

Proposal for IEEE Milestone Submission - GMRT

List of some of the important milestone publications related to the GMRT :

1. Overall design concept of GMRT, including new areas of technology developments (1991) :

“The Giant Meter-wave Radio Telescope”, Swarup, G. et al., published in Current Science, Vol. 60, p. 95-105 (1991).

2. First published result from GMRT data (of 1998) reported in international refereed journal (1999):

“Giant Metrewave Radio Telescope observations of low-z damped Ly alpha absorbers“, Chengalur, J. N. & Kanekar, N., published in MNRAS, Vol. 302, L 29 (1999).

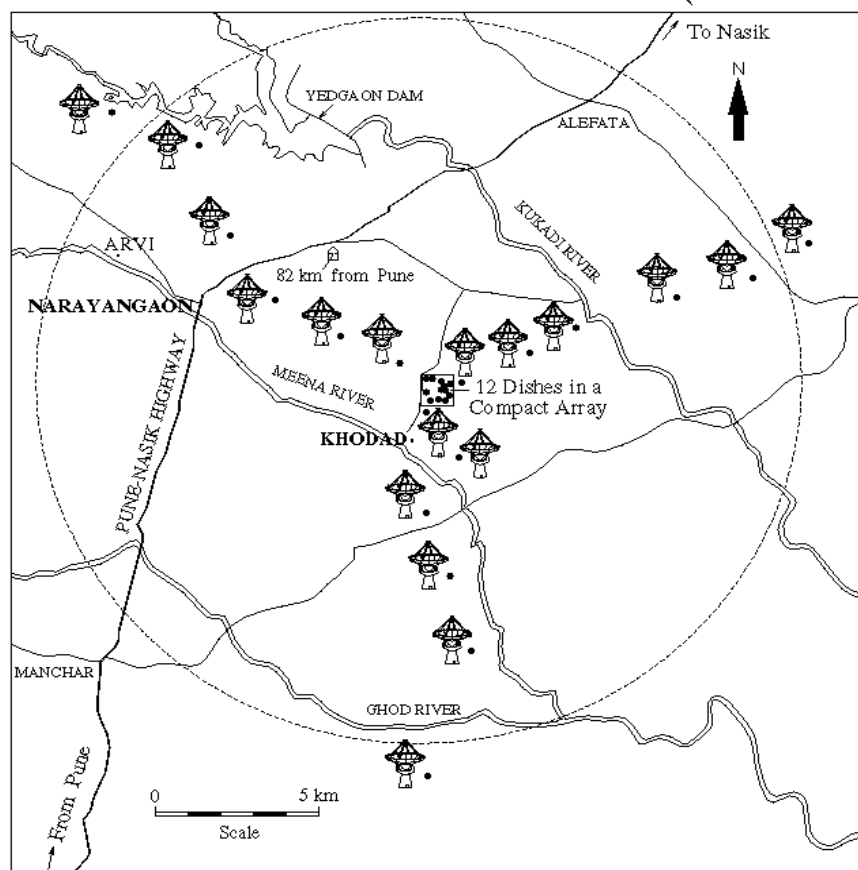
3. Overview of the upgrade of the GMRT :

“The upgraded GMRT: opening new windows on the radio Universe“, Gupta, Y. et al., published in Current Science, Vol. 113, p. 707 (2017).

