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Small-scale anisotropy in cosmic ray flux observed by GRAPES-3 at TeV energies

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The deflection of cosmic rays (CRs) in the interstellar magnetic field results in an almost isotropic flux as observed on Earth. However, anisotropies of different angular scales have been predicted at the level of ~10^{-4}—10^{-3}. Small-scale anisotropic structures on angular scales of $\lesssim 60^{\circ}$ have been predicted due to relative diffusion of CRs in the local turbulent magnetic fields, the contribution of local sources and several other factors. The GRAPES-3 experiment, consisting of a dense array of scintillator detectors, records over a billion cosmic ray events per year in the TeV-PeV energy range, hence it is suitable for probing cosmic ray anisotropy due to its high statistics. A careful analysis was performed to probe such an exceedingly small magnitude of anisotropy which gets overwhelmed by systematics such as atmospheric or detector effects. Several small-scale anisotropic structures were observed using four years of GRAPES-3 data which are consistent with the observations of some major air shower arrays, collecting very high statistics. The details about the observed anisotropic structures will be presented.

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