Analysis Tools Breakout Session

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What We Need to Accomplish

- Determine whether the tool suite is sufficient
- Establish collaborations of scientists for groups of tools (pulsar, GRB, likelihood) who will:
  - Further refine the tool requirements
  - Investigate the algorithms that the tools will implement
  - Once the tool requirements are ratified, these collaborations will most likely be the core of the development team
- Discuss interfaces
- Discuss testing and tool acceptance

The Tools to be Developed

- A8--Interstellar emission model: Subject of its own breakout session.
- A2--Source ID: This is a standard comparison of sources in different catalogs. Such tools exist in data centers such as the HEASARC.
- A3-5--Pulsar tools: Fairly standard, if computation-intensive. Existing software can be adapted.
  - A3--Phase assignment: A standard calculation. The "interesting" part is the barycentric correction. The barycentric correction and the pulsar ephemeris must use the same solar system model.
  - A5--Pulsar period search: A standard calculation with established algorithms. Because of the low photon rate, a long stretch of data is required, increasing the sensitivity to P-dot. This tool will be computation-intensive.
  - A4--This tool will make spatial cuts to maximize the pulsar's S/N; the development will require experimentation and analysis.

The Tools to be Developed, cont.

- **A6-7--GRB tools: These tools will perform related spectral-temporal analysis relevant to GRBs. The tools will analyze both LAT and GBM data.**
  - **Temporal**
    - **Standard display of lightcurves**
    - **Pulse decomposition**
    - **Time series creation. Users will be able to select time ranges manually, or use Bayesian blocks.**
  - **Spectral fitting**
    - **Standard 1D fitting of the LAT data may be possible because the burst may dominate the background. Thus XSPEC may be used rather than the 3D likelihood tool (A1).**
    - **χ^2 will usually not be the fit statistic for the LAT photons.**
    - **Physical spectral models will be available in addition to empirical models.**

The Tools to be Developed, cont.¢

- A1--The likelihood tool: This is the tool that will be used for most analysis since it is based on the data's likelihood. It will be used for fitting, model comparison, source detection, source upper limits, pulsar phase analysis, etc. The goal is 3D (2D spatial+1D spectral) analysis. Memos about the likelihood have been written by Pat Nolan, Seth Digel and David Band. Issues:
  - Binning of data
  - Time series capabilities
  - Multimission capabilities (i.e., joint fits between LAT and other data)
  - Moving sources (e.g., solar system objects)
  - Understanding the fit statistic