Contribution ID: **371** Type: **Oral Presentation**

Inverse Compton emission from millisecond pulsars in the Galactic bulge

Thursday 1 August 2019 14:00 (20 minutes)

Millisecond pulsars (MSPs) are old, rapidly rotating neutron stars that have been detected in multiple wavelengths, including gamma rays. A population of faint MSPs in the Galactic bulge could potentially explain the mysterious GeV excess found in the Fermi Large Area Telescope data. If MSPs are responsible for the excess, their leptonic injections ($e^{\pm}$) could produce detectable inverse-Compton (IC) emissions by up-scattering ambient photons to gamma-ray energies. This provides a useful handle to distinguish MSP from other origin scenarios of the GeV excess, such as dark matter. For the first time, we calculated such IC emissions with a triaxial 3D model of the bulge stars as the tracer of the putative MSP population. We show that the IC emissions above TeV leave unique signatures in their skymaps. They could be detected by future high-energy gamma-ray detectors such as the Cherenkov Telescope Array and provide a viable multiwavelength handle for the MSP origin of the GeV excess.

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Session Classification: Astroparticles & CMB

Track Classification: Astroparticles & CMB