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Propagation of ultra-high-energy protons in cosmic magnetic fields

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Abstract content

We simulate the arrival distribution of ultra-high-energy (UHE) protons above 10^{19} eV by calculating their propagation, considering structured extragalactic magnetic field (EGMF) with several strengths and a Galactic magnetic field (GMF). We estimate the most appropriate source number density of UHE protons that reproduces the small-scale anisotropy observed by Akeno Giant Air Shower Array. The number density of $\sim 10^{-5} - 10^{-6} \text{ Mpc}^{-3}$, dependent on the EGMF strength, is required by a source model that all sources have the same power, with large uncertainty. The GMF does not affect the expected number density, but affects the arrival distribution at lower energies ($\sim 10^{19}$ eV). We also investigate the arrival distribution predicted by our simulation in the near future. Significant spatial correlation between the arrival distribution of highest energy cosmic rays and their source distribution is expected at a few degree scale.

If this paper is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 4 (HE part 1), pages 519-522

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