

Diffuse flux of ultra-high energy photons from cosmic-ray interactions in the disk of the Galaxy and implications for the search for decaying super-heavy dark matter

Wednesday, 5 October 2022 15:00 (20 minutes)

When propagating to Earth, UHECRs can interact with the gas in our Milky Way and produce secondary particles including photons. This can impact the search for UHE photons as we face a diffuse flux of UHE photons resulting from their propagation. This flux, together with the photon flux expected from the GZK interactions, participates in the diffuse photon flux which is limiting the detection of UHE-gamma sources. We present an estimate of the diffuse flux resulting from the interactions of UHECRs in our galaxy above 10^{17} eV, using results from the Pierre Auger Collaboration concerning the flux and its composition, and two different interstellar gas density models. We also discuss the impact of the evaluated diffuse flux of UHE photons on SHDM searches, as the former can be considered as a floor below which other signals would be overwhelmed. Similarly, the neutrino flux produced during the same process can be evaluated, by accounting for the neutrino mixing.

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