

Government of India
Ministry of Home Affairs
Directorate of Coordination
Police Wireless



Block No.9,C.G.O. Complex, Lodhi Road,
New Delhi-3 Dated the 31stth January 2018

EOI No. L-13011/1(Test Infrastructure)/2016-WS

Notice Inviting Expression of Interest (Eoi)

Directorate of Coordination Police Wireless (DCPW), Ministry of Home Affairs invites Expression of Interest (Eoi) from reputed and eligible Firms/Vendors for supply and installation of following Test Instruments/equipment's.

Sl.No.	Test Instrument/Equipment's	Quantity
1	Digital Radio Communication Test Set with accessories	one
2	Programmable Function Generator, 1GHz, Two Channel with accessories	one
3	Through Line Watt Meter along with RF Elements	one
4	RF Combiner (up to 1 GHz) with accessories	one
5	Cable & Antenna Analyzer with accessories	one
6	Power Supply tester	one
7	Battery Capacity Tester	one
8	Signal Analyzer with accessories	one

The Eoi document containing Objective & Scope of work, Eligibility criteria, QRs etc. can be downloaded from Directorate Website <http://dcpw.gov.in>. or from Procurement Portal of Government of India i.e <http://eprocure.gov.in>. W.e.f 31/01/2018.

Interested Firms/Vendors may submit their Expression of Interest (Eoi) online on the Procurement Portal <http://eprocure.gov.in> with all necessary documents including non-refundable processing fee in the form of demand draft of Rs,1000/- (One thousand only) drawn in favour of Accounts Officer, DCPW payable at New Delhi, signed copy of Eoi, Firm profile ,etc. along with covering letter duly signed by the authorised Signatory as per schedule below.

Last Date & Time for download the Eoi Document	1500Hrs on 31 January 2018
Last Date & Time for submission(uploading) of Eoi Documents	1500Hrs on 28 February 2018
Date & Time for opening the Eoi	1500Hrs on 5 March 2018

The scanned copy of demand draft of Rs,1000/- (One thousand only) as processing fee must be uploaded with the Eoi documents and original demand draft has to be submitted to the Dy. Director(MM), DCPW, Block no.9 CGO Complex, Lodhi Road, New Delhi-11003 on or before 1500Hrs of 28 February 2018 in an envelope superscribing "Eoi for supply and installation of Test Instruments". Eoi received without processing fee will not be entertained and shall be rejected.

This Expression of Interest is being issued on "no commitment basis" purely for seeking the details of potential vendors interested to participate in the Advertised Tender Enquiry which is likely to be issued through www.eprocure.gov.in subsequently on receipt of details of interested Vendors.

Director DCPW reserves the right to accept or reject any or all Eois without assigning any reason.


Dy. Director (WS)

For Director, DCPW, MHA
Phone 011-24360491, Fax 011-3436276

EXPRESSION OF INTEREST FOR SUPPLY OF TEST INSTRUMENTS

No. L-13011/1(Test Infrastructure)/2016-WS
Government of India
Ministry of Home Affairs
Directorate of Coordination
Police Wireless

Block No.9, C.G.O. Complex, Lodhi Road,
New Delhi-10003 Dated the 25th January 2018

Subject: Inviting Expression of Interest (Eoi)for supply of Test Instruments

Directorate of Coordination Police Wireless (DCPW), Ministry of Home Affairs invites Expression of Interest (Eoi) from reputed and eligible Firms/Vendors for supply and installation of following Test Instruments/equipment's.

Sl. No.	Test Instrument/Equipments	Quantity	Mainly to be used for/ Remarks
1	Digital Radio Communication Test Set with accessories	one	To measure Receiver and Transmitter parameter of Digital Radios of Technology DMR, APCO & TETRA
2	Programmable Function Generator, 1GHz, Two Channel with accessories	one	To measure Inter modulation Distortion in Transmitter / Receiver of Radio.
3	Through Line Watt Meter along with RF Elements	one	To measure forward and reflected power and load match in 50 ohm coaxial cables
4	RF Combiner (up to 1 GHz) with accessories	one	To measure Inter modulation Distortion in Transmitter / Receiver of Radio.
5	Cable & Antenna Analyzer with accessories	one	To measure return loss / VSWR in cable and antenna system.
6	Power Supply tester	one	To test different electrical parameters i.e. Current, Voltage & Power Output of the different types of Power Supplies and Batteries Charger's
7	Battery Capacity Tester	one	To measure capacity of batteries from 1400 mAh to 160 AH.
8	Signal Analyzer with accessories	one	To measure FM Modulation:11KOF3E, Digital Modulation:4FSK, Modulation Limiting:±2.5KHz, Adjacent Channel Power:-60dBc, TDMA : 2-Slot & Channel Spacing:12.5KHz of Digital VHF/UHF Radios.

