GLAST Science Working Group
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Jonathan F. Ormes – Project Scientist

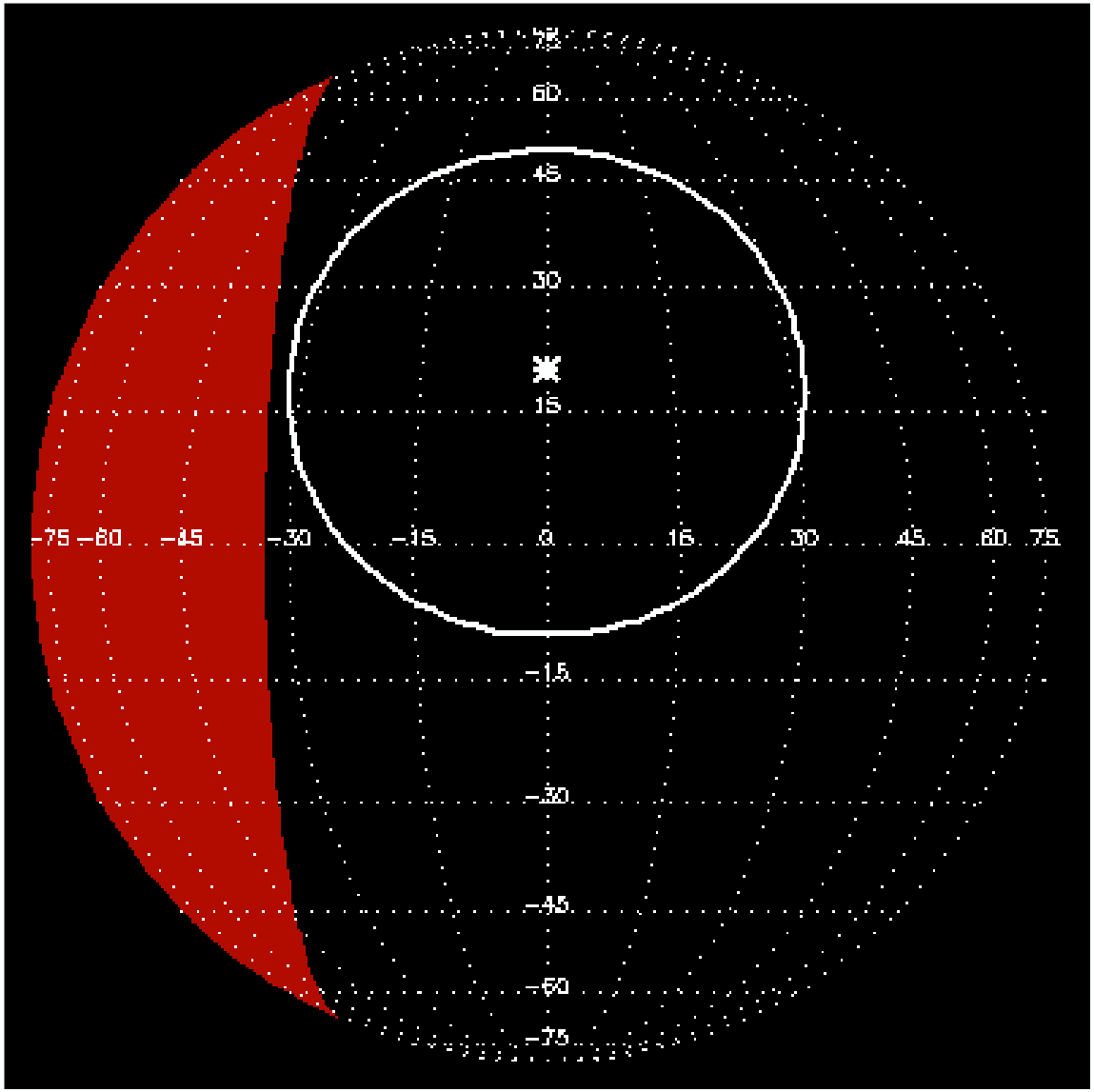
Actions from April '01 Meeting

- Get MOUs in place
- Determine division of responsibilities between IOCs and SSC
- Report on balloon test results
- Organize and finish the PDMP – make list of tasks and assign them resolve issues around the exposure maps
  - Meaningful work at SSC
  - All software to be delivered to SSC
  - Users Group to meet and review plans and comment mid September
    - Required prior to NAR
- Review the LAT calibration plan
  - Need overall chart that explains
    - Tower et being exposed to beam
    - Role of analytical tools
    - Interpolation strategy
  - Need information for users
  - Need to couple with science analysis needs
- Plan science for public release during checkout
- Using GBM for hard x-ray transient studies
- High level mock data challenges

Discussions Since April '01 Meeting

- Circulate Martin Pohl's note on "blind" pulsar searches
  - Martin estimates that inertial pointing factor of two more sensitive than "survey mode"
  - Scan pointing can have essentially the same sensitivity as inertial
    - Just does something useful when the source is below the Earth's horizon
- Should the year 1 GI program be a Legacy program like the SIRTF program?
- Ground Based AGN followup
- Pulsar ephemeredes for GLAST
  - New surveys and how to fund
  - Contemporaneous?
- Pulsar science suggests series of 2 week pointings along the galactic plane

Scan-pointing



GLAST Mission Profile

- Observatory checkout 30-60 days
- First year is scanning
  - Planned observations subject to interruption for extraordinary transients
- Second year and beyond- scanning and/or pointing as driven by competitive proposals
  - Observatory is designed to “point anywhere, anytime”
    - Operate without pointing at the Earth
    - Reorient quickly to follow a transient
  - 3 normal operational modes
    - Inertial pointing
    - Scan
    - Scan pointing - takes advantage of the wide field of view to optimize time on sky

