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Evidence for inverse Compton emission from globular clusters

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Millisecond pulsars are very likely the main source of gamma ray emission from globular clusters. However, the relative contributions of two separate emission processes-curvature radiation from millisecond pulsar magnetospheres vs. inverse Compton emission from relativistic pairs launched into the globular cluster environment by millisecond pulsars-has long been unclear. In this talk, I will present the result for searching inverse Compton emission in 8-year *Fermi*-LAT data from the directions of 157 Milky Way globular clusters. We find a mildly statistically significant (3.8σ) correlation between the measured globular cluster gamma-ray luminosities and their photon field energy densities. However, this may also be explained by a hidden correlation between the photon field densities and the stellar encounter rates of globular clusters. Analyzed *in toto*, we demonstrate that the gamma-ray emission of globular clusters can be resolved spectrally into two components: i) an exponentially cut-off power law and ii) a pure power law. The latter component-which we uncover at a significance of 8.2σ-is most naturally interpreted as inverse Compton emission by cosmic-ray electrons and positrons injected by millisecond pulsars. We find the luminosity of this inverse Compton component is comparable to, or slightly smaller than, the luminosity of the curved component, suggesting the fraction of millisecond pulsar spin-down luminosity into relativistic leptons is similar to the fraction of the spin-down luminosity into prompt magnetospheric radiation.

Keywords

Globular clusters; Millisecond pulsars; Gamma ray; inverse Compton

Collaboration

other Collaboration

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Experimental Results

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