prop_num	pi_lname	title	abstract
41001	BEGELMAN	GAMMA-RAY SIGNATURES OF DISSIPATION IN BLAZAR JETS	Fermi observations, in conjunction with data from other bands, are providing new insights into the properties of relativistic jets in active galaxies, confirming the "blazar sequence" wherein broad-band emission from low-luminosity sources appears to be dominated by higher energy particles than that for more luminous jets. We propose a theoretical investigation to further elucidate the structure of relativistic jets, aimed at explaining this relationship as a result of the very different nature of jet confinement and thus the location of the dissipation region in the two sub-classes. This work will include realistic models for the dissipation of kinetic and magnetic energy of the jet, and will build on results from our successful Fermi Cycle 1 proposals.
41006	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.
41009	HARDING	PROBING THE EMISSION GEOMETRY OF MILLISECOND PULSARS	We plan to study the emission geometry of millisecond pulsars (MSPs) by modeling jointly the gamma-ray and radio light curves(LCs) of this growing population. We will first use geometric models of the radio and gamma-ray LCs and fit the existing data to derive the magnetic inclination, observer angles and the altitude of emission. Using different magnetic field geometries, including retarded vacuum dipole, force-free and pair-starved magnetospheres, may constrain the magnetic field structure at large altitude. Next we will use full radiation models to fit phase-resolved spectra of the brightest MSPs to explore the geometry of acceleration in the magnetosphere. We will use our fits to study the distribution of inclination angles and LC classes as a function of spin parameters.

41010	HURLEY	MAINTAINING THE FERMI GBM IN THE 3RD INTERPLANETARY NETWORK	We propose to continue our successful AO-2-3 efforts to maintain the Fermi Burst Monitor in the 3rd Interplanetary Network of Gamma-Ray Burst detectors. This will 1) assist the Fermi team in understanding and reducing their systematic localization uncertainties, 2) reduce the sizes of the GBM error circles by up to 3 orders of magnitude, 3) facilitate the identification of GRB sources with objects found by ground- and space-based observatories at other wavelengths, 4) reduce the uncertainties in associating some LAT detections of high energy photons with GBM bursts, 5) discover and monitor magnetars, and 6) facilitate searches for non-electromagnetic GRB counterparts, particularly neutrinos and gravitational radiation. We will make our results public as soon as they are available.
41012	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.
41021	ALLER	PROBING GAMMA-RAY-FLARING AGN JETS WITH RADIO BAND LINEAR POLARIZATION	We propose to continue UMRAO multifrequency, cm-band, linear polarization and total flux density monitoring of gamma-ray-flaring AGN, combined with radiative transfer model development, through cycles 4 and 5. This work will allow us to evaluate the role of shocks in producing gamma-ray flares, and to determine jet flow conditions during events exhibiting a shock signature. New program elements are increased sampling of key sources, comparison of optical and cm-band polarization variability, and inclusion of time-retardation in the propagating shock simulations. Combined data and model fitting will identify relations between radio jet conditions and gamma-ray-flare characteristics in a variety of sources and investigate whether a shock or turbulence dominates during specific events.

41028	ROMANI	OPTICAL IMAGING STUDIES OF LAT PULSARS AND BL LACS	We propose an interleaved program of 4m imaging of three LAT source types. Deep i-band images of LAT BL Lacs lacking redshifts will be used to detect the host galaxies, providing distance estimates for these extreme, continuum dominated blazars. This enables population and evolution studies of this key LAT source class. Narrow band Halpha images of LAT pulsars will be searched for bow shock nebula, constraining the pulsar orientation and spin-down. Similar images of pulsar-like unidentified LAT sources can also show bow shocks, confirming the pulsar nature and aiding in direct discovery of LAT pulsations (eg. `blind' detection of a LAT MSP). The program employs tested observational techniques and efficiently uses the telescope time, providing important opportunities for discovery.
41030	CAPPELLUTI	FERMI-LAT STACKING ANALYSIS OF X-RAY SELECTED GALAXY CLUSTERS	LAT did not achieve any detection of gamma-rays from galaxy clusters, yet. The main goal of this proposal is to push the Fermi-LAT sensitivity, by means of stacking, to constrain the gamma-ray emission of galaxy clusters and to study its origin. In particular we are interested in testing CR acceleration from Cosmological shocks and in detecting signature of WIMP from a sample of X-ray selected galaxy clusters.
41036	TAYLOR	EXPLORING THE PARSEC-SCALE ENVIRONMENTS OF FERMI AGN	We propose to carry out a detailed investigation of the polarization properties of gamma-ray loud blazars by conducting multi-frequency polarimetry observations for 25 strongly polarized sources selected from our recent VLBI surveys at 5 GHz. These observations will allow us to image the polarized structure and spectral index of the jets at high angular resolution, and to test if regions of flat or inverted spectrum correspond with strong polarization during times when gamma-ray emission is high. We will also make Faraday rotation measure images to explore the parsec-scale environment of these interesting blazars, yielding information about magnetic field strengths and densities. This research will take advantage of new observing capabilities of the Very Long Baseline Array.
41037	CUI	GAMMA-RAY PRODUCTION IN CYGNUS X-3: A MULTI-WAVELENGTH PERSPECTIVE	Microquasars are, in many ways, similar to AGN and GRBs, which are among the most prominent gamma-ray emitters. The recent detection of Cyg X-3 at GeV gamma-ray energies has lent support for such a comparison. We propose to carry out a comprehensive study of the gamma-ray properties of Cyg X-3 in a multiwavelength context. The Fermi/LAT survey data will be complemented by similar data from all-sky X-ray monitors, as well as by data from pointed observations at radio, infrared, soft X-ray, hard X-ray, and TeV gamma-ray wavelengths during periods of enhanced gamma-ray activities. The results are expected to cast significant light on particle acceleration and gamma-ray production in the source and perhaps in microquasars in general.

41043	BARING	THE IMPACT OF PAIR CREATION ON SPECTRAL TURNOVERS IN FERMI GAMMA-RAY PULSARS	A major portion of the Fermi mission's pulsar legacy has been the identification of exponential maximum energy turnovers in the 1-8 GeV band in most pulsars. This project aims to aid interpretation of these turnovers by exploring opacities due to two-photon pair creation. We will perform a comprehensive study of pair opacities in different magnetospheric locales, to assess geometric and surface temperature constraints on when this mode of pair creation can attenuate pulsar spectra in the super-GeV band. A central focus will be on Fermi pulsars with visible thermal X-ray emission, such as Geminga and PSR J1836+5925, and how pair opacity can be determined as a function of pulse phase, given input from caustic and outer gap pulse profile constraints on the emission geometry.
41046	FALCONE	OBSERVATIONS AND ANALYSIS OF BLAZARS WITH SWIFT AND FERMI: SIMULTANEOUS OPTICAL/X-RAY/GAMMA-RAY SPECTRA AND LIGHTCURVES	This proposal enables long-term multiwavelength coverage on the "sources of interest" that will be monitored by Fermi and publicly released in the form of lightcurves and spectra. We will also obtain contemporaneous Swift data during high states (LAT flux > 1 10-6 ph cm-2 s-1) from these sources or from any other new sources that exceed this threshold, thus triggering Fermi-LAT monitoring campaigns. Continuation of this highly successful effort will provide long-term simultaneous variability studies and enhance the publicly produced data products available on the web. As a Swift team member, the PI will coordinate these observations and work to maximize the science return by providing simultaneous multiwavelength observations that can be publicly accessed, analyzed, and interpreted.
41062	BOETTCHER	A TIME-DEPENDENT LEPTO-HADRONIC BLAZAR MODEL	We propose to develop a self-consistent, time-dependent lepto-hadronic blazar model. Our proposed framework will self-consistently include first- and second-order Fermi acceleration of both leptons and protons through shock and stochastic acceleration, and radiative cooling. In contrast to previous hadronic blazar models, we will use a new semi-analytical representation of photo-hadronic interactions which allows us to include the effects of synchrotron emission from pions and muons before they decay, without the need to invoke time-consuming Monte-Carlo simulations. The resulting code will be used to constrain physical parameters in Fermi-detected blazars through model fitting of broad-band spectral energy distributions and variability.

