

PRASAR BHARATI
(India's Public Service Broadcaster)
DIRECTORATE GENERAL: ALL INDIA RADIO
(PLANNING & DEVELOPMENT UNIT)

SPECIFICATIONS

for

Supply, Erection, Testing and Commissioning (SETC) of 100 W Digital Compatible VHF FM Solid-State MOSFET Technology Based Broadcast Transmitter in (1+1) configuration alongwith VHF FM Antenna, RF coaxial foam dielectric cable, U-NMS and other associated equipments/items

INTRODUCTION

This Specification is for Supply, Erection, Testing, and Commissioning (SETC) of 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration alongwith VHF FM Antenna, RF coaxial foam dielectric cable, U-NMS and other associated equipments/items to be installed at various sites in AIR network.

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A. ESSENTIAL REQUIREMENTS FOR TENDERERS:

1. (i) The tenderer should submit Schedule of Requirements/Materials (un-priced) for SETC *in the same format as given in Section-I* of AIR Specifications in the technical bid, failing which, the tender shall be considered incomplete and is liable to be rejected.

(ii) It is also mandatory to mention *Make & Model of the offered equipment* in the Schedule of Requirements/Materials of Supply, failing which, the tender shall be considered incomplete and is liable to be rejected.
2. Each statement of this specifications has to be complied with & supported by printed technical literature, technical data sheets, schematic drawings and technical manuals from the manufacturer of the equipment by the tenderer, to assess the full merit of the offer, without which tender will be considered incomplete and is liable to be rejected.
3. The tenderer should submit the tender offer to AIR in the format given below, section wise & clause wise, in respect of all the sections of technical specifications. The OEM/tenderer must provide the page number reference, in column (4) of the table given below, of the technical bid clearly indicating the volume number also, if any, for each supporting document to verify the parametric values shown in the compliance statement, to assess the full merit of the offer, failing which the tender shall be considered incomplete and is liable to be rejected.

S. No. of AIR Specifications (Section wise & Clause wise) (1)	Details of AIR Specifications (Part/ Section wise & Clause wise) (2)	Compliance (Yes/No) (3)	The page no. of the tender offer, where the information/ supporting document is available (4)	Remarks (5)
Section-I Clause wise				
Section-II Clause wise				
Section-III Clause wise				
Section-IV Clause wise				
Section-V Clause wise				

4. The tenderer should quote the rate/cost of individual items in the tender offer while submitting the offer for spares (**OPTIONAL**) in commercial bid.
5. The complete technical specifications (Section wise & Clause wise) compliance statement along with Schedule of Requirements/Materials (un-priced) must be signed & stamped on each page by the respective Original Equipment Manufacturer (OEM) in the tender document including the clarifications, if any, asked by AIR, failing which the tender shall be considered incomplete and is liable to be rejected.

In case tender offer is from other than the Original Equipment Manufacturer, the tenderer must also sign & stamp each page of the complete Technical specifications compliance statement (Section wise & Clause wise) including the clarifications, if any, asked by AIR, failing which the tender shall be considered incomplete and is liable to be rejected. The OEM & tenderer should mention their name in CAPITAL LETTERS & designation of the signatories, full address with pin code, phone number, fax number, e-mail addresses etc.

6. All the volumes of the entire technical bid must be page numbered.
7. The authorization and guarantee must be given by respective Original Equipment Manufacturer (OEM) on their letter head pad duly signed & stamped on each page. In case tender offer is from other than the Original Equipment Manufacturer, the tenderer must also give guarantee on their letter head pad duly signed & stamped on each page, failing which the tender shall be considered incomplete and is liable to be rejected without any notice/back reference. Guarantee shall be as per the format given in clause 2.5 of Section-I.
8. In case tender offer is from other than the Original Equipment Manufacturer, the tenderer should also furnish a certificate from the OEM that the tenderer can quote items of the OEM directly, failing which the tender shall be considered incomplete and is liable to be rejected without any notice/back reference.
9. Public Procurement (Preference to Make in India) Order No. P-45021/2/2017-B.E-II dated 15.06.2017 of Government of India, Ministry of Commerce and Industry, Department of Industrial Policy and Promotion shall be applicable.
10. Any change in the AIR technical specifications format or language or in parameters or of any other nature including the deletion of technical specifications clause, words, lines in the technical specifications compliance statement by the OEM/ tenderer will not be acceptable to AIR and the tender is liable to be rejected.
11. Optional items will not be considered for ranking purpose.

A. ESSENTIAL ELIGIBILITY CRITERIA FOR TENDERERS:

- (a) The tenderer should either be the OEM of VHF FM transmitter or their authorized representative/dealer.
- (b) (i) The OEM of the transmitter must have an experience of manufacturing and supplying VHF FM transmitters of not less than 100 W power output for at least last 10 years. Documentary evidence to support this must be provided.
 (ii) The OEM should have supplied VHF FM transmitters to reputed/public broadcasters. The OEM must provide the details of past supply record **in the format given below** for last five years ending last day of the month previous to the one in which the tender is invited, for at least 25 Nos. of **quoted model of the offered VHF FM transmitters.**

Order No. with date, reference	Transmitter Type, Model and Transmitter Power Output	Qty.	Name of the broadcaster with full postal address including e-mail address to whom transmitter was supplied, for getting feedback on transmitter performance	Remarks
(1)	(2)	(3)	(4)	(5)

(iii) All India Radio reserves the right to get performance feedback of the transmitters from any of the above broadcasters named by the tenderer/OEM.

(iv) Copies of orders for supply and actual performance certificates of at least 15 Nos., out of the 25 Nos. of **100 Watt VHF FM transmitters** submitted by the tenderer in above format, are also to be enclosed by the tenderer.

- (c) In case the tenderer is the authorized representative/dealer, it must be in the business of sales and supply of VHF FM transmitters/TV transmitters of power not less than 100 W, for last three years or more. Documentary evidence to support this must be provided.
- (d) The OEM of the offered VHF FM transmitter must have his local office/authorized representative/dealer in India only for after sales support. **A certificate** in this regard duly signed by the OEM, on their letterhead **as per Annexure-II** including copy of Agreement/MoU in this regard between OEMs and their local representative/dealer **and signed by both** must be submitted with the offer.
- (e) The local office/authorized representative/dealer will be the nodal point for resolving issues related to after sales support. It is the responsibility of local office/authorized representative/dealer to arrange the repair/replacement of faulty items. Any module of transmitter or other equipment requiring repairs will be repaired at site. If it is not feasible to repair the module at site, the same will be collected from the site by local office/authorized representative/dealer that will arrange repairs locally. The cost of transportation, repairs etc. shall be borne by the tenderer during the guarantee period.
- (f) After sales support for the repairs/maintenance of transmitter system after the completion of guarantee period, shall also be provided by the respective OEM of the transmitter and other associated equipments through their representatives/dealers in India.
- (g) The OEM should have complete setup for maintenance/repair of the transmitter in India, either of its own or through authorized service provider.
- (h) The details of technical facilities in the local after sales support office, such as test bench, necessary test & measuring equipment and photographs thereof, must be provided in the technical bid.
- (i) AIR representatives may visit the works of local authorized representative/dealer of OEM in India to ensure/verify that adequate technical infrastructure is available for after sales service for timely resolving the issues related to attending/replacing the equipments. Tenders from the tenderers who failed to meet these criteria shall be considered incomplete and is liable to be rejected without any notice/back reference.

SECTION-I

Schedule of Requirements/Materials (un-priced) for SETC of 100 W Digital Compatible VHF FM Solid-State MOSFET Technology Based Broadcast Transmitter in (1+1) Configuration alongwith VHF FM Antenna, RF coaxial foam dielectric cable and other associated equipments/items **for ONE SET**

- 1.1** All India Radio is interested to procure on SETC basis 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration alongwith VHF FM Antenna, RF coaxial foam dielectric cable and other associated equipments/items at various places. These 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter units will be as per the specifications of AIR. The transmitters should be rugged, reliable and stable in operation under Indian tropical condition.
- 1.2** The FM Transmitter Units are to be supplied as “complete system” including, cooling system (air cooled with built-in fan unit), Automatic Changeover Unit (ACU), UPS, PDP (Power Distribution Panel), interconnecting cables, installation materials etc. as per the Schedule of Requirements/Materials for SETC (un-priced) in Para 1.6, below.
- 1.3** It will be the responsibility of the tenderer to ensure that the system is complete in all respects.
- 1.4** A detailed block schematic diagram for the entire FM Transmitter system in (1+1) configuration with all its constituent items should be provided with the offer.
- 1.5** The layout of the various equipments in the Transmitter cum Programmer Input Equipment Rack as per AIR Specification should be provided with the offer.

1.6 SCHEDULE OF REQUIREMENTS/MATERIALS (UN-PRICED) FOR SETC ONE SET OF TRANSMITTER & ASSOCIATED EQUIPMENTS/ITEMS

{The tenderer must quote all items}

Tenderer should quote the rate/cost of individual items/units/job in the tender offer while submitting the offer.

(I) SUPPLY AT SITE:

S. No.	Description	Make	Model	Qty.
1.	Supply of 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration including in-built Exciter, Stereo Coder with Automatic Changeover Unit (ACU) alongwith remote control & telemetry equipment as per AIR specification. (Each Set shall comprise of 2 Nos. of independent 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter Units and Automatic Changeover Unit)			1 Set Complete
2.	(i) Supply of RF coaxial foam dielectric cable with connector at the one end suitable for connecting to Transmitter Output and with 7/8" EIA flange connector fitted at other end of the cable (with Bullets (inners) for 7/8" EIA Flange Connectors, ‘O’ rings, nuts, bolts etc.) for connecting to antenna system and hoisting stockings (As per RF cable manufacturer’s recommendations) as per AIR specification for each place. (Rate per Unit length to be quoted and exact length may increase or decrease depending upon the site requirement)			70 M*

