प्रसार भारती/Prasar Bharati
(भारत का लोक सेवा प्रसारक)
(*India's Public Service Broadcaster*)
आकाशवाणी महानिदेशालय /Directorate General: All India Radio
योजना एवं विकास एकक, आकाशवाणी भवन, संसद मार्ग, नई दिल्ली-110001
P & D Unit, Akashvani Bhawan, Sansad Marg, New Delhi-110001
[एफ. एम. डिजाईन अनुभाग /FM Design Section]
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No. SPECS-100W FM TX.-9/4/2019-D (TD/FM) Dated 26.04.2019

Subject: 100 W Digital Compatible VHF FM Solid-State MOSFET Technology Based Broadcast Transmitter in (1+1) configuration alongwith pre-wired Rack including Programme Input & Monitoring equipments and other associated equipments/items-100 Places

Kindly find enclosed herewith the draft technical specification [**AIR Specification No. 100 W FM Tx./44/April/2019-D (TD/FM)]** for Supply of 100 W Digital Compatible VHF FM Solid-State MOSFET Technology Based Broadcast Transmitter in (1+1) configuration alongwith pre-wired Rack including Programme Input & Monitoring equipments and other associated equipments/items-100 Places, to get feedback from Original Equipment Manufacturers (OEMs) of the product/prospective bidders.

Please submit your feedback via e-mail on or before 10.05.2019 at 17.00. Hrs. at the following e-mail addresses.

satyendra@prasarbharati.gov.in
rnahar@prasarbharati.gov.in
manzoor@prasarbharati.gov.in

Encl: As above.

(Manzoor Ali)
Asstt. Director (Engg.)
for Director General

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

SPECIFICATIONS
for
Supply of 100 W Digital Compatible VHF FM Solid-State MOSFET Technology Based Broadcast Transmitter in (1+1) configuration alongwith pre-wired Rack including Programme Input & Monitoring equipments and other associated equipments/items

INTRODUCTION

This Specification is for Supply of 100 W Digital Compatible (**Transmitter should be able to switch into class AB linear mode for OFDM use**) VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration alongwith pre-wired Rack including Programme Input & Monitoring equipments and other associated equipments/items to be installed at various sites in AIR network.

SUMMARY OF CONTENTS:

A. ESSENTIAL REQUIREMENTS FOR TENDERERS:

1. (i) The tenderer should submit Schedule of Requirements/Materials of Supply (un-priced) ***in the same format as given in Section-5.0 (A&B)*** of All India Radio 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 specification 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 merit of the offer without which the tender will be

considered incomplete and is liable to be rejected.

3. The tenderer should submit the tender offer to All India Radio 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 technical specifications compliance statement, to assess the full merit of the offer, failing which tender shall be considered incomplete and is liable to be rejected.

S. No. of AIR Specifications (Section wise & Clause wise) (1)	Details of All India Radio 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)
A. Essential requirements for tenderers				
B. Essential eligibility criteria for tenderer				
Section-1.0 Clause wise				
Section-2.0 Clause wise				
Section-3.0 Clause wise				
Section-4.0 (A&B) 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 1.7 of Section-1.0.

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. 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.

10. 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.

11. ***Optional items will not be considered for ranking purpose.***

B. <u>ESSENTIAL ELIGIBILITY CRITERIA FOR TENDERER:</u>

(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 5 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 50 Nos. of such VHF FM transmitters not less than 100 W power output. The offered model should have field proven track record and should already be in production by OEM. Documentary evidence to support this must be provided.

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 Completion certificates/delivery challans/invoice of at least 10 Nos., out of the 50 Nos. of 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, the tenderer must be an authorized representative/dealer of any OEM of VHF FM transmitters/TV transmitters/AM 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 - 1.0

GENERAL

1.1 Please refer tender documents for general terms and conditions of contract for supply including all the commercial aspects like; Packing and packing list, Insurance and Marine Risk etc. Payment terms, Penalty/Compensation for delay, Damages and liabilities, Time Period and Extension for Delay, Foreclosure of contract due to Abandonment or Reduction in scope of supply, Cancellation of contract in full or part, Recovery of security deposit, Performance Guarantee, Unsatisfactory workmanship, Damages incurred during transit, tenderer liable for damages, Defects, Recovery of compensation, Ensuring payment and amenities, tenderer to indemnify Government against Patent Rights, Release of security deposit, Safety Code, insurance from manufacturer's works/factory to respective site etc. **i.e. in totality**.

