Work Breakdown Structure

WBS	Task	Description	Responsibility	Manager
4.1.D	**Science Analysis Software**	**The Science Analysis Software comprises several components: (1) Prompt processing of instrument data through to Level 1 event quantitites; (2) Provide near real-time monitoring information to the IOC; (3) Monitor and update instrument calibrations; (4) Create high level science products from Level 1 for the PI team; (5) Reprocessing of instrument data; (6) Provide access to event and photon data for higher level data analysis; (7) Bulk production of Monte Carlo simulations; (8) Interface with mirror PI team site(s) - sharing data and algorithims; (9) Interface with the SSC - sharing data and algorithms.**	**SLAC**	**Dubois**
4.1.D.1	Sources, Simulation and Reconstruction	Particle flux generators provide input to GlastSim. These model the characteristics (origin, energy) of the signal photons as well as background cosmic rays, albedo and heavy nuclei used for calibrations. GlastSim takes input distributions of photons or background particles, follows their path through GLAST and simulates any interactions with the device. The simulation phase outputs "raw data" that is identical in form to real data, but adds Monte Carlo truth to the record. Reconstruction takes the raw data and attempts to recover the initial properties of the incident particle, and to tag it as signal or background.	UW	Burnett
4.1.D.1.1	Sources	Particle flux generators, which are the input to GlastSim.	HEPL/Hiroshima	Fukazawa
4.1.D.1.2	Intial Framework Prototyping	The initial prototype of the GLAST Gaudi code framework. Involves making code packages adhere to the framework and to communicate via data in a transient store, with the abillity to interact with a persistent store.	UW	Burnett
4.1.D.1.3	GISMO	simulation package developed and supported by GLAST to simulate the transport and interactions of particles traversing the instrument, and to record the intrinsic energy deposits in the detector elements.	UW	Burnett
4.1.D.1.3.1	Existing Simulation Upgrade	Modify AO-era code to new infrastructure plus small upgrades	UW	Burnett
4.1.D.1.3.2	New Geometry & Hits Scheme	Modify Gismo to make use of new geometry & "hits" schemes	UW	Burnett
4.1.D.1.3.3	Ongoing Support	Gismo Maintenance	UW	Burnett
4.1.D.1.4	GEANT 4	similar to Gismo, but a separate package supported by a CERN-led consorium.	Italy	Giannitrapani
4.1.D.1.4.1	External Package Requirements	Provide code build capabilities for CMT code management system	SLAC	Lindner
4.1.D.1.4.2	detModel Geometry converter	Use detModel interface to XML geometry description to derive GEANT4 geometry	Italy	Giannitrapani
4.1.D.1.4.3	GEANT4 Prototype	Create prototype simulation with GEANT4, using proper geometry and outputting standard GLAST data structures representing the energy deposit in the LAT.	Italy	Giannitrapani
4.1.D.1.4.4	GEANT4 Validation	Validate basic physics and compare to Gismo, TB99 and BFEM data.	Italy	deAngelis
4.1.D.1.4.5	Ongoing Support	Maintenance and consulting on the use of G4	Italy	deAngelis

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4.1.D.1.5	ACD Simulation	The ACD-specific portions of the simulation and reconstruction in terms of response to traversing particles and corrrelation with found tracks.	GSFC	Kelly
4.1.D.1.5.1	Existing Digitization Upgrade	update digitization to use new structures	GSFC	Kelly
4.1.D.1.5.2	Upgrade for new hits scheme	Modify ACD digitization to accept new "hits" definition and structure	GSFC	Kelly
4.1.D.1.5.3	Ongoing Support	Maintenance and adiabatic upgrades	GSFC	Kelly
4.1.D.1.6	Calorimeter geometry, simulation & reconstruction	The CAL-specific portions of the simulation and reconstruction in terms of response to traversing particles, reconstruction of deposited energy, and corrrelation with found tracks and hit ACD tiles.	NRL/France	Grove/Djannatti-Atai
4.1.D.1.6.1	Geometry	Create and maintain geometry descriptions for engineering models and the flight instrument	NRL	Chekhtman
4.1.D.1.6.2	Simulation	Simulation of the Calorimeter		
4.1.D.1.6.2.1	Initial Version of Simulation	Import existing simulation into new framework + small upgrades	NRL	Chekhtman
4.1.D.1.6.2.2	Simulation Improvements	Programme to include new digitization effects, such as light taper, electronics non-linearities and optical gains.	NRL	Chekhtman
