



All India Radio



**PRASAR BHARATI
BROADCASTING CORPORATION OF INDIA
DIRECTORATE GENERAL:ALL INDIA RADIO
(PLANNING & DEVELOPMENT UNIT)**

F.No. 27/12/ Spec./DEs Comm -I/2006D(TD/FM)&
FNo: 27/12/2(4 bay)/2007-D(TD/FM)

**SPECIFICATION FOR 4 BAY CIRCULAR POLARIZED POLE
TYPE VHF FM ANTENNA WITH DE-ICER
(With Ice loading]) (For antenna to be mounted on the leg of TV tower at
Srinagar TV Site)**

Specification No.: **Specification No: Xth plan/4 BAY VHF ANTENNA /FM /3/March/2008/-
D(TD/FM)**

[Total number of pages - 16 Nos.]

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N.B. : 1. Each clause of this specification has to be complied with & supported by printed matter from the manufacturer of the equipment by the

Tenderer, without which tender will be considered incomplete and liable to be rejected .The Tenderer should make a detailed offer while quoting for the 4 bay Pole type VHF FM Circularly Polarized antenna.

2. All the 4 bay VHF FM Circularly Polarized antenna data, technical details, Schematic drawings and schedule of requirement/material must be submitted and enclosed with the tender by the tenderer and failing which the tender shall be liable to be rejected .

3. The Tenderer shall submit schedule of material/requirement of Supply without price as above in Section-I, II , III (A) & III(B) of AIR Specification (two bid system i.e. technical bid and commercial bid).

4. This Specification document contains 16 pages.

5. Tenderer shall quote the rate / cost of individual spares in the tender offer while submitting the offer for spares in commercial bid

6. The tenderer shall submit the tender offer to AIR in the format given below .

Sr No. of AIR Spec. Section wise & Clause wise	Details of AIR Spec.	Performance figures of equipment, schematic drawing Nos. and Model No.	Compliance Yes/NO	Deviations in case of non-compliance	Ref to tender page No.	Remarks
Section -I						
Section -II						
Section -III(A)						
Section -III(B)						

7. The tenderers shall fill up their name in CAPITAL LETTERS, full address with pin code , phone number, fax number, e-mail address and with their full signatures before the submission of their tender offer to AIR.

SECTION - I
GENERAL SPECIFICATION:

1.0 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., Guarantee, 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

2.0 INSPECTION: 4 bay VHF FM Circularly polarized antenna will be accepted on the basis of manufacture's test Certificates of actual performance measurements as per Standard International manufacture's practice after assembly of full antennae System with all accessories & before dispatch to AIR. This Predespatch performance Measurements, (full details) must be supplied with the Equipment to Consignee and indenter as per terms & condition of Supply Order.

3.0 DETAILS REQUIRED ALONG WITH TENDER (4 BAY CIRCULARLY POLARIZED VHF FM ANTENNA SPECIFICATION (PRESSURIZED):

- 3.1 Complete technical compliance must be signed & stamped by the Original Equipment Manufacturer (OEM) of the equipment in the tender documents. Tel. No. Fax No. and E-mail address of the OEM should be given on first page of the tender document. In case tender offer is from other than Original Equipment Manufacturer, the Tenderer must also sign & stamp each page of the compliance statement.
- 3.2 Complete technical information, details, parameters and drawings as mentioned in **Section -II (technical specifications)** as above are to be submitted with tender *by the tenderers*; from the Original Equipment Manufacturer (OEM) of the equipment.

- 3.3 Complete set of *Technical* drawings / Engineering drawings giving full details and dimensions of dipoles / Bays and rigid lines etc. with complete list of items to be submitted with tender.
- 3.4 Make, model and type of rigid lines, interconnecting RF co-axial air dielectric cables, end connectors etc are to be given in tender along with their power (continuous average) handling capacity. Details of rigid lines assembly, components used and engineering drawings are to be given.
- 3.5 A write up giving full working details and salient *technical* features of the antenna system are to be submitted with tender by the tenderers.