Illustration #1 : The GMRT array configuration

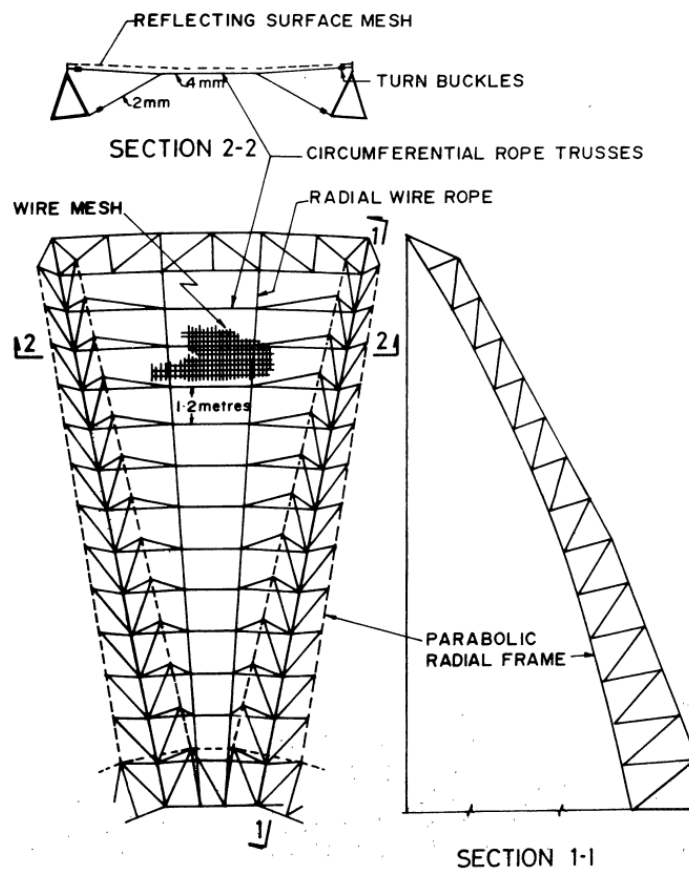


LOCATIONS OF GMRT ANTENNAS (30 dishes)



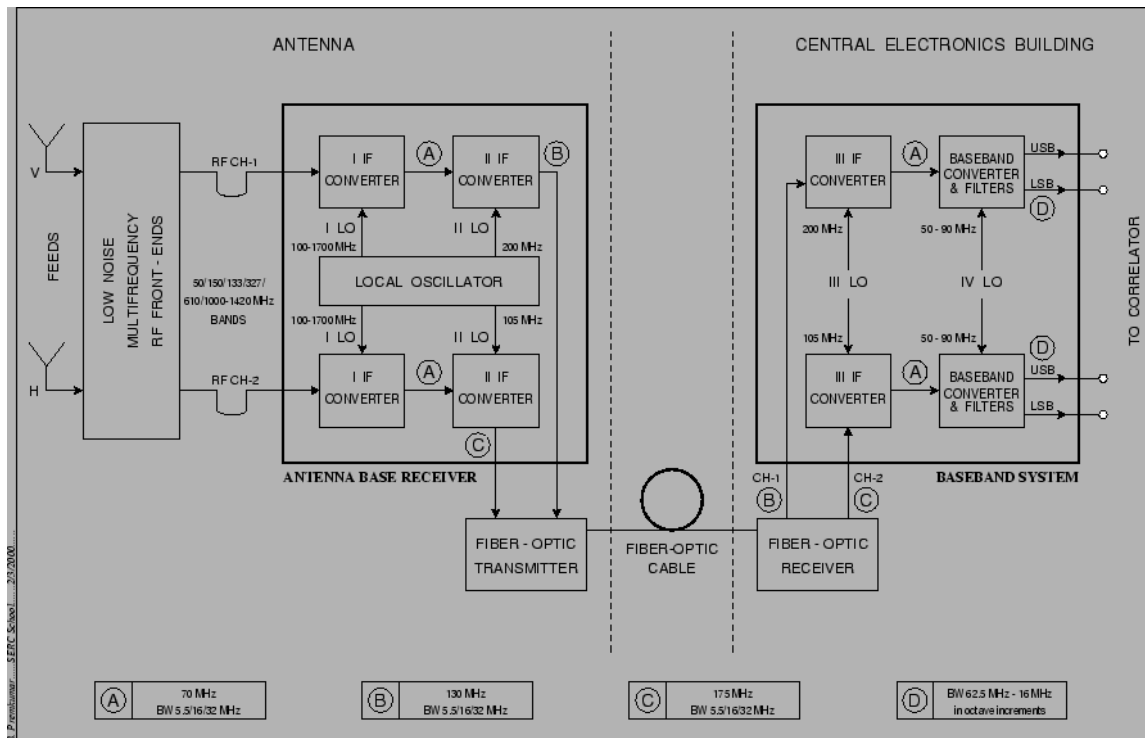
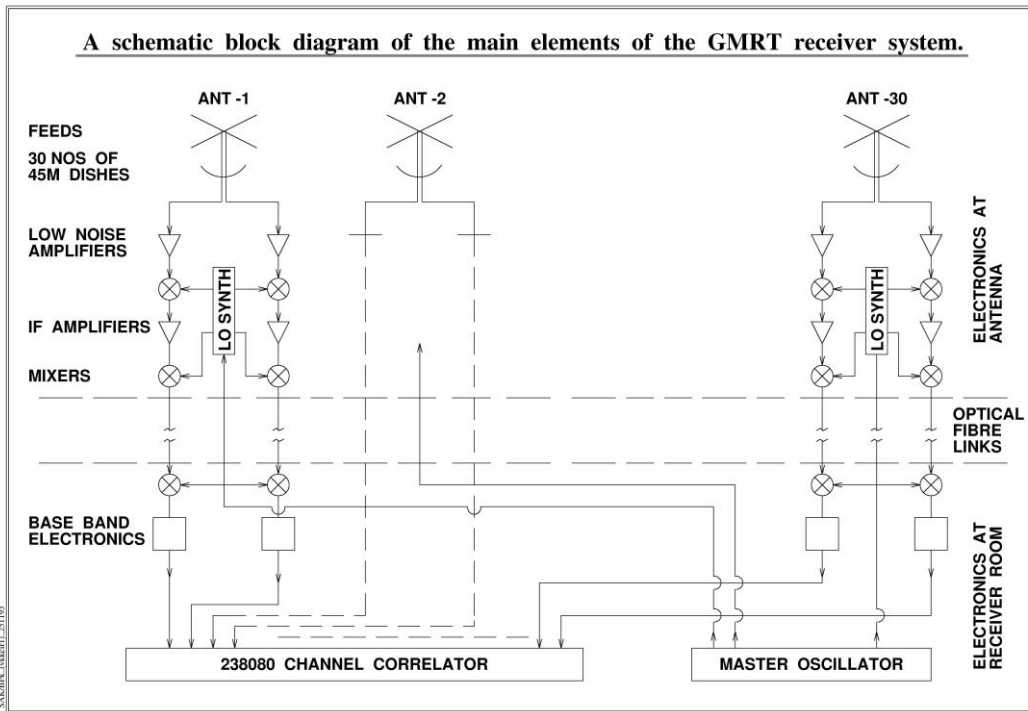
Caption : Showing the configuration of the 30 antennas of the GMRT array (bottom) spread out over a region of almost 30 km diameter, with 12 antennas in a central compact array within a 1 km x 1 km square region; a panoramic view of many of the antennas in the compact central array (top) – each antenna is 45 m in diameter.

