be a dust halo or a pulsar wind nebula. The discovery of high energy gamma-ray emission towards W41 with Fermi-LAT opens the possibility to study this region over seven decades in energy. The joint H.E.S.S and Fermi-LAT data analysis will allow us to unveil the origin of the gamma-ray emission towards the W41 region.

Meyer, E. T., Giovanni Fossati, Markos Georganopoulos, Matthew L. Lister

Rice University

Poster
AGN S1.N66

THE NEW BLAZAR DIVIDE: INVERSE COMPTON EMISSION IN STRONG AND WEAK JETS

In examining a select sample of over 200 blazars of known jet kinetic power (L_kin) and well-characterized SEDs, we found (Meyer et al, 2011) that intermediate synchrotron-peaking (ISP) blazars may have lower gamma-ray output than high synchrotron-peaking (HSP) blazars of similar jet kinetic power, consistent with our hypothesis that ISP blazars are less-beamed versions of HSP blazars, rather than a distinct population. Further, by using the radio core dominance as a measure of relative beaming, we find that gamma-ray luminosity depends on beaming in a consistant way for blazars ranging over all jet kinetic powers (10^42 - 10^46 ergs/s). We re-examine the gamma-ray properties of this core sample of blazars using the entire 3-year Fermi dataset to confirm the initial finding (based on the 1-year LAT Catalog), and present new detections for a number of our sources. We find evidence that the IC to synchrotron ratio remains constant with increased beaming, consistent with an SSC model for the jet emission.

Mignani, R. P.

Mullard Space Science Laboratory - University College London

Poster
PSR S2.N22

OPTICAL FOLLOW-UP OBSERVATIONS OF FERMI-LAT SOURCES

Multi-wavelength observations are crucial to characterise the emission properties of gamma-ray pulsars detected by the Fermi-LAT and test models of magnetospheric emission. Moreover, multi-wavelength observations are crucial to determine the nature of the hundreds of unidentified sources detected by the Fermi-LAT. In this talk, I discuss dedicated campaigns of optical observations of both Fermi-LAT pulsars and unidentified sources now on going with the VLT and I present early results.

Miller, H. R., Eggen, J. and Maune, J.

Georgia State University

Poster
AGN S1.N67

THE 2010-11 OUTBURST OF THE FAINT BLAZAR OE 110

The blazar, OE 110, underwent an exceptional optical outburst during the past year and culminating in winter, 2010. The maximum brightness detected was R=17.5, which represents a luminous state comparable the baseline state reported by Leacock et al. (1976). The optical outburst was accompanied by a simultaneous gamma-ray outburst. The historical optical light curves extending back to the mid-1970s show one major outburst. Only intermittent monitoring of OE 110 from 1975 – present is available due to the generally faint state of this source. Thus many of the reported detections are thought to be the peaks of rather modest optical flares rather than the true quiescent state of this blazar. The results of the more than 30 year optical monitoring of this source will be reported in addition to the correlated optical-gamma-ray variations detected during the 2010-2011 outburst.

Mitthumsiri, W., Carmelo Sgro', Markus Ackermann, Justin Vandenbroucke, Stefan Funk

Stanford University/ KIPAC

Oral

COSMIC-RAY POSITRON MEASUREMENT WITH THE FERMI-LAT USING THE EARTH'S MAGNETIC FIELD

The Fermi LAT has demonstrated an excellent capacity to detect electrons and positrons. Even though the LAT itself cannot distinguish electrons from positrons, the Earth's magnetic field creates natural "shadows" for negatively and positively charged particles. With an up-to-date geomagnetic field model, we are able to predict a charged particle's motion and use this information to separate electrons from positrons. The most difficult task is to reliably estimate the background contamination, mainly misidentified cosmic-ray protons and atmospheric leptons. Here we present the technique used in the analysis, a summary of the LAT capability and our preliminary results on electron and positron spectra and positron fraction.

Monte, C., Claudia Monte, Silvia Raino', Fabio Gargano, Dario Gasparrini, Sara Cutini on behalf of the Fermi-LAT Collaboration and J. Leon Tavares, G. Polenta on behalf of the Planck Collaboration.

INFN and University of Bari

Poster
AGN S1.N68

FERMI-LAT SPECTRAL ANALYSIS OF FERMI, PLANCK, SWIFT AND RADIO SELECTED SAMPLES OF AGN

Blazars are jet-dominated extragalactic objects characterized by the emission of strongly variable non-thermal radiation across the entire electromagnetic spectrum. Therefore, the study of blazars (and in general of radio loud AGN) through the use of multi-frequency simultaneous data is essential in order to understand the physical processes that take place in these objects. With Planck, Fermi and Swift simultaneously on orbit, complemented with other space and ground-based observatories, it is possible to assemble high-quality multi-frequency simultaneous broad-band spectra of large and statistically well-defined samples of radio-loud AGN. In particular, four samples of sources have been selected. The first three samples are flux limited in the high energy part of the electromagnetic spectrum: the soft X-ray (0.1-2 keV) sample includes 43 sources from the Rosat All Sky Survey Bright Source Catalog, the hard X-ray (15-150 keV) sample includes 34 sources from the Swift-BAT 54 months source Catalog and the gamma-ray sample includes 50 sources from the Fermi-LAT 3 months Bright AGN Source List. The fourth sample is radio flux limited, including 104 bright northern and equatorial radio-loud AGN (most of which have been monitored at Metsahovi Radio Observatory for many years) with average radio flux density at 37 GHz greater than 1 Jy. We present the methods applied and the results of the analysis performed using Fermi-LAT data for all sources in the four different samples of AGN.

Monzani, M. E., Nicola Omodei, on behalf of the Fermi-LAT Collaboration

SLAC National Accelerator Laboratory

Poster
Instr S2.N20

A NEW MULTIVARIATE APPROACH TO THE CLASSIFICATION OF FERMI UNIDENTIFIED SOURCES

We have developed a new technique to classify Fermi/LAT sources based solely on their observed gamma-ray properties. Our technique, based on Classification Trees, employs the properties of identified objects in the 1FGL Catalog in order to build a classification analysis, which computes the probability for an unidentified source to belong to a given astronomical class. We applied this technique to Fermi source Catalogs and provided a classification ranking for each unidentified source, thus allowing a prioritization of multi-wavelength observations.

Mori, M., Nakagawa, Kenji; Umeda, Yoshihiro

Department of Physics, Ritsumeikan University

Poster
AGN S1.N69

TIME CORRELATION AND VARIABILITY OF GEV GAMMA-RAY AND X-RAY EMISSION FROM ACTIVE GALACTIC NUCLEI

The LAT detector of the Fermi Gamma-ray Space Telescope and the MAXI detector onboard the International Space Station are monitoring the whole sky simultaneously at GeV gamma-ray and X-ray energies, respectively. Light curves of active galactic nuclei (AGN) have been accumulating with their data and are available on-line. These are the most contiguous datasets ever and the ideal database for time variation study in time scales of days and longer. In this paper we report the study of time correlation between GeV gamma-ray and X-ray emission and characteristic variability from some flaring AGN.

Mori, M.,
Kawachi, Akiko;
Nagataki, Shigehiro;
Takata, Jumpei

Department of Physics, Ritsumeikan University

Poster
SNR/PWNe S2.N19

GEV GAMMA-RAY EMISSION FROM THE BINARY PSR B1259-63/SS2883 DURING THE 2010 PERIASTRON PASSAGE

GeV gamma-ray emission from the TeV binary PSR B1259-63/SS2883, which is known to be a binary consisted of a 48ms pulsar and a Be star, has been detected with the LAT detector onboard the Fermi Gamma-ray Space Telescope around the periastron in December 2010. In this paper we show the analysis of the gamma-ray light curve and the spectrum of LAT data, and discuss the result with data at other wavelengths in comparison with model predictions.

Morlino, G.,
Carioli, D.

INAF - Osservatorio di Arcetri

Poster
SNR/PWNe S2.N20

COSMIC RAY PRODUCTION AND GAMMA-RAY EMISSION FROM TYCHO'S SUPERNOVA REMNANT

We calculate the flux of non-thermal radiation from the Tycho's supernova remnant in the context of the non-linear theory of particle acceleration at shocks, which allows us to take into account self-consistently the dynamical reaction of the accelerated particles, the generation of magnetic fields in the shock proximity and the dynamical reaction of the magnetic field on the plasma. Assuming a modest acceleration efficiency we find that the strength of the magnetic field obtained as a result of streaming instability induced by cosmic rays is compatible with the interpretation of the X-ray emitting filaments being produced by strong synchrotron losses in ~300 Î¼G magnetic fields. In such a strong magnetic field the magnetic turbulence in the upstream region of the shock can move with a speed which is a non negligible fraction of the shock speed. As a consequence the accelerated particles feel an effective compression factor less than 4 and their energy spectrum is steeper than the standard prediction, $n(E)\propto E^{-2}$. Taking into account the speed of magnetic turbulence, we consistently predict the observed gamma-ray spectrum, from the GeV band observed by FermiLAT up to the TeV band observed by VERITAS, as due to pion decay produced in hadronic collisions of a population of accelerated ions with a slope ~2.2. Remarkably the same model predict a relativistic electron population whose synchrotron emission well explain both the radio spectral index of 0.65, as well as the non-thermal X-ray emission.

Moskalenko, I. V.,
A. Vladimirov, T. Porter, G. Johanneson

Stanford University

Oral

UNDERSTANDING THE ORIGIN OF HIGH-ENERGY COSMIC RAYS

Recent accurate measurements of the CR proton, He, and heavier nuclei by ATIC, CREAM, and Pamela reveal unexpected spectral hardening in the spectra of CR species above a few hundred GeV per nucleon. We discuss possible interpretations of this newly-discovered feature and make predictions of the diffuse Galactic gamma-ray emission, CR isotopic ratios, and anisotropy of CRs in different scenarios. Our predictions can be tested by currently running or near-future high energy astrophysics experiments.

Munar-Adrover, P., Paredes, J.M., Romero, G.E.

Universitat de Barcelona

Poster
UNID S1.N3

EXPLORING THE ASSOCIATION OF FERMI SOURCES WITH YOUNG GALACTIC OBJECTS

Massive protostars have associated bipolar outflows which can produce strong shocks when interact with the surrounding medium. In these conditions particle acceleration at relativistic velocities can occur leading to gamma ray emission, as some theoretical models predict. To identify young galactic objects that may emit gamma rays we have crossed the Fermi First Year Catalog with some Catalogs of known young stellar objects (YSOs), WR stars, O-type stars and OB associations, and we have implemented Monte Carlo simulations to find the probability of chance coincidence. With this procedure we obtained a list of YSOs spatially coincident with Fermi sources that may show gamma ray emission. Our results indicate that ~70% of the YSO candidates should be Î³-ray sources with a confidence of ~5Ïf. We have studied the coincidences one by one to check the viability of these YSOs as potential counterparts of Fermi sources and plan further detailed observations of few of them. The results for other type of objects are not conclusive.

Nakamori, T., Takahashi, Y., Maeda, K., Kataoka, J., Yatsu, Y., Kawai, N, et al.

Waseda University

Poster
UNID S1.N4

SUZAKU DISCOVERIES OF X-RAY COUNTERPARTS FOR FERMI LAT UNASSOCIATED SOURCES ON THE GALACTIC PLAIN

From the first 1-year observation, the Large Area Telescope onboard the Fermi Gamma-ray Space Telescope detected 1451 point sources with statistical significance of >5 sigma. While large fraction of those sources are associated with objects ever known in other wavelengths, there still remains unassociated gamma-ray emitters even with high position accuracy. We observed with Suzaku two bright gamma-ray sources, namely 1FGL J1018.6-5856 and 1FGL J1839.1-0543c which are located on the Galactic Plain. We discovered X-ray counterparts for the both sources within the localization error of LAT. We report X-ray morphology and spectra, then discuss their natures.

Nalewajko, K., Sikora, M.; Hayashida, M.; Madejski, G. M.

Nicolaus Copernicus Astronomical Center

Poster
AGN S1.N70

MODELING SELECTED SPECTRAL STATES OF BLAZAR 3C 279

We present models of two spectral states of blazar 3C 279 selected from an extensive multiwavelength campaign led by the Fermi Collaboration in years 2008-2010. We focus our attention on the February 2009 state, corresponding to the peak of gamma-ray and optical flares simultaneous with a polarization swing. Data from the Spitzer Space Telescope indicate a sharp mid-IR spectral break. We have fitted this spectral state with models assuming source location either outside or inside the broad-line region (BLR). In the first case, the mid-IR break corresponds to a break in the electron energy distribution, while in the second case it can be reproduced by the synchrotron self-absorption. In the July 2008 state the synchrotron component peaks in the far-IR band and we propose a model locating its source outside BLR, but with jet parameters strictly related to the inside-BLR model of the February 2009 state.

Naumann-Godo, M., Francesco Giordano, Keith Bechtol, Yasunobu Uchiyama, Jean Ballet

CEA/IRFU/Sap

Poster
SNR/PWNe S2.N21

FERMI OBSERVATIONS OF THE YOUNG TYCHO SUPERNOVA REMNANT

After two years of observations in sky-survey mode the FERMI LAT telescope has detected a gamma-ray signal associated with the remnant of Tycho's supernova. The supernova was observed in AD1572 and is thought to originate from a Type Ia supernova explosion. The measured gamma-ray spectrum is compatible with a power-law of spectral index 2.5 +- 0.1 and the integral flux in the energy range 100 MeV - 100 GeV is found to be (4.3 +- 0.9) 10^-8 cm^-2 s^-1. The new results together with multi-wavelength data comparison and their interpretation are presented at the conference.

Nava, L., Ghisellini, G., Ghirlanda, G., Celotti, A.

SISSA

Oral

THE ORIGIN OF GEV EMISSION IN GAMMA-RAY BURSTS

Very high energy (> 100 MeV) emission in Gamma-Ray Bursts was first detected, in a handful of cases, by the EGRET instrument onboard the CGRO satellite and is now confirmed by the LAT instrument onboard Fermi. This high-energy radiation is detected during the prompt emission (as seen by the GBM instrument in the 8 keV-30 MeV energy range) but, generally, compared to the prompt emission it starts with a small time delay (a few seconds or less) and it lasts for a longer time. This suggests that it belongs to a different component. We present spectral and temporal analysis of the LAT data for 11 bursts detected in the 100 MeV-100 GeV energy range. This analysis reveals that some features are common to all bursts, both in the spectral and temporal domain. In particular, i) spectra are consistent with F(E) proportional to E^-1 and do not much evolve in time and ii) the light curves decay in times as t^-1.5 and, at least in the 50% of cases, present an initial peak. Supported by our results, we suggest that the flux above 100 MeV has the same origin as the afteglow emission detected in the X-ray and in the optical and radio bands. We then interpret it as forward shock emission produced by a radiative fireball expanding in the external environment.

Nemmen, R., Thaisa Storchi-Bergmann, Charles Bonatto

NASA GSFC

Poster
AGN S1.N71

THE CONNECTION BETWEEN ULTRA-HIGH-ENERGY COSMIC RAYS AND FERMI GAMMA-RAY SOURCES

We analyze the correlation of the positions of gamma-ray sources in the Fermi Large Area Telescope First Source Catalog (1FGL) and the First LAT Active Galactic Nuclei (AGN) Catalog (1LAC) with the arrival directions of ultra-high-energy cosmic rays (UHECRs) observed with the Pierre Auger Observatory, in order to investigate the origin of UHECRs. We find that Galactic sources and blazars identified in the 1FGL are not significantly correlated with UHECRs, while the 1LAC sources display a mild correlation (2.6sigma level) on an ~2.4deg angular scale. When selecting only the 1LAC AGNs closer than 200 Mpc, we find a strong association (5.4sigma) between their positions and the directions of UHECRs on an ~17deg angular scale; the probability of the observed configuration being due to an isotropic flux of cosmic rays is 5E-8. There is also a 5sigma correlation with nearby 1LAC sources on an 6.5deg scale. We identify 7 "gamma-ray loud'' AGNs which are associated with UHECRs within ~17deg and are likely candidates for the production sites of UHECRs: Centaurus A, NGC 4945, ESO 323-G77, 4C+04.77, NGC 1218, RX J0008.0+1450 and NGC 253. We interpret these results as providing additional support to the hypothesis of the origin of UHECRs in nearby extragalactic objects. As the angular scales of the correlations are large, we discuss the possibility that intervening magnetic fields might be considerably deflecting the trajectories of the particles on their way to Earth (Nemmen et al. 2010, ApJ, 722, 281).

Nemmen, R.

NASA GSFC

Oral

UNIFYING BLACK HOLE JETS: THE CONNECTION BETWEEN BLAZARS AND GAMMA-RAY BURSTS

The central engines of radio-loud AGNs and gamma-ray bursts share the same basic astrophysical ingredients, despite the vastly different black hole masses and mass accretion rates. We present evidence for a connection between some of the observed high-energy properties of jets in blazars (observed with Fermi) and GRBs. These results point towards an unification of the physics of relativistic jets across a vast range of black hole masses and accretion timescales.

**Nieto, D.,
V. Martínez, N. Mirabal,
J.A. Barrio, S. Pardo**

Universidad Complutense de Madrid

**Poster
DMNP S1.N10**

A SEARCH FOR IACTS TARGETS AS POSSIBLE DARK MATTER SUBHALOES IN THE FIRST FERMI LAT SOURCE CATALOG.

We present a systematic search for potential dark matter subhaloes in our Galaxy among the 630 unassociated sources included in the First Fermit LAT Source Catalog. Assuming a hypothetical dark matter particle that could generate observable gamma-ray photons beyond the Fermi energy range through self-annihilation, we compile a list of reasonable targets for ground-based Imaging Atmospheric Cherenkov Telescopes at energies E > 100 GeV. In order to narrow the origin of these enigmatic sources, we summarize ongoing multiwavelength studies of their error regions including X-ray, radio, and optical spectroscopy. We find that the synergy between Fermi and Cherenkov telecopes, along with multiwavelength observations, could play a key role in indirect searches for dark matter.

**Nikolashvili, M. G.,
Kurtanidze O.M.,
Kimeridze G.N and
Sigua L.A**

Abastumani Observatory

**Poster
AGN S1.N72**

OPTICAL STUDY OF 1FGL J2001.1+4351 AND B2 2308+34 SINCE THEIR DISCOVERY BY MAGIC AND FERMI/LAT

After discovery of J2001.1+4351 (MAGIC, M. Mariotti et al., ATel #2753, 22 July 2010) and B2 2308+34 (FERMI/LAT, F.DAmando et al., ATel #2783, 9 Aug 2010) at VHE we started systematic monitoring in Abastumani Observatory using 70-cm meniscus (f/3) and Apogee Ap6E CCd camera. Here we present the results of very frequent observations in the 2nd half of 2010. Thanks to good weather condition we collected about 800 (J2001.1+4351) and 480 (B2 2308+34) frames during 94 and 67 nights, respectively. Constructed light-curves show that maximum observed amplitudes of variation was detected in the case of B2 2308+34 (1.31 mag., rms=0.04). The variability amplitude of J2001.1+4351 is 0.82 magitudes (rms=0.02) in R band.

