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Title:A modified physical optics method based on discrete real mirror image theory for structures with electrically large dimension and embedded between two parallel metal plates

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Abstract:Traditional Physical Optics (PO) is able to efficiently deal with 3D electromagnetic problem involving structures with electrically large dimension in the open space, usually obtaining calculation results with good precision. However, traditional PO appears to be inapposite for special complicated structures with electrically large scattering objects embedded between two parallel metal plates, so does the full wave method because of the large computation resource consumption. In this paper, a modified PO method based on Discrete Real Mirror Image theory (DRMI-PO) is proposed. The basic idea of DRMI-PO is to expand the electromagnetic current between the parallel metal plates into the Fourier series, and then linearly combine the field solution for each term, derived with the 2D PO. In comparison with Multilevel Fast Multipole Algorithm (MLFMA), DRMI-PO is able to keep enough precision and obtain higher efficiency when analyzing specific electromagnetic structures. As an application example, two terahertz fan-beam scanning antennas with different polarization are calculated with DRMI-PO and measured. The measured radiation patterns are in well agreement with the calculated results, which indicates the effectiveness of DRMI-PO.

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