

Design, development and validation of RF system for Active Phased Array MST Radar

M. Durga Rao^(1,2), P. Kamaraj^(1,2), K.Jayaraj⁽¹⁾, K.M.V.Prasad⁽¹⁾, J.Raghavendra⁽¹⁾, J.Kamal Kumar⁽¹⁾, and A.Jayaraman⁽¹⁾

(1) National Atmospheric Research laboratory, Gadanki, India-517112

(2) Vellore Institute of Technology, Tamilnadu, India

mdrao@narl.gov.in

Active Phased Array Indian MST radar (AAMSTR) configuration has dedicated TR module connected to each individual antenna. The array consists of 1024 solid state TR modules placed outdoor to generate a peak power about 1Mw. RF system design is very crucial for achieving the desired input levels to these TR modules with proper amplitude and phase to generate the desired power level. The RF system of the AAMSTR consists of DDS based exciter, generates the pulse coded RF signal with reference to a highly stable OCXO. RF distribution and switching network distributes the pulse coded RF signal generated by the exciter to all the TR modules located in the antenna field over an array size of 130mx130m in Transmit path with equal amplitude and phase, as well as, combines the received backscattered signals from all the 1024-antenna elements in a desired fashion depending on the mode of operation (DBS or SA).

The power combining of the received echo signals is to be carried out at various levels to improve the detectability of the signal. RF power combiner/dividers are placed outdoor with proper environmental protection and switched Combining Units in the instrumentation room (indoor). Flexible design approach has been incorporated to select the sub array level such as 4x4, 8x8, 16x16 and 32x32 elements for the spaced antenna, interferometry/imaging applications.

Multichannel Analog receiver system has been designed to provide the required gain and matched filtering of the received echoes with very good isolation levels across the channels. Provision has been made to select the various filters for different pulse widths of radar operation. RF feed network has been realized with corporate feed topology with low loss outdoor cables to achieve equal amplitude and phase.

This paper describes the design philosophies and realization approach of RF subsystems for Active Phased Array MST Radar with multi -channel operation flexibilities and results of the various subsystem outputs.