CHARACTERISTICS OF AMPLIFIED ANTENNAS OF RADIO LOCATION STATIONS

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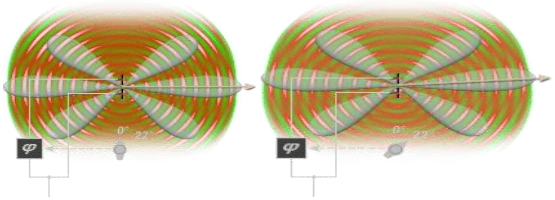
Phased antennas (PA) are a group of antennas in which each individual radiator can be fed with different phase angles. Thus, an electronically controlled antenna generates an electromagnetic motive force (EMF). As a result, the entire antenna spectrum can be electronically bent. Electronic tilting is more flexible and requires less maintenance than mechanical antenna tilting [1]. It is the interference effect that is important in the principle of this antenna; that is, it is possible to ensure that two or usually more radiation sources overlap depending on the phase angle. As noted in the graph in Figure 1, in-phase signals of the same color are reinforced and out-of-phase signals weaken each other. An interference occurs when two pulses are sent from two radiators at the same time. At this time, the sign is strengthened in the main direction and weakened in the lateral directions. By feeding both radiators of the radiator group in phase, the signal from the upper radiator is sent with a phase difference of about 22 ° (ie, a slight delay) relative to the lower radiator. Therefore, the main direction of the general radiation sign has changed slightly upwards. In the graphs shown, radiators are shown without reflectors. Therefore, the size of the back lobe of the antenna radiation pattern is the same as the main lobe. The direction of the back petal is also upward [2, 3].



a) b)

Figure 1. Two antenna radiators fed from one phase (a); two antenna radiators fed from different phases (b)

If the emitted signal is passed through a phase control circuit, the direction of its arc can be controlled electronically. However, this is not unlimited because the efficiency of this antenna arrangement is greatest in the main arc direction perpendicular to the antenna plane. Excessive bending in the direction of the main arc increases the number and size of unwanted side lobes and reduces the surface efficiency of the antenna. The sinusoidal rule can be used to calculate the required

amount of phase shift. Any antenna structure can be used as a radiator in the antenna field. By adjusting the amount of phase shift of each radiator according to the most basic feature of a phased antenna, it can change the main direction of the radiation beam as a result. A large number of radiators are used to obtain both horizontal and vertical electromagnetic radiation in the antenna plane. For example, in the AN/FPS-117 radar antenna, 1548 of these individual radiators are used, so that the reception signal is similar to the diagram of the antenna shown in Fig. 2. In contrast, modern multifunction radar devices use the technique of digital formatting of the antenna pattern in the receiving path.

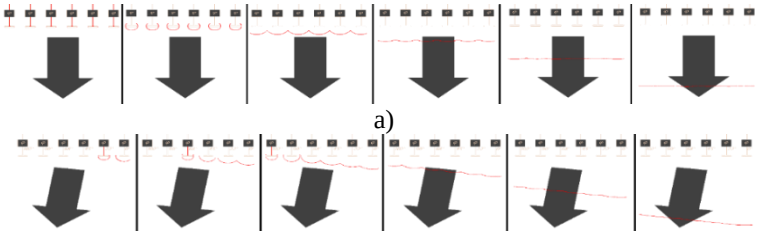


Figure 2. Images showing straight (a) and electron bending (b) antenna beams

Phase shifter circuit is required for each valve line. Multiple vertically stacked linear arrays form a planar antenna. Such antennas are mainly used in places where it is necessary to scan only in one plane, so in the example of the RRP-117 type radar, the antenna is already rotated in the horizontal direction.

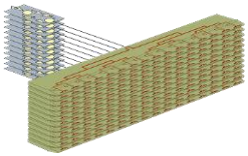


Figure 3. Linear phased array antenna

Thus, the planar array phased antennas all consist of single radiators, each of them having its own phase shifter, and the radiators are arranged as in a matrix, and this type of planar arrangement of radiators creates a common antenna system.

References

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