ANTENNA AND WAVE PROPAGATION

UNIT -2

Point Sources and Their Arrays: Introduction

The total field pattern of an array of non-isotropic but similar sources is the product of the individual source& The array pattern of isotropic point sources each located at the phase center of the individual source and the array pattern of isotropic point sources each located at the phase center of the individual sources having the same amplitude and phase .

Broadside Antenna:

A broadside array is a stacked collinear antenna consisting of half-wave dipoles spaced from one another by one-half wavelengths.

This antenna produces a highly directional radiation pattern that is broadside or perpendicular to the plane of the array.

The broadside antenna is bidirectional in radiation, but the radiation pattern has a very narrow beam width and high gain.

Broadside arrays may also b e formed from other types of elements, such as horns, slots, helixes and poly rods

Radiation Pattern for Arrays Depends on:

- The type of the individual elements .
- Their orientation.
- Their position in space.
- The amplitude and phase of the current feeding them.
- The total number of elements.

End-Fire Antenna - The end-fire array uses two half-wave dipoles spaced one-half wavelength apart.

- The end-fire array has a bidirectional radiation pattern, but with narrower beam widths and lower gain.
- The radiation is in the plane of the driven elements.
- A highly unidirectional antenna can be created by careful selection of the optimal number of elements with the appropriately related spacing.
- Above a Plane Ground, Yagi -Uda Antenna Design, Long-Wire Antennas, folded Dipole

The Short Electric Dipole

- The Fields of a Short Dipole:

The fields everywhere around a short dipole of length l, coincident with the z-axis and its center is at the origin . It is assumed that medium surrounding the dipole is vaccum or air.

Radiation Resistance of Short Electric Dipole :

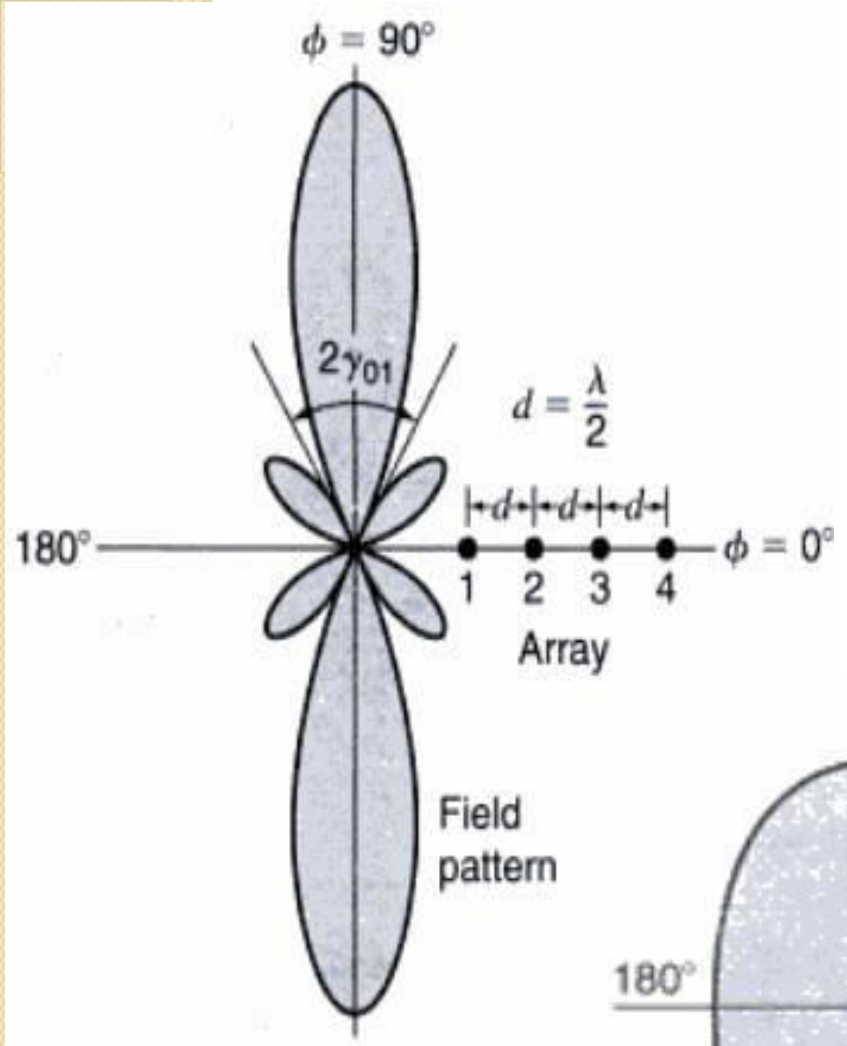
The antenna is a radiating device,I n which the power is radiated into space in the form of electromagnetic waves.