1.2 INSPECTION:

1.2.1 Detailed inspection of transmitters will be carried out at OEM's Works by representatives of DG: AIR as per details given in Annexure-I.

1.2.2 Call for Pre-dispatch Inspection (PDI) at OEM's Works is to be given by the tenderer to All India Radio at least **4 weeks** in advance. **Inspection period will be 5 working days.** Testing/measurements reports as per approved ATP must be submitted to All India Radio alongwith the call for inspection of transmitters for analyzing etc.

1.2.3 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(s) will be borne by AIR.

1.2.4 The complete Acceptance Test Procedure/Protocol (ATP) will be prepared by the respective OEM and submitted to DDG (E-FM), P&D Unit, DG: AIR for approval within **15 days** 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 OEM 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.

1.3 INFORMATION TO BE SUPPLIED WITH THE TENDER:

1.3.1 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).**

1.3.2 Complete printed technical literature/technical data sheet/schematic drawings/detailed information including Technical Manuals (for Installation, Testing, Commissioning, Operation, Maintenance & Service, including theory of operation, circuit description and fault diagnosis) of 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration, pre-wired Rack including Programme Input & Monitoring equipments and associated equipments/items as per Section-5.0 (A&B) from the respective Original Equipment Manufacturer (OEM) in support of compliance statement should be furnished on non-returnable basis, to assess the full merit of the offer, without which the tender offer will be considered incomplete and is liable for rejection.

1.3.3 Detailed Schedule of Requirements/Materials (un-priced) for the supply of 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration, pre-wired Rack and associated equipments/items should be in conformity with Section-5.0 (A&B) 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.

1.3.4 Descriptive information and complete details of each equipment offered shall be given by the tenderer.

1.3.5 Country of Origin, Make, Type & Model of all the offered items should be mentioned including the name & address of their vendors.

1.3.6 A copy of the Installation Manual, Operation, Maintenance & Service 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, Maintenance & Service 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.

1.4 INFORMATION TO BE SUPPLIED BY THE TENDERER WITHIN 15 DAYS AFTER ISSUE OF ACCEPTANCE OF TENDER:

One set of Technical Manuals (for Installation, Testing, Commissioning, Operation, Maintenance & Service, including theory of operation, circuit description and fault diagnosis) **COLOUR** printed and duly bound for 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration, Automatic Changeover Switch, RF Coaxial Changeover Switch, Automatic Audio Changeover Switch, pre-wired rack including Programme Input & Monitoring equipments, dummy load and associated equipments/items alongwith soft copy on CD must be supplied to "DDG (E-FM), P & D Unit, DG: AIR, New Delhi-110001".

1.5 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 consignee prior to dispatch of Equipment:

a) Detailed list of equipment under dispatch.

b) Photograph showing location of various units/sub units with item numbers marked thereon.

1.6 INFORMATION TO BE SUPPLIED ALONGWITH EQUIPMENT:

Technical manuals (for Installation, Testing, Commissioning, Operation & Maintenance, including theory of operation, circuit description and fault diagnosis) **COLOUR** printed and duly bound for 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration, Automatic Changeover Switch, RF Coaxial Changeover Switch, Automatic Audio Changeover Switch, pre-wired rack including Programme Input & Monitoring equipments, dummy load and associated equipments/items and OEM test certificate with soft copy on CD shall be supplied as per Section-5.0 (A&B).

1.7 GUARANTEE:

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

{This Guarantee clause is applicable to all the equipments/items mentioned in Schedule of Requirements/Materials in Section-5.0 (A&B)}.

(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 from the date of supply. 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 during next 10 years, the manufacturer stops production of this model of VHF FM transmitter, the firm shall intimate All India Radio in advance to enable the latter to stock the critical items.

1.8 LANGUAGE/UNITS:

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

All dimensions, units on drawings, all references to weights, measures & quantities shall be in SI Units.

1.9 DELIVERY PERIOD OF EQUIPMENT:

i. For Indian Bidders:

Supply will have to be completed within Three **months** from the date of Acceptance of Tender or Three **months** from the date of the Decision Letter from WPC(wherever is required) in respect of RF equipment, provided by AIR, whichever is later.

ii. For Foreign Bidders:

Supply will have to be completed within Three **months** from the date of Opening of Letter of Credit (LC).

1.10 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 Dy. Director General (E-FM), P & D Unit, DG: AIR, New Delhi.

1.11 INSURANCE AND MARINE RISKS ETC:

Please refer to commercial terms.

