Request for Proposal (RFP)

for

Supply & Installation
Of
Radiated Emission (RE102)
And
Radiated Susceptibility (RS103)

Test setup as per MIL-STD-461G

Space Applications Centre
Indian Space Research Organization
Ahmedabad

Change History Log

Sr No	Revision	Effective from	Description/Change
1	Initial Version	September, 2024	Original
2	Rev-1	November, 2024	1. Revised Fig 1, Fig 3 & Fig 4. 2. Addendum Sr No 2.4.6, 3. Revised Sr No 3.7.1.1.16 & 3.7.1.2.16; 4. Revised Sr No 3.8 5. Addendum VI & VII in Sr No 3.8; 6. Revised Sr no 14 in Annexure-2 7. Revised Annexure-3 Layout (Note added)

Contents

1.0 Scope of work:

1. The vendor should quote for delivery, installation and demonstration of full test setup for Radiated Emission test (RE102) and Radiated Susceptibility test (RS103) as per MIL-STD-461G for Space.
2. Vendor should deliver test instruments as part of setup:

   ➢ **Test Instruments :**

   2.1 **RE102 Test setup**: Test instruments like EMI test receiver upto 40GHz, Low frequency Signal Generator, EMI antenna set (10KHz to 40GHz), External pre-amplifiers mountable on antennas (10KHz to 40GHz), RF switch matrices with control platform, LISNs and all required accessories. (Complete list of deliverables mentioned in Annexure:1)

   2.2 **RS103 Test setup**: Test instruments like Signal Generator, RF/MW Power amplifiers, E-Field generator, transmit antenna set (10KHz to 40GHz), E-Field Monitor with E-field probes, Power meters, RF switching unit with control platform and all required accessories. (Complete list of deliverables mentioned in Annexure:2)

3. Vendor should deliver and install complete test setup at **EMI/EMC facility, PFTF building, SPACE APPLICATIONS CENTRE, ISRO, NEW BOPAL CAMPUS, AHMEDABAD-380058.**
4. Vendor will be responsible for end-to-end system design of RE and RS test setup and the system shall be designed to share some important common systems/instruments between two test setups.
5. The vendor shall install and integrate the test setup and demonstrate satisfactory operation with the software and hardware to meet the requirements of RE102 and RS103 tests as per MIL-STD-461G including;

   5.1 The system should be able to perform fully automated Path check/calibration and measurement for RE102 and RS103 tests as per MIL-STD-461G. (please refer Fig.- 1 to 4)

   5.2 **RE102:** Ambient measurement should be 6 dB below from specified limit shown in fig 5 & 6.

   5.3 **RS103:** Calibration of E-field: 20 V/m over 10 kHz - 40 GHz under feedback controlled loop with software using E field probes

6. Vendor shall provide onsite training on supplied software and hardware.
7. Vendor shall install entire test setup in the existing **S**emi **A**nechoic **C**hamber and control room at SAC, NEW BOPAL CAMPUS in consultation with SAC Engineers.

