PDF versions of previous colloquia and more information can be found in “events” at http://gcosmo.bao.ac.cn/

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Towards the precision era of 21cm tomography from the epoch of reionization

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Abstract

Three-dimensional mapping of our Universe using the redshifted 21cm hydrogen line from the epoch of reionization (EOR) has recently emerged as a promising cosmological probe. To fulfill this promise, further progress is required to ensure that predictions of the cosmic 21cm background are accurate enough. This accuracy depends not only on the realistic astrophysical modeling of reionization and the H I spin temperature, but also on the accuracy of the methods used to extract the 21cm signal from simulations of the EOR. I will report the recent progress on both issues. On the former issue, I will present a number of new state-of-the-art large- scale numerical simulations of reionization. I will demonstrate from these simulations that upcoming measurements of 21cm brightness temperature power spectra using the first-generation 21cm telescopes can distinguish the model of the Universe ionized only by high-mass atomic-cooling halos from that by both high- and low-mass atomic-cooling halos. On the latter issue, I will present a robust, accurate yet efficient computational scheme to predict the 21cm background in observer redshift space, given real-space simulation data, which accounts for peculiar velocity in the fully nonlinear way. Specifically, while it is true that fluctuations in the matter density at such high redshift are likely to be of linear amplitude on the large scales, the nonlinearity of smaller scale structure indensity, velocity and reionization patchiness can leave its imprint on the signal, which might then spoil the linear theory. I will present the new results of testing the validity of using 21cm background measurements for cosmology and characterizing the predicted signal for upcoming radio surveys, by applying this new 21cm computational scheme to the new numerical simulations.

All are welcome! Tea, coffee, biscuits will be served at 2:45 P.M.

You are welcome to nominate speakers to Shude Mao (shude.mao@gmail.com), Licai Deng (licai@bao.ac.cn), Xuelei Chen (xuelei@cosmology.bao.ac.cn).