

Answer on Question #54801, Engineering, Other

Explain, how directivity of the antenna output can be increased by using an antenna array.

Answer:

Using multiple antennas instead of one of the antennas connected in-phase grating leads to increase the output of such an antenna system, a narrowing pattern and resulting in an increase in the gain compared with the gain of a single antenna, a part of the lattice. Increasing the gain in phase array antenna is due to two factors.

First, each antenna array of the transmitter of the received electromagnetic field induces a signal of a certain power, the one which would be induced in the single antenna of this type, and then the power of signals received by all antennas, formed in the load. Therefore, the resulting output signal at the output of phase grating as many times greater power at the output of a single antenna of the same type as antenna contained in the lattice. Due to the fact that the resistance load remains unchanged, regardless of whether they use a single antenna or more, the voltage of the resultant signal at the output of phase grating is increased as compared with the voltage signal at the output of a single antenna of the same type are not as many times as the antenna is contained in lattice, and in a number equal to the square root of the number of antennas. Thus, the presence in the lattice of four antenna output signal at the output of the lattice is increased 4 times, and the voltage - 2 times (6 dB) at nine antennas power is increased by 9 times, and the voltage signals - 3 times (9.5 dB), and so on. d. Accordingly, the gain increases phase grating compared with the gain of a single antenna.

Secondly, the transverse dimensions of the array relative to the direction from which the signal arrives, a large cross section of a single antenna. In other words, when using the phase grating surface increases the absorption of the antenna is the surface from which the antenna absorbs the power of the electromagnetic field. This leads to a narrowing of the antenna system, which is equivalent to further increase antenna gain, ie. e. an additional increase in the voltage of the output signal of the lattice. The restriction pattern of the lattice due to the fact that only the signals which are received by each antenna with the main direction perpendicular to the lattice plane, are in phase. The signals coming in at an angle to the main direction, proceed to the antenna array, spaced apart, not simultaneously, but with a shift in time or phase. Thus, signals entering at an angle through the path difference induced in the antenna array voltage phase-shifted, which are formed geometrically as vectors. Their geometric sum is less than the arithmetic sum of the voltage induced in the antenna

array signals coming from the main line. The larger transverse dimensions of the lattice, the more the path difference signals arriving at the same angle to the main direction, and the greater the phase shift t . E. Less resultant signal. Consequently, with increasing absorption surface and narrows directivity pattern increases the gain-phase lattice. Increasing the vertical dimension of the lattice narrows the beam in a vertical plane, increasing the horizontal dimension of the lattice narrows the directivity pattern in the horizontal plane. Theoretically, twice the increase in the surface absorption should lead to an increase in the gain by 3 dB lattice.