A copy of printed tech. manuals, including specifications of antenna and installation / operation instructions are to be forwarded with tender. Technical details relating to design of pressurization are to be submitted with tender *by the tenderers* for the complete system as per para 1.0 and 1.2 of Section -II(technical specifications)

- 3.6 A list of required spares and tools etc. along-with item-wise price details are to be quoted separately(as option) with tender by the tenderers.
- 3.7 Para-wise & item-wise compliance statement should be forwarded with tender. Actual value *shall* be indicated wherever possible and deviations may be clearly stated. All information and details asked for must be forwarded with tender.
- 3.8 In support of Tenderer's claim an "up-to-date" list of their customers including their full address, Telephone/Fax No & E-mail address is required to be submitted as an essential stipulation, alongwith complete set of actual performance figures *i.e. Performance measurement taken on the fully assembled 4 bay VHF FM circularly polarized antenna must be furnished along with the tender.*

4 bay VHF FM circularly polarized antenna shall be field proven for satisfactory operation. A supply record of 4 bay VHF FM circularly polarized antenna power wise and year wise in the last 5 years may be enclosed by the tenderer.

Names, Postal address, E-mail address and Fax numbers of customers must be indicated.

4.0 GENERAL:

4.1 INFORMATION TO BE SUPPLIED BY THE TENDERER AFTER

AWARD OF SUPPLY ORDER :

One **printed & duly bound** set of Installation, Commissioning, Operation & Maintenance manuals for complete 4 bay VHF FM circularly polarized antenna shall be supplied to the Director Engineering (Project), P&D Unit DG AIR New Delhi within one month of Acceptance of Tender.

All the details should be complete and exhaustive. One Soft copy of these documents is also required on CD for use with PC.

4.2 INFORMATION TO PRECEDE DESPATCH OF EQUIPMENT:

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

- 4.2.1 Detailed list of Equipments under dispatch.
- 4.2.2 Photograph & Engineering Drawings with illustrations identifying the various component/subsystems and showing location of items.

4.3 INFORMATION TO BE SUPPLIED ALONGWITH EQUIPMENT:

4.3.1 For each complete 4 bay VHF FM circularly polarized antenna **two** printed & duly bound copies of manuals and books for Installation, Testing, Commissioning, Operation, Maintenance, Fault diagnosis are to be supplied to consignee.

4.3.2 Three Complete set, of these documents i.e. **printed & duly bound** set of *Installation, Commissioning, Operation & Maintenance* manuals for complete 4 bay VHF FM circularly polarized antenna against the order are required to be sent to (irrespective of number of antenna ordered), the following officers / offices / places:

- 4.3.2.1 Zonal Office (Project Wing) - 1 set
- 4.3.2.2 Technical Library, P&D Unit, DG:AIR - 1 set
- 4.3.2.3 Staff Training Institute (Technical) - 1 set
- Total - 3 sets

One Soft copy of these documents is also required on CD for use with PC to be delivered to DE(Proj), P & D Unit, DG AIR .

4.3.2.7 One copy each of the Pre-despatch Performance Test at manufacturer's work as per ATP and Inspection Report - carried out at factory - should be sent to Director (Project), P&D Unit, DG:AIR and consignee.

4.4 DELIVERY OF EQUIPMENT

Within five months from date of placing of order

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

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

4.6.1 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.

4.6.2 A guarantee to make good within 30 days at his own expense any component which becomes defective under normal operating conditions within 18 months from the date of acceptance of the equipment at respective site.

4.6.3 A guarantee to supply all components for a period of 10 years from the date of acceptance of equipment at site, at rates at which these are being supplied by him to other customers & also should match prices of original manufactures of these components prevailing at the time.

4.6.4 If at any stage, during next 10 years, the manufacturer stops production of this model of equipment, he shall intimate All India Radio in advance to enable the later to stock the critical items.

SECTION - II (TECHNICAL SPECIFICATIONS)

1.0 INTRODUCTION:

The 4 bay pole type VHF FM circularly polarized antenna is required for use with FM transmitters of All India Radio for multi frequency operation at Srinagar (J&K). The transmitters will be procured by AIR separately and will conform to ITU-R standards.

The tenderer is required to offer complete Antennae System, comprising of Dipoles, Inter bay RF coaxial air dielectric feeders, Power Splitters including Rigid Lines , Fine Tuning arrangement (on site), Lightning protection Kit for Antenna, and similar other Accessories for the completeness of offered Antenna System. The entire Antenna System offered should comply with the provision of this specification pertaining to power handling capacity, mechanical & electrical characteristics.

