Feed Influence On Reflector Antenna Scattering Pattern

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Abstract – **Influence of horn feed on single-reflector antenna scattering pattern with symmetrical parabolic reflector is researched.**

Keywords – **Scattering pattern, reflector antenna, feed influence.**

I. Introduction

Antenna scattering characteristics should be known during solving technical problems. As for reflector antennas, characteristics can be calculated with the help of FEKO program [1]. While ratio of reflector diameter (D) to wavelength λ grows, random access memory necessary capacity increases unacceptably during calculation of such kind of tasks. This is happening because we use the method of moments during feed simulation. Reflector scattering field with great D/λ ratio can be calculated with the help of physical optics method acceptably accurate. This method doesn't require computer resources greatly.So the questions arouse:" what is the contribution of feed in radiation field and should it be taken into account during reflector antenna radiation characteristics calculation?". There are results of solving this problem in this article. Influence of feed on single-reflector antenna scattering pattern with symmetrical parabolic reflector is researched numerically with the help of FEKO program. Feed is a pyramidal horn with TE_{10} wave. The cases of matched and non-matched horn feed are considered.

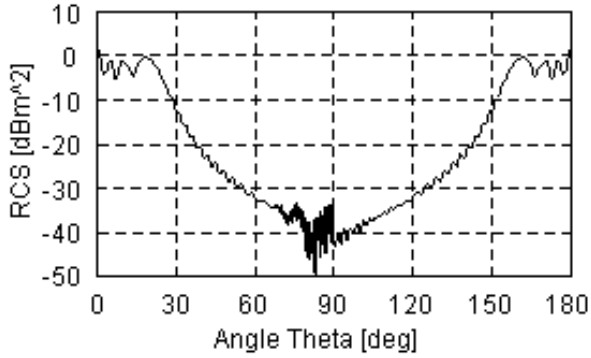
II. Research results

Numerical simulation was made for various values and the size of the horn feed. Monostatic and bistatic scattering pattern for horizontal and vertical polarization of feed wave. Backward scattering pattern examples for reflector antenna with reflector size D/λ=40 are shown on fig.1 and fig.2. Horn feed aperture size in E and H plane are 0,84 λ and 1,17 λ.Horn length is 1,67 λ.Having such size, on the edge of reflector the level of scattering is 0, 3 from maximum in the center of reflector. Theta angle was laid off on east-west direction on figures. Theta angle is the angle between focal reflector axis and feed wave direction propagation. Theta=0 value corresponds to wave propagation along the focal axis from feed side.

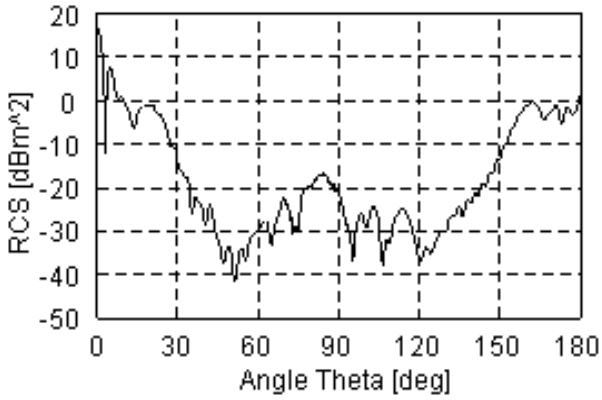
These examples and other results allow us to make conclusions:

1. The level of backward scattering feed field is maximal and almost the same at Theta=0 and 180°.

2. Mentioned ratio doesn't changes during short circuit on the feed input practically. It means that horn scattering field defines by structure, not by antenna generally.



a) Without a feed



b) With a matched feed

Fig.1.Backward scattering pattern

3. The level of backward scattering feed field much greater at Theta=0 than at Theta=180°.It means that during reflector antenna radiation from front half-space, feed makes the main contribution in scattering field.

4. Described laws don't depend much on feed wave polarization.

III. Conclusion

Described scattering laws should be taken into account during communication centers, radio relay lines and other radio systems organization that use reflector antennas.

References

[1] http://www.feko.info/about-us.

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