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DIRECTORATE GENERAL; ALL INDIA RADIO
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INTRODUCTION: This Specification is for supply of 1 kW VHF FM Solid State Broadcast Transmitter using MOSFET technology and associated Auxiliary Equipment.

SUMMARY

1. Each clause of this specification has to be complied with & supported by printed matter from the manufacturer of the equipment by the Tenderer, without which tender will be considered incomplete and will liable to be rejected. The Tenderer should make a detailed offer while quoting for the Transmitter, auxillary equipment and accessories.

2. This Specification comprises of 29 pages.

SECTION- I GENERAL

The broad scope of the supply and schedule of requirement is as follows:

1.0 1 kW MOSFET based technology VHF FM Transmitter, capable of giving ≥1 KW continuous power, including two nos. of Exciters complete as per AIR Specification.

Transmitter shall be complete in itself and integrated in Standard rack and will be supplied with Auxiliary Equipment & accessories including installation material mentioned below. (Price for each item is to be quoted separately) :

1.1 2.5 kW Dummy Load and thru line power meter etc. as per Section -IV.
1.2 1-5/8" RF Coaxial foam dielectric RF Feeder Cable etc as per Section -IV
1.3 Complete installation material for each set of transmitter such as rigid lines, elbows, unions and matching reducers, wherever necessary to complete the installation for feeding to the Antenna and Dummy Load as per Section -IV. The tenderer must quote all items of Section V(A) & V(B).
1.4 Motorized RF Changeover switch as per Section -IV.
1.5 FM Stereo modulation monitor as per Section -IV.
1.6 4 bay VHF FM Circularly polarized side mount antenna as per Section -IV.
1.7 Factory Test and Inspection : at Manufacturer's Works .
1.8 A set of recommended spares In case of kits, full item wise details of kits are to be provided . **(OPTIONAL)**
1.9 TRAINING: At AIR Site: **(OPTIONAL)**

1.10 **The following are excluded from the scope & will be provided by AIR:**
1.10.1 Construction of necessary buildings, all masonry works & materials connected therewith, masonry foundations, cable trenches & under floor ducts etc.(Dimensions for which are to be furnished by the Transmitter supplier) if any.
1.10.2 Electric supply connection for the transmitting equipment, at a single point.
1.10.3 Tower for mounting Antennae
1.10.4 Furniture & fittings not forming a part of the transmitter equipment.
1.10.5 Installation of equipment at site.
1.10.6 Commissioning of Transmitters at site.

1.11 **Please refer tender documents(instructions to bidders) for general term and conditions of contract for supply including all the commercial aspects** like ; Packing and Packing List, Insurance and Marine Risk etc., Payment terms, Penalty/Compensation for Delay, Damages and Liabilities, Time Period and Extension for Delay , Foreclosure of Contract due to Abandonment or Reduction in Scope of Supply , Cancellation of Contract in Full or Part, Recovery of Security Deposit, Performance Guarantee, Unsatisfactory Workmanship, Damages Incurred During transit, Tenderer Liable for Damages, Defects, Recovery of Compensation, Ensuring Payment and Amenities, Tenderer to Indemnify Government against Patent Rights, Release of Security Deposit, Safety Code, insurance from manufacturer's works/factory to respective site etc **i.e. in totality** (except of para 8.2.2).

1.12 LANGUAGE / UNITS:

All information supplied by the Tenderer & all markings, notes, designation on the drawings & associated write-ups shall be in **"English language"** only.

All dimensions and units on drawings and all references to weights and measures and quantities shall be in metric units.

1.13 INFORMATION TO BE SUPPLIED WITH THE TENDER :

1.13.1 A **Compliance Statement** to the Complete specification of AIR, para wise, for each clause .

1.13.2 Complete **printed information** in support of compliance statement should be furnished with the tender to assess the full merit of the offer. Similar information should be furnished in respect of Auxiliary items, Accessories and Spares etc. The tender & the associated information should be submitted in **duplicate**.

1.13.3 Detailed Schedule of Materials offered for Transmitter ,Auxiliary Equipment & accessories for each transmitter should be in conformity with the Schedule of requirement /materials in SECTION -V (A & B).

This list should be in the same format as in the price bid without indicating the prices. The tenderer must quote all items of Section -V (A&B).

1.13.4 Make, type, model number, country of origin name, address of individual units as well as information necessary for ordering & selection of specific units.

1.13.5 Layout plan and full construction details of Transmitter cubicles and external units including dimensions, weights (overall sizes) & photographs/ illustrations of the interior of the Transmitter cubicles. This should include characteristics affecting the environment, for example; heat dissipation, EMI and acoustic noise, tentative accommodation plan with elevations for Transmitter and accessories. This information should be in CD form also.

1.13.6 Details and extent of ventilation and Air- conditioning requirements, if any, for main Transmitter and its accessories.

1.13.7 Full technical information and characteristics of all high power semiconductor devices used in the equipment. Details to be provided.

1.13.8 Details of MTBF (Mean Time Between Failure) & MTTR(Mean time to repairs) to be provided in respect of power semi conductor devices.

1.13.9 Details of failure modes of individual devices, components based upon field feed back reports.

1.13.10 In support of Tenderer's claim an "up-to-date" list of their customers along with complete set of actual performance figures i.e. Transmitter, auxillary equipment and accessories Performance measurement taken on the Transmitter **,**auxillary equipment and accessories (duly certified by the customers) must be furnished along with the tender.

A supply record of 1 kW VHF FM transmitters power wise and year wise in the last 5 years (Tr. shall be field proven for satisfactory operation) may be enclosed by the tenderer.

1.14 INFORMATION TO BE SUPPLIED BY THE TENDERER AFTER AWARD OF SUPPLY ORDER :

One printed & duly bound set of Installation, Commissioning, Operation &

Maintenance including theory of operation and fault diagnosis technical manuals for main Transmitter, Auxiliary Equipment & accessories shall be supplied to the Director Engineering (Project), P&D Unit DG AIR New Delhi within two months of Acceptance of Tender. (irrespective of number of transmitters ordered). All the details should be complete and exhaustive. One Soft copy of these documents is also required on CD for use with PC.

1.15 INFORMATION TO PRECEDE DESPATCH OF EQUIPMENT:

Following information should be supplied to the DE (Proj) P&D Unit DG AIR New Delhi, prior to dispatch of Equipment :

1.15.1 Detailed list of Equipments under dispatch.

1.15.2 Photograph with illustrations showing location of components in the various units and sub-units with item numbers marked there-on (i.e. on component as well at its location).

