REFLECTOR ANTENNAS

PARABOLIC (REFLECTOR / DISH) ANTENNA

- Is a big dish like structure made from metal or wire mesh / grid.
- Mesh hole ≤ λ / 12.
- Widely used in microwave propagation via free space.
- Also known as secondary antenna since it depends on primary antenna which acts as a feeder at the focal point (horn antenna or dipole antenna) to enhance the performance quality of the transmitter and the receiver

Introduction of parabolic antenna

- A **parabolic antenna** is a high-gain reflector antenna used for radio, television and data communications, and also for radiolocation (radar), on the UHF and SHF parts of the electromagnetic spectrum
- With the advent of TVRO and DBS satellite television, the parabolic antenna became a ubiquitous feature of urban, suburban, and even rural landscapes.

Figure : Parabolic Antenna

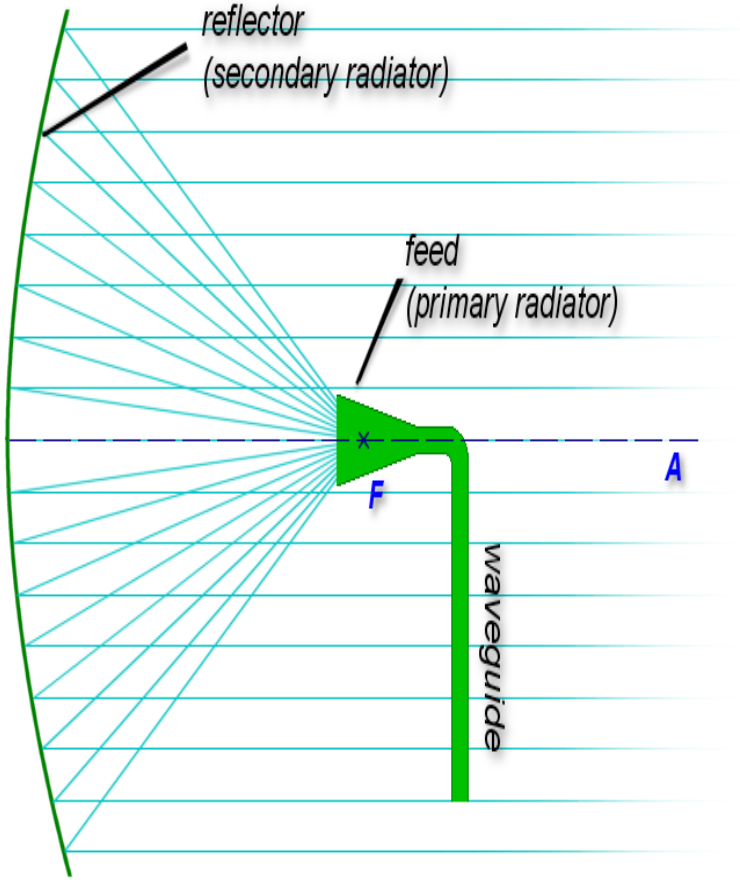
Why is it used?

- At higher microwave frequencies the physical size of the antenna becomes much smaller which in turn reduces the gain and directivity of the antenna
- The desired directivity can be achieved using suitably shaped parabolic reflector behind the main antenna which is known as primary antenna or feed .

Working rules

- A parabolic reflector follows the principle of geometrical optics.

- When parallel rays of light incident on the reflector they will converge at focus or wher a point source of light is kept at focus after reflection by the reflector they form a parall beam of rays



CORNER REFLECTOR

- The CORNER-REFLECTOR ANTENNA consists of two flat conducting sheets that meet at an angle to form a corner, as shown in figure
- The corner reflector is normally driven by a HALF-WAVE RADIATOR located on a line which bisects the angle formed by the sheet reflectors.

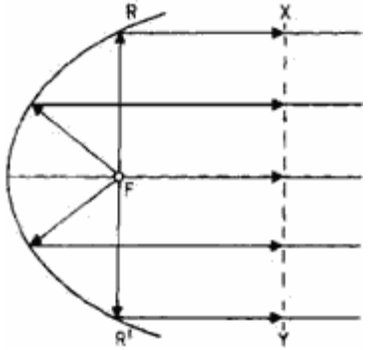
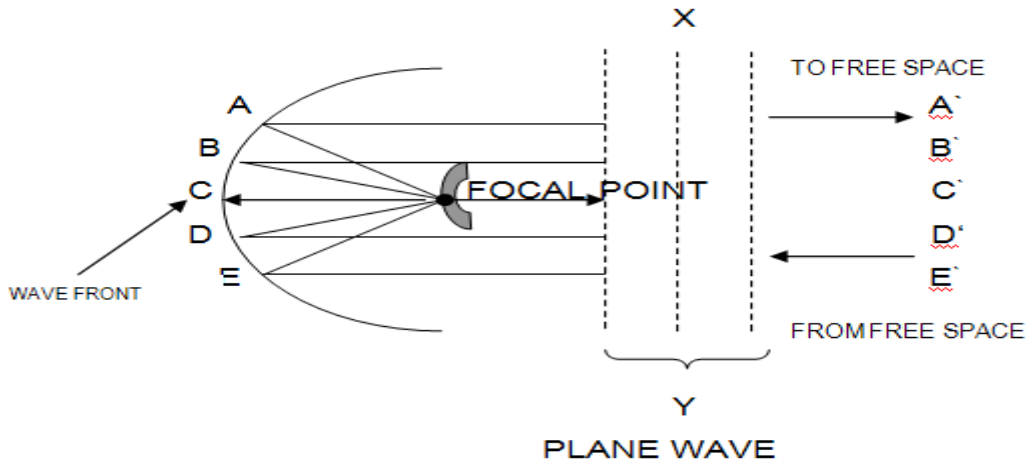


Figure : Parabolic reflector radiation.