**Nishikawa, K.I.,
Y. Mizuno, P. Hardee,
J. Niemiec, M.
Medvedev, B. Zhang,
A. Nordlund, J. T.
Frederiksen, H. Sol, M.
Pohl, D. H. Hartmann,
J. F. Fishman**

Univerisity of Alabama Huntsville

**Poster
GRB S2.N19**

SIMULATION OF RELATIVISTIC JETS AND ASSOCIATED SELF-CONSISTENT RADIATION

Plasma instabilities are responsible not only for the onset and mediation of collisionless shocks but also for the associated acceleration of particles. We have investigated particle acceleration and shock structure associated with an unmagnetized relativistic electron-positron jet propagating into an unmagnetized electron-positron plasma. Cold jet electrons are thermalized and slowed while the ambient electrons are swept up to create a partially developed hydrodynamic-like shock structure. In the leading shock, electron density increases by a factor of about 3.5 in the simulation frame. Strong electromagnetic fields are generated in the trailing shock and provide an emission site. These magnetic fields contribute to the electrons' transverse deflection and, more generally, relativistic acceleration behind the shock. We have calculated, self-consistently, the radiation from electrons accelerated in the turbulent magnetic fields. We found that the synthetic spectra depend on the Lorentz factor of the jet, its thermal temperature and strength of the generated magnetic fields. We are currently investigating the specific case of a jet colliding with an anti-parallel magnetized ambient medium. The properties of the radiation may be important for understanding the complex time evolution and/or spectral structure in gamma-ray bursts, relativistic jets in general, and supernova remnants.

Nymark, T., Magnus Axelsson, Christoffer Lundman, Elena Moretti, Felix Ryde on behalf of the Fermi-LAT collaboration, Asaf Péer

Department of physics, KTH, Stockholm, Sweden

Poster
GRB S2.N20

SUBPHOTOSPHERIC HEATING IN GRBS: ANALYSIS AND MODELING OF FERMI BURSTS

The emission from a GRB photosphere can give rise to a variety of spectral shapes. The spectrum can retain the shape of a Planck function or be broadened into a Band function. This mainly depends on the strength and location of the dissipation in the jet, the ratio of the energy densities of thermal photons and of the electrons at the dissipation site, as well as on the strength of the magnetic field. We analyse strong Fermi bursts showing that subphotospheric dissipation actually occurs. We further discuss numerical models of the dissipation and relate these to the observed spectra.

Ojha, R., Kadler, M; Wilms, J.; Lovell, J.; Edwards, P.; Blanchard, J.; Boeck, M.; Dutka, M.; Hungwe, F.; Krauss, F. Mueller, C.; TANAMI Collaboration

NASA/Goddard Space Flight Center

Poster
AGN S1.N73

SPECTRAL INDEX MAPPING OF THE BLAZAR ZONE OF FERMI AGN WITH TANAMI

The TANAMI (Tracking AGN with Austral Milliarcsecond Interferometry) and associated programs provide the only comprehensive monitoring of Fermi-detected AGN for the southern third of the sky both at radio and higher energy wavebands. Exclusively, TANAMI is providing dual-frequency VLBI images of a large sample of gamma-ray bright AGN to pinpoint blazar-like flat-spectrum emission jet regions with parsec-scale resolution. Here, we present milliarcsecond scale images at 8.4 and 22 GHz along with associated spectral index images of Fermi/TANAMI AGN. We discuss these results in the context of our quasi-simultaneous IR/optical and X-ray observations of TANAMI sources and highlight results on key sources such as the nearby radio galaxy Centaurus A, whose blazar-zone is probed on scales of less than 0.013pc by TANAMI observations.

Omodei, N., Luca Baldini, Veronique Pelassa, Fred Piron, Rob Preece, for the Fermi LAT collaboration

Stanford University

Poster
SolarSystem S2.N2

LAT LOW ENERGY EVENTS, GRBS AND THE JUNE 12TH 2010 SOLAR FLARE AS SEEN IN THE LARGE AREA TELESCOPE

The LAT Low Energy (LLE) technique was developed by the LAT team in order for the energy range below 100 MeV to become accessible for transient studies. The large increase in the effective area at 100MeV and the overlap with the GBM at 30 MeV makes such technique perfect for studying transient events. The transient nature of the events allows for the background subtraction that cannot be performed when analyzing steady sources. We demonstrate the validity of the LLE technique using studies of the Vela Pulsar. The relatively modest rate of GRBs with emission above 1 GeV provides an evidence of the importance of the LLE analysis for the study of GRBs between 30 MeV and 1 GeV. We will present spectral analyses of GRBs detected by the LLE with a non-standard event selection. We will also present the spectral analysis of the LLE data from the M-class solar flare on June 12, 2010, which could not be detected using the standard event selection. Our analysis of this flare reveals a possible signature of the pion-decay radiation, providing crucial information on the high-energy accelerated-particle spectrum.

**Omodei, N.,
Jim Chiang, Fred Piron, Vlasios Vasileiou, Giacomo Vianello, for the Fermi LAT collaboration**

Stanford University

Oral

THE FIRST FERMI LAT CATALOG OF GAMMA-RAY BURSTS

We will present the first Catalog of Gamma Ray Bursts detected at high energies by the Fermi-LAT during its first 2.5 years of operations. During this period of time the LAT detected more than 20 GRBs, which were analyzed using an automated and unbiased analysis pipeline. We will present the prescription of the full analysis chain, its results, and we will address in a systematic way the current measurements of the time onset, the extra spectral component, and the extended emission as observed in LAT GRBs, providing a complete picture of GRB as observed by the LAT.

**Orienti, M.,
Dallacasa, D., Giroletti, M., Giovannini, G., D'Ammando, F.**

University of Bologna

**Poster
AGN S1.N74**

YOUNG RADIO SOURCES: THE DUTY-CYCLE OF THE RADIO EMISSION AND PROSPECTS FOR GAMMA-RAY EMISSION

The evolutionary stage of a powerful radio source originated by an AGN is related to its linear size. In this context, compact symmetric objects (CSOs), which are powerful and intrinsically small objects, should represent the young stage in the individual radio source life. However, the fraction of young radio sources in flux density-limited samples is much higher than what expected from the number counts of large radio sources. This indicates that a significant fraction of young radio sources does not develop to full kpc-scale objects, suggesting an intermittent jet activity. We present the parsec-scale multifrequency images of a few CSOs, showing relic features connected to the various stages of intermittency: newly born, switching off, restarted. As the radio jets are expanding within the dense and inhomogeneous interstellar medium, the ambient may also play a role in the jet growth. Moreover, this environment may provide the seed photons for high energy emission, detectable by Fermi-LAT.

**Orlando, E.,
Brigida, M.; Giglietto, N. ; Moskalenko, I.V. for the Fermi/LAT Collaboration**

Stanford University

**Poster
SolarSystem S2.N3**

THE QUIET SUN WITH FERMI/LAT

We show the latest results of Fermi-LAT observations of the quiescent Sun during the first 18 months of the mission. During this period the solar activity was at its minimum, hence the solar emission induced by cosmic rays was at its maximum. Two emission components are clearly distinguished: the point-like emission from the solar disk due to the cosmic-ray cascades in the solar atmosphere, and the extended emission due to inverse Compton scattering of cosmic ray electrons on solar photons in the heliosphere. The observed integral flux from the solar disk is about a factor of 7 higher than predicted by the “nominal” model by Seckel et al. (1991). In contrast, the observed integral flux of the extended emission is consistent with the theoretical predictions of the inverse Compton emission. For the first time, we present the entire analysis, showing spectra and angular profiles of both components and discuss the comparison with models and the outcomes.

**Orr, M.,
Krennrich, F. and
Dwek, E.**

Iowa State University

**Poster
AGN S1.N75**

STRONG NEW CONSTRAINTS ON THE EBL IN THE NEAR- TO MID-IR

The extragalactic background light is comprised of all nuclear and gravitational energy releases since the epoch of recombination. It's intensity is surpassed only by that of the cosmic microwave background. Very high energy (VHE) gamma-rays from blazars, as they propagate through the Universe, interact via pair production with the photons comprising the EBL. Signatures of EBL absorption are therefore imprinted on the observed spectra of blazars. Current generation imaging atmospheric Cherenkov telescopes (IACTs), operating at energies from ~100 GeV to ~30 TeV, can probe the emission spectra of blazars for clear signatures of EBL absorption and place constraints on both the overall intensity and shape of the EBL spectral energy distribution. In this poster we will present our recent work to constrain the EBL utilizing two distinct analysis techniques applied to the high energy spectra of blazars.

**Ostapchenko, S.,
K. Dolag, M.
Kachelriess, R.
Thomas**

Norwegian University for Science and Tech (NTNU)

Oral

ON THE STRENGTH AND SPACE-FILLING FACTOR OF THE INTERGALACTIC MAGNETIC FIELD

High energy particles interacting with the extragalactic photon background initiate electromagnetic pair cascades. We will discuss the resulting constraints on the intergalactic magnetic field (IGMF) for time-variable sources. We show that the non-observation of 1ES 0229+200 by Fermi-LAT requires that the IGMF is stronger than $\sim 5\times 10^{-15}$G in at least 60\% of space. Thus the (non-) observation of GeV extensions around TeV blazars probes the EGMF in voids and puts strong constraints on the origin of EGMFs, favoring a primordial origin. Finally, we present briefly a new public code for the calculation of electromagnetic cascades.

**Otte, N.,
for the VERITAS Collaboration**

University of California Santa Cruz

Oral

VERITAS OBSERVATIONS OF THE CRAB PULSAR ABOVE 100 GEV

The Crab Pulsar is one of the strongest gamma-ray sources observable with Fermi. Above a few GeV the energy spectrum sharply turns over. Studying the cutoff regime, in particular at the highest possible energies, provides unique insight into how particle acceleration takes place in the magnetosphere. Here we present observations of the Crab Pulsar above 100 GeV with VERITAS and discuss the results in the context of Fermi measurements below 10 GeV.

Pacciani, L., AGILE team

IASF-Roma/INAF

Poster
AGN S1.N76

THE UNUSUAL GAMMA-RAY FLARE OF AGLJ 1238+0406

AGILE pointed the Virgo Region for the first time for 3 weeks, starting from the second half of December 2007. We detected two FSRQ: 3C 273 and 3C 279, and a gamma-ray source: AGLJ 1238+0406. The source is positionally consistent with an AGN of the Sloan Digital Survey, namely SDSS J123932.75+044305 at z=1.76. In the 2nd edition of the Roma-BZCAT Multi-frequency Catalogue of Blazars the source is associated with a Flat Spectrum Radio Quasar, BZQ 1239+0443. During the AGILE observation, INTEGRAL observed the same field for 600 ksec. IBIS didn't detected the source in hard X-ray. OMC instead detected a weak signal from SDSS J123932.75+044305. AGL J1238+0406 has been already detected at low significance by EGRET, integrating the whole mission dataset. Then it was detected by FERMI one year after the AGILE pointing of the Virgo field. The FERMI localization firmly established the association of the gamma-ray source with SDSS J123932.75+044305. We'll report the simultaneous multiwavelength data obtained for the two periods of high gamma-ray activity of the source. We'll report also the the archival data, with optical observations showing the object in a rather low state dominated by the disk emission. We were able to derive the BH mass from optical spectroscopy. The sources showed variations of ~50 from low to high state in optical and of ~10-20 in gamma-rays. In spite of the sparse observations performed so far, we'll depict a coherent picture of the source, modeling the spectral energy distribution during flare states in the frame of leptonic models, with the contribution of external Compton from disc, BLR, and dusty torus. We used the observed gamma-ray variability to constrain the size of the emitting region. We observed for the source an unusual flat gamma-ray spectrum up to 20 GeV. We'll discuss the implications of the high energy spectra on the physics of the source.

Pal'shin, V. D., A. E. Tsvetkova, D. S. Svinkin, R. L. Aptekar, S. V. Golenetskii, D. D. Frederiks, E. P. Mazets, P. P. Oleynik, M. V. Ulanov, T. Cline

Ioffe Physical-Technical Institute of the Russian Academy of Sciences

Poster
GRB S2.N21

KONUS-WIND OBSERVATIONS OF GAMMA-RAY BURSTS WITH MEASURED REDSHIFT

In the course of its mission, the Konus-Wind experiment has detected nearly a hundred gamma-ray bursts with measured redhshift. We report on the temporal and spectral characteristics of these bursts obtained by Konus-Wind in a wide energy range from ~20 keV to 10 MeV. Using this large, homogeneous dataset we analyze various distributions and correlations of the burst parameters.

Pal'shin, V. D., K. Hurley, D. S. Svinkin, R. L. Aptekar, S. V. Golenetskii, D. D. Frederiks, E. P. Mazets, P. P. Oleynik, M. V. Ulanov, T. Cline, I. G. Mitrofanov, D. V. Golovin, A. S. Kozyrev, M. L. Litvak, A. B. Sanin, W. Boynton, C. Fellows, K. Harshman, J. Trombka, T. McClanahan, R. Starr, J. Goldsten, R. Gold, A. Rau, A. von Kienlin, D. M. Smith, C. Wigger, W. Hajdas, S. Barthelmy, J. Cummings, N. Gehrels, H. Krimm, D. Palmer, K. Yamaoka, M. Ohno, Y. Fukazawa, Y. Hanabata, T. Takahashi, M. Tashiro, Y. Terada, T. Murakami, K. Makishima, M. S. Briggs, R. M. Kippen, C. Kouveliotou, C. Meegan, G. Fishman, V. Connaughton, C. Guidorzi, F. Frontera, E. Montanari, F. Rossi, M. Feroci, L. Amati, L. Nicastro, M. Orlandini, E. Del Monte, E. Costa, I. Donnarumma, Y. Evangelista, I. Lapshov, F. Lazzarotto, L. Pacciani, M. Rapisarda, P. Soffitta, G. Di Cocco, F. Fuschino, M. Galli, C. Labanti, M. Marisaldi, J.-L. Atteia, C. Barraud, A. Pëlangeon, M.Boër, R. Vanderspek, G. Ricker

Ioffe Physical-Technical Institute of the Russian Academy of Sciences

Poster
GRB S2.N22

IPN LOCALIZATIONS OF KONUS SHORT GAMMA-RAY BURSTS

Between the launch of the GGS Wind spacecraft in 1994 November and the end of 2010, the Konus-Wind experiment detected 301 short duration gamma-ray bursts. During this period, the IPN consisted of up to eleven spacecraft, and using triangulation, the localizations of 268 bursts were obtained. We present the IPN localization data on these events. The localizations can be used for a wide variety of purposes, including searches for a) gravitational wave and neutrino signals from merging compact objects b) very high energy photons from the burst sources c) giant SGR flares in nearby galaxies.

Paneque, D., Finke, J., Georganopoulos G., Reimer A., Stawarz L., Tescaro D., on behalf of the Fermi-LAT, MAGIC, VERITAS and other groups and collaborations participating in the multifrequency campaigns

Max Planck Institute for Physics (Munich)

Poster
AGN S1.N77

EXTENSIVE MULTIFREQUENCY CAMPAIGNS ON THE CLASSICAL TEV BLAZARS MRK421 AND MRK501 IN THE FERMI ERA

We are performing an unprecedentedly long and dense monitoring of the multifrequency (radio to TeV) emission from the classical TeV blazars Mrk 421 and Mrk 501. These objects are among the brightest X-ray/TeV blazars in the sky and among the few sources whose Spectral Energy Distribution (SED) can be completely characterized by the current instruments. This is a multi-year, multi-instrument program involving the participation of VLBA, Swift, RXTE, MAGIC, VERITAS, Whipple, F-GAMMA, GASP-WEBT, and other collaborations and instruments which is providing the most detailed temporal and energy coverage of these sources to date. In the conference, we will focus mostly on the results we obtained with the multifrequency data from 2009. We will show that, when Mrk421 and Mrk501 are in low state, their SEDs are very comparable and can be similarly modeled in the framework of a 1-zone Synchrotron self-Compton scenario with an electron energy distribution parameterized by three power laws with the two breaks (in the electron energy distribution) at roughly the same energies, and a size of the emitting region comparable to the size of the partially resolved VLBA radio core. We will also present some preliminary results from 2010 and 2011, which show that the behavior of these objects can be very different over time, hence indicating that the complexity in resolving the underlying processes occurring in those objects can only be achieved through a well-sampled, coordinated monitoring of the broad-band SED lasting several years.

Paneque, D., Fortin, P., Ajello, M., Ballet, J., Chiang, J. on behalf of the Fermi-LAT collaboration

Max Planck Institute for Physics (Munich)

Poster
Catalog S1.N4

SOURCES IN THE FERMI SKY ABOVE 10 GEV

We searched for sources at energies above 10 GeV using the Fermi-LAT data accumulated from August 2008 to August 2010, and measured their spectra and variability. We found approximately 300 sources (80% of them associated with known sources), out of which 25% were found to be variable above 10 GeV. We will describe the implications of this study for the populations of high-energy gamma-ray emitters. Moreover, we will also highlight the subset of sources which are good candidates for detection at very high energies (VHE) with Cherenkov telescopes, which amount to about one third of the above list. We envision that this VHE candidate list will greatly increase the efficiency of searches for new VHE sources.

Papini, P., PAMELA collaboration

INFN - Sezione di Firenze

Oral

RESULTS FROM THE PAMELA EXPERIMENT

After five years of data taking in space, the experiment PAMELA is showing very interesting features in cosmic rays, namely in the fluxes of protons, heliums, electrons, that might change our basic vision of the mechanisms of production, acceleration and propagation of cosmic rays in the galaxy. In addition, PAMELA measurements of cosmic antiproton and positron fluxes are setting strong constraints to the nature of Dark Matter. PAMELA is also measuring the radiation environment around the Earth, and has recently discovered an antiproton radiation belt. The analysis of particles coming from the Solar activity is part of the scientific program of PAMELA too, and important improvements in the comprehension of the solar modulation mechanisms are achievable. In this presentation the PAMELA main results will be reviewed.

Parent, D.,
Freire, P. C. C., the LAT Collaboration, the Pulsar Timing Consortium

George Mason University, resident at Naval Research Laboratory

Poster
PSR S2.N23

DETECTION OF A LUMINOUS GAMMA-RAY PULSAR IN A GLOBULAR CLUSTER WITH THE FERMI-LAT

Millisecond pulsars (MSPs) have recently been confirmed by the Fermi Large Area Telescope as a class of pulsed gamma-ray emitters. They have been observed individually contributing to the population of high latitude gamma-ray sources, and suggested to explain the gamma-ray emission of globular clusters as a collective emission. We report the Fermi Large Area Telescope detection of gamma-ray pulsations above 100 megaelectron volts from pulsar J1823-3021A in the globular cluster NGC 6624 with high significance (7 sigma). The number of millisecond pulsars in NGC 6624 was previously estimated at ~100, based on its high gamma-ray flux. We find instead that most of it originates in this single pulsar, whose gamma-ray luminosity L = 8.4E34 erg/s is among the highest observed for any MSP. We find no detectable gamma-ray emission from the direction of the cluster in the off-pulse phase of J1823-3021A, implying that the number of MSPs in this cluster is much smaller than previous estimates and ruling out several competing mechanisms as the dominant contributors to its gamma-ray emission.