1.16 INFORMATION TO BE SUPPLIED ALONG WITH EQUIPMENT:

1.16.1 For each Transmitter, Auxiliary Equipment & accessories **two** printed & duly bound copies of technical manuals along with soft copy of these documents on CD for use with PC as per clause 1.14 as above are to be supplied to each consignee.

1.16.2 Six sets , of these documents as per clause 1.14 as above**,** against the order for 1 KW FM Transmitter, Auxiliary Equipment & accessories are required to be sent to (irrespective of number of transmitters ordered), to the officers / offices / places as per SECTION - V(A):

1.17 DELIVERY OF EQUIPMENT:

Within **six** months from date of placing of order .

1.18 GUARANTEE:

Tenderer shall submit with his tender an undertaking to accept the following guarantees:

1.18.1 A guarantee to make good within 30 days at his own expense any component in respect of all equipment as per AIR specification which becomes defective under normal operating conditions within 18 months from the date of receipt of the equipment at respective site or 12 months from the date of commissioning at site, whichever is later.

1.19 INSPECTION:

Detailed inspection of Transmitter, Auxiliary Equipment & accessories will be carried out at Manufacturers Works by Engineer(s) of All India Radio as per detail given in Annexure-I. The manufacturer shall put up all the Transmitter, Auxiliary Equipment & accessories for test on the Test Bench at his premises before the AIR representatives and shall provide electric energy, consumable materials, tools, testing instruments, labour and assistance of every kind for carrying out the acceptance tests & preparation of Inspection Test Report. Complete specifications & details will be checked and all parameter values will be measured.

Prior intimation for carrying out Inspection at Works is to be given by the Tenderer to the indenter at least 6 weeks in advance. Inspection period

for Transmitters will be two days for first transmitter and one day each for subsequent nos. of transmitters.

1.20 TRAINING: At AIR Site (OPTIONAL).

The tenderer shall train AIR engineers for Transmitter, Auxiliary Equipment & accessories **at one** AIR Site to enable them to become acquainted with all particulars as well as installation, operation and maintenance of the Transmitter, Auxiliary Equipment & accessories. Training will be for 5 working days for 12 persons.

The training programme will be structured so as to cover theory of operation of Transmitter, Auxiliary Equipment & accessories and including of its various subsystems, Maintenance, Practical demonstrations of circuits, Maintenance demonstrations, Fault finding, Circuit Tracing exercises and Part Replacements. (irrespective of number of transmitter ordered)

1.21 ISO CERTIFICATION: The tenderer should either be original equipment manufacturer or supply the equipment only from the original equipment manufacturer. Original equipment manufacturer should have ISO Certification for the manufacturing work and the documentary proof for the same are to be enclosed by the tender with the tender paper/documents.

SECTION II

TECHNICAL DESCRIPTION OF TRANSMITTER

2.0 TRANSMITTER CONFIGURATION:

2.1 1 kW solid state MOSFET technology FM Transmitter shall be capable of giving ≥1 kW power continuously. It should consist of a number of low power hot pluggable modular power amplifiers (minimum two).

The Transmitter will be provided with 2 nos. of Exciter units. The second Exciter unit will work as hot standby in automatic change over mode (with manual override) which will also incorporate auto audio changeover.

The automatic change over of exciter should take place when power of exciter goes down by 3dB.

2.2 The Transmitter will be complete in all respects. AIR will provide power supply of single phase, 230 (rms) Volt ± 10%, 50 Hz ± 4% at a single point. All other transmitter's inbuilt subsystem shall drive supply through this source .

Testing and measurements of the Transmitter, Auxiliary Equipment & accessories will be carried out at above single phase , 230 Volts(rms) ± 10%,50 Hz ± 4% power supply available at the Transmitters's input circuit breaker (without any outside transformer unit etc.). No other voltage will be acceptable to AIR at the Transmitters's input circuit breaker. The performance of transmitter as per parmeters in Section-III should be guaranteed without degradation with the given power supply tolerances.

2.3 A set of RF, DC, power supply and control cables with appropriate connectors , extender cables and extender cards are to be supplied for testing the PA unit / IPA unit and exciter unit etc. outside the Transmitter rack . Details of above are to be enclosed.

2.4 The Transmitter shall be suitable for unattended round-the-clock operation with 1:2 redundancy for any stage/module in the RF chain between exciter and PA stages (i.e IPA, if applicable).

2.5 Transmitter equipment should be housed in a rack having pleasing appearance. All metal works shall be protected against rust and corrosion. All materials shall be non-inflammable and fire retardant.

2.6 All stages i.e. Exciter, IPA(if applicable)/PA's, Combiner, harmonic filters, etc. should be capable of operation in the entire VHF frequency band, 88 to 108 MHz **with out tuning**.

2.7 The Transmitter shall be suitable for Mono and Stereo FM Radio Broadcast in the VHF Band.

2.8 Transmitter should be of modular design for easy maintenance & part replacement. It should be possible to take out PA module without **"switching-**

off" the the transmitter i.e. in working condition

2.9 The Transmitter construction shall ensure complete shielding of high power RF circuits to minimize radiation. The FM Transmitter will have to work in a common Transmitter hall having other high power Medium Wave, Short Wave Transmitters, TV Transmitters in VHF & UHF band as well as other FM Transmitters. Therefore, the transmitter should be adequately protected from resultant E.M.I. (Electro Magnetic Interference) as per ETS-300447.

2.10 It should comply with IEC 215 safety standards so as to eliminate hazards to personnel. Access to parts carrying dangerous voltage shall be through interlocked doors.

2.11 The Transmitter will consist of solid state devices and have only MOSFETS in (IPA, if applicable)/PA stages. It must have Auto Ramp Up circuit for power rise when Transmitter is "Switched-On". It should be possible to vary the Transmitter power from a low value to full value from front panel control on controller. Details to be provided by tenderer.

2.12 **Exciter**:-

2.12.1 Exciter should accept analog mono, analogue stereo (left and right) / encoded stereo signals (MPX), RDS, RBDS,DARC, SCA inputs and AES / EBU digital inputs. It should be compatible for mono and Stereo Broadcasting using pilot tone system conforming to ITU-R, Rec.450 .

2.12.2 It should have its own manually adjustable power control. The pre-emphasis should be Selectable / Switchable.

2.12.3 It should display various parameters like forward and reflected power, frequency deviation, input-audio level, DC voltages & currents, on its panel meters or LCD display. Status and faults should also be indicated. List of meters / display, measured parameters, LED's & status / fault indications to be enclosed.