Hence power dissipation is

$$w' = I^2 R$$

$$R_r = \frac{W'}{I^2}$$

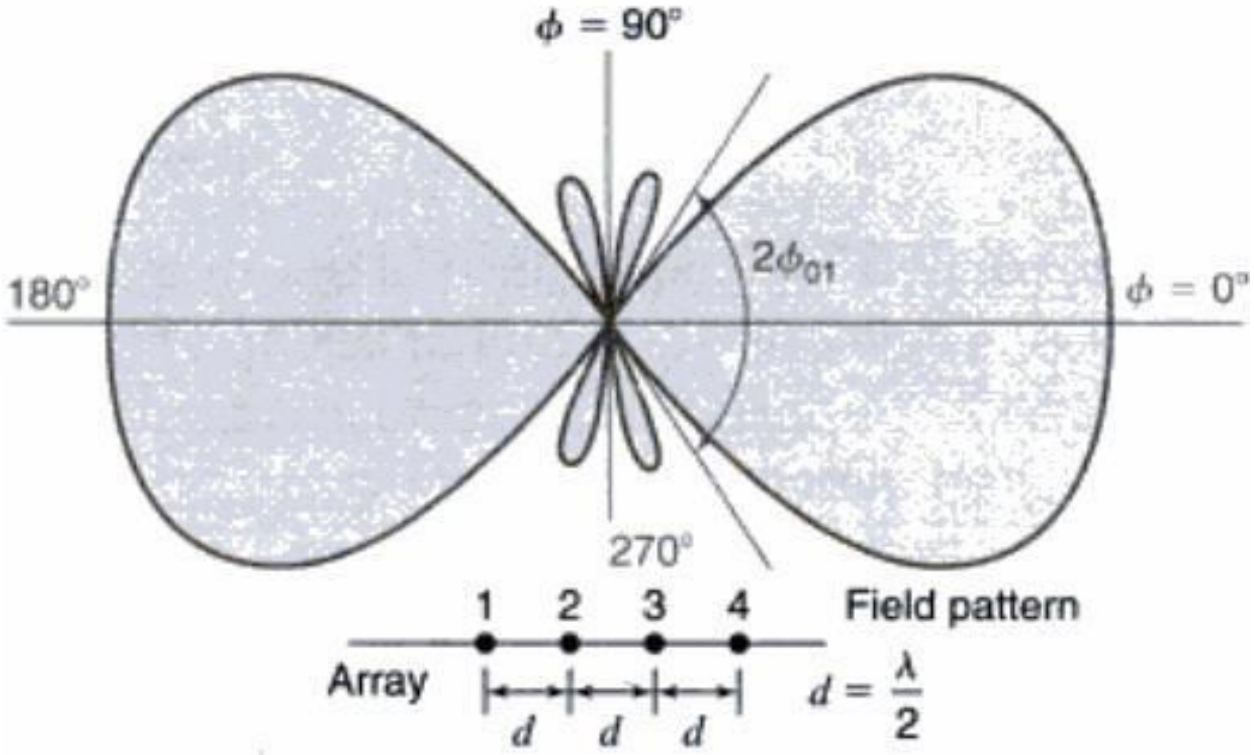
This fictitious resistance called as radiation resistance.



