Effect Of Feeding Antenna On The Scattering Pattern Of Reflector Antenna

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Abstract – **It is investigated the influence of feeder on the scattering pattern of single reflector antenna with symmetrical parabolic reflector.**

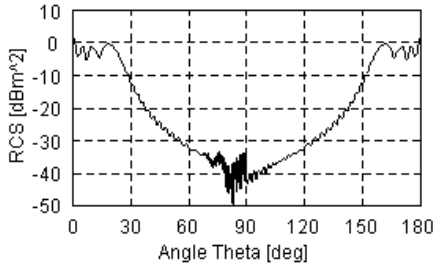
Keywords – **Scattering pattern, reflector antenna, feeder effect.**

I. INTRODUCTION

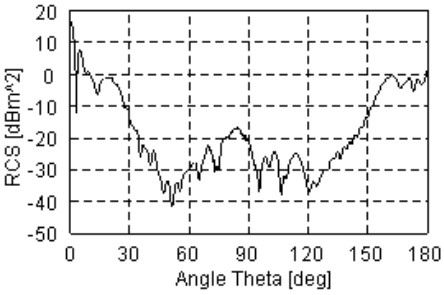
The scattering characteristics of antennas need to know to solve a number of technical problems. For reflector antennas they could be calculate, for example, using of program FEKO. But the time to determinate the solution and computer operating memory unacceptable increases with increasing of relation of diameter of reflector (D) and wave length λ.This is due to the fact that it is used the method of moments in the feed simulation. Scattering pattern of the reflector with respect to the large D / λ with sufficient accuracy can be calculated by the method of physical optics, that does not require large computer resources. This raises the question of what contribution to the radiation field the feed gives and whether you need to take it into account when calculating the scattering characteristics of a reflector antenna. This report presents the results of solving this problem. Numerically using the FEKO program examines the effect of feed on the scattering pattern of single-reflector antenna with a symmetrical parabolic reflector. As the feeder is used pyramidal horn with a wave of TE10. It is considered the cases of matched and not matched horn feeder.

II. RESULTS OF STUDY

Numerical simulation is carried out for several values of D / λ and the size of the horn feeder. It is investigated two positions and monostatic scattering pattern for the horizontal and vertical polarization of the incident wave. Examples of scattering pattern in the opposite direction are shown in Figures 1 and 2. For a reflector antenna with the size of the reflector D / λ = 40. The dimensions of the aperture of the horn radiator in the planes E and H are equal to 0,84 λ and 1,17 λ. The length of the horn 1,67 λ, the length of the feed waveguide λ. With these dimensions of the horn in radiation mode the level of excitation at the edge of the reflector is 0, 3 of the maximum in the center of the reflector. The horizontal axis on the graphs postponed angle Theta - the angle between the focal axis of the reflector and the direction of the incident wave. The value of Theta = 0 corresponds to the wave propagation along the focal axis of the feeder direction.



a) Without feeder



b) with matched feeder

Fig.1. Diagram of backscattering

These examples and other results lead to several conclusions:

1. Without the feeder level backscattered field is maximal and almost the same at Theta = 0 ° and 180 °.
2. With the feeder at Theta=0 level of the backscattered field significantly greater than with Theta = 180°. This means that during irradiation of a reflector antenna from the front half-space the main contribution to the scattering pattern gives the feeder.
3. This ratio remains virtually unchanged during a short circuit at the input of the feeder. This means that the scattering pattern of the horn, mainly determined by the structural component, not the antenna.
4. The described regularities are weakly dependent on the polarization of the incident wave.

III. CONCLUSION

The described regularities of scattering must be considered when organizing communication centers, relay points microwave lines and other radio systems using reflector antennas.

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