2.12.4 It should be Synthesized with easy channel selection of minimum 100 KHz spacing i.e. can be operated on any of the FM channels from 88 MHz to 108 MHz in VHF Band-II. The Exciter should be **"Frequency agile"** --- not requiring any output tuning over its entire specified operating frequency range.

2.13 **Power Amplifier Modules**: Total transmitter output power will be developed by a optimum combination of low power PA Modules (minimum two) and should be capable of operation in the entire VHF frequency band, 88 to 108 MHz **without tuning** .

Each of the PA will be inter changeable in any position. The rated power output of the PA unit and its maximum power output may be indicated. PAs must be protected against **"short"** & **"open" loads**, **"over-current", "over-temperature**", "**over-drive"** and **"air-flow"** failure.
The efficiency figures for each PA may be indicated.

2.14 Transmitter Power Amplifiers **---- Combiner Unit** : The power combiner should

be capable of operation in the full VHF Band 88 to 108 MHz **without tuning**. The Insertion & Return **Loss figures** of the combining unit may be given and full details along with **schematic diagrams** should be enclosed in the tender.

Tenderer shall indicate the reduction in transmitter RF output power in case of failure of individual power amplifier modules units.

SNo.	Number of PA modules/units failure	Transmitter RF output power in kW
1.	one No.	…… kW
2.	two Nos.	……. kW
3.	three Nos.	……. kW
….	….	……. kW
N	N…Nos.	……. kW

2.15 **Protection System** : Adequate protection system should be provided to safe guard the system from damage under fault conditions. The protection system should be fast acting to safe guard the system and components. Following are the typical requirements in this regard:

2.15.1 Over load protection for Transmitter as well as for individual PAs etc.

2.15.2 Protection against over temperature on heat sinks.

2.15.3 Protection against blower failure and less volume of cooling air.

2.15.4 Protection against higher VSWR including open and short conditions at output.

2.15.5 Immediate power foldback under severe / damaging fault conditions. Details of foldback to be provided.

2.15.6 External units and accessories like Dummy Load change over switches etc. should be wired in Transmitter interlock.

2.15.7 Transmitter should be protected against lightning by providing DC / RF discharge path and details be given in the tender. The details of **"lightening protection"** shall be given by the tenderer.

2.16 **Control and Interlocking:**

2.16.1 The Control and Interlock circuits shall ensure protection and operational safety of the equipment and personnel. They shall allow the Transmitter to be "Switched-in" Or "out-of-service" in a proper sequence only by operation of switch buttons or manual controls on transmitter panel. Switching-in of the auxiliary units such as Dummy Load, reject-loads, exhaust fan etc. shall be suitably interlocked.

2.16.2 Details of the control/monitoring/protection unit should be given.

2.16.3 It shall be possible to switch off the entire Transmitter in emergency with operation of a **single push button/ manual command**.

2.16.4 Stages of sequential operations of Switching "on" and "off" of the Transmitter shall be indicated by use of suitably coded electronic display. In addition, after tripping and "power-fold-back", the status of high VSWR shall remain indicated until reset. The fault indication shall be supplemented with audible alarm.

2.17 **INSTRUMENTATION & INDICATIONS :**

The Transmitter will be provided with appropriate meters for complete monitoring of the Transmitter operation. All important parameters required for fault diagnosis will be displayed on either respective meters or on LCD display. Some of these are Forward & Reflected power of Transmitter and individual PA units, AF input level in each channel, total deviation on exciter, current in MOSFET stage / pallet, DC voltage etc. No. of meters/transducers with details should be enclosed with tender.

2.17.1 Transmitter status and fault conditions shall be indicated by colour coded Display on a mimic diagram - No. of LED's or Display for **"status indication"** and **"fault indication"** to be indicated in tender.

2.17.2 Suitable test points for operational check out side the module shall also be provided.

2.17.3 RF Sampled outputs (Forward and Reverse) should be provided on connectors for performance measurement.

2.18 **COOLING SYSTEM:**

Full details of cooling system and blowers shall be given. Temperature rise of cooling air for rated power output into Antenna is to be indicated. Details of air filters shall be given.

2.19 **TRANSMITTER POWER SUPPLY:**

Transmitter should have its own input circuit breaker for the mains supply. The transmitter's inbuilt power supply system should be able to take care of specified variations in the main supply i.e. Tr. should comply with single phase voltage 230 volts(rms) $\pm$10 %, single phase, 50 Hz $\pm$ 4%.

The rectifier and filter circuits should be able to take care of switching voltage surges on power lines. The AC and DC supply should have their protective devices. Adequate metering / indications like DC voltage and current to be provided. Power supply unit to be protected against "over temperature", "over-current" and "over-voltage", transients etc.

2.20 **SPARES (OPTIONAL):** The tenderer shall quote for one set of spares. These shall include:

2.20.1 PA MOSFET / Sub Modules
2.20.2 Low power semi conductor devices / MOV/ Tunnel Diodes etc.
2.20.3 IC's / L.S.I.
2.20.4 PCB's / Interface Cards/modules
2.20.5 Switches / Opto couplers/Transducers
2.20.6 Meters / Displays
2.20.7 Discrete items like resistances, capacitors & inductance
2.20.8 Spare Modules PA.
2.20.9 Sub assemblies/Changeover Units
2.20.10 Spare resistance for Dummy Load.
2.20.11 Spare power supply unit

2.20.12	Complete control unit/Microprocessor Controller
2.20.13	One set of filter
2.20.14	Blower with motor
2.20.15	Other miscellaneous items including power combiner, its sub-systems, harmonic filter, absorbers, etc.

Note: Tenderer shall quote the rate / cost of individual spares in the tender offer while submitting the offer for spares.

2.21	**REMOTE CONTROL AND TELEMETRY (OPTIONAL)**
2.21.1	Transmitter should be provided with Remote Control and Telemetry Interface Card and equipment to operate it from a distant/centralized location via TCP-IP/ PSTN network.
2.21.2	It should be also compatible to operate with general purpose PCs with Modems. Users can dial-in to the stations using the remote control software running on a PC from a remote place to operate and monitor the Transmitter System.
2.21.3	The Remote Control software should be Graphical User Interface based and the screens should be clear and intuitive to the operator. The screen layout should contain mimic diagram of AC mains flow and Audio/RF Flow separately. Preferably, each unit may have its own screen in a block diagram style for quick location of faults. The ports for Remote PC and local PC should be separate so that both can operate simultaneously.
2.21.4	Details of control parameters & indications/metering shall be given.

