

# MICROWAVE TRAINING KITS

COST EFFECTIVE, QUALITY PRODUCTS FOR SUPERIOR PERFORMANCE



Anechoic Chamber



## About Our Company

LAMBDA MICROWAVES PVT. LTD. Is a team of microwave professionals. The company started its design and production activity on Microwave components in 1995.

The company started its production in Passive wave guide components . Lambda is now serving major Microwave/BTS equipment manufactures & installers. The company is emerging as a single window for supply of all type of microwave components and installation accessories.

LAMBDA'S Products are Microwave components, Microwave Absorbers, EMI/EMC Shielded Chambers, Anechoic Chambers etc. Our customers are various telecom companies & Defence organizations. We supplied waveguide components in bulk to Andrew telecom (I) Pvt. Ltd., ITI, BEL, and PUNCOM , NDTV , TV Today, HFCL, Essel Shyam, ISRO & DRDO etc. Lambda has also served Bharti Cellular Ltd, Bharti Mobile Ltd. Spice telecom, Hutchinson Essar Ltd. Lucent Technologies Hindustan Ltd, Alcatel, Nortel, Ericsson, Nortel Networks Ltd. on Installation material for BTS Equipments. The company supplied CDMA/GSM installation Kits for more than 20000 sites. Lambda also supplies band pass filters & Surge Arrestors in bulk. We have supplied Anechoic Chambers to Indian Air Force, Hindustan Aeronautics Limited & JNU

### IN HOUSE TEST FACILITIES

- 1 Agilent Network Analyzer PNA 8363B upto 40 Ghz
- 2 Agilent Network analyzer E 5062 6 Nos.
- 3 Agilent Spectrum Analyzer upto 26Ghz
- 4 Agilent Power Meter 4418 B
- 5 Anritsu Spectrum Anylizer Portable
- 6 Anechoic Chamber
- 7 Sumitek IM Analyzer
- 8 Agilent 87050E Multiport Analyzer

LAMBDA MICROWAVES PVT. LTD. Is an ISO 9001 Company accredited by ICS under Registration No QAC R91/0667

### GOALS

Our primary goals are to deliver quality products and services to our customers while maintaining a pleasant work environment for our employees. We are committing our full resource, experiences and talents to achieving these simple yet most important goals.

### COMMITMENT TO QUALITY

LAMBDA is dedicated to providing the best service in the Industry from initial inquiry all the way through product delivery and after sales support. In addition, Lambda strives to design and produce products that meet or exceed the performance specifications to which we have agreed upon and fully comply with all applicable quality standards. Lambda commitment to quality includes a formal Quality Assurance Program, Manual that addresses the various quality standards as per ISO 9001:2000.

### QUALITY POLICY

Ensure quality at all levels of production and maintain quality standards per management objectives.

### RF DESIGN CENTRE

LAMBDA is equipped with state of art Software Tools such as Genesys & 3D Software, CAD/CAM, ProE Gerber Plotter, Anechoic Chamber, Profile Projector etc.

RF Lab of Lambda Microwave Pvt. Ltd. is recognised by Directorate of Scientific & Industrial Research (DSIR), Govt. of India as approved R&D Lab for Microwave Components & Systems under Regn. No.

TU/IV-RD/2636/2007



**GSM ANTENNA PRODUCTION**  
Unit-IV, Baddi

## LAMBDA 9100 SERIES MILLIMETER WAVE COMMUNICATION LINK TRAINER



**TX / RX UNIT**



**FINLINE MIXER UNIT  
(Optional)**

- |  |        |
|--|--------|
| 1. Gunn Source                                 | 1no.   |
| Frequency 35 GHz                               |        |
| Wave Guide WR 28                               |        |
| Power 20 mwatts                                |        |
| 2. Pin Modulator                               |        |
| 3. Isolator                                    | 2 Nos. |
| 4. Variable Attenuator                         |        |
| 5. Parabolic Antenna                           | 2 Nos  |
| 6. Gain 20 dB min Horn Feed                    |        |
| 7. Wave Guide Detectors                        | 2 Nos. |
| 8. Wave Guide Bends E and H Plane              | 1 Each |
| 9. Mixer Preamplifier ( Imported )             |        |
| 10. LO Source at 34 Ghz                        | 1 No.  |
| 11. IF Preamplifier with supply Gain 20 dB     |        |
| 12. Wave Guide Stands And Hardware             | 4 Sets |
| 13. Fixed Short                                |        |
| 14. VSWR Meter (or Use Power Meter)            |        |
| 15. Gunn Power Supply Analog dual mode display |        |

## RADIATION PATTERN MEASUREMENT SYSTEM

### MODEL LM - 3000

#### System Details:

System consists of one fixed arm for carrying transmitter, components and horn antenna and one rotatable arm for carrying a Horn antenna and detector to measure relative signal power.

