



## INTRODUCTION

Nowadays the microwave systems are widely used in many branches of the communications technologies, in military and civilian applications, because microwaves links allow reliable and long range communications. With their small wavelength allows using smaller sized antennas than other system at lower radio frequencies, this is very important in systems where the space and weight are limited, like satellite system.

The waveguide devices are efficient systems that allow signal transmission with low losses and low noise added. The only losses of these systems are caused by the stationary waves formed by mismatched loads.

The Microwave Trainer "EMI", designed by EDIBON, allows to study different microwave waveguide configurations for introduce students the main concepts about microwave communications through waveguide and antennas systems.

The trainer is provided with a set of practical exercises, through which the student will understand how to work with different devices of the trainer in order to obtain a basic knowledge of the concepts behind the microwave communication system; stationary wave ratio (SWR) measurement in waveguide systems, attenuation, function of different waveguide components, aerial communication links, reflection and absorption of different materials, matched and mismatched load, operation with Smith chart, etc.

## GENERAL DESCRIPTION

The Microwave Trainer "EMI" integrates a microwaves measuring test bench formed by microwaves generator, a kit of different standardized (WR-90) waveguides devices (horns antennas, attenuators, etc) and measure devices for complete the set of practices (Power-meter, Slotted line, etc).

This trainer includes different components to conform many configurations of the microwave test bench, including an aerial microwaves link, Hybrid Tees's configurations, determination of unknown impedance, etc, all of them are full explained in the set of practices.

The "EMI" allows the familiarization and experimentation with essential measurements in microwaves systems: power emission, attenuation, matched and mismatched loads, gain of a horn antenna, frequency, wavelength, stationary wave (SWR), impedance, operation with Smith chart, etc.



The Microwave Trainer "EMI" is composed of:

Electronic console (in metallic box):

Gunn oscillator connector. Power meter connector. Power meter display. SMA connector to slotted line. SWR measurement display.

Power meter:

Based on Thermistor. Wide frequency range: 10 to 12000 MHZ.

Typically level range: -55 dBm to +18 dBm. Stability over temperature. Slope: -25mV/dB.

Connector to electronic console.

Slotted line:

Tunnel Diode detector mounted. Frequency range: 2 to 18 GHz. VSWR (max.): 3.5:1.

Maximum input power: 100mW (20dBm). Work in the quadratic detection zone.

Designed for 8.2 to 12.4 GHz (X-band). Longitudinal movable Diode detector holder.

Millimeter ruler. Waveguide in the standard size WR-90.

SMA connector to electronic console.

Gunn oscillator (Microwave signal generator):

Gunn oscillator diode. Frequency band: X band (fixed at 10.525GHz).

Power output: 10dBm. Waveguide in the standard size WR-90.

Connector to electronic console.

Broad-wall Waveguide Directional Coupler:

Designed for 8.2 to 12.4 GHz (X-band). 3 ports (input, output and coupled).

Waveguide in the standard size WR-90.

Cross-guide Waveguide Directional Coupler:

Designed for 8.2 to 12.4 GHz (X-band). 4 ports (input, output, isolated and coupled). Waveguide in the standard size WR-90.

Hybrid Tee:

Designed for 8.2 to 12.4 GHz (X-band).

3dB coupler. 4 ports (2 co-linear, sum and difference). Waveguide in the standard size WR-90.

6dB Fixed attenuator:

Designed for 8.2 to 12.4 GHz (X-band). Fixed attenuator at 6 dB. Waveguide in the standard size WR-90.

15dB Fixed attenuator:

Designed for 8.2 to 12.4 GHz (X-band). Fixed attenuator at 15 dB. Waveguide in the standard size WR-90.

Vertical variable attenuator:

Designed for 8.2 to 12.4 GHz (X-band). Precision micrometer. Waveguide in the standard size WR-90.

Horizontal variable attenuator:

Designed for 8.2 to 12.4 GHz (X-band). Precision micrometer. Waveguide in the standard size WR-90.

Termination load (Dummy load):

Designed for 8.2 to 12.4 GHz (X-band). Adapted load. Waveguide in the standard size WR-90.

2 Short circuit terminations.

2 Horn antennas:

Designed for 8.2 to 12.4 GHz (X-band). Sectorial horn flared in the direction of the electric plane (H-plane).

Waveguide in the standard size WR-90.

Adjustable termination:

Designed for 8.2 to 12.4 GHz (X-band). Movable short circuit. Precision micrometer. Waveguide in the standard size WR-90.

Microwave Absorber Plate: Plate with resistive material.

Microwave Reflector Plate: Plate with metallic material.

4 Tower antennas with adjustable height, including each one: waveguide holder and degree disc with position indicator.

10 Quick release fasteners for an easy operation with the waveguide devices.

Cables and accessories, for normal operation.

Manuals: This unit is supplied with the following manuals: Required Services, Assembly and Installation, Starting-up, Safety, Maintenance & Practices Manuals.

## EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Familiarization with the microwave trainer.
- 2.- Power emission measurement.
- 3.- Study of different fixed attenuators and variable attenuators.
- 4.- Calibration of variable attenuators.
- 5.- Wavelength, frequency and SWR measurement with the waveguide slotted line.
- 6.- Basic principles of Smith chart.
- 7.- Calculation of impedance, admittance and reflection coefficient, with the Smith chart.
- 8.- Calculation of impedance, admittance and reflection coefficient for different terminations, with the Smith chart.
- 9.- Comparison between matched and mismatched loads.
- 10.-Study of the Broad-wall Waveguide Directional Coupler.
- 11.-Study of the Cross-guide Waveguide Directional Coupler.
- 12.-Study of the Hybrid Tee.
- 13.-Measure of power emission in free space.
- 14.-Measure of wavelength, frequency and SWR measurement in free space.
- 15.-Radiation pattern of a horn antenna.
- 16.-Study of gain and directivity of a horn antenna (dBi).
- 17.-Reflectance and absorbance of metallic and resistive plates.

## REQUIRED SERVICES

- Electrical supply: single-phase, 220V./50Hz or 110V./60Hz.

## DIMENSIONS & WEIGHTS

EMI:

-Dimensions: 800 x 600 x 450 mm. approx.  
(31.49 x 23.62 x 17.72 inches approx.).

-Weight: 20 Kg. approx.  
(44 pounds approx.).

## AVAILABLE VERSIONS

Offered in this catalogue:

-EMI. Microwave Trainer.

Offered in other catalogue:

-EMIC. Computerized Microwave Trainer.

\*Specifications subject to change without previous notice, due to the convenience of improvements of the product.



C/ Del Agua, 14. Polígono Industrial San José de Valderas.  
28918 LEGANÉS. (Madrid). SPAIN.

Phone: 34-91-6199363 FAX: 34-91-6198647

E-mail: [edibon@edibon.com](mailto:edibon@edibon.com) WEB site: [www.edibon.com](http://www.edibon.com)

Issue: ED01/16  
Date: March/2016

REPRESENTATIVE: