LAT Gamma-ray Pulsar Timing Models

Overview

This page is for distribution of **pulsar timing models made by the LAT team directly from LAT gamma-ray data**, independent of any radio timing data that may exist. We use the methods documented in Ray, Kerr, Parent et al. (2011, ApJS, **194**, 17, arXiv:1011.2468). This work has been supported by the Fermi Cycle 3 Guest Observer program.

You are free to use these LAT timing solutions to fold your data. If you publish work based on these models, please reference Ray, Kerr, Parent et al. (2011) and this page in your publication. The primary intent is to support pulsar analyses requiring timing ephemerides, such as phase-resolved spectroscopy and analyses of sources close to bright pulsars through the use of pulsar `gating'. If, on the other hand, you want to publish something based on the **values** of the timing model parameters (e.g. timing positions, glitch parameters, etc...) we ask that you contact us first because there may be important caveats or publication plans.

Participants

Paul Ray, Matthew Kerr, Pablo Saz Parkinson, Max Razzano, and others... Thanks much to those who have moved on to other projects, including Damien Parent, Michael Dormody, and Aous Abdo.

Timing Solutions

New! Matthew Kerr has developed a sophisticated highly-automated timing pipeline that handles glitch detection and fitting in the presence of timing noise much better than our previous scripts. We run it on nearly all LAT-detected pulsars that are bright enough for a TOA to be formed in less than about 56 days of integration. The results are posted to a machine-generated web page accessible from the link below. Please pay attention to the following notes when accessing these models:

- These methods used for this pipeline will be documented in Kerr et al. (2014, in prep). Once this paper is available, please cite it for any uses of this work.
- Each row of the table corresponds to one pulsar timed using the LAT data. Both the full par file and the TOAs are available via links in the first column.
- The Whitened Residuals show the residuals for the full timing model. Unlike previous timing solutions, whitening is achieved by estimating the time-domain realization of the timing noise, then subtracting this signal by linear interpolation (the "SIFUNC" terms in the ephemeris).
- The Unwhitened Residuals show the residuals to a model without any red noise terms. For most pulsars, only the first frequency derivative is included in this model. For the Crab, this includes up to F2.
- Horizontal dashed lines on the plots indicate the epoch of glitches.
- The Phaseogram shows a 2-D plot of the LAT photons vs pulse phase and time.
- The Pulse Profile plot shows the full LAT profile along with the analytic template (solid blue, with the individual components in dashed blue lines). The residuals between the model and the data are in red.
- The Position plot shows the timing position with uncertainty, along with the published multiwavelength location (e.g. X-ray counterpart), when available. The LAT timing position uncertainty includes the effects of timing noise.

Be very cautious about applying these models to data outside the START/FINISH range in the PAR file! Many of them will not extrapolate well. Also, beware that we don't typically follow any particular absolute phase convention in these models since they are gamma-ray only. In particular, you cannot assume that phase 0.0 is at the peak of the radio pulse (if there is one) or any other particular convention. If you need to figure out phase ranges to blank, fold the data using the PAR file and make your selection based on that, not a phase range from a published paper or other source.

The LAT solutions can be used with the Fermi plugin available in the TEMPO2 distribution. This is generally the preferred method as the Fermi ScienceTool `gtpphase` doesn't support the full complexity of many timing models.

Access Current Timing Models **HERE**