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Seminar of the theory group of APC

Mardi 2 Novembre 2021, 14 :00
APC, seminar room 483A, contact roperpol@apc.in2p3.fr for Zoom meeting details
Domaines : gr-qc

Titre : *Evolution and signatures of primordial magnetic fields*

Orateur : **Salome Mtchedlidze (Ilia State University)**

Résumé : *The existence of magnetic fields is ubiquitous on astrophysical (e.g., planets and stars) as well as on cosmological scales (galaxies and galaxy clusters). Low- frequency radio observations are revealing an increasing number of diffuse radio sources in galaxy clusters visible through their synchrotron emission. Recently, the diffuse synchrotron radio emission was also detected in the region connecting the pairs of galaxy clusters which is an indirect probe of magnetisation of the Universe on filamentary scales. On the other hand, a search for extended gamma- ray emission from distant blazars provides an intriguing possibility of detecting very weak magnetic fields in cosmic voids. This poses an exciting avenue for studying the generation mechanisms and evolution of observed large-scale magnetic fields. In this talk, I will review few observational effects of magnetic fields helping us to explore the magnetized Universe on cosmological scales ; I will briefly discuss the astrophysical and primordial scenarios for explaining the observed magnetization of the Universe, including the motivation for studying the primordial magnetic fields (PMFs ; the seed fields generated in the early Universe). Finally, I will present our results on the evolution of PMFs during large scale structure formation (in connection with previous work for the radiation dominated epoch). We use cosmological magnetohydrodynamical (MHD) code ENZO to evolve inflation-generated magnetic fields which might have unlimited correlation length scale and causally, phase-transition generated magnetic fields characterized by the correlation length having an upper limit equal to the Hubble length scale. We study how these seed magnetic fields evolve during structure formation and what can be the observable traces of such fields. Our findings include the distinctive evolution of dif-*

ferent seed fields retaining the information of magnetic initial conditions on the largest scales of the Universe. We compare simulated Faraday rotation measures from different seeding scenarios with recent observational data and give future prospects in the search of the origin of cosmic, large scale correlated magnetic fields.