

The Precision Array for Probing the Epoch of Reionization (PAPER): Overview and Recent Results

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The Precision Array for Probing the Epoch of Reionization (PAPER) is a focused experiment aimed at detecting the spatial power spectrum of neutral hydrogen emission during the Epoch of Reionization (EoR). PAPER is an interferometer operating from 100 - 200 MHz, with antennas measuring linear polarization and a correlator producing full-Stokes output. The science array is located at the site of the future Square Kilometre Array (SKA) site in South Africa, with a prototyping and test facility in Green Bank, WV. A staged build-out of PAPER South Africa (PSA) began in late 2009. PAPER has been obtaining science-grade observations since late 2011, when 32 dipoles (PSA-32) began taking data full-Stokes data. PAPER currently has 64 antennas and has just completed a 141-day science integration (PSA-64). An expansion to 128 antennas and another long observing campaign will be complete in late 2013.

The most stringent current upper limits on the amplitude of the power spectrum from 21 cm fluctuations have recently been submitted for publication from the PSA-32 data set (Parsons et al 2013). The unique approach taken by PAPER to achieve maximum sensitivity to the power spectrum is based on

1. High spectral smoothness of the instrument response (both primary beam and bandpass)
2. A highly redundant array configuration to achieve maximum sensitivity to particular modes of the power spectrum
3. The isolation of power spectrum modes of interest from spectrally smooth foregrounds by exploiting the delay-spectrum approach (Parsons & Backer 2009; Parsons et al 2012)

These aspects of the PAPER approach will be reviewed, as well as lessons learned from data so far. The recent results of Parsons et al 2013 will be presented and summarized.