Searching for Cosmic Reionization with HI 21cm signal

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Abstract. In order to understand the structure formation and evolution in the universe, it is very important to be able to analyze the end of the "dark ages" of the Universe through the process of reionization. Cosmic Reionization is the phase which marks the transition between a fully neutral Inter Galactic Medium (IGM) and a mostly ionized IGM. Through the study of the IGM in this era we can understand the gaps in the knowledge of cosmic structure formation and formation of the first luminous objects. Study of this era through the HI 21 cm line is one of the major science drivers in the construction of upcoming low frequency radio telescopes such as LOFAR, MWA, PAPER, SKA and LRA (Lunar Radio Array). One of the most difficult challenges in detecting the faint HI 21 cm signal during reionization is the accuracy of the foreground source removal. In this study we show that bright sources (> 1 Jy) need to be removed from the observed data of MWA with a positional accuracy of ~ 0.1 arc-second. This study also demonstrates that foreground subtraction can only tolerate a residual calibration error of 0.2 % in amplitude per $u-v$ cell, assuming that individual visibility errors average down over consecutive days. This work also presents power spectra of simulated residual foreground subtraction with position and calibration errors. This work shows that the two dimensional power spectra might be the best way to extract the HI 21 cm signal. We will also show the implications of the foreground removal accuracies for future observations with the Lunar Radio Array (LRA).