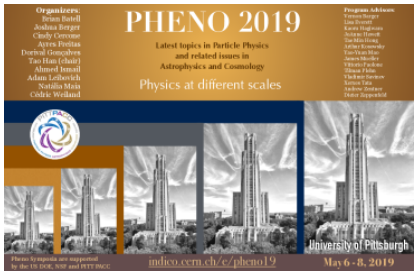

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Evolution of Primordial Magnetic Fields from their Generation till Recombination

Monday 6 May 2019 18:00 (15 minutes)

Magnetic fields are observed at all scales in the universe, from planets all the way up to clusters of galaxies. To explain the presence of magnetic fields in the inter-cluster voids that are correlated on large scales, we need to consider the possibility of primordial magnetic fields. These fields, generated at early epochs of the universe like inflation or phase transitions, are subsequently amplified by magnetohydrodynamic evolution. In addition, the magnetic fields can be helical, with the corresponding generation processes involving parity violation; such processes can be intimately linked to baryogenesis. Working with my collaborators (Tina Kahniashvili, Axel Brandenburg, Alberto Roper Pol, Tanmay Vachaspati, and Alexander Tevzadze), we performed direct numerical simulations to model the magnetohydrodynamic turbulence affecting the evolution of these primordial fields, and study how the presence of helicity affects the evolution. We compare our results to existing limits on the strength and correlation lengths of magnetic fields at recombination from TeV blazars, and conclude that only helical magnetic fields can have the observed nG strength at 30 kpc scales.

Summary

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