Park, P.,
Bong Won Sohn, Sang-Sung Lee, Junghwan Oh

Korean VLBI Network, Korea Astronomy and Space Science Institute

Poster
AGN S1.N78

PRELIMINARY F-GAMMA MONITORING USING KVN TELESCOPE AT 22 / 43 GHZ

..

Parsons, R. D.,
Hinton, J. A. for the CTA collaboration

University of Leeds

Poster
CR S2.N6

STUDYING COSMIC RAY ELECTRONS WITH CTA

The ultra-relativistic particles that arrive at the Earth, the long-studied yet enigmatic cosmic rays, include >TeV electrons as well the energetically dominant protons and nuclei. As during their diffusion in the ISM these electrons undergo severe energy losses through both synchrotron and inverse Compton processes they are hence only able to travel relatively short distances. Therefore measurement of the spectrum of these electrons is able to give us an important insight into the local distribution of cosmic ray sources. Recent measurements using the PAMELA, Fermi and HESS instruments have revealed interesting features in both the combined electron/positron spectrum and the positron fraction, which were not expected in the standard models of diffusion. These features may be indicative of either physical processes which have not been accounted for, or alternatively local sources or a new source population. We will present an introduction to the next generation gamma ray telescope CTA, alongside predictions of the ability of CTA to improve upon the results from HESS and Fermi, expanding the measurements to energies beyond 10 TeV. The predictions will be based on a model developed to simulate the diffusion of electrons through the ISM and the energy losses they undergo in this time.

Pastushenko, V., past.vlad@mail.ru

Vladymyr Pastushenko

Poster
DMNP S1.N11

QUANTUM THEORY OF THE RELATIVITY AND SUPER QUASAR

Elementary particles, Quantum Theory of the Relativity and super quasar located on http://ic.km.ua/~pva

Pavlidou, V., Giroletti, M., Reimer, A. on behalf of the Fermi-LAT Collaboration, Angelakis, E

California Institute of Technology

Poster
AGN S2.N1

THE RADIO GAMMA RAY CONNECTION IN ACTIVE GALACTIC NUCLEI IN THE FERMI ERA

We present a statistical study of the low-frequency characteristics of Active Galactic Nuclei (AGN) detected by the Fermi Large Area Telescope during its first year of operation, including a detailed analysis of the correlation between radio and gamma-ray properties of these sources. We use both archival interferometric 8.4 GHz data typically from CRATES) and concurrent (time-averaged over the same interval as the gamma-ray observations) single-dish 15 GHz measurements from the Owens Valley Radio Observatory (OVRO). These data represent the largest datasets ever used to study the relation between radio and gamma-ray properties of AGNs and are well representative of both the flat spectrum radio quasar and BL Lac type populations. The time-averaged gamma-ray fluxes are correlated with radio fluxes; however, even in the most strongly correlated samples the scatter is large. The strength of the correlation depends on blazar type, but also on the gamma-ray energy band examined. For the first time we confirm the long-standing expectation that concurrent radio fluxes are more strongly correlated than archival radio fluxes. The statistical significance of these correlations is assessed using a method based on surrogate data, designed to simultaneously account for common-distance bias in the observed correlations between fluxes at different energy bands, and the effect of a limited dynamical range in the observed fluxes. We find that the statistical significance of a positive correlation between the cm radio and > 1GeV gamma-ray flux is very high when the sample contains sources of all types, with a probability < 10 -7 for the correlation appearing by chance. When comparing archival with concurrent data we find that the moderate significance of the correlation derived from the archival radio – gamma-ray sample increases appreciably when concurrent data are used. Both the specific energy bands and source types considered impact the significance of the correlation.

Pelassa, V., on behalf of the Fermi-LAT collaboration

University of Alabama in Huntsville

Oral

RECOVERING LAT GAMMA RAY BURSTS' PROMPT EMISSION ABOVE 30 MEV WITH THE LAT LOW-ENERGY SELECTION

Fermi Large Area Telescope (LAT) standard science analyses are restricted to events of high-quality reconstruction and measured energies larger than 100 MeV. Applying a loosened selection allows one to recover the signal from Gamma-Ray Bursts' (GRB) prompt emission between 30 MeV and 100 MeV, at the expense of an increased background rate, thus enabling better constraints of the high-energy spectra of GRB. This alternative technique, called LAT Low-Energy (LLE), is described here. Performance and validation studies are presented, in particular a study of systematic errors.

Perkins, J. S., Cheung C. C., Stawarz, L. and Wood, D. L. on behalf of the Fermi-LAT Collaboration

CRESST/UMBC/GSFC

Poster
AGN S1.N79

TWO YEARS OF OBSERVATIONS OF THE RADIO GALAXY CENTAURUS A WITH THE FERMI LAT

Gamma-ray emission from the giant radio lobes of Centaurus A was discovered by the Fermi LAT after 10 months of observation. The MeV/GeV emission was interpreted as inverse Compton-scattered radiation from the cosmic microwave background and the optical-to-infrared extragalactic background light. The large extent of the gamma-ray emission implies that highly energetic electrons are either created within the lobes or are efficiently transported over the hundreds of kpc from the core to the emission region. In this contribution we expand the data set and report on the results of the first 24 months of gamma-ray observations on Centaurus A using the Fermi LAT.

Pesce-Rollins, M.

INFN-Pisa

Poster
Instr S2.N21

IN-FLIGHT MEASUREMENT OF THE ABSOLUTE ENERGY SCALE OF THE FERMI LARGE AREA TELESCOPE

To perform an in-flight verification of the absolute energy scale of the LAT it is necessary to find an astrophysical source with a spectral feature whose absolute energy and shape are well known. A potential candidate is the geomagnetic cutoff in the observed cosmic ray electron plus positron spectrum in low Earth orbit. The energy and spectral shape of this cutoff can be calculated with the aid of a numerical code tracing charged particles in the Earth's magnetic field. This provides a reference value for the cutoff rigidity to compare with the value measured in flight. In order to obtain several calibration points we have measured the cutoff rigidity in different geomagnetic positions. In this poster, I present the result of this comparison and estimate the uncertainty on the absolute energy scale of the Fermi LAT.

Pesce-Rollins, M., Baldini, L., Latronico, L., Tinivella, M.

INFN-Pisa

Poster
Instr S2.N22

APPLICATION OF THE NAIVE BAYES CLASSIFIER TECHNIQUE TO THE FERMI LAT CALORIMETER DATA

A clustering stage in the Calorimeter, followed by a moments analysis of the resulting clusters, is currently the first pass of the new event reconstruction being developed for the Fermi Large Area Telescope. One of the primary goals is to identify possible signals due to out-of-time, accidental coincidences in the detector and separate them from the genuine gamma-ray event. To this aim, we developed a multivariate classification technique based on a Naive Bayes Classifier algorithm, trying to exploit the full topological information made available by the clustering and the moments analysis stages. The probability density functions for the discriminating variables are stored in the form of one-dimensional histograms with (approximately) equally populated bins. The energy dependence of the event topology is accounted for by training different classifiers in suitable energy bins, with a weighting scheme being investigated in order to avoid possible artifacts at the bin edges. Preliminary tests on flight data and Monte Carlo simulations show that this approach indeed provides some discrimination power between in-time and out-of-time events. It also features a good separation power between electromagnetic and hadronic events that can be used in the following reconstruction steps and for background rejection.

Piano, G., Bulgarelli, A.; Tavani, M., Vittorini, V; on behalf of the AGILE Team

INAF/IASF Rome

Poster
Microquasar S2.N1

AGILE MONITORING OF THE MICROQUASAR CYGNUS X-3

AGILE data on Cygnus X-3 are reviewed focussing on the correlation between the production of gamma-ray transient emission and spectral state changes of the source. AGILE clearly establishes a relation between enhanced gamma-ray emission and the "quenched" radio/hard X-ray states that prelude in general major radio flares. We discuss the theoretical implications of our findings focussing on the high-energy spectrum of the gamma-ray flares.

Pilia, M., A. Pellizzoni, on behalf of the AGILE Team and AGILE Pulsar Working Group

Università dell'Insubria, Como - INAF, OACagliari

Oral

JOINT AGILE+FERMI OBSERVATIONS OF THE "SOFT" GAMMA-RAY PULSAR B1509-58

We present the discovery and follow-up observations of emission at energies E > 30 MeV from PSR B1509-58 with a simultaneous analysis of data from the italian satellite AGILE and from Fermi. PSR B1509-58 was detected by COMPTEL up to at least 10 MeV, while EGRET reported only marginal evidence (< 4 sigma) for a weak source. AGILE detected pulsed emission from PSR B1509-58 at 6.4 sigma. The COMPTEL sharp spectral break between 10 and 30 MeV seems confirmed by AGILE point at 100 MeV. Our data imply a soft photon index of ~1.87 going from tens to hundreds of MeV and the lowest up to now energy cutoff at E=80 MeV, which is confirmed by the Fermi observations. Such a low-energy break, compared to the more common GeV spectral break in gamma-ray pulsars, could be the signature of the photon splitting process inducing significant electromagnetic cascade attenuation due to the strong magnetic polar field (>10^13 G). Higher magnetic field pulsars have been observed in gamma-rays by Fermi, so that a concurrence of factors has to be invoked in order to explain the soft break. With the AGILE capability of observing with good sensitivity at E>30 MeV, we investigate this peculiar population of highly magnetized pulsars as a possible contributor to a new class of "soft" gamma-ray pulsars.

**Piron, F.,
Vlasios Vasileiou,
Giacomo Vianello, on behalf of the Fermi-LAT Collaboration**

CNRS/IN2P3/LUPM and Montpellier 2 University

**Poster
GRB S2.N23**

EVENT COUNTING METHODS FOR DETECTION AND STUDY OF THE TEMPORAL PROFILE OF FERMI-LAT GAMMA-RAY BURSTS

The standard technique for Gamma-Ray Burst (GRB) analysis with the LAT is based on the maximization of an unbinned likelihood function which makes use of the LAT instrument response functions (IRFs) on an event by event basis, in particular its point spread function (PSF). This standard analysis is restricted to events in the standard LAT data classes, which have good reconstruction quality, in order to minimize the systematic uncertainties due to the limited knowledge of the IRFs. Because the IRFs below 100 MeV are not well-characterized, standard LAT analyses are always performed using data with energies above this threshold. In the case of GRBs occurring at large inclinations with respect to the LAT boresight or having very soft spectra, the likelihood analysis can become difficult and/or signal limited. In this contribution, we present two alternate approaches for GRB detection and for the study of GRB temporal profiles, which require good photon statistics. Both methods consist of counting events in celestial regions of an energy-dependent radius that depends on the PSF. While the first approach considers data in the standard LAT data classes above a low-energy threshold of 50 MeV, the second one uses a more relaxed event selection, considering all LAT events that passed the onboard gamma filter with at least one well-reconstructed track in the LAT tracker and providing a rough direction measurement. We present the detailed implementation of these techniques, including the background estimation, the statistical methods for source detection and the calculation of signal significance, and the algorithms which are used to characterize the temporal profile of the LAT emission (onset, duration).

**Pittori, C.,
F. Verrecchia, M. Capalbi, F. Lucarelli, E. Striani, S. Vercellone, and P. Giommi on behalf of the AGILE Collaboration**

ASDC

**Poster
AGN S1.N80**

THE MAJOR GAMMA-RAY FLARE OF THE BLAZAR 4C +21.35 ON JUNE 17-19, 2010: AGILE DATA ANALYSIS AND MULTIWAVELENGHT FOLLOW UP OBSERVATIONS

The 4C +21.35 blazar, also also known as PKS 1222+21, at redshift z=0.432, has shown extraordinary flaring activity above 100 MeV during the year 2010. A particularly intense gamma-ray emission has been reported on June 17-19, 2010 by AGILE and Fermi satellites. Flaring activity from this source has been also detected in the previous few days by the MAGIC Collaboration at energies above 100 GeV, together with a NIR flux increase. Six Swift Target of Opportunity observations were performed between June 20 and 23, 2010. Optical polarimetric observations during the gamma-ray flare, and optical follow-up were also reported. We present the results of AGILE data analysis and multiwavelength follow up observations of the 4C +21.35 intense flare on June 2010.

**Porter, T.,
Simona Murgia, on behalf of the Fermi-LAT Collaboration**

Stanford University

Oral

FERMI'S VIEW OF THE INNER GALAXY

The inner region of the Milky Way Galaxy is one of the most interesting and complicated regions of the gamma ray sky because of the many point sources and potential confusion, the uncertainties associated with the diffuse gamma-ray emission, together with the potential for dark matter detection. In this talk, we report on the Fermi LAT team analysis of a 10 degree region around the direction of the galactic center using over 2 years of data.

Poutanen, J., Stern, Boris

University of Oulu

Oral

FERMI OBSERVATION OF BLAZARS AND IMPLICATIONS FOR THE ORIGIN OF GAMMA-RAYS

GeV spectra of the brightest blazars detected by the Fermi Gamma-ray Space Telescope cannot be described by a simple power law model. A much better description is obtained with a broken power law, with the break energies of a few GeV. We show that the sharpness and the position of the breaks can be well reproduced by absorption of gamma-rays via photon--photon pair production on He II and H I Lyman recombination continua and lines. This is the first direct observational proof that the blazar zone lies inside the broad-line region (BLR) within a few light-months from a super-massive black hole. This also implies that the jet is fully accelerated to relativistic velocities at 1000 Schwarschild radii from the black hole. We also study Fermi/LAT blazar spectra at various flux levels in order to obtain the variations in the gamma-ray opacities due to He and H lines and to determine changes its position of the gamma-ray emitting region within the BLR.

Prandini, E., on behalf of the MAGIC Collaboration

Padova University & INFN

Poster
AGN S1.N81

THE MAGIC VIEW OF PG 1553+113

We present the results of five years (2005-2009) of MAGIC observations of the BL Lac object PG 1553+113 at very high energies (VHEs). Adding the new data set (2007-2009) to previous observations, this source becomes one of the best long-term followed sources at energies above 100 GeV. In the last three years of data, the flux level above 150 GeV shows a marginal variability. Simultaneous optical data also show only modest variability that seems to be correlated with VHE gamma-ray variability. We also performed a temporal analysis of all available Fermi/LAT data of PG 1553+113 above 1 GeV. Finally, we present a combination of the mean spectrum measured at very high energies with archival data available for other wavelengths. The mean spectral energy distribution can be modeled with a one-zone SSC model, which gives the main physical parameters governing the VHE emission in the blazar jet.

Prandini, E., Marotti, M., Tavecchio, F.

Padova University & INFN

Poster
AGN S1.N82

CONSTRAINING BLAZARS DISTANCES WITH COMBINED GEV AND TEV DATA

Recently, a new method to constrain the distance of blazars with unknown redshift using combined observations in the GeV and TeV regimes has been developed. The underlying assumption is that the Very High Energy (VHE, E > 100 GeV) spectrum corrected for the absorption of TeV photons by the Extragalactic Background Light (EBL) via photon-photon interaction should still be softer than the gamma-ray spectrum observed by Fermi/LAT. The constraints found are related to the real redshifts by a simple linear relation, that has been used to infer the unknown or uncertain distance of blazars. The sample will be revised with the up-to-date spectra in both TeV and GeV bands, the method tested with more recent EBL models and ï¬nally applied to the unknown distance blazars detected at VHE.

**Preece, R.,
Adam Goldstein, J.
Michael Burgess and
the Fermi GBM Team**

**University of Alabama
in Huntsville**

oral

THE FIRST GBM GRB CATALOGS

We present our burst global properties and spectral analysis Catalogs of GRBs observed with the Fermi/GBM during the first two years of the mission (2008-2010). The full data sets will be available online. The GBM Burst Catalog covers global burst properties similar to that of the series of BATSE Catalogs; e.g.: durations, peak fluxes, fluences and localizations. For each burst in the Spectroscopy Catalog we fit two spectra to an assortment of spectral functions: a one second accumulation at the peak flux for long GRBs (64 ms accumulation for short events) plus, a time-averaged ('fluence') spectrum over the entire burst interval. We describe here our data selection methodology, the data archive format, and the main result distributions.

**Pursimo T.,
Roopesh Ojha, David
Jauncey, Jim Lovell,
Barney Rickett, J-P
Macquart, Hayley
Bignall, Lucyna
Kedziora-Chudczer,
Mike Dutka, Cliff
Senkbeil & Stas
Shabala**

**Nordic Optical
Telescope, Spain**

**Poster
AGN S1.N83**

CONNECTION BETWEEN RADIO COMPACTNESS AND FERMI/LAT AGN DETECTIONS FROM THE MASIV SURVEY

The MASIV 5 GHz VLA flat-spectrum radio source variability survey of the northern sky has discovered that more than 50% of the 475 targets exhibited inter-stellar scintillation (ISS) on one or more of the four survey epochs. In comparison to the other flat-spectrum radio surveys MASIV selected only unresolved sources at 8.4GHz with the VLA (CLASS and JVAS Catalogues). Based on their optical spectrum, the majority of the sources are QSOs. However there are many BL Lac objects and some narrow-line AGN in the sample. The BL Lac fraction appears to be much higher amongst the ISS than non-ISS sources and most narrow-line objects are non-ISS sources. Our results show that ISS sources have a flat redshift distribution between 0.5 and two, in comparison to the non-ISS which has a peak at redshift one and a tail up to redshift four. Particularly intriguing is a lack of z>2 ISS sources in the MASIV sample, which may be explained by the scattering properties of the Intergalactic Medium. The radio and optical luminosities of ISS and non-ISS sources are similar. We find that about 40% of the ISS sources with S(5Ghz) >0.3 Jy are LAT detected in comparison to the 20% detection rate of the non-ISS sources. Also, the BL Lac fraction amongst LAT detected MASIV sources is higher for the ISS sources in comparison to the non-ISS sources.

**Racusin, J. L.,
Oates, S. R.**

NASA/GSFC

**Poster
GRB S2.N24**

FERMI AND SWIFT GAMMA-RAY BURST AFTERGLOW POPULATION STUDIES

The new and extreme population of GRBs detected by Fermi-LAT shows several new features in high energy gamma-rays that are providing interesting and unexpected clues into GRB prompt and afterglow emission mechanisms. Over the last 6 years, it has been Swift that has provided the robust data set of UV/optical and X-ray afterglow observations that opened many windows into components of GRB emission structure. The relationship between the LAT GRBs and the well studied, fainter, less energetic GRBs detected by Swift-BAT is only beginning to be explored by multi-wavelength studies. We explore the large sample of GRBs detected by BAT only, BAT and Fermi-GBM, and GBM and LAT, focusing on these samples separately in order to search for statistically significant differences between the populations, using only those GRBs with measured redshifts in order to physically characterize these objects. We disentangle which differences are instrumental selection effects versus intrinsic properties, in order to better understand the nature of the special characteristics of the LAT bursts.

