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Gamma-ray emission from massive star clusters

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We report the detection of diffuse gamma-ray emissions towards several massive star clusters in our Galaxy. The detailed spectral and spatial analysis reveal a remarkable constancy of the energy and radial distribution of the cosmic ray density,
w(E; r) ~ E^2.3 r^{-1} around these massive star clusters. The 1/r decrement of the CR density with the distance from the star cluster is a distinct signature of continuous injection of CRs and their diffusion through ISM. The analysis of gamma-ray data show that the hard energy spectra of parent protons continue up to 1 PeV. The results imply that the population of young massive stars can provide a substantial fraction of Galactic cosmic rays and are potential candidates of Galactic PeVatrons.

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