The moving arm can be rotated thru 270 deg in azimuth. Elevation adjustment is possible thru vertical adjustment by changing rotation of Horn antenna.

Radiation Pattern can be plotted against azimuth position by relative signal power. Azimuth angle can be measured on circular scale.



Optional : PC Control with Stepper Motor Antenna Positioner along with RS 232 C

#### System Consists of :

- ◆ Transmitter channel on fixed rail
- ◆ Receiving Movable Channel
- ◆ Vertical Rotating System
- ◆ Azimuth Rotating System

## MICROWAVE LAB KIT

Model 2100

### LIST OF EXPERIMENTS

1. Measurement of Klystron Characteristics
2. Measurement of Frequency & Wavelength
3. Measurement of VSWR
4. Measurement of Impedance

### CONTENTS OF KIT

1 Klystron Power Supply	1	10 Detector Mount	1
2 VSWR Meter	1	11 Frequency Meter Direct	1
3 Klystron Mount	1	12 Wave guide Bend E/H	1
4 Klystron Tube 2k 25 or equ	1	13 Fixed Short/ Reflector	1
5 Isolator	1	14 Movable Short	1
6 Variable Attenuator	1	15 W/G Stands	3
7 Slotted Line	1	16 Hardware Fixing	1
8 Tunable probe	1	17 BNC Cables	3
9 Matched termination	1	18 Experiment manual	1

## MICROWAVE LAB KIT

Model 2200

### LIST OF EXPERIMENTS

1. Measurements on Directional Coupler/ cross Coupler
2. Gunn diode Characteristics
3. Measurement on Magic Tee/ Isolator/circulator
4. Measurement of relative Power/Attenuation

### CONTENTS OF KIT

1. Gunn Power Supply Dual Display	1	10. Detector mounts	1
2. VSWR Meter	1	11. Frequency Meter Direct	1
3. Gunn Oscillator	1	12. Directional Coupler	1
4. PIN Modulator	1	13. Magic tee	1
5. Isolator	1	14. Fixed short/ Reflector	1
6. Variable Attenuator	1	15. Fixed Attenuator	1
7. Slotted Line	1	16. W/G stands	3
8. Tunable probe	1	17. Hardware Fixing	1 set
9. Matched termination	2	18. BNC Cables	3
		19. Experiment Manual	1

### Specification : KLYSTRON POWER SUPPLY

Operating Voltage : Mains, 230-AC, 50 Hz  
 Beam Supply  
 Voltage : 200-400 V ( $\pm 40V$ )  
 Current : 50 ma  
 Regulation : 0.5 % for +/-10% variation in  
 Power supply Ripple < 5 mv  
 Repeller Voltage Supply :  
 Voltage:- 15V TO-235 ( $\pm 10V$ )  
 Regulation : 0.25 % for +/- 10 % variation  
 in power supply

Ripple < 5 mv  
 Filament Supply : 6.3 VAC  
 Modulation Square Wave/Saw Tooth  

Freq	Amplitude
AM 50-2500 Hz	10-15V
FM 50-5000 Hz	10-15V

 Display : Separate Digital 3.5 digit for Beam  
 Supply, Repeller Voltage, Beam current.



### Specification : GUNN POWER SUPPLY

Operating Voltage : 230 VAC, 50 Hz.  
 Voltage Range : 0 to 12 Volts variable (+0-12)  
 Regulation : 0.2 % for +/- 10 % variation (mains)  
 Ripple : 1 mv rms  
 Modulation Square : 900-2500Hz variable 0-10vpp variable  
 - Frequency  
 - Amplitude  
 Display : DIGITAL (separate for Voltage and Current)



## MICROWAVE LAB KIT

Model 2300

### LIST OF EXPERIMENTS



- 1 Measurement of dielectric constant of solid
- 2 Measurement of dielectric constant of liquid
3. Measurement of Phase Shifter

### CONTENTS OF KIT

1. Klystron Power Supply	1	10. Detector mount	1
2. VSWR Meter	1	11. Solid dielectric cell	1
3. Klystron Mount	1	12. Liquid dielectric cell	1
4. Klystron Tube 2k 25 or equivalent	1	13. EH Tuner	1
5. Isolator	1	14. Sliding Termination	1
6. Variable Attenuator	1	15. Fixed short/ Reflector	1
7. Slotted Line	1	16. Waveguide Stand	3
8. Tunable Probe	1	17. Hardware Fixing	1 set
9. Matched Termination	1	18. BNC Cables and manuals	3
		19. Phase shifter	1