**Rainò, S.,
F. Gargano,
G.Madjeski, L.Reyes,
E.do Couto e Silva on behalf of the Fermi-LAT collaboration**

Dipartimento di Fisica Università di Bari and INFN-Bari

**Poster
AGN S1.N84**

STUDY OF THE BLAZAR AO0235+164 DURING THE MULTI-WAVELENGTH OBSERVATION PERIOD FROM OCTOBER 2008 TO FEBRUARY 2009

AO 0235+164 is one of the most-studied and monitored BL Lac objects in the sky. Since the launch of Fermi, the source has been monitored in the gamma-ray band by Fermi-LAT.Starting from October 2008, AO0235+164 showed an increasing activity in gamma-rays that led to a multi-wavelength campaign with instruments in the radio, near-infrared, optical, UV and X-rays bands. We present here the results of the analysis of the multi-wavelength data collected during the flaring period: the high variability properties of this source and the SED built from radio frequencies to gamma-rays are shown.

**Rau, A.,
Schady, P., Ajello, M., Greiner, J., Bottacini, E.**

Max-Planck Institute for Extraterrestrial Physics

**Poster
AGN S1.N85**

NEW REDSHIFT CONSTRAINTS FOR 200 FERMI LAT BLAZARS

Fermi LAT's discovery of more than thousand extra-galactic sources (mostly blazars) has the potential to revolutionize our picture of the high-energy Universe. Blazars, in particular those at high redshift, are important probes of the formation of relativistic outflows and, being typically hosted in massive galaxies, also for the formation of galaxies. Furthermore, their high-energy spectral cut-off can be an exicting probe for the ionization of the Universe. Redshifts, however, are often missing, and in particular for BL Lacs difficult to obtain. Here we present the results of a dedicated photometric redshift campaign for ~200 extra-galactic Fermi sources that lack a distance scale. Using near-simultaneous observations in 13 bands from ultra-violet to near-infrared wavelengths with Swift/UVOT and the 7-channel imager GROND at the ESO/MPG 2.2m telescope in Las Silla, Chile, we are sensitive to the Lyman-limit at redshifts of z>1.2. We will present the redshift and luminosity distributions and discuss the impact of our findings on our understanding of the high-redshift Universe.

**Ray, Paul S.,
Fermi Pulsar Search Consortium**

Naval Research Laboratory

Oral

RADIO SEARCHES OF FERMI LAT UNASSOCIATED SOURCES AND BLIND SEARCH PULSARS

I present a summary of the Fermi Pulsar Search Consortium (PSC), an international collaboration of radio astronomers and members of the LAT collaboration, whose goal is to organize radio follow up of Fermi pulsars and pulsar candidates among the unassociated LAT source population. The PSC includes pulsar observers with expertise using the world's largest radio telescopes that together cover the full sky, including the Green Bank Telescope, Parkes, Nancay, Arecibo, Effelsberg, and, most recently, the GMRT. We have performed very deep observations of all 26 pulsars discovered in blind searches of the LAT data, resulting in the discovery of radio pulsations from three of them. We have also searched over 300 LAT gamma-ray sources that don't have strong associations with known gamma-ray emitting source classes and have pulsar-like spectra and variability characteristics. These searches have led to the discovery of 31 new radio millisecond pulsars and two normal pulsars. These discoveries greatly increase the known population of MSPs in the Galactic disk, more than double the known population of so-called `black widow' pulsars, and contain many promising candidates for inclusion in pulsar timing arrays.

Razzano, M., Belfiore A., Dormody M., Saz Parkinson P. and Ziegler M. on behalf of the Fermi-LAT Collaboration & the Pulsar Timing Consortium

INFN-Pisa and University of Pisa

Poster
PSR S2.N24

FERMI LAT OBSERVATIONS OF GAMMA-RAY PULSARS IN THE CYGNUS REGION

The Cygnus region has long been known as one of the most complex and interesting regions in the gamma-ray sky, containing pulsars, supernova remnants, the Cygnus-OB2 association and the Cyg-X3 microquasar. In particular, the bright LAT-detected gamma-ray pulsars account for a large part of the gamma-ray emission from this crowded region, as exemplified by J2021+4026 (Gamma Cygni) and J2021+3651 (the Dragonfly). We will report updated results from 2.5 years of Fermi LAT observations of gamma-ray pulsars in the Cygnus region, as well as a study of unidentified sources in the region that are good pulsar candidates.

Richards, J. L., Walter Max-Moerbeck, Vasiliki Pavlidou, Anthony C. S. Readhead, Timothy J. Pearson, Oliver King, Rodrigo Reeves, Matthew A. Stevenson, Martin C. Shepherd

California Institute of Technology

Poster
AGN S1.N86

RADIO VARIABILITY STUDIES OF GAMMA-RAY BLAZARS WITH THE OVRO 40-M TELESCOPE

Since late 2007, we have been monitoring a large sample of known and likely gamma-ray-loud blazars at 15 GHz twice per week with the Owens Valley Radio Observatory (OVRO) 40-meter Telescope. Our initial sample included the 1158 sources above declination -20° from the Candidate Gamma-Ray Blazar Survey (CGRaBS), and we have since added nearly 400 more sources, including all blazars associated with Fermi-LAT detections in the First AGN Catalog (1LAC). Here, we describe the new sample and present results for 2008 through early 2011. Using statistical likelihood analyses, we compare the variability amplitude for various sub-populations within our sample. These include comparisons of gamma-ray-loud versus quiet objects, BL Lac objects versus flat-spectrum radio quasars, and a study of the variability amplitude trend with redshift. We also describe KuPol, the new digital Ku-band receiver being constructed for the 40-meter telescope. This new receiver will provide total intensity and linear polarization measurements over the 12-18 GHz band, with 16 MHz spectral resolution.

Roberts, M., Maxim Lyutikov, Ester Aliu, Paul Ray, Regis Terrier, Maura McLaughlin, Jason Hessels

Eureka Scientific

Poster
SNR/PWNe S2.N22

SOME CRITTERS PLAY FRISBEE, SOME DON'T: X-RAY OBSERVATIONS OF VARIOUS FERMI PULSARS AND THEIR NEBULAE

We present X-ray imaging and timing observations of several Fermi pulsars and their wind nebulae morphologies, comparing them to radio images where appropriate. In some cases, it appears their is a hybrid morphology where on large scales there is a bow shape from their motion, and on smaller scales a torus+jet morphology which is tilted and offset with respect to the symmetry axis of the apparent bow shock. We present a simple model of the effects of an equatorially enhanced wind on a ram-pressure confined nebula. We discuss implications of this picture for birth sites and potentially related TeV sources.

Rochester, L., on behalf of the Fermi-LAT collaboration

SLAC National Accelerator Laboratory

Poster
Instr S2.N23

AN INVESTIGATION OF ALTERNATIVE CONFIGURATIONS OF THE READOUT CONTROLLERS OF THE FERMI LAT TRACKER

The Fermi Large Area Telescope (LAT) consists of 16 towers, each incorporating a tracker made up of a stack of 18 pairs of orthogonal silicon strip detectors (SSDs), interspersed with tungsten convertor foils. The strip numbers of the struck strips in each SSD are collected by two readout controllers (RCs), one at each end, and nine RCs are connected by one of eight cables to a cable controller (CC). The tracker readout electronics limits the number of strips that can be read out. Each RC can store up to 64 hits, but a CC can store maximum of only 128 hits. To insure that backsplash in the lower layers of the tracker doesn't compromise the readout of the upper layers, we artificially limit the number of strips read out into each RC to 14, so that no CC can ever can see more than 126 strips. In this contribution, we explore other configurations that may allow for a more complete readout of large events, and investigate some of the consequences of using these configurations..

Rodi, J., Case, G. L.; Cherry, M. L; Wilson-Hodge, C. A.; Camero-Arranz, A.; Chaplin, V.; and Jenke P.

Louisiana State University

Poster
Instr S2.N24

ALL-SKY IMAGING WITH THE FERMI GAMMA-RAY BURST MONITOR

Because the x-ray/gamma-ray sky is highly variable, being able to observe sources over various timescales is important. As demonstrated by BATSE and GBM, Earth occultation with non-imaging detectors can be used as a method for measuring source fluxes by looking at the differences in count rates in a detector that occur when a source moves into or out of occultation. The Earth Occultation Technique requires a predefined input Catalog of source positions. Having an incomplete Catalog has shown to result in increased systematic errors. In order to find sources not included in the input Catalog, an indirect imaging method has been developed using the twelve NaI detectors on GBM onboard Fermi. The imaging algorithm uses the projection of the Earth's limb onto the sky at the time a source occults. Over the course of an orbital precession period (~53 days), all available projection angles are sampled. These projections add constructively near the position of a source, thus allowing the source to be localized. We present all-sky image results in the 12-25 keV band and the 100-300 keV band for ~ 2.5 years of data from GBM, and discuss the correlations with the ROSAT, SWIFT/BAT, INTEGRAL/SPI, and Fermi/LAT Catalogs.

Romani, R. W.

Stanford University

invited

WHAT THE FERMI PULSARS TELL US ABOUT MAGNETOSPHERE MODELS

With roughly 100 detections, Fermi has now collected a good sample of both young and millisecond pulsars. Some basic patterns have emerged and it is clear that the bulk of the emission occurs in the outer magnetosphere far from the neutron star surface. However there are some surprises and exceptions, which can help us understand the magnetospheric physics. We review the pulsar phenomenology and show how it connects to the underlying theoretical models. Several magnetospheric pictures are still viable but it is clear that LAT data are providing stringent tests of the emission zone locations and acceleration power. As statistics accrue on the brightest pulsars, the next frontier for model comparison is phase-resolved spectra, which provide a map of the magnetosphere's radiating particle populations.

Romano, P., S. Vercellone (INAF-IASF Palermo), H.A. Krimm (NASA/GSFC/ CRESST), P. Esposito (INAF-OACagliari), G. Cusumano, V. La Parola, V. Mangano (INAF-IASF Palermo), J.A. Kennea, D.N. Burrows (PSU), C. Pagani (UL), N. Gehrels (NASA/GSFC)

INAF-IASF Palermo

Oral

PROPERTIES OF SUPERGIANT FAST X-RAY TRANSIENTS AS OBSERVED BY SWIFT

We present the most recent results from our investigation on Supergiant Fast X-ray Transients, a class of High-Mass X-ray Binaries, with a possible counterpart in the gamma-ray energy band. Since 2007 Swift has contributed to this new field by detecting outbursts from these fast transients with the BAT and by following them for days with the XRT. Thus, we demonstrated that while the brightest phase of the outburst only lasts a few hours, further activity is observed at lower fluxes for a remarkably longer time, up to weeks. Furthermore, we have performed several campaigns of intense monitoring with the XRT, assessing the fraction of the time these sources spend in each phase, and their duty cycle of inactivity.

Roth, M.

University of Washington

Poster
Instr S2.N25

VALIDATION AND CALIBRATION OF THE LARGE AREA TELESCOPE POINT SPREAD FUNCTION

With two years of data, the LAT point spread function is characterized through a likelihood analysis of stacked point sources (AGN, Pulsars) for data processed with both the current version of the event analysis ("pass6") and the latest update ("pass7"). In addition, the angular resolution estimated from this analysis was validated up to 10 GeV with an analysis of pulsars based on phase selection. We confirm a discrepancy between the on-orbit and Monte Carlo PSF width above 5 GeV for all events, and we provide an improved description of the instrument performance for the analysis of LAT data. We also discuss the systematics of measuring the PSF with both stacked sources and pulsar phase selection.

Rousseau, R.

CENBG, University of Bordeaux (France)

Poster
SNR/PWNe S2.N23

OBSERVATIONS OF THE PWN HESS J1857+026 WITH FERMI-LAT

HESS J1857+026 is a gamma-ray source detected by the HESS Cerenkov telescopes in their Galactic Plane Survey. The TeV source was recently identified as a Pulsar Wind Nebulae (PWN) after the discovery of the energetic pulsar PSR J1856+0245. Using more than two years of Fermi-LAT observations, we have conducted a detailed study of this TeV PWN and detected a significant emission coincident with this source. Results on the morphological and spectral analysis wil be described in detail.

Rügamer, S., on behalf of the MAGIC collaboration; Angelakis, E., for the F-Gamma program; Bastieri, D., on behalf of the Fermi LAT team; Dorner, D.; Kovalev, Y. Y., for the MOJAVE team; Lähteenmäki, A.; Lindfors, E.; Pittori, C., on behalf of the AGILE team; Reinthal, R.; Sokolovsky, K. V.; Stamerra, A.; Ungerechts, H., on behalf of the IRAM team

University of Würzburg

Poster
AGN S1.N87

MAGIC AND MULTI-FREQUENCY OBSERVATIONS OF THREE HBLS IN 2008

High-frequency peaked BL Lacertae objects (HBLs), a sub-class of Active Galactic Nuclei, are known to emit nonthermally from radio up to TeV energies, showing variability from minutes' to month' time scale. They are the most prominent sources in the extra-galactic TeV sky and therefore prime candidates for simultaneous wide-range multi-frequency observations. In 2008, the two HBLs Mrk 180 and 1ES 2344+514 were observed (quasi-)simultaneously by RATAN-600, Metsähovi, Effelsberg, VLBA (only 1ES 2344+514), IRAM (only Mrk 180) (radio), KVA (optical), Swift (UV and X-rays), AGILE, Fermi LAT (high energy gamma rays) and MAGIC (very high energy gamma rays). In addition, prior to the launch of Fermi, another campaign has been conducted on the HBL 1ES 1011+496 by Metsähovi, KVA, Swift, AGILE and MAGIC. In contrast to the well-studied objects Mrk 421 and Mrk 501, these three sources are rather weak at gamma-ray energies, challenging the current instruments' detection capabilities. In fact, Mrk 180 and 1ES 1011+496 had just been discovered by MAGIC in gamma rays in 2006 and 2007, respectively. The observations reported here consequently mark the very first multi-frequency campaigns including gamma-ray coverage on these two sources. The Fermi LAT observations of Mrk 180 yield a flat spectral shape, indicating that the second peak of the spectral energy distribution was lying within the Fermi LAT energy range, and a flux level compatible with the value listed in the 1-year Catalogue, whereas 1ES 2344+514 was found in a quite low flux state. In this contribution, the detailed results of the three campaigns will be presented, including multi-frequency light curves and modelling of the complete spectral energy distribution.

Sabatini, S., AGILE Team

INAF-IASF Roma

Poster
OtherGal S2.N10

AGILE MONITORING OF CYG X-1

AGILE detected gamma-ray emission from the black hole binary Cyg X-1. We will review the context and relevance of our observations in relation to the known properties of the system. Starting in 2010 Cyg X-1 entered in a "soft" state, and the AGILE monitoring of the system provides crucial data for the high-energy emission modelling.

Saito, T. Y., on behalf of the MAGIC Collaboration

Max-Planck-Institut fuer Physik

Poster
PSR S2.N25

THE CRAB PULSAR ABOVE 25 GEV OBSERVED BY THE MAGIC TELESCOPE

The Crab remains to be the only one pulsar that has been detected at all energy bands: radio, optical, X-ray and gamma-rays. The recent detection of pulsed emission with the MAGIC Telescope extends even further the portion of the electromagnetic spectrum that can be used to study this extreme object. In the conference we will report on the MAGIC observations from Oct. 2007 to Jan. 2009, which revealed for the first time the energy spectrum of the Crab pulsar above 25 GeV. This spectrum will be compared with the one measured by Fermi-LAT below 30 GeV, which can be described by a power law with an exponential cutoff at 6 GeV.

Salvetti, D.,
Saz Parkinson, P. M.,
Caraveo, P. A., de Luca, A., Belfiore, A.

University of Pavia

Poster
UNID S1.N5

A LOGISTIC REGRESSION ANALYSIS OF 1FGL UNASSOCIATED SOURCES

The Fermi Large Area Telescope First Source Catalog (1FGL) lists positional, spectral, and temporal properties for 1451 gamma-ray sources. 630 of these sources (~40%) remain "unassociated", i.e. do not have any plausible known counterpart. We report on the use of Logistic Regression as a very promising method to understand the nature of Fermi-LAT unassociated sources. Logistic Regression allows us to quantify the probability for an unidentified source to be either an AGN or a pulsar (the two most abundant classes of objects in the Fermi Catalog), using parameters describing the gamma-ray properties of the source. We will discuss applications of our results for obtaining a preliminary estimate of the pulsar and AGN fractions among unassociated sources, as well as for planning multiwavelength follow-up observations.

Sasmaz Mus, S.,
Gogus, Ersin

Sabanci University

Poster
PSR S2.N26

SEARCH FOR HIGH ENERGY GAMMA-RAY EMISSION FROM AN ANOMALOUS X-RAY PULSAR, 4U 0142+61

Discovery of the hard X-ray emission from anomalous X-ray pulsars (AXP) has prompted a great attention since AXPs were considered to emit only in soft X-ray band or longer wavelengths. The origin of this high energy emission is still not fully understood. Uncovering the broadband spectral behavior of these sources provides important clues for understanding the physical mechanism. Here, we present our detailed search for the persistent and pulsed high energy gamma-ray emission from the brightest AXP, 4U 0142+61 using the data collected with the Large Area Telescope on board Fermi Gamma-ray Space Telescope. We did not detect any significant emission from 4U 0142+61. However, we estimated upper limits to the persistent and pulsed high energy gamma-ray emission. In turn, we calculated an upper limit to the spectral break energy and evaluated the existing physical models in terms of our results.

Savolainen, T.,
Quasar Movie Project team

Max Planck Institute for Radio Astronomy

Poster
AGN S1.N88

THE QUASAR MOVIE PROJECT: COORDINATED VLBA AND MULTI-WAVEBAND MONITORING OF THE GAMMA-RAY QUASARS 3C273 AND 3C279

We describe an ongoing Fermi cycle 3 program designed to provide unprecedentedly densely-sampled, 15-86 GHz VLBA monitoring data on the jets of two archetypical gamma-ray bright quasars, 3C273 and 3C279, as well as equally well-sampled broad-band spectral energy distribution (SED) monitoring from Oct 2010 to Oct 2011. The primary data products of the project are sub-parsec resolution "movies" of the structural, spectral and polarization evolution in the vicinity of the mm-wavelength core, which is a potential site for producing the gamma-ray emission. The main goals are to identify changes in the magnetic field structure and particle density in and near the core, to correlate these with the variability in the SEDs obtained with Fermi, Swift and ground-based telescopes, and to ultimately test blazar emission models. Sample data and initial results from the first half of the project are presented.

Saz Parkinson, P. M., Bill Atwood, Andrea Belfiore, Michael Dormody, Robert Johnson, Max Razzano, Marcus Ziegler, for the LAT Collaboration

SCIPP/UCSC

Poster
PSR S2.N27

BLIND SEARCHES FOR GAMMA-RAY PULSARS USING 2 YEARS OF FERMI LAT DATA

During its first year of operations, the Large Area Telescope (LAT) on the Fermi Gamma-ray Space Telescope discovered 24 gamma-ray pulsars, 21 of which remain undetected in radio. Many of the blind search pulsars discovered early in the mission were bright enough to be discovered by searching just weeks of data (the so-called "cream"). The majority of the remaining undiscovered gamma-ray pulsars, however, are expected to be fainter and/or located in high background regions, therefore requiring very long integration times for their discovery. We will present the results of a targeted search for new gamma-ray pulsars in the Fermi LAT First Source Catalog (1FGL), using two years of LAT data. We will also discuss our efforts to improve the sensitivity of our searches and the prospects for additional blind search discoveries.