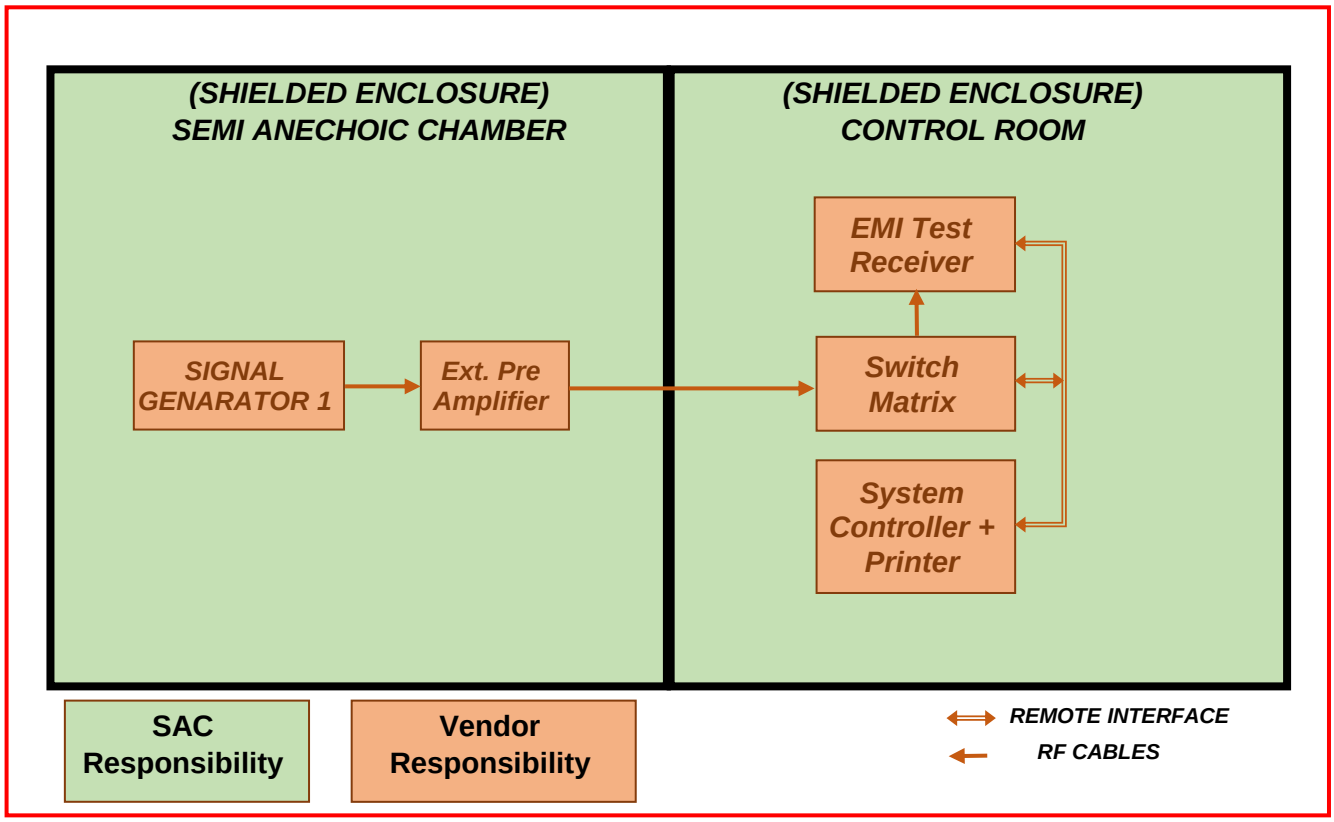


FIG.-1. RE102 TEST SETUP FOR SYSTEM PATH CHECK

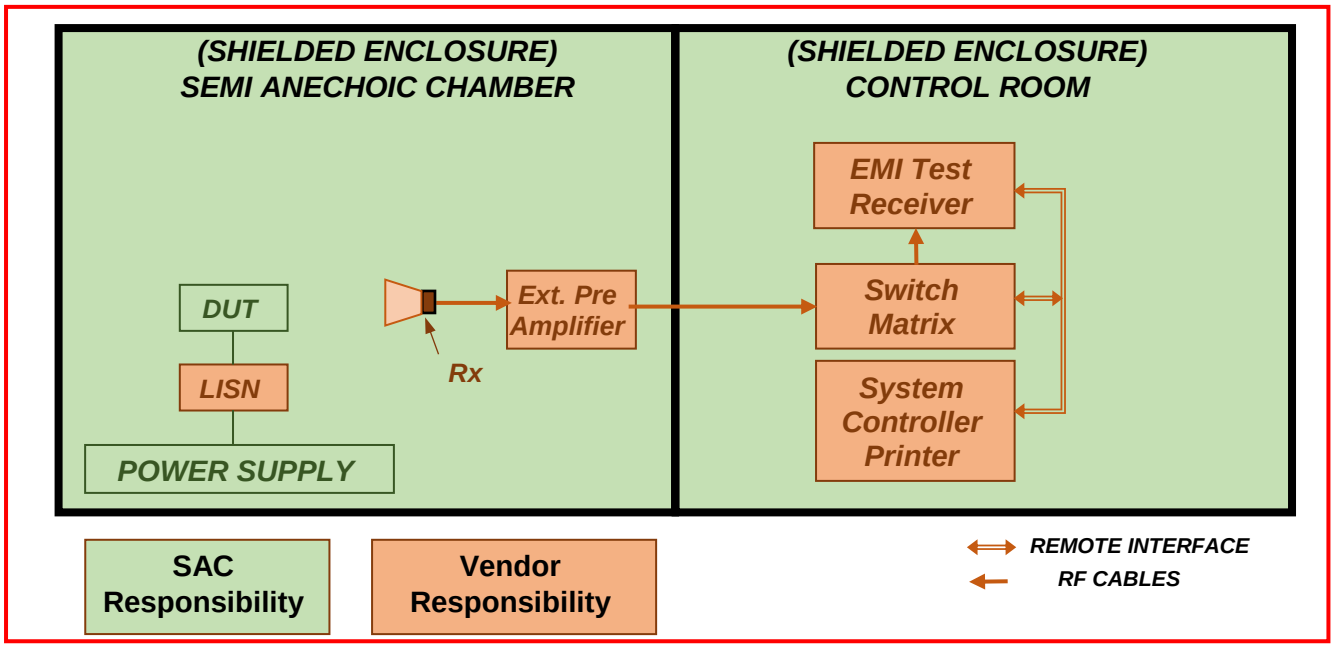


FIG.-2. RE102 TEST SETUP FOR DUT MEASUREMENT

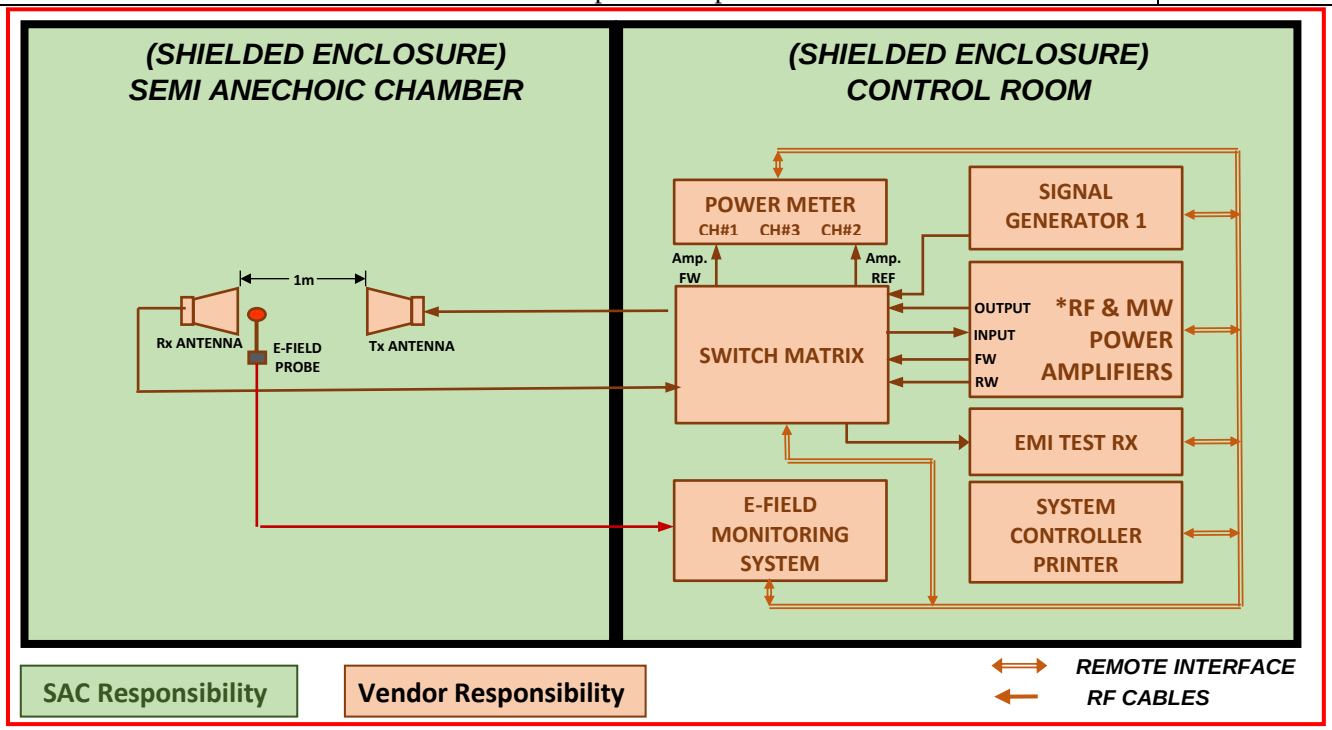


FIG.-3. RS103 TEST SETUP FOR CALIBRATION

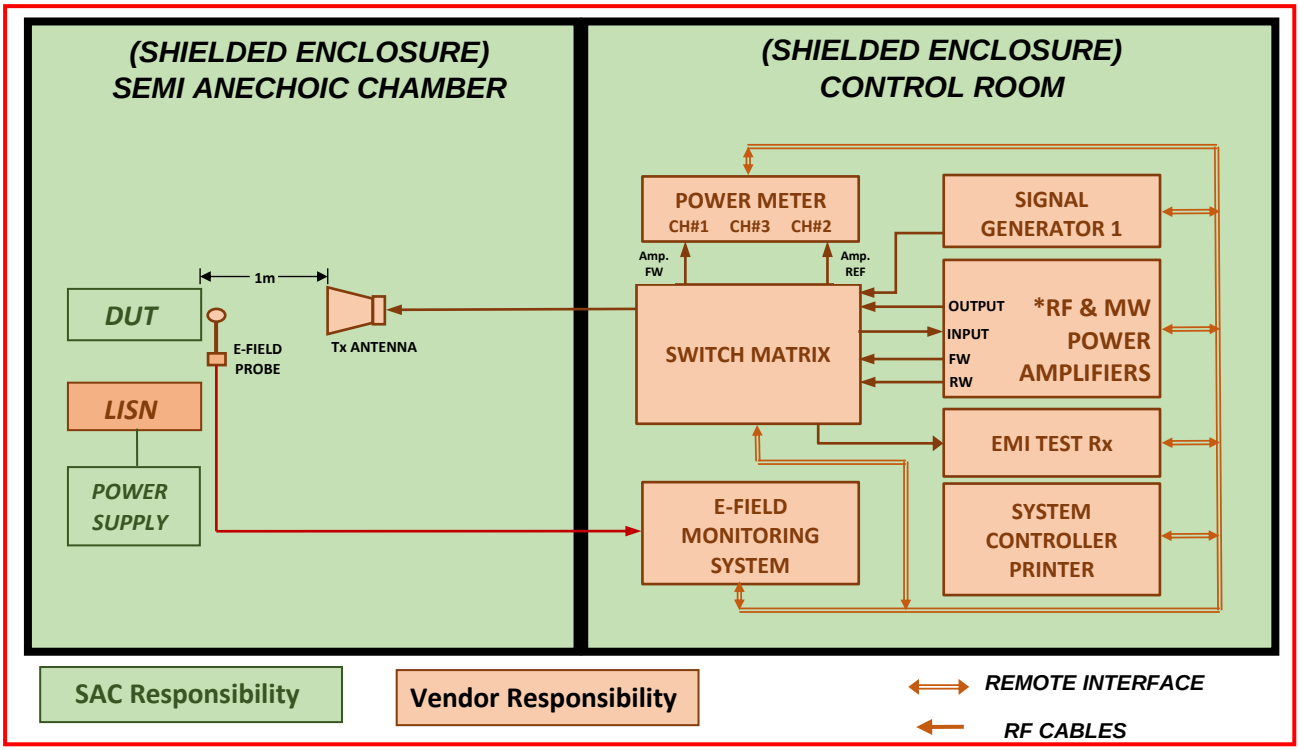


FIG.-4. RS103 TEST SETUP FOR DUT MEASUREMENT

(*RF & MW POWER AMPLIFIER(s): 10 kHz to 40GHz)

