SLOT ANTENNA

Like parabolic reflectors, slot is used to convert circular or spherical wave fronts into planar wave fronts, as a transmitter and vice-versa as a receiver. Lens is a medium through which the waves are transmitted or received.

Lenses are of two types like decelerating medium and accelerating medium. In decelerating system, the velocity with in the medium is les s than that of free space velocity. Pure dielectrics like Lucite or polystyrene, impure dielectrics or H-plane metal plates can be used as decelerating mediums.

Accelerating system is the one in which the velocity within the medium is more than that of free space velocity. E -plane metal plates are the examples for accelerating types.

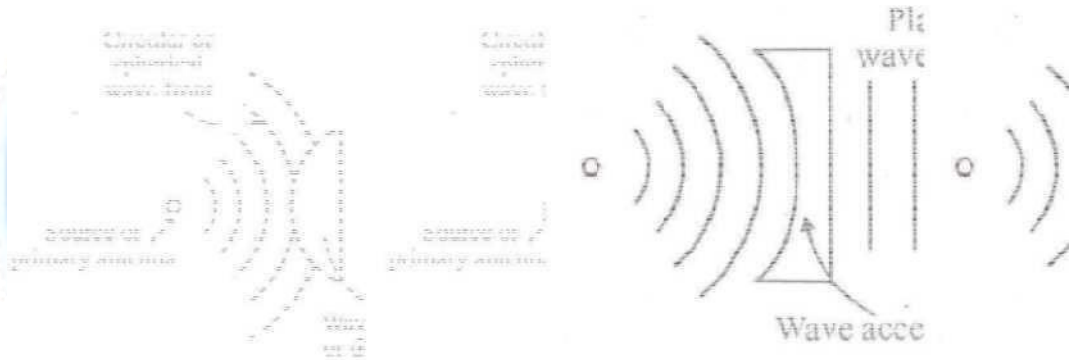

Fig 6.12: slot Antenna

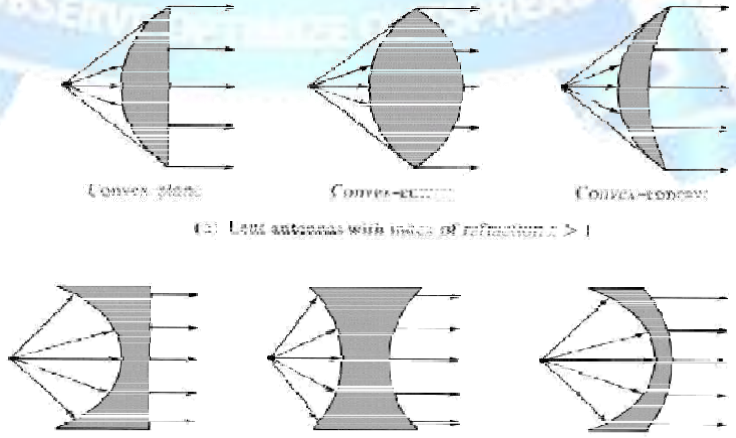

Fig 6.13 : Lens Antenna with different refractive index

Dielectric Antenna

The dielectric material used should have a refractive index more than 1 w.r.t. free space having minimum dielectric losses. Lucite and polystyrene can be used having a refractive index a=1.5. The system is constructed in the form of plane - convex lens. The source or primary antenna is placed at the focus point

_O'having focal length L.

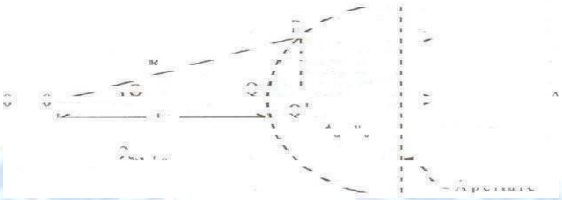

Fig 6.14: Dielectric Lens Antenna

Planar wave fronts can be obtained at the aperture when the electrical path OQ' and OP remains same *OP OQ QQ'*

Consider the dielectric lens with a primary source at the focus point O as showwn in fig.6.15. Let P is the power density and U is radiation intensity at a distance y from the axis. Assuming P and U remain constant within the elemental aperture subte nded by dθ or dy, the power radiated through elemenntal aperture is

$$dW = 2\pi y.dy.P \quad \text{..... } 6.30$$

Where $W = \iint U\,.d\Omega$

$$2\pi\,\theta\,d\theta$$

$$W = \int\int U \sin\theta\, d\theta\, d\varphi$$

Relative electric field:

Relative Electric field is as shown in fig.6.16

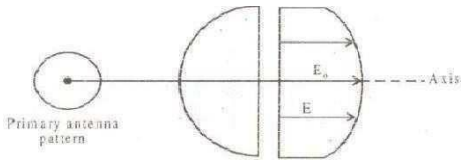

Fig 6.16 : Relative Electric Field

Plane Metal Plate Lens

The velocity in between E-Plane Metal Plate is more than the Free space velocity v0

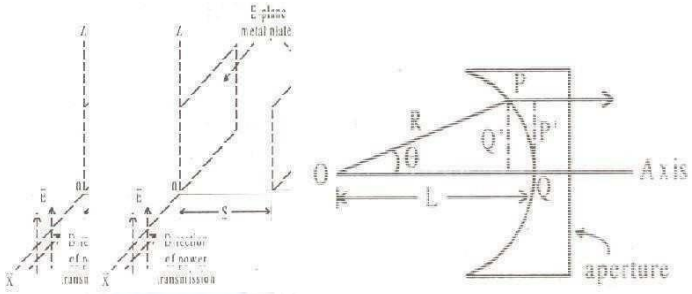

Fig 6.17 : E-Plane Metal Plate Lens

Advantages

1. Can be used as Wide band Antenna since its shape is independent of frequency.
2. Provides good collimation.
3. Internal dissipation losses are low, with dielectric materials having low loss tangent.
4. Easily accommodate large band width required by high data rate systems.
5. Quite in-expensive and have goo d fabrication tolerance

Disadvantages

1. Bulky and Heavy
2. Complicated Design
3. Refraction at the boundar ies of the lens