

DESCRIPTION STORES AND TECHNICAL SPECIFICATIONS

Description/specifications, Material Code, Quantity of Items.

S. No.	Description	Qty. (No.)	Specification No.
1.	10 KW UHF TV Transmitter with station items for Mehboobnagar (A.P)	1	SPEC NO. TX/UHF/2009/1 Dated: 19.08.2009

Note: -

Delivery instruction

- a. Delivery Period 6 Months.
- b. Destination: Mehboobnagar (A.P)

Taxes

1. All taxes as applicable, must be quoted and shown separately.
2. The supplier shall be required to submit their claim in excisable/Modvat Invoice, if Service Tax/Excise/countervailing Duty is involved in the claim.

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PRASAR BHARATI
BROADCASTING CORPORATION OF INDIA
DIRECTOR GENERAL: DOORDARSHAN
DOORDARSHAN BHAWAN
MANDI HOUSE: NEW DELHI

**Specification of 10kw fully Solid State UHF Analogue
TV Transmitter**

Scope:

1.0. Fully solid state transmitters are required for Doordarshan for its network. The transmitters should be rugged, reliable, and stable in operation under Indian tropical condition. In India climate may vary from very cold to hot, humid and dusty.

1.1. The TV transmitter are to be supplied as "complete system" including input and monitoring equipment, cooling system, AVR (Automatic Voltage Regulator), surge suppressors, PDP (Power Distributions Panel) interconnecting cable, installation materials and measuring equipment etc.

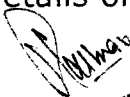
1.2. A suggestive composition list of items/equipment required which may be treated essential for the system is provided with these specs at Annexure-I and should be quoted with their detailed specifications, data sheets and pamphlets. Any other item/equipment, which is essential for the completeness of the system, should also be included in the offer. It will be the responsibility of the tenderer to ensure that the system is complete in all respects.

1.3. A detailed block schematic diagram for the whole TV transmitter system with all its constituent's items should be provided with the offer

1.4. A suggestive, typical detailed equipment floor layout plan, dimensions of the transmitter and all its allied equipment cooling system etc should be provided with the offer. Full details of transmitter

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Dir: Doordarshan, New Delhi

hall / building requirements are to be shown in these drawing. This drawing is to be attached with the offer to ensure the covered building space requirements.

1.5. Any special building requirement for installation of Tx system must be brought out clearly. Typically, Doordarshan installs the complete transmission system on the same floor and division of equipment below or above this floor is not acceptable.

1.6. All Equipment assemblies, sub assemblies, PCB's, devices and components should be of latest proven design. All materials used in the TV transmitter system should be of **Professional Broadcast Quality.**

1.7. The transmitter system quoted must confirm to the latest international standards of safety and EMC. The conformance to such standards (indicating Standard's name & Number) must be stated in compliance statement.

1.8. The transmitter should be able to be used as DTT (DVB-T) (Digital terrestrial transmitter adopting "DVB-T" format) Transmitter in future with the minimum possible changes. The transmitter should have low level diplexing (Common Amplification). Technical details for use of quoted transmitter as DTT (DVB-T) transmitter along with financial requirement must be furnished with the offer separately, this cost will however not be counted for deciding the lowest tenderer.

SPECIFICATION FOR THE TV TRANSMITTER SYSTEM

1.	Ac power supply requirements	
1.1	Power supply	400 V \pm 10%, 50Hz \pm 2 Hz three phase 4-wire / 230V single phase.
1.2	Power factor	>0.9

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1.3	(a) Ac power consumption of TV transmitter system at black level (b) Ac power consumption of cooling system (c) Total power consumption of Complete TV transmitter system	To be given by the manufacturer in KW
2.0	Environmental Requirements	
2.1	Ambient Temperature (For operation)	5° C to 45° C
2.2	Ambient Temperature (for storage)	-10° C to 60° C
2.3	Max Altitude	3000 m above sea level
2.4	Relative Humidity	90% (max) at 40° C (non condensing)
2.5	Requirement of Air conditioning	Any requirement of air conditioning of the transmitter hall should be specified clearly by the manufacturer
3	System parameters	
3.1	Frequency Range	Any assigned channel between 470Mhz to 862 Mhz ((Band IV / V)) with facility of frequency offset by $\pm 2/3$ of line frequency.
3.2	TV standard	PAL – 625 lines, CCIR -G
3.3	Carrier frequency stability	± 150 Hz over a period of three months
3.4	Output power (a) Visual (sync peak) At the output of band pass filter, if used. (b) Aural	10KW (i) FA ₁ = -13 db (ii) FA ₂ = -20 db w.r.t Visual carrier power
3.5	Output connector of Transmitter. Note 3 1/8" EIA unflanged copper rigid line is to be	3 1/8" EIA unflanged (copper)

