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Visibility based angular power spectrum estimation in low frequency radio interferometric observations

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We present two estimators to quantify the angular power spectrum of the sky signal directly from the visibilities measured in radio interferometric observations. This is relevant for both the foregrounds and the cosmological 21-cm signal buried therein. The discussion here is restricted to the Galactic synchrotron radiation, the most dominant foreground component after point source removal. The Bare Estimator uses pairwise correlations of the measured visibilities, while the Tapered Gridded Estimator uses the visibilities after gridding in the uv plane. The former is very precise, but computationally expensive for large data. The latter has a lower precision, but takes less computation time which is proportional to the data volume. The latter also allows tapering of the sky response leading to sidelobe suppression, an useful ingredient for foreground removal. Both estimators avoid the positive bias that arises due to the system noise. We propose the tapered gridded estimator as an effectively tool to observationaly quantify both foregrounds and cosmological 21-cm signal.

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