41068	FINKE	MULTI-ZONE SPECTRAL MODELING OF BLAZARS	With numerous telescopes, a large amount of the electromagnetic spectrum, from radio to gamma-rays, can be observed. This constant coverage is useful for blazar observations, particularly since it extends not just over flaring states, but quiescent ones as well. Quiescent states are a challenge for single-zone spectral modeling, and requires multiple components of blazar jets to be taken into account. We propose to develop a model for emission from blazars which 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.
41070	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.
41079	KUMAR	ORIGIN OF HIGH ENERGY EMISSION FROM GAMMA-RAY BURSTS	We propose to study the process by which high energy gamma-ray radiation is produced in gamma-ray bursts (GRBs). This understanding would shed light on the central engine of GRBs. The plan is to carry out a critical investigation of models for high energy gamma-ray data (>100 MeV) obtained by the Fermi satellite for a number of GRBs. One of the models (suggested by the PI) is that the high energy photons are generated in shock heated circum-stellar medium. Some other models invoke internal shocks or hadronic processes (such as photo-pion or proton synchrotron mechanism) for gamma-ray production. All of these models will be analyzed in detail, and confronted with the Fermi/LAT & GBM data in order to determine the correct mechanism for gamma-ray generation.

41080	RAZZAQUE	MODELING X-RAY TO GAMMA-RAY LIGHT CURVES OF NOVA 2010 IN V407 CYGNI AND FUTURE GAMMA-RAY NOVAE	In the first gamma-ray nova V407 Cyg (2010), discovered by Fermi, we modeled the gamma-ray data as neutral pion-decay radiation or Compton radiation by protons or electrons, respectively, that are accelerated in the shock of the nova shell. A qualitative picture of slowing down of the nova shell in the red-giant wind also broadly explained time evolution of gamma-ray and thermal X-ray emissions. Here, we propose detailed modeling of the multiwavelength (gamma-ray, X-ray and radio) observations of the V407 Cyg (2010) event, and test gamma-ray emission mechanisms. This modeling will also allow us to investigate the gamma-ray detectability of other recurrent nova systems, considering parameters such as the binary separation, masses and accretion rate.
41081	CAMP	MULTIWAVELENGTH SEARCH WITH GBM AND LIGO FOR NS-NS AND NS-BH MERGERS	We propose a multiwavelength analysis with GBM and LIGO, to search for coincident electromagnetic (EM) and gravitational wave (GW) signals from a NS-NS or NS-BH merger. The first direct observation of such an event would constitute revolutionary science, with the EM and GW signals offering complementary scientific views of the merger source. Also, the coincident search will reject background and allow sub-threshold analysis of both the EM and GW signals, and thus enhance the probability of detection. Finally, to facilitate the GBM search, we propose to develop a coherent analysis of sub-threshold coincident events in the GBM detectors. This technique will be of general use to the GBM team in analyzing sub-threshold events for other investigations.
41084	CENKO	UNCOVERING THE OPTICAL AFTERGLOWS OF GBM BURSTS WITH THE PALOMAR TRANSIENT FACTORY	To date, not a single optical afterglow has been identified solely based on a GBM localization. Because the GBM targets a different population of events from Swift (more nearby, more tightly collimated, more short-hard events), the community has likely missed out on a great deal of exciting science. Here we request continued operational support for our recently begun program to promptly identify the optical afterglows of GBM bursts with the multiple automated facilities of the Palomar Transient Factory.

41086	STECKER	NEW STUDIES OF THE INTERGALACTIC BACKGROUND LIGHT	We propose to use observational results from recent deep galaxy surveys to develop an analytical format to fit the galaxy luminosity functions as a function of redshift from the IR to the UV with emphasis on the UV, the range most important for annihilating the multi-GeV gamma-rays observed by Fermi. We will also construct average IR-UV spectral energy distributions for galaxies at various redshifts. We will also utilize the results of ongoing observations by Co-I Malkan. We will then use our intermediate results (galaxy luminosity functions and SEDs) to construct a empirically based model of the intergalactic background light (IBL). From the IBL model we can then determine the gamma-ray opacity as a function of energy and redshift.
41087	BENBOW	JOINT VERITAS-FERMI STUDY OF EXTRAGALACTIC STAR-FORMATION REGIONS	In 2009, MeV-TeV gamma-ray emission was discovered from starburst galaxies. The emission results from the interaction of cosmic rays with interstellar gas, and models include distinguishable hadronic and leptonic contributions. Deeper exposures are required to make robust conclusions regarding the underlying processes, and to strengthen associated conclusions regarding cosmic-ray origin. We propose to double the VERITAS exposure of M82, to combine the updated VHE spectrum with that determined from the ~5 times larger Fermi-LAT exposure, and to model the resulting SED. We will also analyze archival Fermi-LAT data on other starburst galaxies and similar ULIRGs, and will propose VERITAS discovery observations of any new emitters to completely measure their SED from ~200 MeV through ~10 TeV.
41095	HARRISON	BROADBAND CALORIMETRY OF FERMI GRBS	We propose to continue our successful program of multiwavelength observations of Fermi gamma-ray bursts (GRBs) with the primary objectives of 1) identifying long-wavelength counterparts and 2) measuring beaming-corrected energies (burst plus afterglow) of the brightest and most energetic GRBs. Combined with ground-based optical (robotic Palomar 60-inch telescope) and radio (EVLA) observations, we will use Fermi to target the high end of the GRB energy distribution - the recently discovered hyper-energetic (E > 10^52 erg) GRBs. This study will provide us with new insights into the least understood aspect of GRBs -- the central engine -- by constraining the maximum energy available for progenitor models (e.g. magnetars and black holes).