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	*(For ranking purpose)			
	(ii) Earthing kit (3 Nos. of earthing kits for one cable)			1× 3 Nos.
	(iii) Wall gland/feed through assembly with accessories			1 Number
	(iv) Cable clamps with nuts, bolts, washers (adjustable height) and associated accessories. Actual No. of Sets may increase or decrease depending upon the length of RF cable. *(For ranking purpose)			70 Sets*
	(v) Any other accessories offered for the completeness of the system.			1 Lot
3.	Supply of 250 Watt Dummy Load mounted in Transmitter cum Programme Input Equipment Rack with suitable RF coaxial foam dielectric cable			1 Set complete
4.	Supply of 2-Bay Vertically Polarized Side Mount VHF FM Antenna system including power divider, branch feeder cables, connectors, clamps for mounting dipoles etc., as per AIR specification with complete installation material and mounting fixtures. All the required hardware for mounting of the antenna including Antenna Supporting Interface on which the antenna will be mounted shall be supplied along with the Antenna system.			1 Set complete
5.	Supply of 1 kVA Online Uninterrupted Power Supply {UPS} system in (1+1) hot standby mode alongwith VRLA {Sealed Maintenance Free (SMF)} batteries for 30 Minute backup (at full load of 1 kVA), necessary power cables and mounted in Transmitter cum Programme Input Equipment Rack as per AIR specification.			1 Set complete
6.	Supply of Transmitter cum Programme Input Equipment Rack: This rack shall house 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration along with ACU, UPS, Dummy load and shall have two numbers of Stereo Jack Strip/Audio Patch Panel for Analog audio signals and two numbers of Stereo Jack Strip/Audio Patch Panel for AES/EBU signal inputs and suitable connectors for SCA, RDS/DARC inputs. Programme Input Equipment Rack shall be provided with cable trays, wiring, necessary modulating inputs level controls in steps, repeat coils, tag blocks, terminal strips, BNC connectors, facility to measure/monitor levels at various points in the programme chain with a dual VU(PPM) meter and a selector switch and bar graph display, Ampli-speakers (two numbers) with mounting arrangement, Analogue Stereo Distribution Amplifier, Digital Distribution Amplifier, ventilation arrangement including accessories complete as per AIR specifications.			1 Set complete
7.	Materials for 2 Nos. of independent earth will be provided by the tenderer/ OEM as per drawing No. TM-16599 for connecting cable earthing Kit at the entrance of the transmitter hall and transmitter rack. Both earth shall be interconnected by copper strip and extended separately through copper strip to grounding terminal (station reference ground) in transmitter hall from where transmitter rack and cable earthing kit shall be connected. <i>The earth resistance of the earthing shall be less than 1 ohm.</i>			1 Job
8.	Technical manuals for Installation, Testing, Commissioning, Operation & Maintenance, including Theory of operation and fault diagnosis, printed and duly bound, for 100 W Digital			

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	Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1), Automatic Changeover Unit (ACU), 250W Dummy Load, 1kVA UPS, 2-Bay Vertically Polarized Side Mount VHF FM Antenna, RF coaxial foam dielectric cable, Transmitter cum Programme Input Equipment Rack, Remote Control & telemetry System etc. alongwith one soft copy on CD & Inspection Report of the inspection carried out at the tenderer's System Integrator's Works as per distribution given below.			
(i)	For DDG (E-FM), P & D Unit, DG: AIR, New Delhi-110001 {Within One Month of issue of Acceptance of Tender} (irrespective of number of transmitters to be ordered)			1 Set
(ii)	For Consignee {To be supplied along with the equipment}			2 Sets
(iii)	For the following Offices/Officers, Technical manuals are to be supplied along with the equipment as per distribution given below) (irrespective of number of transmitters to be ordered)			13 Sets
	(i) DDG (E-FM), P&D Unit, DG:AIR - 1 Set			
	(ii) Zonal Offices (Project Wing) - 4 Sets			
	(iii) Zonal Offices (Maintenance Wing) - 4 Sets			
	(iv) DDG (E-TM), DG: AIR -1 Set			
	(v) Technical Library, P&D Unit, DG:AIR -1 Set			
	(vi) NABM (T), New Delhi -1 Set			
	(vii) DDG (E-R&D), DG: AIR -1 Set			
	Total - 13 Sets			
9.	Any other item/accessories offered for the completeness of the system (Items wise details of offered and included material with part numbers, if any, are to be given by the tenderer)			1 Lot
Total of Supply (A)				

(II) WORKS:

S. No.	Description	Qty.	Unit
1.	Erection, Testing and Commissioning of 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration including Auto Changeover Unit(ACU), 250W Dummy Load, 2-Bay VHF FM Antenna on the existing tower (after unpacking, physical checking/ necessary care for the safety of the Antenna system like cleaning etc. at site before erection in accordance with the Erection manual of the manufacturer), RF coaxial foam dielectric cable, Transmitter cum Programme Input Equipment Rack complete, 1kVA UPS and other associated equipments/items as per specification.	1 Job	Job
2.	Inspection at System Integrator's Works. The tenderer is required to clearly mention the name of place of System Integrator's Works.	-	-
	(i) For Lot-I	1 Job	Job
	(ii) For Lot-II	1 Job	Job
	(iii) For Lot-III	1 Job	Job
3.	Erection, testing & commissioning of 2 Nos. of independent earth will be provided by the tenderer/ OEM as per drawing No. TM-16599 for connecting cable earthing Kit at the entrance of the transmitter hall and transmitter rack. Both earth shall be interconnected by copper strip and extended separately through copper strip to grounding terminal (station reference ground) in transmitter hall	1 Job	Job

	from where transmitter rack and cable earthing kit shall be connected. <i>The earth resistance of the earthing shall be less than 1 ohm.</i>		
4.	Any other works required for the completion of SETC. Break up details of work are to be given by the tenderer.	1 Job	Job
Total of Works (B)			

SCHEDULE OF REQUIREMENTS/MATERIALS (UN-PRICED) (SPARE) (OPTIONAL)

These will not be considered for ranking purpose

{The tenderer must quote all items}

Tenderer should quote the rate/cost of individual items/unit/spares in the tender offer while submitting the offer for spares

S. No.	Description	Make	Model	Qty.
	Recommended spares for one set of transmitter & associated equipments: State NA, if not applicable			
1.	100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter including in-built Exciter as per AIR specifications (One Set)			1 Set Complete
2.	Remote Control & Telemetry Equipment			1 Set Complete
3.	Power Supply modules of transmitter			1 Set
4.	Automatic Changeover Unit (ACU)			1 Set
5.	Synthesizer module			1 Set
6.	Power amplifier module			1 Set
7.	Display Board			1 Set
8.	Monitor Board			1 Set

1.7 The following are excluded from the scope and will be provided by AIR:

- (a) Construction of necessary buildings, all masonry works and materials connected therewith, masonry foundations, Cable trenches and under floor ducts (Dimensions for which are to be furnished by the Transmitter supplier), if any.
- (b) Power supply connection for the transmitting equipment, at a single point.
- (c) Tower for mounting Antenna.
- (d) Cable tray, if required.
- (e) Furniture and fittings not forming a part of the transmitter equipment.

SECTION-II

2.1 GENERAL TERMS AND CONDITIONS

2.1.1 LANGUAGE/ UNITS:

All information supplied by the tenderer and all markings, notes, designation on the drawings and associated write-ups including Instruction Manuals 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.

2.1.2 INFORMATION TO BE SUPPLIED WITH THE TENDER:

- 1.4.1.** The complete technical specifications (Section wise & Clause wise) compliance statement alongwith Schedule of Requirements/Materials (un-priced) duly signed & stamped on each page by the respective Original Equipment Manufacturer (OEM) and countersigned by the tenderer as per the format given above in clause A (3), to assess the full merit of the offer, without which the tender offer will be considered incomplete and is liable for rejection.
- 1.4.2.** Complete printed technical literature/technical data sheet/schematic drawings/detailed information including Technical Manual of transmitter and associated equipments/items as per Schedule of Requirements/Materials (un-priced) from the respective Original Equipment Manufacturer (OEM) in support of compliance statement should be furnished, to assess the full merit of the offer, without which the tender offer will be considered incomplete and is liable for rejection.
- 1.4.3.** Detailed Schedule of Requirements/Materials (un-priced) for SETC of the transmitter, associated equipments & accessories for each transmitter should be in conformity with Section-I without any change in the format, failing which the tender will be considered incomplete and is liable for rejection. The tenderer must quote all items.
- 1.4.4.** Descriptive information and complete details of each equipment offered shall be given by the tenderer.
- 1.4.5.** Country of Origin, Make, Type & Model of all the offered items should be mentioned including the name & address of their vendors.
- 1.4.6.** The performance figures of the offered equipment/items must be given by the tenderer, to assess the merit of the offer, without which the tender will be considered incomplete and is liable to be rejected.
- 1.4.7.** A copy of the Installation Manual, Operation and Maintenance Manual must be enclosed with technical bid for assessing the transmitter system. The Installation Manual and the Operation & Maintenance Manual must include at least the details given below:
 - (a) The Installation Manual must describe the following information:**
 - (i)** A suggestive floor equipment layout plan drawing with dimensions in metres for installation of the VHF FM transmitter system in a transmitter hall with all allied equipments.

- (ii) Diagrams showing the isometric view of VHF FM transmitter and allied equipments with dimensions in metres are to be provided.
 - (iii) All installation drawings with dimensions in respect of supplied equipments are to be provided.
 - (iv) All mechanical assembly drawings of the VHF FM transmitter system with dimensions are to be provided.
 - (v) All the views, i.e. front, rear, top and side (open) of the VHF FM transmitter with dimensions are to be provided.
 - (vi) The details of unpacking are to be provided.
 - (vii) A detailed write up in English regarding installation of VHF FM transmitter system along with its associated equipments/items should be provided.
 - (viii) All *Do's and Don'ts* which are essential for safe installation of the transmitter system should be described.
 - (ix) An inter-wiring diagram for all transmitter units/modules installed in the transmitter rack, input/output to transmitter and interlocks with external units and accessories like dummy load, changeover switches, patch panel etc. which are wired in the transmitter interlocks.
- (b) Operation and Maintenance Manual must describe the following:**
- (i) General description of the offered VHF FM transmitter, transmitter block diagram/schematic drawings indicating the details of different blocks, modules and redundancy incorporated in transmitter and its subsystems.
 - (ii) General description and structural overview of the transmitter racks indicating the position of different modules, units, power distribution etc., front, rear, top & side (open) views with dimensions.
 - (iii) Colour Photographs of transmitter showing the following:
 - (a) Front view of the transmitter
 - (b) Rear view of the transmitter
 - (c) Top view of the transmitter
 - (iv) Screen shots of various display screens showing monitorable and measurable parameters of transmitter.
 - (v) A detailed description with all relevant circuit diagrams of the transmitter should be provided with details of test points.
 - (vi) The details of all electrical circuits in various stages of the transmitter used along with their write-ups.
 - (vii) General description of RF signal flow diagram for complete RF chain from exciter to filter output with information about power level at input & output of each stage.
 - (viii) Description of protections under abnormal conditions and schematic drawing indicating interconnections to different external units and accessories like dummy load, changeover switches, patch panel etc. which are wired in the transmitter rack.
 - (ix) Details and schematic drawings of remote control & telemetry system along with screen shots of the interface displays. The remotely monitorable and controllable parameters of the transmitter should be clearly indicated.
 - (x) General description of transmitter Control System and schematic drawings for control signal distribution.
 - (xi) Description of protection mechanism against high VSWR, overload, high temperature of the transmitter.
 - (xii) Description of VSWR/temperature foldback along with range of foldback. The explanation of foldback with the help of circuit diagram must also be provided.