SECTION-III TECHNICAL SPECIFICATIONS OF TRANSMITTER

SNo.	TECHNICAL PARAMETER	TECHNICAL SPECIFICATION	COMMENTS OF TENDERER WITH TECHNICAL DATA / SCHEMATIC DRAWINGS Nos
3.1	**GENERAL**		
3.1.1	Frequency Range	: 88 to 108 MHz.	
3.1.2	Class of Emission	: 180 KF8E.	
3.1.3	Stereo transmissions	: Acc. to ITU-R Rec. 450 (Pilot tone).	
3.1.4	Nominal Frequency deviation	: $\pm$75 KHz (peak)	
3.1.5	Maximum Frequency Deviation	: up to $\pm$100 KHz (peak)	
3.1.6	Pre-emphasis	: 0, 50 or 75 micro seconds selectable.	
3.2	**RF OUTPUT**:		
3.2.1	Rated output power	: $\geq$ 1 kW	
3.2.2	Rated output(Load)impedance	: 50 ohm unbalanced.	
3.2.3	Permissible VSWR	: 1.5: 1 with full power; Power fold-back beyond 1.5: 1 ; Details of power fold back characteristics to be provided.	
3.2.4	Harmonics suppression and Spurious	: Within limits as per Radio Regulations & ITU-R Recommendations. Actual values to be indicated.	
3.2.5	Overall efficiency	: $\geq$ 50 %.	
3.2.6	Transmitter RF Power output connector size	**:** 1-5/8"with EIA flange	
3.2.7	Max. Frequency tolerance	: $\pm$ 300 Hz.	
3.2.8	Synchronous AM S/N at reference to 100% AM modulation at 400 Hz , 50 micro seconds with FM modulation at 75 KHz Deviation	: Better than 50 dB	

3.2.9	Asynchronous **AM S/N** *unweighted*, referred to 100% AM modulation at 400 Hz , 50 micro seconds and without FM modulation	: Better than 55 dB	
3.3	**INPUTS**:		
3.3.1	Modulating input	:Exciter should accept analog mono, analogue stereo (left and right) / encoded stereo signals (MPX), RDS, RBDS,DARC, SCA inputs and AES / EBU digital inputs. It should be compatible for mono and Stereo Broadcasting using pilot tone system conforming to ITU-R, Rec.450.	
3.3.2	Input impedance (Analog) Input impedance (Digital)	600 ohm and 10K ohm or greater, adjustable 110 ohm .	
3.3.3	Analog and Digital input level for ± 75 KHz (peak) deviation:	**ANALOG AUDIO INPUT:** At 1 KHz , 0 dBu : Input Level Adjustable from -6 dBu to +12 dBu . **DIGITAL AUDIO INPUT:** At 1 KHz : Input Level Adjustable from -20.0 to 0.0 dBFS .	
3.4	**POWER SUPPLY**		
3.4.1	Power	: Single Phase, 230 (rms) volts ± 10%, 50 Hz ± 4%	
3.4.2	Power factor	: better than 0.9	
3.5	**MONO OPERATION**		
3.5.1	S/N ratio at 75 KHz deviation (30 Hz to 15 KHz Band Width) rms, unweighted	: Better than 75 dB	
3.5.2	THD + N	: Better than 0.1 %.	
3.5.3	IMD SMPTE	: Better than 0.1 %.	
3.5.4	Amplitude response 30 Hz to 15 KHz	: Better than ± 0.3 dB	
3.6	**STEREO**		

	OPERATION :		
3.6.1	Stereo separation (sine wave) : 30 Hz to 15 KHz	:Better than 50 dB	
3.6.2	Dynamic stereo separation : (30 Hz to 15 KHz)	:Better than 45 dB	
3.6.3	Linear Cross Talk referred to 100% modulation: (30 Hz to 15 KHz)	: Better than 50 dB	
3.6.4	Non-linear Cross Talk referred to 100 % modulation.	: Better than 60 dB	
3.6.5	S/N ratio at 75 KHz deviation (L or R) (30 Hz to 15 KHz Band Width) rms, unweighted	: Better than 70 dB	
3.6.6	THD + N(L or R)	: Better than 0.1 %.	
3.6.7	IMD SMPTE (L or R)	: Better than 0.1 %.	
3.6.8	Amplitude response (L or R)30 Hz to 15 KHz	: Better than ± 0.3 dB	
3.6.9	Pilot tone Stablity :	: As per ITU(R)	
3.7	**WIDEBAND COMPOSITE OPERATION**:		
3.7.1	FM S/N ratio at 75 KHz deviation rms, unweighted	: Better than 70 dB	
3.7.2	THD+N (Total Harmonic Distortion plus Noise)	: Better than 0.1 %.	
3.7.3	IMD (SMPTE)	: Better than 0.1 %.	
3.7.4	Amplitude response 30 Hz to 100 KHz	: Better than ± 0.3 dB	
3.8	**ENVIRONMENT CONDITIONS** :		
3.8.1	Ambient temperature	: -5° C to + 50° C	

	range for operation		
3.8.2	Relative humidity	: 95 percent, non condensing.	
3.8.3	Working altitude	: Up to 3000 meters AMSL	

REMOTE CONTROL AND TELEMETRY : (OPTIONAL)

SNo.	Technical Parameter	Specification	Comments of tenderer with technical details/data and schematic drawing etc.
3.9	Remotely Controllable/ Setting Parameters:	1. Transmitter: ON/OFF 2. Exciter ON/OFF, Power Level, Audio input, Pre-emphasis (0/50/75), Stereo: ON/OFF; 3. Power Amplifier (PA): RF Output Power Level: ON/OFF 4. AC and Diesel Generator ON/OFF 5. Program 1/ Program 2 selection 6. Auto change over of Exciter 1 and 2 7. DG ON/OFF	
3.9.1	Remotely Monitorable Parameters:	1. Exciter RF forward and reflected power 2. Exciter Audio Level (L/R) 3. P.A.'s VSWR, Voltage and Current, Temperature and over drive alarms (Over Current, Over Voltage) 4. Individual Unit faults and indications 5. Alarm Indications: Temperature, VSWR, ON AIR, Audio etc. 6. Co-axial Switch Position 7. Power supply status of Voltages, currents, power factor 8. Status of AC Units 9. Temperature, humidity etc. 10. Any other parameter which the manufacturer things essential for proper functioning of a remote-controlled FM Station	
3.9.2	Data Format	To be indicated and compatible for above system.	
3.93	Data Rate	to be indicated and compatible for above data format	
3.9.4	Modem Speed	to be indicated and compatible for above data format / rate to be used for a distant/centralized location via TCP-IP /PSTN network	

SECTION IV (TECHNICAL SPECIFICATION OF OTHER ITEMS AUXILLARY EQUIPMENT AND ACCESSORIES) A- 4 BAY SIDE MOUNT VHF FM ANTENNA

4.1 INTRODUCTION: The 4 bay VHF FM circularly polarized side mount antenna (Unpressuried) is required for use with FM transmitter of All India Radio for multi frequency as well as single frequency operation in tropical condition of heavy rainfall & high humidity and arid desert regions. Two or more transmitters are likely to be combined/multiplexed and fed to this antenna, therefore, the antenna should be wide -band in the frequency range.