2. OBJECTIVE & SCOPE OF WORK:

Directorate of Coordination Police Wireless (DCPW), Ministry of Home Affairs having a Central Radio Workshop at its Headquarter Block no.9 CGO Complex Lodhi Road, New Delhi for repair and testing of radio/communication equipment's. Directorate intends to upgrade the capability of Workshop by inducting the test infrastructure for testing the various Radio/communication equipments including digital

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equipment's. Procurement of these Test instruments/equipments is proposed to be done through Tender from potential Bidders short listed through this Expression of Interest.

Scope of work includes supply of above mentioned Test instruments with all accessories required to test the radio equipment's, Vendor shall supply one hard copy with a softcopy of operating and technical manuals of each Instrument, Vendor shall also need to install the Test instruments where ever required to make it operational in all respect and provide minimum one week training to 5-10 persons of Directorate on use of these instruments for measurements of various parameter of Digital radios and other communication equipments. All test instruments shall have 5 years warranty period and vendor need to extent minimum 5 years repair and maintenance support for each test instrument.

This Expression of Interest is being issued purely on **“no commitment basis”** for seeking the details of potential vendors interested to participate in the Advertised Tender Enquiry which is likely to be uploaded on **www.eprocure.gov.in**. Subsequently on receipt of details of interested Vendors. Directorate's decision with regard to the short-listing of bidders through this EOI shall be final and binding on all concerned.

3. ELIGIBILITY CRITERIA:

- a. The Firm/Vendor should be a company registered either under Indian Companies Act or Societies Act full filing the following criteria

1.	Vendor should be either original equipment manufacturer (OEMs) of proposed instruments or an authorized agent of such OEMs.	In case of authorized agent, authorisation certificate should be submitted with EoI documents.
2.	The Vendor should have an annual turnover of Rs. 3(Five) Cr. or more in each of the last three Financial Years i.e 2014-15, 2015-16 and 2016-17.	Last three year's balance sheet/Audited Statements of Account should be submitted with EoI documents.
3.	The Bidder must have successfully executed minimum two supply order every year for supply of test instruments valuing not less than 50 lakh in last three years,	Copy of supply orders shall be submitted with EoI documents.
4.	Vendor shall have valid PAN and cleared its all income tax dues at the time of submission of EoI.	Relevant Documents shall be submitted with EoI documents.
5.	The bidder should not be black listed by any Ministry / Dept. of GOI / State Govts / organizations.	A declaration has to be submitted with EoI documents.

4. Documents to be submitted:-

- a. All documents of EoI in original including QRs duly signed and stamped at every page by authorised signatory of vendor conforming the compliance to the QRs and acceptance of terms & condition of EoI.
- b. Duly signed Firm/Vendor profile as per Appendix-I
- c. Non compliance to the QRs if any shall be given as per Appendix-II
- d. Company registration certificate/s and document/s
- e. Copy of supply order valuing not less than Rs. 50 Lakh executed successfully in last three years.
- f. Last three year's balance sheet/Audited Statements of Accounts
- g. Declaration regarding not blacklisting.
- h. Any other document in support of work experience in the relevant field.

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5. Evolution (Pre-qualification) Criteria

All eligible EoIs will be examined to shortlist the potential Bidders on the following criteria.

- a. Compliance to the QRs of Test Instruments.
- b. Experience i.e Nos. And value of Supply orders executed successfully by the Bidder
- c. Adherence to the other terms & conditions of EoI.