4.1.D.1.6.3	Reconstruction	Calorimeter reconstruction algorithms - determine the deposited energy, estimating leakage. Determine shower directions.	NRL/France	Grove/Djannatti-Atai
4.1.D.1.6.3.1	Initial Version of Reconstruction	Import existing reconstruction into new framework + small upgrades	NRL	Chekhtman
4.1.D.1.6.3.2	Reconstruction Improvements	Implement programme of improvements to algorithm	NRL/France	Grove/Djannatti-Atai
4.1.D.1.6.3.3	Iterative Reconstruction with TKR	Develop iterative recon with TKR, allowing each to use the other for positions and energy estimates.	NRL/France	Grove/Djannatti-Atai
4.1.D.1.6.3.4	Failure modes/perforamce state	Prepare strategies for handling expected failure modes	NRL/France	Grove/Djannatti-Atai
4.1.D.1.7	Tracker geometry, simulation & reconstruction	The TKR-specific portions of the simulation and reconstruction in terms of response to traversing particles, reconstruction of tracks and attempt to combine tracks into gamma candidates	SLAC	Usher
4.1.D.1.7.1	Simulation Improvements	Import existing simulation into new framework + small upgrades	SLAC	Usher
4.1.D.1.7.2	Digitization Improvements	Programme to improve charge sharing and TOT simulation	Italy	Giglietto
4.1.D.1.7.3	Initial Tracker Reconstruction	Import existing reconstruction into new framework + small upgrades	SLAC	Usher
4.1.D.1.7.4	Tracker Reconstruction Resdesign	Rework the pattern recognitiion and fitting	SLAC	Usher
4.1.D.1.8	Trigger Simulation	The flight trigger code, made to run in the offline environment and any analysis that goes with the understanding of the trigger code.	GSFC	Ritz
4.1.D.1.9	Background Rejection	Algorithms, tuned to different science goals, which identify incident particles as background, allowing the remaining interactions to be identified as signal photons.	GSFC	Ritz
4.1.D.1.A	Major Releases of Sim & Recon	Milestones for code releases	SLAC	Dubois
4.1.D.2	Analysis Tools	Tools and infrastructure to facilitate event analysis and give access to the data.	GSFC	Kelly
4.1.D.2.1	Coding conventions	Standard coding rules	SLAC	Bogart

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4.1.D.2.2	Static Constants Handling	These are for non-time dependent constants.	SLAC	Bogart
4.1.D.2.3	Gaudi developments	Infrastructure developments supporting the Gaudi framework	UW	Burnett
4.1.D.2.4	Event Display	Interactive tool to view detector response correlated to the instrument geometry		
4.1.D.2.4.1	GlastSim GUI/graphics	event display contained in sim/recon packages	UW	Burnett
4.1.D.2.4.2	Event Display for All Clients	event display external to sim/recon package. Takes data input from server or sim/recon processes. Acts as client of data.	Italy	Giannitrapani
4.1.D.2.5	Root-to-IDL	Interface for IDL users to access Root output classes directly	GSFC	Kelly
4.1.D.2.6	Merit Improvements	Standard analysis package	UW	Burnett
4.1.D.2.7	New Geometry Mechanism	Ascii file description of the instrument and its required surroundings (eg spacecraft, gondola etc); utilities to extract the information from the input file; interfaces to the simulation packages (eg GEANT4 and Gismo) to create the geometric volumes; interface to the reconstruction to extract needed geometrical quantities.	SLAC	Bogart
4.1.D.2.8	PSF/Effective Area Monitoring and Optimization	An ongoing effort to optimize and track the performance of the instrument through the PSF and effectve area measures.	GSFC	Ritz
4.1.D.2.9	Code & Release Management	Utilities & procedures needed to reliably tag the versions of code that form releases and to validate the performance of those releases.	SLAC	Young
4.1.D.2.A	Continuing tools development	Incremental development and support of analysis tools	GSFC	Not assigned
4.1.D.2.B	Ongoing User Support	Ongoing support of users and code packages	GSFC	Not assigned
4.1.D.3	Engineering Models	These are the tasks that are specific to supporting Engineering Model tests. These are in addition to the GlastSim efforts that provide the base for doing simulations and reconstruction. Specifics include handling the raw data format; setting up the balllon instrument geometry and doing reconstruction in the balloon environment, particularly with the external targets.		
