

The Third National Workshop on the SKA Project - The Italian Route to the SKAO Revolution



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Forward-Modelling SKA Beam Errors in 21cm Parameter Estimation Experiment

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Detection of signals from the Epoch of Reionization (EoR) is one of the new frontiers in observational cosmology. However, predictions of the ability of 21-cm experiments to discriminate EoR signal models are typically limited by the simplicity of data models, in which the effects of foregrounds and characteristics of the instrument are often neglected. Current experiments have shown that these components are crucial in determining the detection prospect of the EoR because their presence can introduce unwanted structures in the observation data. To move towards more realistic scenarios, we had previously added a simple foreground and instrumental model and showed their effects on reionization constraints. Currently, we are exploring the effects of applying a realistic perturbed beam model and the ability to discriminate the EoR astrophysical parameters. We use 21cmFAST to efficiently generate the brightness temperature fluctuations from the EoR and the publicly available OSKAR package to generate the beam of the future Square Kilometre Array. We also extend the current prescriptions of the plug-in code, `py21cmMC_fg`, to account for beam perturbation and earth rotation synthesis. The analysis framework we develop is useful for upcoming 21cm experiments, providing insights into the effects of beam perturbation in the presence of foregrounds on astrophysical parameter estimation.

Research area

Epoch of Reionization

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