Fast Transients with Indian telescopes

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Fast Radio Bursts: A decadal journey



Why Fast Transients with the GMRT?

Interferometric detection

- FRBs with extreme luminosity and intrinsic short period suggest extreme events
- GMRT is only one of very few facilities (e.g. MeerTRAP, ASKAP) can give detection and arc-sec localisation
- > Localise at extragalactic distance \rightarrow probe IGM, identify host, distances
- Triggering multi-wavelength follow-up rapidly after the burst

Lower frequency

- ➢ FRBs are detected 400 MHz to 8 GHz
- After CHIME detection, GMRT is more important to find low-frequency cut-off (if any), spectral-index, scattering
- ➤ 3-times more sensitive than previous GBNCC 350 MHz fluence → can probe different luminosity distribution

Fast Transients @ GMRT



Fast Transients @ GMRT

- Remove RFIs to a large extent compared to conventional beamformer currently in place at the GMRT
- 2-5 times of current time-domain sensitivity of the GMRT
- Further mitigation of correlated-RFI with short baseline flagging



Fast Transients @ ORT

Ooty Wide-field Array: 1056 dipoles array with 264 elements 2m*20m (Subrahmanya, Monoharan and Chengalur 2017)

308.5 - 346.5 MHz, $G/T_{svs} = 0.02$ Jy⁻¹, FoV = 48 deg²

Bhattacharyya, Bera, Bharadwaj, Bhat and Chengalur et al. 2017



Fast transients @ NCRA 15-m dish

15-m dish: 1280 – 1380 MHz, $G/T_{sys} = 0.0003 \text{ Jy}^{-1}$, 100 Jy-ms, FoV = 1 deg²

Detection of ~ 1000 giant pulses from Crab by Bera and Chengalur 2019



New developments:

15-m dish with 400 MHz band: 1100 - 1500 MHz, 50 Jy-ms

15-m dish with PAF: 1280 – 1380 MHz, 100 Jy-ms, FoV = 30 deg² (50% of ASKAP population)

Other projects

Fast transients with Sky Watch Array Network (SWAN) by Deshpande et al.: Wide-band interferometric array of antenna across different parts of India <u>http://www.rri.res.in/SWAN/SWANRRI.html</u> (talk on Thursday)

Low-frequency follow-up of FRB 121102 at the GMRT by Chengalu et al., Gajjar et al.

Summary

Following up ASKAP repeaters with the GMRT

Following up bright ASKAP FRBs with 15-m dish@NCRA for finding repeaters

Synergy between FRB@ORT and UTMOST

Synergy between PAF@15-m and ASKAP

Finally going towards PAF@GMRT for wide-field FRB search (eGMRT, Patra et al. 2019)