6. Clarification on EoI:-

For any clarification on EoI the following officer may be contacted:

Dy Director (WS)
Directorate of Coordination Police Wireless (DCPW)
Room no.604, Block no.9 CGO Complex Lodhi Road
New Delhi-110003
Phone 011-24360491, Fax 011-24362769

7. Technical Specifications

QRs OF ANALOG & DIGITAL RADIO COMMUNICATION TEST SET

(1) The unit shall comprise of following test instruments in a single unit :

- | | |
|-------------------------------|---------------------------------|
| 1. RF Signal Generator | 8. Oscilloscope |
| 2. Modulation | 9. RF Spectrum Analyzer |
| 3. AF Level Meter | 10. Hum and Noise Meter |
| 4. Audio Generator & Analyzer | 11. Signal to Noise Ratio Meter |
| 5. SINAD/Distortion Meter | 12. Digital Multimeter |
| 6. Radio Frequency Counter | 13. RF Error Meter |
| 7. RF Power meter | |

General Characteristics		
(a)	Operating Voltage	AC 220V \pm 10% @ 50 Hz
(b)	Internal Storage Capacity	10 GB or more
(c)	Display Size	6" or better
(d)	USB port	Minimum 1 Port
(e)	Ethernet	Minimum 1 port
(f)	GPIO Connector Type, IEEE	Minimum 1 port
(g)	RS-232 Connector Type	Minimum 1 port
(h)	IF Output Connector Type	Minimum 1 port

Analog Measurement:

1. RF Signal Generator		
SL No.	Parameters	Specifications
(a)	Frequency Range	2 MHz to 1.0 GHz or better
(b)	Resolution	1 Hz or better
(c)	Accuracy	\pm 1 count or better
Output Level		
(d)	Range	-130.0 to -30.0 dBm or better
(e)	Resolution	0.1 dB or better
(f)	Accuracy	0.6 dB or better

2. Modulation		
(a)	Selections	AM, FM, SSB (USB, LSB)
(b)	Waveform	Sine, Square, Triangle, Ramp, DCS, DTMF
Internal FM		
(a)	Deviation Range	\pm 0.001 to \pm 150 kHz or better
(b)	Resolution	1 Hz or better
(c)	Deviation Rate	20 Hz to 20 kHz
Internal AM		
(a)	Modulation Range	0 to 100%
(b)	Resolution	0.1% or better
(c)	Rate	20 Hz to 20 kHz
Internal SSB		
(a)	Modulation Selection	USB or LSB
(b)	Modulation Range	0 to 100%
(c)	Resolution	0.1% or better
(d)	Rate	300 Hz to 20 kHz
External AM/FM/SSB		
(a)	Audio Inputs	1 V rms,
(b)	Microphone Inputs	50 mV rms,

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6. Radio Frequency Counter		
(a)	Range	2 MHz to 1.0 GHz or better
(b)	Resolution	1 Hz or better
(c)	Accuracy	±1 count
(d)	Level Range	T/R Port: -10 to +50 dBm ANT Port: -60 to +10 dBm
(e)	Signal	CW, FM, AM, SSB

7. RF Power Meter		
(a)	Frequency Range	2 MHz to 1 GHz or better
(b)	Level Range	10 mW to 125 W or better
(c)	Resolution	0.1 dB or better
(d)	Accuracy	10 % / 1digit
(e)	Signal	CW, FM, AM, SSB, C4FM, 4FSK or more
8. Oscilloscope		
(a)	Traces	Dual
(b)	Trace Type	Live, captured, accumulated
(c)	Markers	2
(d)	Markers Functions	Time with amplitude, deviation or % depth Delta marker
	Vertical	
(e)	3 dB Bandwidth	16 MHz or higher
(f)	Frequency Range	DC to 4 MHz
(g)	Input Range	0 to 100 V peak Max, Category II
(h)	Scales	2 mV to 20 V/division
(i)	Resolution	Better than 1% of full scale
(k)	Coupling	DC, AC, GND
	Horizontal	
(l)	Sweep Factors	1 µSec to 1 Sec/division
(m)	Accuracy	>1.5% of full scale
(n)	Resolution	>1% of full scale
(o)	Input Impedance	1 MΩ, 20 pF or better
	Trigger	
(p)	Trigger Source	Trace A, Trace B
(q)	Trigger Edge	Rising/falling
(r)	Trigger Mode	Auto/normal Continuous/single shot
(s)	External Trigger Level	1 MΩ, BNC input on the rear panel of the unit Adjustable from -5 to +5 V

