The Art of Higher-Order Probe Correction inSphericalNear-Field Antenna Measurements

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Abstract

The traditionalsphericalnear-field antenna measurementtechniquerequires a first-order probe, i.e., a probe with only first-orderazimuthalmodes in the sphericalwaveexpansion of the probe field, sincethisprovides an efficient and robust probe-correction in the near-field to far-fieldtransformation. Thistraditionaltechniqueyields high accuracy and ithasmaturedinto a well-established and widelyrecognizedtechniquethatforms the basis for manyexisting antenna measurementfacilities. However, the first-orderrequirementsignificantlylimits the types of antennasthat can be usedasprobes for sphericalnear-fieldmeasurements; one of a veryfew high-accuracy, practicalprobesbeing the conicalhornfedthrough a circularwaveguideoperating in the fundamental TE11-mode. This antenna hascertaindisadvantagessinceitprovidesonly a 10-15% bandwidth and becomesunmanageable large and heavyatfrequenciesbelow 1GHz. In recentyears, a number of sphericalnear-field antenna measurementtechniquesfacilitatinghigher-order probe correctionhavebeenproposed by severalauthors and theseallow a widerrange of probe antennas. Thesetechniques are based on widelydifferentapproaches and maythuspossessdifferentregions of validityaswellasdifferentadvantages and disadvantages. In this work, theseproposedhigher-order probe correctiontechniques are compared and evaluatedwrt. to the parameters of importance for practicalspherical near-field antenna measurements.