## MICROWAVE LAB KIT

Model 2400

### LIST OF EXPERIMENTS



- 1 Measurement of gain of Antenna
- 2 Plot Radiation Pattern

### CONTENTS OF KIT

1 Klystron power Supply	1	8 Detector mount	1
2 VSWR Meter	1	9 Sectorial Antenna E/H	1
3 Klystron Mount with 2k 25 Tube	1	10 Slotted Antenna	1
4 Isolator	1	11 Radiation Pattern Turn Table	1 Set
5 Variable Attenuator	1	12 Hardware Fixing	1 Set
6 Horn Antenna	2	13 BNC Cables	3
7 Parabolic Reflector	1	14 Experiment Manual	1
		15 Waveguide Stand	2 No.

### Specification : VSWR Meter



Bandwidth	1000 Hz adjustment approx. 10%.
Sensitivity	20Hz or 100 Hz
Noise	0.2v for full scale deflection at maximum
Input	At least 6 db below full scale at maximum terminated in 100/500 ohm
- Input Connector	: Unbiased, optimised crystals with a source impedance 2-10 kohm
- Range	: BNC female
Adjustment	: 70 db in 6 steps of 1 db & 10 db
Accuracy	: Variable by at least 10dB by coarse control approx 0.5 db by fine control
Meter Scale	0.1 % db/10 step max. cumulative error between any two 10 dB steps
Temperature Range	0.05 db when switching NORMAL EXPAND
Power	Calibrated for square law detectors
	1-4/3.2-10 . (NORMAL)
	1-1.3 (EXPANDED)
	DB 0-10 (NORMAL)
	0-0.25 (EXPANDED)
	0-50 deg . C
	200-260 v 50 Hzs

## MICROWAVE TEST BENCHES & KITS

### KLYSTRON SOURCE

#### TEST BENCH KIT MODEL LM 1000-X

(Available at S/C/X band)

#### KIT CONSISTS OF FOLLOWING COMPONENTS



1	Klystron tube	-----	1 Nos.
2	Klystron mount	-----	1 Nos.
3	Isolator	-----	1 Nos.
4	Slotted line	-----	1 Nos.
5	Tunable probe	-----	1 Nos.
6	Detector mount	-----	1 Nos.
7	Variable attenuator	-----	1 Nos.
8	Directional coupler	-----	1 Nos.
9	Magic tee	-----	1 Nos.
10	SS tuner	-----	1 Nos.
11	EH tuner	-----	1 Nos.
12	Horn parabolic	-----	2 Nos.
13	Reflector plate	-----	1 Nos.
14	Frequency meter direct reading-		1 Nos.
15	Movable short	-----	1 Nos.
16	Matched termination	-----	2 Nos.

#### ACCESSORIES AND INSTRUMENTS SUPPLIED IN KIT

- Klystron power supply digital display
- VSWR meter
- Waveguide Stand ---- 1 set
- BNC cables ---- 3nos
- S/S Hardware ---- 1 set

**DOCUMENTATION:** Operating & service manual on experiments

## GUNN SOURCE MICROWAVE

### TEST BENCH KIT MODEL LM 1020-X

(Available at X/ku/ka band)

#### KIT CONSISTS OF FOLLOWING COMPONENTS



1	Gunn oscillator		1
2	Pin Modulator		1
3	Isolator		1
4	Slotted line		1
5	Directional coupler		1
6	Magic tee		1
7	S S tuner		1
8	EH tuner		1
9	Tunable probe		1
10	Detector mount		1
11	Variable attenuator		1
12	Horn Pyramidal		2 nos
13	Fixed attenuator		1
14	W/G stands		3 nos
15	Frequency meter		1
16	Reflector sliding termination		1
17	Movable short		1
18	Matched termination		2 nos

#### ACCESSORIES AND INSTRUMENTS SUPPLIED IN KIT

- Gunn power supply digital display
- VSWR meter
- BNC cables 3 nos
- SIS Hardware 1 set

