

New capabilities of the Gadanki MST radar

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The 53 MHz Gadanki MST radar, having peak power aperture of $3 \times 10^{10} \text{ Wm}^2$, was established nearly two and half decades ago. The antenna system consisted of a semi-active phased array of 1024 3-element Yagi antennas in the form of 32 linear sub-arrays and 32 high power tube-based transmitters feeding one sub-array of the antenna system. Recently, the radar system has been upgraded with 1024 identical solid-state transmit-receive modules each feeding one Yagi antenna of the existing antenna array. Transmit-receive modules have been designed to deliver peak power of 1 kW with a duty ratio of 10 % and they are capable of radiating with long pulse having duration as high as 500 μs . These transmit-receive modules are placed outdoor and signal distribution is made through a low-loss corporate feed network. The new configuration provides capability of forming beams in any azimuth direction, which was not possible earlier, and supports multi-receiver capabilities with 64 phase centers to carry out spaced antenna and interferometry/imaging studies of the neutral atmosphere, ionosphere and meteors. Currently, five receivers have been installed to initiate spaced antenna and interferometry experiments. The antenna system is further being modified to transmit circular polarized signal by exciting the orthogonal Yagi-elements through hybrids so that the upgraded system can be used for incoherent scatter applications. The upgraded system has been tested for its overall performance. A few scientific experiments to study troposphere-stratosphere, mesosphere and ionosphere have also been carried out. This paper presents the latest updates on the upgradations, new capabilities of the Gadanki MST radar, and the first results obtained using the system.