- (xiii) Description of various interfaces, connectors, connecting cables and accessories used in the VHF FM transmitter.
- (xiv) A complete list of all parts/transistors/ICs/Components used in the transmitter must be provided.
- (xv) The make and number of LDMOS/MOS devices used in the VHF FM transmitter.
- (xvi) Technical data sheet of LDMOS/MOS devices used in the VHF FM transmitter.
- (xvii) Procedure for changing the frequency of operation of the transmitter.
- (xviii) All *Do's and Don'ts* which are essential for safe Operation & Maintenance of the transmitter should be described.
- (xix) The detailed procedure for trouble shooting of the VHF FM transmitter preferably up to component level should be described.
- (xx) The systematic trouble shooting/fault tree and flow diagram should be provided for diagnosis of the faults with their remedial measures.
- (xxi) The maintenance schedule for the transmitter should also be described.
- (xxii) General description of electrical power distribution and schematic drawings of power supply system used for the transmitter system.

2.1.3 INFORMATION TO BE SUPPLIED BY THE TENDERER WITHIN ONE MONTH AFTER ISSUE OF ACCEPTANCE OF TENDER:

One Set of **Technical manuals** {for Installation, Testing, Commissioning, Operation & Maintenance, including Theory of operation and fault diagnosis}, **COLOUR PRINTED** and duly bound, for 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter (1+1), automatic change over unit, 250W Dummy Load, UPS, 2-Bay VHF FM side mount antenna, RF coaxial foam dielectric cable, Transmitter cum Programme Input Equipment Rack, Remote Control & Telemetry System etc. alongwith one soft copy on CD} shall be supplied to "The DDG (E-FM), P & D Unit, DG: AIR, New Delhi-110001".

2.1.4 INFORMATION TO PRECEDE DESPATCH OF EQUIPMENT:

Following information should be supplied to The DDG (E-FM), P & D Unit, DG: AIR and each of the consignees prior to dispatch of equipment:

- a) Detailed list of equipments under dispatch.
- b) Photograph showing location of various units/subunits with item numbers marked thereon.

2.1.5 INFORMATION TO BE SUPPLIED ALONGWITH EQUIPMENT:

Technical manuals {for Installation, Testing, Commissioning, Operation & Maintenance, including Theory of operation and fault diagnosis}, **COLOUR PRINTED** and duly bound, for 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter (1+1), Automatic Changeover Unit (ACU), 250W Dummy Load, UPS, 2-Bay VHF FM side mount antenna, RF Coaxial foam dielectric cable, Transmitter cum Programme Input Equipment Rack, Remote Control & Telemetry System etc. alongwith one soft copy on CD } shall be supplied as per SECTION-I.

2.2 DELIVERY PERIOD:

1. For Indian Bidders:

Supply, Erection, Testing & Commissioning (SETC) will have to be completed within TWELVE MONTHS (12) months from the date of Acceptance of Tender or TWELVE MONTHS (12) months from

the date of the Decision Letter from WPC(wherever is required) in respect of RF equipment, provided by AIR, whichever is later, as per the details given below:

- (i) The tenderer shall start SETC of Lot-I (40 Nos.) within 4 MONTHS and shall complete before or upto 7 MONTHS of twelve months Delivery Period as mentioned above.
- (ii) The tenderer shall start SETC of Lot-II (40 Nos.) within 7 MONTHS and shall complete before or upto 10 MONTHS of twelve months Delivery Period as mentioned above.
- (iii) The tenderer shall start SETC of Lot-III (20 Nos.) within 10 MONTHS and shall complete before or upto 12 MONTHS of twelve months Delivery Period as mentioned above.

2. For Foreign Bidders:

Supply, Erection, Testing & Commissioning (SETC) will have to be completed within TWELVE MONTHS (12) months from the date of Opening of Letter of Credit (LC), as per the details given below:

- (i) The tenderer shall start SETC of Lot-I (40 Nos.) within 4 MONTHS and shall complete before or upto 7 MONTHS of twelve months Delivery Period as mentioned above.
- (ii) The tenderer shall start SETC of Lot-II (40 Nos.) within 7 MONTHS and shall complete before or upto 10 MONTHS of twelve months Delivery Period as mentioned above.
- (iii) The tenderer shall start SETC of Lot-III (20 Nos.) within 10 MONTHS and shall complete before or upto 12 MONTHS of twelve months Delivery Period as mentioned above.

However, the Payment for the tender shall be linked to various milestones of SETC work as detailed below:

Lot-I:

S. No.	Milestone	Payment
1	On receipt of Complete Equipment as per Schedule of Requirements/Materials for SETC in good condition at respective site (40 sites)	70% of Equipment Cost
2	After successful completion of Erection, Testing & Commissioning at 40 sites	30% of Equipment cost +100% of ETC Cost

Lot-II:

S. No.	Milestone	Payment
1	On receipt of Complete Equipment as per Schedule of Requirements/Materials for SETC in good condition at respective site (40 sites)	70% of Equipment Cost
2	After successful completion of Erection, Testing & Commissioning at 40 sites	30% of Equipment cost +100% of ETC Cost

Lot-III:

S. No.	Milestone	Payment
1	On receipt of Complete Equipment as per Schedule of Requirements/Materials for SETC in good condition at respective site (20 sites)	70% of Equipment Cost
2	After successful completion of Erection, Testing & Commissioning at 20 sites	30% of Equipment cost +100% of ETC Cost

2.3 PACKING AND PACKING LISTS

All the equipment should be securely and properly packed to withstand transit hazards. Equipment packing shall be fit for sea freight and incorporate adequate protection against ingress of moisture.

Packing slips giving details of the items contained in each package shall be placed inside the package in a water proof envelop to enable easy identification and should contain cross references to item/part numbers of installation drawings/components lists. Copies of packing slips and other details should be sent separately to respective consignee and also to The DDG (E-FM), P & D Unit, DG: AIR, New Delhi.

2.4 INSURANCE AND MARINE RISKS ETC.

Please refer to commercial terms.

2.5 GUARANTEE:

The tenderer shall submit with his offer an undertaking to accept the following guarantees:

- (i) A guarantee that the equipment supplied will be in accordance with these specifications, varied only to the extent stated in his tender and agreed to in the contract.
- (ii) A guarantee to make good within 7 days (from the date of first intimation to OEM/tenderer) at tenderer's expense any component which becomes defective under normal operating conditions for 60 months (5 years) from the date of commissioning by the tenderer at site. If the tenderer failed to rectify the fault within the stipulated period of 7 days, the guarantee period would be extended corresponding to the outage period.
- (iii) A guarantee to supply all components for a period of ten years from the date of supply, at rates at which these are being supplied by the firm to other customers and also should match prices of original manufactures of these components prevailing at that time.
- (iv) If at any stage after 10 years, the manufacturer stops production of this model of transmitter, the firm shall intimate All India Radio in advance to enable the latter to stock the critical items.

2.6 INSPECTION

- 2.6.1 Detailed inspection of transmitters will be carried out at System Integrator's works by representatives of DG: AIR as per details given in Annexure-I.
- 2.6.2 Call for Pre-dispatch Inspection (PDI) at System Integrator's works is to be given by the tenderer to All India Radio at least **4 weeks** in advance. **Inspection period will be 4 working days each for Lot-I & Lot-II and 2 working days for Lot-III.** Expenses for inspection charges, if any, are to be quoted by the tenderer. The expenditure towards To and Fro journey, lodging, boarding & DA in respect of inspector will be borne by AIR.
- 2.6.3 Expenses for inspection charges, if any, are to be quoted by the tenderer. The expenditure towards To and Fro journey, lodging, boarding & DA in respect of inspector will be borne by AIR.
- 2.6.4 **The tenderer will clearly state and mention the name & address of the tenderer's System Integrator's works in the tender offer, failing which, the tender will be considered incomplete and is liable to be rejected.**
- 2.6.5 The complete Acceptance Test Procedure/Protocol (ATP) will be prepared by the tenderer in consultation with respective OEM and submitted to DDG (E-FM), P&D Unit, DG: AIR for approval within **ONE MONTH** of issue of Acceptance of Tender. ATP will also indicate full details of setup for measuring/testing equipments to be deployed during the performance measurements/inspection at the tenderer's System Integrator's works. The **approved ATP** shall form the basis for performance measurements/inspection to be carried out. AIR has the right to

include other technical parameters in ATP submitted by OEM within the ambit of specification of the product offered.

2.7 INSTALLATION, TESTING AND COMMISSIONING

The Transmitter and associated equipments and accessories will be installed, tested and commissioned by the tenderer in accordance with the instructions and drawings of manufacturer.

2.8 MAINTENANCE SUPPORT AND SPARES:

- (a) The spares as mentioned in Section-I shall be quoted by the tenderer.
- (b) The OEM shall also give a certificate attached with the offer to extend repair/maintenance support and supply all spares during the lifetime of the transmitter. The life of transmitter should be more than ten years and it must be certified by the OEM.
- (c) In case, the tenderer quotes the optional items as 'a set', the details of the components/items offered in the 'set' must be spelt out clearly including their Make & Model and quantity, failing which, the tender offer is likely to be rejected.
- (d) In addition, the tenderer shall provide the address, contact information for after sales support of the equipment including the third party bought out equipment that are to be supplied with the transmitter system in the following format:

Name of Equipment with Make & Model	OEM	After sales support office address	Name, Telephone/ Fax/ E-mail of concerned person	Authorization certificate by the OEM for after sales support of the equipment
(1)	(2)	(3)	(4)	(5)

2.9 LOCAL REPRESENTATIVE(S)/DEALER(S):

- (a) The OEM of the offered VHF FM transmitter must have his local office/authorized representative/dealer in India only for after sales support. **A certificate** in this regard duly signed by the OEM, on their letterhead **as per Annexure-III** including copy of Agreement/MoU in this regard between OEMs and their local representative/dealer **and signed by both** must be submitted with the offer.
- (b) The local office/authorized representative/dealer will be the nodal point for resolving issues related to after sales support. It is the responsibility of local office/authorized representative/dealer to arrange the repair/replacement of faulty items. Any module of transmitter or other equipment requiring repairs will be repaired at site. If it is not feasible to repair the module at site, the same will be collected from the site by local office/authorized representative/dealer that will arrange repairs locally. The cost of transportation, repairs etc. shall be borne by the tenderer during the guarantee period.
- (c) After sales support for the repairs/maintenance of transmitter system after the completion of

guarantee period, shall also be provided by the respective OEM of the transmitter and other associated equipments through their representatives/dealers in India.

- (d) The OEM should have complete setup for maintenance/repair of the transmitter in India, either of its own or through authorized service provider.
- (e) The details of technical facilities in the local after sales support office, such as test bench, necessary test & measuring equipment and photographs thereof, must be provided in the technical bid.
- (f) AIR representatives may visit the works of local authorized representative/dealer of OEM in India to ensure/verify that adequate technical infrastructure is available for after sales service for timely resolving the issues related to attending/replacing the equipments. Tenders from the tenderers who failed to meet these criteria shall be considered incomplete and is liable to be rejected without any notice/back reference.

