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AXIALLY DISPLACED ELLIPSE REFLECTOR ANTENNA DESIGN AND ANALYSIS USING MULTILEVEL FAST MULTIPOLE ACCELERATED METHOD OF MOMENTS SOLUTION OF ELECTRIC FIELD INTEGRAL EQUATION

Abstract

Ring-focus dual reflector antennas have recently been employed in various satellite communication applications because of their higher gain and compactness in size as compared to the conventional Cassegrain or Gregorian counterparts. Innovative and efficient analytical modelling, full-wave analysis and testing of a ring-focus dual reflector antenna based on axially displaced ellipse (ADE) configuration are reported in the present contribution. The geometrical design of the dual reflector system has been achieved with the help of modified conic section formulations. The indigenously developed multilevel fast multipole method (MLFMM) accelerated method of moments (MoM) solution of electric field integral equation for open perfect electrically conducting objects has been applied to predict the RF performance of the designed ring-focus geometry. The distinct nature of the surface current distribution on the ring-focus subreflector has been studied for comparison with that of the Cassegrain counterpart and its possible application in sidelobe reduction techniques. Finally the predicted and the measured results of a 35λ diameter reflector antenna have been compared where close agreement can be seen. Clearly high gain has been achieved with a combination of ADE reflector and tracking feed network.