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NRAO 43-m telescope operation at 170 - 1700 MHz: a Bi-Static Radar Collaboration

Glen Langston

National Radio Astronomy Observatory, Green Bank, WV 24944, USA
email: glangsto@nrao.edu

Abstract. The NRAO 43m telescope has been refurbished and begun regular observations in the frequency range 170 - 1700 MHz. The 43 m operations support a Bi-Static Radar Collaboration to measure the Earth's ionospheric turbulence. Researchers from Chalmers University of Technology in Sweden have designed and built a unique design wide-band feed, 150 - 1700 MHz. Lincoln Laboratories/MIT has packaged the feed with room temperature low noise amplifiers. Lincoln Laboratories has installed a high-dynamic range RF system together with a wide-band sampler system. The NRAO operates the 43 m telescope according to schedules authored by Lincoln Laboratories. Currently the 43 m telescope is tracking spacecraft 48 hr a week. The tracking antenna operation is completely automated. A group at MIT/Haystack have installed a second radar experiment at the 43 m as well as an array of 6 'discone' antennas. Their experiment is testing the use of reflected FM radio stations as probes of the ionosphere.

Keywords. atmospheric effects, turbulence

Experiments

Three separate experiments are being implemented at the NRAO 43 m antenna. The main experiment is a "bi-static radar spacecraft tracking experiment" led by R. Sridharan of MIT's Lincoln Laboratory. In this experiment the radar signals are transmitted towards spacecraft and reflections simultaneously sampled at the NRAO 43 m and at the Millstone hill radar station (see documentation at <http://www.gb.nrao.edu/mlln/>.)

The second experiment is an 'incoherent scattering radar' in which the ionosphere radar is directly illuminated by a 440 MHz radar at MIT's Haystack observatory. The reflected signals are recorded at the 43 m (see Phil J. Erickson, <http://www.haystack.mit.edu/~pje>.

The third experiment is a passive (FM radio) radar prototype experiment (see Frank Lind, <http://www.haystack.mit.edu/~flind>). In this experiment commercial FM radio stations are used to illuminate the atmosphere and eventually >1000 detection stations will sample the signals reflected off of the ionosphere. The collection of these signals will allow measurement of the total electron content (TEC) of the ionosphere.