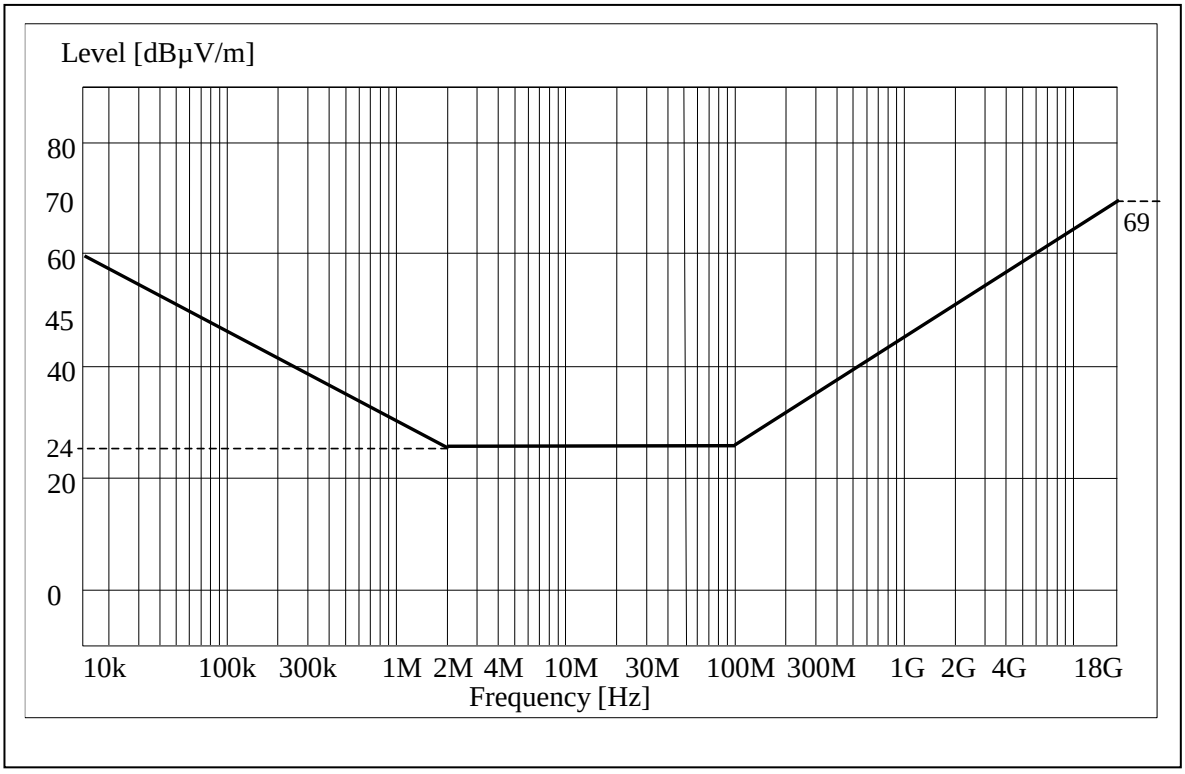


FIG.-5. RE102 TEST LIMITS AS PER MIL-STD-461G

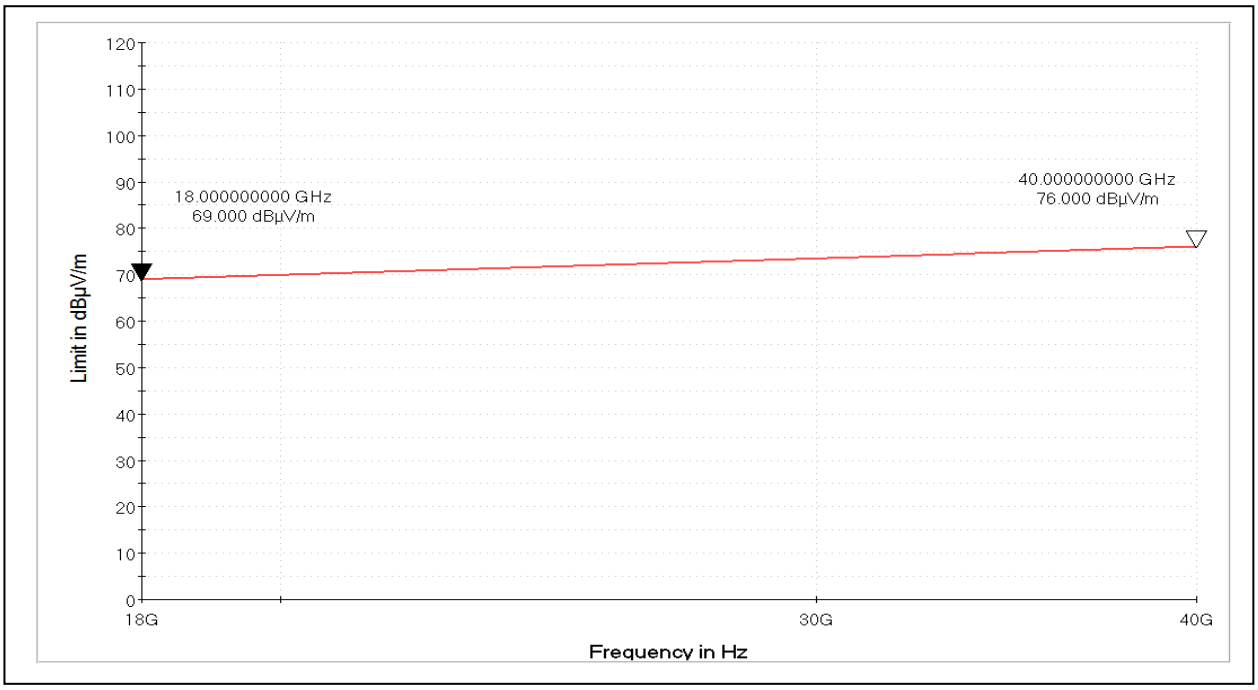


FIG.-6. RE102 TEST LIMITS 18GHz – 40 GHz (custom requirement in addition to 461G)

2.0 Test Instruments and Accessories required for integrated RE102 Test setup:

<table>
<tr><th>Sr. No.</th><th>Equipment / Accessories</th><th>Specifications</th><th>Qty.</th><th>Vendor Response</th></tr>
<tr><td>2.1</td><td>EMI Test Receiver 20 Hz - 40 GHz</td><td>
Important Features:
I. The EMI test receiver must be a single box only.
II. The receiver must have capability to operate in EMI Receiver mode and Spectrum Analyzer mode.
III. Receiver must have Built in Pre-selectors & Pre-amplifiers.
IV. Capability to perform Automated Radiated and Conducted Emission measurements conforming to MIL-STD-461G & latest CISPR standard requirements.
V. Receiver should have inbuilt fully automatic internal calibration/adjustment facility without additional hardware.
VI. Internal Memory to store Transducer Factors, User Definable Limit Lines.
VII. Storage of various test configurations for different EUTs.
VIII. Storage of measurement results.
IX. EUT-specific test selection and data management.
X. Time domain scan for fast analysis during pre-identification.
<table>
<tr><th>SR</th><th>Parameter</th><th>Specification</th></tr>
<tr><td>2.1.1</td><td>Frequency Range</td><td>20Hz to 40GHz</td></tr>
<tr><td>2.1.2</td><td>Freq Ref : Aging Rate</td><td>± 1 X 10 $^{-7}$ / year</td></tr>
<tr><td>2.1.3</td><td>Operating Modes</td><td>The EMI Receiver must be having following operating modes: EMI Receiver mode and Analyzer Mode</td></tr>
<tr><td>2.1.4</td><td>Measurement time (dwell time) per frequency in Receiver Mode</td><td>0.015 sec to 0.15 sec</td></tr>
<tr><td>2.1.5</td><td>Sweep time (Analyzer Mode)</td><td>10 μS to 4000S</td></tr>
<tr><td>2.1.6</td><td>Measurement points per Trace (Analyzer Mode)</td><td>Up to 100001 measurement points per Trace</td></tr>
</table>
</td><td>1</td><td></td></tr>
</table>