9. RF Spectrum Analyzer with Full Tracking Generator		
(a)	Frequency Range	2 MHz to 1.0 GHz or better
(b)	Resolution	1 Hz or better
	SPAN	
(a)	Mode	Start/Stop, Centre /Span and Zero Span
(b)	Range	Selection list is 2 kHz to Full Span
(c)	Display Accuracy	Span Accuracy + Frequency Accuracy +50% of RBW
(d)	Span Accuracy	±1% of span width
(e)	Marker Accuracy	±1% of span width
	Level	
(a)	Ref Level Range	T/R Port: -50 to +50 dBm ANT Port: -90 to +10 dBm
(b)	Vertical Scales	1, 2, 5, 10 dB/division
(c)	Reference Level Resolution	0.1 dB or better
(d)	Ref Levels Units	dBm, dBµV, dBmV
(e)	Dynamic Range	70 dB (Antenna, no attenuation, Ref Level -30 dBm, 30 kHz RBW)
(f)	Bandwidth Switching Error	±1 dB (After Normalize)
(g)	Log Linearity	±1 dB (RBW: 3 kHz, 30 kHz, 60 kHz, 300 kHz, 6 MHz)

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		±1 dB (300 Hz RBW typical)
(h)	Accuracy	±1 dB
(i)	Attenuator Selections	0 to 50 dB of attenuation, controlled by changing the Ref Level
(j)	3 rd Order Intermodulation	-60 dBc (Input Level of -30 dBm, Ref Level at -20 dBm)
(k)	Harmonic Spurious	-55 dBc (Input Level of -30 dBm, Ref Level at -20 dBm)
(l)	Non Harmonic Spurious	-60 dBc (Input Level of -30 dBm, Ref Level at -20 dBm)
(m)	Displayed Average Noise Level (DANL)	-125 dBm (Typical, 300 Hz RBW, ANT Port terminated, 20 sweep average)
Resolution Bandwidth		
(a)	RBW Selections	300Hz, 3KHz, 30KHz, 60KHz, 300KHz & 6 MHz
(b)	RBW 60 dB/3 Filter Shape	>10:1
(c)	Selectivity-Filter Shape	60 dB/3 dB ratio better than 10:1
(d)	Accuracy	±10% of RBW for 3 kHz, 30 kHz, 60 kHz, 300 kHz -10%/+25% of RBW FOR 6 MHz ±20% of RBW for 300 Hz
(e)	Bandwidth Switching Error	±1dB
Video Bandwidth		
(a)	Range	10 Hz to 1 MHz in a 1, 3, 10 sequence
Sweep		
(a)	Frequency Sweep Time	100 mS to 100 S in a 1, 2, 5 sequence
(b)	Zero Span Sweep Time	50 mS to 100 S in a 1, 2, 5 sequence
(c)	Sweep Trigger Source	Internal and external
(d)	Trigger Modes	Continuous (repeat), single (single-shot)
Function/Features		
(a)	Display/Modes	Live, average, max hold
(b)	Averages	1 to 100
Markers		
(a)	Track	Frequencies (or time) and amplitudes
(b)	Number of Markers	8
(c)	Marker Functions	Marker to Peak; Marker to Next Right/Left; Marker to Minimum; Marker to Ref Level; Marker to Center Frequency Marker sets Span; Marker sets Vertical Scale (Zero Span only)
(d)	Tracking Generator	Facility for measurement of VSWR, Return Loss, Distant to fault, Cable Loss.

10. Hum and Noise Ratio Meter		
(a)	Range	-100 dB to 0 dB
(b)	Resolution	0.01 dB or better
(c)	Accuracy	±1 dB/ ±1 count
(d)	Signal Frequency	300 Hz to 5 kHz
(e)	Audio input Level	0.1 to 30 Vrms
(f)	RF Input Level	T/R Port: -10 to +50 dBm ANT Port: -80 to +10 dBm

11. Signal to Noise Ratio Meter		
(a)	Range	-100 to 0 dB
(b)	Resolution	0.01 dB or better
(c)	Accuracy	±1 dB/ ±1 count
(d)	Signal Frequency	300 Hz to 5 kHz
(e)	Audio input Level	0.1 to 30 Vrms
(f)	RF Input Level	T/R Port: -10 to +50 dBm ANT Port: -80 to +10 dBm

