# Design of Calibration Algorithms for Fully-Activated Millimeter-Wave Phased Array Antennas

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***Abstract*—This paper focuses on the study of the calibration technology for fully activated millimeter-wave phased array antennas. It utilizes a self-developed 1x8 array antenna module in conjunction with the M3-Force software defined radio (SDR) platform. By initiating the calibration mode with all antennas fully activated, the array antenna tuning is accomplished using the rotating element electric field vector (REV) algorithm. However, this algorithm involves the issues of ambiguity, and the paper proposes a technique to strengthen the synthesis of vectors to stabilize the estimation of antenna calibration parameters. Furthermore, an enhanced version of the REV method is introduced for incrementally joint block tuning of subarrays, facilitating the calibration of large array antennas. The paper overcomes the limitations of the traditional REV method in large array antenna calibration. Computer simulation results confirm the superior performance of this technique in overcoming issues with traditional REV methods and its applicability to large array antenna calibration. Finally, the paper validates the proposed technique through hardware testing with an array antenna and an SDR platform, confirming that the enhanced REV technology can calibrate a 1x8 millimeter-wave phased array antenna and suggesting its potential extension to the calibration of larger array antennas in the future.**

***Keyword*—millimeter-wave phased array, rotating element electric field vector, software defined radio platform, calibration.**

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