2.10 POWER SUPPLY FOR ALL EQUIPMENT

(i)	Operating voltage	AC Single Phase : 230 Volts ±10 %
(ii)	Frequency	50 Hz ± 4%

2.11 AMBIENT CONDITIONS FOR ALL INDOOR EQUIPMENT:

(i)	Operating temperature range	0 °C to 45 °C
(ii)	Relative Humidity	95% non-condensing
(iii)	Working altitude	upto 3000 meters AMSL

- 2.12 The tenderer shall make his own arrangements for providing accommodation for his workmen at site along with storage of equipments/ materials including the safe custody at site.
- 2.13 The tenderer should conform to all local State laws/Central laws and regulations amended up to date concerning labour and their employment as applicable. The insurance etc. of the labourers shall be the responsibility of the tenderer including any kind of pre/post action and consequences relating to above insurance etc.
- 2.14 The tenderer shall indemnify and hold harmless AIR and his employees from any liability that may arise out of infringements of patents and copy rights associated with the design, fabrication, erection of any equipment etc.
- 2.15 After completion of SETC work, the tenderer shall remove dust, dirt, debris and leave the building/premises in a clean condition.
- 2.16 Erection, testing and commissioning (ETC) of above “set-up” as per specifications shall be done under the supervision of Qualified Engineer of OEM or Engineer duly trained and certified by OEM of main equipment i.e. Transmitter and antenna at site.

- 2.17 The successful tenderer should indemnify and hold harmless AIR against all claims in respect of damages to buildings, property, articles situated nearby not belonging to AIR, and public personnel arising from the erection, testing & commissioning (as per SETC specifications) in the course of such erection and throughout the guarantee period.
- 2.18 The successful tenderer should indemnify and hold harmless AIR against claims in respect of injury to any person, howsoever, arising from the erection (as per SETC specifications) in the course of such erection and throughout the guarantee period.

2.19 DEMONSTRATION OF THE OFFERED EQUIPMENT:

The tenderer will have to arrange demonstration of the complete offered VHF FM transmitter as a part of technical evaluation at New Delhi, India within 30 days from the date of issue of AIR request letter. Accordingly, the tenderer should be in readiness for demonstration within 30 days from the date of issue of AIR request letter, **failing which the tender offer is liable to be rejected without any further correspondence.**

The tenderer is also required to demonstrate the digital compatibility of the offered VHF FM transmitter in HD or DRM+ mode. All necessary equipments required for this purpose will be arranged by the tenderer.

The tenderer will have to make all necessary arrangement for testing of the complete offered VHF FM transmitter with full rated power. Exhaustive checking and measurements will be carried out so as to completely check the compliance of the transmitter and its sub systems with the requirements as projected in the specifications.

All expenses & liabilities for demonstration of above offered VHF FM transmitter will be borne by the tenderer. This is purely for Technical Evaluation of the offered VHF FM transmitter and is without any commitment for acceptance of offer, whatsoever at this stage.

SECTION-III

DETAILED TECHNICAL SPECIFICATIONS FOR SETC OF 100 W DIGITAL COMPATIBLE VHF FM SOLID-STATE MOSFET TECHNOLOGY BASED BROADCAST TRANSMITTER IN (1+1) CONFIGURATION WITH AUTOMATIC CHANGEOVER UNIT

3.0 Brief Description:

Two nos. of 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration with auto changeover unit shall be supplied with each set of Transmitter. The operation in (1+1) auto changeover mode is done by an Automatic Changeover Unit (ACU), the detailed specifications for which are given in Section-V.

The Digital Compatible 100 W VHF FM Solid-State MOSFET technology based Broadcast transmitter should be compatible for DRM+/ HD Radio mode.

3.1 100 W Digital Compatible Transmitter Unit:

- 3.1.1 The FM Transmitter unit shall be consistent with the latest state of the art technology using most rugged, reliable components, circuit design and shall be suitable for unattended operation. It should be user friendly and simple to operate.
- 3.1.2 All equipment assemblies, sub assemblies, PCB's, devices and components should be of latest field proven design. All materials used in the FM Transmitter System should be of Professional Broadcast Quality.
- 3.1.3 The Transmitter system quoted must conform to the latest International Standards of safety and EMC. The conformance to such standards (indicating Standard's Name and Number) must be stated in compliance statement.
- 3.1.4 The Transmitter unit shall be suitable for FM monophonic and stereophonic/ multiplex transmission in the frequency range from 88 MHz to 108 MHz.
- 3.1.5 The Transmitter and other ancillary units shall be characterized by high reliability, high MTBF. It should be field proven.
- 3.1.6 The Transmitter shall satisfy the requirement of ITU Radio Regulations. It should comply with IEC-215 Safety Standards so as to eliminate electrical hazards to the personnel.
- 3.1.7 Transmitter equipment shall have compact design. All metal works shall be adequately protected against rust and corrosion and shall be non-inflammable and fire retardant.
- 3.1.8 **The 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter should have the facility on the front panel of the transmitter for selection of either FM Mode or Digital Mode so that external DRM+/HD Radio Modulator is selected in place of FM Exciter.**

3.2 Facilities:

- 3.2.1 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration shall have in-built Limiter and low pass filter (30 Hz to 15 kHz) at audio input to ensure distortion free transmission irrespective of source level. The transmitter shall have in-built Exciter, Stereo Coder with each 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter along with Automatic Changeover Unit (ACU) in (1+1) automatic changeover mode with manual override.

3.3 Circuit Design:

- 3.3.1 The Transmitter will consist of solid state devices. All stages i.e. Exciter, Amplifier, harmonic filters, etc. should be of Broad Band design for operating in the entire VHF frequency band of 88 MHz to 108 MHz without need of any tuning/change of components.

3.4 Exciter :

- 3.4.1 The Exciter should have Direct Digital Synthesis. The Exciter should be an integral part of 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast Transmitter. It should accept Analog Mono, Analog Stereo (left and right) / Encoded Stereo signals (MPX), RDS/DARC, SCA and AES/EBU inputs. It should be compatible for Mono and Stereo Broadcasting using pilot tone system conforming to ITU-R BS.450-3 Rec.
- 3.4.2 It should display various parameters like forward and reflected power, frequency deviation, input-audio level, DC voltages & currents on LCD display.
- 3.4.4 It should be synthesized with easy channel selection of minimum 10 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**” i.e. not requiring any tuning over its entire specified operating frequency range.

3.5 Power Amplifier (PA):

- 3.5.1 The Power Amplifier (PA) should be an integral part of 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast Transmitter. The Power Amplifier (PA) shall be of wide band design for operation in the entire VHF frequency band of 88 MHz to 108 MHz without tuning / change of components. The PA shall be rugged in design and will consist of MOSFET device incorporated in a separate amplifier board. The PA shall be provided with RF monitor located on Front Panel to monitor output RF Power.
- 3.5.2 The PA shall have built in protection against high Reflected Power (Short and Open loads). PA shall also be protected against, over current, over temperature, overdrive and airflow failure.

3.6 Power Supply:

- 3.6.1 The Power Supply unit should be an integral part of 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast Transmitter. The Transmitter shall be complete in all respects. AIR shall provide power supply as per clause 2.10 at a single point. All the power supply required for the Transmitter and its associated equipments should be derived from the same point.
- 3.6.2 The transmitter shall have in-built voltage stabilizer for taking care of specified variations in the main supply. The rectifier and filter circuits should be able to take care of voltage surges on power lines. Power supply unit shall be protected against over temperature, over current and over voltage etc.

3.7 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:

- 3.7.1 Protection against over loads, transients, severe fluctuation/variation in power supply, any other malfunctioning etc. for transmitter.

- 3.7.2 Protection against over temperature on heat sinks.
- 3.7.3 Protection against blower failure and less volume of cooling air.
- 3.7.4 Protection against high VSWR including open and short conditions at output.
- 3.7.5 Immediate power fold back under severe/damaging fault conditions of VSWR and temperature. The power of transmitter should automatically come down to a suitable safe design limit, so that the transmitter and its subsystem do not get damaged due to load mismatch/ high temperature. **Details of fold back are to be provided.**
- 3.7.6 Transmitter should be protected against lightning by providing DC/RF discharge path and details of the same are to be given.

3.8 Control and Interlocking:

- 3.8.1 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. Switching-in of the Dummy Load shall be suitably interlocked.
- 3.8.2 Details of control/monitoring/protection unit should be given. Stages of sequential operations of switching 'ON' and 'OFF' of the Transmitter shall be indicated. In addition, tripping and power fold back shall remain indicated until reset.

3.9 INSTRUMENTATION AND INDICATIONS:

- 3.9.1 The Transmitter shall be provided with LCD display for fully monitoring the Transmitter operation. All important parameters required for fault finding should be displayed. These are indications for forward and reflected power, VSWR, AF input level for each channel, deviation, DC voltage etc. The details of these should be enclosed with tender. Transmitter status and fault conditions shall be indicated by color coded LED's.
- 3.9.2 Transmitter units shall be provided with Non Volatile Random Access Memory (NV RAM) with Battery Backup to save all parameters when transmitter is switched-OFF.
- 3.9.3 Following connectors /socket/ controls/ input level monitoring shall be provided, preferably on Front Panel:
 - a) BNC socket for RF Monitor output.
 - b) Input level of Mono/ MPX signal.
 - c) Input level of left and right channels.
 - d) Output power level.
 - e) LCD back lighted display.
 - f) Navigation buttons to browse/selection/operation of menus with parameter validation button.
 - g) LED's for high RF, high VSWR indications.
- 3.9.4 Following connectors /socket shall be provided, preferably on Back Panel:
 - i. One earthing clip (GROUND).
 - ii. Mains input socket with a Start/Stop switch.
 - iii. Female N-type socket for RF output.
 - iv. Female BNC socket for Multiplex / Mono input.
 - v. Female BNC socket for RDS/DARC, SCA
 - vi. XLR socket for Balanced Analog L/ R audio Input.
 - vii. XLR socket for AES/EBU
 - viii. BNC socket for 19 kHz and multiplex output.
 - ix. Suitable & compatible interface connectors for Remote control & monitoring

3.9.5 The Transmitter shall be supplied with a Dummy load of 250 Watts capacity which shall be mounted in Transmitter cum Programme Input Equipment Rack with suitable RF Coaxial Cable. **Please refer Clause 4.8 for technical specification of Dummy Load 250 Watt.**

3.10 COOLING SYSTEM:

Full details of air cooling system shall be given. Temperature rise of cooling air for rated power output is to be indicated.

3.11 SPARES: (Optional)

The tenderer shall quote for one unit of 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast Transmitter with Remote Control & Telemetry system.

Price of each item shall be quoted separately.

3.12 REMOTE CONTROL AND TELEMETRY SYSTEM

- 3.12.1 The transmitter shall be controllable from distant location with web browser-based GUI and SNMP over TCP/IP via a telecom or network connection as well as locally with password protection and works with any PC/laptop or smart phone. 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.
- 3.12.2 The Remote control and Telemetry system should be capable for controlling and monitoring various parameters of FM transmitter and associated systems from a distant location. System shall be such that an engineer sitting at a distant location is able to control and monitor various FM transmitters located at different places of the country by connecting the PC to the web as well as SNMP through broadband connection
- 3.12.3 Details of monitoring, control parameters, indications & metering etc. shall also be given by the tenderer.
- 3.12.4 Software and allied equipments for remote control and telemetry shall be part of the supply of the transmitter. The broadband connection shall be provided by AIR.