1.12 MAINTENANCE SUPPORT AND SPARES:

(a) The minimum recommended essential spares shall be quoted separately by the tenderer.
(b) The minimum recommended essential spares may be based on predicted rate of failure.
(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.

1.13 LOCAL REPRESENTATIVE/DEALER:

(a) The OEM of the offered RF coaxial foam dielectric cable must have his local office/authorized

representative/dealer in India 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.

(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 the offered equipments/ items 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 offered equipments after the completion of guarantee period, shall also be provided by the respective OEM of the offered equipments/ items through their representatives/dealers in India.

(d) The OEM should have complete setup for maintenance/repair of the offered equipments/items 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.

1.14 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.

Functional checking as per AIR specification clause 2.6 & 2.7.8 under Section-2.0 and performance measurements as per AIR specification clause 3.7 under Section-3.0 will be carried out for compatibility test of the offered VHF FM transmitter in HD or DRM+ mode.

HD/DRM+ Equipments are not the part of Supply with this tender. However, all necessary equipments required for checking the compatibility of the offered VHF FM transmitter in HD or DRM+ mode, at technical evaluation stage as well as PDI stage will be arranged by the tenderer.

The tenderer will also 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.

1.15 POWER SUPPLY FOR ALL EQUIPMENT:

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

1.16 AMBIENT CONDITIONS FOR ALL INDOOR EQUIPMENT:

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

1.17 TRAINING AT OEM's WORKS:

a. OEM(s) shall train a team of AIR Engineers for 5 working days at **OEM's Works** to enable them to become acquainted with all particulars as well as installation, operation, maintenance, trouble shooting of the transmitter and associated equipments at no cost to AIR. However, AIR shall bear all touring expenses of AIR Engineers deputed for training and the same is not to be included by the tenderer in their offer.

b. The training shall cover theoretical concepts, demonstration of salient features, remote control operation, configuration of transmitter, operational & maintenance, fault finding, circuit tracing, component/ module replacements, trouble shooting, preventive maintenance and other relevant topics etc. related to the transmitter.

c. Training material in hard and soft copies are to be provided by the OEM to each AIR engineer undergoing the above training.

d. **Colour printed & duly bound** two sets of training lecturer notes, schematic drawings, hand books etc. shall be supplied to DDG (E-FM), P&D Unit, DG: AIR within One Month after approval of ATP.

SECTION-2.0

TECHNICAL SPECIFICATIONS OF TRANSMITTER:

2.1 All India Radio is interested to procure on 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration alongwith pre-wired Rack 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.

2.2 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), RF Coaxial Changeover switch, Automatic Audio changeover switch, interconnecting cables, Dummy load, pre-wired Rack, Analog Distribution Amplifier, Digital Distribution Amplifier, Monitoring Amplifier etc. as per the Schedule of Requirements/Materials for Supply (un-priced).

2.3 It will be the responsibility of the tenderer to ensure that the system is complete in all respects.

2.4 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.

2.5 The layout of the various equipments in the Transmitter cum Pre-wired Rack as per AIR Specification should be provided with the offer.

2.6 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-4.0.
The Digital Compatible 100 W VHF FM Solid-State MOSFET technology based Broadcast transmitter should be compatible for DRM+/ HD Radio mode. HD/DRM+ Equipments are not the part of Supply with this tender. However, all necessary equipments required for checking the compatibility of the offered VHF FM transmitter in HD or DRM+ mode, at technical evaluation stage as well as PDI stage will be arranged by the tenderer.
The Digital Compatible 100 W VHF FM Solid-State MOSFET technology based Broadcast Transmitter should be able to switch into class AB linear mode for OFDM use without any requirement of modifications in the supplied transmitter equipment.

2.7 100 W Digital Compatible Transmitter Unit:

2.7.1 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.

2.7.2 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.

2.7.3 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.

2.7.4 The Transmitter unit shall be suitable for FM monophonic and stereophonic/ multiplex transmission in the frequency range from 88 MHz to 108 MHz.

2.7.5 The Transmitter and other ancillary units shall be characterized by high reliability, high MTBF. It should be field proven.

2.7.6 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.

2.7.7 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.

2.7.8 **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.**

2.8 Facilities:

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.

2.9 Circuit Design:

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.

2.10 Exciter :

2.10.1 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.

2.10.2 It should display various parameters like forward and reflected power, frequency deviation, input-audio level, DC voltages & currents on LCD display.

2.10.3 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.

2.11 Power Amplifier (PA):

2.11.1 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.

2.11.2 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.

