prop_num	pi_lname	title	abstract
51214	LISTER	THE VLBA 2CM MOJAVE/FERMI PROGRAM	The combination of Fermi and the VLBA represents a powerful tool to understand the physics of high energy emission in AGNs. We propose to continue to obtain 15 GHz linear and circular polarization VLBA images of ~300 AGN jets as part of the MOJAVE program during Cycle 5, and perform analysis through Cycle 6. The survey contains two complete radio- and gamma-ray selected samples, and also tracks flaring LAT sources, and a representative set of known TeV and lower-luminosity hard spectrum AGNs. The long continuous VLBA dataset on this large sample, combined with coordinated observations at other facilities, will form a key public resource for answering longstanding questions regarding the kinematic and magnetic field properties of AGN jets and their high-energy emission.
51101	SMITH	THE GAMMA-RAY / OPTICAL CONNECTION IN BLAZARS DURING THE FERMI ERA	We propose continued optical monitoring of blazars observed by Fermi, providing a comprehensive public archive that includes high-quality spectropolarimetry. These data are particularly important, as they yield direct information on the magnetic field within the source of the continuum emission. During the first four years of the Fermi mission, our data have been successfully used to constrain the location of the gamma-ray and optical emission from blazars. We have delivered a public archive of over 4000 observations of nearly 50 blazars (available at http://james.as.arizona.edu/~psmith/Fermi). Support for this program will enable continued spectropolarimetry and spectrophotometry of gamma-ray-bright blazars during monthly week-long campaigns for the next three years of the Fermi mission.
51374	TIMOKHIN	MODELING OF PAIR PLASMA CREATION AND GAMMA-RAY EMISSION IN PULSARS.	We propose to carry out truly self-consistent numerical modeling of particle acceleration, electron-positron pair creation and high energy emission in both the polar cap of pulsar and in the outer regions of pulsar magnetosphere for realistic physical setup. These simulations must be done at least in 2D as particle acceleration zones should be thin and elongated. We plan to develop a 2D code using the existing 1D hybrid PIC/Monte-Carlo code. We anticipate to get information about plasma properties which will help to create realistic global models of pulsar magnetosphere essential for modeling of pulsar light curves, and make progress in unveiling physical mechanisms responsible for particle acceleration and gamma-ray emission in the outer parts of pulsar magnetosphere.

prop_num	pi_lname	title	abstract
51361	HAYS	LAT TOO OBSERVATIONS OF FLARES IN THE CRAB NEBULA	Fermi LAT and AGILE have observed dramatic gamma-ray outbursts from the Crab Nebula. The LAT captured a spectacular flare in April 2011 with a pointed observation of the peak permitting sub-hourly lightcurves. The ToO enhanced the sensitivity in a meaningful way. The rapid rise of the emission and extreme energy of the SED peak challenge acceleration models. There is no explanation for the mechanism producing the flares and no precise knowledge of their location. Future outbursts are likely and multiwavelength observations are planned. The enhanced exposure and minimally interrupted views provided by ToO observations impact the analysis and interpretation potential of the LAT data. Additional TOOs of Crab flares will help to resolve key questions about these extreme outbursts.
51365	SHARE	OPTIMIZING FERMI SOLAR SCIENCE DURING EXTREME PERIODS OF FLARING ACTIVITY	Fermi provides the capability to make unprecedented solar-flare observations up to tens of GeV. It has already detected nine solar events: four during impulsive flares and five in the hours after impulsive emission. These observations are the focus of significant analysis and interest because of unusual characteristics discovered by Fermi. The solar exposure for the standard products is at most 15% with observations made every other orbit. It is important to increase this exposure and duty cycle during periods of high solar activity in order to optimize the flare science from Fermi. We request approval for a Target of Opportunity (~2/yr) to double the solar exposure and duty cycle by maintaining Fermi's 50-degree rocking angle in the position closest to the Sun.
51326	KOUVELIOTOU	MAGNETAR OBSERVATIONS WITH THE FERMI/GAMMA RAY BURST MONITOR	Since the beginning of GBM operations (2008 July 14) we discovered two new magnetar sources, studied hundreds of SGR bursts, serendipitously observed the smallest hot spot on the surface of a NS, found SGR-like emission from a low magnetic field NS, started a project on determining the magnetic PRE, and revealed new trends in the burst Epeak vs flux/fluece correlations. These results were reported in 10 papers and multiple meetings. In the next two years we aim to determine the magnetic Eddington limit via PRE bursts, perform magnetar seismology studies, monitor known and discover new sources and study the magnetar population, complete spectral analysis of the brightest bursts to establish their emission mechanism, and combine GBM with NuSTAR, X-Shooter, LOFAR, Spitzer, and radio data.

prop_num	pi_lname	title	abstract
51137	PETROSIAN	DISTRIBUTIONS AND COSMOLOGICAL EVOLUTIONS OF BLAZAR LUMINOSITY AND SPECTRA AND IMPLICATIONS FOR THE GAMMA-RAY BACKGROUND	We propose to continue our analysis of Fermi-LAT Blazars to obtain accurate distributions and cosmological evolutions of their luminosity and photon spectral index, and the correlations among these properties. We will use the Efron and Petrosian methods, which are non-parametric and can deal with the complex detection selection biases to determine the intrinsic distributions directly from the observational data. We have already applied our methods successfully to the determination of the flux and spectral index distributions and the contribution of blazars to the extragalactic Cosmic Gamma-ray Background, and now seek to expand this analysis with the important additional input of redshift information, which is coming available. Our results can shed light on the physics of AGNs.
51019	FALCONE	SYSTEMATIC SEARCH FOR X-RAY COUNTERPARTS OF FERMI-LAT UNASSOCIATED SOURCES USING SWIFT: NEW BLAZARS, PULSARS, AND MORE	We propose that Swift will continue a search for X-ray and UV/optical counterparts of unassociated Fermi gamma-ray sources, which are likely to be new, exciting sources. We will add 199 new 2FGL unassociated sources to the search list. These data will determine the basic properties (with ~5 arcsec positions) of all detected X-ray sources in the Fermi-LAT localization circles, thus enabling identification, classification, and follow-up. This proposal supports the large analysis and interpretation task, which will require additional automation of data reduction software. The Swift PI and Executive Committee commit to the required Swift observing time. Reduced data will be made available to the entire scientific community on a public web page.
51065	CAMILO	GREEN BANK TELESCOPE TIMING OF FERMI MILLISECOND PULSARS	The discovery of millisecond pulsars in radio searches of Fermi-LAT unidentified sources continues apace. In order to fulfill the promise of these discoveries, one must obtain phase-coherent rotational ephemerides over an interval of at least one year. Such ephemerides are then used to fold sparse gamma-ray photons and obtain gamma-ray pulsations, the starting point for subsequent studies. Sub-arcsecond positions also result, which are invaluable for multiwavelength studies. Here we propose to use Green Bank Telescope observations in order to obtain timing solutions for eight millisecond pulsars that our group has discovered in LAT unidentified sources, thereby making a substantial contribution to the study of this newly identified important class of Galactic gamma-ray sources.

