

Course Name: Microwave Engineering

Experiment No.1

STUDY OF MICROWAVE COMPONENTS

Objective: To study the microwave components in detail.

RECTANGULAR WAVE GUIDE

Wave guides are manufactured to the highest mechanical and electrical standards and mechanical tolerances.

L and S band wave guides are fabricated by precision brazing of brass-plates and all other wave guides are in extrusion quality.

W.G. sections of specified length can be supplied with flanges, painted outside and silver or gold plated in side.

Frequency : 8.2 - 12.4 GHz

FIXED ATTENUATORS

Fixed Attenuators are meant for inserting a known attenuation in a wave guide system. These consists of a lossy vane inserted in a section of wave guide, flanged on both ends. These are useful for isolation of wave guide circuits, padding and extending the range of measuring equipment's. Frequency : 8.2 - 12.4 GHz

TUNABLE PROBE

These are meant for exploring the energy of the EF in a suitably fabricated section of wave guide. The depth of penetration into a wave guide - section is adjustable by the knob of the probe. The tip pick up the RF power from the line and this power is rectified by crystal detector, which is then fed to the VSWR meter or indicating instrument.

Freq (Ghz) : 8.2 - 12.4

WAVE GUIDE DETECTOR MOUNT (TUNABLE)

Tunable Detector Mount is simple and easy to use instrument for detecting microwave power through a suitable detector. It consists of a detector crystal mounted in a section of a Wave guide and shorting plunger for matching purpose. The output from the crystal may be fed to an indicating instrument. In K and R bands detector mounts the plunger is driven by a micrometer.

Freq. Range (Ghz) : 8.2 - 12.4

Wave guide type (WR-) : 90

Detector : IN23

KLYSTRON MOUNT

Klystron mounts are meant for mounting corresponding Klystrons such as 2K25, 723A/B, 726A or RK - 5976 etc. These consists of a section of wave guide flanged on one end and terminated with a movable short on the other end. An octal base with cable is provided for Klystron. Freq. Range (GHz) 8.2 -12.4/ WG Type: WR-90

CIRCULATORS

T and Y types of three port circulators respectively. These are precisely machined and assembled to get the desired specifications. Circulators are matched three port devices and these are meant for allowing Microwave energy to flow in clockwise direction with negligible loss but almost no transmission in the anti-clockwise direction.

Frequency Range (Ghz) : 8.2 – 12.4

SLIDE SCREW TUNERS

Slide screw tuners are used for matching purposes by changing the penetration and position of a screw in the slot provided in the center of the wave guide. These consists of a section of wave guide flanged on both ends and a thin slot is provided in the broad wall of the Wave guide. A carriage carrying the screw, is provided over the slot. A VSWR up to 20 can be tuned to a value less than 1.02 at certain frequency.

Freq. Range (Ghz) : 8.2 - 12.4/WG Type (WR-) : 90

MULTIHOLE DIRECTIONAL COUPLERS

Multihole directional couplers are useful for sampling a part of Microwave energy for monitoring purposes and for measuring reflections and impedance. These consists of a section of Wave guide with addition of a second parallel section of wave guide thus making it a four port network. However the fourth port is terminated with a matched load. These two parallel sections are coupled to each other through many holes, almost to give uniform coupling; minimum frequency sensitivity and high directivity.

Frequency Range (Ghz) : 8.2 - 12.4

Wave guide type (WR-) : 90

E PLANE TEE

E - Plane tee are series type T - junction and consists of three section of wave guide joined together in order to divide or compare power levels. The signal entering the first port of this T - junction will be equally dividing at second and third ports of the same magnitude but in opposite phase.

Frequency Range (GHz) : 8.2-12.4

WG Type (WR) : 90

H - PLANE TEE

H - Plane Tee are shunt type T - junction for use in conjunction with VSWR meters, frequency - meters and other detector devices. Like in E-plane tee, the signal fed through first port of H - plane Tee will be equally divided in magnitude at second and third ports but in same phase.

Frequency Range (GHz) : 8.2 - 12.4

WG Type (WR-) : 90

MAGIC TEE

E - H Tee consists of a section of wave guide in both series and shunt wave guide arms, mounted at the exact midpoint of main arm. Both ends of the section of wave guide and both arms are flanged on their ends. These Tees are employed in balanced mixers, AFC circuits and impedance measurement circuits etc. This becomes a four terminal device where one terminal is isolated from the input terminal.

Frequency Range (Ghz) : 8.2 - 12.4

WG Type (WR-) : 90

MOVABLE SHORT

Movable shorts consists of a section of waveguide, flanged on one end and terminated with a movable shorting plunger on the other end. By means of this non-contacting type plunger, a reflection co-efficient of almost unity may be obtained.

Frequency Range (GHz) : 8.2 - 12.4

WG Type (WR-) : 90

MATCHED TERMINATION

These are low power and non-reflective type of terminations. It consists of a small and highly dissipative taper flap mounted inside the center of a section of wave guide. Matched Terminations are useful for USWR measurement of various waveguide components. These are also employed as dummy and as a precise reference loads with Tee junctions, directional couplers and other similar dividing devices.

Freq. Range (Ghz) :8.2 - 12.4

WG Type (WR-) 90,

PYRAMIDAL WAVEGUIDE HORN ANTENNA

Pyramidal Wave guide Horn antenna consists of waveguide joined to pyramidal section fabricated from brass sheet. The pyramidal section shapes the energy to concentrate in a specified beam. Wave guide horns are used as feed horns as radiators for reflectors and lenses and as a pickup antenna for receiving microwave power.

Frequency Range (Ghz) : 8.2 - 12.4
WG Type (WR-) : 90

GUNN OSCILLATORS

Gunn Oscillators are solid state microwave energy generators. These consists of waveguide cavity flanged on one end and micrometer driven plunger fitted on the other end. A gunn-diode is mounted inside the Wave guide with BNC (F) connector for DC bias. Each Gunn oscillator is supplied with calibration certificate giving frequency vs micrometer reading.

Freq : 8.2 - 12.4 Ghz,

WG Type (WR): 90

PIN MODULATORS

Pin modulators are designed to modulate the CW output of Gunn Oscillators. It is operated by the square pulses derived from the UHF(F) connector of the Gunn power supply. These consists of a pin diode mounted inside a section of Wave guide flanged on its both end. A fixed attenuation vane is mounted inside at the input to protect the oscillator.

Frequency Range (Ghz) : 8.2 - 12.4

WG Type (WR-) : 90

GUNN POWER SUPPLY

Gunn Power supply comprises of a regulated DC power supply and a square wave generator, designed to operate Gunn-Oscillator and Pin modulators respectively. The power supply has been so designed to protect Gunn diode from reverse voltage application over transient and low frequency oscillations by the negative resistance of the Gunn-diode.

ISOLATORS

The three port circulators may be converted into isolators by terminating one of its port into matched load. These will work over the frequency range of circulators. These are well matched devices offering low forward insertion loss and high reverse isolation. Frequency Range (GHz) : 8.2 – 12.4

