

A parabolic antenna for the radiation power UWB pulses on the basis of the satellite dish

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The paper considers the design of the simple reflector antenna to radiate the power UWB impulses. To reduce the cost of the antenna, the dish for the satellite TV was used as reflector. The typical TEM horn with flat plates (but of an unequal width) has been considered as feed. To obtain the best gain of the antenna the optimum feed geometry has been found. At the first stage of optimization the approximate method (Buchenauer C. J., Tyo J. S. and Schoenberg J. S. IEEE Trans. Antennas Propagat., vol. 49, №8, pp. 1155-1165, 2001) has been applied. Electrostatic problem has been solved by numerical solution of the integral equation. The optimization showed that it is advantageous to extend the lower conductor of the feed. On the contrary the top conductor should be made narrower. The final optimization has been performed by FDTD method. Optimum geometry (fig. 1) uses about 0.9 of the reflector surface and a part of the top conductor is in the area of the reflected field. Antenna is feed by the coaxial line and the UWB high-power zipper balun.

The calculated total efficiency over the antenna bandwidth (0.5-5.0 GHz) is not high - about 0.3. Nevertheless, the efficiency of the antenna designed is by 1.5-2 times greater then that of IRA-1 (Farr E.G., Baum C. E. et al. Sensor and Simulation Note 463, 2002). It should be noted that it is exactly the total efficiency, which is calculated for the power of the incident wave in the feed coaxial line. It allows for the losses by reflection from antenna and balun. Besides, the aperture area means the whole area of the circular dish aperture. Now losses by mismatch are 20% because of the large difference between the feeder wave impedance and the horn impedance. Subsequently, the efficiency of the antenna is expected to be increased due to the better match of the antenna and feeder.



Fig.1