Illustration #2 : The SMART antenna design concept



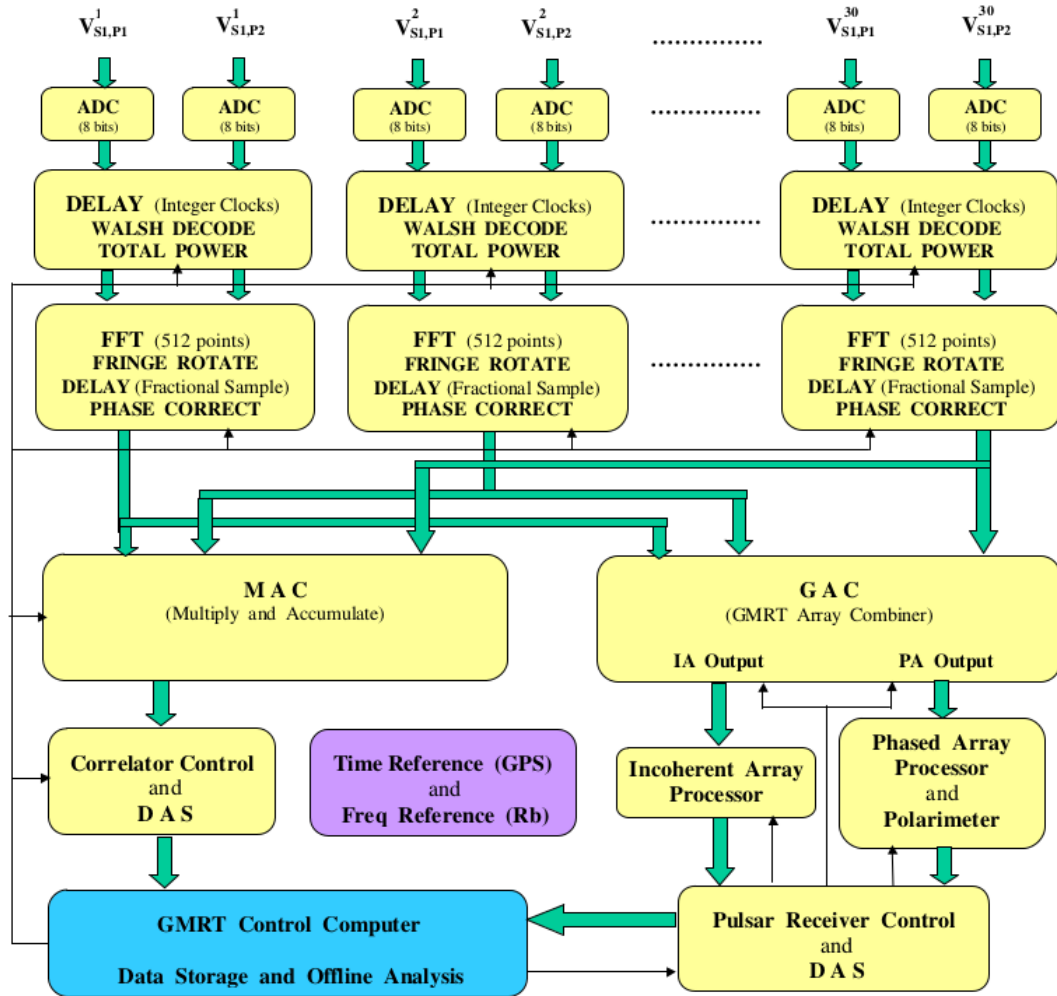
Caption : Illustrating the novel concept of SMART (Stretched Mesh Attached to Rope Trusses) used for the antenna design for the GMRT – 45 m diameter antennas weighing less than 100 tons !

Illustration #3 : GMRT Receiver System



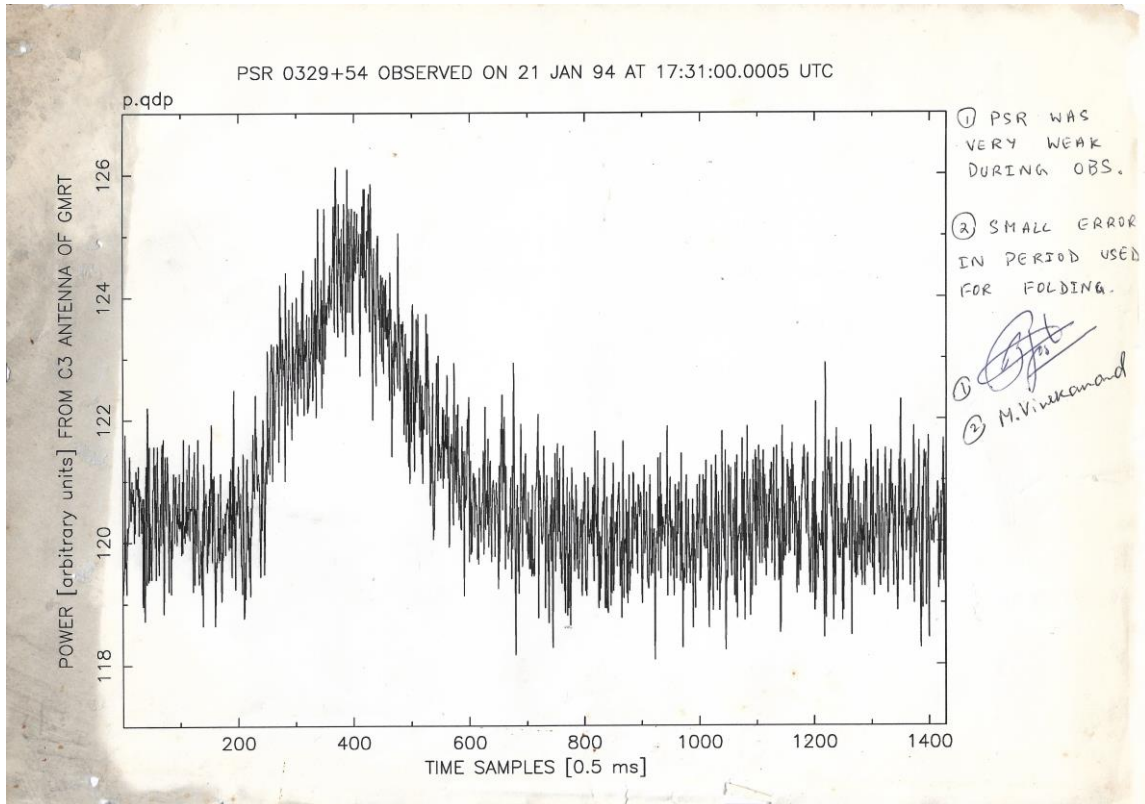
Caption : Showing the block diagram of the full GMRT receiver system (top panel); and the RF front-end and baseband receiver part of it (bottom panel)

