Evolution and Signatures of Primordial Magnetic Fields

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Brief Description:

Observations of blazar spectra show the existence of correlated magnetic fields at extragalactic scales [1-3]. The origin of these fields can be either primordial or astrophysical.

We study the evolution of these large scale magnetic fields through structure formation processes and look for the imprints of different primordial magnetogenesis scenarios.

Evolution of Magnetic Energy in Fourier Space (Homogeneous & Stochastic)

Methodology:

★ We use numerical, cosmological code ENZO to simulate the structure formation and the evolution of large scale magnetic fields.
★ We use different initial conditions (in correspondence with various magnetogenesis scenarios), which are obtained through numerical magnetohydrodynamical simulations (using the PENCIL code).
★ We study the magnetic fields in Fourier space in order to understand the energy distribution of these fields on different scales.

Simulated H&S Magnetic Field Distributions

Current Results and Future Plans:

• We see a notable difference in the evolution of magnetic fields with redshift for the uniform and stochastic cases.
• Our ongoing research includes zoom-in simulations of cosmological objects, such as galaxy clusters and filaments and of magnetic fields within these objects.
• Our future runs will include the analysis of massive halos with 2.44 kpc resolution.

Magnetic Power Spectrum in Massive Halos

References:


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