

Antenna Theory - Antenna Arrays

An antenna, when individually can radiate an amount of energy, in a particular direction, resulting in better transmission, how it would be if few more elements are added it, to produce more efficient output. It is exactly this idea, which led to the invention of **Antenna arrays**.

An antenna array can be better understood by observing the following images. Observe how the antenna arrays are connected.



An **antenna array** is a radiating system, which consists of individual radiators and elements. Each of this radiator, while functioning has its own induction field. The elements are placed so closely that each one lies in the neighbouring one's induction field. Therefore, the radiation pattern produced by them, would be the vector sum of the individual ones.

The spacing between the elements and the length of the elements according to the wavelength are also to be kept in mind while designing these antennas.

The antennas radiate individually and while in array, the radiation of all the elements sum up, to form the radiation beam, which has high gain, high directivity and better performance, with minimum losses.

Advantages

The following are the advantages of using antenna arrays –

- The signal strength increases
- High directivity is obtained
- Minor lobes are reduced much
- High Signal-to-noise ratio is achieved
- High gain is obtained
- Power wastage is reduced
- Better performance is obtained

Disadvantages

The following are the disadvantages of array antennas –

- Resistive losses are increased
- Mounting and maintenance is difficult
- Huge external space is required

Applications

The following are the applications of array antennas –

- Used in satellite communications
- Used in wireless communications
- Used in military radar communications