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LARGE-SCALE ANISOTROPY OF TeV-BAND COSMIC RAYS

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The expected anisotropy in the 1 to 104 TeV energy range is calculated for Galactic cosmic rays with both anisotropy
in the diffusion tensor and source discreteness taken into account.We find that if the sources are distributed radially
(but with azimuthal symmetry) in proportion to Galactic pulsars, the expected anisotropy almost always exceeds
the observational limits by one order of magnitude in the case of isotropic diffusion. If the radial diffusion is more than an order of magnitude smaller than the azimuthal diffusion rate, the radial gradient of the sources can
be accommodated about 5% of the time. If the sources are concentrated in the spiral arms, then the anisotropy depends on our location between them, but in some spatial window, roughly equidistant from adjacent spiral arms,
the observational constraints on anisotropy are obeyed roughly 20%–30% of the time for extremely anisotropic diffusion. The solar system is in that window less than 10% of the time, but it may be there now. Under the assumption of isotropic diffusion, nearby supernovae are found to produce a discreteness anisotropy that is nearly
two orders of magnitude in excess of the observational limit if all supernovae are assumed to contribute equally
with a source rate 1 in every 100 years

Collaboration

– not specified –

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Primary author: KUMAR, Rahul (Ben Gurion University)

Presenter: KUMAR, Rahul (Ben Gurion University)

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