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Magnetic Turbulence and the Origin of Cosmic-Ray Small-Scale Anisotropies

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The arrival directions of cosmic rays are highly isotropic which is expected due to the interaction between these particles and magnetic turbulence in the interstellar medium. High-statistics observatories like IceCube and HAWC have however observed significant deviations from isotropy down to very small angular scales. Such small-scale anisotropies could not be predicted in the standard theory for Galactic cosmic-ray transport. In this talk, we will explore the recently developed theoretical framework to study small-scale anisotropies which takes into account correlations between fluxes of cosmic rays from different directions. The first analytical calculation of the angular power spectrum assuming a physically motivated model of the magnetic field turbulence will be presented and confronted with numerical simulations to provide more insights into the formation of cosmic-ray anisotropies due to magnetic turbulence.

Summary

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