# ANTENNAS , WAVE PROPAGATION &TV ENGG

# SYLLABUS

- ***SECTION A*:**

Retarded potential, field of short dipole, antenna pattern and antenna parameters, Gain, Directivity, Radiation resistance, aperture, beam-width etc, reciprocity theorem for antenna.

## *SECTION B:*

Wave Eq for radiated fields from current and voltage sources in terms of electric scalar potential and magnetic vector potential. Fields and pattern of an infinite small dipole. Definition of various potentials used in antenna

Relationship between current distribution and field pattern of an antenna, linear antenna, halfwave dipole, antenna impedance, directivity, radiation resistance, directional properties, effect of ground on antenna pattern, input impedance , broad band matching.

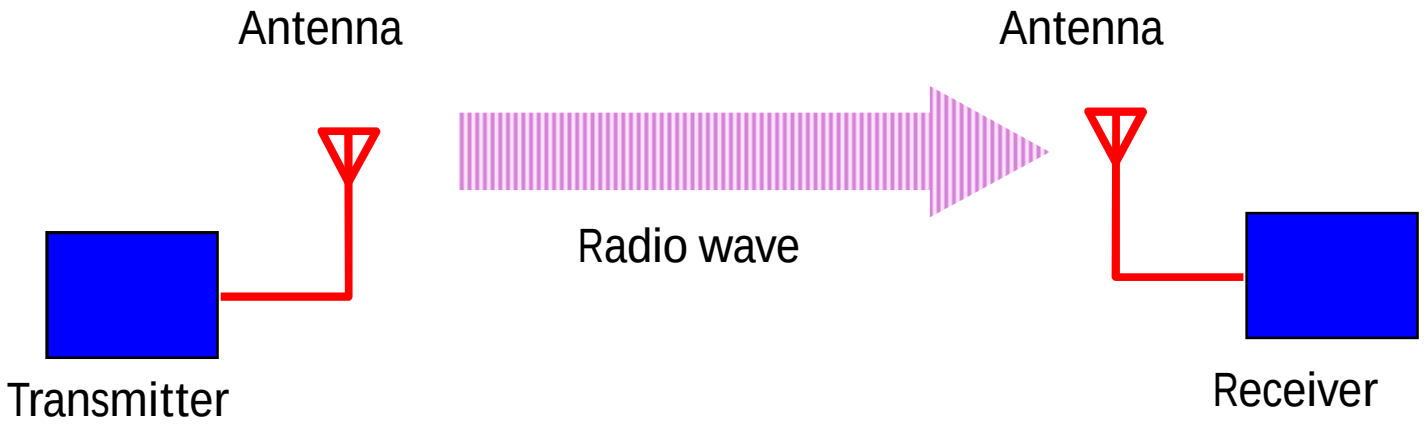
## *SECTION C:*

two element array, broad side, end fired pattern, beam width pattern multiplication, multi element array and their properties, synthesis of an array, parabolic feed antenna, conical , helix, log periodic horn. Microwave , gndwave, sky wave propagation.

## *SECTION D:*

Picture transmission, sound transmiision, picture receptio, sound reception synchronisation, receiver cntrols, color tv. Monochrome picture tube, beam deflection, screen phosphor, face plate, picture tube characteristics, picture tube, circuits controls. Tv camera tubes: basic principla. Image orthicon. Vidicon.

# Radio Link




Antennas: important elements of any radio link

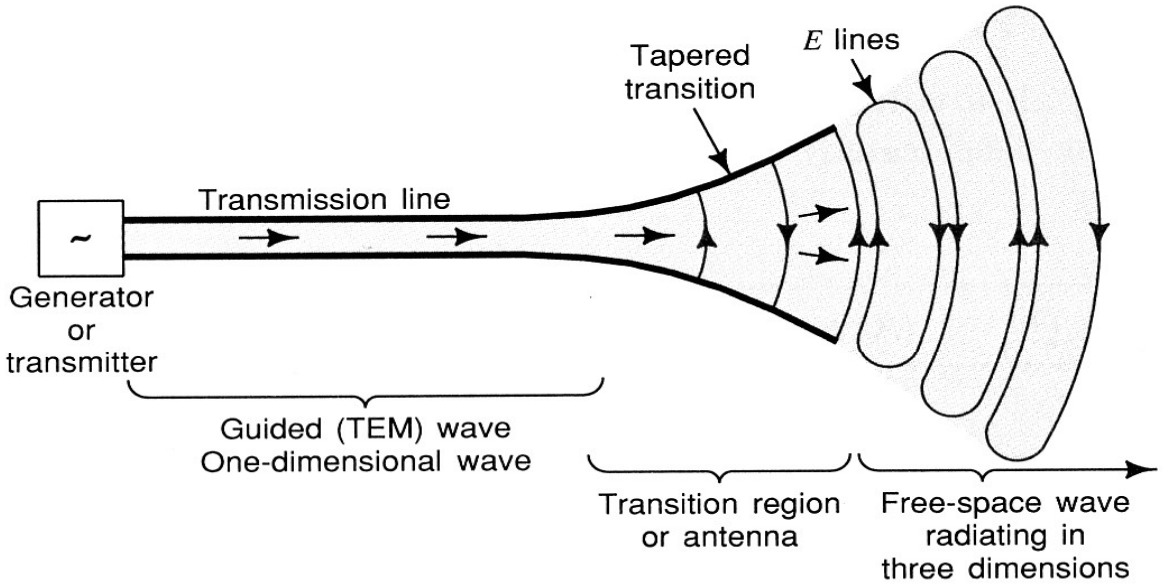
# *Antenna Defnition*

- An antenna is an electrical conductor or system of ELEVATED conductors
  - Transmission - radiates electromagnetic energy into space
  - Reception - collects electromagnetic energy from space

