

## Preliminary probe into the low-energy CRs via nuclear de-excitation lines at the prospect of next-generation MeV telescopes

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Low-energy cosmic rays (LECRs) contribute substantially to the energy balance of the interstellar medium and play a significant role in the heating and chemistry of gas, which consequently impact the star formation process. Despite the current difficulties of studying LECRs directly, in the near future, next-generation MeV telescopes will provide us with unique opportunities for indirect research of LECRs through nuclear de-excitation lines that are produced via the interaction of LECRs and interstellar medium. By analytical calculation, we find LECRs are concentrated around their acceleration sites due to the slow propagation and enhanced energy losses of sub-relativistic particles. Then we present results on the production of MeV de-excitation lines combining the numerical treatment of nuclear reactions using the code TALYS, with the propagation and energy losses of LECRs. In addition, we estimate the possible MeV lines from the young supernova remnant Cassiopeia A (Cas A), taking into account the CR injection spectrum, and chemical abundance of the medium. We also investigate the possible detectability of MeV line emission from the assumed LECR injection site and Cas A against the newly measured diffuse Galactic background in the MeV band given the capability of the proposed MeV telescopes.

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