41096	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.
41098	GALANTE	FERMI-VERITAS JOINT OBSERVATION OF RADIO GALAXIES	VERITAS observations of Fermi high-confidence radio galaxies provide crucial constraints to structured jet models. The population of VHE-detected radio galaxies is constantly increasing since the first discovery of gamma-ray emission from M 87, including now also NGC 5128, NGC 1275 and IC 310. Moreover, other radio galaxies are also suggested or confirmed as HE gamma-ray emitters. Correlated studies of the non-thermal emission from radio galaxies have been able to probe the sub-structures of the jet and the core that are expected to be the origin of the gamma-ray emission. We propose a two-years program to perform a high sensitivity and high accuracy Fermi-VERITAS joint observation of radio galaxies in order to investigate the gamma-ray emitting regions and the jet structure.
41128	OMODEI	UNVEILING INTERMEDIATE DURATION TRANSIENTS	The strategies for transient detection in the LAT processing pipeline are optimized for GRBs (< 100 seconds) or for longer duration flares from AGNs (> 1 day). There is no detection algorithm that is designed for time scales between 100 and 10^5 seconds. Yet this is a time domain where interesting phenomena could be found, such as high redshift GRBs. We propose to develop algorithms optimized for detecting intermediate duration transients and will apply these methods to the existing and future LAT data. These algorithms will be implemented in an automated pipeline, which will promptly alert the community in case of findings. We will also investigate modified survey strategies to increase the LAT sensitivity to these time scales, while preserving much of its all-sky monitoring capability.

41131	YUSEF-ZADEH	TIME VARIABILITY ANALYSIS OF THE DIFFUSE GAMMA-RAY AND RADIO EMISSION FROM THE GALACTIC CENTER	There are currently two models to explain the prominent 6.4 keV Fe line emission detected from Galactic center molecular clouds. One model explains the emission due to the impact of low-energy cosmic ray particles with neutral gas. The other is due to the irradiation of molecular clouds from past energetic outbursts of Sgr~A*. Multiple X-ray flares from SgrA* can explain yearly variability of the 6.4 keV line emission. However, there has never been any investigations of the variability of diffuse gamma-ray and radio emission from Galactic center clouds using three years of Fermi and archival radio data. To distinguish between these two models, we propose to analyze the variability of gamma-ray and radio emission and the spatial and spectral correlation of MeV and gamma-ray emission.
41134	FALCONE	SYSTEMATIC SEARCH FOR X-RAY COUNTERPARTS OF FERMI-LAT UNASSOCIATED SOURCES USING SWIFT: NEW BLAZARS, PULSARS, AND MORE	We propose to use Swift to continue the highly successful GI program to search for X-ray and UV/optical counterparts of 261 unassociated Fermi gamma-ray sources, which are likely to be new, exciting sources. We will add 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.
41149	BLANDFORD	"OBSERVING" SIMULATIONS OF RELATIVISTIC JETS	It is proposed to continue a program of performing 3(space)D simulations of general relativistic magnetohydrodynamical jets launched by accreting black holes out to 100,000 gravitational radii. Simple prescriptions will be made for the emissivity and radiative transfer and they will be "observed" from many directions to evaluate the gamma ray, optical (including polarization) and radio emission. The results will first be compared with simple analytic models in order to determine which of them are good representations of the flows they replace. They will then be used to interpret the emerging large database of multi-wavelength, blazar observations.

41162	PE'ER	A NEW ANALYSIS METHOD OF FERMI DATA, AND STUDY SUB-PHOTOSPHERIC DISSIPATION	We propose to continue our research (successful Fermi cycles 2 and 3 proposals) on identifying and studying the properties of thermal emission, and its relation to the non-thermal component during the prompt phase of GRBs. Following earlier breakthroughs, we intend this year to address the relative rareness of a photospheric component. We intend to: (1) re-analyze LAT data, in order to search for consistency between the data and a hybrid model, that indicate two separate emission zones; and (2) study the effect of sub-photospheric dissipation, that inevitably leads to broadening of the Planck spectrum. By comparing the numerical results to the observations, we intend to constrain the properties of sub-photospheric dissipation.
41166	MARSCHER	THERMAL EMISSION FROM HOT DUST AS A SOURCE OF SEED PHOTONS FOR PRODUCING GAMMA-RAYS IN BLAZARS	Observational indications that many gamma-ray outbursts in blazars occur parsecs from the black hole require a source of seed photons for inverse Compton scattering other than the accretion disk or emission lines. A suggestion that IR emission from hot dust could be such a source has received support from the investigators' detection of dust emission in the gamma-ray bright quasar 4C21.35. The proposed project uses multi-wavelength polarization and time variability to determine the location of the hot dust in 4C21.35 and to identify and measure the properties of dust in other gamma-ray bright blazars. The derived photon field will then be used in models for the spectral energy distributions and multi-waveband variability of blazars.
41168	KRENNRICH	SEARCH FOR UNIQUE SIGNATURE FROM EBL ABSORPTION	We propose to measure the near/mid-IR intensity of the Extragalactic Background Light (EBL), and to search for a unique EBL absorption signature (1 TeV) in the energy spectra of blazars. This work builds on analysis techniques developed by our group and recent findings of several hard spectrum TeV blazars, that substantially increase the chances of finding such absorption feature. We propose deep exposures of four hard spectrum TeV blazars with VERITAS.
41172	JORSTAD	EXPLORATION OF GAMMA-RAY BLAZARS ACROSS THE ELECTROMAGNETIC SPECTRUM	We propose to perform four 2-week campaigns over the period Autumn 2011 - Spring 2013 of multiwaveband observations of a sample of gamma-ray blazars. The campaigns will involve: (1) gamma-ray light curves constructed using the Fermi LAT data, (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, Swift, and RXTE; (6) mid-IR (5-26 microns) band measurements with the IRTF. The research aims to study variability of flux, polarization, and spectral index at different wavelengths and at different states of gamma-ray and radio jet activity to explore mechanisms of high energy production and locations of gamma-ray emission regions in blazars.

41177	WEINSTEIN	CORRELATED ANALYSIS OF GAMMA-RAY EMISSION NEAR G78.2+2.1	Particle acceleration in supernova remnant (SNR) shocks has long been favored as a mechanism for producing Galactic cosmic rays with energies below 10^15 eV. The secondary production of gamma-ray emission by these particles provides a key tool for imaging potential acceleration sites. Detection of GeV (1FGL J2020.0+4040) and TeV (VER J2019+407) gamma-ray emission overlapping the radio shell of SNR G78+2.1 may add this remnant to the still-select group of GeV-TeV gamma-ray SNR. We propose a broadband energy-dependent morphology study of all gamma-ray emission seen near G78.2+2.1 in order to disentangle emission from the remnant from that produced by other sources in the field.
41179	WILLIAMS	OBSERVATIONS ABOVE 100 GEV OF GAMMA-RAY BURSTS DETECTED BY FERMI	We propose to conduct follow-up observations with VERITAS at very high energy (VHE; >100 GeV) of GRBs detected by Fermi, to analyze the resulting data, and to engage in other activities to support the observations. Many afterglow emission models show the SEDs of GRBs to be similar to those of blazars and predict an inverse Compton component with luminosity comparable to the synchrotron component, extending to VHE energies. Yet this component has eluded definitive detection. Results from Fermi reinforce the evidence from EGRET of delayed high-energy emission from some bursts, motivating a search for such emission at the still higher energies accessible to VERITAS.
41183	RAY	LONG-TERM GAMMA-RAY PULSAR TIMING WITH FERMI	Pulsar timing yields the rotational parameters and arcsecond position determinations, allows us to study the glitch and timing noise behavior, and enables phase-resolved gamma-ray spectroscopy and PWN/confused source studies. We propose to extend our program of precise pulsar timing of pulsars detected by the Fermi LAT to include both pulsars found in blind LAT searches as well as radio pulsars that can be accurately timed with the LAT. Our two-year program will include algorithmic improvements and regular distribution of timing models to the community via a public web site.

