



**Advanced Microwave Integrated Circuit Lab** includes instruments and accessories for studying the characteristics of any MIC (Microwave Integrated Circuits) component over the Frequency Range 2.2 to 3GHz. Characteristics and measurements like Transmission Loss and Reflection Loss of different MIC components can be studied with the help of instruments provided with Order Code- 10411 / 10411A. Directivity and Gain of Antennas can also be measured with the setup provided. The theoretical background on these components and experimental details are provided in the learning material.

**Features**

- Complete setup with Generator, MIC Components and Meter.
- Gold Plated Components and Connectors.
- Microwave Generator with internal AM and FM.
- PC to PC Data Communication.
- Antenna Radiation Pattern measurement.
- Directivity and Gain measurement.  
2 Year Warranty

**This Training System Includes:**

- Microwave Generator (2.2 - 3GHz)
- VSWR Meter
- MIC Components
- Learning Material
- Transmitting and Receiving mast

**MIC Components**

MIC Components	10411	10411A
50 Microstrip Line	✓	✓
Band Stop Filter	✓	✓
Parallel line Directional Coupler (15 dB)	✓	✓
Wilkinson Power Divider (3 dB)	✓	✓
Branchline Directional Coupler (3 dB)	✓	✓
Low Pass Filter	✓	✓
Band Pass Filter	✓	✓
Ring Resonator	✓	✓
Rat-Race Hybrid Ring Coupler (3 dB)	✓	✓
MIC Patch Antennas (2 Nos.)	✓	✓
Yagi antenna	✓	✓
Dipole Antenna	✓	✓
MIC Amplifier	✓	✓
RF Switch Optional	✓	✓
RF Mixer	Optional	✓
Local Oscillator	Optional	✓
Measuring Line	Optional	✓
Isolator	Optional	✓
Circulator	Optional	✓
Vector Network Analyser (3MHz-3GHz)	Optional	Optional

**Scope of Learning:**

- PC to PC Data Communication using MIC components.
- Measurement of Transmission Loss and Reflection Loss.
- Measurement of substrate dielectric constant using Ring Resonator.
- Measurement of power division, isolation and return loss characteristics.
- Measurement of coupling, isolation and return loss characteristics.
- Measurement of coupling and directivity.
- Measurement of Low Pass Filter characteristics.
- Measurement of Band Pass Filter characteristics.
- Measurement of Band Stop Filter characteristics.
- Measurement of characteristics of Patch Antennas.
- Measurement of characteristics of an MIC Amplifier.
- To study RF switch.
- To study RF Mixer.
- Measurement of Guide wavelength, Free Space Wavelength and SWR using Measuring Line.
- Measurement of Directivity and Gain of Antennas : Yagi Antenna, Patch Antenna, Dipole Antenna.
- To study the characteristics of Isolator.
- To study the characteristics of Circulator.

**Accessories:**

- Matched Loads (5 Nos.)
- Short
- Coaxial Detector
- Microstrip Directional Coupler (10 dB)
- SMA to SMA Adapters (Both male & female)
- SMA (male) connector fitted cables
- Attenuator (3 dB)
- +12V DC Adaptor
- Transmitting and Receiving Mast
- SMA (Male) to BNC (Female) adaptor
- 3-pin Lunar cable

Note: Specifications are subject to change.

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### VSWR Meter:

<b>Sensitivity</b>	: 0.1 $\mu$ V for 200W input impedance for full scale deflection
<b>Noise Level</b>	: Less than 0.02 $\mu$ V
<b>Range</b>	: 0- 60 dB in 10 dB steps
<b>Input</b>	: Un-biased low and high impedance crystal biased crystal (200 and 200K)
<b>Meter Scale</b>	: SWR 1-4, SWR 3-10, dB 0-10, expand SWR 1-1.3, dB 0-2
<b>Gain Control</b>	: Adjusts the reference level, variable range 0-10 dB (approximate)
<b>Input Connector</b>	: BNC (F)
<b>Input Frequency</b>	: 1000Hz $\pm$ 10%
<b>Power Supply</b>	: 230V $\pm$ 10%, 50Hz / 60Hz on request
<b>Power consumption</b>	: 2VA (approximate)
<b>Dimension (mm)</b>	: W 262 x D 316 x H 130

### Specification of MIC Components

#### 1. Test Jig

It includes of the following:

- a) 10 dB directional coupler
- b) Detector
- c) Shorts
- d) Matched Loads
- e) Attenuator

#### 2. Low pass Filter

Cut off frequency	: 2.5GHz (approximate)
Dielectric material	: Ceramic Substrate
Dielectric constant	: 3.02

#### 3. Band Pass Filter

Center frequency around	: 2.4GHz
Dielectric material	: Ceramic Substrate
Dielectric constant	: 3.02

#### 4. Band Stop Filter

Center frequency around	: 2.4GHz
Dielectric material	: Ceramic Substrate
Dielectric constant	: 3.02

#### 5. Branch Line Coupler

Dielectric material	: Ceramic Substrate
Dielectric constant	: 3.02
Coupling	: 3dB

#### 6. Rat-Race Coupler

Dielectric material	: Ceramic Substrate
Dielectric constant	: 3.02
Coupling	: 3dB

#### 7. Parallel Line Directional Coupler

Dielectric Material	: Ceramic Substrate
Dielectric Constant	: 3.02
Coupling	: 15dB