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	connected as indoor coaxial line. In case Tx is having different output connector or Aluminium output line, Proper transfer coupling rings must be supplied to ensure that firm connection is made to copper rigid line.	
3.6	RF output impedance	50 ohms unbalanced with VSWR <1.3
3.7	Harmonic level	60 dB below carrier level or 10 mw whichever is less
3.8	Spurious emission	60 dB below carrier level or 10 mw whichever is less
3.9	System configuration	The TV transmitter shall have the following features in addition to specs.
3.9.1	The monitoring system shall have LCD display. Control circuits should be microprocessor based. Mimic RF flow diagram should be provided for diagnostic and trouble shooting of transmitter system.	
3.9.2	(a)It shall have dual exciters with auto changeover facility, manual change over facility (b)Each exciter shall have its own DC power supply (c) There shall be digital signal processing in the exciter. It shall have facility for auto correction of non linear distortions i.e. luminance non linear distortions, DG,DP and ICPM	

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Senior Engineer

3.9.3	<p>(a) Each power amplifier(PA) must have its own DC power supply unit.</p> <p>(b) All PAs must be inter changeable at any position and to be use at any channel in the specified band of operation without change of any hardware/software.</p> <p>(c)All PAs shall have protection against high SWR, Over current, Over voltage and Over temperature. Visual indication for above protections should be available in each power amplifier</p> <p>(d) LD MOSFET device shall be used in all power amplifiers (Bipolar transistors not acceptable). The detailed specifications, make, model, Type, source of supply, MTBF of MOSFET device shall be provided.</p> <p>(e) All PAs should be hot pluggable i.e. PAs shall be replaceable even when the transmitter is "ON".</p> <p>(f) Transmitter shall be capable to remain ON AIR with reduced power output without any break in service even if a number of PAs have failed.</p> <p>(g)All PAs shall be fully broadband for operation in UHF Band IV/V i.e.470MHz to 862MHz.</p>
3.9.4	<p>Cooling system</p> <p>(a) The transmitter must have liquid cooling system. Forced air cooling system is not acceptable . To make the system fully reliable , all possible redundancy must be incorporated in to the system. Full details of the system are to be supplied with the offer.</p> <p>(b)All materials , piping, tools, liquid upto double capacity of system, essential spares must be supplied along with the transmitter so that system could be installed at site with out any extra requirement from Doordarshan and reliability and quick repairs are ensured.</p> <p>(c) Connectors on amplifiers etc shall be of self locking type so that no liquid escapes during change over.</p> <p>(d) Outside temperatures may vary from -20° C to +50° C. Heat exchanger and liquid used must be compliant with these temperature variations.</p> <p>(e) A typical diagram showing details of liquid cooling system and heat balancing of transmitter system, bringing out all special requirements, should be attached with the offer.</p>

HPT 10KW(UHF) Specification for Mahboobnagar

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3.9.5	Transmitter system must be capable of delivering NICAM stereo sound. However, presently NICAM encoder would not be procured and transmitter will be operated with mono sound. Similarly audio input equipment will be Stereo sound capable. NICAM encoder may be quoted as an option only.	
3.10	Modulation (a) Vision (b) Aural	Negative AM (C3F) FM (F3E)
3.11	Remote control for operation of transmitter & monitoring of Tx parameters.	The transmitter shall have the necessary interface RS 232 for connecting to a personal computer. All parameters should be monitor able on the personal computer. Provision for remote operation & control of the transmitter including monitoring of parameters through modem, Telephone line and personal computer shall also be available. Necessary software on CD shall be provided. Two Nos. Compatible P.C. of reputed make (Intel Pentium core 2 duo, speed minimum 2.83GHz,DVD,1GB RAM, 250GB sata HDD, Intel original mother board, 19" LCD/TFT monitor, Optical mouse, KB, UPS 600VA) is also part of supply.
3.12	(a)Dimension of transmitter (L x B x H) (b) Dimension of Pump rack (L x B x H) (c) Dimension of Heat exchanger (L x B x H)	To be specified by the suppliers in meters.
3.13	(a)Weight of transmitter (b) Weight of Pump rack (c)Weight of Heat	The be specified by the suppliers in Kgs.

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4.0	Performance specifications for visual transmitter :(As per CCIR Standard PAL –B system) (After last output connector)	
4.1	Type of modulation	Negative AM (C3F) with colour PAL-B
4.2	Video input level	Sync 0.3V +/- 6dB,video 0.7V
4.3	Video input return loss	>34dB(up to 5 Mhz)
4.4	Video input impedance	75 ohms unbalance (BNC)

4.7. Amplitude Vs frequency Response of the vision transmitters.

Freq. relative to carrier in MHz	Limits Maximum (dB)	Limits Minimum (dB)
-4.43	-30	-
-4.43 to -1.25	-20	-
-1.25 to -0.75	+0.5	-
-0.75	+0.5	-4.0
-0.5	+0.5	-1.5
0 to 1.5	+0.5	-0.5
+1.5	Reference	-
+3.0	+0.5	-0.5
+4.43	+0.5	-0.5
+5.0	+0.5	-2.5
+5.5	-26	-

4.8 AM Noise (S/N) or Video Noise (100KHz to 5MHz) RMS Value:-

a)	Unweighted continous (Random Noise)	-52dB (RMS) or better
b)	Weighted continous (Random Noise)	-60dB (RMS) or better
c)	Hum (1KHz peak value)/Periodic Noise	-46dB (p-p) or better

