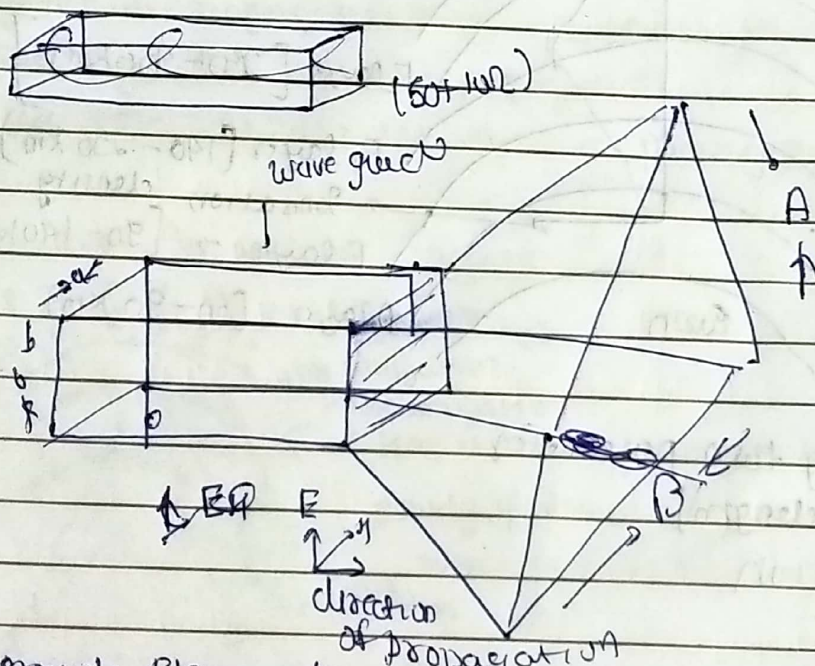# Horn antenna

→ Horn antenna are constructed by flaring of wave guide
→ 9t increases directivity
→ 9t improves the impedance matching
→ 9t is directional Antenna, so it can utilized for long distance communication

Structure of Horn Antenna

(E or H)
wave guide

direction of propagation

we provide flaring to wave guid for impedance matching free space

The cross section area increases from $a \times b$ to $A \times B$ and Hence Directivity also increases.
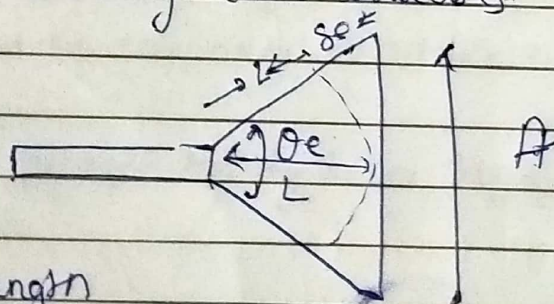
$\delta_e \to$ E plane
Flaring difference.

L - Flaring length
θ_e = Flaring angle with E plane

→ By Pythagoras theorem

$$(L + \delta e)^2 = L^2 + (A/2)^2$$

$$L^2 + 2\delta e L + \delta e^2 = L^2 + \frac{A^2}{4}$$

$$2\delta e L + \delta e^2 = \frac{A^2}{4}$$

δe is small, So neglecting δe^2

$$2 \boxed{L = \frac{A^2}{8 \delta e}}$$

$\delta_E < 0.25\lambda$

$\delta_H < 0.4\lambda$

① Sectoral E-plane Horn
Flaring towards the electric field direction

$HPBW = \frac{56}{(A/\lambda)}$

② Sectoral H-plane Horn
Flaring towards the Magnetic field direction

$HPBW = \frac{67}{(B/\lambda)}$

③ Pygramidal Horn
Flaring towards both direction

④ Conical horn

$$gain = \frac{4\pi Ae}{\lambda^2} \times n$$
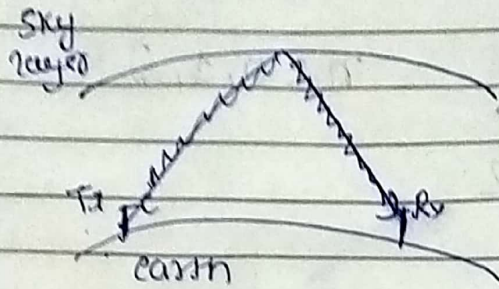
Application of Horn antenna
→ Microwave Engineering
Feed for Parabolic Reflector
Short range Radar

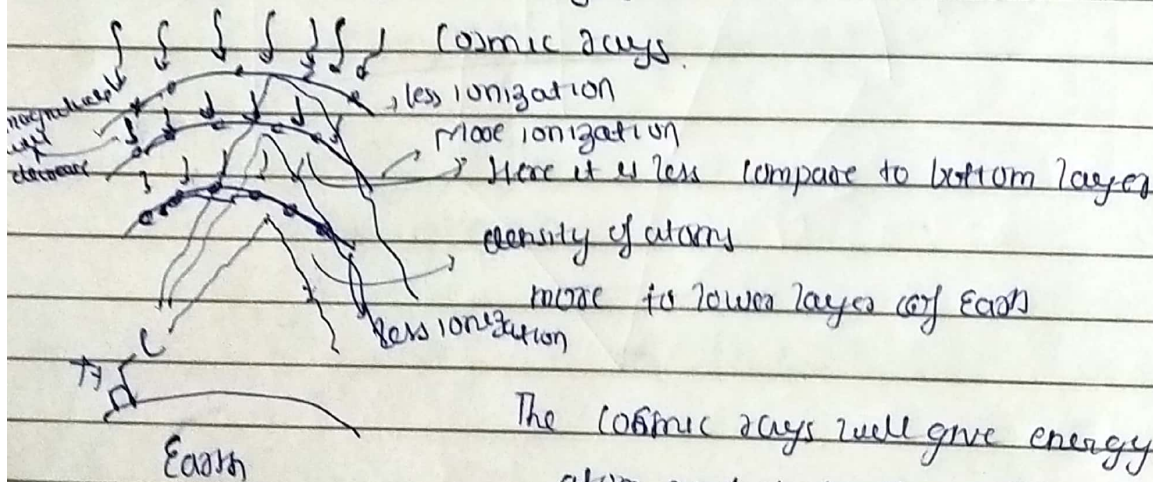Sky wave Propagation or ionospheric wave propagation