41184	O'NEILL	THE COMPOSITION OF GAMMA-RAY BURST OUTFLOWS	While the collapsar origin of long-duration gamma-ray bursts is observationally well-established, the composition of the GRB jet remains unknown, making it difficult to unambiguously interpret Fermi observations of the prompt gamma-ray emission. An essential ingredient to understanding the emission mechanism is to know the degree to which the jet energy remains magnetically dominated as the flow exits the progenitor star. Numerical studies of this process thus far have either been restricted to two spatial dimensions or have neglected baryonic mixing. We therefore propose to use the numerical code Athena to conduct fully three-dimensional, relativistic, magnetohydrodynamic jet simulations to explore how the flow composition evolves as the gamma-ray burst develops.
41195	KOVALEV	2FGL ACTIVE GALACTIC NUCLEI AT PARSEC SCALES	We propose to perform a 48 hours long VLBA+GBT survey of all 2FGL associations north of -30deg declination which were never observed before with VLBI. This proposal is a follow-up of our highly successful cycle 3 VLBI study of radio weak 1FGL associations where we had almost 100% detection rate. We will collect parsec-scale information for all the 2FGL AGN associations down to 2 mJy. The proposed observations will eliminate the current VLBI sample bias towards strongest radio cores in Fermi AGNs. It will allow robust analysis of gamma-ray / parsec-scale radio properties of the two main Fermi AGN populations, the flat-spectrum radio quasars and BL Lac objects, and constrain their emission models.
41196	SMITH	PROBING STERILE NEUTRINO DARK MATTER WITH THE GBM	We will utilize 3 years of Fermi-GBM data to search for line emission from the Milky Way halo. Observation of keV lines could provide a dramatic indirect detection of sterile neutrinos, while a non-detection will provide the strongest constraints to date on this dark matter candidate. Key to the success of this endeavor is the large photon statistics and low energy threshold available from the GBM.
41198	TANAKA	DISENTANGLING EMISSION MECHANISMS OF GAMMA-RAY EMISSION FROM THE SUPERNOVA REMNANT W44	The origin of cosmic rays has been one of the major problems in the field of astrophysics. It is widely believed that supernova remnants (SNRs) are the major production sites of Galactic cosmic rays. However, there is no clear evidence of proton acceleration in SNRs even after 1st-year Fermi-LAT results on several SNRs were published. In this proposal, we aim to identify proton acceleration by analyzing LAT data of SNR W44, which is the brightest in the GeV energy band. A key is to construct sufficiently good Galactic diffuse background model for the region. Additionally, we will study and test the "crushed cloud model", which was recently proposed to account for emission from the GeV-bright SNRs, by analyzing radio and infrared data of SNR W44.

41200	CAMILO	RADIO TIMING OF KEY FERMI 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 mainly Green Bank Telescope observations to obtain timing solutions for 16 millisecond pulsars that our group has recently discovered in LAT unidentified sources, thereby making a very substantial contribution to the study of this newly identified important class of Galactic gamma-ray sources.
41204	GEORGANOPOULOS	LOCATING THE BLAZAR EMISSION SITE WITH FERMI VARIABILITY STUDIES	This proposal addresses the following debate: is the GeV emission produced inside the sub-pc broad line region (BLR) or further out at scales ~10 pc, similar to the size of the dusty torus? In the first case, the GeV emission, which is external Compton emission off the UV BLR photons, takes place at the onset of the Klein Nishina regime, resulting in achromatic GeV variability. In the second case the seed photons are the IR dust photons and the scattering is in the Thomson regime, resulting to energy-dependent GeV variability. We propose to analyze all existing and future (within the proposal duration) flares with adequate photon statistics. Our goal is to unveil the proportion of near and far flares, as well as any yet unknown connections between flare location and source physics.
41212	ZHANG	CONTRIBUTION TO EXTRAGALACTIC DIFFUSE GAMMA-RAY BACKGROUND BY PAIR ECHOES FROM OFF-BEAM TEV BLAZARS	We propose to develop a new model for the extragalactic diffuse gamma-ray background detected by Fermi LAT. TeV blazars interact with the cosmic infrared background light and produce electron-positron pairs. The pairs upscatter the cosmic microwave background (CMB) radiation and produce "pair echo" emission which contribute to the diffuse background. If the intergalactic magnetic fields are strong enough, each blazar would have a near isotropic pair echo halo, and the off beam blazars would contribute significantly to the observed diffuse background. We propose to calculate this background through a Monte Carlo simulation by incorporating luminosity function, spectral shape distribution, and redshift distribution of the entire off-beam blazar population.

41213	GEHRELS	TANAMI: RADIO MONITORING OF SOUTHERN HEMISPHERE FERMI AGN	The TANAMI (Tracking AGN with Austral Milliarcsecond Interferometry) and associated programs provide the the ONLY comprehensive radio monitoring of Fermi-detected AGN for the southern third of the sky. As the only means to directly determine many intrinsic jet parameters and the techinque that sets the tightest constraints on the location of gamma-ray emission regions, these radio data are playing an indispensable role in deciphering the fundamental astrophysical riddles posed by gamma-ray loud AGN. Thus TANAMI observations are crucial to the realization of the science goals of Fermi/LAT. We request support for the US portion of this vital US-lead international program.
41219	WEHRLE	AN EXTRAORDINARY FLARE IN QUASAR 3C454.3	We propose to analyze multiwavelength data and model SEDs of 3C454.3 during its extraordinary November 2010-January 2011 flare. We obtained TOO Herschel observations at five submillimeter and far-infrared bands. We will combine Fermi LAT , Swift, Herschel , SMA, optical polarimetry, optical and near-infrared photometry, and other ground based data. This dataset's wavelength and time coverage is unprecedented: we have over two dozen complete SEDs during a major flare. Multiwavelength light curve analysis and modeling will enable us to quantify time-dependent relationships between synchrotron-emitting charged particle distributions, internal and external seed photons, the inverse-Compton gamma-ray emission, and jet physical conditions as the flare evolved.
41221	ERRANDO	FERMI POINTED OBSERVATIONS AND MULTIWAVELENGTH COVERAGE OF THE QUASARS 3C 279 AND 4C 21.35 DURING GAMMA RAY FLARES	We propose target of opportunity Fermi-LAT pointed observations of 3C 279 and 4C 21.35 during extraordinary gamma ray flares. These are the only known very high energy emitting (VHE, E>100GeV) quasars visible from the northern hemisphere. The trigger condition is F(E>1GeV)>3.5E-7cm-2s-1. The campaign involves infrared and optical oservatories, Fermi, VERITAS and MAGIC. Previous VHE detections of 3C 279 and 4C 21.35 challenge standard leptonic emission scenarios and unexpectedly prove sub-hour flux variability in flat spectrum radio quasars. New observations of flaring quasars with a better multiwavelength coverage and increased Fermi exposure will help to understand the emission mechanism, and the location and size of the gamma ray emission region.

