

On-The-Fly interferometric imaging using MeerKLASS survey

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MeerKLASS, the MeerKAT Large Area Synoptic Survey, aims to survey large areas of the sky with MeerKAT in order to probe cosmology using the single-dish HI intensity mapping technique while producing continuum images with the interferometer. The target is to cover 10,000 square deg on the UHF band with 25 μ Jy rms and 13" resolution (a new survey in the L-band with the MeerKAT extension aiming at 5,000 square deg, 9 μ Jy rms and 5" resolution has also been proposed). The single-dish survey requires a fast scanning mode at constant elevation in order to deal with systematics. This requires the use of the "On-The-Fly" (OTF) interferometric imaging technique to enable commensal observing for intensity mapping and interferometric imaging. OTF has been used previously by the VLA since it enables fast survey speeds while removing the settle-and-slew overhead from traditional step and stare observations. In this work, we demonstrate that science-quality OTF interferometric continuum imaging with fast scanning speeds is possible with MeerKAT, using available MeerKLASS data. However, OTF imaging comes with its own set of challenges, such as flux errors due to phase smearing or flux biases due to the motion of the pointing centre on the sky during the correlator integration time. We develop a framework to transform MeerKLASS scan observations into OTF-format measurement sets and mitigate these issues. We use these measurement sets to produce OTF interferometric imaging snapshots and employ two different techniques to add multiple OTF snapshots. Till now we have processed ~2700 of such OTF snapshots in the L-band, which covers about 300 square degrees in the Southern sky. With this fractional processed observation we have achieved an image sensitivity of ~140 μ Jy and we aim to reach about 30 μ Jy with the existing observations. In the future, with many fold data acquisition by the MeerKLASS survey, we expect to embark on the search for slow transient and deep imaging.

keywords

survey overview, imaging, calibration, cosmology

In-person or online?

in-person

Career level

ECR

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