2.12 Power Supply:

2.12.1 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 1.15 at a single point. All the power supply required for the Transmitter and its associated equipments should be derived from the same point.

2.12.2 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.

2.13 Protection System:

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

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

2.13.2 Protection against over temperature on heat sinks.

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

2.13.4 Protection against high VSWR including open and short conditions at output.

2.13.5 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.**

2.13.6 Transmitter should be protected against lightning by providing DC/RF discharge path and details of the same are to be given.

2.14 Control and Interlocking:

2.14.1 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.

2.14.2 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.

2.15 INSTRUMENTATION AND INDICATIONS:

2.15.1 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.

2.15.2 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.

2.15.3 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.

2.15.4 Following connectors /socket shall be provided, preferably on Back Panel:

(i) One earthling 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

2.16 COOLING SYSTEM:

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

2.17 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.

2.18 REMOTE CONTROL AND TELEMETRY SYSTEM

2.18.1 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.

2.18.2 The Remote control and Telemetry system should be capable for controlling and monitoring various parameters of FM transmitter and automatic changeover unit 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.

2.18.3 Details of monitoring, control parameters, indications & metering etc. shall also be given by the tenderer.

2.18.4 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-3.0

TECHNICAL PARAMETERS OF THE TRANSMITTER

3.1 GENERAL

3.1.1	Frequency Range	88 MHz to 108 MHz
3.1.2	Nominal Frequency deviation	±75 kHz (peak)
3.1.3	Maximum Frequency Deviation	±100 kHz (peak)
3.1.4	Frequency Setting	Direct from front panel in 10 kHz steps
3.1.5	Class of Emission	256KF8E
3.1.6	Stereo transmissions	Acc. to Rec. ITU-R BS.450-3 (Pilot tone)
3.1.7	Pre-emphasis	0, 50 µs (selectable).

3.2 INPUTS

3.2.1	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
3.2.2	Input impedance (Analog)	10 k Ω or greater (for Mono) 10 k Ω or greater (for Stereo)
	Input Impedance (AES/EBU)	110 Ω
3.2.3	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

3.3 RF OUTPUT

3.3.1	Output power (RF)	≥100 W
3.3.2	Output Impedance	50 Ω. (Unbalanced)
3.3.3	Output connector	N (F) connector (Rear)
3.3.4	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.
3.3.5	Harmonic and Spurious Signal Suppression.	Within the limits as per Radio Regulations & ITU-R Recommendations. The actual values are to be indicated.
3.3.6	Maximum Frequency Tolerance	As per ITU-R

3.3.7	Synchronous AM S/N Ratio referenced to 100% AM modulation at 400 Hz, 50 µs Pre-emphasis with FM modulation at ±75 kHz deviation.	Better than 50 dB
3.3.8	Asynchronous AM S/N Ratio unweighted, referenced to 100% AM modulation at 400 Hz, 50 µs Pre-emphasis and without FM modulation.	Better than 60 dB
3.3.9	Overall efficiency	≥ 55 %

3.4 MONO OPERATION:

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

3.5 STEREO OPERATION:

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

3.6 WIDEBAND COMPOSITE OPERATION:

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

3.7 DIGITAL (DRM+/HD Radio) OPERATION:

3.7.1	MER (Modulation Error Ratio) for HD Radio	≥ 14 dB
3.7.2	MER (Modulation Error Ratio) for DRM+	≥ 21 dB @ DRM+ @ 16-QAM & ≥ 13 dB @ DRM+ @ 4-QAM

3.8 TECHNICAL SPECIFICATIONS OF REMOTE CONTROL AND TELEMETRY SYSTEM:

S. No.	Technical Parameters	Technical Specifications
3.8.1	Remote Control and Monitoring (Controllable Settings/Parameters)	1. Transmitter: ON/OFF 2. RF Output Power Level Control 3. Audio input level 4. Selection of Transmitters 1/2.
3.8.2	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.
3.8.3	Data Format	To be indicated by tenderer and compatible for above system.
3.8.4	Data Rate	To be indicated by tenderer and compatible for above data format

SECTION-4.0

TECHNICAL SPECIFICATIONS OF AUTOMATIC CHANGEOVER UNIT, RF COAXIAL CHANGEOVER SWITCH, PRE-WIRED RACK INCLUDING PROGRAMME INPUT & MONITORING EQUIPMENTS, AUTOMATIC AUDIO CHANGEOVER SWITCH, DUMMY LOAD etc.

4.1 AUTOMATIC CHANGEOVER UNIT (ACU):

4.1.1 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.

