A STUDY OF SECTORIAL HORN PARABOLIC ANTENNA FOR WIRELESS COMMUNICATIONS

Teplyuk Oleksandr

Radar Department, Usikov Institute for Radiophysics and Electronics, 44a Astronomicheskaya str. ap.1, Kharkov, Ukraine,

A bstract:

The main goal of the paper is deal with the quite difficult and important problem in modern communication systems, which is known as the problem of “last mile”. When it is necessary to deliver information from the base station directly to a customer the most effective way is to use microwave networks. Usually development of receiving antennas is not a problem, taking into account the modern state of planar microwave technology. But in the case of transmitting antennas the problem appears when dealing with the high level of operation power 50 -100 W and that is why planar antennas cannot be used.
On the other hand, the transmitting antennas usually have to provide a sectorial power pattern with beamwidth in the azimuthal plane about 45º ÷ 270º, in the vertical plane it is usually about ten degrees. Thus it is very difficult to obtain the realized power properties for the above-mentioned power values using conventional types of microwave antennas. Actually, beamwidth of the open end of a waveguide is not more than 60º. The main problem is to expand the power pattern of such feed. Nowadays, there are some ways to increase beamwidth. For example, it is possible to use dielectric lenses. However, expansion of the beamwidth is accompanied by defocusing for big aperture antennas. Also, it is possible to use a hollow metallic waveguide with the slotted flange, which provides expansion of beamwidth up to 120º, but only in E-plane. On the other hand, application of a dielectric waveguide with complicated cross section allows increasing the beamwidth only in H-plane that is accompanied by strong frequency dependence of power pattern parameters. It is also possible to use a corner scatterer for expanding of beamwidth of lens beam antenna. Nevertheless all these methods do not meet the requirements mentioned above.That is why the goal of my paper is to develop the method of expansion of aperture antenna beamwidth beyond the limit of open end of waveguide The main idea of solving the problem is based on application of a pin metallic scatterer, which is situated near the antenna aperture. Operation of the antenna proposed is based on physically obvious principal that is the aperture field reradiation by the pin scatterer in wide-angle range. As my calculations and experiments showed the necessary amplitude and phase relations may be achieved for main and reradiating fields to provide the permissible ripple of power pattern by properly choosing geometry of the system. Preliminary experiments with the prototypes of such antennas showed that it is possible to obtain beamwidth more then 180º in both E- and H-planes independently and therefore such method is quite perspective for development of transmitting antennas for base stations in wireless communications systems.