41222	BECKER	MODELING THE FLARING CRAB	One of the most exciting recent results from the Fermi LAT and AGILE is the discovery of flares from the Crab nebula in the photon energy range between several hundred MeV and ~ 1 GeV. The duration and luminosity of these flares imply that the flaring gamma-ray emission is produced in confined regions near the Crab pulsar's wind termination shock. We propose to model the Crab pulsar nebula and its flares analytically, by solving the transport equation with particle acceleration and losses, and numerically, by varying the outflow Lorentz factor or magnetic field at the termination shock.
41225	CASE	INVESTIGATING THE HARD X-RAY/LOW-ENERGY GAMMA RAY BEHAVIOR OF GALACTIC BLACK HOLES WITH GBM	Black holes in binary systems are known to be variable on timescales from milliseconds to years. Some black hole systems are active for long periods of time, while some are normally quiescent but undergo outbursts. Long term monitoring in the hard X-ray and low energy gamma-ray energy range is necessary to observe the outbursts and/or state transitions of these systems. With its 8 keV to 40 MeV energy range and nearly all-sky coverage, GBM is ideally suited for these observations. We propose to use GBM with the Earth occultation technique and timing analysis techniques developed for pulsar monitoring to investigate the spectral and temporal behavior of galactic black holes using observations of previous outbursts and/or state transitions as well as any new outbursts occurring in Cycle 4.
41227	GUIRIEC	IDENTIFICATION AND INTERPRETATION OF THE MULTI COMPONENTS OBSERVED IN PROMPT EMISSION SPECTRA OF FERMI GRBS	Fermi offers a broad sensitive energy range for spectral analysis of GRBs. With GBM and joint GBM-LAT spectral fits, we are finding deviations to traditional empirical functional fits. We propose to fit multi-component functions to Fermi GRB spectra and study the evolution of the components over the duration of the burst. We have already associated one of these components with the black body emission anticipated in the standard fireball model. By studying the evolution of all components, we expect to uncover the physical meaning of the empirical functions associated with the non-thermal emission of GRBs. We will use simulations and joint fits of these GRBs with Swift BAT and Konus-Wind data to validate our results.

41232	MCSWAIN	MULTIWAVELENGTH OBSERVATIONS OF GAMMA-RAY BINARY CANDIDATES	In 2.5 years of operation, Fermi has detected hundreds of unidentified GeV sources in the Galactic plane, but only a handful have been correlated with X-ray or optical counterparts. Several of these are high mass X-ray binaries that also exhibit MeV, GeV, and/or TeV emission, leading to a new class of gamma-ray binaries. Most of the known gamma-ray binaries are Be star systems. We have identified two new Be stars that may be associated with GeV point sources in the Fermi Year 1 Point Source Catalog. Here we propose a multiwavelength investigation to study the X-ray counterparts of these sources using XMM-Newton. We will also perform an optical spectroscopic study to search for binary orbital periods and study the radiation field and mass loss properties of the optical stars.
41244	RACUSIN	NEW INSIGHT INTO FERMI-LAT GRBS FROM SWIFT FOLLOW-UP OBSERVATIONS	The small sample of extremely energetic Fermi-LAT detected GRBs with spectral coverage up to 300 GeV are providing new and exciting clues into GRB emission mechanisms. However, the origin and context of these observations remains a mystery largely because of a lack of early-time broadband simultaneous observations. We propose to continue Swift follow-up observations of all LAT detected bursts with accurate position determinations. We plan to use these observations to study the extended GeV emission that is often attributed to an afterglow. On longer timescales, we will study the afterglows of LAT bursts, and constrain the energy budgets of the extreme LAT bursts with late-time multi-wavelength observations.
41245	VAN DER HORST	THE SPECTRAL EXTREMES OF THE EXTREME: CORRELATED GAMMA-RADIO STUDIES OF HIGH-ENERGY TRANSIENTS	We propose to use the Fermi Gamma-ray Burst Monitor (GBM) in combination with the all-sky low-frequency radio telescope LOFAR to study the joint behavior of extreme high-energy transients, in particular gamma-ray bursts and magnetars. With the very wide fields of view of both LOFAR and GBM, and the extreme pointing agility of LOFAR, we can catch even fast transients simultaneously at both ends of the electromagnetic spectrum, greatly enhancing our chances of unraveling the physics of these fleeting, enigmatic sources.

41246	ENOTO	INVESTIGATION INTO GAMMA RAYS FROM MOLECULAR CLOUDS AS TRACERS FOR GALACTIC COSMIC-RAY ACCELERATORS	We propose an investigation into molecular clouds in the gamma-ray band along the galactic plane as tracers for Galactic cosmic-ray accelerators. We search, as a first step, the unidentified Fermi sources for candidates associated with the molecular clouds using the high-resolution survey data of the NANTEN Submillimeter Observatory. As a next step, we compare the morphologies of the radio and gamma-ray images, utilizing an image restoration technique developed by our team, to compensate for effects of the point spread function of Fermi. Based on the morphology and mass of the molecular clouds, we estimate the local energy density of the cosmic rays, and further discuss a variety of the cosmic-ray accelerators along the Galactic plane.
41248	BUEHLER	A SYSTEMATIC STUDY OF THE VARIABLE GAMMA-RAY SKY	We propose to study systematically the variability of the gamma-ray sky. We propose to apply an innovative and powerful method based on the prediction of the average flux of any position in the sky. We will address several scientific questions, focusing in particular on the detection of gamma-ray transients in the Galactic plane. We will create an automated analysis pipeline that will search for flaring or fading sources in real time. The results will be made publicly available. For the most interesting transients we will perform immediate follow up observations with the GROND and Swift telescopes to determine the nature of the source.
41259	MAJID	A MULTI-WAVELENGTH CAMPAIGN TO STUDY CRAB GIANT PULSES	We plan to carry out a correlative analysis of a large sample of Crab Giant Pulses (GPs) obtained at multiple radio wavelengths with Fermi photons from the Crab pulsar. To constrain the GP emission mechanism and test the model of Lyutikov (2007) for GP emission, we will carry out a campaign of simultaneous observations of the Crab pulsar at gamma-ray using Fermi survey mode data and radio wavelengths using a large DSN antenna with the capability to observe simultaneously in multiple radio bands. We expect at least 200 Fermi photons to coincide with a GP detection in radio, allowing us to either confirm a correlation in average gamma-ray pulsed flux increase with GP emission or place a tight upper limit, at least a factor 10 more constraining than previous work.