Senturk, G. D., M. Boettcher, P. Coppi, M. Errando, R. Mukherjee

Columbia University

Poster
AGN S1.N89

GEV/TEV BLAZAR POPULATION STUDIES

The increasing number of blazars detected in very high energy gamma-rays (VHE, E>100 GeV) and the coverage provided by Fermi in the 0.1-100 GeV energy range gives us the opportunity for the first time to characterize the high energy component of blazar emission over more than four decades in energy in a sample of more than 30 sources. In this study we focus on deriving the peak frequency and luminosity of the high energy component of the emission for all VHE-detected blazars using the Fermi-LAT data and archival TeV spectra. Our results show interesting trends for different blazar populations and hints of absorption features in the GeV band that could be interpreted as internal opacity at the source.

Sgro', C, Baldini, L

INFN-Pisa

Poster
Instr S2.N26

A MINIMUM SPANNING TREE CLUSTERING ALGORITHM FOR THE FERMI LAT CALORIMETER

The event reconstruction developed for the Fermi Large Area Telescope before the launch, and currently in use with minor modifications, does not feature a clustering stage for the Calorimeter (i.e. all the crystals hit in a given event are simply grouped together). In a low occupancy environment such as the one in which the telescope operates this approach proved to be adequate to support the science analysis of the first two years. Nevertheless, the first months of operation clearly showed that some clustering algorithm is necessary in order to handle properly the signal from pile up and accidental coincidences in the detector and recover the resulting loss in effective area. We present a clustering algorithm for the Large Area Telescope Calorimeter based on the concept of Minimum Spanning Tree: for each event the tree spanning the entire crystal collection is first constructed and then the edges exceeding an adjustable energy-dependent threshold are removed. The tests performed on flight data and Monte Carlo simulations show that our approach is effective in separating the genuine gamma-ray signal from the leftovers of accidental coincidences. We also briefly discuss the impacts of the clustering on the Calorimeter performance in terms of energy and direction reconstruction and on the entire event level analysis.

Share, G., R. Murphy, N. Omodei, E. Grove, F. Longo on behalf of the Fermi - LAT collaboration, M. Briggs, D. Gruber, A. Tylka, S. White, R. Schwartz, K. Tolbert, and V. Petrosian

University of Maryland

Oral

IMPULSIVE HIGH-ENERGY PARTICLE ACCELERATION IN THE SOL2010-06-12T00:57 M2 X-RAY FLARE

The GOES M2-class solar flare, SOL2010-06-12T00:57, was modest in many respects yet exhibited remarkable acceleration of energetic particles. While both radio and SDO/AIA UV/EUV images indicate a compact flare with foot-point separation of just 10 arc sec, this small region produced an ~70 sec burst of hard X- and gamma-ray emission up to at least 200 MeV observed by the Fermi GBM and LAT experiments. The gamma-ray line and >300 keV bremsstrahlung fluences from this flare were about ten times higher than that typically observed from this modest GOES-class of X-ray flare. Analysis of the combined nuclear line and high-energy gamma-ray emissions suggests that the accelerated proton spectrum at the Sun softened significantly above ~50 MeV from the differential power-law index of about -3.5 determined in the energy range from ~5-50 MeV. We compare these observations with measurements of solar energetic protons to determine whether the particle populations at the Sun and in space may have a common origin. The 34 and 80 GHz microwave emissions are very bright and well correlated with the few hundred keV X-ray emission, but with small time lags suggesting mild trapping of electrons in the corona.

Shearer, A., Paul Moran, Susan Collins, Roberto Mignani

Centre for Astronomy, National University of Ireland Galway

Poster
PSR S2.N28

OPTICAL OBSERVATIONS OF FERMI PULSARS

Only seven pulsars/magnetars have been observed to pulsate at optical wavelengths, and new ones are intrinsically faint and difficult to locate. Lacking a dedicated survey to date, optical pulsar studies have been limited a few favoured objects. Fermi's pulsar Catalogue is a good starting point for the discovery of new optical pulsars. A targeted search is underway based on refined Fermi and X-ray coordinates for possible optical pulsars. A comprehensive CCD survey of the optical emission from 12 Fermi pulsars has been carried using the WHT, TNG and INT telescopes as part of the La Palma International Time Programme. Candidate targets, PSR J0205+6449 and PSR J0007+7303 have been identified for follow-up time-resolved observations with instruments such as GASP - the Galway Astronomical SAtokes Polarimeter. The talk will summarise these results and discuss the future possibilities, particularly of optical polarimetry studies.

Sheidaei, F., Djannati-Ataï, ,A., Gast, H., for the HESS Collaboration

North-West University and APC

Poster
SNR/PWNe S2.N24

DISCOVERY OF VHE EMISSION NEAR PSR J1831-0952 WITH HESS A NEW GAMMA-RAY DISCOVERED PULSAR WIND NEBULA?

The HESS galactic plane survey, undertaken since 2004, has revealed more than 50 Very High Energy (VHE) gamma-ray sources. We will report on the latest discovery of an extended source near the 67 ms pulsar PSR J1831-0952. Adopting the Dispersion Measure distance of the pulsar (4.3 kpc), less than 1% of its spin-down energy would be required to provide the observed luminosity of the VHE source. Multi-wavelength searches have not revealed any other plausible counterpart yet. If the VHE emission originates within a wind nebula around PSR J1831-0952 this would constitute another case of a gamma-ray discovered pulsar wind nebula. The morphology and spectrum of the extended emission, assumed as a single source, as well as possible other scenarios will be presented and discussed.

Shukla, A.,
B. S. Acharya, G. C. Anupama, Richard J. Britto , P. Bhattacharjee, Varsha R. Chitnis, Sahana Kale, T. P. Prabhu , Lab Saha, B. B. Singh, P. R. Vishwanath

Indian Institute of Astrophysics, Bangalore, India

Poster
AGN S1.N90

MULTIWAVELENGTH STUDY OF TEV BLAZAR MRK421 DURING GIANT FLARE AND OBSERVATIONS OF TEV AGNS WITH HAGAR.

The radiation mechanism of very high energy gamma ray emission from blazars and crucial parameters like magnetic field, size of the emitting region are not well understood yet. To understand the above mentioned properties of blazars, we observed five nearby TeV gamma ray emitting blazars (Mrk421,Mrk501,1ES2344+514,1ES1218+304 and 3C454.3) and one radio galaxy (M87) using the High Altitude GAmma Ray (HAGAR) telescope. HAGAR is an array of seven telescopes located at Hanle, India to detect Cherenkov light caused by extensive air showers initiated by gamma rays. Mrk421 was observed to undergo one of its brightest flaring episodes on 2010 February 17, and detected by various experiments in X-rays and gamma rays. HAGAR observations of this source during 2010 February 13 – 20, in the energies above 200 GeV show an enhancement in the flux level, with a flux of 6 Crab units being detected on 2010 February 17. We present the spectral energy distribution of the source during this flaring episode and investigate the correlation of the variability in X-ray and gamma ray bands. In addition to this, analysis procedure to extract gamma ray signal from HAGAR data will be discussed and preliminary results on all the AGNs will be presented.

Siegal-Gaskins, J. M., on behalf of the Fermi-LAT collaboration and E. Komatsu

CCAPP / The Ohio State University

Oral

AN ANISOTROPY ANALYSIS OF THE DIFFUSE GAMMA-RAY BACKGROUND MEASURED BY THE FERMI-LAT

The contribution of unresolved sources to the diffuse gamma-ray background could induce anisotropies in this emission on small angular scales. Recent studies have considered the angular power spectrum and other anisotropy metrics as tools for identifying the contributions to the diffuse emission from unresolved source classes, such as extragalactic and Galactic dark matter as well as various astrophysical gamma-ray source populations. We present the results of an angular power spectrum analysis of the high-latitude diffuse emission measured by the Fermi-LAT, and discuss the implications of the measured angular power spectrum for gamma-ray source populations that may provide a contribution to the diffuse background.

Singal, J.,
V. Petrosian and M. Ajello

KIPAC, Stanford University

Poster
AGN S1.N91

ON THE GAMMA-RAY FLUX AND SPECTRAL INDEX DISTRIBUTION OF THE FERMI-LAT BLAZARS

Fermi has accumulated a large sample of blazars with known fluxes and spectral indexes based on a single power law fit to observed photon counts from which one can obtain the flux distribution (i.e. what is commonly called the $\log N-\log S$ relation) and the distribution of the indexes. However, since harder spectra can be detected to lower fluxes that softer ones the observational selection process introduces a bias in this bi-variate distribution which truncates the data severely at low fluxes and larger (absolute) values of indexes. We have used the non-parametric method described by Efron and Petrosian to correct the data for this truncation and obtained the true mono-variate distributions. The methods were first tested using a simulated data, subjected to the same selection bias as the LAT data, and shown to reproduce the input distribution. We will present our result applied to a sample of LAT blazars consisting of 352 sources and describe its implication for the extragalactic background gamma-ray radiation.

Slane, P.

Harvard-Smithsonian Center for Astrophysics

Oral

FERMI LAT STUDIES OF COMPOSITE SNRS

As a pulsar wind nebula evolves inside its host supernova remnant, its gamma-ray emission becomes increasingly brighter due to the buildup of energetic particles injected by its pulsar. When the SNR reverse shock collides with the PWN, the resulting increase in the magnetic field results in rapid synchrotron losses, modifying the particle spectrum of the nebula. Gamma-ray observations of composite SNRs thus provide a probe of the underlying particle spectra that can be compared with models for the evolution of these systems. Here I report on Fermi LAT studies of several composite SNRs, and discuss the implications of the gamma-ray results in the context of models of their broadband spectra.

Slowikowska, A., Mignania, R., Kanbach, G., Krzeszowski, K.

Institute of Astronomy, University of Zielona Gora

Poster
PSR S2.N29

DECOMPOSITION OF POLARIZATION COMPONENTS OF THE CRAB PULSAR AND ITS NEBULA

We show results of archival polarization HST/ACS data of the Crab nebula and compare them to the polarization characteristics obtained with the very fast photo-polarimeter Optical Pulsar Timing Analyzer (OPTIMA). Our highly time resolved OPTIMA observations allow us to decompose the polarized radiation into components of the pulsar, a localized DC source, and the surrounding nebula. By cross correlation with the spatial polarization map from HST we can investigate the origin of the DC emission. The orientation of the phase-averaged position angle of the Crab pulsar is compared with its axis of rotation and the symmetry axis of the X-ray torus surrounding the pulsar. Moreover, in the context of the phase-averaged polarization degree and position angle, the Crab pulsar results are compared with the results for two next brightest pulsars, PSR B0540-69 and the Vela pulsar (PSR B0833-45).

Smith, D. A., The Fermi LAT collaboration

CNRS/IN2P3 Bordeaux

invited

GAMMA-RAY PULSARS WITH THE FERMI LAT

By the time the Symposium in Rome begins, Fermi will be approaching its one hundredth gamma-ray pulsar. They come in different flavors: radio-loud, radio-quiet, young ones, recycled ones, some in globular clusters, some powering nebulae. Their signature spectral shape is a hard power-law exponentially cut off below about 5 GeV. Their pulse profiles vary widely. When compared with the radio and X-ray lightcurves, profiles help constrain the emission regions. Additional constraints from radio polarization sweeps are being applied to a growing number. Pulsars are by far the largest gamma-ray source class in the Galaxy, and as-yet unknown pulsars surely lurk in unidentified gamma-ray sources. They contribute to the diffuse gamma radiation, and to the cosmic electron flux. The Fermi discoveries, through huge support by the radio and X-ray pulsar communities, are laying the basis for improved population syntheses of neutron stars and, as a result, of their progenitors and siblings. This talk will summarize observations to date, and sketch prospects for the years to come.

Smith, P. S., Schmidt, G. D., Jannuzi, B. T.

University of Arizona

Poster
AGN S1.N92

THE OPTICAL PROPERTIES OF PKS 1222+216 DURING THE FERMI MISSION

Since 2009 April, PKS 1222+216 (4C 21.35; z=0.435) has been included in the sample of gamma-ray bright blazars being monitored optically at Steward Observatory in support of the Fermi Gamma-ray Space Telescope.The quasar has been highly active in gamma-rays during the past two years, showing several intense flares with durations of typically just a few days. In addition, very high energy (VHE) gamma-ray emission has recently been reported from this object (Aleksic et al. 2011). The optical data consist of spectropolarimetry and spectrophotometry obtained on >100 nights. During this period, the optical continuum varied by about a magnitude in brightness and the linear polarization has been measured to approach 10%. The flux and polarization variability, combined with the spectral properties of PKS 1222+216, suggest that there are two primary sources contributing to the optical emission: (1) a polarized and highly variable power-law synchrotron continuum, and (2) an unpolarized blue continuum component (plus strong Balmer emission lines) having a spectrum typical of optically-selected QSOs. The extensive public spectropolarimetric database allows for an accurate spectral separation between these components and determinations of the spectral index and intrinsic polarization of the nonthermal continuum. The optical properties of both sources can then be compared to the high energy emission observed from PKS 1222+216. This research is supported by Fermi Guest Investigator grant NNX09AU10G. Data from the Steward Observatory blazar monitoring program can be found at http://james.as.arizona.edu/~psmith/Fermi.

Sokolovsky, K., the Fermi-LAT collaboration, Vercellone S. (INAF-IASF Palermo), Carrasco L. (INAOE)

Max Planck Institute for Radio Astronomy

Poster
AGN S1.N93

TWO ACTIVE STATES OF GB6 B1310+4844 COMPARED

The flat spectrum radio quasar GB6 B1310+4844 (GB1 1310+487) drew the attention of observers after exhibiting a prominent GeV gamma-ray flare in November 2009 which was detected by Fermi/LAT and AGILE/GRID. The peak photon flux at E>100 MeV has reached 1.2 +/-0.2 x 10^-6 photons cm^-2 s^-1 on November 26, more than 40 times above the average level during the first 11 months of the Fermi mission. The gamma-ray flare has triggered follow-up X-ray, UV, optical, IR and radio observations with Swift, KANATA, 2.1m Guillermo Haro and the Effelsberg 100m telescopes. The second high gamma-ray state of the source was observed by Fermi/LAT in June 2010. It was considerably longer than the previous flare and was characterized by a lower peak gamma-ray flux. Additional observations with Swift, Nordic Optical Telescope and Effelsberg were obtained. Here, we investigate multi-wavelength properties of the two active states of GB6 B1310+4844 observed so far.

Stamerra, A., J. Becerra, G. Bonnoli, L. Maraschi, D. Mazin, K. Saito, F. Tavecchio (MAGIC Coll.), Y. Tanaka, D. Wood (Fermi/LAT Coll.)

Universita' di Siena / INFN Pisa

Oral

CHALLENGING THE HIGH ENERGY EMISSION ZONE IN FLAT SPECTRUM RADIO QUASARS

The blazar zone in quasars is commonly assumed to be located inside the broad-line region at some hundreds of Schwartzschild radii from the central black hole. Now, the simultaneous Fermi/LAT and MAGIC observations of a strong flare in the FSRQ PKS 1222+21 (4C 21.35, z=0.432) on 2010 June 17 challenge this picture. The spectrum can be described by a single power law with photon index 2.72+/-0.34 between 3 GeV and 400 GeV, and this is consistent with emission from a single component in the jet. The absence of a spectral cutoff constrains the gamma-ray emission region to lie outside of the broad-line region, which would otherwise absorb the VHE gamma-rays. On the other hand, the MAGIC measurement of a doubling time of about 10 minutes indicates an extremely compact emission region, in conflict with the "far dissipation" scenario. This could be a hint for the importance of jet sub-structures, such as filaments, reconnection zones or shear layers for the occurence of blazar flares.

Stecker, F. W.,
Tonia M. Venters

NASA/GSFC

Poster
AGN S1.N94

THE CONTRIBUTION OF UNRESOLVED BLAZARS TO THE EXTRAGALACTIC GAMMA-RAY BACKGROUND

We present new theoretical estimates of the relative contribution of unresolved blazars to the extragalactic gamma-ray background (EGB). We find that the Fermi source count data do not rule out a scenario in which the EGB is dominated by emission from unresolved blazars. The spectrum of unresolved FSRQs, when accounting for the energy-dependent effects of source confusion, could be consistent with the combined spectrum of the low-energy EGRET EGB measurements and the Fermi–Large Area Telescope (LAT) EGB measurements.

Striani, E.,
G. Pucella on behalf of the AGILE Team

Università di Roma Tor Vergata e INFN Tor Vergata

Poster
SNR/PWNe S2.N25

AGILE OBSERVATIONS OF GAMMA-RAY FLARES OF THE CRAB NEBULA

AGILE discovered the September 2010 and October 2007 gamma-ray flares from the Crab Nebula. We will review the properties of these two flares, their temporal and spectral characteristics and focus on their similarities and differences. Two classes of major flares are identified, and we will discuss the theoretical implications of our findings.

Strong, A. W.,
E. Orlando, T. R. Jaffe, et al.

MPE Garching, Germany

Poster
Diffuse S1.N11

SYNCHROTRON CONSTRAINTS ON COSMIC-RAY ELECTRONS

Exploiting the complementary information on cosmic ray electrons from direct measurements and synchrotron radiation gives unique and essential constraints, and has implications for solar modulation and gamma rays. This connection is especially relevant now in view of the ongoing PLANCK, Fermi and PAMELA missions, and the upcoming AMS-02 experiment. We use synchrotron radiation to constrain the low-energy interstellar electron spectrum, with radio surveys from 22 MHz to 23 GHz, in combination with electron data from Fermi-LAT and other experiments. Both high-latitude and Galactic-plane analyses with realistic magnetic field models are presented. We show that some current models are excluded by the synchrotron data, and present spectra consistent with available data.

Su, M.,
Finkbeiner,D.P,
Slayter,T.R.

Harvard Univeristy

Oral

FERMI BUBBLES: A 10 KPC SHOCK FROM THE GALACTIC CENTER?

Data from the Fermi-LAT reveal two large gamma-ray bubbles, extending 50 degrees above and below the Galactic center, with a width of about 40 degrees in longitude. The gamma-ray emission associated with these bubbles has a significantly harder spectrum (dN/dE ~ E^{âˆ’2}) than the IC emission from electrons in the Galactic disk, or the gamma-rays produced by decay of pions from proton-ISM collisions. The bubbles are spatially correlated with the hard-spectrum microwave excess known as the WMAP haze; the edges of the bubbles also line up with features in the ROSAT X-ray maps at 1.5 âˆ’ 2 keV. I will summarize observational evidence of the Fermi bubbles, including features of polarization and rotation measure of the bubble edges. The bubbles have sharp edges in gamma-ray, X-ray, and polarized microwave. I'm going to argue that these Galactic gamma-ray bubbles are ongoing shocks (instead of a stable structure), and were most likely created by some large episode of energy injection in the Galactic center, such as past accretion events onto the central massive black hole, or a nuclear starburst in the last âˆ¼10 Myr.

