Electromagnetics Lab

DEPARTMENT OF ELECTRONICS & COMMUNICATIONS NGINEERING

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Objective

To provide platform to the students for understanding the basic concept of electromagnetic wave propagation in different mediums and to provide exposure and hands on experience on waveguide, antenna, Gunn diode, Klystron tube and different types of microwave components as they are vital parts of any communication system.

Hardware/Software Availability

Antenna Trainer Kit

Antenna trainer kit allows us to see visually how the most common types of real-world antenna designs function. The radiation pattern of the antenna is of principle concern when engineering a communication system. Through this trainer kit one can examine the radiation patterns of several antennas by hands on field testing. It covers S band to wide frequency coverage up to 3.2 GHz. It has high dynamic range of power transmission. It provides practical approach for microstrip antenna design covering concepts of size reduction, bandwidth enhancement, stacked multilayer configuration and impedance matching. It has 4.5Kg motor assembly for heavy antenna rotary table motion and 8 GHz wideband standalone RF detector facility. It has PRE-AMP facility for closely spaced SNR signal. It is also software compatible for windows 8 platform.

Klystron Tube Based Microwave Bench

The general setup for measurement of any parameter in microwaves is normally done by a microwave bench. The signal generator is a microwave source whose output is of the order of milliwatts. It could be a Gunn diode oscillator, a backward wave oscillator or a reflex klystron tube. The Reflex Klystron makes use of velocity modulation to transform a continuous electron beam into microwave power. Its oscillation frequency can be varied over a wide band and it can be pulse and frequency modulated. Klystron mounts are used for mounting klystrons such as 2K25,723A/B,726A or RK-5976 etc. These consists of a section of waveguide flanged on one end and terminated with a movable short on the other end. An octal base with cable is provided for Klystron. One can study the performance characteristics of reflex klystron tube through this microwave bench.

GUNN Diode Based Microwave Bench

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 gun diode is mounted inside the waveguide with BNC(F) connector for DC bias. Each gunn oscillator is supplied with caliberation certificate giving frequency vs micrometer reading. It can operates in frequency range 8.2-12.4 GHz and can produce an output power of 10MW. One can study Gunn oscillator as a source of Microwave power and plot its V-I characteristics.

Vector Network Analyzer

A vector network analyzer is an instrument that measures the frequency response of a component or a network composed of many components, which can be both passive and active. A VNA measures the power of a high-speed signal going into and coming back from a component or a network, because power, in contrast to voltage and current, can be measured accurately at high frequencies. Both amplitude and phase of the high-frequency signal are captured at each frequency point. The built-in computer in the VNA calculates key parameters such as return loss and insertion loss of the network under test. It is also capable of visualizing the results in different formats—for example, real/imaginary, magnitude/phase, Smith chart, etc.

Ansys HFSS(High Frequency simulation software) 2020 R1

Ansys HFSS(High Frequency simulation software) 2020 R1 is the latest version of HFSS and is the industry-standard software for S-parameter and full-wave SPICE extraction and for the electromagnetic simulation of high-frequency and high-speed components. HFSS is widely used for the design of on-chip embedded passives, PCB interconnects, antennas, RF/microwave components and high frequency IC packages. HFSS improves engineering productivity, reduces development time, and better assures first-pass design success. The latest release of HFSS delivers significant productivity gains to Microwave/RF engineers and expands electromagnetic co-design to a new segment of engineers working in the areas of RF/analog IC and multi-gigabit designs as well as EMI/EMC.

Glimpses of the Venue