prop_num	pi_lname	title	abstract
51259	CHATTERJEE	PRECISION DISTANCES AND VELOCITIES FOR FERMI-DETECTED RADIO PULSARS	The distance to a source is a fundamental quantity in astrophysics. We propose to continue multi-epoch astrometric observations of a sample of Fermi-detected radio pulsars with the VLBA in order to obtain model-independent estimates of their velocity and distance. With Cycle 3 VLBA observations we searched for calibrators around 22 targets, and astrometric observations are ongoing in Cycle 4. In Cycle 5, we propose to complete 8 epochs of astrometry on 13 sources, and thus measure their proper motions and parallaxes. These measurements will enable precise comparisons of spin-down power and gamma-ray luminosity for the neutron stars, probe their birth sites and relativistic winds, help refine Galactic electron density models, and enable more stringent tests of theories of gravity.
51191	CHEUNG	PROMPT FOLLOW-UP OF FLARING/TRANSIENT FERMI-LAT GALACTIC PLANE SOURCES	We propose a comprehensive follow-up program of flaring/transient Fermi-LAT Galactic plane gamma-ray sources. Essential to this effort are the EVLA observations requested here; triggered Swift X-ray/optical follow-up observations have already been approved. At high-significance (>=5 sigma), we expect 2 such events/year visible with the EVLA, thus request 2 ToOs. We aim to identify plausible radio, X-ray, and optical counterparts following the LAT event via expected correlated variability. In case a plausible EVLA counterpart is identified, we will obtain further radio follow-up with the OVRO 40m and Effelsberg 100m. These observations will characterize the broad-band properties of each LAT transient, providing critical clues as to the nature of this enigmatic source population.
51178	MCBREEN	A TOOL FOR BACKGROUND ESTIMATION WITH GBM	The conventional method for determining the background of GRBs with GBM is to interpolate intervals before and after the GRB as a polynomial (order 0-4). The timescales on which the prompt emission occurs is usually short enough that this method is sufficient. However, this method is not suited to separating smoother long lived emission from GRBs, or in defining background intervals for solar flares which typically have ill-defined end-points and occur during periods of highly-variable underlying solar activity. We propose to develop a background estimation tool, using the rates from adjacent days when the satellite has approximately the same geographical coordinates. After a suitable period of development and testing this tool will be provided as user-contributed software on the FSSC.

prop_num	pi_lname	title	abstract
51258	AJELLO	BL LACERTAE OBJECTS AT HIGH REDSHIFT	We propose to continue in cycle 5 our effort to observe, in a coordinated fashion using Swift and GROND, all the Fermi sources which do not have a redshift and are visible from Chile. The coupling of the 7 GROND filters and the 4 Swift/UVOT ones allows us to determine accurate photo-z in the 1.3--13 redshift range. The published results from cycle-3 show that this program is able to find distant (i.e. z>1.3) BL Lac objects which are instrumental to probe the energy density of the extragalactic background light and for our knowledge of the blazar family. At the end of this program we expect to produce a sample of ~30 BL Lac at z>1.3 and to put an upper limits of z<1.3 for ~170 BL Lacs. Our program will provide, for all 200 sources, high quality sampling of their SEDs from IR to UV.
51378	PURSIMO	REDSHIFTS AND OPTICAL IDENTIFICATIONS OF TANAMI/FERMI AGN	We wish to measure redshifts for the optical identifications of those gamma-ray loud southern hemisphere extragalactic radio sources being monitored by the TANAMI program that lack them. We also propose imaging of those sources that currently lack optical identifications after which their redshifts will also be measured. The study of blazar physics has been revolutionized by Fermi which has ushered in the age of quasi-simulataneous multi-wavelength studies for which knowledge of physical quantities like blazar-jet luminosities and speeds are crucial. TANAMI is the only significant source of milliarcsecond scale radio information for the southern third of the sky. Source redshifts are essential to determine the linear sizes and physical properties of TANAMI/Fermi sources.
51306	HARDING	TESTING PULSAR MAGNETOSPHERE MODELS	We propose to construct atlases of pulsar gamma-ray light curves and phase-resolved spectra using our recent 3D dissipative pulsar magnetosphere models. These models span the range of pulsar magnetosphere solutions between the extreme cases of vacuum and force-free (FF) solutions by variation of the conductivity of the magnetospheric plasma. Unlike the vacuum or FF solutions, the dissipative solutions map the location and strength of currents and large-scale electric fields parallel to the magnetic field, affording the possibility to compute realistic light curves and spectra. Since gamma-ray pulsar emission is very sensitive to the structure of the magnetosphere, comparison of our results with Fermi data will constrain the physics of the magnetosphere and underlying pulsar emission.

prop_num	pi_lname	title	abstract
51081	BARING	ENERGETIC PARTICLE INJECTION INTO THE CRAB PULSAR WIND NEBULA	One of the most interesting discoveries by the Fermi-LAT is the variability of the Crab nebula in the 200 MeV - 2 GeV window. This has called into question whether the relativistic pulsar wind termination shock is the site of lepton injection for the surrounding nebula. This proposal examines the important issue of the time of diffusive particle acceleration at the Crab's shock. We will compute the acceleration time of high energy particles at relativistic shocks of arbitrary obliquity, using a fully-developed Monte Carlo simulation. This study is motivated by the known result that highly oblique, non-relativistic shocks are faster accelerators than their quasi-parallel counterparts. Our goal is to ascertain whether such a property extends to the Crab's relativistic termination shock.
51197	DENNIS	FERMI SOLAR FLARE OBSERVATIONS	This two-year effort is designed to continue our work over the previous three years to make Fermi solar flare data readily available for analysis by the international solar physics community. We propose to continue providing the GBM CSPEC data and to augment this data service by making the high time resolution CTIME and TTE data available for analysis with our familiar software tools. We will also provide access to LAT standard data products and to the LLE data for GBM triggered flares as they become publicly available. We will work with the GBM and LAT teams to improve the spectral analysis of the flare data sets and modify our spectral analysis software accordingly so that the LAT and GBM data are fully integrated with the analysis of RHESSI observations.
51026	BERGER	RAPID SPECTROSCOPY OF FERMI GRBS: REDSHIFTS, ENERGETICS, AND HOST GALAXIES	Rapid spectroscopy of GRB afterglows enables a wide range of studies related to basic GRB physics (redshifts, energetics), the progenitors (metallicities), the properties of high-redshift galaxies (chemical abundances), and potentially fundamental physics (Lorentz invariance violation). As such, rapid spectroscopy is the most essential correlative observation for Fermi GRB studies. Here we request support for our rapid spectroscopy program (using Gemini, Magellan, MMT), which will provide redshifts and metallicities. We will further combine the redshifts with late-time EVLA observations to determine beaming-independent energies for Fermi GRBs, and assess whether Fermi and Swift bursts probe the same population. The data will be released to the community in real-time via GCN circulars.