SECTION-IV

TECHNICAL PARAMETERS OF THE TRANSMITTER

4.1 GENERAL

4.1.1	Frequency Range	88 MHz to 108 MHz
4.1.2	Nominal Frequency deviation	± 75 kHz (peak)
4.1.3	Maximum Frequency Deviation	± 100 kHz (peak)
4.1.4	Frequency Setting	Direct from front panel in 10 kHz steps
4.1.5	Class of Emission	256KF8E
4.1.6	Stereo transmissions	Acc. to Rec. ITU-R BS.450-3 (Pilot tone)
4.1.7	Pre-emphasis	0, 50 μ s (selectable).

4.2 INPUTS

4.2.1	Modulating input signal	Exciter should accept Analog Mono, Analog Stereo (left and right)/Encoded Stereo Signals (MPX), AES/EBU, RDS/DARC & SCA inputs. It should be capable for Mono and Stereo Broadcast using pilot tone system conforming to Rec. ITU-R BS.450-3
4.2.2	Input impedance (Analog)	10 k Ω or greater (for Mono) 10 k Ω or greater (for Stereo)
	Input Impedance (AES/EBU)	110 Ω
4.2.3	Analog and AES/EBU input Level for ± 75 kHz (peak) Deviation	ANALOG AUDIO INPUT: Input Level Adjustable from -6 dBu to + 6 dBu. AES/EBU AUDIO INPUT: Input Level Adjustable from -12 dBFS to 0 dBFS

4.3 RF OUTPUT

4.3.1	Output power (RF)	≥ 100 W
4.3.2	Output Impedance	50 Ω . (Unbalanced)
4.3.3	Output connector	N (F) connector (Rear)
4.3.4	Permissible VSWR	a. 1.5: 1 with full power; b. Automatic power reduction beyond 1.5:1. Details of power fold back characteristics to be provided by the tenderer. c. Transmitter should be protected for short and open circuit conditions.

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4.3.5	Harmonic and Spurious Signal Suppression.	Within the limits as per Radio Regulations & ITU-R Recommendations. The actual values are to be indicated.
4.3.6	Maximum Frequency Tolerance	As per ITU-R
4.3.7	Synchronous AM S/N Ratio referenced to 100% AM modulation at 400 Hz, 50 μ s Pre-emphasis with FM modulation at ± 75 kHz deviation.	Better than 50 dB
4.3.8	Asynchronous AM S/N Ratio unweighted, referenced to 100% AM modulation at 400 Hz, 50 μ s Pre-emphasis and without FM modulation.	Better than 60 dB
4.3.9	Overall efficiency	≥ 55 %

4.4 MONO OPERATION:

4.4.1	FM S/N Ratio at ± 75 kHz Deviation (30 Hz to 15 kHz), rms, unweighted	Better than 70 dB
4.4.2	Total Harmonic Distortion plus Noise (THD+N)	Better than 0.2 %
4.4.3	Amplitude response (30 Hz to 15 kHz)	Better than ± 0.2 dB
4.4.4	Inter Modulation Distortion (IMD) SMPTE(60 Hz/7 kHz, 4:1)	Better than 0.1 %

4.5 STEREO OPERATION:

4.5.1	Stereo Separation (30 Hz to 15 kHz)	Better than 50 dB
4.5.2	Linear Cross Talk referred to 100% modulation (30 Hz to 15 kHz)	Better than 50 dB
4.5.3	Non-linear Cross Talk referred to 100 % modulation	Better than 55 dB
4.5.4	FM S/N Ratio at ± 75 kHz Deviation (L or R) (30 Hz to 15 kHz) rms, unweighted	Better than 70 dB
4.5.5	Total Harmonic Distortion Plus Noise (THD + N) (L or R)	Better than 0.2 %
4.5.6	Inter Modulation Distortion IMD SMPTE (L or R) (60 Hz/7 kHz , 4:1)	Better than 0.1 %
4.5.7	Amplitude Response (L or R) (30 Hz to 15 kHz)	Better than ± 0.2 dB
4.5.8	Pilot Tone Stability	As per ITU-R Rec.

4.6 WIDEBAND COMPOSITE OPERATION:

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4.6.1	FM S/N Ratio at ± 75 kHz deviation, rms, unweighted 30 Hz to 15 kHz	Better than 70 dB
4.6.2	Total Harmonic Distortion Plus Noise (THD + N) 30 Hz to 15 kHz	Better than 0.2 %
4.6.3	Amplitude response (30 Hz to 80 kHz)	Better than ± 0.5 dB

4.7 DIGITAL (DRM+/HD Radio) OPERATION:

4.7.1	MER (Modulation Error Ratio) for HD Radio	≥ 40 dB
4.7.2	MER (Modulation Error Ratio) for DRM+	≥ 21 dB @ DRM+ @ 16-QAM & ≥ 13 dB @ DRM+ @ 4-QAM

4.8 TECHNICAL SPECIFICATIONS OF REMOTE CONTROL AND TELEMETRY SYSTEM:

S. No.	TECHNICAL PARAMETERS	TECHNICAL SPECIFICATIONS
1.	Remote Control and Monitoring (Controllable Settings/Parameters)	1. Transmitter: ON/OFF 2. RF Output Power Level Control 3. Audio input level
2.	Remote Control and Monitoring (Monitorable Settings/Parameters)	1. RF forward and reflected power of each transmitter. 2. Power supply status i.e. Voltages, Currents etc. 3. Alarm Indications: Temperature, VSWR, ON AIR, Audio etc. 4. Any other parameters which the manufacturer considers essential for proper control /functioning of a remote-controlled FM transmitter.
3.	Data Format	To be indicated by tenderer and compatible for above system.
4.	Data Rate	To be indicated by tenderer and compatible for above data format

4.9 DUMMY LOAD-250W

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S. No.	TECHNICAL PARAMETERS	TECHNICAL SPECIFICATION
4.1.1	Power Rating	250 W continuous
4.1.2	Connector	Type N-female
4.1.3	Frequency Range	88 to 108 MHz
4.1.4	VSWR	$\leq 1.1:1$
4.1.5	Impedance(Nominal)	50 Ω
4.1.6	Load Coolant	Air cooled
4.1.7	Dimensions (Length x Width x Depth)	To be given by the tenderer.
4.1.8	Weight	To be given by the tenderer.
4.1.9	ENVIRONMENTAL CONDITIONS	As per Section -I

(Y.P. Singh, AE) (V. Panwar, AE) (Manzoor Ali, ADE) (Sandeep Singh, DDE) (Rajendra Nahar, DDE) (Aditya Chaturvedi, DDG E)

SECTION-V

TECHNICAL SPECIFICATIONS OF THE AUTOMATIC CHANGEOVER UNIT, EQUIPMENT RACK, UPS, ANTENNA AND RF CABLE

5.1 AUTOMATIC CHANGEOVER UNIT (ACU):

- 5.1.1 One Automatic Changeover Unit (ACU) for operating the Transmitter in (1 + 1) mode to facilitate automatic switch “ON” of the 2nd Transmitter Unit in case of failure of RF output of 1st Transmitter Unit shall be supplied with each set.
- 5.1.2 Any one of the 100W Transmitter unit shall be selectable as master or slave automatically in active stand by mode. When the RF power of the 1st transmitter goes down by more than 3 dB, it should be sensed as a failure to switch to second transmitter automatically. In case of failure of the complete system, three trials at interval adjustable up to 10 minutes shall be done before final switch off.
- 5.1.3 The complete switching sequence of changeover of transmitters and associated equipments may be provided with the technical offer.
- 5.1.4 Arrangement shall be made for bypassing the ACU in case of its failure so as to enable operating personnel to operate the transmitter in the manual mode.
- 5.1.5 Power Supply to the ACU shall be fed through the UPS.
- 5.1.6 In case of audio failure, an indication shall be displayed in the front panel of ACU.

5.2 Transmitter cum Programme Input Equipment Rack :

- (i) Transmitter cum Programme Input Equipment Rack shall house 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration along with ACU, UPS, Dummy load and shall have two numbers of Stereo Jack Strip/Audio Patch Panel for analog audio signal and two numbers of Stereo Jack Strip/Audio Patch Panel for AES/EBU signal inputs and suitable connectors for Analog Audio (Stereo), AES/EBU (Digital) Audio, SCA, RDS/DARC inputs.
- (ii) Transmitter cum Programme Input Equipment Rack shall be provided with cable trays, wiring, necessary modulating inputs level control in steps, repeat coils, tag blocks, terminal strips, BNC connectors, facility to measure/ monitor levels at various points in the programme chain with a dual VU (PPM) meter and a selector switch and bar graph display, ampli-speaker (1+1) with mounting arrangement, ventilation arrangement including other accessories as per AIR specifications.
- (iii) There will be two external sources of audio from the output of two Set Top Boxes (DTH). The audio shall be fed to both the Transmitters from one external source. Therefore, **Distribution Amplifier** is to be provided for proper arrangement of splitting the audio, after due amplification, for feeding to both the Transmitters. The other external source shall also be brought to the Jack Field to facilitate feeding of this source to both the transmitters through Patch Chords, in case of failure of first audio source.

5.2.1 General: It shall be a standard 19" Rack conforming to professional standards of sound broadcasting for mounting equipment and accessories having lockable door and side panels, Front Glass Panel.

5.2.2 Mechanical

- (i) Construction Details: The rack shall be sturdily constructed from aluminum extrusion sections of suitable size fastened to form framework properly reinforced with stiffeners, suitably welded. The front side of the rack shall be open for mounting equipments. The rear side of the rack shall be provided with a single leaf, hinged removable type door and handle with latching arrangement. The sides should be covered with panels which can be screwed to the frames. These panels should be reinforced with stiffeners. The Racks shall have holes for grouting bolts on the bottom plate. The thickness of the sheet used for sides of the rack and door shall be 1.6mm and 1.3mm respectively. The overall dimensions of the rack may be approximately 2200 mm (H) x 600 mm (W) x 700 mm (D).
- (ii) Mounting Arrangement: Panel mounting rails with pre-drilled and tapped holes corresponding to metric thread 'MS' are to be provided at the front. Suitable mounting arrangement is to be made at the top and the bottom of the frames for mounting the rails at different intervals. Pre-drilled holes shall be such that it shall be possible to mount any standard equipment of width 483mm and height 1U to 4U. Necessary equipment support angle to relieve strain on holding screws wherever required shall be provided. Any equipment which is less than standard 19" width shall be provided with rack mount kit.
- (iii) Style/Strips or Trims: To render sleek look style, strips/trims are to be provided on the front side which will cover the drilled holes on the mounting rails.
- (iv) Ventilation Arrangement: Louvers are to be provided throughout the length of rear door of the rack. Provision is required to be made for mounting a cooling fan of minimum 100 CFM at the top. Separate cooling system for UPS at the bottom of the rack shall be provided.
- (v) Finish of the Rack: The inside and outside of the rack shall be spray painted with dark grey after necessary anti rust treatment.