41262	KELLY	STOCHASTIC MODELING OF FERMI LIGHTCURVES OF AGN: DEVELOPING NOVEL METHODS FOR TIME SERIES ANALYSIS OF COUNT DATA	We propose to develop new statistical methods for characterizing the variability of Fermi/LAT lightcurves of blazars. Our method will provide unbiased estimates of variability parameters, such as characteristic time scales and amplitude of variability, directly from the Fermi/LAT counts. The method will also provide a quantitative definition and identification of flares in Fermi/LAT lightcurves. New methods are needed because current commonly used methods, such as the periodogram and structure function, perform poorly on all but the best sampled lightcurves. We will develop a MCMC sampler to contribute to the Fermi data analysis package. We will apply our method to Fermi/LAT lightcurves of blazars to probe the physics of these jets and the location of the gamma-ray emitting region.
41264	RANSOM	SEARCHING FOR MORE RADIO MILLISECOND PULSARS IN FERMI UNASSOCIATED SOURCES	Fermi is revolutionizing our understanding of the GeV sky as well as how we find radio millisecond pulsars (MSPs). In the past 16 months the "Pulsar Search Consortium" of radio astronomers and LAT team members has discovered 31 new MSPs (24 by our group, including 19 at the GBT) in Fermi unassociated sources! We aim to continue this amazing pace of MSP discovery using the GBT. With two years of data, there are now several dozen new pulsar-like high Galactic latitude sources to search. In addition, we will re-search approximately 10 bright and very pulsar-like sources in case eclipses or unfortunate 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.
41266	RANSOM	FERMI@HOME: BLIND SEARCHES FOR NEW PULSARS VIA DISTRIBUTED COMPUTING	Fermi's amazing sensitivity has enabled it to uncover 25 new pulsars via blind gamma-rays searches. Most of these are radio-quiet and constrain the population of active pulsars in the Galaxy and the pulsar emission process. These searches have already found all the "easy" pulsars, though, so to find more we need to do something different. We propose a volunteer computing effort called Fermi@Home to coherently search for new gamma-ray pulsars. This program will educate and excite the public about gamma-ray astronomy and allow them to participate in the scientific process. By targeting sources already deeply searched in the radio and in gamma-rays using traditional techniques, we will likely uncover new pulsars (and possibly millisecond pulsars) impossible to find in any other way.

41267	FINGER	STUDIES OF ACCRETING BINARY PULSARS WITH THE FERMI GAMMA-RAY BURST MONITOR	In cycles 1 - 3 we have established a program for monitoring accreting pulsars using the Gamma-Ray Burst Monitor on Fermi. We are currently monitoring the full sky daily for pulsars with spin frequencies in the 1 mHz to 2 Hz range using a blind pulse search for discovering previously unknown or quiescent pulsars, and making source specific analyses for tracking the evolving pulse frequency of all detected pulsars. Quick-look results are plotted on our website and available for use by the community, and refined long-term histories of pulse profile, pulsed flux, and frequency will be archived. We propose in cycle 4 to continue this monitoring of accreting pulsars, make sensitivity improvements, and study the currently active transient pulsar XTE J1946-274.
41270	LINARES	THE GBM ALL-SKY X-RAY BURST MONITOR	The Fermi Gamma-ray burst monitor (GBM) has made possible a tenacious hunt for rare, short-lived and highly energetic bursts. Among these are two special kinds of thermonuclear explosions on accreting neutron stars: long duration bursts and superbursts. While thousands of normal duration type I X-ray bursts have been observed in the last three decades, only about a dozen each superbursts and long bursts have been detected to date. We have set up a Fermi-GBM all-sky search for X-ray bursts, in a coordinated effort between MIT and NSSTC. In only 10 months this has yielded a total of 441 X-ray burst candidates, and at least 10 long duration thermonuclear bursts. We hereby request funds to refine the ongoing search, extend our analysis and compile a GBM X-ray burst catalog.
41272	KOCEVSKI	TIME RESOLVED SPECTROSCOPY OF GAMMA-RAY BURSTS	We propose to focus on the time resolved spectral analysis of prompt gamma-ray burst (GRB) emission detected by the GBM on board the Fermi spacecraft. There have now been over 70 GRB simultaneously detected by both the Swift and Fermi spacecrafts, with roughly half this number having known redshifts. This combination of a broad energy window to perform spectral evolution studies and a frowning sample of events with known redshift will represent a unique parameter set in GRB astronomy allowing for several new avenues of research. We propose to concentrate our analysis on quantifying the evolution of GRB spectral parameters and how this evolution is related to a burst s source frame quantities such as the peak luminosity, total emitted energy Eiso, and source frame Epk.

41274	ERRANDO	USING FERMI-LAT TO SELECT VARIABLE AND UNIDENTIFIED TEV SOURCE CANDIDATES	The study of the highest energy photons (E>30GeV) collected by Fermi-LAT has provided critical guidance to ground-based gamma ray telescopes. A number of new TeV sources have been detected, and searches for more are ongoing. Fermi-LAT data also reveal a number of hard spectrum sources which are not obviously identified with counterparts at other wavelengths, and whose emission may extend into the very high energy regime (VHE, E>100GeV) regime. We propose to analyze the Fermi data at energies E>1GeV and use our independent all sky monitoring at these energies to select TeV source candidates, and observe these sources over a range of wavelengths, including TeV observations with VERITAS and optical spectroscopy with MDM.
41285	COHEN	FERMI LAT TOO ON A FLARE FROM THE CRAB NEBULA	The Fermi and AGILE satellites recently detected gamma-ray flares of the synchrotron component of the Crab Nebula. The brief, high energy flares challenge particle acceleration models of the pulsar powered wind nebula. A major result of the Fermi-LAT study is that the energies of the nebular electrons must be >1 PeV, implying that the flare resulted from the highest energy particles associated with any distinct astrophysical object. A LAT ToO of the September 2010 flare missed the entirety of the event. We propose to develop a dedicated analysis to promptly detect future Crab flares and to trigger a ToO at the next occurrence of a bright flare. The increased exposure of the ToO will allow the most sensitive spectral and timing studies of the event to probe the outburst producing mechanism.
41287	GOTTHELF	OPTIMIZED TIMING SEARCHES FOR GAMMA-RAY PULSARS USING NEW TECHNOLOGY	We propose a new approach to mining the Fermi 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 already achieved 2 order-of-magnitude acceleration in these computations as applied to X-ray pulsar searches and are eager to bring this new technology to Fermi. We will use several tests for periodicity appropriate for gamma-ray signals, including the H-test statistic, the most sensitive for unknown pulse profiles, to discover fainter pulsars missed by previous searches using less sensitive methods. Fully exploring the pulsar discovery space will further the scientific returns of Fermi.