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12. Digital Multimeter		
(a)	AC/DC Voltmeter	
(i)	Range	200 mV, 2V, 20V, 200V, 2000V, Auto
(ii)	Resolution	3-1/2 digits(2000 counts)
(b)	AC/DC AMmeter	AC $\pm 5\%$ full scale ± 1 count
(i)	Scale	200mA, 2A, 20A, Auto (20 A range through shunt)
(ii)	Resolution	3-1/2 digits(2000 counts)
(c)	OHM Meter	
(i)	Range	200 ohms, 2 kohms, 20 kohms, 200 kohms, 2Mohms, 20 Mohms, Auto
(ii)	Resolution	3-1/2 digits(2000 counts)

13. RF Error Meter	
Frequency Range	Range: 0 to ± 2.5 MHz from receiver frequency
Level Range	T/R Port: -10 to +50 dBm, ANT Port: -60 to +10 dBm
Signal	CW, FM, AM <70% modulation

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Digital Measurement:

1. (DMR) Digital Mobile Radio		
(a)	Measurement of Modulation & their patterns	4FSK
(b)	FSK Error Range Resolution Accuracy	0 to 20% 0.01% <5% of reading (2.5 to 10%)
(c)	Symbol Deviation Range Resolution Accuracy	1500 Hz to 2350 Hz 1.1 Hz 1.2 ±10 Hz (1745 to 2140 Hz)
(d)	Symbol Clock Error Range Resolution Accuracy	±1000 mHz 0.01 MHz 1 ppm (-48 to +48 mHz)
(e)	Frequency Error Range Resolution Accuracy	±4000 Hz 1.01 Hz Frequency Standard ± 1 count
(f)	Magnitude Error Range Resolution Accuracy	0 to 5% 0.01% <10% of reading (0 to 2%)
(g)	UUT TX/RX Bit Error Rate Range Resolution	0 to 20% 0.1 %
(h)	Signal Power/Slot Power Range Resolution Accuracy	T/R port: -60 to +51 dBm ANT port: -100 to +10 dBm 0.1 dB ±1 dB
(i)	Protocol	Decode (Color Code, Call ID, Unit ID) Simulation (Color Code, Call ID)
(j)	Vocoder	IMBE/AMBE Vocoder Test
(k)	Duplex Radios	Should have facility to test any radio with an offset (duplex mode)
(l)	Repeater Tests	Test Set Should have facility to test repeaters also should have the signalling necessary to open communication with the repeater
GRAPHICAL DISPLAYS		
Should be able to display Constellation & Eye Diagram and generate the consolidated report of the above Test.		

2. TETRA		
(a)	Measurement of Modulation & their patterns	$\pi/4$ DQPSK, 18 ksymbols/sec, TETRA filter (RRC with ≤ 0.35)
(b)	Power	Average power across the useful part of the burst measured at the symbol points through a TETRA filter.
(c)	Resolution	0.1 dB
(d)	Accuracy	±1.0 dB
	MODULATION ACCURACY	Modulation accuracy measures the displacement of symbol points from their ideal position
(a)	Range	20.0% RMS vector error

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		40.0% Peak vector error 20.0% Residual carrier
(b)	Resolution	0.1%
(c)	Accuracy	±0.5% at 10% error
	BURST TIMING ERROR	Timing error relative to downlink results available for avg, max, min and worst case for a sample of up to 250 bursts
(a)	Range	±510.00 symbols
(b)	Resolution	0.01
(c)	Accuracy	±0.05 symbols
(d)	Time Offset Range	±999.99 symbols
	FREQUENCY ERROR	
(a)	Range	±500.0 Hz
(b)	Resolution	0.1 Hz
(c)	Accuracy	±15 Hz +frequency standard accuracy
(d)	BER Testing (TETRA MS T1 mode)	BER, MER and PUEM
(e)	BER Testing (TETRA MS mode)	BER, RBER and MER
(f)	BER Testing (TETRA BS T1 mode)	BER, MER and PUEM
	GRAPHICAL DISPLAYS	
	Should be able to display Constellation & Eye Diagram and generate the consolidated report of the above Test.	

