Contribution ID: **8** Type: **Talk**

Impact of the Mean Free Path on the Large Scale 21-cm Power Spectrum from Reionization

Thursday 21 October 2021 13:20 (10 minutes)

During the cosmic dark ages, the Universe primarily consisted of neutral hydrogen (HI), which emits radiation via the 21-cm hyperfine transition. Radio interferometers, such as the Low-Frequency Array (LOFAR) and the future Square Kilometre Array (SKA), are attempting to measure its spherically averaged 21-cm power spectrum from the Epoch Of Reionization (EoR). The statistic is not only a valuable source of information on the nature of the first sources of light, and their impact on the intergalactic medium (IGM), but also of the underlying cosmological density field itself. We base our study on the analysis of numerical simulations and focus on the largest detectable scales. In this talk, I will discuss how the decomposition of the 21-cm power spectrum into its constituting parts can help us understand its evolution and aid in extracting information about the impact of the sources and the density field. I address the significance of the value of the mean free path (MFP) for ionizing photons on the shape of the 21-cm power spectrum. Our findings indicate that the MFP constraint determines the scale that separates the astrophysical and cosmological parts of the power spectrum. A recent measurement of the mean free path from Becker et al. (2021) estimates a value of λ_{mfp}= 3.57/h cMpc at z = 6 from Quasi-Stellar Object (QSO) spectra. Through our analysis, we conclude that detection of the 21-cm signal with SKA on scales k < 0.38 Mpc-1 could be utilised as a potential cosmological probe.

Primary author: GEORGIEV, Ivelin (Stockholm University)

Co-author: Prof. MELLEMA, Garrelt (Department of Astronomy at Stockholm University, Oskar Klein Centre)

Presenter: GEORGIEV, Ivelin (Stockholm University)

Session Classification: Cosmology and Extragalactic Astronomy