→ Transmitted signal by Tx antenna reflected by ionospheric layer (sky) and received by Rx antenna is Sky wave propagation or ionospheric wave propagation

→ For ground wave propagation range was limited, so for long range we should go for Sky wave propagation

→ We use 3MHz - 30 MHz for sky wave propagation

→ Formation Ionospheric layer

Cosmic rays
less ionization
more ionization
→ Here it is less compare to bottom layer
density of atoms
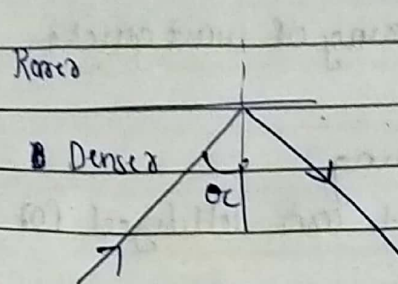more to lower layer of Earth
less ionization
Earth

The cosmic rays will give energy to atom and electrons will be released
Formations ions

Ionisation will occur maximum at second layer. As the energy of cosmic rays and no. of atoms in that layer are sufficient as compared to other two layer
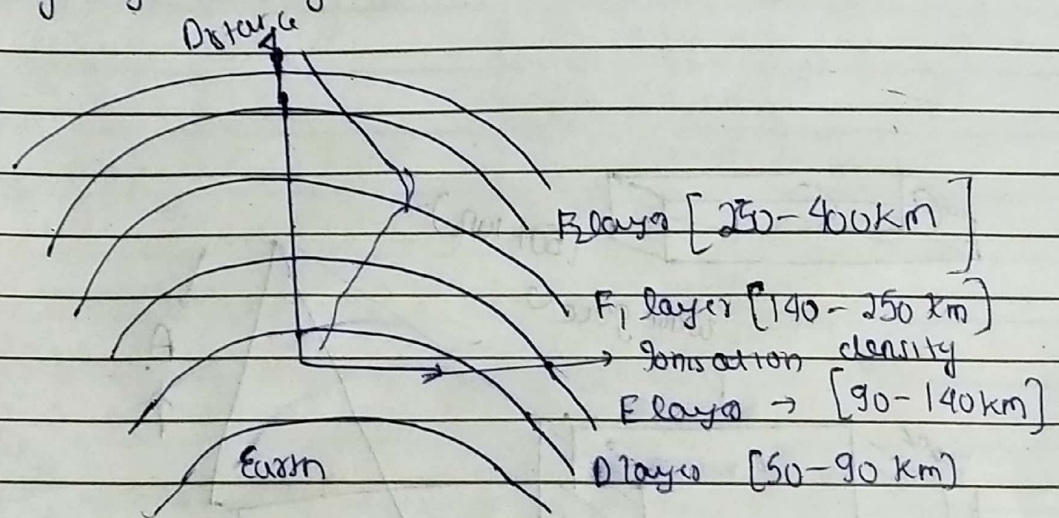
low frequency reflected by lower layer

We have reflection, if angle greater than critical angle

Rarer

B Denser

θ_c

higher the frequency longer the range

Distance

Ionization layer

B layer [250-400km]

F_1 layer [140-250 km]

→ Ionisation density

E layer → [90-140 km]

D layer [50-90 km]

Earth

Range is controlled by two parameter
① Frequency (wavelength)
② Angle propagation

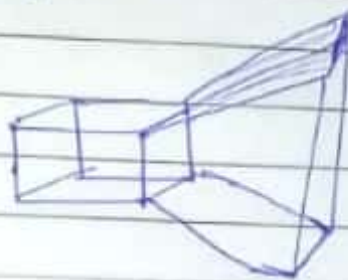# Horn Antenna, How is this antenna fed, And its Application.

Horn antenna is an antenna made up flared waveguide. The function of horn antenna is to produce uniform phase front whith larger aperture than that waveguide and hence greater directivity.

It improve impedence matching with free space.

Ha

Hom Antenna

Horn antenna is typically fed by a section of waveguide. The waveguide itself is fed by short dipole which is shown in figure.
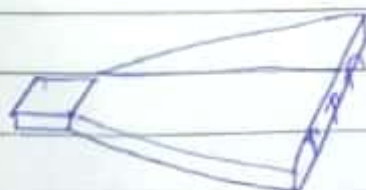
Some of horn antenna are shown below

Rectangular HA

Circular H-Antena

Sectoral H-plane

Sectoral - E-plane antenna