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Insights from W51C-B on supernova remnant-molecular cloud interactions with CTAO and ASTRI Mini-Array

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Supernova remnants (SNRs) are key cosmic ray (CR) sources, as strongly supported by extensive γ-ray observations of the characteristic pion bump, particularly by AGILE-GRID and Fermi-LAT, which confirmed them as hadronic accelerators. LHAASO recently detected >100 TeV γ-rays from several Galactic sources, including some regions containing SNRs. However, current theoretical models suggest that SNRs can only accelerate CRs up to PeV energies within their first ~100 years, while known SNRs associated with LHAASO sources are much older. A possible explanation of the detected PeV emission is runaway CRs interacting with nearby molecular clouds (MCs) in regions of suppressed diffusion.

LHAASO observed ~200 TeV γ-ray emission from the W51 region, that includes the star forming regions W51A, W51B, and the middle-aged SNR W51C, which interacts with MCs in W51B. We investigate the W51C-B region to examine possible SNR-MC interactions. Our focus is on a direct SNR-MC shock interaction, investigating its role in accelerating particles to high energies and evaluating whether CR acceleration-compression can account for the observed UHE emission. We will also present simulations of W51C-B for CTAO and ASTRI Mini-Array, highlighting their potential role in spatially resolving the UHE emission from the interaction region.

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