STUDIES ON BROADBAND CONJUGATE MATCHED FEED HORN

A Thesis submitted

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by

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ABSTRACT

The research work described in the thesis is mainly focused on the investigation of improving the bandwidth of the conjugate matched feed horn for offset parabolic reflector antennas. Although, the offset parabolic reflector configuration offers significant advantages as compared to the front-fed parabolic reflector antenna, it suffers from two serious drawbacks. Due to the structural asymmetry, when illuminated by a linearly polarized primary feed, it generates high cross-polarization. The presence of high cross-polarization in the antenna radiation patterns implies the loss of energy in the undesired polarization, which ultimately results into reduction of the antenna efficiency. High degree of cross-polarization degrades the performance of the communication channel and can cause measurement errors in case of remote-sensing applications. In mono-pulse tracking radars, the high cross-polarization creates bore-sight-jitter, which severely affects the tracking accuracies. Considering these undesirable effects of high cross-polarization, it becomes necessary to develop a suitable technique to suppress the unwanted cross-polarization of the offset parabolic reflector antenna over a wide bandwidth. In the present thesis, the high cross-polarization of the offset parabolic reflector has been suppressed over a wide bandwidth by using a wide band conjugate matched feed. The concept of matched feed is thoroughly described at the beginning of the thesis. Design of matched feed using symmetric triple post discontinuity is also presented. The novel wide band conjugate matched feed horn has been designed in smooth as well as in corrugated cylindrical structure. The detailed designs of these matched feed structures have been presented in the thesis. It has been verified numerically that the proposed matched feeds effectively suppress the undesired high cross-polarization of the offset parabolic reflector antenna over a wider bandwidth.