5.2.3 Jack Strip Field/ Audio patch Panel :

- a. Standard Jacks Strip of robust construction and positive action shall be used. Input and output of all the equipments and the programme lines shall be brought to the Jack Field. Few jack points shall be used as check points without disrupting the signal flow & few to be left as spares for the tie lines, parallel points and for future use. The jack strip panels shall be openable on front sides without strain on connector and wiring.
- b. Jack Strip construction: The jacks shall have preferably a nickel plated brass frame, with nickel-silver springs and gold-silver/ Palladium contacts. The jacks shall be mounted on 20mm centers. The Jacks shall be as per DIN specifications.
- c. Contact arrangement: Each jack shall be a 20 point jack, providing a break circuit (on both wires) and an isolated earthing lug.
- d. Indicating strip: A strip covered with transparent plastic shall be provided above the row of jacks for labeling purposes.
- e. Separate jack strip field/ audio patch panel for analog and digital inputs will be provided by the tenderer.

5.2.4 Programme Meter (PPM/VU)

The Program Meter shall preferably be a dual VU/PPM meter or Bar graph Display with LEDs or both. The signal fed at the input connectors shall be processed and displayed on the Bar graph. This unit shall work independently in any configuration for signal monitoring without loading the source. There shall be provision for selecting VU or Peak response using a front panel switch.

5.2.5 Ampli-speaker Panel

The Ampli-speaker (8 watt) with mounting arrangements shall have two ampli-speakers of 6" size, one for each channel. The monitoring output will be fed to the ampli-speakers. The loudspeaker impedance shall be 8 Ω .

5.2.6 Repeat Coil:

- (i) A Line to line audio transformer shall be provided for isolating balanced and unbalanced circuits.
- (ii) Primary & Secondary Impedances: The primary and secondary windings shall consist of two exactly identical sections which can be connected in series for 600 Ω operation or in parallel for 150 Ω operation.
- (iii) Hum reduction : The shielding and design of the windings shall be such that the hum level picked up by the unit, when placed in normal magnetic field inside equipment rack is better than -75dBm, as measured across either winding, both secondary and primary being terminated by 600 Ω .

5.2.7 Rack Wiring:

All the wiring in the rack shall be carried out with MIL standard approved PTFE insulated, shielded, twin core, audio cables of standard size in PVC cable duct.

- (i) The wiring for all the equipment shall be routed through terminal blocks which shall be suitably located for easy accessibility. All the wiring on the terminal block shall be suitably marked. The wiring bunches shall be neatly laid and clamped to the body of the rack.
- (ii) The low level audio lines shall be suitably isolated from high level audio lines in order to avoid interference.
- (iii) Power supply wirings shall pass through separate conduits and shall be segregated suitably from the audio wiring in order to avoid noise and hum pick up.

5.2.8 Distribution Amplifiers:

The Analogue Stereo and Digital Audio Distribution Amplifier will be used for feeding analogue stereo and digital audio programme to various destinations.

Analogue Stereo Distribution Amplifier should be solid state audio amplifier having one stereo input and 4 separate individually adjustable stereo outputs.

The Digital Distribution Amplifier should be solid state having one digital input and 4 separate digital outputs.

5.2.8.1 Analogue Stereo Distribution Amplifier:

1. **Input Impedance:**
Input impedance shall be $\geq 10 \text{ k } \Omega$ (balanced).
2. **Input Level:**
 - (a) Nominal : 0 dBu
 - (b) Maximum : +20 dBu
3. **Gain:** Shall have adjustable gain of $\pm 5 \text{ dB}$ with respect to nominal setting.
4. **Output Level:**
 - (a) Nominal : 0 dBu
 - (b) Maximum : +20 dBu
5. **Output Impedance:** Output impedance shall be $\leq 50 \text{ } \Omega$ (balanced).
6. **Frequency Response:** $\pm 0.1 \text{ dB}$ in frequency range of 20 Hz to 20 kHz.
7. **Total Harmonic Distortion Plus Noise (THD + N):**
Less than 0.1% at nominal level (1 kHz) and less than 0.5% at maximum output level. (Terminated into a load of 600 Ω) throughout the audio frequency range of 20 Hz to 20 kHz.
8. **Signal to Noise Ratio at nominal Input/Output, rms unweighted (22 Hz-22kHz):** $\geq 90 \text{ dB}$
9. **Inter Output Loading:**
 - (a) If one of the outputs gets short circuited, the level on the rest of the outputs shall not fall by more than 0.3 dB.
 - (b) If two of the outputs get short circuited, the level on each of the remaining outputs shall not fall by more than 0.6 dB.
10. **Inter-Channel Phase Difference:**
Not more than 5 degree in frequency range of 125 Hz to 10 kHz and 10 degree from 20 Hz to 20 kHz.
11. **Inter-Channel Level Difference:** Within $\pm 0.5\text{dB}$, from 20 Hz to 20 kHz.
12. **Inter-Channel Crosstalk:** Equal to or better than 60 dB at 20 kHz at nominal level.
13. **Input/Output Connectors:** Input and all outputs shall be on 3-pin XLR connectors.

5.2.8.2 DIGITAL DISTRIBUTION AMPLIFIER:

DIGITAL AUDIO INPUT		
i	Configuration	AES/EBU standard, 24-bit resolution
ii	Sampling Rate	32, 44.1 or 48 kHz automatically selected
iii	Connector	XLR-type, female, EMI-suppressed
iv	Input reference level	Variable within the range of -20 to 0 dBFS

DIGITAL AUDIO OUTPUT		
i	Configuration	AES/EBU standard, 24-bit resolution
ii	Sample Rate	32, 44.1 or 48 kHz, selected in software
iii	Connector	XLR-type, male, EMI-suppressed
iv	Impedance	110 Ω

5.2.9 Other Accessories:

- (i) A lamp to illuminate when the door is opened shall be provided on one of the side at top.

- (ii) Arrangement may be made for mounting tag-blocks/terminal strips at a height of 450mm from the bottom at the rear side.
- (iii) PVC channels may be provided at the front as well as the rear for routing cables.
- (iv) Necessary drawers shall be provided for keeping patch cords & headphones.
- (v) Suitable arrangement is to be made for mounting AIR Monogram on the top frame on the front side.
- (vi) Two 2U blank space shall be provided for fixing Satellite Receivers (Set Top Box).
- (vii) Blank panels of 1U height wherever required for proper gap between equipment are to be provided suitably.

5.2.10 Power Supply:

- (i) A single phase Mains Panel to distribute power supply with indication lamp and MCB for various equipments, mounted on front side bottom in the rack shall be provided.
- (ii) RFI Filter to protect against electrical & EM disturbances shall be provided for protection in the mains supply. A Distribution panel with suitable rating fuses for over current protection for each outlet shall be provided at the output of this filter.
- (iii) Power supply to all the equipments/circuits in the rack shall be distributed from this panel along the height of rack at each equipment level. A spare 5A, 3 Pin power socket shall also be provided. The Rack shall also be provided with two additional sockets of 3 pin, 5A for AC Power supply input to the equipment. Blank Space is to be provided in the rack for mounting other equipment, if any.

5.2.11 Earthing:

All the equipment in the Rack shall be properly earthed. 2 Nos. of independent earth will be provided by the tenderer/ OEM as per drawing No. TM-16599 for connecting cable earthing Kit at the entrance of the transmitter hall and transmitter rack. Both earth shall be interconnected by copper strip and extended separately through copper strip to grounding terminal (station reference ground) in transmitter hall from where transmitter rack and cable earthing kit shall be connected. *The earth resistance of the earthing shall be less than 1 ohm.*

5.2.12 Shielding:

The Rack shall be installed in the transmitter Hall. Necessary precautions shall be taken to shield the equipment and wiring from high level R.F. field.

N.B. The tenderer shall prepare schematic drawings & layout of equipments in the offered Rack and submit along with tender.

5.3 UNINTERRUPTED POWER SUPPLY (UPS) SYSTEM:

The input power to the transmitter system is supplied from an external 230 V single phase system. Two nos. of 1 kVA On-line UPS are to be provided in (1+1) hot standby mode to maintain power to the selected transmitter and other equipments alongwith VRLA {Sealed Maintenance Free (SMF)} batteries with each set. In case one UPS fails, the second UPS shall automatically take full load of equipment to sustain broadcast service. The UPS system should work on True Online Double-conversion technology. 1 kVA On-Line UPS (hot standby mode) shall conform to the following Specifications.

S. No.	Parameters	Specifications
5.3.1	Input Voltage	140 - 260 Volt AC, 50 Hz \pm 4%, Single Phase
5.3.2	Output Voltage	230 Volt AC \pm 1 %
5.3.3	Capacity	1000 VA
5.3.4	Input Power factor	\geq 0.99
5.3.5	Efficiency (From I/P to O/P of the U.P.S. System)	\geq 90 %
5.3.6	Input Current Harmonic Distortion	\leq 4%
5.3.7	Output Voltage Harmonic Distortion	\leq 5%
5.3.8	Current Crest Ratio	3:1
5.3.9	Indications and Protections	Self-diagnostic, Spike Suppressor, Electronic overload protection.
5.3.10	Isolation Transformer	In-built
5.3.11	Battery capacity	i) Backup time 30 minutes on full load ii) Minimum 720 VAH
5.3.12	Remote Control & Monitoring	The UPS shall be provided with remote control and monitoring facility through SNMP as well as web browser based.

5.4 ANTENNA SYSTEM

5.4.1 One No. of 2-Bay Vertically Polarized Side Mount VHF FM Antenna along with mounting arrangement shall be supplied with each set.

5.4.2 The Antenna will be mounted on the Guyed Mast/Self Supporting tower or on a Pole to be provided by AIR.

5.4.3 **Following documents shall be supplied along with the Tender:**

- a. VSWR curve for complete Frequency range i.e. 88 MHz-108 MHz.
- b. Horizontal Radiation Pattern.
- c. Vertical Radiation Pattern.

5.4.4 Brief Specifications of Antenna to be supplied are given below:

S. No.	Parameters	Specifications
5.4.4.1	Operating Frequency Range	88 MHz -108 MHz
5.4.4.2	Impedance	50 Ω unbalanced
5.4.4.3	VSWR	Better than 1.2 : 1 over 5 MHz from 100 MHz to 105 MHz and to be optimized to 1.1 : 1 for operating frequency (to be intimated later at the time of placement of order)
5.4.4.4	Power Handling Capacity (Total)	\geq 500 Watts
5.4.4.5	Polarization	Vertical
5.4.4.6	Gain w.r.t. Half Wave Dipole	\geq 4.5 dBd

5.4.4.7	Lightning Protection	All metal parts to be DC grounded.
5.4.4.8	Branch feeder cables and Clamps for mounting Dipoles	Suitable Branch feeder cable fitted with 7/8" EIA Flange connector at both ends and Clamps to be supplied with the Antenna.
5.4.4.9	Input Connector of main power divider of antenna system	7/8" EIA Flange connector suitable for 7/8" RF Coaxial Cable connection fitted with with 7/8" EIA Flange connector
5.4.4.10	Output Connectors of main power divider of antenna system	7/8" EIA Flange
5.4.4.11	Input Connector of dipoles	7/8" EIA Flange
5.4.4.12	Mounting of Antenna	All the required hardware for mounting of the antenna including Antenna Supporting Interface on which the antenna will be mounted shall be supplied along with the Antenna system.
5.4.4.13	Maximum Wind Speed	198 km/Hour
5.4.4.14	Ambient Temperature	-5°C to 50 °C
5.4.4.15	Humidity	95% non-condensing
5.4.4.16	Rainfall	Moderate to heavy

5.4.5 Inter-bay feeding/Feed System: Full details of Feeding arrangement and the engineering drawings with dimensions along-with the details of inter-connecting RF coaxial foam dielectric cables/rigid lines etc. to be submitted with the tender. The entire feeding system should be adequately protected against heavy rainfall, extreme daily temperature variance.