4.1.D.3.1	Test Beam 99 Support	These are the simulation and reconstruction tasks needed in support of the SLAC Test Beam run of 1999-2000.	SLAC	Dubois
4.1.D.3.2	Balloon Flight Support	These are the tasks that are specific to supporting the 2001 Balloon Flight.	SLAC	Dubois
4.1.D.3.3	4-Module Test Support	These are the tasks that are specific to supporting the 2003 module test	SLAC	Dubois
4.1.D.4	Science Software	The high level tasks required to extract science from the reconstructed data and MC. These include the various utilities to manipulate the Level 1 data and perform the required analyses, such as GRB detection, sky maps and so on.	GSFC	Digel
4.1.D.4.1	Utilities	Basic Utilities used by multiple analysis tools	GSFC	Digel
4.1.D.4.2	Analysis Software	Analysis tools	GSFC	Digel
4.1.D.4.3	Analysis Databases	Databases supporting utilities and analysis tools	GSFC	Digel

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4.1.D.5	Data Processing Facility	Co-located with the IOC to perform near-real time data reconstruction from the instrument and provide feedback to Operations from high level subsystem-correlated instrument response, as well as input to the instrument calibration process. It will also perform bulk MC production. It will provide the Level 1 reconstructed photons that will be used for science and passed on to the Science Support Center.	SLAC	Young
4.1.D.5.1	Prototype Data Manager	First version of data server to handle performance studies and BFEM	SLAC	Young
4.1.D.5.2	Automated Server	Fully automated server to receive data from IOC and process it through to Level 1. Deliver rear real-time diagnostics to the IOC. Facilitate computation of calibration constants and apply to processed to data.	SLAC/HEPL	Young
4.1.D.5.3	Instrument Diagnostics	Near real time histograms, statistics, etc to feed back to IOC for high level assessment of instrument performance.	SLAC/HEPL	Not Assigned
4.1.D.6	Calibration	These include the subsystem instrumental calibrations and alignment as well as higher level calibrations of overall instrument response.	SLAC	do Couto e Silva
4.1.D.6.1	Tools for Accessing Constants	Tools for Accessing Constants	SLAC	Bogart
4.1.D.6.2	ACD Calibration	ACD Calibration: tile gains and pedestals	GSFC	Kelly
4.1.D.6.3	CAL Calibration	CAL Calibration: log gains and pedestals	NRL	Grove
4.1.D.6.4	TKR Calibration	TKR Calibration: hot, noisy strips; alignment	SLAC	Usher
4.1.D.6.5	High Level Calibrations	Determining Instrument Response Functions	SLAC	do Couto e Silva
4.1.D.7	Management		SLAC	Dubois
4.1.D.7.1	Science Analysis Software Management	Management oversight and code architect	SLAC, UW	Dubois/Burnett
4.1.D.7.2	Science Analysis Software Requirements	Level 3 & 4 requirements	SLAC	Dubois
4.1.D.7.2.1	Level 3 Requirements	Level 3 Requirements	SLAC	Dubois
4.1.D.7.2.2	Level 4 Requirements	Level 4 Requirements	SLAC	Dubois
4.1.D.7.3	PDR Support	PDR Support: prep for Instrument Performance studies	SLAC	Dubois
4.1.D.7.4	Mock Data Challenge I	Extensive simulation/reconstruction/analysis effort to exercise the entire data chain	SLAC	Dubois