

Simulations of the TeV-PeV cosmic-ray anisotropy

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We calculate the shape of the TeV-PeV cosmic-ray anisotropy (CRA) in 3D Kolmogorov turbulence. We present the first numerical calculations of the CRA down to TeV energies, using realistic values for the coherence length of the interstellar turbulence. At these low energies, the large-scale CRA aligns with the direction of local magnetic field lines around the observer. In this type of turbulence, the cosmic-ray intensity is flat in a broad region perpendicular to magnetic field lines. Even though the CRA is rather gyrotropic, we show that the local realization of the turbulence around the observer results in the appearance of weak, non-gyrotropic, small-scale anisotropies, which contain important information about the local turbulence level. Our findings will be useful to interpret observations of the cosmic-ray anisotropy by LHAASO.

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