TECHNICAL SPECIFICATION : 4 BAY ANTENNA

SNo.	TECHNICAL PARAMETER	SPECIFICATION	COMMENTS OF TENDERER WITH TECHNICAL DATA / SCHEMATIC DRAWINGS Nos
4.2	**ELECTRICAL PARAMETERS:**		
4.2.1	Polarization	: Circular	
4.2.2	Input impedance	: 50 ohm unbalanced.	
4.2.3	Max. freq. deviation of transmitter.	: $\pm$ 100 KHz.	
4.2..4	Frequency band	: 88 -108 MHz.	
4.2..5	Operating frequency	:Operating frequency shall be intimated at the time of placement of order.	
4.2.6	VSWR	**:** Better than **1.2 : 1** within the operating bandwidth of **fc (carrier /operating frequency) $\pm$ 2.5 MHz.**	
		: VSWR value in graph form over entire VHF FM Band-II range of 88-108 MHz is to be enclosed with tender	
4.2.7	Continuous **Average Power rating**	: $\geq$10 kW.	
4.2.8	Downward beam tilt	: 1.5 deg	
4.2.9	Null filling	: Required, 10%.	
4.2.10	4 bay Antenna Gain	$\geq$ 3.0 dBd (actual value to be indicated the tender).(Gain figure is for each polarization	

		i.e. Horizontal & Vertical and which shall be given by the tenderer separately). Note: (Gain figure is to be submitted in dBd only i.e. with respect to half wave dipole.)	
4.2.11	No. of vertical Bays (Dipoles)	: 4 Nos.	
4.2.12	Spacing between Bays	: 0.7 to 0.8 λ. Actual distance to be indicated in tender, and a drawing to be enclosed	
4.2.13	Radiation pattern :		
4.2.13(i)	Horizontal plane	: The "radiation pattern" should be Omni-directional . **Gain variation** should be ± 1.5 dB in free space. **Expected Gain** of 4 bay antenna system should be **within 3.0 dB from maximum when mounted on tower.** Antennae radiation pattern over **0° to 360°** Vertical & Horizontal vectors are to submitted with the tender by the tenderer. tenderers.	
4.2.13(ii)	Vertical Plane	: Expected pattern for **0° to ± 90°** in vertical plane for Verticals and Horizontal vectors should be submitted with the tender.	
4.2.14	Inter-bay feeding / Feed System	: Full details of Feeding arrangement and the Engineering drawings with dimensions; along-with the details of Inter-connecting RF co-axial foam dielectric cables, fine tunning arrangements etc to be submitted with tender. The entire feeding system should be adequately protected against heavy rainfall, extreme daily temperature variance.	

4.2.15	Lightning protection	: Antenna should be DC grounded. Additional details for complete lightening protection to be provided for Antennae installation . (Items wise details of offered and included material , items & part are to be given by the tenderer)	
4.3	**MECHANICAL DETAILS:**		
4.3.1	Maximum Wind Speed	: 198 km. per Hr.	
4.3.2	External material of Dipoles and rigid feed lines	Exterior of dipoles will be made of stainless steel or hot dip galvanised steel or Marine Brass. Rigid lines with Marine Brass or Copper.	
4.3.3	**Internal material (for Power Divider, Rigid lines & interconnecting feed cables / lines)**	: Inner lines of Dipoles will be of copper, Brass or Aluminium & those of Power Dividers will be of copper or Brass. All electrical contacts will be silver plated. All inners and bullets ---- of connecting head or mating head - will be made of Beryllium copper and silver plated. Insulators will be made of virgin Teflon.	
4.3.4	Ambient Temperature Range / Maximum RH	: - 5º C to 50 º C , : RH 95% NC.	
4.3.5	**Input connector** -- main power divider of antenna system	: To match with 1-5/8" EIA Flange connector, RF output of FM transmitter will be available through the 1-5/8" EIA Flange connector mounted on 1-5/8" RF co-axial foam dielectric cable.	
4.3.6	**Set of clamps**	**:** Suitable clamps for dipoles, Power Divider / Splitter and RF co-axial foam dielectric cables etc. are to be included in the offer and the mechanical details (dimension & materials used etc) be indicated in the tender.	
4.3.7	Antennae System	:The entire Antennae System	

		should be adequately protected against Heavy rainfall & Humid climate of Tropical Region. Each component / Sub system of the Antennae System should be adequately tropicalised for extreme weather conditions . The Antennae system should also be well protected against dust / sand / smog as well as desert conditions of extreme day & night temperature variance.	
4.3.8	Antenna Mounting	:The Antenna will be side mounted on a latticed tower (50 M approximately) having cross-section size of 400 mm x 400 mm. The four (4) dipoles of the FM Antenna will be mounted on a GI / stainless steel pipe (100 mm dia NB), to be fixed on one face of the tower at a distance of 310 mm. Expected field pattern (both horizontal & vertical vectors) with such a supporting tower should be submitted along-with the tender. Details for carrying out field adjustments for ensuring that actual Radiation Pattern (Horizontal and Vertical plane) conform to AIR specification, if any**,** in the field or at site are to be enclosed with the tender.	

SECTION IV ,B-Technical Specification FM Stereo Modulation Monitoring
Instrument including RF amplifier:

4.4 One Set. of FM Stereo Mod Monitor to be used in – tandem with RF amplifier are to be quoted as per technical specification given below.

