

INTERFEROMETRIC BANDPASS CALIBRATION WITH REDUNDANT BASELINES FOR 21 CM COSMOLOGY

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Abstract

The greatest challenge facing 21 cm cosmology is the isolation of bright astrophysical foregrounds that are often 10^5 times stronger than the underlying cosmological signal. Techniques for isolating the 21 cm signal generally rely on the spectral smoothness of the foregrounds, which restricts them to a “wedge” in Fourier space. That method of avoiding foregrounds is rendered ineffective if the instrument imparts spectral structure due to, for example, a complicated antenna bandpass. Redundant arrays, like the Precision Array for Probing the Epoch of Reionization (PAPER) and the Hydrogen Epoch of Reionization Array (HERA), can use their redundancy to calibrate antennas one frequency at a time without reference to a sky model. This leaves an overall bandpass for the entire array that must also be calibrated. In this talk, I show how that redundancy can be further exploited to calibrate the instrumental bandpass, potentially eliminating one of the major systematics frustrating our efforts to detect and characterize the 21 cm signal from the Epoch of Reionization.