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Implementation of a goodness-of-fit test for finding optimal concurrent radio and gamma-ray pulsar light curves

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Abstract content
   (Max 300 words)
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Since the launch of the Fermi Large Area Telescope (LAT) in 2008 the number of known gamma-ray pulsars has increased immensely to over 160. Many of these sources are not only visible in the gamma-ray band, but in the radio and x-ray bands as well. Seyffert et al. (2011) demonstrated how constraints on the viewing geometries of some of these pulsars could be obtained by comparing their observed radio and gamma-ray light curves by eye to predicted light curves generated by established geometric models. While the constraints obtained through this approach compare reasonably well with those yielded by more rigorous single-wavelength approaches (e.g. Weltevrede et al., 2010), they are still a somewhat subjective representation of how well the models reproduce the observed radio and gamma-ray light curves. Constructing a more rigorous approach is however made difficult by the large uncertainties associated with the gamma-ray light curves as compared to those associated with the radio light curves. Naively applying a chi-squared-like goodness-of-fit test to both bands invariably results in constraints dictated by the radio light curves. A number of approaches have been proposed to address this issue. Johnson et al. (2014) use the gamma-ray uncertainties to generate artificial uncertainties for the radio light curves. Pierbattista et al. (2014) also introduce artificial uncertainties, but they use a more iterative approach to generate them. In this talk we investigate these approaches and compare the results they yield to those obtained using the by-eye approach. Based on what we learn, we implement our own version of a goodness-of-fit test, which we then use to investigate the behaviour of the geometric models in multi-dimensional phase space.

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