



Contribution ID: 39

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# Contributory: JWST-informed Cosmological Inference from 21-cm Tomography

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The redshifted 21-cm line of neutral hydrogen provides a unique probe of the high-redshift Universe, tracing the evolving state of the intergalactic medium (IGM) during the Epoch of Reionization (EoR). The 21-cm signal, however, depends on both the underlying cosmological density field and the astrophysical properties of the sources driving reionization, leading to potentially strong degeneracies between cosmological and astrophysical parameters. This degeneracy presents a fundamental challenge for extracting robust cosmological information from 21-cm observations alone. Observations of high-redshift galaxies with the James Webb Space Telescope (JWST) provide complementary information on the population of sources responsible for ionizing the IGM. In this work, we investigate a JWST-informed framework for extracting cosmological information from 21-cm tomography. We construct simulated EoR lightcones spanning a joint parameter space of cosmological and astrophysical parameters and generate corresponding galaxy observables, including UV luminosity functions, together with the 21-cm signal. We first use the JWST-like galaxy observables to constrain the properties of the underlying galaxy population and use these constraints as informative priors on the astrophysical parameters entering the 21-cm forward model. We then employ machine-learning-based inference to recover cosmological parameters from the 21-cm field while marginalizing over the remaining astrophysical uncertainties. By comparing 21-cm-only and JWST-informed inference, we quantify how external information on the high-redshift galaxy population changes the cosmological posterior and the associated astrophysics–cosmology degeneracies.

**Primary author:** CHOUDHURY, Madhurima (Birla Institute of Technology and Science, Pilani - Hyderabad campus.)

**Presenter:** CHOUDHURY, Madhurima (Birla Institute of Technology and Science, Pilani - Hyderabad campus.)