prop_num	pi_lname	title	abstract
51033	JORSTAD	MULTI-FREQUENCY CAMPAIGNS TO STUDY RAPID VARIABILITY IN GAMMA-RAY BLAZARS	We propose to perform two 2-week multi-frequency campaigns of observations of a sample of gamma-ray blazars during Fermi Cycle 5. The campaigns will involve: (1) gamma-ray monitoring with the Fermi LAT, (2) VLBA total and polarized intensity imaging at 43 GHz 3 times per campaign, (3) daily optical photometric B,V,R, and I measurements, (4) R-band polarimetric observations, (5) X-ray observations with Suzaku and Swift; (6) mid-IR measurements with IRTF; and (7) near-IR photometric J,H, and K observations. The research aims i) to search for correlated variability on short timescales; ii) to compile SEDs at different states of gamma-ray and radio jet activity; and iii) to explore mechanisms of high energy production and locations of gamma-ray emission regions in blazars.
51267	JOSHI	TRACKING THE EVOLUTION OF MULTI-WAVEBAND OUTBURSTS OF FERMI BLAZARS	We aim to explore the dynamic evolution of outbursts from gamma-rays to radio frequencies for blazars by developing a self-consistent multi-wavelength jet emission model that can follow the shock from inside the broad line region to ~ 20 pc downstream of the jet. To do this, we will modify our existing numerical code for time-dependent multi-zone leptonic jet model, with radiation-feedback scheme in the internal shock scenario, to calculate shock and radio emission from sub-pc to pc scales. The goal is to comprehend the connection between flares at different wavelengths by relating the shocks at different positions to the observed lightcurves and spectral energy distributions. The site of gamma-ray emission in the jets of blazars can also be probed through this study.
51296	RANSOM	SEARCHING FOR MORE RADIO MILLISECOND PULSARS IN FERMI UNASSOCIATED SOURCES	Fermi is revolutionizing our understanding of the GeV sky and how we find radio millisecond pulsars (MSPs). In the past 2.5 years, radio astronomers and LAT team members, primarily the "Pulsar Search Consortium", have discovered 40 new MSPs (28 by our group, including 23 at the GBT) in Fermi unassociated sources! We aim to continue this amazing pace of MSP discovery using the GBT. With three years of Fermi data, there are now several dozen new high Galactic latitude unassociated sources to search. We will also re-search approximately 10 very pulsar-like sources in case eclipses or scintillation hampered earlier searches. Finally, we will attempt higher frequency searches of the best 10 or so Galactic plane sources. We request 80 hours of GBT time for this project.

prop_num	pi_lname	title	abstract
51211	PORTER	CHARACTERIZATION OF RESIDUALS BETWEEN FERMI LAT DATA AND MODELS FOR THE GALACTIC DIFFUSE GAMMA-RAY EMISSION	The majority of the celestial gamma rays detected by the Fermi-LAT (~80%) are attributable to the diffuse Galactic gamma-ray emission produced by cosmic rays interacting with the interstellar gas and radiation fields. Physically motivated codes like GALPROP are successful at reproducing the general features of the diffuse Galactic emission. However, it is the discrepancies between physical models and high-resolution data, so-called ``residuals'', that are information gold mines for discovering new phenomena. We propose to perform a systematic and an in-depth analysis of the spatial and spectral properties of residuals relative to GALPROP model predictions. Our study will provide an improved understanding of Galactic cosmic rays and their interactions in the interstellar medium.
51386	CENKO	AFTERGLOWS, REDSHIFTS, AND CALORIMETRY OF FERMI GAMMA-RAY BURSTS	We propose to continue our successful program of multiwavelength observations of Fermi gamma-ray bursts (GRBs) with the primary objectives of 1) identifying the long-wavelength counterparts; 2) obtaining spectroscopic redshifts; and 3) measuring beaming-corrected energies (burst plus afterglow) of the brightest and most energetic GRBs. Combined with ground-based optical (robotic Palomar 60-inch, Keck, Gemini) and radio (EVLA) observations, we will use Fermi to target the high end of the GRB energy distribution - the recently discovered hyper-energetic (E > 10e52 erg) GRBs. This study will provide us with new insights into the least understood aspect of GRBs - the central engines - by constraining the maximum energy available for progenitor models (e.g., magnetar and black holes).
51400	TROJA	CLUES TO THE ORIGIN OF X-RAY FLARES WITH JOINT SWIFT-FERMI OBSERVATIONS OF GRB AFTERGLOWS	We propose a joint Swift-Fermi analysis of GRB afterglows aimed at unraveling the origin of X-ray flares. X-ray flares are expected to be associated to a high-energy (HE) counterpart, of which different models predict substantially different properties. Evidence of such HE emission was recently found in coincidence with the X-ray flaring activity of GRB100728A. The unique opportunity of Swift and Fermi flying together allows us for the first time to perform a systematic search for the HE flares and perform a correlated analysis of the high- and low-energy properties of X-ray flares. The proposed research will provide unique constraints on theoretical models for the flaring activity in GRBs, bearing important implications for the GRB central engine and progenitors.

prop_num	pi_lname	title	abstract
51216	MASSARO	UNIDENTIFIED GAMMA-RAY SOURCES: HUNTING BLAZARS	Recently we developed and successfully used a new association method able to recognize if there is a blazar counterpart associated with a gamma-ray source. For the first time, adopting our association procedure, we have been able to provide a low energy candidate counterpart for 187 out of 313 unidentified gamma-ray sources in the 2nd Fermi LAT catalog. This method is based on the infrared data of the WISE all sky survey today available for 57% of the whole sky. The two main goals of our proposal are: a) to improve and extend our association procedure by including additional infrared - gamma-ray data and by applying it to the whole sky when the full WISE archive will be released; b) to investigate the IR-gamma-ray properties of newly discovered blazars.
51141	MARSCHER	TURBULENT EXTREME MULTI-ZONE MODEL FOR BLAZAR VARIABILITY	The PI proposes to continue development of his model for variability of nonthermal emission from a relativistic blazar jet. The model, whose concept is based on recent multi-waveband monitoring of Fermi-detected blazars, involves turbulent plasma flowing across a conical recollimation shock. Funds are requested to support the PI and a graduate student to add capabilities to the numerical model and for the student to adapt the code to run on a high-end computer. The model will be calculated over a range of physical conditions and the results will be compared with observational data.
51387	ORLANDO	CONSTRAINING MODELS OF OUR GALAXY, DIFFUSE GAMMA-RAY EMISSION AND COSMIC-RAY PROPAGATION USING FERMI/LAT AND PLANCK DATA	The aim of this proposal is to give a new picture on the propagation of cosmic rays and the diffuse emission in the Galaxy. We perform a parallel study with Fermi/LAT, WMAP, radio surveys and Planck of the diffuse gamma-ray and synchrotron emission from the Galaxy. This is important for constraining distribution and propagation of cosmic rays, the interstellar medium, especially the magnetic field, and the Galaxy parameters, needed for understanding the Fermi observations. We propose to compare multi-wavelength data with theoretical models of the diffuse emission from the Galaxy such as the GALPROP model, as adopted in the Fermi collaboration. This proposal will exploit the essential synergy between two currently active space observatories (Fermi/LAT and Planck) in a timely manner

