

30 Nights of Observations at the Murchison Radio Observatory

John S. Morgan⁽¹⁾

(1) Curtin Institute of Radio Astronomy, 1 Turner Avenue, Bentley, WA 6102, Australia

The Murchison Widefield Array (MWA), located at the Murchison Radio Observatory (MRO) is the only low-frequency SKA precursor. It operates in the frequency range 80-300MHz and is characterised by excellent UV coverage afforded by its 128 interferometer elements, and its exceptionally wide field of view (of order 500 square degrees).

Among the MWA key projects is the GaLactic and Extragalactic All-sky MWA (GLEAM) survey. Between August 2013 and June 2014, in four observing runs of around 7 nights each, the entire sky visible from the MRO was covered, utilising a drift-scan mode to image the entire sky over the full MWA frequency range.

As well as providing an exquisite view of the low-frequency radio sky, these data also have the potential to provide a wealth of information about the ionosphere at the MRO and its effects on radio astronomy at these frequencies. Not only does GLEAM cover a full range of elevation angles over a full year, but the broad frequency range allows source offsets due to ionospheric refraction (which scale with the square of the wavelength) to be decoupled from instrumental effects such as timing errors.

This paper will summarise the work which has been done to measure quantitatively the effects of ionospheric refraction on the GLEAM survey and the methodology used to produce sharp and astrometrically-correct images. The ionospheric measurements produced by the MWA will be compared with those derived from dual-frequency Global Positioning System data. Finally, the typical refractive shifts and their timescales will be summarised to give some insight into the calibration challenges the ionosphere will pose for future instruments such as the low-frequency Square Kilometer array.