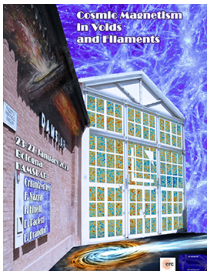

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Modelling the Evolution of Primordial Magnetic Fields

Tuesday, 24 January 2023 16:30 (30 minutes)

Primordial Magnetic Fields (PMFs), being good candidates for explaining the large-scale magnetisation of our Universe, evolve in a distinguishable fashion across different cosmological epochs. Their post-recombination structure and coherence scale depend on (i) details of the particular magnetogenesis model and (ii) evolutionary trends in the pre-recombination Universe. Inflation and phase-transition magnetogenesis scenarios lead to the infrared and blue spectra of initial seed fields, respectively. We study the evolution of such fields in the cosmic web and galaxy clusters. We take into account their pre-recombination magnetohydrodynamic (MHD) decay effects to evolve PMFs during structure formation. I will briefly review some of the processes that have been studied in the context of PMF evolution in the early and late Universes and the complexity in the modeling of the evolution of PMFs. I will present the results from our cosmological MHD, ENZO simulations which argue in favour of distinguishing between different primordial magnetogenesis scenarios on galaxy-cluster as well as on filamentary and cosmic voids'scales. I will compare our results with the results from other cosmological (or pure MHD) simulations and discuss future prospects for distinguishing different primordial magnetogenesis scenarios. Finally, the results of our studies will be presented in the context of rotation measure (RM) analysis while I will also discuss their relevance for the blazar spectra observations. Discriminating among different PMF models opens up the possibility of understanding the role of PMFs on the early-Universe processes, the thermalisation of the intergalactic medium (IGM; i.e., reionisation history of the Universe), and structure formation.

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