prop_num	pi_lname	title	abstract
51072	ROMANI	COMPLETING ASSOCIATIONS FOR THE BRIGHT LAT SAMPLE: RADIO QUIET MSP?	We propose a program of optical imaging and spectroscopy to study counterparts for the handful of unassociated sources remaining in the bright LAT sample. These are likely binary millisecond pulsars and the data will constrain the orbital properties, allowing a meaningful search for pulsations directly in the LAT gamma-ray data. This program has the potential to find the first radio-quiet MSP and will provide a complete assessment of the pulsar and blazar content of this flux limited sample, making it particularly valuable for background and population studies.
51133	PETROSIAN	TESTING MODELS OF ACCELERATION, TRANSPORT AND RADIATION IN SOLAR FLARES BASED ON FERMI AND OTHER RELATED DATA	Observations of solar flares by Fermi combined with other (RHESSI, SDO,GOES etc) data provide an unprecedented opportunity for investigation of the radiation, transport, energy loss, and acceleration site and mechanism of electrons and ions. We propose a program of analysis of the combined data and theoretical modeling with emphasize on the acceleration mechanism for Fermi-LAT flares. We have considerable expertise in data analysis and years of experience in theory of high energy processes in flares. We also have the necessary codes developed by several past and current students (e.g. The Stanford Acceleration and Transport Code). In the first year we will focus on two flares and later continue with the other past and future flares detected during this active period of the Sun.
51279	GUIRIEC	IDENTIFICATION AND INTERPRETATION OF THE MULTI COMPONENTS OBSERVED IN THE PROMPT EMISSION SPECTRA OF FERMI GRBS	With Fermi, we have been entering a new Era for the study of the prompt emission of GRBs. Prompt emission spectral shapes are more complex than the simple empirical functions used in the past. Fermi GRB spectra often require a combination of components. We propose to identify these components and follow their evolution in order to understand their origin in terms of emission mechanisms. This will result in a better understanding of the composition of the GRB jets as well as the origin of the energy reservoirs powering them, which will inform subsequently on the nature of the central engine.

prop_num	pi_lname	title	abstract
51272	TAYLOR	UNVEILING UNASSOCIATED FERMI-LAT SOURCES WITH A DEEP EVLA/VLBA SURVEY	We aim to undertake a detailed examination of every Fermi detected object in the northern sky not yet identified with a known source type (blazar, pulsar, etc.). In 2FGL there are still a large number (576) of such sources, 30% of the total. For every unassociated Fermi source we will use VLA observations to gather a list of radio sources within the LAT error ellipse, and will determine their flux densities, spectral indexes, and morphologies. We will follow up with VLBA observations using the VLA positions to confirm AGN identifications. This will increase the number of radio-gamma associations, especially in the poorly explored regime of radio-weak AGN. We will find a population of radio silent gamma-ray sources or demonstrate that such a population does not exist.
51394	COPPI	DETAILED MODELING OF BRIGHT FERMI BLAZAR FLARES	The dramatic flaring activity of LBL blazars such as 3C 454 produces statistics good enough to finally follow the gamma-ray spectral evolution down to shortest, ~hour variability timescales. Coupled with coordinated multi-wavelength observations at NIR/optical wavelengths, we can now track the evolution of both the putative synchrotron and Compton peaks in the leptonic blazar emission. This should allow detailed tests of models, and if they pass, important constraints on the jet emission regions, e.g., its spatial location. Efforts are currently hampered by inadequate modeling, using incomplete data sets and overly simple models. Based on intuition developed using a one zone code, we will develop a state-of-the art multi-zone code capable of realistically confronting models to data.
51139	PRINCE	OPTICAL VARIABILITY OF FERMI GAMMA-RAY PULSARS	We propose to use optical variability data from large-area sky surveys, specifically the Catalina Realtime Transient Survey (CRTS), the Lincoln Near-Earth Asteroid Research (LINEAR) survey, and the Palomar Transient Factory (PTF), to identify counterpart candidates for Fermi unidentified sources. Significant optical periodicity has already been observed for three known or suspected Fermi gamma-ray millisecond pulsars: PSR J2129-04 , 2FGL J2339.6-5032, and FIRST J102347.6+003841. Optical variability analysis has two attractive aspects: (1) it can determine important parameters of the pulsar-companion interaction, and (2) it provides an alternative for determining accurate positions of Fermi pulsars in the case of radio-quiet, ``gamma-ray only'', sources.

prop_num	pi_lname	title	abstract
51297	FINGER	STUDIES OF ACCRETING BINARY PULSARS WITH THE FERMI GAMMA-RAY BURST MONITOR	Since cycle 1 we have been monitoring accreting pulsars using the Gamma-Ray Burst Monitor on Fermi. This monitoring program includes daily full sky searches for previously unknown or quiescent pulsars with spin frequencies in the 1 mHz to 2 Hz range using a blind search, and making source specific analyses to track the frequency evolution of all detected pulsars. Quick-look results are plotted on our website and available in fits files while refined long-term histories of pulse profile, pulsed flux, and frequency are available by request, and will be archived. We propose to continue this monitoring, expand our coverage of short period sources, and redetermine the binary orbit of two transient pulsars so that we may study the accretion torques that occur during and between their outbursts.
51399	MOSKALENKO	EMISSION FROM THE QUIESCENT SUN: A STUDY AND A TOOL	We propose to perform a study of variations of the gamma-ray emission from the Sun over the solar cycle using all available data from the start of the Fermi mission. The outcome of this work will be (i) a publicly available model of the solar emission (both components) to use with the Fermi-LAT Science Tools which can be updated as the solar activity changes, and (ii) the derived spectra of CR electrons in the inner heliosphere and their variations over the solar cycle. The proposed research will contribute to the analysis of point sources and to studies of the heliospheric modulation. The tools developed in this work can be easily generalized to include the Moon, another bright variable and moving source.
51266	GROVE	TERRESTRIAL GAMMA-RAY FLASHES AT THE HIGHEST ENERGIES WITH FERMI LAT	We propose to test the spectrum of Terrestrial Gamma-ray Flashes (TGFs) above 20 MeV with the Fermi LAT. Recent observations with AGILE show a power-law spectrum of gamma rays above 7 MeV, extending to ~100 MeV, which is in significant disagreement with the prediction of the generally accepted model for the production of TGFs. With an effective area at least a factor of 2-8 larger than that of AGILE between 50 MeV and 100 MeV, LAT can confirm or refute those observations. This is a follow-on to an approved Cycle 4 proposal for nadir-observing of TGFs with LAT. Additional nadir observations are required to make a statistically compelling conclusion about the spectral shape.

