CALIBRATING THE MWA LOW FREQUENCY DEMONSTRATOR

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The Mileura Widefield Array (MWA)is a planned low-frequency imaging radio interferometer to be located at the Mileura Station in outback Western Australia. This location is extraordinarily radio quiet, offering unrestricted access to bands that elsewhere are generally considered lost to radio astronomy. The MWA Low Frequency Demonstrator (LFD) covers the 80-300 MHz range, and is planned to be operational by the end of 2007. The LFD consists of 500 antenna "tiles", each composed of a 4x4 array of crossed wideband active dipoles. The total physical extent of the LFD is planned to be 1.5 km.

The science goals of the array, which include studies of the Epoch of Reionization as well as Faraday rotation studies of the heliosphere, demand a high precision calibration of both the full polarization instrumental response, and the effects of the ionosphere. In this contribution, we describe new approaches to array calibration that exploit the potential of a fully digital array architecture. The signals from each of the 500 tiles are digitized at RF, and all 125,000 baselines in the array are correlated in order to preserve information over the full field of view of the antennas. Combined with the large number of bright sources on the sky at these low frequencies, the calibration system has access to an unprecedented wealth of information in the torrent of data flowing from the correlator. This data-rich environment facilitates the development of algorithms that are simple, robust, and rapidly convergent.

The calibration is achieved in a three-step process, solving first for position-independent antenna-based gains, then for ionospheric distortions, and finally for the full polarization power patterns of each antenna. The algorithms for accomplishing these calibrations are described, and the results of algorithm prototyping will be presented.

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