4.1.2 Any one of the 100W Transmitter unit shall be selectable as master or slave automatically in active standby 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.

4.1.3 The complete switching sequence of changeover of transmitters and associated equipments may be provided with the technical offer.

4.1.4 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.

4.1.5 In case of audio failure, an indication shall be displayed in the front panel of ACU.

4.2 RF COAXIAL CHANGEOVER SWITCH:

Four ports, RF coaxial Changeover switch fitted with N type connectors for connecting transmitter 1 & 2, dummy load & antenna, is to be quoted as per technical specifications given below. RF coaxial switch should also work in manual mode. The switch should be equipped with a visual position indicator and emergency knob for manual switching. All the technical specifications/parameters are to be supported with printed technical literature/data sheet etc. from the OEM. The RF switch shall communicate with ACU.

S. No.	Technical Parameters	Technical Specifications
(i)	No. of Ports	4
(ii)	Input Ports (2), Output Port (1), Termination/Dummy Load Port(1)	N
(iii)	Frequency Range	88 MHz to 108 MHz
(iv)	Impedance (Nominal)	50 Ω
(v)	Average Power Handling Capacity	$\geq$ 500 W
(vi)	Isolation	$\geq$ 60 dB
(vii)	VSWR	$\leq$ 1.05
(viii)	Insertion loss	$\leq$ 0.05 dB
(ix)	Mechanical life	$\geq$ 1, 00, 000 operations
(x)	Signaling and Interlock Contacts	The interlock contacts should be coupled with RF contacts for interrupting RF power before and during switching. They should open before the RF contacts separate and closes after the RF contacts are in their new position. The auxiliary contacts should be suitably rated.

4.3 PRE-WIRED RACK :

(i) Pre-wired Rack shall house 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration along with Automatic Changeover Unit, RF Coaxial Changeover Switch, Automatic Audio changeover switch, Distribution Amplifiers, Monitoring Amplifier, Dummy load etc. 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) Pre-wired Rack shall be provided with cable trays, wiring, tag blocks, terminal strips, BNC connectors, repeat coils, necessary modulating inputs level control in steps, facility to measure audio levels at various points in the programme chain with a PPM meter and monitor audio levels at various points in the programme chain with an ampli-speaker (1+1) with mounting arrangement, selector switch, ventilation arrangement and other accessories as per AIR specifications.

(iii) There will be two external sources of audio from the output of two Set Top Boxes (DTH) [to be provided by AIR]. The audio shall be fed to both the Transmitters via Distribution amplifier from one external source as selected by the Automatic Audio changeover switch.

4.3.1 GENERAL: It shall be a standard 19" Rack conforming to professional standards of sound broadcasting for mounting equipment and accessories having lockable rear door and side panels.

4.3.2 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 1500 mm (H) × 600 mm (W) × 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.

(v) Finish of the Rack: The inside and outside of the rack shall be spray painted with dark grey after necessary anti rust treatment.

4.3.3 JACK STRIP FIELD/ AUDIO PATCH PANEL:

(i) 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.

(ii) 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.

(iii) Contact arrangement: Each jack strip shall be a 20 point jack, providing a break circuit (on both wires) and an isolated earthing lug.

(iv) Indicating strip: A strip covered with transparent plastic shall be provided above the row of jacks for labeling purposes.

(v) Separate jack strip field/ audio patch panel for analog and digital inputs will be provided by the tenderer.

4.3.4 PEAK PROGRAMME METER:

The Programme level metering shall be with **Peak Programme Meter** (Bar graph Display or LEDs Type). This unit shall work independently in any configuration for signal monitoring without loading the source.

4.3.5 AMPLI-SPEAKER PANEL:

The Ampli-speaker with mounting arrangements shall have two ampli-speakers, one for each channel. The monitoring output will be fed to the ampli-speakers. The Ampli-speaker shall meet the following specifications:

S. No.	Technical Parameters	Technical Specification
(i)	Frequency range	63 Hz-15 kHz
(ii)	Audio Power	8 Watt Continuous for each channel
(iii)	Volume Control	adjustable for each channel
(iv)	Audio input	Balanced Stereo
(v)	Input Impedance	≥10 kΩ
(vi)	Power Supply	As per AIR specification clause 1.15

4.3.6 REPEAT COIL:

(i) A Line to line audio transformer shall be provided for isolating balanced and unbalanced circuits.

(ii) 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 then -75dBm, as measured across either winding, both secondary and primary being terminated by 600 Ω.