Broad side type of array

- Endfire

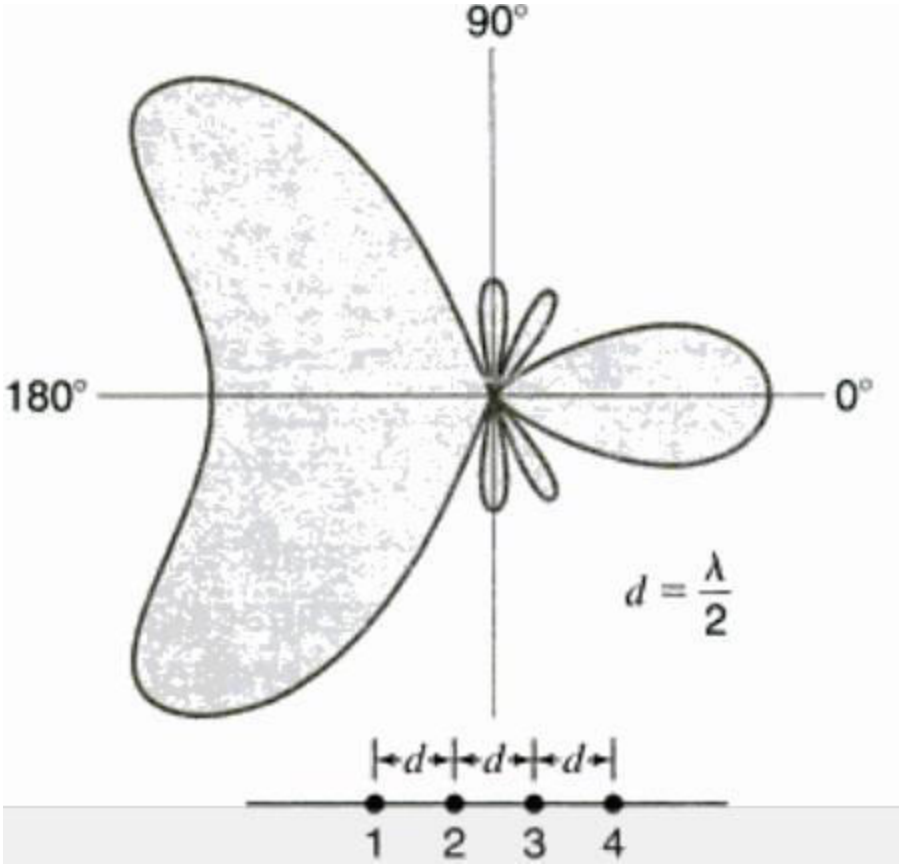
Type of array

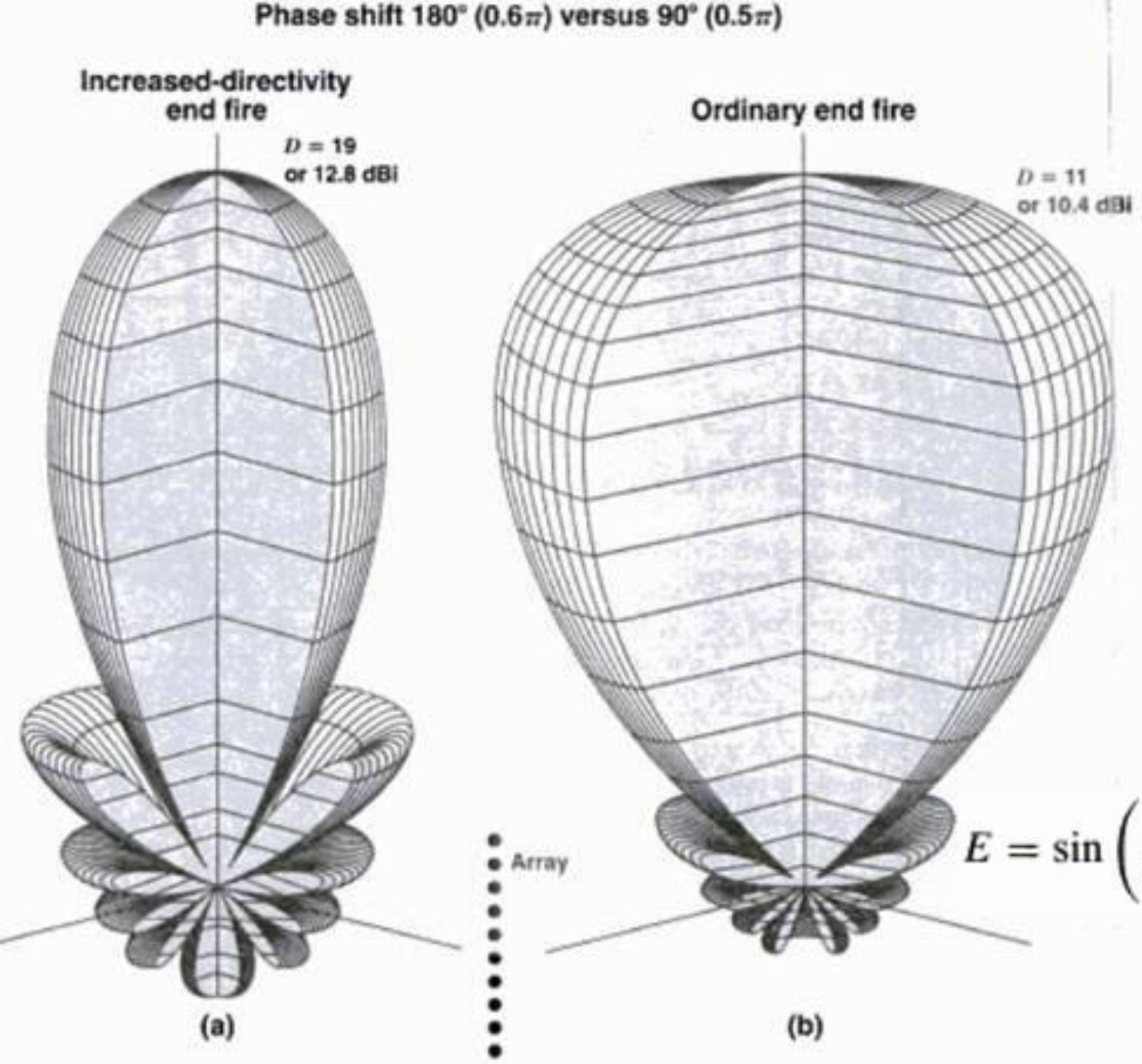


- Endfire with increased directivity

$$\delta = -\left(d_r + \frac{\pi}{n}\right)$$

$$\psi = d_r(\cos\phi - 1) - \frac{\pi}{n}$$





$$E = \sin\left(\frac{\pi}{2n}\right)\frac{\sin(n\psi/2)}{\sin(\psi/2)}$$