TEST SIGNALS

SL No.	Parameters	Specification
1	TETRA MS	Main Control Channel (MCCH) Traffic Channel (TCH/S) containing silence or 1 kHz tone or talk-back, Fast Associated Control Channel (FACCH)
2	TETRA MS T1	In accordance with ETSI EN 300 394-1
3	TETRA BS T1	In accordance with ETSI EN 300 394-1
4	TETRA DM	Traffic Channel (TCH/S) containing silence or 1 kHz tone or talk-back

RF RECEIVERS

SL No.	Parameters	Specification
1	Frequency range	2 MHz to 1.0 GHz or better
2	Level Range	T/R Port: -40 dBm to +40 dBm ANT Port: -70 dBm to 0 dBm
3	Burst Types	MS: Control Burst (CB), Normal Uplink Burst (NUB) BS: Normal Downlink Burst (TS1+2, TS1, and TS2), Synchronization Burst, PRBS with no training sequence

3. APCO P25 : Phase I & II

(a)	Measurement of Modulation & their patterns	C4FM, CQPSK, LSM (P25 Phase-I)	HCPM, HDQPSK, HD8PSK (P25 Phase-II)
	MODULATION FIDELITY		
(a)	Range	0 to 20%	
(b)	Resolution	0.01%	
(c)	Accuracy	<5.0% of reading (2.5 to 10%)	
	SYMBOL DEVIATION		
(a)	Range	1500 Hz to 2100 Hz	
(b)	Resolution	0.1 Hz	
(c)	Accuracy	±10 Hz (1620 to 1980 Hz)	
	SYMBOL CLOCK ERROR		
(a)	Range	±1000 mHz	
(b)	Resolution	0.01 mHz	
(c)	Accuracy	1 ppm (±48 mHz)	

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FREQUENCY ERROR		
(a)	Range	±4000 Hz
(b)	Resolution	0.01 Hz
(c)	Accuracy	Frequency Standard ±1 count
Bit ERROR Rate		
(a)	Range	0 to 20%
(b)	Resolution	0.1%
SIGNAL POWER		
(a)	Range	T/R Port: -60 to +51 dBm ANT Port: -100 to +10 dBm
(b)	Resolution	0.1 dB
(c)	Accuracy	±1 dB
ERROR VECTOR MAGNITUDE		
(a)	Range	0 to 20%
(b)	Resolution	0.01%
CARRIER FEEDTHROUGH		
(a)	Range	0 to -80.00 dB
(b)	Resolution	0.01 dB
GRAPHICAL DISPLAYS		
Should be able to display Constellation & Eye Diagram and generate the consolidated report of the above Test.		

CALIBRATION

Calibration	Calibration Facilities should be available in India & Radio Communication Test Set shall be calibrated annually free of cost during the guarantee/warranty period.
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ACCESSORIES

Should provide all mandatory software/accessories required for measurement of the above test.

ENVIRONMENTAL

(a)	Operating Temperature	0°C to +50° C
(b)	Storage Temperature	-20°C to +60°C
(c)	Humidity	MIL-PRF-28800F Class 3
(d)	Shock	MIL-PRF-28800F Class 3
(e)	Vibration	MIL-PRF-28800F Class 3
(f)	Altitude	MIL-PRF-28800F Class 3
(g)	EMC	EN 61329, Class A

Note: Supplier shall demonstrate the testing capability of Analog & Digital Radio Communication Test Set to test Analog Radios, DMR Radio & TETRA Radios as specified by ETSI and APCO Radio as specified by TIA Standards.

QRs of Signal Analyzer

Sl No.	Parameters	Specification
1	Frequency Range	20 Hz to 3 GHz
2	Capture bandwidth	10 MHz or higher
3	Time correlated Multi-Domain Analysis	Time, Frequency, Modulation
4	Trigger	Free Run, External
5	Traces Types	Normal (RMS) , Average, Max, Hold, Min Hold
6	Modulation Analysis	AM, FM, PM, 4FSK
7	Memory Depth	64 MB or more (a) Span in Real time Spectrum : 10MHz Analyzer (b) Sample Rate : 50 MS/s
8	Displayed Average Noise	-140 dBm /Hz Level or better
9	Pre-defined Measurements	Channel Power, ACPR, Carrier to Noise ratio, Occupied BW, Carrier frequency, CCDF
10	Automatic Measurement (Time Mode)	IQ vs Time, Power vs Time, Frequency vs Time CCDF, crest factor Pulse Measurements : Pulse Width, Pulse Peak Power On/Off Ratio, Pulse Ripple, Pulse Repetition Interval, Duty Cycle Pulse-Pulse, Phase, Channel
11	Phase Noise Measurement	10 Hz to 10 MHz Freq. Offset
12	Interface	USB
13	Power Supply	0 to 40 degree C
14	Operating Temperature	230 \pm 10 % VAC, 50 Hz