FM Stereo Modulation Monitoring Instrument including RF amplifier

SNo.	Parameter	Technical Specification	COMMENTS OF TENDERER WITH TECHNICAL DATA / SCHEMATIC DRAWINGS Nos
4.5	**R.F. INPUT:**		
4.5.1	Frequency range	88-108 MHz [To be Tunable to any frequency in VHF FM band 88 Mhz to 108 Mhz].	
4.5.2	Maximum (High level) RF Input	30 dbm, 50 Ohm BNC.	
4.5.3	Nominal Input level	3.5 V p-p, 50 Ohms on BNC.	
4.5.4	AGC range	60 db.	
4.5.5	Sensitivity	100 mv or better.	
4.5.6	Accuracy	$\pm$ 2%	
4.6	**BASEBAND MEASUREMENTS:**		
4.6.1	Modulation frequency	30 Hz - 100 KHz	
4.6.2	Frequency deviation	$\pm$ 75 KHz for 100% modulation.	
4.6.3	Frequency deviation indication	0 to 133%	
4.6.4	Frequency deviation indication accuracy	$\pm$ 2%	
4.6.5	AM noise measurement	To measure AM noise down to 70 db from 100% AM modulation.	
4.6.6	It should provide standard deviation reference and zero deviation for SNR.		
4.6.7	It should provide MPX signal output with:		
4.6.7(i)	Frequency response (30 Hz to 100 KHz)	Better than 0.01 db	
4.6.7(ii)	Harmonic Distortion	Better than 0.01%	
4.6.7(iii)	IMD (SMPTE)	Better than 0.01%	
4.6.7(iv)	SNR	Better than 90 db	

4.7	**STEREO MEASUREMENTS:**		
	It should have 2 semi peak modulation meters for simultaneous monitoring of L & R channels, total modulation and measurements of channel separation, cross talk, S.C. suppression, noise and		

	pilot etc. It should be possible to feed in MPX signal separately.		
4.7.1	Channel separation (L/R or R/L)	Better than 65 db, 30 Hz to 15 KHz	
4.7.2	Cross talk (L+R) to (L-R) or (L-R) to (L+R)	Better than 65 db, 30 Hz to 15 Khz with full range reading as 0 to 90 db.	
4.7.3	Pilot carrier measurement	0.5%, from 7% to 13% injection	
4.7.4	Range indication	0-60 db, auto in 10 db steps	

4.8	**OUTPUT:**		
4.8.1	Level (L & R)	+ 5 dbm, 600 ohms, balanced	
4.8.2	Frequency response	$\pm$ 0.3 db, 30 Hz to 15 KHz	
4.8.3	De-emphasis	50 u sec.	
4.8.4	Signal to noise ratio	80 db	
4.8.5	Harmonic distortion	0.01%	
4.8.6	Inter-modulation distortion (SMPTE)	0.01%	
4.9	**POWER REQUIREMENTS**		
4.9.1	Input power	Single Phase ,230 V(rms) $\pm$ 10%, 50 Hz $\pm$ 4%	

4.10	**GENERAL REQUIREMENTS:**
4.10.1	All RF input and power input cords with suitable connectors are to be provided.
4.10.2	Instrument should be able to be mounted in a standard 19" rack.
4.10.3	All accessories needed for various measurements be quoted.

SECTION IV, **C - TECHNICAL SPECIFICATION - 2.5 KW DUMMY LOAD**

4.11 **2.5 KW Dummy Load, 50 Ohm:** One no. 2.5 KW Dummy Load, 50 Ohm with thru line power meter etc. are to be quoted for transmitter as per technical specification given below including power meter , line section, 1-5/8" EIA flanges, for measuring forward & reflected power along with element 2500 W and 100W including all accessories , cables complete with Adaptor Kit.

4.12 **A thru line power meter** - to be used with 2.5 KW Dummy Load as above - for measuring forwarded & reflected power along with Transducers / Sensing elements are to be are to be quoted as per technical specification given below .

2.5 KW DUMMY LOAD

S.No.	Description	Technical Specification	COMMENTS OF TENDERER WITH TECHNICAL DATA / SCHEMATIC DRAWINGS Nos
4.13	Power Rating	2.5 KW continuous	
4.14	Connector	1-5/8" EIA Flange	
4.15	Frequency Range	88 to 108 MHz	
4.16	VSWR	1.1:1	
4.17	Impedance	50 Ohm	
4.18	Load Coolant	Oil cooled/air cooled	
4.19	AC Power	Single Phase, 230 (rms) volts $\pm$ 10%, 50 Hz $\pm$ 4%	
4.20	Dimensions: (Length x Width x Depth)	To be given by the tenderer	
4.21	Weight:	To be given by the tenderer	

Thru line RF power meter

S.No.	Description	Technical Specification	COMMENTS OF TENDERER WITH TECHNICAL DATA/ SCHEMATIC DRAWINGS Nos
4.22	RF Power Meter Rectangular in housing with FORWARD & REFLECTED switch suitable for mounting in 19" rack including measuring elements, elements sockets and line section for connectivity with the rigid lines of size 1-5/8"complete as required. Forward Power : 2.5 kW Reflected Power: 250 Watt	1 Set	
4.23	Power Rating: Forward Power	2.5 KW continuous	
4.24	Power Rating: Reflected Power	250 Watt	
4.25	Frequency Range	88 to 108 MHz	
4.26	VSWR	1.1:1	
4.27	Impedance	50 Ohm	

4.28	AC Power	Single Phase, 230 (rms) volts ± 10%, 50 Hz ± 4%	
4.29	Dimensions: (Length x Width x Depth)	To be given by the tenderer	
4.30	Weight:	To be given by the tenderer	
4.31	Dimensions: (Length x Width x Depth)	To be given by the tenderer	

SECTION IV, D- TECHNICAL SPECIFICATION
MOTORISED RF COAXIAL CHANGE OVER SWITCH

4.32 Motorized RF co-axial Changeover switch , Single Phase, 230 (rms) volts ± 10% 50 Hz ± 4%,1-5/8" including control panel with port & matching flanges for connecting rigid line are to be quoted as per technical specification given below. The switching will be carried out through above motorized RF coaxial relay / switch.

S.No.	Description	TECHNICAL SPECIFICATION	COMMENTS OF TENDERER WITH TECHNICAL DATA / SCHEMATIC DRAWINGS Nos
4.33	Connector	1-5/8", EIA male	
4.34	Frequency Range	88 to 108 MHz	
4.35	Impedance	50 ohm	
4.36	VSWR	1.05:1	
4.37	Power Supply	Single Phase, 230 (rms) volts ± 10%, 50 Hz ± 4%	
4.38	Control Voltage	Single Phase, 230 (rms) volts ± 10%, 50 Hz ± 4%	
4.39	Isolation	≥ 55dB	
4.40	No. of Ports	4	
4.41	Dimensions: (Length x Width x Depth)	To be given by the tenderer	
4.42	Weight:	To be given by the tenderer	
4.43	Control panel with port & matching flanges for connecting rigid line	Suitable for above Motorized RF co-axial Changeover switch.	
4.44	Average Power Handling Capacity	≥ 5 kW	

SECTION IV , E-TECHNICAL SPECIFICATION - RF COAXIAL CABLE

4.45 Transmitter power will be fed to the Antenna System by an internal 1-5/8" copper rigid line and then an external 1-5/8" foam dielectric RF Coaxial cable .