2.1.7	RF Pre-selector Filters	Frequency Range : up to 40 GHz
2.1.8	Preamplifier / LNA	150 kHz to 40GHz
2.1.9	Resolution Bandwidth	1Hz to 8 MHz
2.1.10	MIL-STD-461G and CISPR EMI bandwidths	MIL: 10Hz, 100Hz, 1kHz, 10kHz, 100kHz, 1MHz CISPR: 200Hz, 9kHz, 120kHz, 1MHz
2.1.11	Video bandwidth (analyzer mode)	1Hz to 8 MHz
2.1.12	Maximum safe input level	1W (+30dBm)
2.1.13	Displayed Average Noise Level (DANL) (Analyzer Mode) 150kHz to 8GHz 8GHz to 26.5 GHz 26.5 GHz to 40 GHz	Input terminated, 0dB RF attenuation, 1Hz RBW : Pre-selector ON; Preamplifier ON ≤ -150 dBm ≤ -155 dBm ≤ -150 dBm
2.1.14	Detectors	Peak, RMS, Average, CISPR RMS-avg & Quasi Peak
2.1.15	Units of Level Axis	dBm, dBμV, dBmV, dBμA, dBpW
2.1.16	Input Attenuator	Setting Range : 0 to 70dB
2.1.17	Split Screen Mode (analyzer mode)	The Receiver must have split screen feature for simultaneous monitoring of two different frequency bands with different RB, VB, Ref level and attenuation setting
2.1.18	EMI Compatibility	Compliance with Radiated Emissions / immunity requirements of IEC / EN 61326
2.1.19	Interfaces	IEEE 488.2 and LAN

		2.1.20	Temperature	+15° C to +40 °C	
		2.1.21	AC supply	230 V, 50 Hz (Nominal) compatible to Indian plug socket	
		2.1.22	Manuals	Operating Manual & Service Manual	
		2.1.23	Warranty	3 years (minimum)	

2.2	**Function Generator**	**Low frequency Generator (Function / Arbitrary wave form) 30Hz to 20MHz**			**1**
		SR	**Parameter**	**Specification**	
		2.2.1	Frequency Range	30 Hz - 20 MHz	
		2.2.2	Amplitude	10 mV_{pp} – 10 V_{pp} into 50 Ohm	
		2.2.3	Harmonics	≤ - 40 dBc	
		2.2.4	Spurious (Non- Harmonics)	≤ - 60 dBc	
		2.2.5	SSB Phase Noise	≤ -110 dBc @ 10 KHz offset	
		2.2.6	Interface	IEEE-488.2 (GPIB) and LAN	
		2.2.7	Waveforms	Sine, Square, Ramp, Triangle, Pulse, Arbitrary & External load waveform	
		2.2.8	Modulation	Amplitude, Frequency, Phase, Pulse Width	
2.3	**LISNs**	**LISN should fulfill requirement of MIL-STD 461 G (As per Fig.-7 & 8)**			**6**
		SR	**Parameter**	**Specification**	
		2.3.1	Frequency Range	10 kHz – 400 MHz	
		2.3.2	Inductance	5uH || 50 Ohm	
		2.3.3	Continuous rated current (D.C)	≥ 50 A	
		2.3.4	Operating Voltage (D.C)	≥ 70 V	
		2.3.5	RF output connector	N/BNC-Female (50 Ohm)	
		2.3.6	EUT & Line input connector	Screw terminal / shrouded sockets	

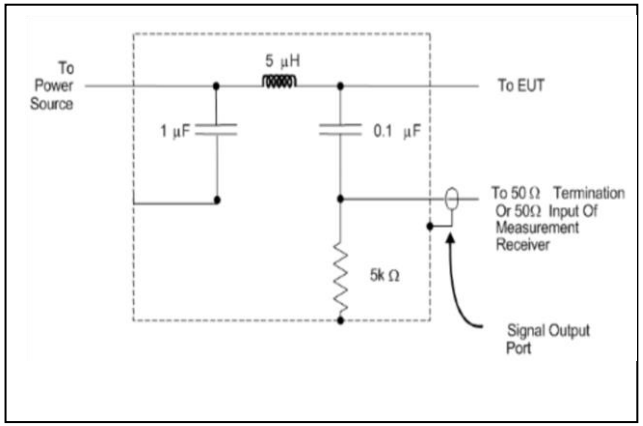


FIG.-7. LISN SCHEMATIC

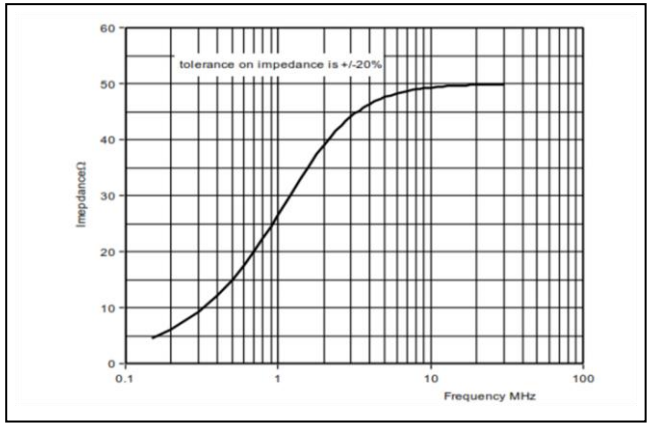


FIG.-8. LISN IMPEDANCE CHARACTERISTICS

2.4	**EMI Antennas Set 10 KHz - 40 GHz**	**2.4.1 Active Rod Antenna (with compatible Tripod)** Antenna mount that can be used to fulfill antenna position in MIL-STD-461G	**2**	

Sr No	Parameter	Specification
2.4.1.1	Frequency Range	10 kHz – 30 MHz
2.4.1.2	Polarization	Linear
2.4.1.3	Input Impedance	50 Ohm
2.4.1.4	Pattern Type	Omnidirectional
2.4.1.5	Connector	N / BNC Female
2.4.1.6	Rod Height	41 Inches
2.4.1.7	Base Plate (Counterpoise)	24 x 24 Inches (61 x 61 cm)
2.4.1.8	Power Supply	A) Power supply/ Bias unit via coaxial cable **or** B) In built chargeable Battery with Suitable Battery Charger compatible with 230 V, 50 Hz

2.4.2 Bi-conical Antenna

Sr No	Parameter	Specification
2.4.2.1	Frequency Range	30 MHz - 200 MHz
2.4.2.2	Polarization	Linear
2.4.2.3	Input Impedance	50 Ohm
2.4.2.4	Input Power (CW)	≥ 500 W
2.4.2.5	Connector	N Female
2.4.2.6	Mounting arrangement	Non-metallic compatible tripod with manual change of polarization and elevation