Illustration #4 : Digital back-end for the GMRT



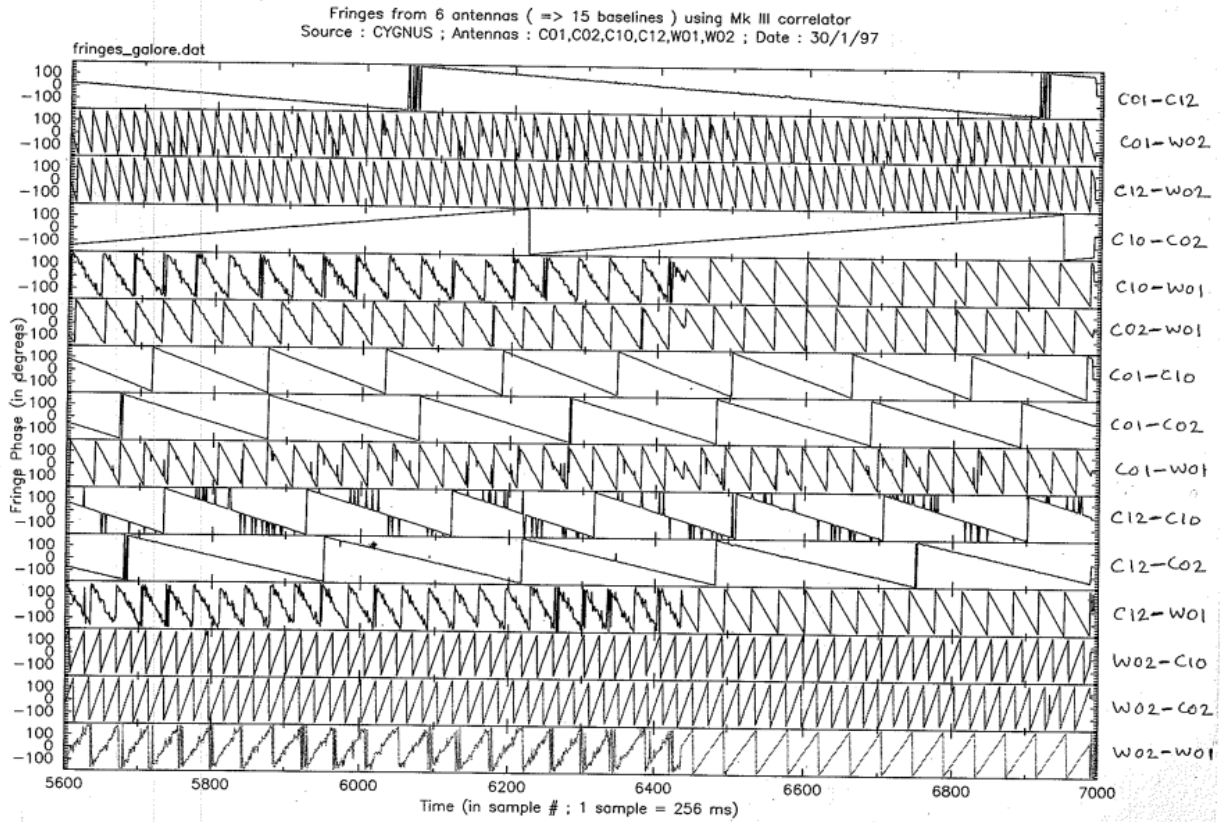
Caption : Block diagram of the digital back-end receiver system for the GMRT

Illustration #5 : First light science experiment with the GMRT (1994)



Caption : Recording of the first light observation of an astronomical source by the GMRT – the radio pulsar PSR B0329+ 54 observed on 21st January 1994.