prop_num	pi_lname	title	abstract
51346	DERMER	GAMMA RAYS FROM ULTRA-HIGH ENERGY COSMIC RAYS IN BLAZARS	Leptonic models have had considerable success in explaining many blazar properties, but unexplained phenomena arising from observations with the Fermi Large Area Telescope and ground-based gamma-ray telescopes threaten this scenario. Blazars represent a favored source class to explain the origin of ultra-high energy cosmic rays with energies >~ 1e18 eV. We propose to investigate the role of UHECRs accelerated in blazar jets and how they could explain or affect various puzzles in blazar physics, including rapidly variable high-energy gamma radiation from FSRQs, inferences of the intergalactic magnetic field, the existence of weakly variable TeV blazars, and hard spectral components implied by deabsorbing measured blazar spectra using models of the extragalactic background light.
51263	BAILYN	SMARTS OBSERVATIONS OF BRIGHT FERMI BLAZARS	We propose to carry out optical and infrared observations of bright Fermi blazars in the southern hemisphere, using the SMARTS consortium telescopes. Science goals include 1) timing and correlation between Fermi gamma-ray flux and optical/IR photometry; 2) analysis of time resolved spectral-energy distributions; study of optical/IR color changes to constrain disk vs jet emission; 4) optical spectroscopy to determine the photoionization flux. All data will be promptly released to the public.
51022	GOTTHELF	OPTIMIZED TIMING SEARCHES FOR GAMMA-RAY PULSARS USING NEW TECHNOLOGY (AO5)	We propose a new approach to mining the Fermi LAT data for pulsars using the most sensitive tests available to uncover faint signals. By exploiting the latest advances in computer hardware, we can now reconsider optimized coherent searches for periodicity, previously computationally prohibited. We have realized over two orders-of-magnitude acceleration in these computations and are now applying this new technology to the Fermi data. We are exploiting several tests for periodicity most appropriate for gamma-ray pulsar signals including the H-test statistic, the most sensitive for unknown pulse profiles, to discover fainter pulsars missed by previous searches. Fully exploring the pulsar discovery space will further the scientific returns from the Fermi mission.

prop_num	pi_lname	title	abstract
51302	GALL	MULTIWAVELENGTH STUDIES OF GALACTIC FERMI-LAT TRANSIENTS	Since 1995, at least seven GeV transients, located near the Galactic plane, have been discovered by EGRET, Fermi and AGILE. Among the sources observed so far, only two have been identified at other wavelengths, one as a nova, a surprising new source of GeV gamma-rays. The physical nature of the other five sources is still unknown. These GeV transients may potentially represent a new class of gamma-ray emitting objects. The key to understanding this potential new class of objects is the identification of counterparts at other wavelengths and the study of their multi-wavelength properties. We propose to carry out multi-wavelength studies of future Galactic Fermi transients in order to determine their physical nature.
51192	SHARE	UNDERSTANDING THE ORIGINS OF LAT-OBSERVED IMPULSIVE AND TIME-EXTENDED SOLAR EMISSIONS	The LAT has observed >100 MeV impulsive emission associated with at least four M and X class soft X-ray flares and hours-long emission following at least five other flares. We propose to understand the differences between these impulsive and time-extended phenomena by: 1. using gamma-ray data from the LAT, GBM, and RHESSI to estimate the spectra and energy content of particles interacting at the Sun; 2. comparing these spectra and energies with those measured in the accompanying Solar Energetic Particles (SEPs); and 3. studying the relevant magnetic structures and plasma conditions at the Sun and inner heliosphere through measurements made by SDO, STEREO, and SOHO. We will focus our efforts on the 2010 June 12 and 2011 March 7 flares and then study other events in 2011 and ensuing years.
51250	OMODEI	EXPLORING THE TIME DOMAIN PROPERTIES OF HIGH ENERGY GAMMA-RAY BURSTS	Time series analysis of data recorded by detectors in different energy ranges is important for understanding the behavior of broad-band spectral components over those energies. Observations by the Fermi GBM and LAT provide a unique opportunity to study the time-dependent spectral evolution of Gamma-Ray Bursts (GRBs) over 7 decades in energy. Currently, the LAT has detected emission from approximately 30 GRBs: spectral and temporal analyses of these bursts have uncovered several unexpected properties. We propose to develop algorithms for time series analysis of LAT and GBM data and apply them to data from GRBs and other rapid transients. In particular, we will study the prompt emission observed by the LAT and GBM and its transition to the extended emission phase observed by the LAT.

prop_num	pi_lname	title	abstract
51274	CHERRY	IMAGING THE HARD X-RAY SKY WITH THE FERMI GBM	Imaging algorithms developed for the GBM Earth occultation analysis will be used to produce a complete GBM catalog of hard X-ray/low energy gamma ray sources in the Galactic Plane, to generate a map of AGNs off the Galactic Plane, and to extend the GBM transient search to unknown sources and sources not included in the standard GBM Earth occultation catalog. The extended GBM source catalog will be used to reduce systematic errors, to correlate the hard X-ray flux of AGNs and galactic binaries with the simultaneous LAT and other catalogs, and to search for undiscovered transients, especially at energies above the range of Swift.
51344	CHANG	THE PLASMA PHYSICS OF TEV BLAZARS	Fermi observations, in conjunction ground-based atmospheric Cherenkov telescopes, are providing new insights into the emission and population of very high energy sources (> 100 GeV). We propose a theoretical investigation into the physics of the propagation of these high energy photons and in particular to the plasma physics of the pair beams that are produced off the extragalactic background light. We will explore the nonlinear saturation of various plasma instabilities to which these beams are subject to. We will answer the crucial question of whether or not this physics precludes the use of simultaneous Fermi and atmospheric Cherenkov observations to constraint the intergalactic magnetic field and the if TeV blazars constribute substantially to the heating of the intergalactic medium.
51359	KAPLAN	THE ECLIPSING MILLISECOND PULSAR J1816+4510 AND ITS STRANGE COMPANION	We discovered the eclipsing millisecond pulsar J1816+4510 in a radio survey toward an unidentified Fermi source. Since then we have identified its companion in optical/ultraviolet data, and its multi-wavelength properties place it apart from all other sources. We suggest that the companion is becoming a helium-core white dwarf with a wind that causes radio eclipses. We request (1) GBT observations of a full orbit at two frequencies to study the orbit and eclipses, (2) precise UBVRI optical photometry to measure the SED, (3) a search for an Halpha nebula, and (4) optical photometry over a full orbit to look for modulation. Together, these data will help unravel the evolutionary state of the companion and constrain its interaction with the pulsar's wind.