Svinkin, D. S., R. L. Aptekar, S. V. Golenetskii, D. D. Frederiks, E. P. Mazets, P. P. Oleynik, V. D. Pal'shin, M. V. Ulanov

Ioffe Physical-Technical Institute of the Russian Academy of Sciences

Poster
GRB S2.N25

SHORT GAMMA-RAY BURSTS WITH EXTENDED EMISSION OBSERVED WITH THE KONUS-WIND EXPERIMENT

Some short gamma-ray bursts (sGRBs) are followed by a long, low-intensity emission. Using Bayesian Blocks method, we have carried out a search for such extended emission (EE) and have found that EE is present in about 10% of the Konus-Wind sGRBs. We analyze the parameters of the initial pulses and EE of this burst sample. In particular, we demonstrate that parameters of the initial pulses of sGRBs with EE are generally consistent with those of bursts without EE. However, the intensity distribution of the initial pulses of sGRBs with EE indicates an excess of bright bursts. Taking this into account we have estimated the true fraction of sGRBs with EE among sGRBs to be about one-third. We also discuss a possibility that long GRBs with short initial pulses and the sGRBs with EE arise from the same population of progenitors.

Svinkin, D. S., V. D. Pal'shin, R. L. Aptekar, S. V. Golenetskii, D. D. Frederiks, E. P. Mazets, P. P. Oleynik, M. V. Ulanov

Ioffe Physical-Technical Institute of the Russian Academy of Sciences

Poster
GRB S2.N26

KONUS-WIND GAMMA-RAY BURSTS: TEMPORAL CHARACTERISTICS, HARDNESS, AND CLASSIFICATION

Between 1994 November and 2010 December, the Konus-Wind experiment detected about 2000 gamma-ray bursts (GRBs) in the triggered mode. Hardness ratios, peak intensities, and temporal parameters, such as (T$_{90}$, T$_{50}$) durations and spectral lags are determined for this burst sample. We argue that T$_50$ is a more robust measure for the burst classification than T $_{90}$. Using a simple two log-normal fit to the T$_{50}$ distribution, we find the boundary between the overlapping classes of short-duration and long-duration bursts to be at T$_{50}\simeq$0.76 s and the fraction of “short” GRBs to be ~14%. Finally, we investigate a possibility to discriminate between physically distinct Type I and Type II GRBs with help of hardness ratios and spectral lags.

Takahashi, K., Mori, M., Ichiki, K., Inoue, S.

Nagoya University

Poster
AGN S1.N95

ROBUST LOWER BOUNDS ON INTERGALACTIC MAGNETIC FIELDS FROM SIMULTANEOUSLY OBSERVED GEV-TEV LIGHT CURVES OF THE BLAZAR MRK 501

We derive model-independent lower bounds on intergalactic magnetic fields from upper limits on the pair echo emission from the blazar Mkn 501, that is, delayed GeV emission from secondary electron-positron pairs produced via interactions of primary TeV gamma rays with the cosmic infrared background. We utilize only simultaneously observed GeV-TeV light curves during the flaring activity in 2009 obtained by VERITAS, MAGIC and {¥it Fermi}-LAT. This leads to limits on the magnetic field strengths of $B ¥gtrsim 10^{-19.5}~{¥rm G}$ and $B ¥gtrsim 10^{-19}~{¥rm G}$, at $99¥%$ C.L. and $90¥%$ C.L., respectively, for a field coherence length of 1 kpc. Our analysis is based firmly on the observational data alone and does not depend on any assumptions concerning the past primary TeV flux during unobserved periods. Thus, our evaluation of the flux of the pair echo is conservative and the deduced constraints are much more robust compared to previous studies.

Takahashi, Y., Maeda, K., Nakamori, T., Kataoka, J.

Waseda University

Poster
UNID S1.N6

SUZAKU X-RAY FOLLOW-UP OBSERVATIONS OF FERMI UNIDENTIFIED SOURCES AT HIGH GALACTIC LATITUDE

We report on the results of deep X-ray follow-up observations of 11 unidentified Fermi/LAT gamma-ray sources at high Galactic latitudes using the Suzaku X-ray observatory. In these observations, we discovered 2 X-ray counterparts, both of which contain thermal components of kT~0.3 keV in their spectra, to the unassociated sources. This supports the recently claimed identification of these sources with millisecond pulsars and that the X-ray counterparts originate as thermal emission from the surface of rotating magnetized neutron star. For other three sources which were recently identified as millisecond pulsars, however, Suzaku did not detected X-ray counterparts to the flux level of 10^(-14) erg/cm^2/s in 2-10 keV band. We also found possible X-ray counterparts for three Fermi unidentified sources, although not conclusive with our Suzaku data alone. For the remained three sources, Suzaku could not detect significant X-ray emission within the Fermi error circles, although one of them shows significant time variability and possible association with blazars is most likely. Our studies therefore indicates while a significant fraction of unidentified high Galactic latitude gamma-ray sources is related to the pulsar and AGN phenomena, association with other unknown classes of astrophysical objects are still valid options.

Takata, J., Y.Wang and K.S. Cheng

The University of Hong Kong

Oral

MILLISECOND PULSARS AND FERMI UNIDENTIFIED SOURCES

We report the results of the population study for the gamma-ray millisecond pulsars with the gamma-ray emissions from the outer gap. In the Monte-Carlo simulation, at least half of the detected gamma-ray millisecond pulsars is categorized as the “radio-quiet” millisecond pulsars, while the Fermi has not detected any radio-quiet millisecond pulsars. We discuss statistically that those radio-quiet millisecond pulsars should be non-variable Fermi unidentified sources located at higher-galactic latitudes. Our emission model predicts that the spectral cut-off energy exists at 1-2GeV, and the distribution of the photon indexes above 100MeV has two peaks at ~1.3 and ~1.9. Although it will be very difficult to identify the radio-quiet millisecond pulsars by the Fermi blind search, our statistical results on the radiation properties will be useful to select the candidate of the radio-quiet millisecond pulsars from the Fermi unidentified sources.

Tam, P.H.T., Stefan Wagner

National Tsing Hua University

Poster
Catalog S1.N5

ARE GEV AND TEV SPECTRA CONNECTED? THE CASE OF GALACTIC GAMMA-RAY SOURCES

To understand the Galactic objects that emits GeV-TeV emission, we carry out a spatial correlation study between the GeV and TeV population. The first Fermi Catalog sources are compared to the very high-energy (VHE; E>100 GeV) gamma-ray sources in the literature. While it is found that a considerably large proportion of VHE sources are indeed also detected in the GeV band, the GeV-TeV spectra of many of these spatially coincident sources cannot be described by a single spectral component, as previously suggested. While some of these cases are gamma-ray pulsars accompanied by VHE gamma-ray emitting nebulae, we highlight cases where the spectral miss-match may indicate that different radiation mechanisms work at different energies or where the miss-match may indicate that radiation comes from different parts of the gamma-ray source.

Tam, P.H.T., Albert K. H. Kong, C. Y. Hui, K. S. Cheng

National Tsing Hua University

Poster
OtherGal S2.N11

FUNDAMENTAL PLANES OF GAMMA-RAY EMISSION FROM GLOBULAR CLUSTERS

We report on the discovery of gamma-ray emission from several globular clusters (GCs), including Terzan 5, the second known gamma-ray GCs. By now, more than a dozen GCs are known to emit gamma-rays at energies above 100 MeV, thus enabling us to carry out the first detailed correlation study with several cluster properties. We found strong correlations between the observed gamma-ray luminosities and four cluster parameters: stellar encounter rate, metallicity [Fe/H], and energy densities of the soft photons at the cluster locations. These "fundamental planes" of gamma-ray GCs put an intimate relation of the observed gamma-rays to the underlying millisecond pulsar population and have important implications on the origin of the gamma-ray emission of GCs.

Tanaka, T., Alice Allafort, Stefan Funk, Francesco Giordano, Hiroyasu Tajima, Yasunobu Uchiyama, for the Fermi LAT collaboration

Stanford University

Oral

GAMMA-RAY OBSERVATIONS OF THE SUPERNOVA REMNANT RX J0852.0-4622 WITH THE FERMI LAT

Galactic cosmic rays are widely believed to be accelerated at expanding shock waves of supernova remnants (SNRs) through the diffusive shock acceleration mechanism. Recent TeV gamma-ray observations by ground air Cherenkov telescopes provided evidence that SNRs, particularly young SNRs, are indeed accelerating charged particles up to TeV energies. Here we report on the detection of GeV gamma rays from one of the TeV-bright SNRs, RX J0852.0-4622 (a.k.a. Vela Jr.) by the Fermi LAT. We will present results of our morphological and spectral studies of the GeV emission. We will also discuss gamma-ray emission mechanisms in a context of multi-wavelength studies.

Tanaka, Y., Giglietto,N., Omodei, N., Takahashi, H., Tanaka, Y. on behalf of the Fermi-LAT Collaboration

Hiroshima Astrophyical Science Center, Institute of Space and Aeronautical Science (JAXA), Dipartimento Interateneo di Fisica dell'Università e Polite

Oral

LONG-LIVED SOLAR GAMMA-RAY EMISSION DURING 2011 MARCH 7TH TO 8TH DETECTED BY THE FERMI LAT

The Large Area Telescope (LAT) onboard the Fermi gamma-ray space telescope observed gamma-rays from the direction of the sun with the duration of more than 10 hours on March 7th and 8th following the M3.7 solar flare at 19:43 on March 7th (UT). The decay time constant of the gamma-ray emission is significantly longer than that of the X-ray, and the peak flux measured by the LAT became even brighter than that of the Vela pulsar, the brightest persistent source in the LAT energy band. The LAT spectrum was softer than the persistent solar emission and the detected photon energies were below 1 GeV. Considering the absence of a strong or evident X-ray emission, there may be a possibility that the gamma-rays were generated by pion decay from accelerated protons. The LAT did not detect >100 MeV gamma-ray emission with such a long life time associated with other X/M-class solar flares from August 4th 2008 up to March 16th 2011.We present the results and discuss the possible explanation for this emission.

Tanaka, Y. T., Y. T. Tanaka on behalf of Fermi-LAT collaboration

ISAS/JAXA

Oral

FERMI LARGE AREA TELESCOPE DETECTION OF BRIGHT GAMMA-RAY OUTBURSTS FROM A TEV FSRQ 4C +21.35

We report on the two-year-long Fermi--LAT observation of the peculiar blazar 4C +21.35 (PKS 1222+216). This source was in a quiescent state from the start of science operations of the Fermi Gamma-ray Space Telescope in 2008 August until 2009 September, and then became more active, with gradually increasing flux and some moderately-bright flares. In 2010 April and June, 4C +21.35 underwent a very strong GeV outburst composed of several major flares characterized by rise and decay timescales of the order of a day. During the outburst, the GeV spectra of 4C +21.35 displayed a broken power-law form with spectral breaks observed near 1-3 GeV photon energies. We demonstrate that, at least during the major flares, the jet in 4C +21.35 carried a total kinetic luminosity comparable to the total accretion power available to feed the outflow. We also discuss the origin of the break observed in the flaring spectra of 4C +21.35. We show that, in principle, a model involving annihilation of the GeV photons on the He II Lyman recombination continuum and line emission of “broad line region” clouds may account for such. However, we also discuss the additional constraint provided by the detection of 4C +21.35 at 0.07-0.4 TeV energies by the MAGIC telescope, which coincided with one of the GeV flares of the source. We argue that there are reasons to believe that the <~ TeV emission of 4C +21.35 (as well as the GeV emission of the source, if co-spatial), is not likely to be produced inside the broad line region zone of highest ionization (~ 10^17 cm from the nucleus), but instead originates further away from the active center, namely around the characteristic scale of the hot dusty torus surrounding the 4C +21.35 nucleus (~ 10^19 cm).

Tavakoli,M., Cholis.I, Evoli.C,Ullio.P

International School for Advanced Study (SISSA)

Poster
Diffuse S1.N12

DIFFUSE GALACTIC GAMMA RAYS AT INTERMEDIATE AND HIGH LATITUDES, CONSTRAINTS ON ISM PROPERTIES AND DM

Recently published gamma-ray spectral data from the Fermi Collaboration have provided the possibility to study the diffuse gamma-ray sky at medium and high latitudes (| b |> 10â—¦) and energies of 1-100 GeV with unprecedented accuracy. This provides us the chance of probing and constraining models of annihilating and decaying Dark Matter, as well as cosmic ray propagation in the Galaxy. Implementing the publicly available DRAGON code, we have done a detailed study on assumptions made in the literature for the interstellar HI and H2 gas distributions, as well as on a variety of propagation models. Each propagation model assumes a distinct global profile for the diffusion and the reaccelaration of CRs. Fitting the propagation models to well measured local CRs such as, B/C ratio, proton, helium, anti proton and electron+positron fluxes, we evaluate the gamma-ray spectra at medium and high latitudes in order to place further constraints on those models of propagation. Using that knowledge we can then place constraints on a garden variety of Dark Matter models recently proposed to explain the local spectra of electrons, positrons, anti protons and gamma-rays at the center of the Galaxy.

Thompson, D. J., on behalf of the Fermi LAT Collaboration

NASA Goddard Space Flight Center

Poster
MULTI-I S1.N1

FUTURE MULTIWAVELENGTH STUDIES WITH THE FERMI LARGE AREA TELESCOPE

With two and a half years of experience, Fermi LAT contributions to multiwavelength studies have become an integral part of many astrophysical research projects. Future efforts will benefit from (1) Deeper LAT exposures, resulting in more sources; (2) More high-energy, high-angular resolution photons, giving better source locations and imaging; (3) Faster analysis of variability and announcements to the community; and (4) Longer time series for studies of variable source properties in comparison to other wavelengths.

Tibaldo, L., Grenier, I. A., on behalf of the Fermi LAT collaboration

University of Padova & INFN Padova

Poster
Diffuse S1.N13

THE FERMI LAT VIEW OF COSMIC RAYS AND INTERSTELLAR GAS IN THE CYGNUS X REGION: A NOT SO SPECIAL SPOT OF THE LOCAL ARM

Cygnus X is the most conspicuous star-forming region close to the Sun, embedded in a giant complex of molecular clouds in the Local Arm. We present an analysis of the Fermi LAT observations of Cygnus X intended to probe the cosmic-ray and interstellar-matter content of the region. From gamma-ray data we estimate a total of (8 +5 -1) million solar masses of interstellar gas in the complex at a distance of 1.4 kpc. The gamma-ray emission from the atomic gas supports the average HI spin temperature derived from radio absorption/ emission pairs to estimate its column-densities. The Xco=N(H2)/W(CO) ratio derived in the massive Cygnus complex is consistent with other LAT estimates for clouds in the Local and Perseus arms. The mass of dark gas, escaping HI and CO observations but traced by dust and gamma rays, amounts to ~40% of the CO-bright molecular gas. We find an average gamma-ray emissivity per interstellar H atom in the 0.1-100 GeV energy band in good agreement with measurements in other segments of the Local Arm. We infer that the cosmic-ray population averaged over a few hundred parsecs is fairly uniform in density and spectrum along the Local Arm. Despite the presence of potential accelerators and much larger interstellar densities in Cygnus X compared to the solar neighborhood, their cosmic-ray populations are similar on such a scale.

Tibaldo, L., Grenier, I. A., on behalf of the Fermi LAT collaboration

University of Padova & INFN Padova

Oral

THE FERMI LARGE AREA TELESCOPE UNVEILS A COCOON OF FRESHLY-ACCELERATED COSMIC RAYS IN THE CYGNUS X REGION

Shockwaves generated by the explosive death of stars are generally considered as the accelerators of the Galactic cosmic rays. The majority of supernovae have massive star progenitors and explode in a highly turbulent medium sustained by stellar winds and intense ionizing radiation in and around the parent stellar clusters. The early diffusion of cosmic rays after their injection in the turbulent medium and the potential trapping and reacceleration of the particles in this environment have escaped observations so far. Their propagation through gas and soft radiation fields can be traced in gamma rays. We present an analysis of the Fermi Large Area Telescope (LAT) observations of the Cygnus X region: gamma-ray emission above 1 GeV reveals a 50-pc wide cocoon of freshly-accelerated cosmic rays following the cavities carved by Cyg OB2 and other young stellar clusters. We will discuss the cocoon properties and its relationship with the nearby gamma-ray bright supernova remnant gamma Cygni.

Tibolla, O., Mannheim, K.

ITPA, Würzburg University

Poster
SNR/PWNe S2.N26

NEW DEVELOPMENTS IN THE ANCIENT PULSAR WIND NEBULAE SCENARIO.

In a Pulsar Wind Nebula (PWN), the lifetime of inverse Compton (IC) emitting electrons exceeds the lifetime of its progenitor pulsar, but it exceeds also the age of the electrons that emit via Synchrotron radiation; i.e. while the PWN grows older, it can remain bright in IC, whereas its GeV-TeV gamma-ray (for 10^5-10^6 years) flux remains high for timescales much larger than the Pulsar lifetime and the PWN visible in X-rays. In this scenario the magnetic field in the cavity induced by the wind of the progenitor star plays a crucial role, but also the magnetic field in the interstellar medium (ISM) cannot be negligible and its falling away from the Galactic disk has consequences for the observations. The discoveries of several unidentified sources in the TeV gamma-ray band without X-ray counterpart seem to support this scenario. Moreover the consequences are important also in order to reinterprete the detection of Starburst galaxies in the TeV gamma-ray band considering a leptonic origin of the gamma-ray signal.

Tramacere, A., Roland Walter, Claudio Ricci - On behalf of the Fermi-LAT collaboration

ISDC Data Centre for Astrophysics

Poster
AGN S1.N96

A PHENOMENOLOGICAL VIEW OF THE FERMI-INTEGRAL Γ-RAY EMITTING BLAZARS, IN THE FRAMEWORK OF LEPTONIC SSC AND EC SCENARIO

We propose a phenomenological approach to derive the low-energy branch of the energy distribution of the particles emitting in blazars jets, by using the spectral features of the rising part of the Inverse Compton emission of the Spectral Energy Distribution (SED). We base our analysis on a leptonic, single-zone,
homogeneous, Synchrotron Self-Compton (SSC), and External Compton (EC) scenario. Our analysis shows that is possible to use the values of Inverse Compton (IC) photon index (αx) observed in INTEGRAL Flat Spectrum Radio Quasars (FSRQs) and intermediate/low-peaked BL Lacs (I/LBLs), and the IC photon index
(αγ) observed in Fermi-LAT high-peaked BL Lacs (HBLs), to constrain the low-energy cut-off (γmin), and the low-energy photon index (s), of the emitting particles energy distribution. We found, in the case of FSRQSs and I/LBL Lacs, that INTEGRAL data rule out a scenario with γmin >> 1 . In the case of HBLs, Fermi data hints for a scenario with γmin << 104, in agreement with previous analysis of the HBL object Mrk 421, based on simultaneous X-ray-to-UV data. The predicted ranges for s, derived from observed data, are ≃ [1.6 – 2.4], and ≃ [1.2 – 2.8], respectively for HBLs, and FSRQs and I/LBLs. The similarity in the range of the predicted values of s, and the same trend of the position of the low-energy cut-off of the
electron distribution, observed in FSRQs and BL Lacs, are interesting features, hinting for a common acceleration scenario acting in the two classes of objects.