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4.9 Incidental carrier Phase modulation

-46 db or less during full sinusoidal modulation of the visual transmitter between 50 HZ and 15 KHZ relative to +/- 50 KHZ deviation. Phase modulation less than +/- 4°

4.10 Waveform response

- a) 2T pulse : within 2.0% K-rating
- b) Line Tilt : within 2.0% (1% K rating)
- c) Field Tilt : within 2 % (1% K-rating)

4.11	Non Linear Distortion at 4.43 MHz a) Differential gain b) Differential phase	Within 5% (at 4.43 MHz at APL 50%) Within 5deg. (at 4.43 MHz and modulation 10 to 87.5%)
4.12	Peak sync output stability	Better than +/- 2% for any picture level.
4.13	Black level stability	Better than +/- 3.0% for any picture level and with variation of +/-6 dB in input sync. Amplitude
4.14	Group delay Vs. frequency response a) Transmitter with receiver pre correction and sound trap OFF test de modulator Freq. in MHz i) Up to 4.5 MHz ii) 4.5 to 4.8 MHz b) Transmitter without receiver pre correction and sound trap off. i) 0 to 4.8 MHz	Group Delay +/- 50 ns +/-100 +/- 50 ns
4.15	Base -line distortion of 20T	Less than 3%

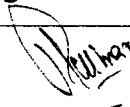
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	pulse	
4.16	Incidental carrier phase modulation	Within ± 4 deg.
4.17	Output power variation (Black to white transition)	Within +/- 2%.
4.18	(IMD) Inter modulation distortion for common amplification	-58 dB or better
4.19	Type of Amplification	Common Amplification
5.0	<u>Specifications for Aural Transmitter</u>	
5.1	Class of emission	Freq. Modulation (F3E)
5.2	Output power	1/10 th of the output power of Visual transmitter.
5.3	Input level	-4 dBm to +10 dBm for ± 50 KHz deviation
5.4	Input Impedance	600 Ohms balanced
5.5	Input return loss	30dB (minimum between 30Hz to 15KHz)
5.6	Modulation capability	Up to ± 75 KHz deviation
5.7	Carrier displacement at 50KHz deviation	+/- 50 Hz(Max)
5.8	AF Bandwidth a) With pre-emphasis b) Without pre-emphasis	30Hz to 15KHz 30Hz to 20KHz
5.9	Pre-emphasis	50 microsecond
5.10	Amplitude Vs Freq. Response(with 50% modulation)	± 0.5 dB between 30Hz to 15KHz
5.11	Harmonic distortion	Less than 0.5% within 30 Hz to 15KHz for 100% modulation i.e. 50KHz deviation.
5.12	FM Noise (Unweightd) (Weighted)	Better than -60dB with respect to 100% modulation -66dB or less

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5.13	A.M. Noise (With <u>no</u> modulation)	-45dB RMS or better
5.14	Synchronous AM Noise with 100% Modulation	-40dB RMS or better
5.15	Freq. Deviation (for 100% Mod)	± 50 KHz nominal
5.16	Stereophonic Sound	Transmitter system shall have NICAM stereo sound. NICAM Encoder is not presently required. Transmitter would be operated with mono sound presently


6.0 General specifications and requirements for tenderers to be complied with the offer of TV Transmitter System:

General Requirements

- a. Input & Monitoring Equipment Racks:-** The transmitter system is to be supplied with two nos of Fully wired up input & monitoring equipment racks. Input and monitoring equipment is to be fitted in to the rack ensuing ease of operation. A typical system Block diagram for video chain and Audio chain for reference is enclosed at Annexure III & IV. In addition measuring equipment (except stand alone items) is also to be housed in these racks. Blank space may be kept for housing IRDs etc.
- b.** Audio chain should be wired for stereo sound. Currently one mono sound shall be used
- c.** A line diagram of Racks Showing equipment interconnections with signal level etc shall be attached with the offer.

6.1. AVR: At a number of sites in India, Stable, interruption free, Clean power supply is not available. Therefore a servo controlled voltage stabilizer is to be provided by transmitter supplier ensuring its suitability for operation with transmitter. Suggestive specification of AVR are attached at Annexure-II. Phase reversal indication is to be provided. Transmitter supplier may examine & provide surge suppressor preferably integrated (or separate) with AVR so that transmitter is fully protected.

6.2 Technical Literature and Manuals: - The detailed description regarding the installation manual and operation & maintenance manual is given below:


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6.2.1 Installation Manual : A detailed installation manual for the installation of TV Transmitter System should contain at least the following details: An installation manual must be provided with each transmitter systems must be enclosed with the offer.