prop_num	pi_lname	title	abstract
51004	LYUTIKOV	CRAB GEV FLARES FROM CORRUGATED TERMINATION SHOCK	The detection of flares from the Crab nebular by AGILE and Fermi satellites is one of the most astounding discoveries of 2010 in high energy astrophysics. The Crab gamma-ray radiation suddenly became two to three times stronger for three days beginning September 19. The brevity of the flare, orders of magnitude shorter that the nebular dynamical time scale, is most surprising. In this proposal we will investigate, using theoretical approach and numerical simulations, a model that the flares are produced by the variable shape of the pulsar wind termination shock. Non-stationary processes in the bulk of the nebular can excite low frequency corrugation perturbations of the shape of the shock. These time-dependent perturbations induce a mildly relativistic downstream flow with varia
51183	DWYER	MODELING TERRESTRIAL GAMMA-RAY FLASHES OBSERVED BY FERMI	Terrestrial gamma-ray flashes (TGFs) are bright bursts of gamma-rays, observed by spacecraft such as Fermi, that originate from the Earth s atmosphere. To date, only one self-consistent model of TGFs exists, called the relativistic feedback discharge (RFD) model. This model explains many properties of TGFs, including their duration, energy spectra and multi-pulsed behavior. However, it is still rudimentary and has only been compared with CGRO/BATSE TGF data. We propose improving the RFD model by making it fully 3-D and including the effects of the Earth s magnetic field. The code will be parallelized and run at the DOD High Performance Computing facility. This will allow, for the first time, detailed, self-consistent model predictions that will then be compared with Fermi observations.
51385	TROJA	RAPID RATIR OBSERVATIONS OF FERMI-LAT GAMMA-RAY BURSTS	We propose to rapidly follow-up and monitor the afterglow of Fermi/LAT Gamma-Ray Bursts with the new Reionization and Transients InfraRed (RATIR) camera. Our proposed observing program will provide rapid localization, photometric redshift and multi-color afterglow observations for any new LAT trigger, thus maximizing the scientific return of the new and exciting population of LAT Gamma-Ray Bursts.

prop_num	pi_lname	title	abstract
51083	FINKE	MULTIZONE SPECTRAL MODELING OF BLAZARS	With telescopes in space and on the Earth, a wide range of the electromagnetic spectrum from radio to gamma rays can be observed. This coverage is useful for blazar observations, particularly since it monitors not just over flaring states, but quiescent ones as well. Quiescent states are a challenge for single-zone spectral modeling, and require multiple components of a blazar to be taken into account. We propose to develop a model for emission from blazars that takes into account emission from multiple zones along the jet. A multi-zone model could also resolve the conflict of where the gamma-ray emission region in jets is located.
51066	BEGELMAN	TESTING THE HYPOTHESIS THAT BLAZAR GAMMA-RAY EMISSION ORIGINATES ON 10-PARSEC SCALES	We propose to explore the structure of blazar jets on 10-parsec scales - where radio emission is thought to originate - and test the hypothesis that the bulk of gamma-ray emission originates on similar scales to the radio emission. In particular, we intend to: 1) study the energetic requirements for the brightest Fermi/LAT flares in blazars under the assumption that they are produced on 10-pc scales; 2) investigate the feasibility of magnetic reconnection and associated phenomena - minijets and extreme particle acceleration - to operate in high-energy-density regions of the jet, so far from the black hole; and 3) extend our existing radiative models to conditions characteristic of the 10-pc scale and apply them to test the connection between gamma-ray and radio activity in blazars.
51089	BEGELMAN	UNDERSTANDING THE CRAB NEBULA'S GAMMA-RAY FLARES	The discovery of gamma-ray flares from the Crab Nebula is one of the great surprises of the Fermi era. We have proposed a radical model to explain the unexpectedly high photon energies of this synchrotron emission, its extreme spectral hardness, and its high intensity, via a reconnection-powered linear accelerator mechanism. We propose to develop this model, by: 1) studying the acceleration process in realistic field configurations and radiation environments; 2) computing the angular distribution, spectrum and intensity of radiation emitted by the accelerated particles; and 3) studying the applicability of our extreme particle acceleration model to other classes of gamma-ray source, including pulsar wind nebulae (PWNe) other than the Crab and striped pulsar winds.

prop_num	pi_lname	title	abstract
51240	WILSON-HODGE	MONITORING VARIATIONS IN THE CRAB NEBULA AND X-RAY BINARIES USING GBM EARTH OCCULTATION	We propose to continue monitoring the sky in the 8 keV to 40 MeV band with GBM using the Earth occultation techniques developed in our large project (cycles 1-3), providing selected energy spectra and automatically updated light curves via our new website. For science investigations, we propose to perform a detailed investigation of hard X-ray variations of the Crab Nebula, correlating multi-wavelength public data including Fermi LAT with GBM as the Crab recovers from its two-year hard X-ray flux decline (7% decline in 15-50 keV band from 2008-2010.) Also we propose to correlate observed energy spectra with unpredictable spin-states for accreting pulsars and provide higher energy coverage to search for cyclotron features now that RXTE is unavailable.
51024	GIACOMAZZO	GENERAL RELATIVISTIC MAGNETOHYDRODYNAMIC SIMULATIONS OF NEUTRON STAR BINARIES	Current observations of short gamma-ray bursts (GRBs) suggest that binary neutron stars (BNSs) could be the central engine that powers such phenomena. Moreover BNSs are powerful sources of gravitational waves and a contemporary detection of a gravitational wave by advanced LIGO together with a Fermi GBM detection of a short GRB would allow us to finally unveil the central engine of these powerful phenomena. We propose to use our fully general relativistic magnetohydrodynamic code Whisky to simulate the merger of magnetized BNSs and investigate under which conditions they can lead to the launch of the relativistic jets necessary to produce a short GRB. We will in particular consider the effect of more realistic equations of state, different mass ratios and eccentric orbits.
51345	SAKAMOTO	MULTI-INSTRUMENT STUDY OF GRB FLARES	We propose a study of the properties of GRB flares which are registered by Fermi GBM, Swift BAT and Swift XRT. It has been pointed out that the GRB light curves are ensembles of pulses with universal shapes, which depend on the photon energy. The possibility of analyzing the same flare at different energy bands offers the opportunity to delineate the photon energy dependence of the universal pulse paradigm and thus shed light in the spectral-temporal properties of GRB pulses and GRB in general.