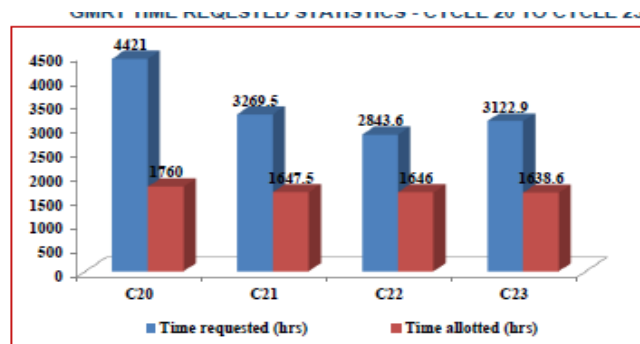
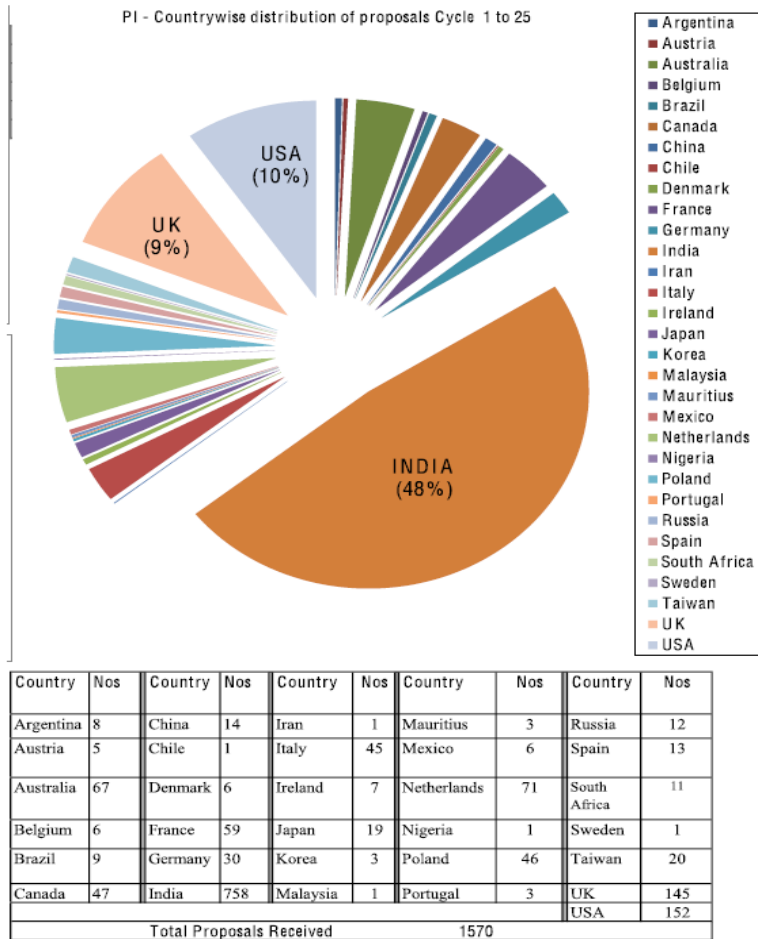
Illustration #6 : First interferometric observations with GMRT (1996-97)



Caption : Recording of one of the first major interferometric observations with the GMRT – fringes on the source Cygnus-A observed on 30th Jan 1997.