- 1.1 The Antenna will be installed on the pipe (dia 100 mm NB) already installed on one leg between 97.7 M & 84.7 M of the existing Square Cross section (approx 3.80Mx3.80M) of self-supporting steel latticed 122 M TV tower.
- 1.2 The entire system of 4 bay VHF FM antenna shall be pressurized.
- 1.3 Following equipment and items will be provided by AIR separately.
 - 1.3.1 The transmitter, which will conform to ITU-R standards.
 - 1.3.2 RF co-axial cable (air dielectric), rigid lines(for inter connections of transmitter Chain in the Transmitter Hall), dehydrator, dummy load and RF switch (for selection of Antennae or Dummy load) etc.
 - 1.3.3 Self-supporting latticed Tower (Existing TV tower of 122 M).
 - 1.3.4 A Stainless steel / GI pipe of 100 mm diameter is already installed installed on the tower by AIR for fixing the four(4) Dipoles / Bays, Side mount VHF FM Antennae.

All the items required for the Completeness of 4 bay VHF FM antenna

system offered by the tenderer and its mounting for optimum performance shall be supplied by the tenderer except equipment and items mentioned above in para No.1.3.1 , 1.3.2, 1.3.3 and 1.3.4

2.0 TECHNICAL SPECIFICATION:

2.1 ELECTRICAL PARAMETERS:

- 2.1.1 Polarization : Circular.
- 2.1.2 Input impedance : 50 ohm unbalanced.
- 2.1.3 Max. freq. deviation of transmitter. : ± 100 KHz.
- 2.1.4 Frequency band : 88 -108 MHz.
- 2.1.5 Operating frequency : Antenna are to be used for multi frequency operation .
The "centre frequency of operation" is within the band from 100.0 Mhz to 104.0 Mhz.
- Exact " operating frequencies" and "operating band" shall be intimated at the time of placement of order.
- 2.1.6 VSWR
- 2.1.6 .1 : Better than **1.12 : 1** over *10 MHz* band width .
- 2.1.6 .2 : **Return loss graph (dB)**-- over entire VHF FM Band-II, from 88-108 MHz is to be enclosed with the tender.
- Return loss shall be better than 25 dB** within the *operating bandwidth of 10 MHz.*
- 2.1.7 Continuous **Average Power rating** : 20 kW.
- 2.1.8 Downward beam tilt : 1.5 deg.
- 2.1.9 Null filling : Required, 10%.

2.1.10	4 bay Antenna Gain	: ≥ 3.0 dBd in the direction of minimum radiation in Horizontal Plane
2.1.10.1		: 4 bay antenna shall be circularly polarized as per 2.1.1 .
2.1.10.2		: Gain figure is for each polarization i.e Horizontal & Vertical and which shall be given by the tenderer separately .
2.1.10.3		: Actual Gain figure in dBd only i.e. with respect to half wave dipole is to be indicated in the tender.
2.1.11	No. of vertical Bays (Dipoles)	: 4 Nos.
2.1.12	Spacing between Bays	: Actual distance to be indicated in tender, and a full Engineering drawing to be enclosed.
2.1.13	Antenna Mounting details	: The FM antenna will be mounted between 84.7M to 97.7 M on one leg/face of existing 122 MTV tower having a Square Cross section (of approx 3.80Mx3.80M) .
	<p>The four (4) dipoles of the FM Antenna will be mounted on a 100 mm dia GI / stainless steel pipe on one leg of the tower. Expected field pattern (circular polarization) with such a supporting tower should be submitted alongwith the tender. Details for carrying out field adjustments for ensuring that actual Radiation Pattern (Horizontal and Vertical plane) conform to AIR specification, if any, in the field or at site are to be enclosed with the tender.</p>	
2.1.14	Radiation pattern (along with antenna mounted on the tower):	
2.1.14.1	Horizontal plane	: The “radiation pattern” should be Omni-directional. Gain variation should be within 2 dB in free space. Expected Gain of 4 bay antenna system should be <i>within 2.0 dB from maximum.</i> Antennae radiation pattern over 0° to 360° for Vertical & Horizontal vectors are to be submitted with the tender by the tenderers.
2.1.14.2	Vertical Plane	: Expected pattern for 0° to $\pm 90^\circ$ in vertical plane for Vertical and Horizontal vectors should be submitted with the tender.

