Contribution ID: **227** Type: **oral**

Gamma rays from dark matter spikes in EAGLE simulations

Thursday, 26 September 2024 16:00 (17 minutes)

Intermediate Mass Black Holes (IMBHs) with a mass range between 100 $M_\odot$ and 10^6 $M_\odot$ are expected to be surrounded by high dark matter densities, so-called dark matter spikes. The high density of self-annihilating Weakly Interacting Massive Particles (WIMPs) in these spikes leads to copious gamma-ray production. Sufficiently nearby IMBHs could therefore appear as unidentified gamma-ray sources. However, the number of IMBHs and their distribution within our own Milky Way is currently unknown.
In this work, we provide a mock catalogue of IMBHs and their dark matter spikes obtained from the EAGLE simulations, in which black holes are seeded into the centre of halos to model black hole feedback influencing the formation of galaxies. The catalogue contains the coordinates and dark matter spike parameters for about 2500 IMBHs present in about 150 Milky Way-like galaxies. We expect about 15^{+9}_{-6} IMBHs within our own galaxy, mainly distributed in the Galactic Centre and the Galactic Plane. We find that current and future gamma-ray observatories, such as Fermi-LAT, H.E.S.S. and CTA, would be sensitive enough to probe the thermal relic cross section of dark matter self-annihilation around IMBHs for dark matter particles with masses from GeV to TeV.

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Session Classification: Indirect Dark Matter Detection