prop_num	pi_lname	title	abstract
51180	YUSEF-ZADEH	THE GAMMA-RAY VARIABILITY OF SGR A* INDUCED BY AN INFALLING CLOUD	Infrared observations of the Galactic center with the VLT have recently discovered a remarkable dense gas cloud approaching the massive black hole Sgr A*. This cloud is on a highly eccentric orbit which has already shown signatures of tidal disruption by the black hole. It is expected that high energy emission from Sgr A* resulting from this encounter will increase significantly in the next two years, especially when it reaches the pericenter in the summer of 2013. Multiwavelength observations are being planned to monitor the flux of Sgr A*. We propose pointed observations of Fermi Lat toward Sgr A*, either triggered by the detection of gamma-ray flare activity or by an enhanced duty cycle of X-ray flaring indicating the onset of an accretion event.
51035	BOETTCHER	GAMMA-RAY POLARIZATION IN BLAZARS	We propose a systematic study of the gamma-ray polarization signatures of various blazar emission models, including leptonic synchrotron self-Compton and external Compton scenarios, as well as hadronic scenarios. We focus on the critical energy range 50 - 200 MeV, in which Fermi offers the opportunity to measure gamma-ray polarization. We will investigate simple single-zone models with isotropic particle distributions, but ordered magnetic fields, as well as inhomogeneous models, such as spine-sheath models, in which Kelvin-Helmholtz-like instabilities are expected to lead to highly anisotropic relativistic electron distributions and ordered, self-generated magnetic fields.
51161	UCHIYAMA	FERMI AND NANTEN JOINT STUDY OF COSMIC-RAY ESCAPE FROM SUPERNOVA REMNANTS	Middle-aged supernova remnants (SNRs) interacting with molecular clouds (MCs) constitute the dominant class of SNRs in the Fermi gamma-ray sky. Fermi-LAT study of such systems has started to offer new understanding of cosmic-ray (CR) escape from SNRs. Motivated by our recent discovery of a CR halo around SNR W44, we propose to analyze Fermi-LAT data of six MC-interacting SNRs aiming at detecting gamma-rays from MCs illuminated by escaping CRs. We also analyze CO survey data acquired with the NANTEN telescope to study shocked MCs associated with the six SNRs and unshocked MCs located on the periphery of each SNR. Combining CO and gamma-ray data will constrain the total spectrum of escaping CRs and the diffusion coefficient in the vicinities of the SNRs.

prop_num	pi_lname	title	abstract
51332	DWARKADAS	THEORETICAL STUDIES OF THE VERY HIGH ENERGY GEV-TEV EMISSION FROM HISTORICAL SUPERNOVA REMNANTS	The Fermi satellite has detected several historical supernova remnants, including the Crab, Cas A, Tycho, and 3C58. This project is aimed at interpreting their very high energy signatures. We propose to make numerical hydrodynamic evolutionary models of the remnants, calculate particle acceleration spectra, and compute the multi-wavelength emission with particular focus on GeV and TeV bands. Comparing these to Fermi and other observations can help us to (1) verify and understand the structure, dynamics and kinematics of the SN shock wave (2) delineate the process (hadronic or leptonic or both) that leads to the emission of gamma-rays and (3) make progress towards interpretation of the multi-wavelength emission and spectral energy distribution from the remnant.
51092	SHIH	RELATIVISTIC-ELECTRON-DOMINATED SOLAR FLARES	We propose to use Fermi/GBM data to study solar flares where the accelerated electron population has an unusually large component at relativistic energies (>~300 keV). Of particular interest are those flares which appear to be deficient in lower-energy electrons that normally would be responsible for heating of flare plasma. We will analyze GBM s X-ray and gamma-ray data to determine how relativistic-electron-dominated acceleration, and its evolution over the course of a flare, is associated with other aspects of the flare such as the plasma temperature. The proposed effort will first analyze those flares that are readily identifiable as having significant numbers of relativistic electrons, and then will continue by developing tools to systematically search for such flares.
51382	FRUCHTER	THE HIGH ENERGY EMISSION OF LAT GRBS: INTRINSIC OR EXTRINSIC ORIGIN?	Fermi-LAT has found a sample of highly relativistic GRBs, which may be among the most energetic bursts ever discovered. We propose to study the origin of the high energy emission from bright LAT GRBs by combining early and late time broadband data. Using the broadband spectra we will estimate the values of the physical parameters and compare these at early and late times. We will be able to determine whether the origin of the high energy emission in LAT bursts is intrinsic or extrinsic and whether it results from an extraordinary bulk Lorentz factor. In addition, our observations will allow us to calibrate the true energy of the explosion, and in turn put constraints on the true nature of the progenitor.

prop_num	pi_lname	title	abstract
51011	CAPPELLUTI	HALO OCCUPATION DISTRIBUTION OF FERMI-LAT AGN	The goal of the project is to derive for the first time the spatial correlation function of Fermi gamma-ray selected AGN. The clustering signal, that we demonstrate in the proposal to be highly significant, will be interpreted by means of Halo Occupation formalism. The main goal of the proposal is to characterize the environment where Fermi AGN live and grow, to constrain their duty cycle and triggering mechanisms. Our clustering analysis will provide an important view on the physics of active galactic nuclei from z=0 to z~3 and fill a gap in the understanding of AGN and galaxy evolution.
51273	FERRARA	MULTI-WAVELENGTH INVESTIGATION OF WELL-LOCALIZED UNASSOCIATED FERMI-LAT SOURCES	We propose systematic development of broadband spectral energy distributions (SEDs) for the candidate counterparts of all well-localized, unassociated 2FGL Fermi-LAT sources. The SEDs will be constructed from Fermi-LAT, Swift-XRT, and VLA/EVLA (north) or TANAMI (south) radio data in two bands, plus archival data as available. Each SED will be compared against known gamma-ray source types using a figure of merit method to produce a probability that the candidate is the source of the GeV photons. We will classify the Fermi-LAT sources as BLLacs, FSRQs, young pulsars, recycled pulsars, SNRs, or other objects of interest (representing discovery space). Likely diffuse component sources will be compared against the known distribution of Galactic dust and gas to search for spatial correlation.
51008	LYUTIKOV	CRAB PULSAR'S VERY HIGH ENERGY EMISSION DUE TO INVERSE COMPTON PROCESS	The observations of gamma-ray emission from pulsars with Fermi and the detection of the Crab pulsar with VERITAS at energies above 100 GeV make it unlikely that curvature radiation is the main source of photons in Crab and many other pulsars. We propose to investigate a model in which the broad UV-X-ray component and the very high energy gamma-ray emission of pulsars are explained within the SSC framework. The bulk of the observed VHE radiation is generated in the Klein-Nishina regime by the secondary plasma produced in the outer gaps. We will perform semi-analytical radiative transfer modeling taking into account the anisotropic particle distribution and test for various observational implications of the IC model.