2.1.15 Inter-bay feeding / Feed System : Full details of Feeding arrangement and the Engineering drawings with dimensions; along-with the details of Inter-connecting RF co-axial air dielectric cables / rigid lines etc to be submitted with tender. The entire feeding system should be adequately protected against heavy rainfall, snow fall extreme daily temperature variance.

2.1.16 Lightning protection : Antenna should be DC grounded. Additional details for complete lightening protection to be provided for Antennae installation. (Item wise details of offered BOM to be given by the tenderer)

2.2. MECHANICAL DETAILS:

2.2.1(i) Antenna Weight : ≤ 200 Kg

2.2.1(ii) Antenna Wind Load : ≤ 300 Kg

2.2.1(iii) Maximum Wind Speed : 198 km. per Hr.

2.2.2.1 Ice Loading : Yes.

2.2.2.2 (i) Deicing : Complete deicing system is required with all cables etc.(Antenna system should be able to with stand ice loading). (Item wise details of the offered material , are to be given by the tenderer)

2.2.2.2 (ii) Operating Voltage of Deicing System: 240 Volts,single phase,50 Hz

2.2.3 External material of Dipoles and rigid feed lines: Exterior of dipoles will be made of stainless steel or hot dip galvanised steel or Marine Brass. Rigid lines with Marine Brass or Copper.

2.2.4 **Internal material (for Power Divider, Rigid lines & interconnecting feed cables / lines) :** Inner lines of Dipoles will be of copper, Brass or Aluminium & those of Power Dividers will be of copper or Brass. All electrical contacts will be silver plated. All inners and bullets ---- of connecting head or mating head - will be made of Beryllium copper and silver plated. Insulators will be made of virgin Teflon.

2.2.5 **Pressurization** : Required for entire Antennae system as per para 1.0 and 1.2 of Section -II (technical specifications) .

2.2.6 Max. Ambient Temperature / RH : -20 to 45 ° C , RH 95% NC.

2.2.7 **Input connector** -- main power divider of antenna system : To match with 3 -1/8” EIA Flange connector, RF output of FM transmitter will be available through the 3-1/8” EIA Flange connector mounted on 3-1/8" RF co-axial air dielectric cable.

2.2.8 **Set of clamps** : Suitable clamps for dipoles, Power Divider / Splitter and RF co-axial air dielectric cables / rigid lines etc. are to be included in the offer and the mechanical details (dimension & materials used etc) be indicated in the tender.

2.2.9 The entire Antennae System should be adequately protected against snow. Each component / Sub system of the Antennae System should be adequately protected for extreme weather conditions . The Antennae system should also be well protected against dust .

2.2.10 **Dead weight and wind load (Kg):** Full technical details for complete antennae system shall be submitted by the tenderer along with the tender in the format given below:

SNo.	Description	Dead Weight	Wind load	Wind load	Wind load
		(Kg)	(Kg)	(Kg)	(Kg)
			At wind speed 198 Km /hr	At wind speed 180 Km /hr	At wind speed 160 Km /hr
1.	Single dipole				
2.	Single bay circularly polarized antenna				
3.	Four bay circularly polarized antenna				
4.	Antenna power dividers, distributors, main RF co-axial air dielectric branch cables, distributors cables etc.				
5.	Antenna clamps hardware etc.				

2.2.11 **Continuous Average Power Rating (KW) etc.** : Continuous Average Power Rating (KW) and full technical details for complete antennae system shall be submitted by the tenderer along with the tender in the format given below:

SNo.	Description	Continuous average power rating (KW)	VSWR	Size & Make
1.	Single dipole antenna i.e. for horizontal or vertical polarization.			
2.	Single bay circularly polarized FM antenna.			
3.	Four bay circularly polarized FM antenna			
4.	antenna input main RF power divider /splitter (as per design of manufacturer)			
5.	main branch RF co-axial air dielectric feeder cables/RF coaxial rigid lines. (as per design of manufacturer)			
6.	sub power dividers / splitters (as the case may be / as per design of manufacturer)			
7.	distributors RF co-axial air dielectric feeder cables/ RF coaxial rigid lines. (as the case may be / as per design of manufacturer)			