2

2.4.3 Log periodic antenna

Sr No	Parameter	Specification
2.4.3.1	Frequency Range	200 MHz - 1 GHz
2.4.3.2	Polarization	Linear
2.4.3.3	Input Impedance	50 Ohm
2.4.3.4	VSWR	≤ 3.5
2.4.3.5	Input Power (CW)	≥ 500 W
2.4.3.6	Pattern Type	Directional
2.4.3.7	Connector	N Female
2.4.3.8	Mounting arrangement	Non-metallic compatible tripod with manual change of polarization and elevation

2

2.4.4 Double Ridge Horn Antenna - 1

Sr No	Parameter	Specification
2.4.4.1	Frequency Range	1 GHz - 18 GHz
2.4.4.2	Polarization	Linear
2.4.4.3	Input Impedance	50 Ohm
2.4.4.4	VSWR	≤ 2.0
2.4.4.5	Input Power (CW)	≥ 200 W
2.4.4.6	Pattern Type	Directional
2.4.4.7	Connector	N Female
2.4.4.8	Mounting arrangement	Non-metallic compatible tripod with manual change of polarization and elevation

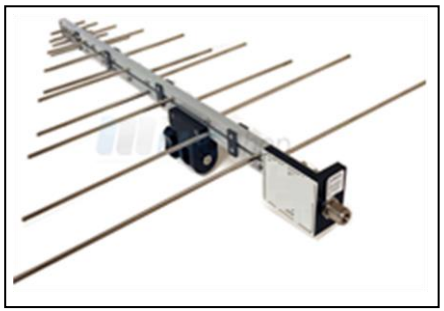
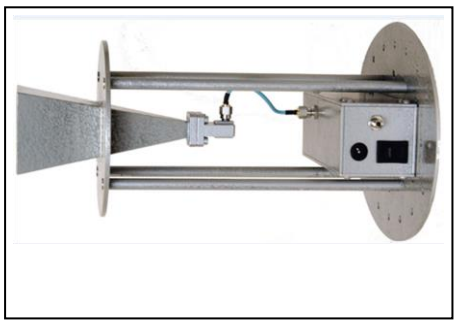
1

2.4.5 Double Ridge Horn Antenna - 2

Sr No	Parameter	Specification
2.4.5.1	Frequency Range	18 GHz - 40 GHz
2.4.5.2	Polarization	Linear
2.4.5.3	Input Impedance	50 Ohm
2.4.5.4	VSWR	≤ 2.5
2.4.5.5	Input Power (CW)	≥ 10 W
2.4.5.6	Pattern Type	Directional
2.4.5.7	Connector	K Female /SMA compatible female
2.4.5.8	Mounting arrangement	Non-metallic compatible tripod with manual change of polarization and elevation

1

2.4.6 An accredited calibration report shall be provided for all antennas.

2.5	**External Pre-amplifiers**	Shielded, High Gain and Low Noise External Preamplifiers to be mounted on EMI Antennas. Mounting fixture and relevant accessory should be supplied with the units. (Please refer below figures for reference purpose only)    **2.5.1 <u>Preamplifier-1 (30 MHz - 1 GHz)</u>** **Sr No** / **Parameter** / **Specification** 2.5.1.1 / Frequency Range / 30 MHz – 1 GHz 2.5.1.2 / Gain / ≥ 28 dB 2.5.1.3 / Noise Figure / ≤ 3.3 dB 2.5.1.4 / Power at 1dB Compression Point / ≥ +5 dBm 2.5.1.5 / Connectors / N type 2.5.1.6 / DC supply / Suitable power adapter with shielded cable Required	**2**	

2.5.2 Preamplifier-2 (1 GHz - 18 GHz)

Suitable Preamplifier is to be supplied to meet the Ambient level 6 dB below the Limit line of RE102 Test as per MIL-STD-461G.

Sr No	Parameter	Specification
2.5.2.1	Frequency Range	1 GHz – 18 GHz
2.5.2.2	Gain	≥ 38 dB
2.5.2.3	Noise Figure	≤ 3 dB
2.5.2.4	Power at 1dB Compression Point	≥ +5 dBm
2.5.2.5	Connectors	N type
2.5.2.6	DC supply	Suitable power adapter with shielded cable

2

2.5.3 Preamplifier-3 (18 GHz - 40 GHz)

Sr No	Parameter	Specification
2.5.3.1	Frequency Range	18 GHz – 40 GHz
2.5.3.2	Gain	≥ 45 dB
2.5.3.3	Noise Figure	≤ 3.7 dB
2.5.3.4	Power at 1dB Compression Point	≥ +5 dBm
2.5.3.5	Connectors	K type
2.5.3.6	DC supply	Suitable power adapter with shielded cable

2

<table>
<tr>
<td>2.6</td>
<td>19 inch RACK</td>
<td>The system shall be configured and engineered such that all the constituent equipment required for RE102 testing is assembled in 19” system racks.
2.6.1 19 inch RACK
<table>
<tr><th>Sr No</th><th>Parameter</th><th>Specification</th></tr>
<tr><td>2.6.1.1</td><td>Height</td><td>42 U (1866.9 mm/ 73.5 inches)</td></tr>
<tr><td>2.6.1.2</td><td>Width</td><td>19 inches (482.6 mm)</td></tr>
<tr><td>2.6.1.3</td><td>Depth</td><td>850 mm</td></tr>
<tr><td>2.6.1.4</td><td>Material</td><td>Steel with ESD powder coating</td></tr>
<tr><td>2.6.1.5</td><td>Load capacity</td><td>500 kg (min.)</td></tr>
<tr><td>2.6.1.6</td><td>Grounding</td><td>Integrated grounding points with bonding kits included</td></tr>
<tr><td>2.6.1.7</td><td>Wheels</td><td>Lockable castor wheels</td></tr>
</table></td>
<td>1</td>
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<tr>
<td rowspan="2">2.7</td>
<td rowspan="2">Accessories</td>
<td>2.7.1 RF Cable assemblies :
I. All necessary RF Cable assemblies shall be provided for integrated RE test setups.
II. Power Handling, Connector interface, Frequency of operation & Length of RF cable assemblies will be depending upon system configuration.
III. All RF cable assemblies shall have shielding effectiveness better than 90 dB.</td>
<td>2 Sets (1 + 1 Spare)</td>
<td></td>
</tr>
<tr>
<td>2.7.2 RF adapters, connectors and terminations shall be provided for integrated RE test setups.</td>
<td>2 Sets (1 + 1 Spare)</td>
<td></td>
</tr>
</table>

3.0 Test Instruments and Accessories required for integrated RS103 Test setup:

I. Complete automated radiated susceptibility to be able to generate electric field strength of 20 V/m from 10 kHz to 40 GHz at a distance of 1m from transmitting antenna.

II. The RS103 susceptibility system shall be provided in two racks:
1) 10 kHz to 1.0 GHz - RF Rack; It has same specification as sr no 2.6.1.
2) Above 1.0 GHz - Microwave Rack; It should be shielded rack with height of total equipment's height used in Rack.
Microwave rack system shall be kept inside the anechoic chamber and the RF Rack shall be kept in amplifier room. The Microwave rack should be movable with Integrated Antenna Mast for Horn Antenna Mounting and it should have suitable Fiber Optic (FO) converters for automated testing through software. FO converters shall have suitable optical to electrical and vice versa conversion for controlling instrument through optical fiber.