prop_num	pi_lname	title	abstract
51174	PIHLSTROM	CHARACTERIZING THE SITES OF COSMIC RAY ACCELERATION	It is commonly accepted that cosmic ray electrons are accelerated by supernova remnants (SNRs), but 99% of the cosmic rays are hadrons for which solid evidence of the accelerator mechanism is lacking. To test whether SNRs also accelerate hadrons accurate estimates of the distance and density is required, measureable using methanol masers. We have demonstrated that 36/44GHz methanol masers are found in SNRs although complete searches for these masers are time consuming due to the small 36/44GHz beams. We propose a Fermi/NRAO GBT project of NH3(3,3) to determine suitable 36/44GHz pointing positons. Our long term goal is to use the methanol masers to determine the ambient gas density and the distance to Fermi-detected SNRs. This is part of a PhD project.
51342	LIANG	TESTING SHEAR FLOW MODELS OF GRBS USING FERMI DATA	We propose a 2-year project to model Fermi GRB spectral data using the radiation output of large-scale particle-in-cell (PIC) simulations of relativistic shear flow boundary layers. The PIC-simulated radiation spectra of shear boundary layers have well-defined signatures which can be used to discriminate between e+e- versus e-ion jets, and also potentially differentiate between shear flow dissipation from shocks and Poynting flux dissipation. This project attacks the fundamental physics of GRB emission from first principles.
51233	LAZZATI	PHOTOSPHERIC EMISSION OF MAGNETIZED AND EXTREME GAMMA-RAY BURST JETS	Photospheric radiation has recently emerged as the best candidate for the GRB prompt radiation mechanism. We propose to perform analytical and numerical investigations to further understand the properties of GRB photospheres. We will focus on making our simulations more realistic by exploring variable central engines, extreme GRBs, and magnetized jets. We will also develop analytical models to investigate the origin of the non-thermal radiation at frequencies far from the thermal peak, such as the optical and GeV bands. This research will provide fundamental tools to help in the identification of the GRB prompt radiation mechanism.
51324	CHU	COSMIC RAY ACCELERATION IN THE MAGELLANIC CLOUDS	The LMC and SMC are the only galaxies, besides the Milky Way, that are well-resolved by Fermi, and thus they provide a unique laboratory to study the generation and diffusion of cosmic rays (CRs). We propose to (1) use the star formation history, resolved in space and time, to assess the supernova energy inputs and CR acceleration efficiency, and (2) compare the gamma-ray emission with the interstellar structure to assess the CR diffusion length. In Fermi Cycle 4, we were awarded funds to study the LMC. In this Cycle, we propose to extend our work to the SMC and compare the LMC and SMC to better establish the generality of the CR generation and diffusion mechanisms.

prop_num	pi_lname	title	abstract
		Large Projects approved for Continuation	
51145	FILIPPENKO	AUTOMATIC PHOTOMETRIC MONITORING OF BRIGHT FERMI AGNS	We propose a large (3-year) program to continue our current 1-year approved project of optically monitoring the 140 brightest LAT-detected blazars accessible to the robotic 0.76-m KAIT. The program will provide high-quality unfiltered light curves on time scales as short as 3 days, with continuous coverage of 9-10 months per year on each source. The dataset will allow many important multiwavelength studies of these AGNs, including correlated variability (gamma/optical/radio) to probe the physics of the jets, as well as triggers of multiwavelength studies. For BL Lac objects with unknown redshift, optical spectra will be triggered during unusual low states, to search for lines. As a service to the Fermi AGN community, we will make the AGN light curves publicly available in real time.
51029	MARSCHER	CONTINUED COMPREHENSIVE MONITORING OF GAMMA-RAY BRIGHT BLAZARS	The investigators propose to continue their highly productive multi-waveband monitoring of 35 gamma-ray and radio bright active galactic nuclei. The observational program includes (1) monthly total and polarized intensity VLBA images at 43 GHz (angular resolution = 0.1 milliarcsec), (2) optical/near-IR photometry and polarimetry, (3) 0.1-300 GeV light curves and spectra, (4) total intensity imaging twice per year with a global VLBI array (resolution = 0.05 milliarcsec), and (5) X-ray flux/spectral index measurements. The flux and polarization light curves will be cross-correlated to determine relationships and physics of emission at the different wavebands. The relative timing of flares and appearance of superluminal knots or core brightening locates the site of gamma-ray emission.

prop_num	pi_lname	title	abstract
51090	BARTHELMY	GCN: ENABLING REAL-TIME GRB & TRANSIENT RESEARCH	GCN is proposing (progress report) for 2 more years of operations on the original 3-yr proposal (i.e. the first year has been completed). GCN collects information from all the GRB- and transient-discovering missions (in real time) and distributes that information to a large customer list that then make follow-up observations. Fermi is one of those missions, along with Swift INTEGRAL, MAXI, and AGILE. A large variety of methods have been developed to distribute that information (to accommodate the needs of the customers). Six of the 10 deliverables were accomplished in year 1; 4 more are left for this coming year and the next year. The main improvement (deliverable) will activating the VOEvent broker/server on a machine outside the Goddard firewall.
51195	READHEAD	FLUX DENSITY AND POLARIMETRY MONITORING OF ~1550 BLAZARS AT 15 GHZ WITH THE OVRO 40 METER TELESCOPE FOR FERMI-GST	Continuation of our twice-weekly 15 GHz flux monitoring, now augmented with polarimetry, of ~1550 objects on the OVRO 40 M Telescope - in number, cadence, and sensitivity the most intensive ever blazar monitoring campaign. It is extremely important that this program be continued: increasing the overlap with Fermi-GST greatly increases the significance and value of cross-correlation analyses. Our large sample and rigorous statistical analysis determines the physical significance of any apparently correlated activity in these two energy bands and hence will determine if gamma-ray activity precedes, follows, or is simultaneous with radio frequency activity, and hence the location of the gamma-ray emitting regions. The OVRO data (2008-2010) are being widely used, especially in Fermi papers.
51190	BRIGGS	TERRESTRIAL GAMMA-RAY FLASH (TGF) OBSERVATIONS WITH GBM ON THE FERMI OBSERVATORY	Terrestrial Gamma-Ray Flashes (TGFs) are brief (~ms), intense, single or multiple pulses of very energetic gamma-rays associated with thunderstorms and lightning. Some TGFs are observed as electrons and positrons. GBM has already discovered new features of TGFs, such as strong positron annihilation lines in some TGFs and that pulses are either symmetrical or have faster rise times than fall times. We will continue this research with spectral analyses of both gamma-ray and electron/positron TGFs, comparing the observations to physical models. We will correlate TGFs to their associated lightning strokes, as observed with VLF radio, determining the temporal order of TGFs and lightning, and characteristics of the lightning strokes.