

UNIT II APERTURE AND SLOT ANTENNAS

* Aperture antennas are commonly known as microwave antenna with many different geometrical configurations

* Aperture may be square, rectangular, circular, elliptical.

* The practical application of aperture antennas are spacecraft.

* Some of the commonly used aperture antennas are, Slot antenna, Horn antenna, Reflector antenna, Lens antenna.

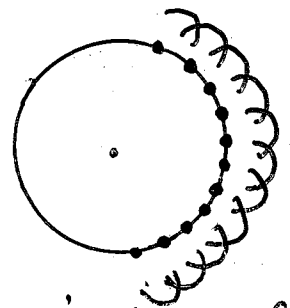
* In aperture antenna analysis, the important theorems and principles required are Field equivalence Principle, uniqueness theorem, Duality Principle and Image Principle.

Huygen's Principle :

Huygen's Principle states that each point on a Primary wavefront can be considered to be another new source



* Plane wavefront



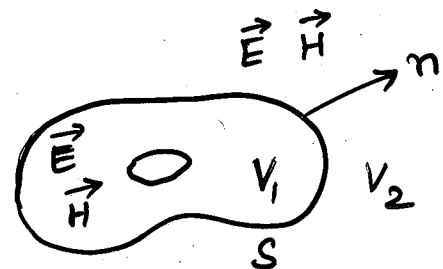
* Spherical wavefront

of a secondary spherical wave and that a secondary wave front can be constructed as the envelope of these Secondary waves.

Field Equivalence Principle :-

"Field equivalence principle states that the aperture fields may be replaced by equivalent electric and magnetic surface currents and from this the radiated fields can be calculated."

Assume that the Electric and magnetic fields are produced in a homogeneous isotropic medium everywhere by a set of current sources.



Fields source inside and outside surface S

If all these sources are enclosed in a closed surface S, then such a closed surface divides a space in medium into 2 parts namely volume V_1 and V_2 .

Volume V_1 is a part which consists all sources while volume V_2 is without any source.

Assume that surface S is source free and a unit vector \vec{n} is drawn from V_1 and V_2 to the surface.

The field equivalence principle states that the fields in volume V_2 because of sources in volume V_1 can be produced by an equiv. set of virtual sources on surface S

given by, $\vec{J}_s = \vec{n} \times \vec{H}$ and

$$\vec{M}_s = \vec{E} \times \vec{n}$$

where, $\vec{J}_s \rightarrow$ Electric surface current density

$\vec{M}_s \rightarrow$ Magnetic surface current density