(iii) Insertion Loss: Less than 1dB

(iv) Frequency response: better than ± 1 dB (30 Hz-15kHz) referred to 1 kHz.

4.3.7 RACK WIRING:

(i) 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.

(ii) 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.

(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.

4.3.8 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.

(i) ANALOGUE STEREO DISTRIBUTION AMPLIFIER:

S. No.	Technical Parameters	Technical Specification
1.	Input Impedance	Input impedance shall be $\geq$ 10 k Ω (balanced)
2.	Input Level	
a.	Nominal	0 dBu
b.	Maximum	+20 dBu
3.	Gain	Shall have adjustable gain of $\pm$ 5 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 Ω (balanced)
6.	Frequency Response	$\pm$ 0.1 dB in frequency range of 20 Hz to 20 kHz
7.	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.	S/N Ratio at nominal Input/Output, rms unweighted (22 Hz-22kHz)	$\geq$ 90 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° in frequency range of 125 Hz to 10 kHz and 10° from 20 Hz to 20 kHz
11.	Inter-Channel Level Difference	Within $\pm$ 0.5dB, 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

(ii) DIGITAL DISTRIBUTION AMPLIFIER:

S. No.	Technical Parameters	Technical Specification
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

4.3.9 Other Accessories:

(i) A LED 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 suitable height from the bottom at the rear side.
(iii) PVC channels may be provided 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).
(vi) Blank panels of 1U height wherever required for proper gap between equipment are to be provided suitably.

4.3.10 Power Supply:

(i) A single phase Mains Panel with indication lamp and MCB to distribute power supply 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.
(iii) Power supply to all the equipments/circuits in the rack shall be distributed from this Mains panel along the height of rack at each equipment level through 3 Pin 5A socket. The Rack shall also be provided with two additional sockets of 3 pin 5A.

4.3.11 Earthing:

All the equipment in the Rack shall be properly earthed. The earth circuits of the power supply and audio circuits shall be kept separate and brought out on suitable terminals for earthing.

4.3.12 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.

4.4 AUTOMATIC AUDIO CHANGEOVER SWITCH:

There will be two external sources of audio from the output of two Set Top Boxes (DTH)[To be provided by AIR]. The audio shall be fed to both the Transmitters via Distribution amplifier from one external source as selected by the Automatic Audio changeover switch.

Automatic audio changeover switch should be suitable for two stereo audio inputs and one stereo audio output for connecting audio from two sources. Selection of one of the audio input to output should be possible manually via front panel and remotely through SNMP over TCP/IP network. In case of failure of one of the audio source, silence detection should be possible and thereby automatic changeover to another audio source should be possible for which changeover time should be adjustable from 5 sec to 120 second. The automatic audio changeover switch shall provide negligible attenuation and shall not cause any deterioration of audio input signal made available at the output.

Technical Parameters of Automatic Audio Changeover Switch shall meet following specifications:

S. No.	Technical Parameters	Technical Specification
(i)	Input Mode	Stereo, Mono
(ii)	Silence wait time	From 5 sec to 75 sec
(iii)	Working mode	Automatic, Manual, Remote control through SNMP over TCP/IP network
(iv)	Output audio mode	Stereo, Mono
(v)	Analog Input-1	2 × XLR female
(vi)	Analog Input-2	2 × XLR female
(vii)	Analog Output	2 × XLR male
(viii)	Ethernet Port/Web Server	For remote control through SNMP over TCP/IP network
(ix)	Power Supply	As per AIR specification clause 1.15.

4.5 DUMMY LOAD-250W

S. No.	Technical Parameters	Technical Specification
4.5.1	Power Rating	250 W continuous
4.5.2	Connector	Type N-female
4.5.3	Frequency Range	88 to 108 MHz
4.5.4	VSWR	$\leq$ 1.1:1
4.5.5	Impedance(Nominal)	50 Ω
4.5.6	Load Coolant	Air cooled
4.5.7	Dimensions (Length x Width x Depth)	To be given by the tenderer.
4.5.8	Weight	To be given by the tenderer.
4.5.9	ENVIRONMENTAL CONDITIONS	As per Section -1.0

ANNEXURE-I

INSPECTION DETAILS

The inspection for acceptance of the Transmitter with Automatic Changeover Unit on dummy load and prewired Rack including Programme Input & Monitoring equipments will be carried out at OEM's Works by Engineers of All India Radio in accordance with Acceptance Test Procedure/Protocol (ATP). All facilities like complete set of measuring instruments, power supply, manpower etc. will be provided by the Manufacturer. Complete details and specifications of the transmitter will be checked and all parameter values will be measured.