<table>
<tr><th>Sr. No.</th><th>Equipment / Accessories</th><th>Specifications</th><th>Qty.</th><th>Vendor Response</th></tr>
<tr><td>3.1</td><td>Signal Generator</td><td>
<table>
<tr><th>Sr No</th><th>Parameter</th><th>Specification</th></tr>
<tr><td>3.1.1</td><td>Frequency Range</td><td>100kHz – 40 GHz</td></tr>
<tr><td>3.1.2</td><td>Resolution of frequency setting</td><td>0.01 Hz</td></tr>
<tr><td>3.1.3</td><td>Power Level Setting</td><td>-120 dBm to +10 dBm</td></tr>
<tr><td>3.1.4</td><td>Power level resolution</td><td>0.01 dB</td></tr>
<tr><td>3.1.5</td><td>Harmonics</td><td>≤ -40 dBc</td></tr>
<tr><td>3.1.6</td><td>SSB Phase Noise</td><td>≤ -100 dBc/Hz centered at 10 GHz with 100 kHz Offset</td></tr>
<tr><td>3.1.7</td><td>Modulation capability</td><td>AM, FM and Pulse Modulation</td></tr>
</table>
</td><td>1</td><td></td></tr>
<tr><td>3.2</td><td>RF Power Amplifiers / Microwave Power Amplifiers</td><td>Frequency range: 10kHz to 40 GHz
Rated output power: Should not exceed 1.0 dB compression point to produce a field strength 20V/ m at the face of DUT when placed at a distance of 1m with matched antennas.
Input for rated output: 1 mW (0 dBm min.)</td><td>-</td><td></td></tr>
</table>

Modulation Capability: CW, Pulse.
Input / output impedance: 50 Ohm
Remote interfaces: GPIB / IEEE 488, LAN
Safety and remote inter locks Cooling: Forced Air (Self-contained fans)
In-built directional couplers to monitor the forward & reverse powers

3.2.1 <u>10kHz -1GHz RF Power Amplifier</u>

Sr No	Parameter	Specification
3.2.1.1	Frequency Range	10 kHz – 1 GHz
3.2.1.2	Power output @1dB compression (CW)	10kHz – 200MHz : ≥ 350 W 200 MHz – 1GHz : ≥ 100 W
3.2.1.3	Harmonic Distortion	≤-15 dBc
3.2.1.4	Mismatch Tolerance	100% Rated Power without fold back / without damage
3.2.1.5	Packaging	Single /Two separate unit

1

3.2.2 <u>1GHz-18GHz Power Amplifier</u>

Sr No	Parameter	Specification
3.2.2.1	Frequency Range	1 GHz – 18 GHz
3.2.2.2	Power output @1dB compression (CW)	≥ 10 W
3.2.2.3	Harmonic Distortion	≤-15 dBc
3.2.2.4	Mismatch Tolerance	100% Rated Power without fold back / without damage
3.2.2.5	Packaging	Single unit

1

3.2.3 18GHz – 40GHz Power Amplifier

Sr No	Parameter	Specification
3.2.3.1	Frequency Range	18 GHz – 40 GHz
3.2.3.2	Power output @1dB compression (CW)	≥ 5 W
3.2.3.3	Harmonic Distortion	≤-15 dBc
3.2.3.4	Mismatch Tolerance	100% Rated Power without fold back / without damage
3.2.3.5	Packaging	Single unit

1

3.3 Antennas Set for Immunity test 10 KHz - 40 GHz

I. Low VSWR, optimized beam width with high gain Antennas for RS103 (For MIL-STD-461G EMI/ EMC measurements @ 1m & 20V/m)

II. Antennas above 1GHz shall be supplied in Mobile antenna rack that can be attached to the amplifier system of portable microwave rack for RS testing. Mobile antenna rack will have motorized control for elevation, as well as, control of antenna polarization and tilt.

III. Antennas below 1GHz are to be supplied with tripod or appropriate antenna mast where applicable.

3.3.1 E-Field Generator (Broad Band)

Sr No	Parameter	Specification
3.3.1.1	Frequency Range	10 kHz – 30 MHz
3.3.1.2	Max. input power (CW)	≥ 500 W
3.3.1.3	Impedance	50 ohm

1

3.3.2 Bi-conical Antenna

Co-shared with RE test antenna

-

3.3.3 Log periodic antenna (200MHz – 1000MHz)

Co-shared with RE test antenna

-

3.3.4 High Gain Horn antenna- 1

Sr No	Parameter	Specification
3.3.4.1	Frequency Range	1 GHz – 18 GHz
3.3.4.2	Maximum Input Power (CW)	≥ 150 W
3.3.4.3	Gain	5dBi min. increasing to 14dBi
3.3.4.4	VSWR	≤ 2 :1
3.3.4.5	Impedance	50 Ohms

1

3.3.5 High Gain Horn antenna- 2

Sr No	Parameter	Specification
3.3.5.1	Frequency range	18 GHz – 40 GHz
3.3.5.2	Gain	10dBi min. increasing to 14dBi
3.3.5.3	VSWR	≤ 2.5 : 1
3.3.5.4	Maximum input power (CW)	≥ 20 W
3.3.5.5	Impedance	50 Ohms

1

<table>
<tr>
<td>3.4</td>
<td>Field Monitoring system with field probes</td>
<td>
3.4.1 <u>Field Monitoring system with field probes.</u>
<table>
<tr><th>Sr No</th><th>Parameter</th><th>Specification</th></tr>
<tr><td>3.4.1.1</td><td>Frequency Range</td><td>10 kHz to 40 GHz</td></tr>
<tr><td>3.4.1.2</td><td>Field strength Range</td><td>0.5 V/m to 20 V/m or better</td></tr>
<tr><td>3.4.1.3</td><td>Resolution</td><td>0.01 V/ m or better</td></tr>
<tr><td>3.4.1.4</td><td>Remote Control</td><td>IEEE 488 and LAN</td></tr>
<tr><td>3.4.1.5</td><td>Probe power</td><td>Laser power</td></tr>
<tr><td>3.4.1.6</td><td>Measurement type</td><td>CW and pulse</td></tr>
</table>
I. Field monitoring system should be provided as 19-inch rackmount.
II. The frequency range may be split into the vendor-desired bands to accommodate the entire frequency range for field probes.
III. Nonconductive adjustable height probe stand and Small Table top tripod should be supplied with Field Probe.
IV. Probe carrying case and Calibration report from an accredited lab should be provided.
V. Optical fiber should be provided with min. 20m length.
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<tr>
<td>3.5</td>
<td>Power meter with sensors</td>
<td>
<u>MONITORING OF FORWARD AND REFLECTED POWER</u>
I. Two Channel power meter with power sensors must be supplied to allow simultaneous monitoring forward and reflected power of power amplifier during test.
II. Power meters and Power sensors shall have capability to measure unmodulated (CW) and modulated power.
III. Zeroing and frequency response correction required.
IV. Power meter should have good matching, low insertion loss and excellent inter modulation characteristics.
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3.5.1 Power meter with compatible sensors

<table>
<tr><th>Sr No</th><th>Parameter</th><th>Specification</th></tr>
<tr><td>3.5.1.1</td><td>Frequency Range</td><td>10 kHz to 40 GHz</td></tr>
<tr><td>3.5.1.2</td><td>No. of channels</td><td>2 (min.)</td></tr>
<tr><td>3.5.1.3</td><td>CW power range</td><td>-60 dBm to +20 dBm</td></tr>
<tr><td>3.5.1.4</td><td>Remote Control</td><td>IEEE 488 and LAN</td></tr>
<tr><td>3.5.1.5</td><td>Impedance</td><td>50 ohm</td></tr>
<tr><td>3.5.1.6</td><td>Range selection</td><td>Automatic / Manual</td></tr>
</table>

3.5.2 Power sensors (Compatible with power meter)

3.5.2.1 The Operating frequency range may be split into the vendor-desired bands to accommodate the entire frequency range i.e. 10 kHz – 40 GHz.