- a) A floor equipment layout plan with dimensions in meters for installing the TV transmitter system in a transmitter hall. All the dimensions of transmitter hall with ceiling height, and equipment to be installed should be provided in meters.
- b) Isometric view to TV Transmitter and allied equipment diagrams with dimensions in meters are to be provided.
- c) All installation drawings with dimensions are to be provided.
- d) All mechanical assembly drawings of the TV Transmitter System with dimensions are to be provided.
- e) All the views, i.e. Front, rear, top and side, of the TV Transmitter System with dimensions are to be provided.
- f) A detailed diagram showing the cooling liquid Inlet to the transmitter and the outlet to heat exchanger system should be provided.
- g) Typical installation drawings with dimensions of heat exchanger are to be provided.
- h) All unpacking/ installing details of the transmitter are to be provided.
- i) A detailed write up in English regarding installing the TV Transmitter along with its associated equipment items should be provided.
- j) The procedure of alignment, and adjustment of various assemblies, sub- assemblies of TV Transmitter System to be described in details in the installation manual.
- k) The procedural details of alignment of Exciter-stage, PA stage, control circuits and output stage of the transmitter should be described with practical examples in this manual.
- l) All do's and don'ts which are essential for safe installation of the Transmitter System should be described in the installation manual.
- m) A detailed description with all relevant circuit diagrams for the control circuit of the transmitter should be provided.
- n) The detailed procedure and possibilities of Bye-passing PA's DC power supply unit and control circuit should be described with diagrams in this manual.
- o) Procedure for operating the transmitter on low power may be provided.

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- p) The installation of the transmitter shall be done by Doordarshan Engineers therefore, the installation manual must be complete so that DD engineers can install it themselves. However final testing after the installation shall be done in the presence of OEM representative.

6.2.2. Operation and Maintenance Manual:- A detailed operation and maintenance manual with all drawings, circuit diagrams, of all PCB's assembly, subassemblies is to be provided with each transmitter system and must be enclosed with the offer.

- a) All details regarding putting "ON" with the sequence of operation of the Transmitter is to be provided in the manual.
- b) The details of all electrical circuits in various stages of the Transmitter used along with their write-ups are to be provided in this manual.
- c) All precautions and detailed instructions regarding operation of the TV Transmitter System should be provided in this manual.
- d) The detailed description with examples for taking various measurements with the measuring equipment along with the test bench details for measuring various parameters for the transmitter should be provided in the manual.
- e) The various tests and measuring equipment required and essential for the routine maintenance and calibration along with the procedure for taking such measurement calibration should be provided in the manual.
- f) The lists of all parts/ components/ assemblies/ subassemblies with their part numbers and with the source of supply with suppliers address etc. are to be provided in this manual.
- g) Technical manuals of all the station items to be attached with the offer.
- h) The details of ordering specifications for all parts/ components/ subassemblies/ PCB/ units should be listed in this manual to facilitate reordering of spares as and when required during the life time of this TV Transmitter System.
- i) The details of self-check for the TV Transmitter System and internal calibration are to be described in the manual.
- j) The detailed procedure for trouble shooting of the TV Transmitter System preferably up to component level should be available in the manual. Various test fixtures and accessories required for the maintenance/ repair of the TV Transmitter System should be clearly described and detailed out in this manual. The systematic trouble shooting/ fault tree and flow diagram should be provided




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for diagnosis of the fault with its remedial measures in this manual.

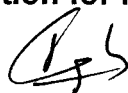
- k) The various assemblies/ sub assemblies PCB's, Parts and Components should be clearly marked to define its functions. The schematic diagrams and references should be described in such a way so that the parts/ assemblies/ PCB's etc. can easily be identified from the components layout diagram provided in the manual.
- l) All the controls, switches, knobs, interfaces and indications should be clearly marked to show their circuit designation and functions.
- m) Accessibility for testing, replacing of components, ease of maintenance calibration and adjustment should be the main design features of the TV Transmitter System.
- n) The operating manual should have description regarding various interfaces, connectors, connecting cables and accessories required for the satisfactory function of the TV Transmitter System. All such items required should be provided by the manufacturer along with the transmitter system.
- o) **A.T.P.-** A detailed "acceptance Test Procedure" (ATP) for testing the TV Transmitter System for its performance as per the specifications should also be attached with the offer which is to be used at the time of inspection at the Tx. Manufacturer works.

6.3. Copies of all softwares used in the transmitter and allied equipment should be provided in the form of CD besides being loaded in to the system. Any Future upgrade of software with in five years of supply of equipment shall be made available free of cost.

6.4 Training: -A proposal for training to two Doordarshan engineers at Tx. Manufacturer works for installation, testing, commissioning & operation of the TV Transmitter as per the specifications should also be attached with the offer. The offer shall cover training fee only (To & fro airfare, per diem, lodging, boarding charges etc shall be borne by Doordarshan and not to be quoted by supplier).

6.5 Guarantee: -

6.5.1 The manufacturer shall guarantee for two years from the date of supply, the working of TV Transmitter System without any fault and defect. Any defect/ failure of equipment component or assembly and non-performance in this period is to be set right




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UHF Transmitter New Delhi

by the manufacturer free of costs at the premises of the consignee.

6.5.1.a. A certificate from all OEMs may be attached with the offer that they will adhere to guarantee clause as above.

6.5.1.b. Any Future upgrade of software within guarantee period of the equipment shall be made available free of cost to Doordarshan by the OEM.

6.5.2 The manufacturer has to attach with the offer the details of its supply record, of 10 KW quoted TV Transmitter System to the various broadcasting organizations. The address of the broadcasting organization to whom the same type of transmitter system has been supplied should also be provided with its past supply record. Past performance of supplied transmitters to Doordarshan / other broadcasting organization shall form a critical criterion for accepting or rejecting the offer.

