

10 Ferrite Devices

- Ferrites are non-metallic materials with high resistivities and dielectric constants. They show magnetic properties similar to ferrous metals. Ferrite materials are oxide based components with general composition of the form MnO, Fe_2O_3 . They are obtained by firing powdered oxides of materials at $1100^\circ C$ or more and pressing them into different shapes. This gives additional features of ceramic insulators so that they can be used at microwave frequencies. Ferrites also exhibits strong magnetic property. Ferrite devices are used for microwave applications like - to reflect power, modulation and for switching circuits.
- The non-reciprocal property of ferrites is also very useful in various applications. Ferrite devices are - Isolator, Circulator, Gyrator etc.

10.1 Faraday Rotation Principle

Faraday's principle states that "If a circularly polarized wave (TE_{11} in a cylindrical waveguide) is made to pass through a ferrite rod, which has been influenced by an axial magnetic field B , the axis of polarization gets tilted in clockwise direction and the amount of tilt depends upon the strength of magnetic field and geometry of the ferrite. This principle is illustrated in Fig. 2.10.1.

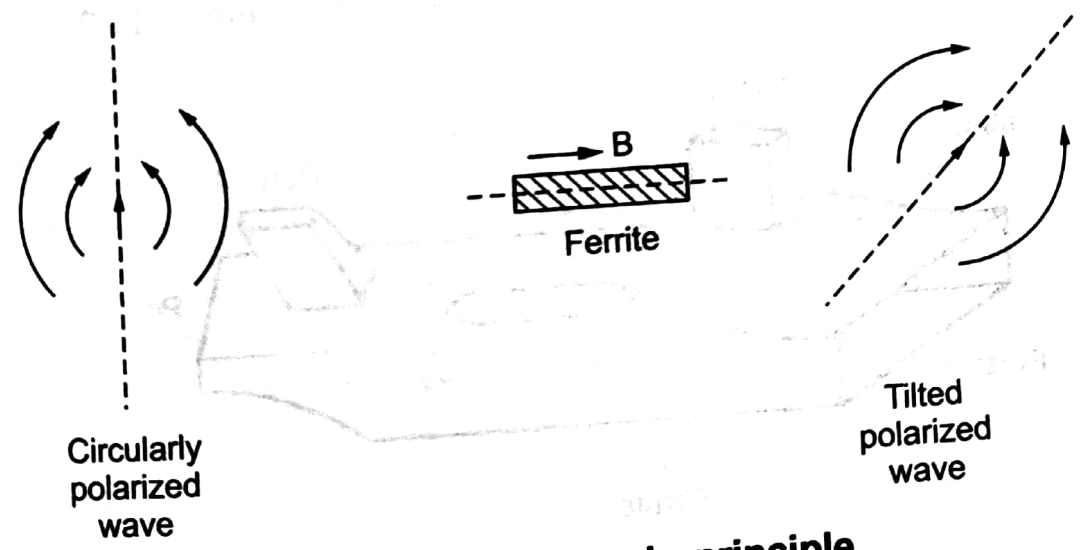


Fig. 2.10.1 Faraday's principle

- Microwave components which make use of this phenomenon are
 1. Circulator
 2. Isolator
 3. Gyrator