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Title:Design, analysis and measurement of a millimeter wave antenna suitable for stand off imaging at checkpoints
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Abstract:A systematic method is proposed to design a novel beam-scanning antenna with fan-beam, which is suitable for stand off imaging at millimeter wave band. The antenna has not only an elliptical main-reflector to generate thin fan beam, but also a rotating sub-reflector to realize beam scanning function. All these structures are embedded between two parallel metal plates. A Reversed Ray Tracing Algorithm (RRTA) was introduced to optimize the positions and dimensions of the subreflector and the feed horn. A modified Physical Optics method based on Discrete Real Mirror Image theory (DRMI-PO) was developed to efficiently analyze and optimize the field patterns of the antenna with specific structures. Based on above methods, an antenna working at 200 GHz is designed and fabricated. The measured patterns are in well agreement with the calculated results. It's found that, the total beam scanning range is about 60 cm with its minimum half -power beam widths about 1.7 cm in the scanning direction. All the results validate the design method and potential applications of the antenna in the stand off imaging systems.
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