6.5.2.1 Documentary evidence of past supply record of similar type of Transmitter System in the following Format must be provided.

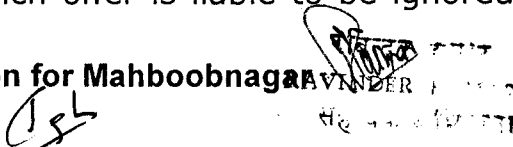
Order No. with date, reference	Transmitter Type, Model and Power of transmitter	Name of the broadcaster with full postal address to whom transmitter is supplied.	Name, Telephone, Fax, Email ID of concerned personnel, purchaser, for getting feedback on transmitter performance

6.5.2.2 Performance certificates issued by users for similar type transmitter system should also be enclosed.

6.5.2.3 DD reserves the right to get performance feedback of the transmitter system from any of the user(s) as mentioned in past supply record.

6.6 Spares: -

6.6.1. The minimum recommended essential spares (modules, PCBs, Components etc) required to maintain the continued service of transmitter in a reliable manner shall be quoted by the supplier positively failing which offer is liable to be ignored. The spares


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(ATP) for testing the transmitter is also to be supplied in advance for carrying out the inspection.

- 6.7.b. Site Acceptance Test:** The transmitter system shall be installed by Doordarshan as per instructions contained in the installation manual. Thereafter the transmitter manufacturer's engineer shall visit the transmitter site and give the site acceptance test, clearly demonstrating that the transmitter and allied equipment is working as per the stated specifications of Doordarshan and International standards. Site acceptance test by manufacturers engineer at site in India shall be at suppliers cost.
- 6.7** All relevant technical pamphlets, data sheets, drawings, block diagram, along with the installation, operation & Maintenance manual of the transmitter system should be attached with the offer otherwise offer may be rejected.
- 6.8** Breakup prices for all items/ equipment should be provided.
- 6.9** The original pamphlets, data sheet, specs sheet of all bought out items should be attached with the offer.
- 6.10** A para by para compliance statement with page numbered at each page of the tender document in the form of a table describing DD specifications, of the manufacturers quoted items and remarks should be attached with the offer by the manufacturer only on the letter head duly signed but not by the agent or representative of the manufacturer with the relevant supporting literature, manuals etc. the compliance statement should be for all technical as well as general specifications for all the paras listed above. This is a mandatory and essential requirement. Para by para compliance statement in the table form as per the format given below for all the paras must be attached with the offer duly signed by OEM of transmitter, on each page of compliance statement. Mere signing of DD Specs sheets shall not be treated as compliance statement. **Any offer without the compliance statement for all paras as detailed above as well as compliance statement in respect of the items/equipment specifications provided in All Annexures shall be rejected in the first instance without making any reference to the bidder.** The compliance statement from the manufacturer should be in the following format:-

185



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DG: Doordarshan New Delhi

Para No of D.D. specification	D.D. specs. value and detail.	Parametric value of quoted Tx. system by OEM with offer No. in technical data sheet.	Page No. of the technical bid where this specs para is provided.	compliance or deviation	Remarks (if any)
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- 6.11** A detailed, complete Bill of material (deliverables) shall be attached with the technical offer leaving price column blank. This Bill of material will be exactly the same which has been given in the commercial offer. Make, model and numbers of each item must be mentioned in the B.O.M.
- 6.12** The tenderer must quote the complete transmitter system as per the list of items provided in Annexure I .The complete system integration for all items must be guaranteed by the O.E.M.(Original Equipment Manufacturer) of transmitter for its working as per the requirements & Specification of Doordarshan. The partly quoted system shall not be accepted.
- 6.13** Cost of training if any as per spec. clause no.6.4 may be indicated separately as an **optional item**.
- 6.14** Installation, Operation & Maintenance manual of all the station items must be provided.
- 6.15** A para by para compliance statement of the specifications of all the station items from OEM must be provided with the offer, without which the offer may be rejected.
- 6.16** The equipment supplied in the list of station items is to be guaranteed for two years from the date of supply. Any defect and non performance in the period is to be set right by the supplier, free of cost.

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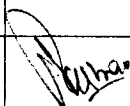
HPT 10KW(UHF) Specification for Mahboobnagar


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 Asst. Engineer
 इ.स.स. महानिरीक्षण, त.स. वि.स.स.
 Ltd: Doordarshan, New

ANNEXURE- I
(SUGGESTIVE BILL OF MATERIAL)

