Theoretical analysis of thin-wire elliptic antennas

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In this communication we extend the state-of-the art by providing closed-form equations for thin-wire elliptical antennas with arbitrary current distributions, valid from low frequencies to the infrared regime. To this end, we derive an electric-field integral equation (EFIE) for imperfectly conducting wires and elliptical geometries. Using this formulation, we obtain unknown arbitrary current distributions through a modal expansion, enabling thus the calculation of far-fields and other radiation parameters. Results shown not only achieve remarkable but also to show the superior design possibilities of elliptical geometries in comparison to the classical circular loops, which may be considered just a particular case of the methodology here presented. Special attention is paid to mathematical details of electric far-field equations, thus providing guidelines to produce efficient codes.

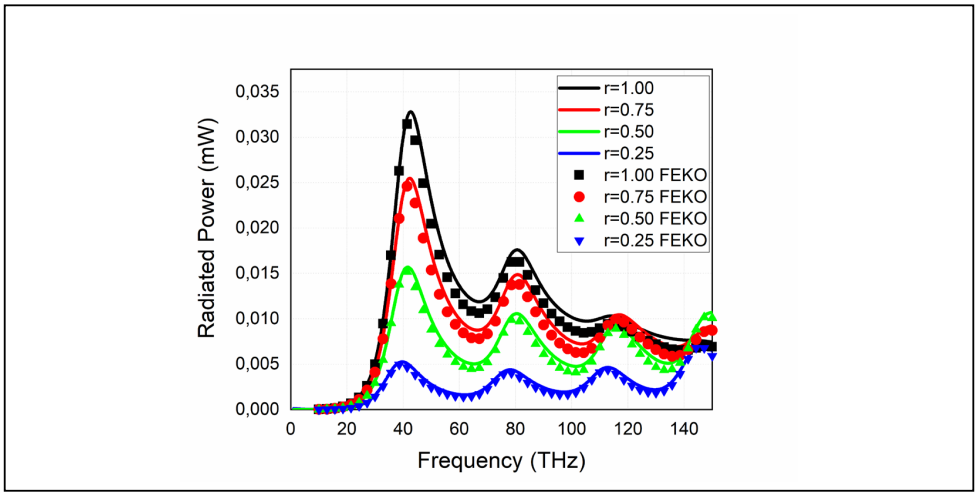

Figure 1. Radiated power for Au antennas of varying r.

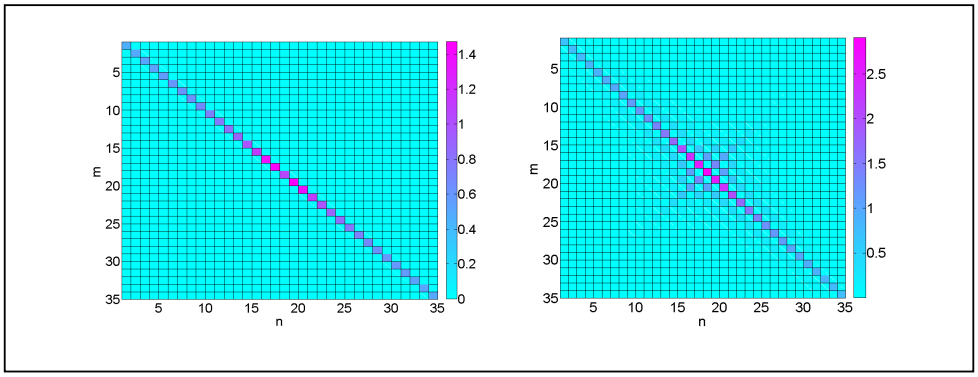

Figure 2. Coupled matrix elements for a) circular (r=1.00) and b) elliptical (r=0.125) PEC antennas at f=208 THz.