4.46 RF COAXIAL CABLE : RF coaxial foam di-electric, Feeder Cable of size (Nominal) 1-5/8" as per technical specification given below;

4.47 Actual Cable length will be intimated at the time of order however feeder cable length may be considered as tentative as given in AIR Specification.

4.48 All accessories associated with Feeder cable are to be Offered as per details given in SECTION-V(A).

SNo.	Technical Parameter	TECHNICAL SPECIFICATION	**COMMENTS OF TENDERER WITH TECHNICAL DATA / SCHEMATIC DRAWINGS Nos**
4.49	Attenuation (100MHz)	≤ 0.7dB / 100M	
4.50	VSWR	≤ 1.1:1.0	
4.51	Impedance	50 Ohm	
4.52	Frequency Range	88-108 MHz	
4.53	Average power (100 MHz) at 40° C	≥ 10 kW	

SECTION IV, F-TECHNICAL SPECIFICATION - RF COAXIAL RIGID LINES

4.54 Transmitter power will be fed to the Antenna System by an internal 1-5/8" copper rigid line and then an external 1-5/8" foam dielectric RF Coaxial cable.

4.55 Following are the Technical Specification of RF co-axial Rigid lines (50 Ohm): All accessories associated with are to be Offered as per RF co-axial Rigid lines details given in SECTION-V(A).

SNo.	Technical Parameter	TECHNICAL SPECIFICATION	**COMMENTS OF TENDERER WITH TECHNICAL DATA / SCHEMATIC DRAWINGS Nos**
4.56	Size	1-5/8”	
4.57	VSWR	1.05:1.0	
4.58	Attenuation (100 MHz)	≤ 0.60 dB/100M	
4.59	Ambient temperature	40°C	
4.60	Inner Conductor Temp.	≥ 100°C	
4.61	Frequency Range	88-108 MHz	
4.62	Impedance	50 Ohm	

SECTION V(A) : SCHEDULE OF REQUIREMENTS / MATERIALS (UN PRICED) FOR ONE SET OF TRANSMITTER & ASSOCIATED EQUIPMENT)

S NO.	Description	Qty
5.1	1 kW **Solid State technology** VHF FM Transmitter, capable of giving ≥ **1 KW** Continuous power, including two nos. of Exciters; complete as per AIR Specification no: 1 KW FM TX/1/September/ 2006/ -D(TD/FM)	1 Set Complete
5.2	Complete installation material RF Coaxial rigid lines as given below for each set of transmitter such as rigid lines, elbows, unions & matching reducers, wherever necessary to complete the installation for feeding to the Antenna & Dummy Load as per specification in Section -IV	
5.2.1	1-5/8" to 7/8" reducer / adaptor	2 nos.
5.2.2	1- 5/8" rigid line	12 M
5.2.3	1-5/8" elbows with inner & bullets	8 nos.
5.2.4	1-5/8" couplings with inner & bullets	10 nos.
5.2.5	1-5/8" to N Test Reducer	1 no.
5.3	2.5 KW Dummy Load, 50 Ohm ,1-5/8" EIA flanges including thru line power meter for measuring forward & reflected power along with element 2500 W and 250 W including all accessories , cables complete with Adopter Kit as per specification in SECTION -IV.	1 set complete
5.3.1	Spare resistance of Dummy Load.	1 No.
5.4	1-5/8" RF Feeder Cable – along with 1-5/8" EIA flange connectors on both ends as per specification in Section IV. (cable length 75 meters. Exact length will be intimated at the time of placement of order) along with following accessories as per Specification.	75M
5.4.1	hoisting stockings	1 Set Complete
5.4.2	earthing kits{ 3Nos}	1 Set Complete
5.4.3	wall gland [Wall / Roof Feed Thrue Assembly along with Cable Entry Boot, Entry Port & Adaptor Plate etc.)	1 Set Complete
5.4.4	cable clamps with nut, bolt washer (adjustable width). 75 Nos	1 Set Complete
5.5	Motorized RF co-axial Changeover switch 1-5/8" including control panel with port & matching flanges for connecting rigid line similar as per specification .	1 Set complete

5.6	FM Stereo Mod Monitor to be **used in – tandem** with RF amplifier as per specification .	1 Set complete
5.7	4 bay VHF FM Circularly polarized antenna including antenna input main RF power divider /splitter **,** main branch RF co-axial feeder cables, sub power dividers / splitters, distributors RF co-axial foam dielectric feeder cables, all the dipole elements of the 4 bay VHF FM antenna, fine tuning arrangement etc. as per design of manufacturer complete as required as per AIR Specification.	1 Set Complete
5.8	Any other item / accessories for equipment/items at SNo. 5.1 to 5.7 offered, for the completeness of the system . Items wise details (including part number, if any) are to be given by the tenderer)	1 Set
5.9	Inspection charges at manufacturer's works of Transmitter, Auxiliary Equipment & Accessories as per AIR specification.	1 No.
5.10	Technical manuals for Installation, commissioning , Operation & Maintenance, including Theory of operation and fault diagnosis printed and duly bound for 1 kW VHF FM transmitter, 2.5 KW Dummy Load and thru line power meter etc.,1-5/8" RF Cable, RF Coaxial rigid lines, Motorized RF co-axial Changeover switch ,FM Stereo Mod Monitor to be used in – tandem with RF amplifier, 4 bay VHF FM antenna etc. - along with one soft copy on CD.	
5.10.1	As per 5.10 as above for DE (Proj.) P&D Unit, DG:AIR { Within Two Months of Supply order) (irrespective of number of transmitter ordered)	1 set
5.10.2	As per 5.10 as above for For each Consignee { Within Two Months of Supply order). **For each Consignee**.	2 Sets
5.10.3	As per 5.10 as above for the following officers: following 6 nos of Technical manuals are to be supplied) { To be supplied along with the equipment}. (irrespective of number of transmitter ordered)	6 sets
	(i) DE (Proj.),P&D Unit, DG:AIR - 1 set	
	(ii) Zonal Office (Project Wing) - 1set	
	(iii) Zonal Office (Maintenance Wing) - 1 set	
	(iv) DE(Transmitter Maintenance), DG:AIR - 1 set	
	(v) Technical Library, P&D Unit, DG:AIR - 1 set	
	(vi) Staff Training Institute (Technical) - 1 set	
	Total - 6 sets One Soft copy on CD for DE(Proj), P & D Unit, DG AIR	

