



TICRA
engineering consultants
communications systems and antennas

Ref.: Short course

A full-day short course on
Reflector Antenna Design and Analysis

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ABSTRACT

The course will give an introduction to the design and analysis of single and dual reflector antennas, center-fed as well as offset. After a brief review of the analysis methods commonly employed for space- and earth-station reflector antennas, the basic design principles will be presented. First, the single and dual spot-beam antennas are considered, with the relationship between size, feed illumination and directivity and sidelobe levels. The influence of struts and subreflector or feed-blockage will be discussed. The origin of cross-polarization in offset designs will be addressed and it will be shown how to improve the polarization characteristics in single reflector systems by using polarization grids, and in dual reflectors by employing the compensation principles by Dragone and Mizuguchi.

The design of contoured-beam antennas for space application will be illustrated by a shaped reflector design, where surface shape is determined by optimizing a spline expansion until a desired radiation pattern over a prescribed coverage area is achieved. Important steps in the design phase will be emphasized, and the corrugated feed horn design principles will be briefly touched upon.

The lecture will be supported by PC presentations using the commercial codes GRASP9 and POS5. A number of the design and analysis principles can be examined by means of the student version of GRASP8W, which is available for free on the internet.

Agenda

- 9:00 – 9:30 Introduction to reflector antennas. Different reflector types. Analysis methods, GO, GTD, PO, PTD, MM. Polarisation conventions.
- 9:30 – 10:45 The single reflector antenna: directivity, beamwidth, illumination function, polarisation characteristics, strut blockage analysis, offset design. Improving the polarisation characteristics by means of polarisation grids.
- 10:45 – 11:00 Coffee break
- 11:00 – 12:30 The dual reflector antenna. Design guidelines,. Blockage calculations. Compensated offset designs.
- 12:30 – 13:30 Lunch break
- 13:30 – 14:30 Contoured beam design: general approach, defining the coverage, choosing between multi-feed reflector, direct radiating array or shaped reflector.
- 14:30 – 15:30 Design of a shaped reflector for contoured beam applications. Sizing the reflector, surface expansion, choosing a feed,
- 15:30 – 16:00 Coffee break
- 16:00 – 17:00 Shaped reflector continued, question and answers.