CORNER REFLECTOR (cont)

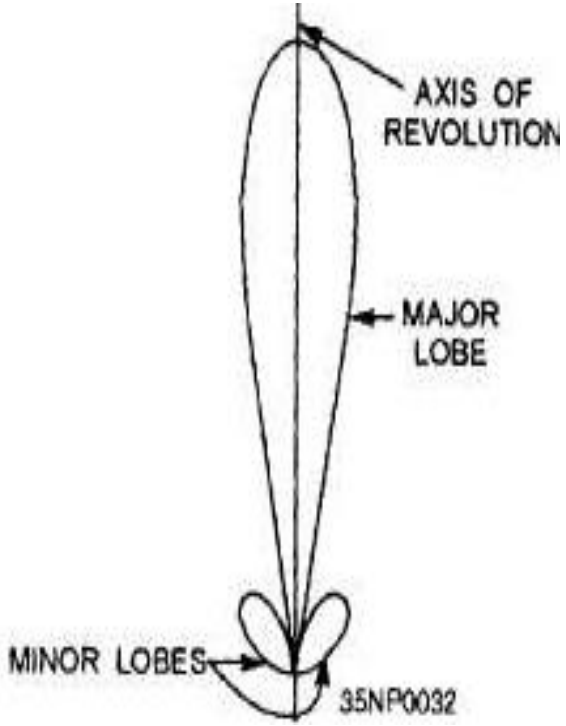
- A microwave source is placed at focal point F.
- The field leaves this antenna as a spherical wavefront.
- As each part of the wavefront reaches the reflecting surface, it is phase-shifted 180 degrees.
- Each part is then sent outward at an angle that results in all parts of the field traveling in parallel paths.
- Because of the special shape of a parabolic surface, all paths from F to the reflector and back to line XY are the same length.
- Therefore, when the parts of the field are reflected from the parabolic surface, they travel to line XY in the same amount of time.



CORNER REFLECTOR (cont)

- A point-radiation source is placed at the focal point F. The field leaves this antenna with a spherical wavefront. As each part of the wavefront moving toward the reflector reaches the reflecting surface, it is shifted 180 degrees in phase and sent outward at angles that cause all parts of the field to travel in parallel paths. Because of the shape of a parabolic surface, all paths from F to the reflector and back to line XY are the same length. Therefore, all parts of the field arrive at line XY at the same time after reflection.
- A parasitic array to direct the radiated field back to the reflector, or a feed horn pointed at the paraboloid is used to make the beam sharper and to concentrates the majority of the power in the beam.
- The radiation pattern of the paraboloid contains a major lobe, which is directed along the axis of the paraboloid and several minor lobes. Very narrow beams are possible with this type of reflector.

PARABOLIC RADIATION PATTERN



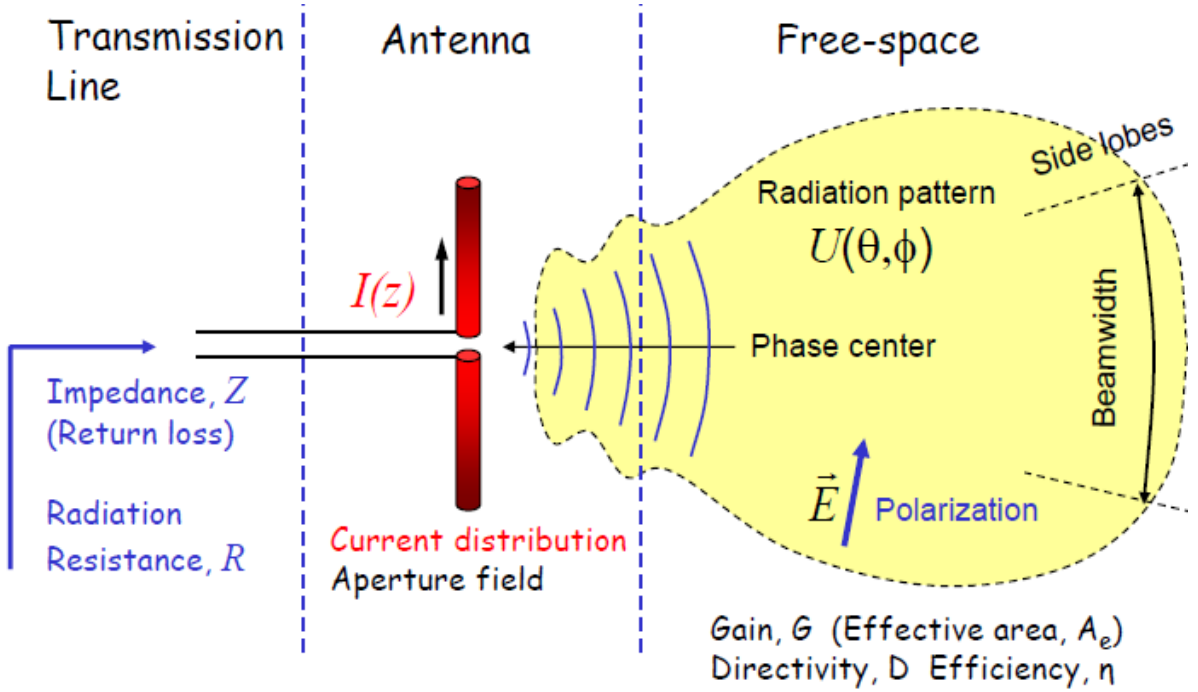


Figure : Parabolic radiation pattern