SECTION V(B) :

SCHEDULE OF REQUIREMENTS / MATERIALS UNPRICED)

(OPTIONAL) AND **THESE WILL NOT BE CONSIDERED FOR RANKING PURPOSE**)

FOR ONE SET OF TRANSMITTER & ASSOCIATED EQUIPMENT)

S NO.	Description	Qty
5.11	Training Charges at one AIR site for AIR engineers (12 persons) for transmitter for 5 working days . (irrespective of number of transmitter ordered) (Optional)	1 No.
5.12	List of recommended spares and any other accessories. (Items wise details of offered material , items & part are to be given by the tenderer). In case of kits, full item wise details of kits are to be provided. Tenderer shall quote the rate / cost of individual items/unit/spares in the tender offer while submitting the offer for spares. (Optional)	
5.12.1	Recommended Spares for One set of transmitter **:** as per specification(Optional)	1 Set complete
5.12.2	Recommended Spares for 2.5 kW Dummy Load and thru line power meter etc. (Optional)	1 Set complete
5.12.3	Spare Dummy load element, 2500 W(Optional)	1 No.
5.12.4	Spare Dummy load element, 250 W(Optional)	1 No.
5.12.5	Recommended Spares for 1-5/8" RF Feeder Cable(Optional)	1 Set complete
5.12.6	Recommended Spares for RF Coaxial rigid lines(Optional)	1 Set complete
5.12.7	Recommended Spares for Motorised RF Coaxial change over Switch (Optional)	1 Set complete
5.12.8	Recommended Spares for FM Stereo Mod Monitor to be used in – tandem with RF amplifier as per specification . (Optional)	1 Set complete
5.12.9	Recommended Spares for 4 bay VHF FM Circularly polarized antenna (Optional)	1 Set complete
5.13	Remote Control & Telemetry Equipment for a distant/centralized location via TCP-IP / PSTN network as per Section -II and Section-III (Optional)	
5.13.1	General Purpose PC complete as required	2 Sets
5.13.2	Remote Control System complete as required	1 Set
5.13.3	Wiring Interface Unit	1 Set
5.13.4	Dial line Suppressor	1Set
5.13.5	External Modems	2 Sets
5.13.6	Complete software, hardware items, accessories, single/ multi core cables, connectors, Humidity/temperature transducer, 2/3 Core Shielded Teflon cable , Extension	1 Set

	cables etc. (Items wise details of offered and included material , items & part are to be given by the tenderer)	
5.13.7	Any other accessories offered for the completeness of the system (Items wise details of offered and included material , items & part are to be given by the tenderer)	1 lot

ANNEXURE-I : INSPECTION DETAILS

The inspection for acceptance of the Transmitter, Auxiliary Equipment & accessories will be carried out at the Works of the Manufacturer in accordance with Acceptance Test Procedure/Protocol (ATP). All facilities like complete set of measuring instruments, power supply, manual assistance, etc. will be provided by the supplier. Complete details and specifications of the Transmitter, Auxiliary Equipment & accessories will be checked and all parameter values will be measured.

The complete Acceptance Test Procedure/Protocol (ATP) will be prepared by the manufacturer and submitted to Director Engineering (Proj.), P&D Unit, DG: AIR for approval. This Procedure after modification (if required during the process of approval) shall form the basis for Performance / Inspection Tests to be carried out. ATP will also indicate full details of set up for measuring / testing equipment to be deployed during the Performance Measurement/ Inspection Test at factory.

Testing , measurements and operation checking of the Transmitter, Auxiliary Equipment & accessories will be carried out direct at above single phase , 230 Volts(rms) ± 10%, 50 Hz ± 4% at the Transmitters's input circuit breaker , without any outside transformer unit etc at any three frequencies in the VHF band, 88 to 108 MHz with out tuning. No other voltage will be acceptable to AIR at the Transmitters's input circuit breaker .

The technical facilities/ equipment for varying within ± 10% of single phase 230(rms) should be available at manufactures's works for Testing , measurements and operation checking of the Transmitter, Auxiliary Equipment & accessories during the inspection.

The performance of transmitter as per parmeters in Section-III shall be guaranteed without degradation with the given power supply tolerances.

Complete set of instruments will be made available in advance and the list of these measuring instruments along with their set ups may be forwarded along with the Tender.

Tenderer shall arrange for the photographs of inside of Transmitter's cubicle , Auxiliary Equipment & accessories etc. which will be attached with the ATP/Inspection report.

Exhaustive checking's/measurements will be carried out so as to completely check the compliance of the Transmitter and its sub systems, other items & the accessories with the requirements as projected in the specifications.

It is mandatory that all these testing and measurements i. e. Operation checking of the Transmitter, Auxiliary Equipment & accessories and measurements at any three frequencies in the VHF band, 88 to 108 MHz without tuning, are carried out well in advance .

These must also be submitted to All India Radio alongwith the call for inspection of Transmitter, Auxiliary Equipment & accessories well in advance for analyzing etc. Each Transmitter will be tested for "heat run" for at least 24 hours of continuous operation on full rated power output.

These measurements details, graphical printout notes and figures must be available, at the factory at the time of inspection.

Following information should also form part of above data which will also be checked for each Tx during inspection by indenter's representative **at manufacturer's works :-**

A-1.0 Make , type , model no and country of origin & name all units of Transmitter, other items & the accessories, and spares.

A-2.0 Dimension of Transmitter rack , Sub-Units and Accessories, other items & the accessories .

A-3.0 Working/operation of all Sub-Units and Accessories.

A-4.0 System configuration check and completeness of Transmitter.

A-5.0 Automatic changeover of Exciter and IPA (if applicable)etc.

A-6.0 Working of Transmitter units after removing them outside the Transmitter rack.

A-7.0 Checking meter readings and calibration.

A-8.0 Measurements of all parameters as per . All the parameters will be measured on any 3 different frequencies in VHF FM band.

A-9.0 Checking of control and protection system of Transmitter.

A-10.0 Checking of all power levels, meters, LEDs etc.

A-11.0 Checking of RF voltages on test points.

A-12.0 .Inter-changeability of PAs, sub-modules and PCBs .

A-13.0 Exciter operation, checking and measurements.

A-14.0 Working of Exciter in all mode as per Specification including Modulating inputs as per specification :

A-15.0 Measurement of levels in the whole AF and RF chain.

A-16.0 Checking of all spares, PCB's, modules for the respective transmitter, other items & the accessories .

A-17.0 Measurements of all parameters as per specification. All the parameters will be measured in respect of other items & the accessories