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QRs of RF COMBINER

SL No.	Parameters	Specification
1	Category	Passive
2	Power	20 Watt
3	Number of Ports	3 (2-Input , 1-Output)
4	Frequency Range	2 MHz to 1 GHz
5	Isolation	Better than 25 dB
6	Impedance	50 Ohm
7	Insertion Loss	Less than 0.5dB
8	Package Type	Shall be based on Surface Mount Technology
	Mechanical Specification	
9	Connectors	Shall be Stainless Steel with Mini SMA to BNC
10	Contact Pin	Beryllium Copper Gold Plate
11	Housing	Aluminum, Clear Iride
12	Operating Temperature	0°C to + 50°C
	Storage Temperature	0°C to + 50°C
13	Humidity	95% ± 5% max (non-condensing)

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QRs of Programmable Function Generator, 200 MHz, Dual Channel

SL No.	Parameter	Specification
1	Frequency Bandwidth	10 mHz to 200 MHz
2	No. of Channel	Two
3	Standard Waveforms :	Sine, square, pulse, ramp, noise, sin(x)/x, exponential rise/fall, Gaussian, DC Offset Facility.
4	Arbitrary Waveform Generator	(a) Bandwidth : 10 mHz to 100 MHz (b) Sample Rate : 250 MS or 2GS/s (c) Record Length : 128K /16K (d) Waveform Memory : 4 Waveforms
5	Vertical Resolution	12 Bit or better
6	Amplitude Range	50mV to 5Vpp
7	Modulation	AM, FM, PM, FSK, Burst, Sweep
8	Interface	USB /LAN
9	Display	LCD
10	Operating Temperature Range	5°C to 40°C
11	Power Requirement	230 V +/- 10% AC, 50 Hz

QRs of Battery Capacity Tester for Handheld Radios

SL No.	Parameters	Specifications
1	Range	To test Handheld batteries 7.2/7.4V with capacity up to 3000mAH or higher
2	Pockets/Adaptor	4 or more with adaptor to connect any battery pack
3	Charge/Discharge Rate	C/1, C/2, C/3, C/5 & C/10 (selectable)
4	Chemistries	Should be able to test the following: 1. Ni-MH 2. Li-Ion 3. Li-poly 4. Ni-Cd
5	Charge Methods	Shall be able to test under mentioned methods: 1. Constant voltage with Current limit. 2. Constant current with Reverse Load Charge adjustable 3. Provision for Temperature controlled 4. Automatic full charge detection
6	Discharge Methods	1. Constant current. 2. Provision to select Depth of Discharge (DOD) of the battery
7	Display	Charging/Discharging: Current, Voltage & Time shall be displayed
8	Power Failure Recovery	Charging/Discharging cycles shall be resumed on power restoration
9	Data Port	RS-232 or USB
10	Power Supply	230 \pm 10 % VAC, 50 Hz
11	Software	PC Interface Software with media

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QRs of Battery Capacity Tester for VRLA/SMF Batteries

SL No.	Parameters	Specifications
1	Range	To test VRLA/SMF Batteries 12V, 7AH to 100 AH or higher
2	Charge/Discharge Rate	C/1, C/2, C/3, C/5 & C/10 (selectable)
3	Discharge Methods	1. Constant current. 2. Provision to select Depth of Discharge (DOD) of the battery
4	Display	Discharging: Current, Voltage & Time shall be displayed
5	Power Failure Recovery	Discharging cycles shall be resumed on power restoration
6	Data Port	RS-232 or USB
7	Power Supply	230 \pm 10 % VAC, 50 Hz
8	Software	PC Interface Software with media
9	Accessories	Essential cable & connector for connecting the battery

QRs of Through Line Watt Meter

SL No.	Parameters	Specification
1	Frequency Range	2 MHz to 1 GHz
2	Power Range	1 Watt to 1000 Watts
3	Average Power Ratio	10dB or better
4	Insertion VSWR (with N Connector)	1.05 max. at 1GHz
5	Settling Time	Less than 1 second
6	EMC	Shall comply with EN55011
7	Impedance, Nominal	50 Ohm
8	Connectors	Should provide all mandatory connectors
9	Approximate Weight	2 Kg (Max)
10	Environmental Parameter	Operating Temperature: 0 °C to 50 °C Storage Temperature : 0 °C to 50 °C