#### 8. Power Divider

Dielectric Material	: Ceramic Substrate
Output Power	: 3dB
Return Loss	: 8dB
Dielectric Constant	: 3.02

#### 9. Ring Resonator

The Resonance freq.	: 2.4GHz
Dielectric material	: Ceramic Substrate
Dielectric constant	: 3.02

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### Microwave Generator:

<b>Frequency Range</b>	: 2.2 - 3GHz continuously variable.
<b>Display</b>	: 16 x 2 LCD
<b>Display Accuracy</b>	: 40MHz
<b>Impedance</b>	: 50
<b>Min RF level</b>	: 5mW
<b>Output Level Variation</b>	: 10 - 20 dB
<b>Operating Modes</b>	: Sweep, CW, Int. AM, Int. FM, Ext. AM, PC communication
<b>Modulating Frequency</b>	: 100Hz to 5kHz AM square wave, FM triangular wave
<b>Power Supply</b>	: 230V $\pm$ 10%, 50Hz
<b>Power Consumption</b>	: 5VA (approximate)
<b>Dimension (mm)</b>	: W 262 x D 316 x H 130

#### 10. 50E Microstrip Line

Dielectric material	: Ceramic Substrate
Dielectric constant	: 3.02

#### 11. RF Switch (Pin Modulator)

Frequency Range	: DC to 5GHz
Rise/fall time	: 6 ns typical
Type	: SPDT

#### 12. RF Mixer

Frequency Range	: 2.0 to 7.0GHz
Conversion Loss	: 6.2dB typical
L-R Isolation	: 30 dB typical
RF Power	: 50mW

#### 13. Local Oscillator

Frequency Range	: 2.2 to 3GHz
Tuning Voltage	: 5V DC
Operating Voltage	: 5V DC

#### 14. Measuring line

Dielectric Material	: Ceramic Substrate
Dielectric Constant	: 3.02

#### 15. Isolator

Isolation	: 15dB
Impedance	: 50 Ohms
Insertion loss	: 0.8dB Max
Avg Power	: 5W
Design Tolerance	: $\pm$ 5%

#### 16. Circulator

Isolation	: 15dB
Impedance	: 50 Ohms
Insertion loss	: 0.8dB Max
Avg Power	: 5W
Port	: 3
Design Tolerance	: $\pm$ 5%



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**Features**

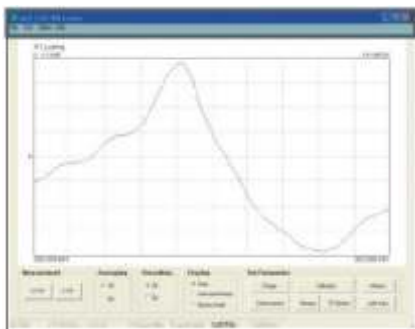
- 3MHz–3GHz range
- 100Hz resolution
- 80dB dynamic range
- Full s-parameter test set
- De-embedding capability
- Time domain facility
- P1dBand AM-PM measurements
- Light weight and small footprint
- Low cost
- Exhaustive learning material
- 1 Year Warranty



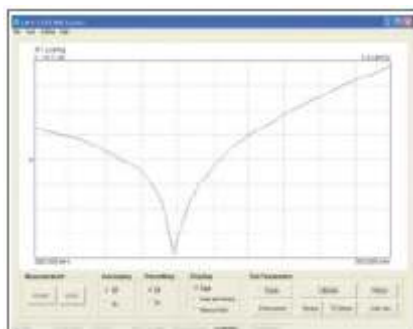
**3MHz - 3GHz Full S-Parameter Vector Network Analyser (Optional)**

It is a PC-driven **Vector Network Analyser** which is suitable for measuring a wide range of devices from **3MHz to 3GHz** with 100Hz resolution. It is housed in a small lightweight package making it very portable. The user interface control software provides many useful features including memory functions, limit lines, de-embedding, time-domain and reference plane extension. Also, utilities such as measurement of power at the 1dB gain compression point and AM to PM conversion factor add versatility to the instrument.

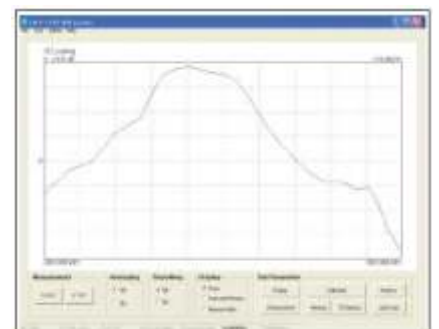
Unique features include OSL calibration that does not require a precision load and importing of data files into memory traces for live comparison with measurements.



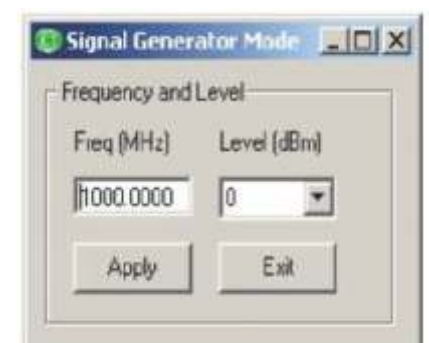
Transmission Characteristic of Ring Resonator (S12)



Transmission Characteristic of Ring Resonator (S11)



Transmission Characteristic of Ring Resonator (S22)



Software Window

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