Tramacere, A., Pavel Binko, Mohamed Tahar Meharga, Reiner Rohlfs, Roland Walter

ISDC Data Centre for Astrophysics

Poster
Instr S2.N27

THE FERMI ALL-SKY PIPELINE AT ISDC HEAVENS

The High-Energy Astrophysics Virtually ENlightened Sky (HEAVENS), is a scientific archive providing analysis services for a number of recent important high-energy missions. HEAVENS allows on-the-fly data analysis producing images, spectra, and light curves, for a The High-Energy Astrophysics Virtually ENlightened Sky (HEAVENS), is a scientific archive providing analysis services for a number of recent important high-energy missions. HEAVENS allows on-the-fly data analysis producing images, spectra, and light curves, for a specific source, sky position, time and energy interval. The user can perform queries through a user friendly web form, whereas no specific mission software knowledge is required. The HEAVENS Fermi-LAT pipeline produces, as precomputed products, light curves, with both daily and weekly binning, for all the sources in the first Fermi-LAT Catalog, from the beginning of the Fermi mission to the latest FSSC public data release. The light curves are produced using likelihood analysis, and a complex algorithm for detection and sky-model building. The sky is partitioned in about 600 regions, and independent likelihood analysis is performed for each of them both on daily and weekly time-scale. Besides fluxes, the pipeline provides detection significance, spectral index, and energy fluxes. The count maps, are generated on the fly, for the integration period corresponding to the light-curve extraction interval. The possibility to build on-the-fly SEDs for each source in the first Fermi-LAT Catalog will be available soon.

**Trepl, L.,
Hui, C.Y.; Cheng, K.S.;
Takata, J.; Wang, Y.;
Liu, Z.Y.; Wang, N.**

Astrophysikalisches Institut und Universitaets-Sternwarte, Universitaet Jena

**Poster
PSR S2.N30**

MULTIWAVELENGTH PROPERTIES OF A NEW GEMINGA-LIKE PULSAR: PSR J2021+4026

We report a detailed investigation of the multiwavelength properties of a newly detected gamma-ray pulsar, PSR J2021+4026, in both observational and theoretical aspects. We firstly identify an X-ray source in the XMM-Newton serendipitous source Catalogue, 2XMM J202131.0+402645, located within the 95% confidence circle of PSR J2021+4026. With an archival Chandra observation, this identification provides an X-ray position with arcsecond accuracy which is helpful in facilitating further investigations. Searching for the pulsed radio emission at the position of 2XMM J202131.0+402645 with a 25-m telescope at Urumqi Astronomical Observatory resulted in null detection and places an upper-limit of 0.1~mJy for any pulsed signal at 18 cm. Together with the emission properties in X-ray and gamma-ray, the radio quietness suggests PSR J2021+4026 to be another member of Geminga-like pulsars. In the radio sky survey data, extended emission features have been identified in the gamma-ray error circle of PSR J2021+4026. We have also re-analyzed the gamma-ray data collected by FERMI's Large Area Telescope. We found that the X-ray position of 2XMM J202131.0+402645 is consistent with that of the optimal gamma-ray timing solution. We have further modeled the results in the context of outer gap model which provides us with constraints for the pulsar emission geometry such as magnetic inclination angle and the viewing angle. We have also discussed the possibility of whether PSR J2021+4026 has any physical association with the supernova remnant G78.2+2.1 (gamma-Cygni).

**Uchiyama, Y.,
on behalf of the Fermi-LAT collaboration**

SLAC, Stanford University

invited

FERMI LAT OBSERVATIONS OF SUPERNOVA REMNANTS

Gamma-ray observations of supernova remnants (SNRs) are commonly expected to provide an essential cornerstone of the understanding of the origin of galactic cosmic rays. The LAT instrument on board Fermi has started to unveil the gamma-ray properties of galactic SNRs at GeV energies. Here we overview the current status of the Fermi-LAT observations of SNRs, including young SNRs, middle-aged SNRs interacting with molecular clouds, and middle-aged SNRs without molecular cloud interactions. Combined with the multiwavelength data, we discuss gamma-ray emission mechanisms in light of theory of diffusive shock acceleration. Also we briefly discuss the prospect of Fermi-LAT observations of SNRs in coming few years.

**Ukwatta, T. N.,
Eda Sonbas, Jim Linnemann, Kirsten Tollefson, Udara Abeysekara**

Michigan State University

**Poster
Instr S2.N28**

A SYSTEM TO LOCALIZE FERMI GBM GRBS THROUGH COORDINATED SCANNING OF THE GBM ERROR CIRCLE VIA OPTICAL/NIR TELESCOPES

We propose to implement a software system that will coordinate ground-based optical and near infrared (NIR) telescopes to cover the Fermi GBM Error Circle (EC). The aim of the system is to localize GBM detected GRBs and facilitate multi-wavelength follow-up from space and ground. This system will optimize the observing locations in the GBM EC based on individual telescope location, Field of View (FoV) and sensitivity. The proposed system will coordinate GBM EC scanning by professional as well as amateur astronomers around the world. We have performed a Monte Carlo simulation to investigate the feasibility of the project and results are presented in this poster.

Usher, T.

SLAC

Poster
Instr S2.N29

TREE-BASED TRACKING - A GLOBAL APPROACH TO TRACK FINDING AND GAMMA-RAY RECONSTRUCTION IN THE FERMI LAT

The current Fermi LAT track reconstruction is based on a local Kalman Filter track following approach where tracks are found one-by-one and then associated to form candidate Gamma-Ray vertices. Here we report on an alternative approach which aims to consolidate the track finding and vertex association into a single step using a global view of the event. The algorithm takes advantage of the topology of Gamma-Ray conversions to associate the corresponding hits in the Tracker into a tree structure from which the corresponding electron and positron tracks can be extracted. The method offers several advantages over the current reconstruction: the gamma-ray association is performed in the first step using all of the information available, it returns fewer unassociated "false" tracks made up from stubs in the bottom of a shower, and it has the ability to return tracks with kinks (where the Kalman Filter will stop). The method also offers new tools which can be used to aid in the rejection of background (by taking advantage of the unique signature Gamma-Ray trees have with respect to those from single charged particles), improve the Tracker energy measurement and associate Gamma-Ray vertices to the new Calorimeter Clusters.

van Putten, T., Watts, A. L.

Astronomical Institute "Anton Pannekoek," University of Amsterdam

Poster
GRB S2.N27

MODELS OF EXTENDED RELATIVISTIC ENVELOPES OF MAGNETARS

It was recently shown by Watts et al. (2010) that it might be possible to observe Photospheric Radius Expansion (PRE) during magnetar bursts. This research was motivated by a Fermi observation of the magnetar SGR J0501+4516, which showed a double peaked light curve resembling those of thermonuclear X-ray bursts where PRE has been observed. Observing PRE bursts from magnetars would help to constrain the equation of state of magnetars as well as the magnetic field strength and burst emission mechanism. To test the feasibility of PRE in magnetars we are creating models of hydrostatic envelopes of magnetars for different photospheric radii to see whether the envelope could remain stable and in radiative equilibrium during a phase of radius expansion and contraction. This is analogous to work done by Paczynski & Anderson (1986), who developed similar models for nonmagnetic neutron stars and showed that during contraction and expansion of the envelope it remains in radiative equilibrium with a luminosity that is within 10^-4 of the critical luminosity everywhere. We present the results of our first models.

Vandenbroucke, J., F. D'Ammando, D. Thompson (for the Fermi LAT collaboration), I. Agudo, E. Bonning, L. Fuhrmann, S. Jorstad, M. Lister, A. Marscher

Stanford University

Poster
AGN S1.N97

MULTI-WAVELENGTH STUDIES OF THE FLAT-SPECTRUM RADIO QUASAR PKS 1730-130, INCLUDING A BRIGHT GAMMA-RAY FLARE IN NOVEMBER 2010

The flat-spectrum radio quasar PKS 1730-130, at a redshift of 0.902, was a bright gamma-ray source during the EGRET era but has been less so during the Fermi era. However, in November 2010 it exhibited a spectacular flare during which the gamma-ray flux increased by more than an order of magnitude relative to the average flux measured during the first eleven months of Fermi LAT observations. We present radio, infrared, optical, X-ray, and gamma-ray observations of this blazar, both during the flare and during its quiescent state. The observations were performed with VLBA, UMRAO, MOJAVE, F-GAMMA, RXTE, SMARTS, MAPCAT, and the Fermi LAT. SMARTS data show an increase in optical and infrared flux contemporaneous with the November 2010 gamma-ray flare. Very-long baseline interferometry (VLBA) images of the source at 43 GHz, obtained from monthly observations between January 2008 and January 2011, reveal a jet with several knots moving at high superluminal apparent velocities, one of which was apparently ejected from the core around the time of the flare.

Venter, C., De Jager, O.C., Kopp, A., Buesching, I., Clapson, A.-C.

North-West University, Potchefstroom Campus

Poster
OtherGal S2.N12

MODELING HIGH-ENERGY AND VERY-HIGH-ENERGY GAMMA RAYS FROM THE TERZAN 5 CLUSTER

Fermi Large Area Telescope (LAT) has recently detected a population of globular clusters (GCs) in high-energy (HE) gamma rays. Their spectral properties and energetics are consistent with cumulative emission from a population of millisecond pulsars (MSPs) hosted by these clusters. For example, the HE spectra exhibit fairly hard power-law indices and cutoffs around a few GeV, typical of pulsed spectra measured for the gamma-ray pulsar population. The energetics may be used to constrain the number of MSPs in the cluster, assuming canonical values for the average gamma-ray efficiency and spin-down power. This interpretation is indeed strengthened by the fact that the first gamma-ray MSP has now been identified in the GC NGC 6624. On the other hand, it has been argued that the MSPs are also sources of relativistic leptons which may be reaccelerated in shocks originating in collisions of stellar winds in the cluster core, and may upscatter bright starlight and cosmic microwave background photons to very high energies. Therefore, this unpulsed component may give an independent constraint on the number of MSPs, for a given cluster B-field and diffusion coefficient. Very high energy (VHE) upper limits on several GCs have now been published which may be useful to constrain the MSP population's properties even more strongly. Lastly, the transport properties of the energetic leptons may be further constrained using multiwavelength data, e.g., to infer the radial dependence of the diffusion coefficient and cluster B-field. We will present results on our modeling of the pulsed and unpulsed gamma-ray fluxes from the GC Terzan 5.

Venter, C., Johnson, T.J. and Harding, A.K.

North-West University, Potchefstroom Campus

Oral

MODELING THE NEW GAMMA-RAY MILLISECOND PULSAR SUBCLASS EXHIBITING PHASE-ALIGNED LIGHT CURVES

The gamma-ray population of millisecond pulsars (MSPs) detected by the Fermi Large Area Telescope has been steadily increasing. A number of the more recent detections, including PSR J0034-0534, J1939+2134 (the first MSP ever discovered), J1959+2048 (the first black widow system), and J2214+3000, exhibit a novel phenomenon: nearly phase-aligned radio and gamma-ray light curves (LCs). To account for the phase alignment, we explore geometric models where both the radio and gamma-ray emission originate either in the outer magnetosphere near the light cylinder or near the polar caps. We obtain reasonable fits for the first three of these MSPs in the context of "altitude-limited" outer gap (alOG) and two-pole caustic (alTPC) geometries. The latter models differ from the standard outer gap (OG) / two-pole caustic (TPC) models in two respects: first, the radio emission originates in caustics at relatively high altitudes compared to the usual conal radio beams; second, we allow the maximum altitude of the gamma-ray emission region as well as both the minimum and maximum altitudes of the radio emission region to vary within a limited range. Alternatively, there also exist phase-aligned LC solutions for emission originating near the stellar surface in a slot gap (SG) scenario ("low-altitude slot gap" (laSG) models). We find best-fit LCs using a Markov Chain Monte Carlo technique (Johnson et al. 2011). Our fits imply that the phase-aligned LCs are likely of caustic origin, produced in the outer magnetosphere, and that the radio emission may come from close to the light cylinder. In addition, we constrain the emission altitudes with typical uncertainties of 10% of the light cylinder radius. Our results describe a third gamma-ray MSP subclass, in addition to the two (with non-aligned LCs) previously found by Venter et al. (2009): those with LCs fit by standard OG / TPC models, and those with LCs fit by pair-starved polar cap (PSPC) models.

Venters, T. M.,
F. W. Stecker

NASA Goddard Space Flight Center

Poster
Diffuse S1.N14

THE UNRESOLVED STAR-FORMING GALAXY COMPONENT OF THE EXTRAGALACTIC GAMMA RAY BACKGROUND

We present new theoretical estimates of the contribution of unresolved star-forming galaxies to the extragalactic gamma-ray background (EGB) as measured by EGRET and the Fermi-LAT. We employ several methods for determining the star-forming galaxy contribution the the EGB, including a method positing a correlation between the gamma-ray luminosity of a galaxy and its rate of star formation as calculated from the total infrared luminosity, and a method that makes use of a model of the evolution of the galaxy gas mass with cosmic time. We find that depending on the model, unresolved star-forming galaxies could contribute significantly to the EGB as measured by the Fermi-LAT at energies between ~ 300 MeV and ~ few GeV. However, the overall spectrum of unresolved star-forming galaxies can explain neither the EGRET EGB spectrum at energies between 50 and 200 MeV nor the Fermi-LAT EGB spectrum at energies above ~ few GeV.

Vercellone, S.,
on behalf of the AGILE Team

INAF-IASF Palermo

Poster
AGN S1.N98

A SUCCESS STORY: 3C 454.3 IN THE GAMMA-RAY ENERGY BAND

Since 2007, the blazar 3C 454.3 has become the most active and the brightest gamma-ray source of the sky, deserving the nickname of "Crazy Diamond''. The short-term variability in the gamma-ray energy band and the extremely high peak fluxes reached during intense flaring episodes make 3C 454.3 one of the best targets to investigate the blazar jet properties. We will review almost four years of observational properties of this remarkable source, discussing both short- and long-term multi-wavelength campaigns, with particular emphasis on the recent flaring episode which occurred on 2010 November 20, when 3C 454.3 reached on a daily time-scale a gamma-ray flux (E>100 MeV) higher than 6E-5 ph/cm2/s, about six times the flux of the brightest gamma-ray steady source, the Vela Pulsar.

Vernetto, S.,
on behalf of the ARGO-YBJ collaboration

IFSI-INAF Torino Italy

Poster
AGN S1.N99

GAMMA RAY SOURCES OBSERVATIONS WITH THE ARGO-YBJ DETECTOR

The ARGO-YBJ experiment, operating at the Cosmic Ray Observatory of Yangbajing (Tibet, China, 4300 m a.s.l.), is a full coverage Extensive Air Shower array of about 6600 m^2 of active area. One if its scientific goals is the observation of gamma ray sources in the energy range E > 0.3 TeV. The large field of view (> 2 sr) and the high duty cycle (> 90%) of the detector allows the continuous monitoring of the sky in the declination band from -10 to +70 degrees. In this work we present the results of our observations of galactic and extragalactic sources during more than three years, focusing our attention on the blazar Mrk421, that underwent many flaring episodes in 2008 and 2010, and on the bright galactic extended source MGRO J1908+06, probably associated to the Fermi pulsar PSR J1907+0602.

Verrecchia, F., C. Pittori, A. Bulgarelli, A. Chen, M. Tavani, F. Lucarelli and P. Giommi, on behalf of the AGILE Collaboration

ASI Science Data Center

Poster
Catalog S1.N6

A STUDY OF THE AGILE FIRST CATALOG GALACTIC GAMMA-RAY SOURCES ON THE 2.3 YEARS AGILE-GRID DATA

AGILE pointed observations performed from July 9, 2007 to October 30, 2009 cover a very large time interval, with a gamma-ray dataset useful to perform studies of medium to high brightness galactic sources in the 30 MeV -- 50 GeV energy range. We present a study of the 1AGL galactic sources over the complete Agile pointed Observation Blocks (OBs) archive. The first AGILE Gamma-Ray Imaging Detector (GRID) Catalog included a significance-limited (4 sigma) sample of 47 sources (1AGL), detected with a conservative analysis over a first year non-uniform sky coverage dataset. We realized a revised data analysis of the 1AGL source fields. In this analysis we used data of an improved full Field of View (FOV) event filter, on a much larger (about 27.5 months) observation dataset, analyzing the merging of all data and each OB separately. The data processing resulted in an improved source list as compared to the 1AGL one, particularly in complex regions of the galactic plane. We present here some results on the revised 1AGL galactic sources and on the variability of some of them.

Vittorini, V., on behalf of the AGILE Team

inaf iasf rome

Poster
PSR S2.N31

MODELLING OF THE CRAB NEBULA GAMMA-RAY FLARES

We will review the particle acceleration and emission models of the Crab Nebula gamma-ray flares. We show that a fast-acceleration and synchrotron model explains both the published AGILE and Fermi-LAT spectra of the Sept. 2010 event. The flaring emission contradicts the usually assumed paradigm of diffusive acceleration leading to synchrotron burn-off. We discuss particle acceleration models that can explain the current observations and be tested by future data.

Vivier, M., VERITAS collaboration

University of Delaware

Poster
DMNP S1.N12

INDIRECT SEARCHES FOR DM ANNIHILATIONS TOWARD DSPH GALAXIES WITH VERITAS

In the cosmological paradigm, Cold Dark Matter (DM) dominates the mass content of the Universe and is present at every scale. Candidates for DM include many extensions of the standard model, with a Weakly Interacting Massive Particle (WIMP) in the mass range from 50 GeV to greater than 10 TeV. The self-annihilation of WIMPs in astrophysical regions of high DM density can produce secondary particles including Very High Energy (VHE) gamma rays with energies up to the DM particle mass. The VERITAS array of Cherenkov telescopes, designed for the detection of VHE gamma rays in the 100 GeV-10 TeV energy range, is an appropriate instrument for the detection of DM and is complementary to Fermi. Dwarf spheroidal galaxies (dSphs) of the Local Group are potentially the best targets to search for the annihilation signature of DM due to their proximity and large DM content. This presentation reports on the latest VERITAS observations of dSphs and discusses the results in the framework of WIMP models, with a special emphasis on leptophilic DM models invoked to explain the recent cosmic-ray leptons anomalies.

Wagner, S., Nikolashvili, M., Hauser, M.

LSW Heidelberg

Poster
AGN S1.N100

DUTY CYCLES AND RELATIVISTIC AMPLIFICATION OF VHE EMITTING AGN

We have monitored all Blazars detected with VHE instruments in the synchrotron regime in order to determine the power spectra of the variability, any potential baseline, and the duty cycle of flares. The optical band is the only one which has sufficient dynamic range to allow a statistically complete and homogeneous study. We find that all lightcurves can be described with (broken) power-law power density spectra. The absence of cutoffs in the low-frequency regime prohibits the determination of true baseline levels. Determination of duty cycles are limited by sampling rate and accuracy. For all well-studied sources variability is saturated, implying duty cycles close to 100% and suggesting that many different subvolumes within the jets are responsible for the variability characteristics. We constrain the relativistic amplification in Blazars from the variability characteristics and conclude that these are higher than the values derived from proper motion studies using interferometric imaging.