All technical parameters are to be supported by printed technical literature, technical data sheets & technical manuals from the OEM by the tenderer to assess the merit of the offer, failing which the tender shall be considered incomplete and is liable to be rejected. The tenderer should make a detailed offer.

5.4.6 External material: Dipoles will be made of stainless steel. Power Dividers & Rigid feed lines will be made of Marine Brass or Copper. End Connectors on Dipoles and Feed Cables will be of standard & reputed make & their make should be indicated in the tender. All electrical contacts must be silver plated. Clamps shall be constructed of hot dip galvanized Steel. All fasteners will be of Stainless Steel or High Tensile non corrosive material.

5.4.7 Internal material: Inner lines of Dipoles will be of copper or Brass. All electrical contacts will be silver plated. All inners and bullets will be made of Beryllium copper and silver plated. Insulators will be made of virgin Teflon.

5.4.8 All joints to be made completely air tight & water tight.

5.5 RF COAXIAL FOAM DIELECTRIC CABLE:

5.5.1 The RF Coaxial foam dielectric cable for feeding to Antenna with suitable connectors shall be supplied with each transmitter. The Transmitter shall be connected to the Antenna via RF Coaxial foam dielectric cable.

5.5.2 The cable shall be complete with end connectors, hoisting stockings (As per RF cable manufacturer's recommendations) and cable clamps for its hoisting.

5.5.3 The 7/8" RF coaxial Foam Dielectric Coaxial Cable shall be supplied with connector at one end suitable for connecting to Transmitter Output and with 7/8" EIA flange connector fitted at other

end of the cable {with Bullets (inners) for 7/8" EIA Flange Connectors} for connecting to antenna system as per AIR specification for each place.

5.5.3 Specifications:

S. No.	Parameters	Specifications
5.5.3.1	Size	7/8"
5.5.3.2	Inner Conductor material	Copper
5.5.3.3	Outer conductor material	Corrugated Copper
5.5.3.4	Dielectric	Foam
5.5.3.5	Operating Frequency Range	88 MHz -108 MHz
5.5.3.6	Impedance	50 $\Omega \pm 1 \Omega$
5.5.3.7	Attenuation of each RF Coaxial foam type Cable at standard conditions VSWR 1.0, ambient temperature 20° C (@ 108 MHz in dB/100 M)	≤ 1.3 dB
5.5.3.8	Average Power Rating of RF Coaxial foam type Cable at standard conditions VSWR 1.0, ambient temperature 40° C (@ 108 MHz)	≥ 5 kW

SPECIFICATION FOR OVERALL NETWORK MANAGEMENT SYSTEM (UMBRELA NMS) FOR INPUT CHAIN, ELECTRICAL EQUIPMENT AND TRANSMITTER SYSTEM:

1. Introduction

- a. AIR intends to have an overall Network Management System, commonly known as Umbrella NMS (U-NMS) for remote operation and monitoring of the FM transmitter setup at 100 Locations.
- b. The OEM of the above U-NMS must have carried out at least three similar or larger deployments for Digital TV terrestrial networks or Radio Networks.
- c. The U-NMS solution shall have existing integrations for multi-vendors, multi protocols, not limited to SNMP only but also Modbus, SOAP, XML, APIs, CORBA, WMI, SQL, HTML, telnet, SSH, SNMP, etc.) and full proprietary / vendor- specific protocols. A list of existing protocols and device integrations shall be provided.
- d. The bidder shall provide the widely recognized U-NMS platform in order to achieve National Level, Regional Level and Site Level management.
- e. The U-NMS shall support important functions (but not limited to) Monitor, Control, Reporting, Dashboards, Mobile Access, Email/SMS Management, Scheduling, Correlation etc.
- f. Devices and / or Systems to be covered under NMS. Depending on the solutions, there shall be 8 to 12 devices and systems per site Level U-NMS, including
 - i. The Transmitter System
 - ii. UPS, Power Meters, Normal Power supply, Voltage and current etc.
 - iii. Other devices like CCTV camera etc.
- g. The National Level U-NMS shall have the Virtual Presentation of all the above elements of all 100 sites. The Virtual Presentation shall be dynamic in nature.
- h. The interface drivers must be open format (like XML), so that anybody can create new drivers.
- i. The U-NMS solution shall allow operators to design user-defined dashboards that consolidate all essential information and key Performance Parameters from the devices.
- j. U-NMS solution shall allow creating all user accounts (with username & password) from scratch, and also to create groups and assign individual users to one or more groups so that different levels of administration, operation etc. can be assigned.
- k. The user interface (UI) shall be compatible with multi-touch screen technology. Support of pie graphs, bar graphs, stacked graphs etc.

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- l. U-NMS solution shall offer trending, where high volumes of data related to some Key Performance Parameters are collected in the database in order to present to the operator the evolutions of the last week, last month, last year.
- m. U-NMS solutions shall support Performance Monitoring, which is the capability to analyze performance data such as creating statistics or zooming in order to get more details. Also the capability to export the trend data to spreadsheet applications or to compare two or more trending parameters for analysis.
- n. The U-NMS solution shall offer reporting, providing statistical analysis information, including but not limited to: top-5 (or user defined number) of devices that generated most of the alarm (number of alarms), top-5 (or user defined number) of devices that were the longest time in alarm (duration of alarms), status reports with a complete overview of all settings of a device, trend reports etc.
- o. The offered U-NMS solution shall provide application level security.
- p. The GUI shall be fully interactive, supporting alarm colour coding, bubble-up and drill-down (i.e. alarms bubble-up to the top level view and operators can click and drill down to have more detailed view of the affected area), real-time, key reading, switch & path updates, automation control buttons etc.
- q. The U-NMS solution shall support sending e-mail and SMS-notifications to authorized user and should be fully user definable. The detail shall be provided by AIR at commissioning time.
- r. The offered platform shall be capable of upgradation for new added Transmitters in future in AIR setup for up to 500 Transmitters.
- s. There shall also be provision for creating Equipment wise History sheet of faults.
- t. The offered platform shall allow proactive network management, with advanced analytics to facilitate forecasting of trending data, automatically learn about the normal behaviour of devices across the entire operational system to flag any abnormal behaviour.
- u. The offered platform shall offer a comprehensive fault management experience, including visual alarm threshold editing, alarm heat maps, in order to reduce the time to resolve issues by providing a visual historical context to alarms.
- v. The U-NMS solution shall provide an unconditional and guaranteed interface with any device or system from any vendor, irrespective of its interface proprietary or standard, and this shall be proven through a sufficiently wide variety of deployed integrations.
- w. It shall support at least 500 simultaneous client accesses from any location through web.
- x. U-NMS solution shall run on industry standard hardware that is readily available from different vendors.
- y. U-NMS solution shall be able to interface with devices directly.

aa. The OEM of the U-NMS or their representative shall also co-ordinate with the bidder and arrange one training session to make operational staff familiar with the system. AIR Specifications clauses may be referred.

bb. All the necessary software required for satisfactory working of the system and the required licenses are to be supplied in the name of All India Radio on perpetual basis.

II. Connections & restoration between National Level U-NMS & Site/ Regional Level U-NMS:

a. The National Level U-NMS server shall be located at New Delhi. This shall be in 1+1 (hot redundant) configuration. This server will have a unique IP address (public IP address) which shall be accessible to all the authorized users of U-NMS depending upon their privileges/ rights of views or actions. The Public IP address shall be arranged by AIR.

b. The Site/ Regional Level U-NMS server(s) shall be accessible to National Level U-NMS via broadband connection available at AIR Transmitter sites. The site level Unified NMS shall be in 1+0 configuration.

c. In case of no connectivity between National Level and Site Level U-NMS, the Site Level U-NMS shall continue to operate and once the connectivity is restored, the national level U-NMS shall synchronize to site level U-NMS or vice versa make sure that we have up to date database of alarms, information events etc.

d. The National Level U-NMS shall be equipped with GSM Modem/Wireless Broadband Modem and Mobile gateway functionalities in order to have centralized automation email/SMS alerts besides mobile based access of U-NMS platform. The GSM modem shall be offered by bidder in recommendation of U-NMS OEM. The required SIM card shall be provided by AIR.

III. Functional Requirements:

A. For National Level U-NMS:

a. It shall have Centralized Access of all Site Level U-NMS (S) including the underlying elements.

b. It shall have Dynamic and Virtual presentation of Site Level elements.

c. It shall have national level reports, and dashboards in a very customized way.

d. It shall have descriptive 'View level rights' and 'Action level rights (read/write/config)' to enable Zone wise, Group wise, Administration wise, Operator wise, Site wise or any customized kind of access.

e. It shall have capability for automated email to respective vendor /team in case of special attention.

f. Customized reporting shall be needed or shall be scheduled to achieve automated reports of any possible parameter, site etc.

- g. System shall have the capability of seamless expansion and clustering of new hardware/ capacity as may be required during expansion.
- h. It shall support Mobile Web Access, offering a lightweight web interface for mobile devices such as smart phones. The graphical user interface shall be secured by the standard user account and shall enable the operator to access and control any of the data available in the solution platform for devices and services.
- i. Shall support static map integration with Drill down architecture.
- j. The solution shall be capable to support inventory management. Asset management, shall be upgradable by adding the additional modules as and when required.
- k. The offered platform shall have the interactive UIs for Mobile devices to offer simplified entry point to all key data across all managed operational systems, which shall be running on any mobile tablet or phone platform.
- l. The National level system would be tested in each Phase of Delivery for functionalities in respect of the concerned sites of that Phase. It would be the responsibility of the bidder to ensure completion of a Phase with successful testing of the National level U-NMS for the concerned sites in the particular phase. However, completion of Testing and commissioning of National level U-NMS would be considered after its successful testing in all phases.

B. For Regional/ Site Level U-NMS:

- a. It shall have the capability to operate as a standalone U-NMS with important functions like monitor, control, fault management, configuration management, dashboards, drill down GUI, web based access etc.
- b. It shall act as data collector and store all the information in database so that the national level U-NMS shall be synchronized with sites, after the connectivity is restored.
- c. It shall have independent drill down architecture related to individual transmitter site.