Should be able to measure the VSWR through different or single elements in the under mentioned Frequency Band:

	Operating Frequency Band	Power Handling Capacity
(a)	HF: 2 MHz to 30 MHz	250 Watt
(b)	VHF: 68 MHz to 88 MHz (Lower Band) & 136 MHz to 174 MHz (Upper Band)	100 Watt
(c)	UHF: 380 MHz to 512 MHz (Lower Band), 806 MHz to 890 MHz (Upper Band)	100 Watt

QRs of Cable & Antenna Analyzer

SL No.	Parameters	Specification
1	Frequency Range	100 KHz to 3.6 GHz
2	Frequency Resolution	1 Hz or better
3	Output Power	0 dB or better
4	Returns Loss	Measurement Range: 0 to 60 dB Resolution: 0.01dB
5	VSWR	Measurement Range: 0 to 65 Resolution: 0.01
6	Cable Loss	Measurement Range: 0 to 30dB Resolution: 0.01 dB
7	Display	LCD, Resolution 640 x 480 pixel or better
8	EMC	European EMC Directive 2004/108/EC
9	Data Port	Minimum one RS-232 & one USB shall be provided
10	Calibration	Shall be calibrated annually free of cost during the guarantee/warranty period
11	Power Supply	230 \pm 10 % VAC, 50 Hz
12	Operating Temperature	0° C to + 50° C

QRs of Power Supply Tester

Should be able to perform the following test on AC/DC Power Supplies, Adapters & Chargers of Communication Equipments:

1. Load Regulation
2. Line Regulation
3. Combined Regulation
4. Efficiency of EUT
5. Phase to Phase Noise
6. Set-up/Hold Time
7. Over Voltage Protection
8. Over Charge Protection

Input Characteristics of the Load

Power input	Shall be up 300 Watt or better
Current input	Shall be up to 0-15 A
Voltage input	Shall be up to 60 V
CC Mode Accuracy	0-15 A \pm 0.2% of FSD or better
CR Mode Accuracy	1-15 K Ohm \pm 0.2% of FSD or better
CV Mode Accuracy	0-60 V \pm 0.1% of FSD or better
CP Mode Accuracy	0-75 W : \pm 0.1% of FSD or better 0-300 W : \pm 0.1% of FSD or better

Protection Testing

Over Voltage Protection (OVP) Voltage Source Accuracy	0-24 V, 4A or better
Over Current Test	15 A or better
Max. Output Voltage	500 VA, 50 Hz
AC Voltage Meter Accuracy	0-300 Vrms \pm 0.3% of FSD or better
AC Current Meter Accuracy	0-1 A \pm 0.5% of FSD or better
AC Power Meter Accuracy	0 to 100 Watt \pm 0.5% of FSD or better

Timing Measurement & Control

Display	LCD Screen
Interface	One RS-232 & one USB
Software	Necessary Interface Software shall be provided with media
Weight	\leq 30 Kg
Test Mode	Auto & Manual
Environmental	Operating Temperature: 0 °C to 50°C Storage Temperature : 0 °C to 50°C Humidity : 95% \pm 5% max (non-condensing)
Accessories	All necessary accessories shall be provided to measure the test at SL No.1 to 8 mentioned above along with operating manuals
Calibration	Shall be calibrated annually free of cost during the guarantee/warranty period

Appendix-I

COMPANY PROFILE

Name of the vendor / Company / Firm (Company profile, in brief, to be attached)	
Type (Tick the relevant category) a) Original Equipment Manufacturer (OEM): b) Government Sponsored Export Agency :(Details of registration be provide) c) Authorized Vendor of Foreign Firm d) Other (Give Specific details)	
Contact Details Postal Address, Fax , Email, Website, Details of contact person etc:	
Local Brach / liaison office in India (if any) Name and Address	
Financial Details :Annual Turnover for Last Three Financial Years	
Details of earlier Contract with any Central/State/PSU/Private Agency.	
Details of Manufacturing infrastructure available in India.	

Signature of Authorised Signatory

Appendix-II

NON COMPLIANCE STATEMENT TO THE QRs

The technical Specifications not complied /deviated in respect of each parameter of Test Instruments shall be furnished as under

Sl No.	Name of Test Instrument	Technical Specification /Parameter	Value Required/ sought	Offered value etc.	Reason /Remarks if any

Signature of Authorised Signatory