The tenderer shall put up all the 100 Nos. of Transmitters with Automatic Changeover Unit and pre-wired Rack including Programme Input & Monitoring equipments for inspection, out of which 10 % (10 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%(90 Nos.) will be accepted on the basis of OEM's Test Certificate.

The tenderer is also required to demonstrate the compatibility of the FM transmitter for Digital Broadcasting (DRM+ **OR** HD Radio) on one of the Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitters. 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+ **OR** HD Radio).

Testing/measurements including Operational & functional checking of the transmitter will be carried out at OEM's Works on single phase, 230 Volt(rms) ± 10%, 50 Hz ± 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.

The technical facilities/equipment for varying within ± 10% of 230 Volts(rms), single phase should be available at OEM's Works for testing/measurements including Operational & functional checking of the transmitter during the inspection. The performance of transmitter as per parameters in Section-3.0 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 including Programme Input & Monitoring equipments 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-3.0 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 OEM's Works at the time of inspection.

All the spares ordered as per AT will be tested in actual circuit at OEM'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.

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

1. Origin of Country, Make, Model and type of Transmitter with Automatic Changeover Unit, Pre-wired Rack including Programme Input & Monitoring equipments, 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.

SECTION-5.0 (A)

SCHEDULE OF REQUIREMENTS/MATERIALS (UN-PRICED) [FOR ONE SET OF RF COAXIAL FOAM DIELECTRIC CABLE & ACCESSORIES]

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.	Supply of Automatic Audio Changeover Switch as per AIR specifications.			1 Set
3.	Supply of Four ports, RF coaxial Changeover switch fitted with N type connectors for connecting transmitter 1 & 2, dummy load & antenna as per AIR specifications. All the necessary low loss RF Coaxial Cables with N type Connectors for connecting Two Nos. of FM transmitters and dummy load shall be supplied alongwith the switch.			1 Set
4.	Supply of 250 Watt Dummy Load mounted in pre-wired Rack as per AIR specifications.			1 Set Complete
5.	Supply of Pre-wired Rack: Pre-wired Rack shall house 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration along with Automatic Changeover Unit, RF Coaxial Changeover Switch, Automatic Audio changeover switch, Distribution Amplifiers, Monitoring Amplifier, Dummy load etc. 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. Pre-wired Rack shall be provided with cable trays, wiring, tag blocks, terminal strips, BNC connectors, repeat coils, necessary modulating inputs level control in steps, facility to measure audio levels at various points in the programme chain with Peak Programme Meter and monitor audio levels at various points in the programme chain with an ampli-speaker			1 Set Complete

	(1+1) with mounting arrangement, selector switch, ventilation arrangement and other accessories as per AIR specifications.			
6.	Any other accessories offered for the completeness of the system.			1 Lot
7.	Inspection charges at manufacturer's works of transmitter as per AIR specifications.			1 Lot
8.	Technical Manuals (for Installation, Testing, Commissioning, Operation, Maintenance & Service, including theory of operation, circuit description and fault diagnosis) **COLOUR** printed and duly bound for 100 W Digital Compatible VHF FM Solid-State MOSFET technology based Broadcast transmitter in (1+1) configuration, Automatic Changeover Switch, RF Coaxial Changeover Switch, Automatic Audio Changeover Switch, pre-wired rack including Programme Input & Monitoring equipments, dummy load and associated equipments/items alongwith soft copy on CD & Inspection Report of the inspection carried out at OEM's works as per distribution given below.			-
8.1	For DDG (E-FM), P & D Unit, DG: AIR, New Delhi-110001 {Within 15 days of issue of Acceptance of Tender) (irrespective of number of transmitters to be ordered)			1 Set
8.2	For Consignee {To be supplied alongwith the equipment}			2 Sets
8.3	For the following Offices/Officers, Technical manuals are to be supplied alongwith 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 Office (Project Wing) (For SZ, WZ, NZ & EZ) - 4 Sets			
	(iii) Zonal Office (Maintenance Wing) (For SZ, WZ, NZ & EZ) -4 Sets			
	(iv) DDG (E-TM), DG: AIR -1 Set			
	(v) Technical Library, P&D Unit, DG:AIR -1 Set			
	(vi) NABM, New Delhi -1 Set			
	(vi) R&D, AIR & DD, New Delhi -1 Set			
	Total -13 Sets			

SECTION-5.0 (B)