2.2.12 Gain: : Gain figures for shall be submitted by the tenderer along with the tender in the format given below:

SNo.	Description	Gain Circularly polarization (dBd) *	Gain Horizontal polarization (dBd)*	Gain Vertical polarization (dBd)*
1.	Single dipole antenna i.e. for horizontal or vertical polarization			
2.	Single bay circularly polarized FM antenna			
3.	Four bay circularly polarized FM antenna			

Note :* Gain figures must be submitted in dBd only i.e. gain with respect to half wave dipole .

SECTION - III(A)
SCHEDULE OF REQUIREMENTS / MATERIALS (UNPRICED)
[FOR ONE SET OF 4 BAY CIRCULARLY POLARIZED VHF FM ANTENNA]
(With Ice loading) (For antenna to be mounted on the leg of TV tower at
Srinagar TV Site)
[PART- “A”]

S NO.	Spec. clause ref.	Description	Qty
1.	Sec.-II (Technical Spec.)	4 bay VHF FM Circularly polarized antenna fully as per details given below in compliance to AIR Specification No: Xth plan/4 BAY VHF ANTENNA /FM /3/March/2008-D(TD/FM)	1 Set Complete
		i) antenna input main RF power divider /splitter (as per design of manufacturer)	
		ii) main branch RF co-axial air dielectric feeder cables/ RF co-axial rigid lines. (as per design of manufacturer)	
		iii) sub power dividers / splitters (as per design of manufacturer)	
		iv) distributors RF co-axial air dielectric feeder cables/ RF co-axial rigid lines. (as per design of manufacturer)	
		v) all the dipole elements of the 4 bay VHF FM antenna system (as per design of manufacturer)	
		vi) fine tuning arrangement . (as per design of manufacturer)	
		vii) Deicing system complete (Items wise details of offered material are to be given by the tenderer)	
		Any other accessories offered for the completeness of the system (Items wise details of offered and included material , items & part are to be given by the tenderer)	1 lot

Specification No: Xth plan/4 BAY VHF ANTENNA /FM /3/March/ 2008/-D (TD/FM)

2.	Sec. I (General)	Instruction (Installation, commissioning , Operational & Maintenance) manuals printed and duly bound - along with one soft copy on CD (within one months of acceptance of tender) - one for DE (Proj.) P&D Unit, DG:AIR (irrespective of number of 4 bay VHF FM Circularly polarized antenna ordered) - one for consignee { Within one Months of Supply order)	1 set +1 set for each consignee.
S NO.	Spec. clause ref.	Description	Qty
3.1	Sec. I (General)	{ To be supplied along with the equipment } Complete set of printed and duly bound (Installation, Testing ,Commissioning, Operation, Maintenance, Fault diagnosis) documents for Consignee.	2 Sets
3.2	Sec. I (General)	{ To be supplied along with the equipment } (irrespective of number of 4 bay VHF FM Circularly polarized antenna ordered, following 3 nos of document are to be supplied) Against order for the complete 4 bay VHF FM circularly polarized antenna system. Complete set of printed and duly bound (Installation, Testing, Commissioning, Operation, Maintenance, Fault diagnosis) documents for the following officers: 2.2.1 Zonal Office (Project Wing) - 1 set (One for each Zone) 2.2.2 Technical Library, - 1 set P&D Unit, DG:AIR 2.2.3 Staff Training Institute - <u>1 set</u> (Technical) Total - <u>3 sets</u> One Soft copy on CD for DE(Proj), P & D Unit, DG AIR	3 sets

Total of PART -“A” :

SECTION-III (B)

OPTIONAL ITEMS:

**[FOR ONE SETOF 4 BAY CIRCULARY POLARIZED VHF FM ANTENNA] (With Ice loading) (For antenna to be mounted on the leg of TV tower at Srinagar TV Site)
PART-“B”**

S NO.	Spec. clause ref.	Description	Qty
1.	Sec.-II	(Optional) Spares: Antenna installation accessories and tools kit. (Items wise details of offered material are to be given by the tenderer)	1 Set

Total of Optional Items PART-“B”: