



## Spectrum management at GMRT Observatory

S. Sureshkumar<sup>1</sup>, Pravin Ashok Raybole<sup>1</sup>, Ankur Prajapati<sup>1</sup>, Sanjeet Rai<sup>1</sup>, Rahul Bomble<sup>1</sup>, Yashwant Gupta<sup>1</sup>,  
Divya Oberoi<sup>1</sup>

GMRT, NCRA-TIFR, Pune, India, 410504, <http://www.gmrt.ncra.tifr.res.in>

This paper presents the various methods and techniques adopted by the Giant Meterwave Radio Telescope (GMRT)[1] observatory in protecting the allocated radio astronomy bands and limiting the radio frequency interference (RFI) generated in the vicinity of the array. With the upgraded GMRT [2] aiming to provide a seamless coverage from 150-1500 MHz and using much larger bandwidths, this has become even more important. A key challenge on this front comes from being located in a comparatively populated region in an agriculturally productive region and amid a growing industrial presence. These factors make the often used approach of establishing a “radio quiet zone” around radio observatories much harder to implement for the GMRT. The approach taken at the GMRT is to build a co-existence model where we try to limit the levels of RFI to manageable levels while working to meet the needs of the citizens, farmers and industries in the vicinity of the array [3,5]. There are many different aspects to this effort. We actively routinely monitor the spectrum in the vicinity of the GMRT to identify, trace and catalogue intentional and unintentional sources of RFI. We have successfully worked with the government spectrum regulatory authorities to convince them to allocate the mobile telephony bands outside the 150-1500 MHz band used by the GMRT. We continue to engage with them for working out the plans for digital TV transmissions and planning new spectral allocations for 5G services and Railway Radio communication Systems between Train and Trackside (RSTT). We also provide regular inputs to the various calls from the regulatory authorities and continue to sensitise them to the needs of radio astronomy for protection beyond the standard RAS bands around the GMRT. The interference from high tension power distribution networks is a significant issue in the GMRT bands. To limit this we have been working with the state government authorities on aspects ranging from routing and specifications of the new power lines to appropriate and timely maintenance of the existing power lines. With cooperation from the state and local administration, the area around the GMRT has been declared to be a restricted zone, as far as setting up new industry is concerned. This gives us the ability to become aware of and understand the RFI potential of the proposed industrial units and work with them to minimise it. The process of setting up a new industry in this restricted zone requires a formal No Objection Certificate from the GMRT before it can go ahead. The GMRT RFI group has pioneered the development and implementation of methods to avoid RFI from satellites where the information of satellite orbits and the observations schedule is used to work out zones of avoidance [4]. Here we share the highlights from our journey to protect the radio astronomy band at GMRT along with our plans for the future.

## References

- [1] Swarup, G., Ananthkrishnan, S., Kapahi, V.K., Rao, A.P., Subrahmanya, C.R., and Kulkarni, V.K. (1991) "The Giant Metrewave Radio Telescope", *Current Science*, vol. 60, pages 90-105.
- [2] Gupta, Y., Ajithkumar, B., Kale, H. S., Nayak, S., Sabhapathy, S. et al., "The upgraded GMRT: opening new windows on the radio Universe", *Current Science*, **113**, 4, p. 707-714.
- [3] Pravin Ashok Raybole and S.Sureshkumar, "External sources of RFI at the GMRT: Methods for control and co-existence with commercial users" in *Proceedings of Science 2010*.
- [4] Pravin Ashok Raybole, S.Sureshkumar, Santaji Katore and Sanjeet Rai, "Real time prediction, detection and co-existing with satellite interference at GMRT" RFI2016, Socorro, New Mexico.
- [5] S. Sureshkumar<sup>1</sup>, Pravin Ashok Raybole<sup>1</sup>, Sanjeet Rai<sup>1</sup>, Ankur<sup>1</sup>, "Laboratory building in a Faraday's cage and Radio Frequency Interference monitoring, 32nd URSI GASS, Montreal, 19-26 August 2017.