



Improved Limits on the Reionization 21 cm Power Spectrum from HERA Phase I

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1 Extended Abstract

Mapping the intergalactic medium (IGM) at Cosmic Dawn and the Epoch of Reionization (EoR) are key science goals for low-frequency 21cm telescopes. As a direct probe of the density, temperature and ionization state of the IGM, the 21 cm line offers a wealth of information about the formation and evolution of the first luminous sources and how their feedback shaped the IGM. However, 21cm cosmology is hindered by overwhelmingly bright radio foregrounds, as well as terrestrial and instrumental effects that have thus far precluded a measurement of the 21 cm EoR power spectrum. To overcome this, 21 cm telescopes are developing new approaches for analyzing radio interferometric data. In particular, a new 21 cm experiment, the Hydrogen Epoch of Reionization Array (HERA), is being built that will have unprecedented sensitivity to the 21 cm power spectrum at the EoR and Cosmic Dawn. Here, we report on first results from the HERA experiment in its Phase I configuration, detailing recent power spectrum upper limits set at redshifts 8 and 10. HERA's redshift 8 limit improves upon existing limits by over an order of magnitude. These improvements come from a new analysis pipeline developed for HERA that places strong emphasis on precise control of instrumental systematics. With this pipeline, HERA Phase I achieves a peak foreground-to-noise floor dynamic range of 9 orders of magnitude in the power spectrum. We will discuss key features of our analysis that enabled this measurement and the scientific impact of the new results.