Illustration #7 : GMRT Usage Statistics

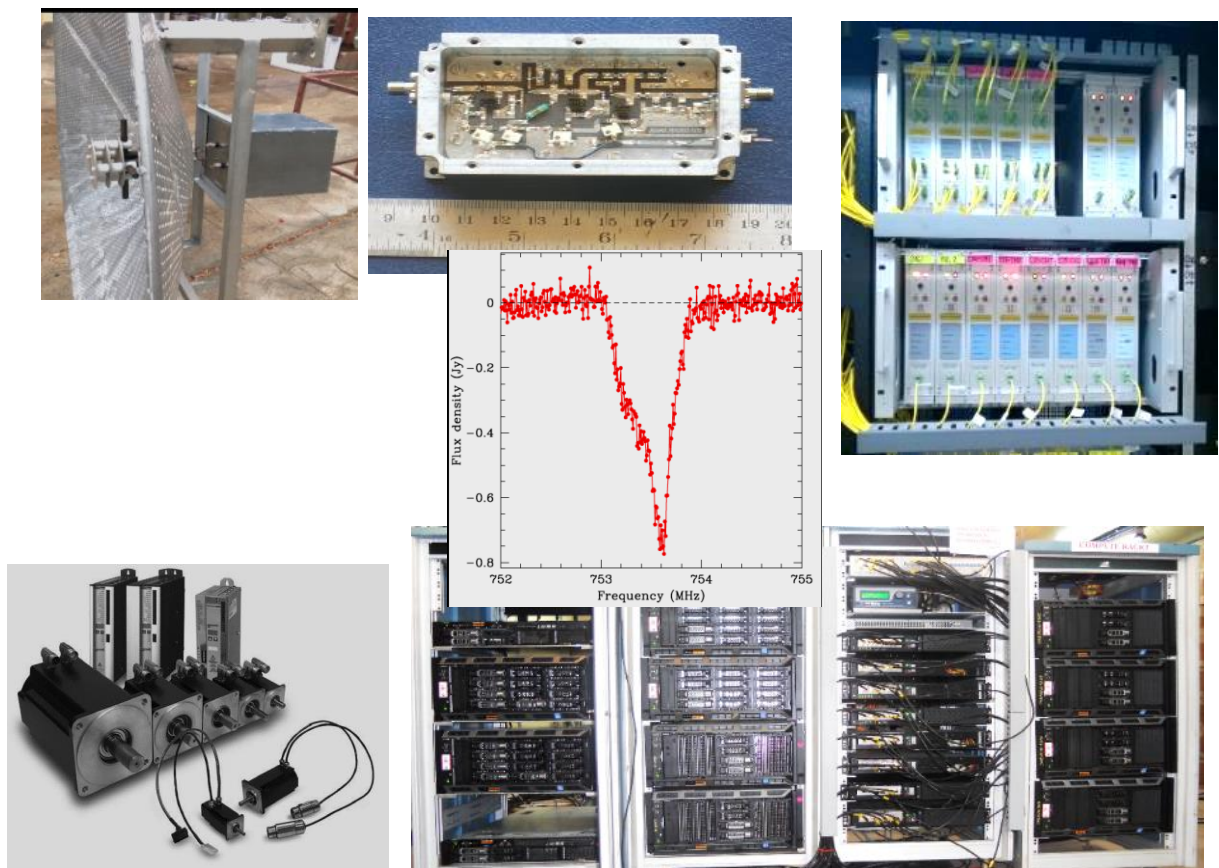
- GMRT sees users from all over the world : distribution of Indian vs Foreign users is close to 50:50
- The GMRT has been typically oversubscribed by a factor of 2 or more



Caption : Illustrating the usage of the GMRT by astronomers from countries all over the world (top panel); and the oversubscription factor for some typical observing cycles (bottom panel).

