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Gamma-gamma absorption in the Galactic Center

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The Galactic Center (GC) is an intriguing lab for non-thermal astrophysics due to its proximity and its transparency in radio, X-ray and γ bands. In addition to hosting a supermassive black hole, a compact luminous young star cluster, and the circumnuclear ring, the central few parsecs of the Milky Way are also notable for hosting a source of cosmic rays extending up to PeV in energy – the first known Galactic Pevatron. However, the spectrum of the brightest γ source, possibly associated with SgrA*, shows a clear cut-off at 1-10 TeV in the H.E.S.S. data. Since the H.E.S.S. PSF FWHM is several arcminutes wide, a possible explanation would be the γ -photon interaction with the IR radiation field in the central 2-3 arcminutes. To investigate the absorption by pair creation, I computed the mid-IR 3d emissivity and thus the mid-IR radiation field with an arcsecond resolution in the central few parsecs, deriving the total opacity given a modeled γ source. I will present the latest results, showing how this method could potentially determine the accelerator position with unprecedented precision in γ astronomy. Lastly, I will quickly go through a few possible applications of my 3d-model for future investigations of the Galactic Center at very-high energies.

Summary

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