SUGGESTIVE LIST OF 10KW UHF Band IV/V Analog TV TRANSMITTER SYSTEM & STATION ITEMS			
SL. NO.	DESCRIPTION	MAKE/MODEL	QTY.
1	10 KW UHF BAND IV/V analog, Fully solid state (with Dual Exciter with auto change over facility), with liquid cooling system having dual pumps, Heat exchanger etc. (Complete), including TRPA extender module		1SET complete
(i)	All item of transmitter should be listed		
(ii)	Transfer coupling (if required) refer para 3.5		
(iii)	Software for monitoring parameters on PC (refer para 3.11)		
(iv)	Installation, Maintenance & Operational Manuals & test data (3 sets)		
2	POWER DISTRIBUTION PANEL		1SET
2.1	3 Phase unbalanced AVR (with phase sequence / reversal sensing circuit) and Surge suppressor in Air cooled construction		1
	INPUT: 340-440 V, 3 PHASE, 50 Hz, AC		
	OUTPUT: 400 V +/- 1%, 3 PHASE, 50 Hz, AC		
	CAPACITY:50 KVA, 3 PHASE		
3	OUTPUT COAXIAL EQUIPMENT		
3.1	DUMMY LOAD Forced air cooled, 10 KW RMS power, UHF Band IV/V, 50 OHMS, 3 1/8" EIA UNFLANGED CONNECTOR, Input 230VAC	BIRD	1No
3.2	Broadcast Power Monitor, UHF Band IV/V, with 3 1/8" EIA unflanged line section and suitable elements for measurement Max Forward power of 10 kw and reflected power of 1 KW, VSWR, Return Loss etc. (Full details of model, type, No of Monitor, Line Section & elements may be given)	BIRD/EXIR/SIRA	1No
4	INDOOR COAXIAL FEEDER COPPER COMPONENTS ONLY		
4.1	3 1/8" EIA ST TX LINE (COPPER) (6 METRES LENGTH) (VSWR<1.05)		3
4.2	3 1/8" EIA 90 DEG. ELBOW UNFLANGED(VSWR<1.05)		15
4.3	STRAIGHT COUPLING 3 1/8" EIA (with inner and outer conductor and two nos of hose clamps for each St coupling) (VSWR<1.05)		30
4.4	FIXED HANGER ASSAY 3 1/8" EIA (VSWR<1.05)		10
4.5	3 1/8" EIA Flange to Non flange adopter(VSWR<1.05)		2
5	INPUT & MONITORING EQUIPMENT RACKS CONSISTING OF:		
5.1	19" STANDARD RACK WIRED WITH ACB PANEL		2
5.2	VIDEO EQUALISING DA WITH CLAMP HS & EQ (1 I/P & 6 O/P) (GRASS VALLEY 8506)		2
5.3	2RU FRAME WITH PASSIVE COOLING & 100W SUPPLY GVG TYPE 8900TF)		1
5.4	REDUNDANT POWER SUPPLY 100W FOR 8900TF GVG TYPE 8900 PSX		1

HPT 10KW(UHF) Specification for Mahboobnagar


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9	MISCELLANEOUS ITEMS		
9.1	REDUCER 1½" unflanged to N Female(VSWR<1.05)		2
9.2	REDUCER 3½" unflanged to 1½" unflanged(VSWR<1.05)		2
9.3	REDUCER 3½" unflanged to N Female (VSWR<1.05)		2
10	INSTALLATION MATERIAL		
10.1	CABLE COAXIAL 50 OHM, 50 MTR.		50 M
10.2	CONN. COAXIAL RF 50 OHM N PLUG RT ANGL (10 Nos)		10
10.3	CABLE PTFE, 2 CORE TWISTED RED & WHITE WIRE 300 MTR.		300 M
10.4	CABLE RADIO FREQUENCY COAXIAL 75 OHM (RG-59B/U) 300 MTR.		300 M
11	CONN COAXIAL 75 OHM BNC PLUG STRAIGHT FOR CABLE RG 59 B/U - (24 NOS.)		24
11.1	CABLE LF FLEXIBLE 3 CORE SH:DD 11.50 (UNARMOURED) 50 MTR.		50 M
11.2	CABLE LF FLEXIBLE 3 CORE SH:DD 6.85 (UNARMOURED) 150 MTR.		150 M
11.3	WIRE POLYTERAFLUROETHYLENE(PTFE), 10 MTR. SIZE:19/0/29, RED		10 M
11.4	WIRE POLYTERAFLUROETHYLENE(PTFE), 50 MTR. SIZE:19/0/29, BLACK		50 M
11.5	WIRE POLYTERAFLUROETHYLENE(PTFE), 100 MTR. SIZE:7/0/20, WHITE		100 M
11.6	WIRE POLYTERAFLUROETHYLENE(PTFE), 100 MTR. SIZE:7/0/20, YELLOW		100 M
11.7	PVC CABLE(COPPER) 1 CORE(50 SQ MM 1100V, 17 DA), D13) 70 MTR.		70 M
11.8	CABLE PVC, INSULATED, UNARMOURED, 4 CORE, 24A, RED, YELLOE, BLUE, GREEN, 100 MTR.		100 M
11.9	CABLE LF SCREENED SHEALTH: PVC, 50 MTR. DD: 7.7,4 CORE		50 M
11.10	Any other installation material required for installing TV Transmitter system must also be included in this list		
11.11	TECHNICAL MANNUALS of all equipments provided as per above list. (a) One sets of all manuals per order for DGDD. (b) Two sets of all manuals for one zonal office per order. (c) Two sets of all manuals for each station.		Total 5 Sets
12	ANY OTHER ITEMS FOR COMPLETING THE SYSTEM		
13A	Technical training charges (Refer 6.4) as required by the Tx. manufacturer for imparting training at their works may be quoted separately (To & fro air fare, per diem, lodging. Boarding etc will be borne by the Doordarshan and not to be quoted by supplier)		
13B	Site acceptance test by manufacturers Engineer at site in India at supplier cost (Pl. see para 6.76)		

15. Essential Spares: All essential spares are to be quoted separately in BOM but shall not be part of main BOM and shall not be considered for considering L1.