# What is an antenna?

- Region of transition between guided and free space propagation
- Concentrates incoming wave onto a sensor (receiving case)
- Launches waves from a guiding structure into space or air (transmitting case)
- Often part of a signal transmitting system over some distance
- Not limited to electromagnetic waves (e.g. acoustic waves)

# Transition from guided wave to free space wave



# *Antenna Definition*

- **Circuit element that provides a transition from a guided wave on a *transmission line to a free space wave* and it provides for the collection of electromagnetic energy.**
- **In transmit systems the RF signal is generated, amplified, modulated and applied to the antenna**
- **In receive systems the antenna collects electromagnetic waves that are "cutting" through the antenna and induce alternating currents that are used by the receiver**

# Types of antennas

**Transmit antenna**: radiate maximum energy into surroundings

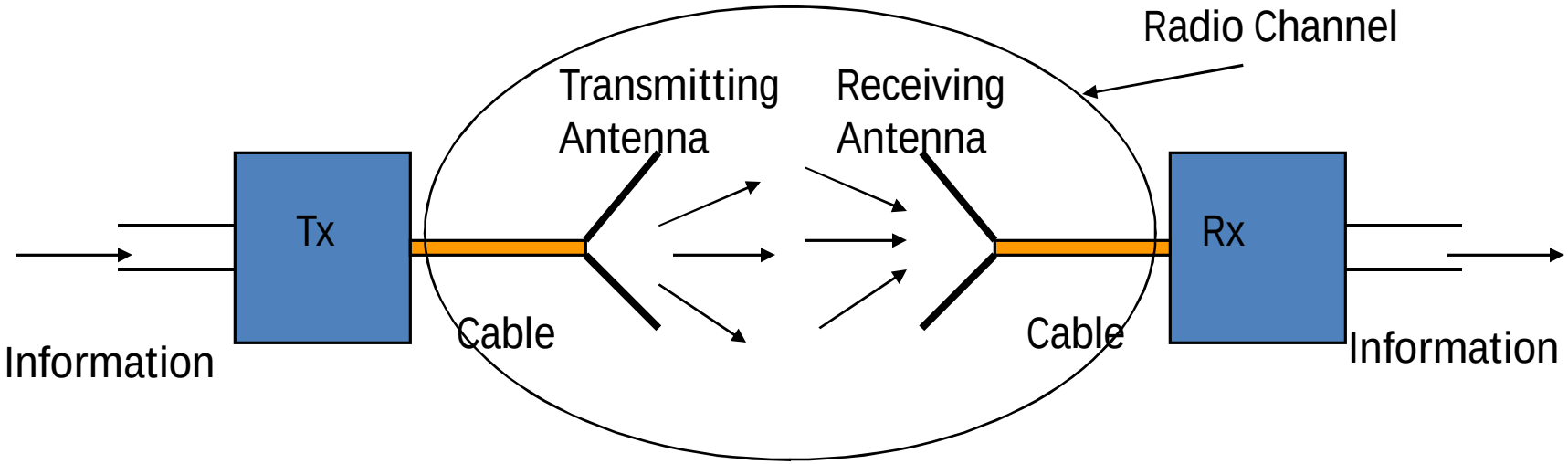
**Receive antenna**: capture maximum energy from surrounding

- radiating transmission line is technically an antenna
- good transmission line = poor antenna

## Major Difference Between Antennas And Transmission Lines

- **transmission line** uses conductor to carry voltage & current
- **radio signal** travels through air (insulator)
- **antennas** are transducers
  - convert *voltage & current* into *electric & magnetic field*
  - bridges transmission line & air
  - similar to speaker/microphone with acoustic energy

# Radio Channel Encompasses Cables, Antennas and Environment Between




- Transmitter impresses information onto the voltage of a high power RF carrier for transmission through the air - called modulation
- Receiver extracts the information from the voltage of a low power received signal - called demodulation

# Types of antennas(cont..)

- .. **Transmit & Receive antennas**

**theoretically** are the same (e.g. *radiation fields, antenna gain*)

**practical** implementation issue:

transmit antenna handles **high power** signal (*W-MW*)

- large conductors & high power connectors,

receive antenna handles **low power** signal (*mW-uW*)

# Antenna

- **Transmission line**

•voltage & current variations → produce EM field around conductor

• EM field expands & contracts at same frequency as variations

• EM field contractions return energy to the source (conductor)

• Nearly all the energy in the transmission line remains in the system

# Points to remember:Antenna

- Designed to Prevent most of the Energy from returning to Conductor
- Specific Dimensions & EM wavelengths cause field to radiate

  several λ before the Cycle Reversal

  ✓- Cycle Reversal - Field Collapses → Energy returns to Conductor

  ✓- Produces 3-Dimensional EM field

  ✓- Electric Field ⊥ Magnetic Field

  - Wave Energy Propagation ⊥ Electric Field & Magnetic Field