3.5.2.2 Qty : 2

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<td>3.6</td>
<td>System controller</td>
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3.6.1 System controller with Printer (Co-shared between RE and RS test setups)

System controller:

Intel Core i9 with 14th generation processor, 1 TB SATA SDD, 1 TB USB SSD(Ext.), 32 GB RAM, Ethernet LAN 10/100/1000, 32″ LED Monitor, Operating System Windows 10 or latest, MS-Office Professional Plus (Eng) latest version, Compatible, Original CD / DVD Pack / software dongles with License for all above Software and Drivers. Ports for user end (Use other than those already used for System): 3 USB 3.0 Ports, 2 USB 2.0 Ports, 1 RS 232,1 RJ – 45 and HDMI.

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<tr><td></td><td></td><td>Printer:
Color laser printer with 2 spare set of cartridges, min. A4 Size printable on both side without human intervention, min. 800 dpi resolution with scanner feature.</td><td></td><td></td></tr>
<tr><td>3.7</td><td>Measurement Software</td><td>3.7.1 <u>Software for RE and RS measurement (Co-share with system controller)</u>
3.7.1.1 <u>Features for RE Measurement</u>
<table>
<tr><th>Sr No</th><th>Features</th></tr>
<tr><td>3.7.1.1.1</td><td>It should be Windows based Menu driven, user friendly interactive and selectable by functional keys</td></tr>
<tr><td>3.7.1.1.2</td><td>Supports GUI environment</td></tr>
<tr><td>3.7.1.1.3</td><td>Vendor to confirm that all future upgradations for the software to address (i) any errors/ bugs in it, (ii) addition of any features and (iii) for ensuring continued compatibility with future equipment upgrades shall be provided.</td></tr>
<tr><td>3.7.1.1.4</td><td>Self-calibration & functional check of the instruments</td></tr>
<tr><td>3.7.1.1.5</td><td>Database for Limit Lines of MIL-STD-461G, EN, CISPR, IEC Standards.</td></tr>
<tr><td>3.7.1.1.6</td><td>Building User's selection of own Emissions Limit Levels.</td></tr>
<tr><td>3.7.1.1.7</td><td>Feasibility to generate the Test Reports as a Printout or as a PDF, RTF and HTML File.</td></tr>
<tr><td>3.7.1.1.8</td><td>Enable user to compare the results graphically.</td></tr>
<tr><td>3.7.1.1.9</td><td>Feasibility to generate the Test Reports in Graphical and Tabulated Data Formats, giving list of Stimulus, Emissions crossing the Limit Levels etc.</td></tr>
<tr><td>3.7.1.1.10</td><td>Alphanumeric Data (Calibration, Measured Values, Settings) storage in Text Format and Graphics (Traces) storage in WMF Format.</td></tr>
<tr><td>3.7.1.1.11</td><td>Correction of Measured data for Transducer Factor, Cable Loss and Internal Correction.</td></tr>
<tr><td>3.7.1.1.12</td><td>Rescan the selected Frequency band of signals, if desired.</td></tr>
<tr><td>3.7.1.1.13</td><td>User's option to Modify / Debug / Update the Measurement templet in Software.</td></tr>
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3.7.1.1.14	Fully Automatic Control of EMI Test System.
3.7.1.1.15	Measurements may be stopped during runtime to evaluate signals or repeat individual measurements while working in the semi automatic mode. After evaluation the measuring routine can be resumed.
3.7.1.1.16	The software should support test instruments like EMI Receivers, Signal Generators, Function Generators, Power Meters and RF Amplifiers of standard makes with available remote access/control using GPIB (IEEE 488.2) / LAN / USB interfaces and SCPI command sets, so that in case of any failure/change in instruments, the same can be replaced with an equivalent instrument of other make and model with GPIB/LAN/USB Interface. If software support for any of the above listed instruments is from a single make only, it shall be treated as Non Compliance.

3.7.1.2 Features for RS Measurement

Sr No	Features
3.7.1.2.1	It should be Windows based Menu driven, user friendly interactive and selectable by functional keys.
3.7.1.2.2	Supports GUI environment.
3.7.1.2.3	Self-calibration & functional check of the instruments.
3.7.1.2.4	Automatic calibration for each test and for the full test frequency range.
3.7.1.2.5	The software should provide automatic configuration of the measurement equipment settings.
3.7.1.2.6	Measurements may be stopped during runtime to evaluate signals or repeat individual measurements while working in the semi – automatic mode. After evaluation, the measuring routine can be resumed.
3.7.1.2.7	Interpolation option (Linear and logarithmic) for missed frequency points, for probe correction and field values.
3.7.1.2.8	It should be able to scale to different field strengths based on one field calibration data.
3.7.1.2.9	It should have several levelling methods like Forward power, Net Power,

				level on field, Signal generator drive, calibration levels etc.,		
			3.7.1.2.10	It should have frequency re-sweep feature for the selected Frequency band.		
			3.7.1.2.11	DUT monitoring and evaluation of the measurements. It should have Interactive EUT Threshold finding mode where user able to reduce field strength to find out EUT susceptibility.		
			3.7.1.2.12	User's option to Modify / Debug / Update the Measurement templet in Software.		
			3.7.1.2.13	Feasibility to generate the Test Reports in Graphical and Tabulated Data Formats.		
			3.7.1.2.14	Drivers for all the equipment like signal generators, amplifiers, power meters, and switching units etc., should be provided.		
			3.7.1.2.15	Context sensitive on line help facility.		
			3.7.1.2.16	The software should support test instruments like EMI Receivers, Signal Generators, Function Generators, Power Meters and RF Amplifiers of standard makes with available remote access/control using GPIB (IEEE 488.2) / LAN / USB interfaces and SCPI command sets, so that in case of any failure/change in instruments, the same can be replaced with an equivalent instrument of other make and model with GPIB/LAN/USB Interface. If software support for any of the above listed instruments is from a single make only, it shall be treated as Non Compliance.		
3.8	**RF Switch Matrices and Control Platforms with Display Panels (DC - 40 GHz)**	**<u>Base Unit (RF Switch Matrices and Control Platforms) with Display Panels (Co-share):</u>** Manual operation with Display, Remote control via IEEE-488.2 / LAN / USB interface. I. RF switching scheme should be able to switch RE and RS test instruments for automation. II. RE Switching involves selection of : RE Antennas - EMI Receiver (Including system check) III. RS Switching involves selection of : Signal generators – Amplifiers including forward & reverse power monitoring – RS Antennas			**2** **(1 for each)**	

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IV. The switch matrix shall have spare port each for antenna, amplifier and power meter for future use.
V. In addition, there should be a provision to switch off the RF (only) for any emergency reasons.
VI. One RF switch matrix will be co shared between 10kHz – 40GHz RE test setup and 10kHz -1GHz RS test setup.
VII. Second RF switch matrix will used in mobile microwave rack for RS test.

3.8.1 <u>RF Switch Module Options:</u>:
<table>
<tr><th>Sr No</th><th>Parameter</th><th>Specification</th></tr>
<tr><td>3.8.1.1</td><td>Relay Type</td><td>Coaxial Changeover Relays</td></tr>
<tr><td>3.8.1.2</td><td>Frequency Range</td><td>DC - 40 GHz</td></tr>
<tr><td>3.8.1.3</td><td>Average Power</td><td>≥ 5 W at 40 GHz</td></tr>
<tr><td>3.8.1.4</td><td>Port to Port isolation</td><td>≥ 40 dB</td></tr>
<tr><td>3.8.1.5</td><td>Switching cycle</td><td>2 million per position (min.)</td></tr>
<tr><td>3.8.1.6</td><td>VSWR</td><td>≤ 2.2</td></tr>
<tr><td>3.8.1.7</td><td>Latching type</td><td>NO (Normally Open)</td></tr>
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<td>3.9</td>
<td>Accessories</td>
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3.9.1 RF Cable assemblies :
I. All necessary RF Cable assemblies shall be provided for integrated RS test setups.
II. Power Handling, Connector interface, Frequency of operation & Length of RF cable assemblies will be depending upon system configuration.
III. All RF cable assemblies shall have shielding effectiveness better than 90 dB.
</td>
<td>2 Sets (1 + 1 Spare)</td>
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<td>3.9.2 RF adapters, connectors and terminations shall be provided for integrated RS test setups.</td>
<td>2 Sets (1 + 1 Spare)</td>
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</table>

4.0 General requirements:

4.1 Vendor must provide the point by point compliance for the above specifications along with page number of data sheet/product literature as per required format given below. Compliance to General requirements must also to be provided. If not provided offer may not be considered.