SCHEDULE OF REQUIREMENTS/MATERIALS (UN-PRICED) [FOR ONE SET OF RF COAXIAL FOAM DIELECTRIC CABLE & ACCESSORIES (OPTIONAL) (Not to be considered for Ranking) {The tenderer must quote all items}

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(s)			1 Set
7.	Display Board			1 Set
8.	Monitor Board			1 Set

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) Name : Signature :	**(Authorized Signatory OEM of VHF FM Transmitter)** Name : Signature :
Place & Date	Place & Date

ANNEXURE-III

List of Places for supply of 100 W Digital Compatible VHF FM Solid-State MOSFET Technology Based Broadcast Transmitter in (1+1) configuration alongwith pre-wired Rack including Programme Input & Monitoring equipments and other associated equipments/items (100 Nos.) at LPT DD sites

S. No.	Name of Place	State	S. No.	Name of Place	State	S. No.	Name of Place	State
1	Alagadda	Andra Pradesh	35	Gangawati	Karnataka	69	Malkangiri	Odhisa
2	Rajahmundry	Andra Pradesh	36	Kolar	Karnataka	70	Nabarangpur	Odhisa
3	Madanapalle	Andra Pradesh	37	Renebenur	Karnataka	71	Phulbani	Odhisa
4	Banka	Bihar	38	Udupi	Karnataka	72	Balasore	Odhisa
5	Buxar	Bihar	39	Kayamkulam	Kerala	73	Abohar	Punjab
6	Gopalganj	Bihar	40	Pathanamthitta	Kerala	74	Baran	Rajasthan
7	Jamui	Bihar	41	Badwani	MP	75	Bhadre	Rajasthan
8	AIR Darbhanga	Bihar	42	Burhanapur	MP	76	Bhilwara	Rajasthan
9	Lakhisaria	Bihar	43	Khargone	MP	77	Bhinmal	Rajasthan
10	Sheikhpura	Bihar	44	Khurai	MP	78	Dungarpur	Rajasthan
11	Nawada	Bihar	45	Kukdeshwar	MP	79	Hanumangarh	Rajasthan
12	Siwan	Bihar	46	Murwara	MP	80	Jalore	Rajasthan
13	Narayanpur	Chhattisgarh	47	Narsinghpur	MP	81	Karanpur	Rajasthan
14	Amreli	Gujarat	48	Panna	MP	82	Khajuwala	Rajasthan
15	Botad	Gujarat	49	Piparia	MP	83	Pali	Rajasthan
16	Chhote Udaipur	Gujarat	50	Seoni	MP	84	Phalodi	Rajasthan
17	Dohad	Gujarat	51	Shajapur	MP	85	Sujangarh	Rajasthan
18	Modasa	Gujarat	52	Shyopur	MP	86	Pratapgarh	Rajasthan
19	Morvi	Gujarat	53	Nagda	MP	87	Kumbakonam	TN
20	Rapar	Gujarat	54	Achalpur	Maharashtra	88	Kachipuram	TN
21	Jamjodhpur	Gujarat	55	Barshi	Maharashtra	89	Davarkonda	Telengana
22	Tharad	Gujarat	56	Hingoli	Maharashtra	90	Nalgonda	Telengana
23	Valsad	Gujarat	57	Mahad	Maharashtra	91	Nirmal	Telengana
24	Veraval	Gujarat	58	Nandurbar	Maharashtra	92	Ramagundam	Telengana
25	Khambalia	Gujarat	59	Pandharpur	Maharashtra	93	Auraya	UP
26	Radhanpur	Gujarat	60	Rajapur/ Rajpur	Maharashtra	94	Deoria	UP
27	Narnaul	Haryana	61	Chiplun	Maharashtra	95	Fatehpur	UP
28	Jind	Haryana	62	Satana	Maharashtra	96	Lalitpur	UP
29	Bhiwani	Haryana	63	Shirdi	Maharashtra	97	Naugarh	UP
30	Godda	Jharkhand	64	Sironch	Maharashtra	98	Car Nicobar	Andman & Nicobar
31	Bagalkot	Karnataka	65	Umarkhed	Maharashtra	99	Mayabunder	Andman & Nicobar
32	Bidar	Karnataka	66	Washim	Maharashtra	100	Alipurduar	West Bengal
33	Belgavi	Karnataka	67	Bargarh	Odhisa			
34	Hosur	Karnataka	68	Kendrapara	Odhisa			

Note: The site locations mentioned above are tentative and the same may be changed later on by AIR Directorate.