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Initial Developments in the TPM Beamformer Activity at GMRT

Giant Metrewave Radio Telescope (GMRT) is a member of the Low Frequency Aperture Array (LFAA) consortium of the Square Kilometer Array group in India (SKA-India). SKA-Low would operate in a frequency range of 50-350 MHz and utilises an array of log-periodic antennas. 256 numbers of such Log-periodic antennas are used at each station, the signal from these antennas are processed to form beams which are further transported to a central processing room. The signal processing in LFAA would be carried out using Tile Processing Module (TPM), which is a FPGA-based hardware board for implementing beamforming system developed by the Italian collaborators. GMRT Backend team is currently involved in setting up the TPM and its control machine, testing beamformer design functionality using Aperture Array Verification System (AAVS) software, validating results, identifying possible bugs in the AAVS and fixing them. We are currently involved in the characterization of system components to achieve performance, identifying possible testing procedures to test part of the beamformer (particularly the phase correction and calibration modules). At present, the TPM is being tested using the RF test setup, however, in future, we plan to test the TPM hardware with the antenna signals. In parallel with these activities, we plan to add a real-time Radio Frequency Interference (RFI) mitigation block to the TPM beamformer signal processing chain. As an initial effort, we have developed a technique similar to that used for mitigating RFI in real-time in the Upgraded GMRT (uGMRT) backend. In this poster, we provide an introduction to the SKA beamformer activities being done in the GMRT labs and present initial results from the functional simulation of the RFI filter design.

Presentation type

Poster

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