

60 GHz Antenna Diagnostics from Planar Near Field Antenna Measurement Without External Frequency Conversion - DTU Orbit (08/11/2017)

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We previously demonstrated that 60 GHz planar near-field antenna measurements without external frequency conversion can provide far-field radiation patterns in good agreement with spherical near-field antenna measurements in spite of the cable flexing and thermal drift effects [P.I. Popa, S. Pivnenko, J.M. Nielsen, O. Breinbjerg, 60 GHz Antenna Measurement Setup using a VNA without External Frequency Conversion, 36th Annual Symposium of the Antenna Measurement Technique Association, October 12-17, Tucson, Arizona, 2014]. In this work we extend the validation of this 60 GHz planar near-field (PNF) set-up to antenna diagnostics and perform a detailed systematic study of the extreme near-field of a standard gain horn at 60 GHz from planar and spherical near-field measurement data. The magnitude and phase of all three rectangular components of the electric and the magnetic aperture fields are calculated, as is the main component of the Poynting vector showing the power flow over the aperture. While the magnitude of the co-polar electric field may seem the obvious object for antenna diagnostics, we demonstrate that there is much additional information in those additional quantities that combine to give the full picture of the aperture field. The usefulness of the complete information is illustrated on an example where the horn aperture is disturbed by a fault. We compare the results of the planar and spherical near-field (SNF) measurements to each other and to simulation results.

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