GLAST Mission Plan

- All-sky survey during the first year.
  - Output of sky survey is a point source catalog and an all sky map.
- Transient source locations are made public immediately (i.e. on time scales consistent with the rise times of the transient) with photon data (light curves, improved positions, etc.) to follow within a few days.
  - During first year photon data to include warning that the data may be unverified and uncalibrated
  - Best efforts to release preliminary catalogs in time for AOs
    - The first 3 months of observations will be delivered at 6 months
    - The full 12 months of observations will be delivered 1 month after the end of the sky survey
- Instrument verification using sources described in the LAT proposal
  - Guest investigators may propose for source studies (no large projects)
  - Data from these sources of interest are made available immediately to the GIs with warning.
- Calibrated sky survey data to be released no later than 30 days following the completion of the one year sky survey.
- Operations to include following five to ten bright gamma-ray bursts

Proposed Definition of "Transient"

- A transient is defined as any gamma-ray flux from a celestial source for which the intensity of photons changes by a statistically significant (5 sigma?) amount. An unexpected loss of flux could be a transient event.
  - Numbers to be checked to make sure they are reasonable
- The time scale for this change may be from seconds to months. The required notification time is comparable to the time required to discover the change.
  - Examples:
  - 1) gamma-ray burst transients – notification time is seconds
  - 2) AGN seen doubling in a few hours, we should notify other observers within a few hours.
  - 3) Pulsars are not "transients" in this sense.
  - 4) An AGN flux decrease could be a transient event.

Guest Investigator Program

- **GLAST will have a robust Guest Investigator Program.**
  - **Survey period: Some Guest Investigators (~dozen) will be selected to study previously known or suspected gamma-ray sources.**
  - **Science requires broad band (radio to gamma-rays) study of these celestial sources. Therefore, following the survey, the observing program will be determined entirely by the community including guest investigators.**
    - **LAT and GBM team members can compete.**
    - **Non-US investigators may apply**
    - **Guest Investigators (from both DoE and NASA) can compete.**
    - **Selection is based on peer reviewed proposals.**
    - **NASA to fund ~100 Guest Investigations each year.**
  - **The community will interface to the GLAST data through the Science Support Center in much the same way that was done for the Compton Gamma Ray Observatory.**
    - **Mirror sites in Europe**

Guest Investigator Program: Data Rights

- Guest Investigator Program: NRA's are released by NASA
  - Investigations are idea driven.
  - All GI rights are awarded by NASA using peer review process.
- First year a dozen or so GIs to study, in parallel with GLAST team but without impact to survey, some specific sources.
- For years two and beyond, observing program TBD by GIs.
  - Data are put into the archive within a few days. Since the awards are idea driven, more than one investigator may have access to any given data.
  - A GI has 3 months to verify the data for the purpose of the chosen investigation.
  - The 3 month "verification" period is for the purpose of determining that the data set meets the requirements of the proposed investigation and assures the investigator has some time to work on the investigation before others can take it up.
- *This was controversial and is "under review"*

Public Access to Data: Phase 2

- Level 1 data are sent to the SSC and placed in databases
  - Within 48 hours (1 day at Stanford and 1 day at the SSC)
- Science topics reserved to specific investigators are listed on the web
- Any "qualified investigator" can get access to the data
  - Meets requirement to make the data "public"immediately
  - Who is a "Qualified investigator"?
    - Persons identified as scientists (or in training to be scientists) as evidenced by refereed publications and/or institutional affiliation or sponsorship
    - Persons who understand and agree to abide by the restrictions on data use as listed on the Web site
    - Persons who will use the data for legitimate scientific investigations
  - Databases will be "password protected"
  - Policed by honor system. If there is a complaint, and it is determined by review that a "violation" has occurred, password will be revoked and the individual will not longer be "qualified".

Key Projects

- Key Projects
  - Key projects are solicited and awarded through competitive peer review.
    - They are large and may involve new observations (pointed or scanning) or large scale data mining.
  - Key projects may be proposed for first year data, except for the development of the catalog of sources and the all-sky map being done by the LAT instrument team.
    - NRA issued prior to launch and open to all.
- A “Legacy” program?
  - HST deep survey was a “Legacy” program
  - Pointed survey of the galactic plane
    - Pulsar searches
    - Improved data on the galactic diffuse
  - Other examples?

Science Support Center

- The Science Support Center
  - Plan and schedule observations
    - Review all commands that affect the time line
    - Implement Targets of Opportunity selected by the Project Scientist
    - Produce and maintain exposure maps
  - Archive all data and data products, tools, and documentation
  - Outreach to the public and support EPO
  - Support the GLAST Guest Investigator Program
    - Support headquarters proposal evaluation and selection
    - Provide GIs access to all analysis resources
  - Assure that GLAST and OSS data policies are implemented
  - Collaborates with the IOCs to define and develop analysis tools

Gamma Ray Burst Issues

- Coordinating Gamma-ray burst science
  - Following on the work of the Ritz group and seeing what else needs to be done to coordinate science planning
- Much GRB science should be "joint" between LAT and GBM.
  - What topics and how to approach this subject overall sounds like a good topic for the SWG meeting.
- Off the top of my head (and including some items mentioned by Chip), here are a few GRB science items that might launch a profitable discussion:

  (1) authorship on GRB papers

  (2) joint spectral analysis

  (3) a GRB science session at the next SWG

  (4) ground-based collaborations -- which have somewhat different requirements than for, e.g., AGN observations

  (5) refined alerts (?), if in fact several dumps per day becomes a reality

  (6) membership in joint GRB science group -- I have several (many) names compiled already representing LAT and GBM -- there may be an issue of too many people, but then only some will want to work
- Others will have additional GRB items that Chip and I have not listed.