Contribution ID: **16** Type: **not specified**

Exploring the PMF imprints through rotation measure in the rarified cosmic regions

Monday 13 May 2024 15:00 (45 minutes)

Faraday rotation of linearly polarized emission as light passes through the foreground magnetised medium is one of the powerful indirect probes of the large-scale magnetic fields (LSMFs). Rotation measure (RM) which quantifies the amount of the rotation of the polarisation plane has been used for reconstructing the magnetic field properties in the intracluster medium. In the recent years, constraining the value of the RM in the intergalactic medium (IGM), referred to as the residual RM (RRM), as well as studying its dependence on redshift has also become a promising approach in the search of the LSMF imprints. In my talk, I will present results of our ongoing research on constraining the primordial magnetic field (PMF) models, candidates for the seeds of the observed large-scale magnetisation of the Universe, through observations of the RM in the rarified regions of the cosmic web. We use deep light cones, constructed by stacking the simulated boxes until redshift 2 to compare the evolution of the simulated RRM with the observational data. We study different PMF models having different coherence scales to understand how the observational RRM evolution translates into constraints on the PMF strengths. For the first time, we use original (non-replicated) data from cosmological magnetohydrodynamical (MHD) simulations to study the evolution of the RRM statistics for different PMF models. Apart from our results on the RRM statistics, I will also review some of the unxeplored questions that can help us in constraining the Universe's magnetism and the open questions related to the PMF evolution during structure formation.

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