**DOCUMENTATION:** Operating and service manual on experiments

## Component Specifications X-Band

Sr No. Item	Model No.	Specifications
<b>I SOURCES</b>		
1 Klystron Mount	KM 90	Waveguide WR 90 Freq 8.2- 12.4 Ghz Insulated top cap
2 Klystron Tube	2k 25	
3 Gunn Oscillator	GO 90	Mech Tuned Centre freq 10 Ghz Power : 5-20 mwatts Free running Plunger micrometer type
5 Pin Modulator	PM 90	WR 90 Vane attenuator BNC input Low Loss
<b>II TEST BENCH COMPONENTS</b>		
1 Isolator	ISO -90	Waveguide WR 90 Isolation 20 dB +/- 2 db Insertion Loss 1 dB Split AI block one port terminated
2 Circulator	CIR 90	Isolation 20 dB +/- 2 dB Insertion Loss 1 dB Split AI block
3 Variable attenuator	VA 90	Attenuation 0 to 20 dB, VSWR 1.2 Insertion Loss < 1 dB
4 Fixed Attenuator	FA 90	Attenuation 3 or 6 dB, VSWR 1.2 Insertion Loss 1 dB
5 Slotted Line	SL 90	With probe carriage Freq 8.2-12.4 Ghz Slope irregularity 1.03
6 Tunable probe	TP	With BNC (f) output with 1N 23 C crystal diode
7 Freq meter	FMM 90	Micrometer type
8 Direct Freq Meter	DFM 90	WR 90 Q= 8000 Accuracy +/- 2 % Dial increment 5 Mhz
9 Matched Termination	TX 90	VSWR 1.04
10 Precision Sliding termination	SLTX 90 P	Waveguide WR 90 Length travel 25 mm
11 Mov Short	MS 90	
12 Mov Short Precision	MS 90	micrometer plunger
13 Waveguide detector	DM 90	Waveguide WR 90 Diode IN23C
14 Detector Broadband	DMF 90	VSWR < 1.1 Diode IN23C
15 Detector with flange on both	DMO	BNC output
16 Coaxial detector	CDM 90	Input N(f) Output BNC (F) with IN23C diode
17 Broad band Probe	BTP 90	
18 Phase Shifter	PS 90	Calibrated
<b>III POWER DIVIDING COMPONENTS</b>		
1 Directional Coupler	DC 90	Waveguide WR 90 Coupling 6/10 dB Directivity : 25 dB VSWR 1.2
2 Cross Coupler	CC 90	Waveguide WR 90 Coupling 20 dB +/- 2 dB





3	Loop Coupler	LC 90	Waveguide WR 90 Coupling 30 dB Bandwidth 5 %
4	Magic tee	MT 90	Waveguide WR 90 Freq : 8.2-12.4 Ghz VSWR 2.0
5	Matched Magic Tee	MTM 90	
6	Tee E plane	TE 90	Waveguide WR 90 Freq : 8.2-12.4 Ghz VSWR 2.0
7	Tee H Plane	TH 90	Waveguide WR 90 VSWR 2.0
8	Rat Race	RR 90	Four Port In phase and out phase ports 3 db power splitting Isolation 20 db
9	Waveguide switch	SW 90	WR 90 SPDT
10	Rotary Joint	RJ 90	WR 90 360 deg 6 inch scale Rotation 360 deg

#### IV MIC COMPONENTS

1	MIC Coupler	MICC 90	4 port , coupling 3 db
2	MIC Antenna	MICA 90	6 db Gain 4 Element
3	MIC Rat Race	MRR 90	
4	MIC Splitter Combiner	MICS 90	Splitter /combiner 1 : 2

#### V TUNERS

1	Slide Screw Tuner	SST 90	Waveguide WR 90 Travel 50 mm
2	E H Tuner	EHT 90	Waveguide WR 90 Precision Tuners EHT-P-90

#### VI RADIATING COMPONENTS

1	Antenna Horn	HA 90	Waveguide WR 90 Gain 15 dB
2	Sectorial E/H Horn	SEC 90 E/H	Waveguide WR 90
3	Pickup Horn	HAP90	
4	Conical Antenna	AC 90	
5	Slot Antenna	SLA 90	
6	Dielectric Antenna	ADE 90	
5	Parabolic Dish with dipole	PA 90	
6	Parabolic Dish with Horn feed	PA 90	

#### VII PLUMBING COMPONENTS

1	W/G Bend E / H	BE 90 E/H	Waveguide WR 90 VSWR 1.1
2	Twist	TW 90	Waveguide WR 90 VSWR 1.1
3	Waveguide to Coax Adopter N (f)	CA 90	Waveguide WR 90 Freq 8.2- 12.4 Ghz

#### VIII DIELECTRIC CELLS

1	Solid Dielectric cell	SDC90	Sample holder
2	Liquid diel cell	LDC 90	Micrometer 50 mm



Lambda Microwaves Pvt. Ltd.

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