ANNEXURE - II

Specification for 50 KVA, 3 Φ Servo Controlled Automatic Voltage Regulator

1.0. INTRODUCTION:

1.1. Servo Controlled Automatic Voltage Regulator (AVR) is to be used in TV Transmitters and other transmission equipment so that these sensitive equipment are protected from low voltage / high voltage and power supply fluctuations and surges.

1.2. The AVR should be rugged, reliable and stable for continuous operation.

1.3. It should be naturally air cool type housed in one steel cubicle and hook at the top for lifting.

1.4. It should be from reputed manufacturer who are ISO 9001/ ISO 14001 certified.

2.0. Inputs:

- 2.1. Nominal voltage : 400 V, 3 Phase
2.2. Range : 340 V to 440 V
2.3. Frequency : 48 to 52 Hz
2.4. Waveform : Sinusoidal

3.0. Outputs:

- 3.1. Nominal voltage : 400 R.M.S. \pm 1.0%, 3 Phase
3.2. Settability : 400 V to 410 V R.M.S.
3.3. Load regulation : \pm 1.0%
3.4. Line regulation : \pm 1.0%
3.5. Capacity : 50 KVA
3.6. Waveform : Sinusoidal

4.0 **Efficiency:** : > 95% at full load, unity power factor and at minimum input voltage

5.0 Correction speed : > 30 V/Second. Phase to phase.

5.1 Switch on delay with timer and contactor: 0 to 60 seconds.

6.0 Protections:

6.1. Overload capacity : 25% for half an hour.

6.2. Output under voltage (380V) : Disconnecting the load through a contactor with alarm bell.

HPT 10KW(UHF) Specification for Mahboobnagar

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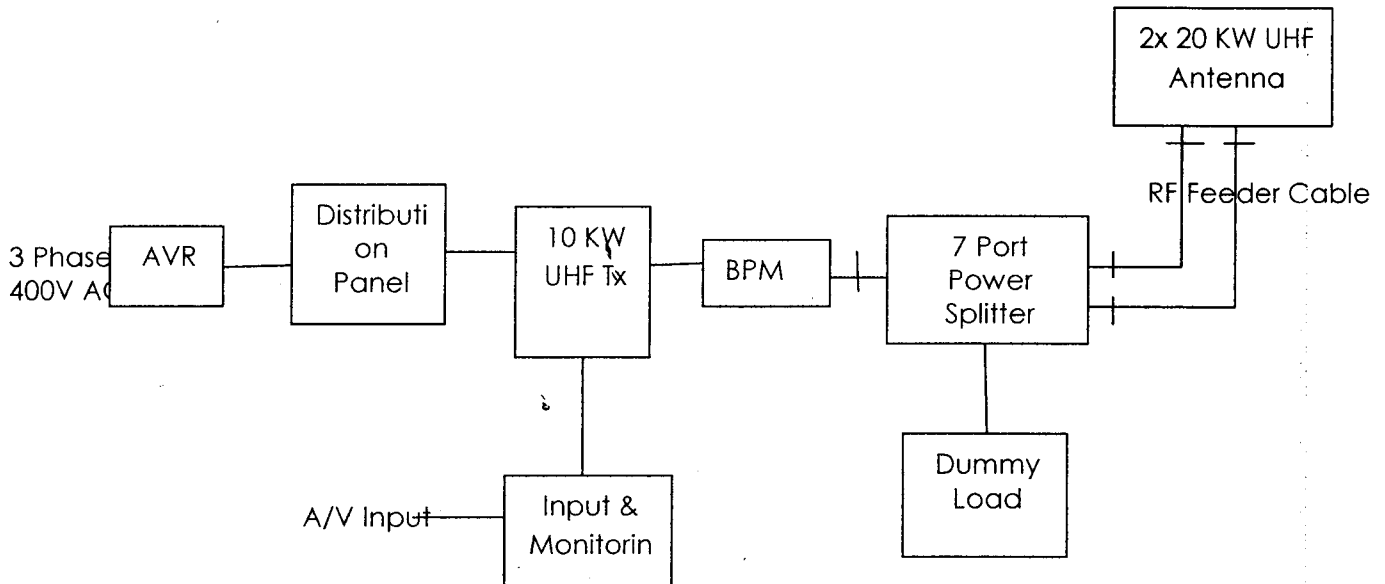
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HPT 10KW(UHF) SPECIFICATION FOR MAHBOOBNAGAR

