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Direction dependently calibrating Low Frequency Array data with two algorithms: DDECal vs. SAGECal

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The detection of the faint 21-cm signal from the Epoch Reionisation (EoR) has been challenging due to strong foregrounds, ionospheric effects and radio frequency interference (RFI) etc. The precise calibration of data has been a key to the detection. Low frequency array (LOFAR) is a radio interferometer which is designed to detect the EoR. Over the years, the LOFAR-EoR team has been working on creating models for the non-signal effects and subtracting them during the calibration process. Due to a very wide field of view of LOFAR, LOFAR data need to be calibrated direction dependently to compensate for different errors from varying beams and ionospheric effects. This DD-calibration process has been performed only by SAGECal (Space Alternating Generalized Expectation Maximization Calibration) in LOFAR-EoR. In this work, we fully process one night raw observation of LOFAR using the standard DD-calibration algorithm SAGECal and a different calibration algorithm DDECal (Direction Dependent Calibration) on an unexplored flanking field of the North Celestial Pole (NCP). Further, we perform foreground removal and power spectrum estimation to compare the performance of two different DD-calibration algorithms. We will compare the results to the standard LOFAR-EoR pipeline to test whether different independent calibration algorithms yield comparable results on the LOFAR data.

Presenter: HYOYIN, Gan (University of Groningen)

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