

**S.P.26. PRAVINKUMAR, P.A.–Synopsis of the Thesis Entitled
Modificatios of Secondary Reflector Antenna Patterns due to
Shaped Beams from Flanged Primary Horn Feeds–1985–
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The work presented in the thesis is a report of the efforts made to investigate the effects of shaped primary beams from sectoral horns on secondary reflector antenna. Primary patterns of H-plane sectoral horns are modified by plane and corrugated flanges fitted to the sectoral horns. The reflector is an off-set paraboloid. Experimental results are presented with appropriate theoretical explanation.

Whole work is divided into 6 chapters:

CHAPTER I: INTRODUCTION

This is the introductory part where the history of the antennas particularly reflector antennas is traced back to the pioneer workers Lodge, Hertz and Marconi. The brilliant exploits of Prof. Hertz in 1886 is described and it is followed by the introduction of different types of reflector antennas. Towards the middle of the Chapter, the description of various types of feeds particularly horn feeds is given. The Chapter ends with a detailed out line of the present work.

CHAPTER II: REVIEW OF PAST WORK IN THE FIELD

This chapter is a review of the work done in the field of secondary reflector antennas.

The chapter starts with a review of the reflector antennas in general. This is

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followed by review of papers on reflector antenna feeds. The chapter comes to an end with a detailed review of paraboloidal reflectors which is the topic of research here.

The review covers the time period from 1888 to 1983 in detail. This is conducted in the chronological order and references are given at the end of the chapter.

CHAPTER III: EXPERIMENTAL SET-UP AND METHODOLOGY

The various equipment used, the experimental set-up and the methodology adopted are described in this chapter.

A good part of this chapter is devoted to the various equipment used. The description include the main components like the off-set paraboloidal reflector, flanged sectoral horn feeds and antenna positioner (turn-table). The actual set-up of the experimental arrangement is described.

The chapter comes to a conclusion with a methodology adopted to measure the various antenna parameters like VSWR, on-axis power density, gain, E-and H-plane patterns, half power beam widths and cross-polarisation.

CHAPTER IV: EXPERIMENTAL RESULTS

This section presents the experimental data and conclusions derived from it.

The effect of the corrugated flanged sectoral horns on the VSWR, on-axis power, radiation patterns, gain, half-power beam widths and cross-polarisation of the system is obtained by analysing the experimental data. A large number of curves were plotted and effect of the various modifications on the properties of the system were studied.

In each case, the comparison between the modified and unmodified antenna is made and pros and cons of the modification are evaluated.

CHAPTER V: THEORETICAL EXPLANATION OF RESULTS

This chapter is dedicated to the theoretical discussion of the modification antenna.

The chapter begins with the detailed theoretical analysis of the corrugated flanged sectoral horn. The modified radiation pattern derived on the basis of line source theory and method of secondary sources of the feed is then applied to derive the secondary pattern of the off-set paraboloidal reflector. The surface current integral method is adopted here.

The computation of the secondary pattern using the resultant expression was carried out and theoretical patterns were derived. Further theoretical calculations by adopting modification of primary feed pattern is suggested to explain the results precisely. A discussion on the limitation of the theory, and practical difficulties in evaluating the final integral expression is also described.

CHAPTER VI: CONCLUSIONS AND SUGGESTIONS FOR FUTURE WORK

This is the concluding chapter highlighting the significance of the present work. A number of suggestions for further experimental and theoretical work in this and closely related fields are made at the end of the chapter.

APPENDIX-I

Design, development and performance evaluation of microwave anechoic chamber constructed as a part of the work to study the radiation patterns of primary horn radiator is described here.

APPENDIX-II

Effect of corrugated flanges on the radiation pattern of E-plane horns is studied in this section. A simple technique for obtaining identical E-and H-plane patterns

from the E-plane sectoral horn is established here. Experimental results for a number of horns with flanges of various parameters are presented here.