IV. Hardware requirement for U-NMS:

- a. Hardware Server in hot redundant mode of suitable capacity for national Level U-NMS based on the recommendation from U-NMS OEM.
- b. 4 nos. of Hardware Servers for Regional Level U-NMS and one no. of Hardware server for National level U-NMS based on the recommendation from U-NMS OEM.
- c. 2xGSM hardware for National level U-NMS based on the recommendation from U-NMS OEM.
- d. The offered servers should be 19' rack mountable preferably of make Dell/IBM/HP or equivalent with foldable LCD display.

V. Brief Technical specification for above servers (Minimum requirements)

a. For National Site & 04 Regional sites:

Items	Qty.	Description
Processor	1	Intel® Xeon® E3-1230 v6 3.5GHz with 4c/8T(72 W)
RAM	1	16 GB 2400MT/s DDR4 ECC UDIMM
Hard drive	4	1TB 7.2K RPM SATA 6Gbps 3.5in Hot-plug Hard Drive
RAID Controller	1	PERC H330 Integrated RAID-5 Controller for Hot Plug Chassis
Power Supply	1	Dual, Hot-plug, Redundant Power Supply, 350 W
Network	4	1 Gb Ethernet Network Interface Card
Operating System	1	Ubuntu v14.04 (or above) Server LTS or Desktop LTS (including GUI)

b. For 100 sites:

Only switch /encoder /decoder may require. As per OEM recommendation.

ANNEXURE-I

INSPECTION DETAILS

The inspection for acceptance of the Transmitters with Automatic Changeover Unit, UPS system and Transmitter cum Programme Input Equipment Rack will be carried out at the tenderer's System Integrator's Works 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 Manufacturer/tenderer. Complete details and specifications of the transmitter will be checked and all parameter values will be measured.

The schedule of inspection shall be as below:-

- (i) **Lot-I (40 Nos.):** The Lot-I shall be inspected in the first week of 4th Month after Acceptance of Tender. The tenderer shall put up all the 40 Nos. of Lot-I Transmitters with Automatic Changeover Unit, UPS system and Transmitter cum Programme Input Equipment Rack for inspection, out of which 10 % (4 Nos.) randomly selected shall be inspected in details and measurements shall be taken. All the 10 % randomly selected transmitters shall be tested for 24 Hours continuously on dummy load. Rest of the 90%(36 Nos.) will be accepted on the basis of OEM's Test Certificate.
- (ii) **Lot-II (40 Nos.):** The Lot-II shall be inspected in the first week of 6th Month after Acceptance of Tender. The tenderer shall put up all the 40 Nos. of Lot-II Transmitters with Automatic Changeover Unit, Antenna system, RF coaxial foam dielectric cable, UPS system and Transmitter cum Programme Input Equipment Rack for inspection, out of which 10 % (4 Nos.) randomly selected shall be inspected in details and measurements shall be taken. All the 10 % randomly selected transmitters shall be tested for 24 Hours continuously on dummy load. Rest of the 90%(36 Nos.) will be accepted on the basis of OEM's Test Certificate.
- (iii) **Lot-III (20 Nos.):** The Lot-III shall be inspected in the first week of 9th Month after Acceptance of Tender. The tenderer shall put up all the 20 Nos. of Lot-III Transmitters with Automatic Changeover Unit, Antenna system, RF coaxial foam dielectric cable, UPS system and Transmitter cum Programme Input Equipment Rack for inspection, out of which 10 % (2 Nos.) randomly selected shall be inspected in details and measurements shall be taken. All the 10 % randomly selected transmitters shall be tested for 24 Hours continuously on dummy load. Rest of the 90%(18 Nos.) will be accepted on the basis of OEM's Test Certificate.

The tenderer is required to demonstrate the compatibility of the FM transmitter for Digital Broadcasting (DRM+/HD Radio) on one of the Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in **Lot-I**. The tenderer is also required to provide additional equipments (if any) during demonstration, to check the compatibility of the FM transmitter for Digital Broadcasting (DRM+/HD Radio).

Testing/measurements including Operational & functional checking of the transmitter will be carried out at tenderer's System Integrator's Works on single phase, 230 Volt(rms) \pm 10%, 50 Hz \pm 4% power supply available at the transmitter's input circuit breaker without any outside transformer unit etc. No other voltage will be acceptable to AIR at the transmitter's input circuit breaker and failing which the transmitter equipment is liable to be rejected.

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The technical facilities/equipment for varying within $\pm 10\%$ of 230 Volts(rms), single phase should be available at tenderer's System Integrator's Works for testing/measurements including Operational & functional checking of the transmitter during the inspection. The performance of transmitter as per parameters in Section-IV shall be guaranteed without degradation with the given power supply tolerances.

Exhaustive checking and measurements will be carried out so as to completely check the compliance of the transmitter and its sub systems as projected in the specifications.

It is mandatory that testing/measurements including operational & functional checking of all the transmitters and measurements as per parameters in Section-IV at three different frequencies including operating frequency of the transmitter in the VHF Band i.e. 88 MHz to 108 MHz without change of components/settings/tuning are carried out well in advance. These must be submitted to All India Radio along with the call for inspection of transmitters well in advance for analyzing etc. These measurement details, graphical printouts, notes and figures must be available at the tenderer's System Integrator Works at the time of inspection.

All the spares ordered as per AT will be tested in actual circuit at tenderer's System Integrator's Works by Engineers of AIR.

Tenderer shall arrange for the photographs of inside of transmitter's cubicle which will be attached with the ATP/Inspection report.

Antenna system, RF coaxial foam dielectric cable and other associated equipments, items and accessories, UPS, Programme Input & Monitoring equipments will be accepted on the basis of OEM test certificates (as per AIR specifications) duly stamped and signed by respective OEM on the letterhead of the OEM, failing which test certificates will be considered incomplete and equipment offered by the firm is liable to be rejected. OEM test certificates are also to be submitted by the tenderer to All India Radio before giving call for inspection for analyzing etc. These OEM test certificates must also be available at the time of inspection.

Following information should also form part of above data which will also be checked during inspection by AIR's representative at the tenderer's System Integrator's Works.

1. Origin of Country, Make, Model and type of Transmitter System, UPS, Transmitter cum Programme Input Equipment Rack along with Automatic Changeover Unit for different modes of operation, accessories and spares.
2. Dimension of Transmitter, sub-units and accessories.
3. Working/operation of all sub-units and accessories.
4. System configuration check and completeness of Transmitter.
5. Checking meter readings and calibration.
6. Measurements of parameters as per specification.
7. Checking of control/protection system of Transmitter.
8. Checking of all power levels, meters, LCDs etc.
9. Measurement of levels in the whole AF and RF chain.
10. Checking of RF voltages on test points.
11. Interchangeability of sub-modules and PCBs.
12. Checking of spares, PCB's, modules for the respective transmitter.

ANNEXURE-II

PERFORMA FOR INFORMATION ABOUT LOCAL OFFICE FOR AFTER SALES SUPPORT

1.	Address of Local Office	
	Telephone (Landline) No.	
	Mobile No.	
	E-mail Address	
2.	Address for communication (if different)	
3.	Legal Status (Authorized Representative/ liaison office/registered company etc.)	
4.	Name, address, contact number (Mobile number) & e-mail address of Local representative	
5.	Brief details of Technical facilities available for after sales support: The details of technical facilities in the local after sales support office, such as test bench, necessary test & measuring equipment and photographs thereof, must be provided in the technical bid.	
6.	Main line of business, specialization and number of years of operation	
7.	Total number of permanent technical employees including their designation and qualification	
8.	Details of Agreement/MoU for after sales support with OEM (Copy must be provided with the offer)	Date of Agreement: Executed at : Executed by :
(Authorized Signatory of local office)		(Authorized Signatory of transmitter OEM)
Name :		Name :
Signature :		Signature :
Place and Date:		Place and Date:

ANNEXURE-III

List of Places for 100 W Digital Compatible VHF FM Solid-State MOSFET Technology Based Broadcast Transmitter in (1+1) configuration (100 Nos.) at LPT DD sites**State: Andra Pradesh – 5 places**

S. No.	Name of Places
1	Alagadda
2	Bheemavaram
3	Guntakal
4	Hindupur
5	Madanapalle

State: Bihar – 10 places

S. No.	Name of Places
1	Banka
2	Buxar
3	Gopalganj
4	Jamui
5	Khagaria
6	Lakhisaria
7	Madhepure
8	Nawada
9	Siwan
10	Sonbarsha

State: Gujrat -13 places

S. No.	Name of Places
1	Amreli
2	Botad
3	Chhote Udaipur
4	Dohad
5	Modasa
6	Morvi
7	Rapar
8	Surendranagar
9	Tharad
10	Valsad
11	Veraval
12	Khambalia
13	Radhanpur

State: Haryana- 2 places

S. No.	Name of Places
1	Bhiwani
2	Jind

State: Jharkhand-1 place

S. No.	Name of Place
1	Godda

State: Karnataka -7 places

S. No.	Name of Places
1	Bagalkot
2	Bidar
3	Chikmagalur
4	GadagBetigeri
5	Gangawati
6	Kolar
7	Renebenur

State: Kerala -2 places

S. No.	Name of Places
1	Kayamkulam
2	Pathanamthitta

State: Madya Pradesh -13 places

S. No.	Name of Places
1	Badwani
2	Burhanapur
3	Khargone
4	Khurai
5	Kukdeswar
6	Murwara
7	Narsinghpur
8	Panna
9	Piparia
10	Seoni
11	Shajapur
12	Shyopur
13	Nagda

State: Maharashtra-13 places

S. No.	Name of Places
1	Achalpur
2	Barshi
3	Hingoli
4	Mahad
5	Nandurbar
6	Pandharpur
7	Rajapur/Rajpur
8	Sangamner
9	Satana
10	Shirdi
11	Sironch
12	Umarkhed
13	Washim

State: Odisha -6 places

S. No.	Name of Places
1	Bargarh
2	Kendrapara
3	Malkangiri
4	Nabarangpur
5	Phulbani
6	Sundergarh

State: Punjab -1 place

S. No.	Name of Place
1	Abohar

State: Rajasthan -14 places

S. No.	Name of Places
1	Baran
2	Beawar
3	Bhadre
4	Bhilwara
5	Bhinmal
6	Dungarpur
7	Hanumangarh
8	Jalore
9	Karanpur
10	Khajuwala
11	Pali

12	Phalodi
13	Sujangarh
14	Pratapgarh

State: Tamilnadu-1 place

S. No.	Name of Place
1	Kumbakonam

State: Telangana – 5 places

S. No.	Name of Places
1	Achampat
2	Davarkonda
3	Nalgonda
4	Nirmal
5	Ramagundam

State: Uttar Pradesh -5 places

S. No.	Name of Places
1	Auraya
2	Deoria
3	Fatehpur
4	Lalitpur
5	Naugarh

State / UT: Andman & Nicobar Islands 1 place

S. No.	Name of Place
1	Car Nicobar

State: West Bengal -1 place

S. No.	Name of Place
1	Alipurduar