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Clouds illuminated by supernova remnants as an explanation for LHAASO unidentified sources

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Wide field-of-view survey instruments with good sensitivity at the highest energies have recently revealed an unexpectedly large population of galactic gamma-ray sources reaching ultra-high-energies (>100 TeV). Several of these have no known counterpart accelerator. However, the highest energy cosmic rays accelerated by supernova remnants will escape from the shock region at early times in the SNRs evolutionary history. These escaped cosmic rays may then interact with nearby target material such as interstellar clouds, undergoing hadronic interactions that subsequently generate a detectable gamma-ray flux. We apply a model for particle acceleration, transport and interactions to catalogues of SNRs and clouds, searching for potential coincidences with LHAASO sources. For the most promising coincidences, we explore the spectral properties in more detail, in particular with a detailed study of LHAASO J2108+5157.

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