

## UTD-Analysis of Compact-Range

J. Hartmann, D. Fasold

- (1) Fachhochschule Muenchen, Electrical and Electronics Engineering Department,  
Lab for Satellite Communications, 80323 Muenchen, Germany

Nowadays compact ranges can be considered as a reference standard in high precision measurements of the radar cross section (RCS) of electrically reflecting objects and for the determination of the radiation pattern of antennas in the microwave and millimeter wave range. With respect to the theoretical analysis of the electromagnetic field in the quiet zone of those type of test facilities, it is the intention of this paper to investigate, whether the electromagnetic field can be determined with an alternative method, exhibiting similar good performance but less computation time compared to the well-known method of Physical Optics (PO).

Such a method is the Unified Theory of Diffraction (UTD) in combination with the Geometrical Optics (GO). With this method the diffracted electromagnetic field of plane reflectors is calculated and subsequently extended to doubly curved reflectors. As the edge- and corner-diffracted rays, caused by the reflectors, deteriorate the quiet zone of the compact range significantly, the reflector rims are equipped with rolled, serrated or resistive loaded edges to reduce these scattered fields. This paper deals with the prediction of the electromagnetic field in the quiet zone of a compact range with serrated reflectors. To obtain a low amplitude- and phase-ripple in the quiet zone, the parameters of the serrations i.e. the length, the shape and the number of serrations will be analysed and compared with PO results. The calculation method is based on the generalisation of Kellers Geometrical Theory of Diffraction (GTD) established by Kouyoumjian and Pathak in 1974. The calculation program mainly consists of a ray-tracing algorithm, which is applied to detect for a given reflector geometry and defined source and observation points the related reflection and diffraction points. The field analysis results will be presented according to the above mentioned parameters. Related to these results an assessment can be made concerning the applicability of the method for the analysis of serrated reflectors.