Illustration #8 : The upgraded GMRT in a nutshell (2019)

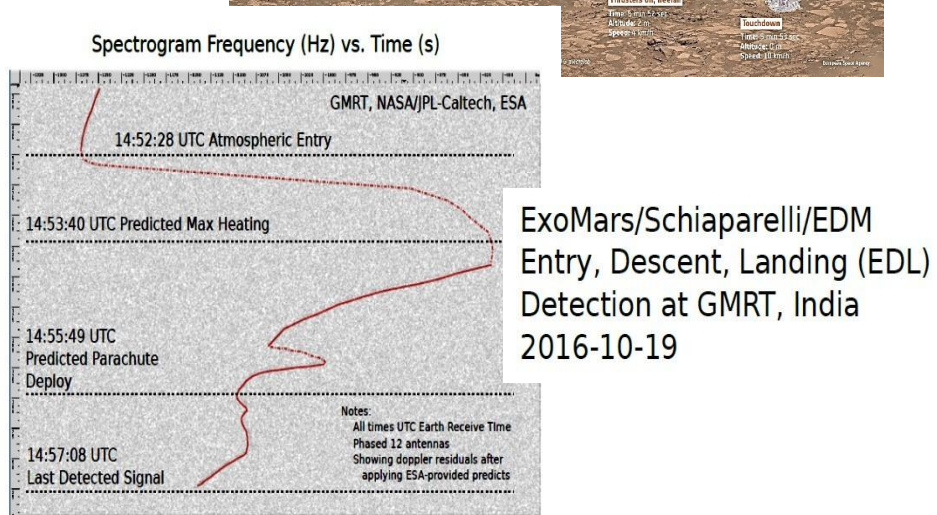
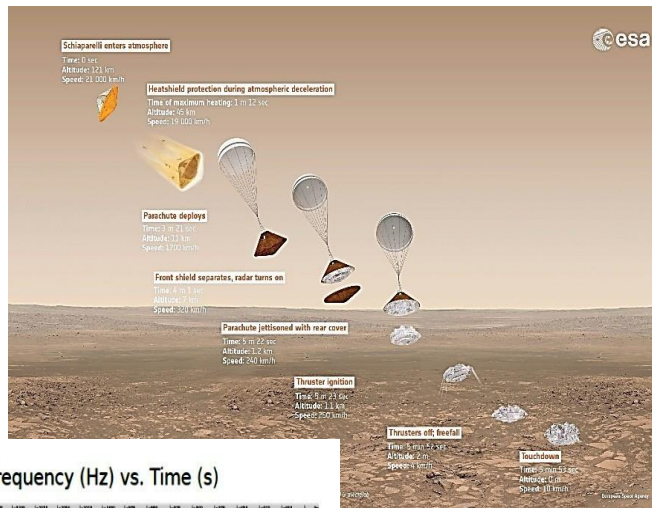
- wideband RF electronics;
- improved optical fibre system;
- next gen digital processing;
- revamped servo systems;
- smart interference rejection;
- exciting, new results !



Caption : Illustrating the main technology developments included in the recently completed upgrade of the GMRT (2019).

Illustration #9 : Tracking space probes with the GMRT (2016)

- GMRT provide ground support for ExoMars mission of ESA
- NCRA + NASA collaboration
- Faithfully tracked Schiaparelli Lander module of ExoMars through “8 mins of hell” landing attempt
- ~ 3 W signal @ 401 MHz transmitted from Mars, detected on Earth by GMRT !



14:57:50 : Predicted Backshell & Parachute Jettison
(This exposes +6 dBIC antenna), Thrusters On
14:58:20 : Predicted Thrusters Off & Touchdown

Caption : Illustrating the use of the sensitivity of the GMRT observatory to track space probes.



OB NEWS DATA BY SEISMIC MONITOR USGS 9:38pm

MAG. 7 6 5 4 3 2

LAST: Hour Day Week

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Pointer 19°05'28.65" N 74°03'02.69" E elev 2150 ft Streaming ||||| 100% Eye alt 3010 ft

This block contains a satellite view of the seismic station. At the top left is a small world map with a red dot indicating the station's location. At the top center is a header for 'OB NEWS SEISMIC MONITOR' with 'DATA BY USGS' and a timestamp of '9:38pm'. At the top right is a north arrow. On the right side is a vertical legend for 'MAG.' (magnitudes 2-7) and 'LAST:' (Hour, Day, Week). At the bottom are copyright notices for Europa Technologies, NASA, DigitalGlobe, and Google. At the very bottom is a status bar with coordinates (19°05'28.65" N, 74°03'02.69" E), elevation (2150 ft), streaming status (||||| 100%), and eye altitude (3010 ft).



Some of the dishes of the Giant Metrewave Radio Telescope