Wagner, S., Hauser, M., Kurtanidze, O.

LSW Heidelberg

Oral

SYNCHROTRON/IC SCALING RELATIONS IN BLAZAR FLARES

Since the launch of the Fermi satellite we have monitored 100 potential GeV blazars in the optical (synchrotron) regime. Half of them have been bright enough in the GeV (IC) regime to allow monitoring with Fermi-LAT on daily timescales at least during periods of increased flux. Synchrotron/IC ratios are derived from simultaneous measurements. While almost all sources exhibit correlated variability, scaling relations show significant scatter around the average trends. Many sources show different scaling relations during different flares, suggesting that local conditions (in different regions giving rise to flares) within a given jet play a significant role in the SED during a particular outburst. While changing flux-ratios mimic temporal lags in blind correlation studies, we show that lags with constant transfer functions are disfavored.

Wang, Y., J. Takata, K.S. Cheng

The University of Hong Kong

Poster
PSR S2.N32

THREE-DIMENSIONAL TWO-LAYER OUTER GAP MODEL: FERMI ENERGY DEPENDENT LIGHT CURVES OF THE VELA PULSAR

We extend the two-dimensional two-layer outer gap model to a three-dimensional geometry and use it to study the high-energy emission of the Vela pulsar. In this model, the outer gap is divided into two parts, i.e. the main acceleration region on the top of last-open field lines and the screening region around the upper boundary of the gap. In the main acceleration region, the charge density is much lower than the Goldreich-Julian charge density and the charged particles are accelerated by the electric field along the magnetic field to emit multi-GeV photons. In the screening region, the charge density is larger than the Goldreich-Julian value to close the gap and particles in this region are responsible for multi-100MeV photon emission. We apply this three dimensional two-layer model to the Vela pulsar and compare the model light curves, the phase-averaged spectrum and the phase-resolved spectra with the recent Fermi observations, which also reveals the existence of the third peak between two main peaks. The phase position of the third peak moves with the photon energy, which cannot be explained by the geometry of magnetic field structure and the caustic effects of the photon propagation. We suggest that the existence of the third peak and its energy dependent movement results from the azimuthal structure of the outer gap.

Weinstein, A., for the VERITAS Collaboration

Iowa State University

Poster
SNR/PWNe S2.N27

DETECTION OF VER J2019+407 (SNR G78.2+2.1) AND TYCHO'S SNR WITH VERITAS

Supernova remnants (SNRs) are widely considered the most likely source of cosmic rays below the knee (10^15 eV). Studies of GeV and TeV gamma-ray emission in the vicinity of supernova remnants can trace and constrain the nature of the charged particle population believed to be accelerated within SNR shocks. We report here on the discoveries and interpretation of VHE gamma-ray emission from the northwest shell of G78.2+2.1 (gamma-ray source VER J2019+407, which was discovered as a consequence of the VERITAS Cygnus region survey) and from G120.1+1.4 (Tycho's supernova remnant).

Weniger, C.

Max Planck Institute of Physics, Munich

Poster
DMNP S1.N13

PROBING GRAVITINO DARK MATTER WITH THE FERMI LAT

Gravitino dark matter in a framework where R-parity is mildly violated is naturally consistent with thermal leptogenesis and primordial nucleosynthesis. In such a scenario, the gravitino dark matter particle is predicted to decay with cosmological lifetimes, making its decay products potentially observable in the cosmic-ray fluxes. For gravitinos with masses up to a few hundred GeV, the most notable decay product is an intense gamma-ray line. Using the public Fermi LAT data, we derive conservative lower limits on the gravitino lifetime from the non-observation of strong lines in the energy spectrum of the diffuse gamma rays. These limits cover the whole phenomenologically relevant gravitino mass range from a few GeV to several hundred GeV. For heavier gravitinos with masses above a few hundred GeV, the decay spectrum is typically dominated by a strong continuous component, stemming from gauge-boson fragmentation as well as inverse Compton scattering of the electrons and positrons produced in the gravitino decay. We derive limits on this component by considering the gamma-ray flux coming from galaxy clusters, taking into account the fact that the dark matter signal would be spatially extended. Lastly, we comment on the impact of our limits on the prospect for observing long-lived particles at the LHC.

Wood, K.S, J.E.Grove, M.T. Wolff (NRL), D.Wood (Praxis), E. Ferrara (NASA-GSFC), N. Kaiser, K. Chambers,J. Heasley, G. Magnier, J. Tonry (IfA), J. Scargle (NASA-Ames)

Naval Research Laboratory

Poster
MULTI-I S1.N2

USING FERMI LAT AND PAN-STARRS AS ALL-SKY MONITORS FOR CORRELATED OBSERVING

The Fermi Gamma-ray Space Telescope Large Area Telescope (LAT) can be regarded as an all-sky monitor, the first such monitor (as distinguished from survey) in high energy gamma-rays and a powerful one in that it reaches the lowest flux levels yet achieved for its band. The LAT has a need for multi-wavelength context information, both to secure source identifications and develop physical understanding. Multi-wavelength campaigns can be pursued in a new way,on an all-sky and all-source basis, provided the LAT can be correlated with other all-sky monitors with comparably powerful sky coverage and sensitivity characteristics. The Pan-STARRS 1 (PS1) optical survey can be regarded as the first high-sensitivity all-sky monitor in visible wavelengths. It has now completed coverage of the sky for declinations north of -30 degrees. Using observations spanning more than a year of simultaneous Fermi and PS1 coverage we present pilot studies of this type of correlated observation, representing the Fermi LAT with the 1FGL Catalog. Details of cross-correlation methodologies are presented along with preliminary results. The techniques are applicable to the variability method for establishing identifications for Fermi LAT sources.

Wood, K.S.,
A. A. Abdo (GMU/NRL), F. Gargano (INFN), F. Giordano (INFN), A. Harding (NASA GSFC), M. DeCesar (NASA GSFC/UMD), C. Miller (UMD)

Naval Research Laboratory

Poster
PSR S2.N33

CONTINUED FERMI LAT OBSERVATIONS OF THE CTA1 PULSAR AND SUPERNOVA REMNANT

One of the main results of Fermi is the discovery of gamma-ray selected pulsars, of which CTA1 pulsar was the first discovered. Initial observations established pulsar spindown energetics and timescales consistent with the CTA1 supernova remenant. After two years of further observation of this source we have used the increased data volume and signal to noise to improve our timing solution and perform a detailed phase resolved spectral analysis. The updated results will be shown. Analysis of the off-pulse emission will be presented as well as light curve analysis and discussion of constraints on cooling of the neutron star.

Wood, K.S.,
M.Roberts (Eureka Scientific), P.S.Ray (NRL), and the Pulsar Search Consortium

Naval Research Laboratory

Poster
PSR S2.N34

FERMI LAT DETECTIONS WITHIN THE POPULATIONS OF BLACK WIDOW AND RED BACK MILLISECOND PULSARS

Black Widow (BW) millisecond pulsars are in binary systems with companions reduced to very low mass by mass transfer and ablation from the pulsar wind. They may or may not be eclipsing. Red Back (RB) millisecond pulsars are transitional objects where the companion mass remains of order 0.2 solar masses. The number of these systems has increased dramatically through identification of Fermi LAT sources to where there are now at least 9 BW and 4 RB millisecond pulsars. This presentation tabulates properties of these systems comparing observed and intrinsic parameters, to show how Fermi LAT discoveries have modified understanding of the populations.

Yavin, I.,
Philip Schuster, Natalia Toro, and Neal Weiner

New York University

Poster
DMNP S1.N14

HIGH ENERGY ELECTRONS AND PHOTONS FROM THE SUN

Some more exotic forms of Dark Matter may result in high energy electrons and/or photons from dark matter annihilations in or near the Sun. Specifically, electrons/photons may escape the sun if DM annihilates into long-lived states, or if dark matter scatters inelastically, which would leave a halo of dark matter outside of the sun. Such a localized source of electrons/photons may affect the spectra observed by experiments with narrower fields of view oriented towards the sun, such as ATIC, differently from those with larger fields of view such as Fermi. I will suggest some simple tests for these possibilities with existing Fermi data that is more sensitive than limits from final state radiation. If observed, such a signal will constitute an unequivocal signature of dark matter annihilation.

Zaharijas, G.,
talk on behalf of the Fermi-LAT collaboration

IPhT-CEA, Saclay, France and OKC, Stockholm University, Sweden

Poster
DMNP S1.N15

DARK MATTER SEARCHES WITH THE FERMI-LAT DIFFUSE GAMMA-RAY FLUX

Diffuse gamma-rays can be a powerful tool in constraining dark matter properties. In this presentation, I will report up-to-date limits on dark matter annihilation in the Milky Way halo and comment on the uncertainty introduced by the modeling of the Galactic diffuse emission. I will also discuss the limits on cosmological dark matter annihilation set by the flux of the isotropic component of the diffuse signal, focusing on recent advances in N-body simulations and new estimates of the astrophysical contribution, derived from Fermi-LAT observations of extragalactic source classes, such as blazars and star forming galaxies.

Zanin, R.,
Zanin, R., Zabalza, V., Boardas, P., Bosch-Ramon, V., Paredes, J.M., Ribó, M. on behalf of the MAGIC collaboration

IFAE

Poster
Microquasar S2.N2

SEARCH FOR A VHE EMISSION FROM THE MICROQUASAR SCORPIUS X-1 WITH THE MAGIC TELESCOPES

Scorpius X-1 is a Z-type low mass X-ray binary containing a low magnetic field neutron star. The detection of both non-thermal hard X-ray emission and radio relativistic jets during the horizontal branch state indicates the presence of highly energetic particles which might give rise to very-high-energy emission via Inverse Compton scattering. The MAGIC stereoscopic system pointed at the source for a total of 7.7 hrs in May 2010. Simultaneous RXTE observations were carried out in order to know the source X-ray spectral state. The search for emission above 300 GeV yielded no signal in any of the observed spectral states, with an upper limit to the integral flux, at 95% CL, of ~2% of the Crab Nebula flux. The obtained results place a constrain on the maximum TeV luminosity to the jet power ratio of L_VHE/L_j < 10^-3 indicating that high-energy emission physics in Sco X-1 must be inherently different to that of other detected binary systems.

Zanin, R.,
Saito, T.Y., Boardas, P., Bosch-Ramon, V., Cortina J., Paredes, J.M., Ribó, M., Zabalza, V. on behalf of the MAGIC collaboration

IFAE

Poster
Microquasar S2.N3

OBSERVATIONS OF CYGNUS X-3 WITH THE STAND-ALONE MAGIC TELESCOPE.

Cygnus X-3 is the only microquasar detected by both the Fermi and AGILE satellites up to now. Many models predict the source to produce very-high-energy gamma rays via Inverse Compton scattering. The main seed photon field consists of photons produced by the Wolf-Rayet companion star. The stand-alone imaging atmospheric Cherenkov MAGIC telescope observed Cygnus X-3 for 70 hrs between March 2006 and August 2009 in different X-ray/ spectral states and also during a period of enhanced emission above 100 MeV detected by both Fermi/LAT and AGILE. MAGIC did not detect any signal from the direction of the microquasar in any of the considered states. The overall 95% CL upper limit to the integral flux above 250 GeV is of 2.2 x 10^-12 photons cm^-2 s^-1. The non-detection of a very-high-energy signal during the period of activity in the high-energy band favors the location of a possible VHE radiation to be the innermost region of the jet, where absorption is significant.

Zanin, R.,
D. Mazin, E. Carmona, J. Cortina, T. Jogler, A. MOralejo, J. Sitarek, for the MAGIC Collaboration and D. Horns and M. Meyer

IFAE

Poster
SNR/PWNe S2.N28

MAGIC MEASUREMENT OF THE CRAB NEBULA SPECTRUM OVER THREE DECADES IN ENERGY

The Crab Pulsar Wind Nebula is the best studied galactic source of gamma-ray astrophysics, but the contribution of the various soft radiation fields to the Inverse Compton component, the strenght of the internal magnetic field and the highest energies reached by electrons are still a matter of discussion. The MAGIC stereoscopic system recorded almost 50 hours of Crab Nebula data in the last two years, between October 2009 and January 2011. Analysis of this data sample using the latest improvements in the MAGIC stereo software provided an unprecedented differential energy spectrum spanning over three decades in energy, from 45 GeV up to 45 TeV. At low energies, the MAGIC spectrum, combined with the Fermi/LAT data, results in a precise measurement of the Inverse Compton peak. At very high energies, above 10 TeV, the MAGIC measurement is sensitive to the possibly variable upper end of the gamma-ray spectrum. In addition, we present light curves of the Crab Nebula at different time scales, including a measurement simultaneous to one of the Crab Nebula flares recently detected by both Fermi/LAT and AGILE. Using the MAGIC spectrum together with multiwavelength data, we discuss the implications for the modeling of the Crab Nebula.

Zechlin, H.-S., Fernandes, M. V., Elsaesser, D., Horns, D.

University of Hamburg

Poster
DMNP S1.N16

DARK MATTER SUBHALOS AS FERMI GAMMA-RAY SOURCES AND FIRST CANDIDATES IN THE 1FGL CATALOG

Based upon the theory of hierarchical structure formation Milky Way-sized galaxies are expected to host numerous dark matter subhalos. Given recent numerical N-body simulations their mass-scale ranges from Earth mass up to the mass of dwarf spheroidal galaxies. In standard dark matter models these subhalos could be visible in the gamma-ray band as faint and non-variable sources without astrophysical counterpart. With regard to realistic subhalo models and current observational constraints up to 4 massive Galactic subhalos may already show up in the 11 months Catalog of Fermi-LAT data (1FGL). Selection cuts applied to the 1FGL reveal twelve possible candidates where the most promising object, 1FGL J0030.7+0724, is further investigated. With dedicated X-ray observations with the Swift X-ray telescope seven point-like X-ray sources have been discovered. Within the positional uncertainty derived from the 24 months data set one previously unknown counterpart candidate for 1FGL J0030.7+0724 has been found in the radio which coincides with a Swift source. The broad-band spectral energy distribution is consistent with a high-energy-peaked blazar. However, flux and extent of the LAT source may also be compatible with a dark matter subhalo. A decision between the two scenarios requires further multi-wavelength observations. Strategies to identify gamma-ray sources associated with self-annihilating dark matter subhalos are discussed.

Zhu, S., Julie McEnery, John Gregg Thayer, J.J. Russell, on behalf of the Fermi-LAT collaboration

NASA / GSFC / University of Maryland

Poster
GRB S2.N28

THE FERMI-LAT ONBOARD GAMMA-RAY BURST DETECTION ALGORITHM

Gamma-ray bursts are bright flashes of gamma rays lasting from less than a second to several hundred seconds, followed by a faint fading afterglow that can be detected in a large range of energies, from radio to x-ray. Because of the short timescales of GRBs, it is important to quickly provide the GRB location to other observatories to enable observations before the afterglow has faded (to study bursts' afterglows, host galaxies, redshifts, etc.) following a detection by the Fermi-LAT onboard algorithm. The LAT has the ability to detect burst photons at energies >100 MeV, which allows for the exploration of a relatively uncharted energy range and gives insight into the high-energy behavior of bursts and their afterglows (such as additional high-energy spectral components and extended high-energy emission). The onboard GRB algorithm provides a near-realtime detection of gamma-ray bursts, which are then communicated to the science community via GCN (GRB Coordinates Network) within 15 seconds of the burst. With limited resources onboard, the algorithm makes use of efficient routines that scan clusters of events in time and space and provide estimates of event direction and energy. In this contribution, we describe the performance of the algorithm in reconstructing events, and detecting clusters of events with the signature of a GRB against a high level of background photons.

Zimmer, S., Conrad, J.

OKC/ Stockholm University

Oral

COMBINED ANALYSIS ON CLUSTERS OF GALAXIES - GAMMA RAY EMISSION FROM COSMIC RAYS AND DARK MATTER

Clusters of Galaxies are the largest virialized structures in the universe. X-ray observations indicate the population of relativistic electrons that can give rise to a distinct gamma-ray signature through scattering with low energetic photons. In addition, multiwavelength observations suggest high mass-to-light ratios in clusters, which makes them interesting targets for indirect dark matter searches with gamma rays, which can arise from the annihilation or decay of a neutralino WIMP. The resulting signals are different from known point sources or from diffuse emission and could possibly be detected with the Fermi-LAT. The expected spectral characteristics of a WIMP annihilation or decay and cosmic ray emission suggest a universal behavior making a combined statistical treatment feasible. We present initial results from a combined likelihood analysis in order to set limits on the Dark Matter annihilation cross section or decay time and on the hadron injection efficiency.

Zimmermann, L., Grinberg, V., Massi, M., Wilms, J.

Max Planck Institute for Radio Astronomy, Bonn

Poster
Binaries S2.N5

ANALYSIS OF HARD X-RAY/HIGH ENERGY DATA FROM LS I +61303 BASED ON IMPLICATIONS FROM ITS 4.6 YR PERIODICITY

The most peculiar radio characteristics of the TeV emitting high-mass X-ray binary LS I +61303 are two periodicities: A large periodic outburst which exhibits the same period as the orbit (phase \Phi) and a second periodicity of 1667 days (phase \Theta) which modulates the orbital phase and amplitude of the large outburst. Recent analysis of the radio spectral index provides strong evidence for the presence of the critical transition from optically thick emission (related to a steady jet) to an optically thin outburst (related to a transient jet) as in microquasars. In parallel to this transition, a transition from a low/hard X-ray state to a transitional state would be expected. We show how the critical transition from optically thick emission to an optically thin outburst is modulated by \Theta. Folding over large \Theta intervals mixes up different states and can yield a false picture of the emission behaviour of the source along the orbit. We therefore analyse the implications of this long period for treatment of hard X-ray/high energy data from LS I +61303 obtained, e.g. with FERMI or INTEGRAL, taking into account this long-term periodicity.

Zoglauer, A., W. Collmar, S. E. Boggs, M. Galloway, R. M. Kippen, G. Weidenspointner, C. B. Wunderer

University of California at Berkeley, Space Sciences Laboratory

Poster
Instr S2.N30

COMPTEL IMAGE RECONSTRUCTION UTILIZING A PARTIALLY-BINNED LIST-MODE RESPONSE DESCRIPTION

A decade after de-orbiting CGRO, COMPTEL's 1-30 MeV all-sky imaging data set remains unsurpassed, and no current or planned mission is capable of challenging COMPTEL's performance in the near future. While the original COMPTEL data analysis techniques were developed in the 1990's, advances in computer technology allow the application of more sophisticated imaging techniques to the COMPTEL measurements. One of these new imaging techniques for Compton-scatter events is based on a list-mode imaging approach using a partially-binned response description. It has the advantage of combining the best aspects of the binned-mode approach, such as taking care of all detrimental measurement effects, with the best aspects of the list-mode approach, such as a low memory footprint and the utilization of the exact instead of the binned event data. In the presentation we will describe the approach, its adaptation to COMPTEL, as well as the method of generating new, higher-dimensional, partially-binned COMPTEL response descriptions. Finally we will present new COMPTEL sky maps generated with this approach.