41288	FERRARA	MULTI-WAVELENGTH INVESTIGATION OF HIGH-SIGNIFICANCE UNASSOCIATED FERMI-LAT SOURCES	We propose development of broadband spectral energy distributions for the candidate counterparts of all 1FGL high-significance unassociated Fermi-LAT sources. The SEDs will be constructed from Fermi-LAT, Swift-XRT, Swift-UVOT, and VLA (north) or TANAMI (south) radio data in two bands, plus archival data as available. Each SED will then be compared against known gamma-ray source types using a figure of merit methodology to produce a probability that the candidate is the source of the GeV photons. We will classify the Fermi-LAT sources as likely blazers, pulsars, diffuse components, or other objects of interest (which represent discovery space). Likely diffuse component sources will be compared against the known distribution of Galactic dust and gas to search for spatial correlations.
41289	DE NOLFO	CONSTRAINING THE SOURCES AND ACCELERATION PROCESSES OF SOLAR ENERGETIC PARTICLES	We propose to use FERMI gamma-ray observations of solar flares together with the Payload for Antimatter Matter Exploration and Light-nuclei Astrophysics (PAMELA) and ground-based neutron/muon monitor data to analyze the radiative signature of flare particles, their deduced accelerated ion characteristics, and the spectrum, composition, and timing of solar energetic particles (SEPs) with the objective of determining whether solar flare ions and SEPs come from the same acceleration source. FERMI gamma-ray observations, in addition to novel and detailed observations of high-energy SEPs, bring new and unique insight that will significantly constrain the origins and acceleration of solar energetic particles.
41295	GROVE	FERMI LAT OBSERVATIONS OF TERRESTRIAL GAMMA-RAY FLASHES OVER THUNDERSTORM REGIONS	We propose to measure 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.
41299	PETROSIAN	DISTRIBUTION AND EVOLUTION OF BLAZAR LUMINOSITY AND SPECTRUM AND THE GAMMA-RAY BACKGROUND RADIATION	We propose analysis of the large number of Blazars (or AGNs) detected by Fermi-LAT with the aim of obtaining the distribution and cosmological evolution of the characteristics describing their emission, such as luminosity and spectral index, using the non-parametric methods developed by Efron and Petrosian, which start first by determination of the correlations between the different characteristics (and with redshift), and can take proper accounting of complex detection selection biases. Most previous such investigations ignore this step which is essential for an accurate determining of unbiased distribution and evolution. Our results can shed light on the physics of AGNs and on the origin of the Extragalactic Gamma-ray Background.

41300	SLANE	FERMI CONSTRAINTS ON PARTICLE SPECTRA IN PULSAR WIND NEBULAE	Recent observations of PWNe have uncovered fundamentally new insights into their structure and evolution. An outstanding problem remains troublesome - the nature of the lowest-energy particles. These particles appear to provide signatures of complex injection spectra as well as the effects of compression by the SNR reverse shock in the late phases of evolution. These particles produce unique signatures in the gamma-ray band, as demonstrated by recent studies of Vela X and HESS J1640-465. Here we propose a study of three composite SNRs for which PWN interaction with the reverse shock is evident, and for which Fermi emission is detected. Through modeling of their broadband emission, we will investigate their evolutionary histories and the content of their underlying particle populations.
41304	BOETTCHER	PIC SIMULATIONS OF MAGNETIC-FIELD GENERATION AND PARTICLE ACCELERATION IN TWO-COMPONENT JETS	In a current Cycle 3 Fermi GI project, we are carrying out 2D PIC simulations of the Kelvin-Helmholtz-like instabilities developing at the jet-spine interface of relativistic jets with a highly relativistic inner jet (spine) surrounded by a mildly-relativistic outer jet. Our results demonstrate that such instabilities can sustain near equipartition magnetic fields and result in anisotropic, relativistic particle distributions. These results may solve the long-standing Doppler factor crisis in AGN jets. We here propose to continue this project in Cycles 4 and 5 by extending our simulations to 3D and to initially magnetized flows, explore the effects of rotational shear, and embark on analytical studies of particle acceleration at relativistic shear flows.
41305	GIANNIOS	INTERPRETING THE FERMI-LAT EMISSION FROM GAMMA-RAY BURSTS	Since its launch, the Fermi mission has detected a unique sample of around 20 gamma-ray bursts with combined emission at the energy range covered by both GBM and LAT. At GeV energies, this emission likely contains contributions from both the `prompt' mechanism result of internal dissipation in the jet, as well as from the forward shock produced by the interaction of the jet with the circumburst medium. In order to maximize the science from Fermi observations of GRBs, we propose to disentangle the two components by modeling in detail both the prompt emission and the early afterglow interactions. The study will contribute to our knowledge of several poorly-understood aspects of GRB physics, such as the prompt emission mechanism, the bulk Lorentz factor of the outflow, and its magnetization.

41309	PROFUMO	IDENTIFYING THE NATURE OF THE GALACTIC CENTER GAMMA RAY SOURCE 1FGL J1745.6-2900	We propose a study aimed at identifying the nature of the Fermi-LAT Galactic Center (GC) gamma-ray source 1FGL J1745.6-2900. Our research plan consists of three subsequent research tasks: (I) a detailed spectral and time-variability study of the Fermi-LAT data, (II) a spectral, spatial and time-variability cross-correlation with data from other wavelengths, including radio, X-ray, soft gamma-ray and very high-energy gamma-ray energies, and (III) a theoretical modeling of the gamma-ray spectrum and of the multi-wavelength spectral energy distribution of the GC source, of nearby sources and of the relevant diffuse emission. Recent claims on a signal from dark matter annihilation from the GC region make this study especially timely.
41310	HAYASHIDA	DETERMINING THE ORIGIN OF GAMMA-RAY EMISSION FROM GALAXIES	Fermi-LAT has established non-blazar galaxies as luminous gamma-ray sources, including AGN with jets oriented off their viewing axis as well as starburst galaxies. A key issue is now to characterize the origin of gamma-ray emission from various galaxy types and estimate their respective contributions to the extragalactic gamma-ray background. We propose to systematically search in Fermi-LAT data for gamma-ray emission from non-blazar galaxies selected from the Swift-BAT survey: can the gamma-ray emission be accounted for by mis-pointed relativistic jet and/or strong starburst activity, or must we invoke another origin? In addition to using existing radio catalogs, we intend to take advantage of the all-sky AKARI infrared survey, which will permit clear identification of starburst activity.
41317	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 18 targets (with 4 more pending), and began astrometry. In Cycle 4, we propose to conduct 4 epochs of astrometry on 12 sources, with a final set of epochs to be requested in future. When completed, 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.

41318	CHU	COSMIC RAY ACCELERATION IN THE LARGE MAGELLANIC CLOUD	The Fermi LMC map is the first resolved, global, gamma-ray image of a star-forming galaxy, and provides a unique cosmic-ray laboratory . (1) We will use stellar population synthesis to infer the supernova energy inputs of cosmic-ray accelerators in the LMC, resolved in space and time. This history will be compared to 3 years of Fermi LAT observations to estimate the cosmic ray diffusion length and acceleration efficiency. (2) We probe cosmic-ray acceleration in superbubbles and supergiant shells, using diffuse X-rays to trace past supernovae, and HI spatial and velocity information to identify superbubble cavities. (3) We will study the paucity of Fermi gamma rays in the Molecular Ridge, and test whether the dense gas acts as "beam dump," producing the unexplained X-ray Spur.
41322	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 3 such events/year visible with the EVLA, thus request 3 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.
41323	FINKBEINER	FERMI BUBBLES: IMPROVED SPECTRAL AND MORPHOLOGICAL MEASUREMENTS	Our recent analysis of the Fermi LAT maps revealed two large gamma-ray bubbles, extending 50 degrees above and below the Galactic center, with a width of about 40 degrees in longitude (Su et al. 2010). These structures could result from a large-scale accretion event on the central black hole, or a nuclear starburst in the last 10 Myr. They are likely associated with the WMAP microwave excess known as the microwave haze. We propose to refine our previous analysis of the spectrum and morphology of the Fermi bubbles in order to better constrain their physical properties. By understanding the origin and evolution of these structures, we will learn about recent energetic events in the inner Galaxy, which may be connected to important questions in galaxy formation.

