Cylindrical Polarimetric Phased Array Radar for Weather Observation

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The Advanced Radar Research Center (ARRC) at the University of Oklahoma (OU) has developed a mobile S-band Cylindrical Polarimetric Phased Array Radar (CPPAR) to investigate the advantages of a cylindrical radar when compared with a planar-faced system. Advanced phased array radars are rapidly becoming viable competitors to spinning-dish radars in civilian applications due to their unique scanning capabilities, but there remain questions about how to maintain the qualities of extremely low differential reflectivity (ZDR) errors and azimuth scan invariance inherent to dish radars without sacrificing sensitivity. Because these features are of primary importance in weather radar missions, one of the main research goals is to perform measurements of the atmosphere for the first time with a cylindrical polarimetric phased array in order to demonstrate the expected advantages. This goal constrains the minimum dimensions and sensitivity of the radar far beyond what can be reasonably attained with commercial off-the-shelf components, requiring nearly all subsystems to be designed from the ground up. In addition to informing the development of multifunction phased arrays, the CPPAR will also serve as a flexible platform for general phased array research and signal processing in the future.