

High-Energy Gamma-Ray Observations of Two Young, Energetic Radio Pulsars

V. M. Kaspi (MIT), J. R. Lackey (MIT), J. Mattox (Boston University), R. N. Manchester (ATNF), M. Bailes (Swinburn University), R. Pace (University of Adelaide)

We present results of EGRET observations of the unidentified high-energy γ -ray sources 2EG J1049–5847 (GEV J1047–5840, 3EG J1048–5840) and 2EG J1103–6106 (3EG J1102–6103). These sources are spatially coincident with the young, energetic radio pulsars PSRs B1046–58 and J1105–6107, respectively. We find evidence for an association between PSR B1046–58 and 2EG J1049–5847. The γ -ray pulse profile, obtained by folding time-tagged photons having energies above 400 MeV using contemporaneous radio ephemerides, has probability of arising by chance of 1.2×10^{-4} according to the binning-independent H-test. A spatial analysis of the on-pulse photons reveals a point source of equivalent significance 10.2σ . Off-pulse, the significance drops to 5.8σ . Archival *ASCA* data show that the only hard X-ray point source in the 95% confidence error box of the γ -ray source is spatially coincident with the pulsar within the $1'$ uncertainty (Pivovarov, Kaspi & Gotthelf 1999). The double peaked γ -ray pulse morphology and leading radio pulse are similar to those seen for other pulsars and are well-explained in models in which the γ -ray emission is produced in charge-depleted gaps in the outer magnetosphere. The inferred pulsed γ -ray flux above 400 MeV, $(2.5 \pm 0.6) \times 10^{-10}$ erg cm $^{-2}$ s $^{-1}$, represents 0.011 ± 0.003 of the pulsar's spin-down luminosity, for a distance of 3 kpc and 1 sr beaming. For PSR J1105–6107, light curves obtained by folding EGRET photons using contemporaneous radio ephemerides show no significant features. We conclude that this pulsar converts less than 0.014 of its spin-down luminosity into $E > 100$ MeV γ -rays beaming in our direction (99% confidence), assuming a distance of 7 kpc, 1 sr beaming and a duty cycle of 0.5.