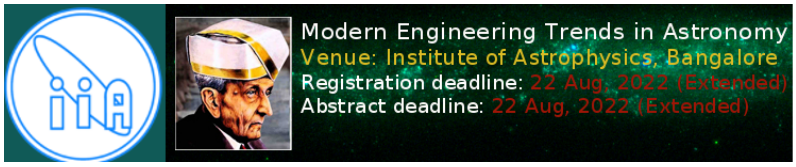


Contribution ID: **42** Type: **not specified**

# Recent Updates from the Expanded GMRT Aperture Array Beamformer Development

A 32-input, 32 MHz bandwidth, 5-beam, aperture array beamformer has been designed and implemented as part of the Expanded GMRT (eGMRT) proposal. This prototype beamformer development was a precursor to a wideband beamformer (300 MHz bandwidth) which is currently being designed. We present the basic architecture and the optimizations to implement these prototype correlator and beamformer designs on a single FPGA board. The beamformer has undergone testing in the free-space range at the GMRT site using the 144-element Vivaldi antenna array procured from ASTRON. Following the basic beamsteering tests, we performed optimum beamforming using the maxSNR method. The process of maxSNR beamforming takes in the array cross-correlation matrix as an input and provides beamformer weights that maximize the signal-to-noise ratio (SNR). We would explain this array calibration process on raw voltage (ADC output) data to understand the implementation of the maxSNR algorithm and to compare it with coherent beamforming using the conventional method. Further, we present results from 30-element maxSNR beamforming.

In parallel to this development, we have developed an end-to-end system simulation model on the MATLAB-Simulink platform for the prototype and its testing in the aperture array mode. We will provide a glimpse of comparing the simulated beamsteering pattern with the experimental one. Currently, we are implementing a wideband correlator and multi-beam beamformer on Xilinx RFSoC (RF System-on-Chip). We will discuss the initial results and implementation plans from this activity.

## Presentation type

Oral

**Primary authors:** DIXIT, Bela (Giant Metrewave Radio Telescope (GMRT), NCRA-TIFR); BUCH, Kaushal (Giant Metrewave Radio Telescope, NCRA-TIFR)

**Co-authors:** Mr AJITHKUMAR, B. (Giant Metrewave Radio Telescope, NCRA-TIFR); Prof. CHENGALUR, Jayaram (National Centre for Radio Astrophysics, TIFR)

**Presenters:** DIXIT, Bela (Giant Metrewave Radio Telescope (GMRT), NCRA-TIFR); BUCH, Kaushal (Giant Metrewave Radio Telescope, NCRA-TIFR)