

A new active phased array Indian MST radar system with enhanced capabilities for high resolution atmospheric observations

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Realizing the importance of the atmospheric dynamics and coupling (lower atmosphere and upper atmosphere including ionosphere), a major project has been undertaken to develop high power active phased array MST radar (AAMSTR) with incoherent scatter capability at NARL, Gadanki, India (13.45°N, 79.18°E). The newly developed radar system has been incorporated with latest technologies such as state-of-the-art high power solid state Transmit-Receive modules (TRM) placed outdoor near individual antenna elements, distributed control signal system to each TRM through optical fiber, flexible antenna array configuration to support upto a maximum of 64 channels with direct digital receiver system for Spaced Antenna (SA) and Interferometry/ Imaging applications.

The AAMSTR system operates at 53-MHz with the existing Indian MST radar antenna array, and is configured for steering the beam on a pulse-to-pulse basis in all 360° azimuth and 20° zenith angle, providing enhanced capability to study the Mesosphere-Stratosphere-Troposphere and Ionosphere. Further, the antenna system has been configured for radiating in circular polarization for its application in the Ionosphere Incoherent Scatter mode.

The AAMSTR system with 1024 solid state Transmit-Receive Modules, low loss corporate feeder network, multi-channel receiver system and a new generation web based radar controller with Python backend. The new configuration with enhanced average power, beam agility with multi-channel experiments will be a potential source for studying middle atmosphere and ionosphere. The initial results are quite encouraging and currently the system is providing wind information to the ISRO satellite launch missions from SDSC, SHAR. In this paper, we present the system configuration, new capabilities and the first results obtained using the Active Phased Array MST Radar.