Provided by SAC				**To be filled up by vendor**		
Sr. No.	**Equipment / Accessories**	**Specifications**	**Qty.**	**Make, Model & Option**	**Specification**	**Compliance**

4.2 Only manufacturer / authorized representative of the manufacturing company shall quote. The vendor must provide an Authorization Letter from OEM for supplied instruments and accessories.

4.3 Hardware and Software must be supplied by a single vendor and it shall be sole responsibility of the vendor to demonstrate the software with supplied hardware.

4.4 A single supplier shall provide all necessary elements to meet complete system requirement as mentioned in RFP.

4.5 Operational, calibration and service manual must be provided with the instrument.

4.6 Only new equipment to be quoted (No quote for refurbished).

4.7 Standard warranty of Three years to be provided for all test instruments. If standard warranty is one year, vendor should quote for two years extended warranty.

4.8 Warranty and post warranty services should be in India preferably at SAC, Ahmedabad.

ANNEXURE 1: Tentative List of deliverables for RE102 Test Setup

List of deliverables for RE102

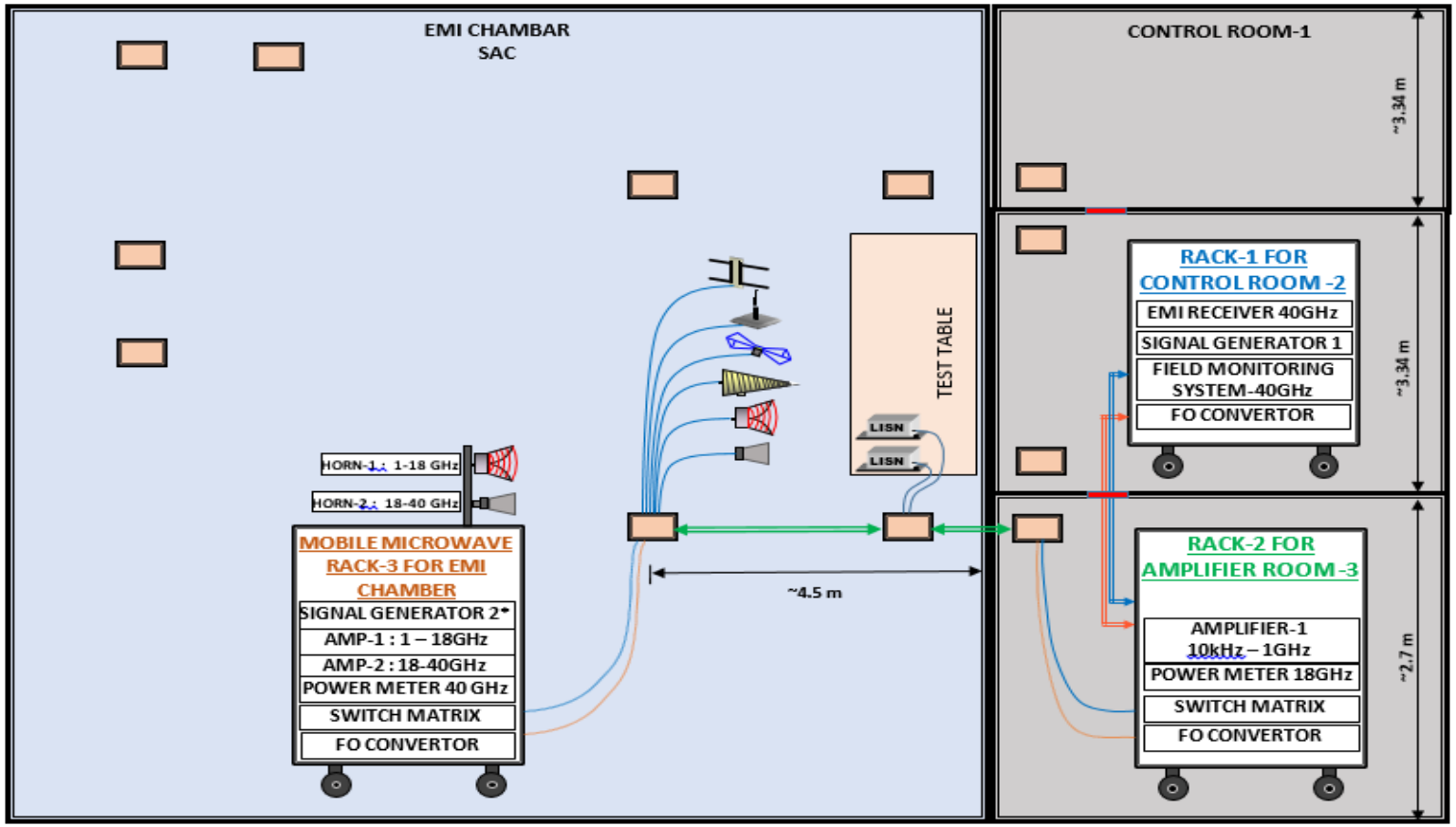
Sr. No	Equipment	Quantity
1	EMI Test Receiver 20 Hz - 40 GHz	1
2	Function Generator (DC – 20 MHz)	1
3	LISNs (5uH || 50 Ohm)	6
4	Active Rod Antenna (with compatible tripod)	2
5	Bi-conical Antenna	2
6	Log periodic Antenna	2
7	Double Ridge Horn Antenna – 1 (1GHz -18GHz)	1
8	Double Ridge Horn Antenna – 2 (18GHz -40GHz)	1
9	Preamplifier – 1 (30MHz – 1GHz)	2
10	Preamplifier – 2 (1GHz – 18GHz)	2
11	Preamplifier – 3 (18GHz – 40GHz)	2
12	RF switch matrix	1
13	System controller & printer	1
14	EMI Measurement software	1
15	Accessories	2 (1 + spare set)

ANNEXURE 2: Tentative List of deliverables for RS103 Test Setup

List of deliverables for RS103

Sr. No	Equipment	Quantity
1	Signal Generator (100 kHz – 40 GHz)	1
2	Power Amplifier 10 KHz – 1 GHz	1
3	Power Amplifier 1 GHz – 18 GHz	1
4	Power Amplifier 18 GHz – 40 GHz	1
5	E-field generator (10 kHz – 30 MHz)	1
6	Biconical Antenna	Co-shared with RE102
7	Log periodic antenna	Co-shared with RE102
8	High Gain Horn antenna (1 GHz – 18 GHz)	1
9	High Gain Horn antenna (18 GHz – 40 GHz)	1
10	Field Monitoring system with field probes	1
11	Power meter with sensors (2 Channel)	2
12	System controller	Co-shared with RE102
13	Software for RS103 (EMS software)	1
14	RF Switch matrix (Cater 1GHz -40GHz RS103 test requirement)	1
15	Accessories	2 (1 + spare set)

ANNEXURE-3: Draft Test configuration and layout of EMI/EMC Chamber



Note:*Signal Generator 2 is SAC's responsibility and it is not part of deliverables.

Floor Access; Connector Panel; RF Connectivity and; Optical Fiber Connectivity; Duct guide

ANNEXURE-4: EMI/EMC Chamber Layout