41328	NEMMEN	PROBING THE GAMMA-RAYS FROM LOW-LUMINOSITY AGNS WITH FERMI	We propose to model the existing Fermi-LAT observations of the LINERs M87, NGC 6251 and NGC 6951 with ADAF/jet models - using also the available radio-to-X-rays data - with the primary goal of disentangling the contribution of the accretion flow and jet at high energies. We also plan to search for the gamma-ray emission of sample of 14 LINERs to complement their broad-band SEDs. Besides carrying out the ADAF/jet modelling with this extended sample, we will also (i) study the gamma-ray variability which will constrain the size of the emitting region and provide additional constraints on the gamma-ray production site; (ii) seek correlations between observational properties (e.g., gamma-ray luminosity, radio loudness) in order to understand what controls the jet/disk connection.
41329	MOSKALENKO	STUDY OF THE GAMMA-RAY EMISSION FROM SOLAR SYSTEM BODIES	The Sun, planets, asteroids, small rocks, and dust in the solar system are the sources of gamma-ray emission due to the cosmic ray (CR) interactions with their surface. The Sun, the Moon, and the Earth have been detected as individual sources. Smaller bodies are not bright enough to be detected. However, a population of small bodies or dust shines much more brightly than a single body of comparable mass. The detection of these objects provides important information about the dynamical evolution of the solar system. Their emission may constitute a significant proportion of the "extragalactic gamma-ray background". We propose to perform a study of the gamma-ray emission from the ecliptic. We also propose to calculate the CR-induced gamma-ray emission for already observed sources.
41333	CHEVALIER	GAMMA-RAY EMISSION FROM SUPERNOVA REMNANTS IN MOLECULAR CLOUDS	Observations with the Fermi Observatory have shown that supernova remnants interacting with molecular clouds are sources of GeV emission. We will calculate the nonthermal emission from such remnants for a particular interaction model that has observational support: the supernova remnant has entered the radiative phase expanding in the interclump medium of the molecular cloud and the cool shell collides with molecular clumps. The collision with molecular clumps generates a high pressure region that is a potential site of high energy emission. Fermi observations indicate that the Gev emission is related to such interactions.

41337	DERMER	CASCADE GAMMA RAYS FROM SOURCES OF HIGH-ENERGY RADIATION: IMPLICATIONS FOR THE EXTRAGALACTIC BACKGROUND LIGHT	We propose to continue our program of using Fermi observations to study the extragalactic background light (EBL) and its effects. This includes using gamma-ray observations of blazars and GRBs to infer the intensity of the EBL. When TeV gamma rays produce pairs by interacting with EBL photons, the pairs Compton-scatter CMB photons to GeV energies. Upper limits to Fermi fluxes of TeV blazars and the presence or absence of a halo around the TeV source can, depending on EBL intensity, constrain the intergalactic magnetic field (IGMF). These issues are complicated if the sources make ultra-high energy cosmic rays that generate photons during transit. We will model cascade radiation from blazars and GRBs with hard gamma-ray spectra, and consider the effects of cosmic rays on EBL studies.
41338	SPITKOVSKY	MODELING LIGHT CURVES AND SPECTRA FROM PLASMA-FILLED PULSAR MAGNETOSPHERES	Recent modeling of Fermi pulsar light curves using self-consistent force-free magnetospheric geometry, including the backreaction of the plasma, has shown that the characteristic double-peak light curves can be explained by emission from the strong equatorial current sheet that separates field lines from the opposite hemispheres near the light cylinder. We will compare the atlas of light curves from the force-free model with the observations of individual pulsars and study the evolution of magnetospheric shape and light curves with pulsar age by constructing force-free models with finite resistivity along field lines. We will also calculate phase-resolved gamma ray spectra from the resistive current sheets, and thus use Fermi results to infer the physics of magnetospheric currents.
41342	WOOD	SIMULTANEOUS ALL-SKY MONITORING IN GAMMA-RAYS AND OPTICAL USING FERMI AND PAN-STARRS	Fermi LAT brings all-sky monitoring to GeV gamma-rays, with a daily mapping of the entire sky. Beginning 2010, Pan-STARRS1 provides analogous capability in optical wavelengths, repeatedly covering all hours of Right Ascension in the sky north of -30 deg Declination. The sensitivities of the two instruments are comparable. For example the faintest blazars seen by Fermi LAT should have optical counterparts accessible to Pan-STARRS. Realizing this science potential requires building a software connection between these databases. This proposal covers building and testing that bridge and integrating it into the operations of both programs.

41343	MEYER	A NEW VIEW OF THE RELATIVISTIC JET DICHOTOMY WITH FERMI	We propose to utilize Fermi observations of blazars and radio galaxies as part of an ongoing multi-wavelength effort to understand the spectral characteristics of radio-loud AGN as a unified population. Prior to Fermi, the high-energy characteristics of blazars were not well-known outside of a few well-studied samples. Our work has suggested a new unification scheme for blazars and radio galaxies, which we propose to test by careful analysis of the gamma-ray emission of the entire Fermi blazar population, supported by multi-wavelength archival data and new observations. The complete blazar multiwavelength database includes as data on individual blazars as possible, and will be made publicly available at the end of the project.
41345	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.
41350	OTTE	THE GEV-TEV CONNECTION OF THE CRAB PULSAR AND NEBULA	The Crab is one of the best studied astrophysical objects. However, the recent detection of variability in the synchrotron emission above 100 MeV and the detection of pulsed emission from the Crab Pulsar above 25 GeV tell us that our understanding of the Crab is not complete. We propose a unique investigation of the Crab Pulsar and Nebula by combining gamma-ray observations of the Fermi-LAT and the VERITAS array of Cherenkov telescopes. The objectives of this proposal are a) the detection of the Crab Pulsar with VERITAS to investigate particle acceleration in the outer magnetosphere and b) the search for correlated 100 MeV - TeV variability to investigate the dynamics of the particle acceleration in the nebula.

41355	MALKAN	THINGS THAT GO BBBUMP IN THE NIGHT: THE JET-DISK CONNECTION IN AGNS	We will obtain intensive UBVRI/JHK/Gamma-ray light curves of 9 Fermi quasars. They show prominent Big Blue Bumps--thermal emission from their accretion disks (ADs). Since they have z>0.9, optical bands will monitor the peak of the AD, while IR monitors variations in the jet s synchrotron emission at the same time. Each multiwavelength SED will be fitted with jet+AD models, and basic parameters (Mbh, Mdot, compactness, etc) determined. Time histories of these thermal and nonthermal components (correlated or anti-correlated, with a lag?) will tell how power in disk and jet are physically connected. We will infer how accretion power is channeled into jet power, and which component(s) are Comptonized to Gamma-rays.
41361	CORBET	HUNTING FOR NEW GAMMA-RAY BINARIES FROM PERIODIC VARIABILITY IN LAT LIGHT CURVES	We propose to continue a program of hunting for new members of the rare gamma-ray binary class of objects by looking for periodic modulation of LAT light curves. We have already developed techniques for creating "weighted photon" light curves and exposure-weighted power spectra which enable us to obtain high signal-to-noise light curves and search for modulation on a wide range of periods. We will continue to develop our techniques, perform searches on the increasing amount of data available, and perform follow-up investigations of any candidates found.