- 6.3. Over voltage (430 V)** : Disconnecting the load through a contactor with alarm bell.
- 6.4 Over load tripping** :Disconnecting the load through a contactor with alarm bell.
- 6.5 Power factor effect** :Nil
- 6.7 Waveform distortion** :Less than 1% at full load.
- 6.8 Line noise suppression (for control circuit only)** :Line noise to be suppressed by at least 30dB for frequency range 10 MHz to 250 MHz
- 7.0. Metering** :
(a) Analog or digital voltmeter to be provided to read input & output R.M.S. Voltages of each phase selected by selector switch.
(b) Analog or Digital Ammeter to be provided to read current.
- 7.1. Indications** :
(a) LEDs for indicating
(i) Input on (ii) Out put on.
(b) LED for indication of input power

(i) LED for indicating low input.
(ii) LED for indicating of input OK.
(iii) LED for indication of high input.
- 7.2. Controls** :
(a) Output On-Off through MCCB.
(b) Auto-Manual switch selection.
(c) Raise/lower the output manual mode.
(d) Manual By pass in case of Malfuction.
- voltage in
- 7.3. Input/ Output terminations** : (a) Suitable input & output terminations should be provided. These terminals along with other distribution board output terminals shall be provided with acrylic sheet, so that these terminals are not accessible inadvertently.
(b) Earthing terminal is to be provided.
- 7.4. Weight & Dimensions (LxBxH)** : To be given by the vendor.
- 8.0. Environmental specifications**
- 8.1. Ambient temperature range** : 0° C to + 45° C (operative).
- 8.2. Storage** : -20° C to + 70° C.

Typical 10 KW UHF TV Transmitter System Block Diagram (Indicative only)



Note:-

1. All Indoor rigid transmission lines components etc are 3 1/8" Copper.
2. BPM: Broadcast Power Monitor
3. A detailed diagram showing all interconnections among various blocks with levels etc to be provided with the offer. This interconnection diagram is an essential requirement.

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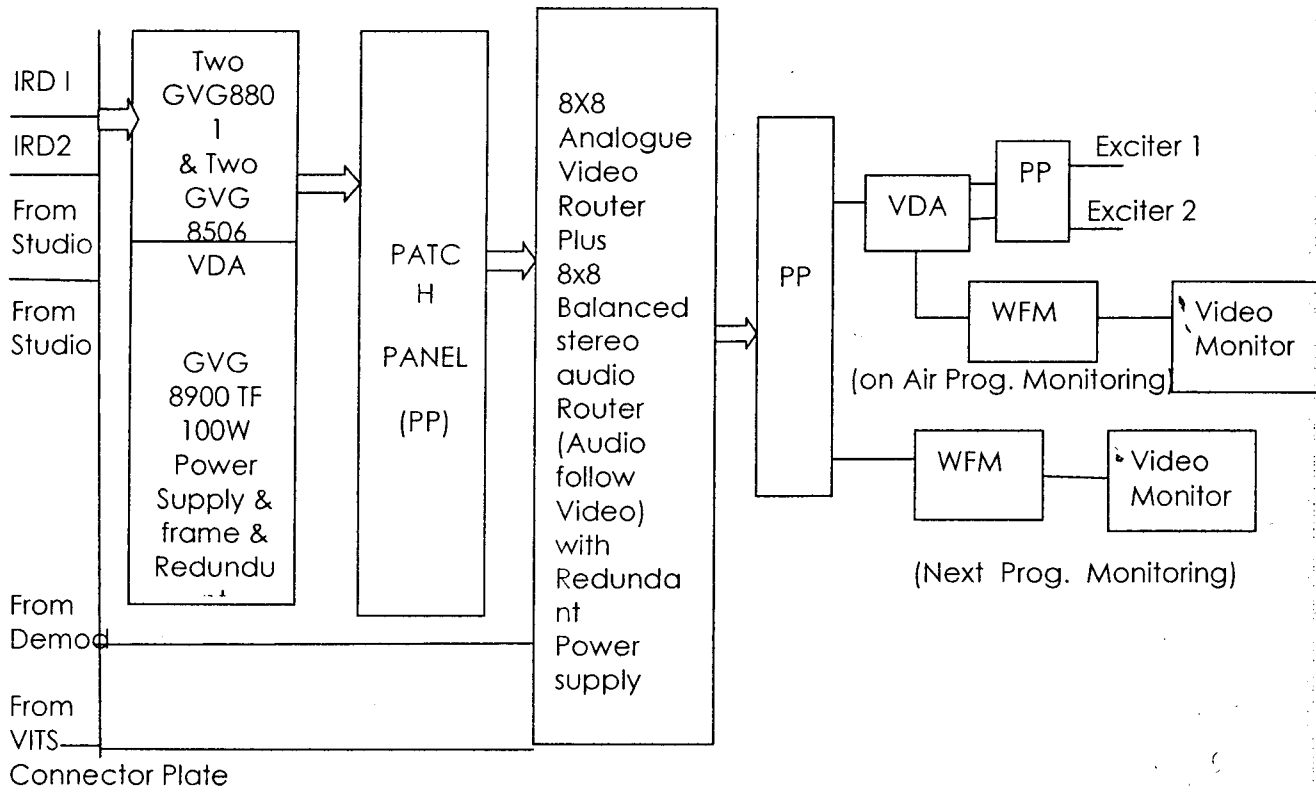
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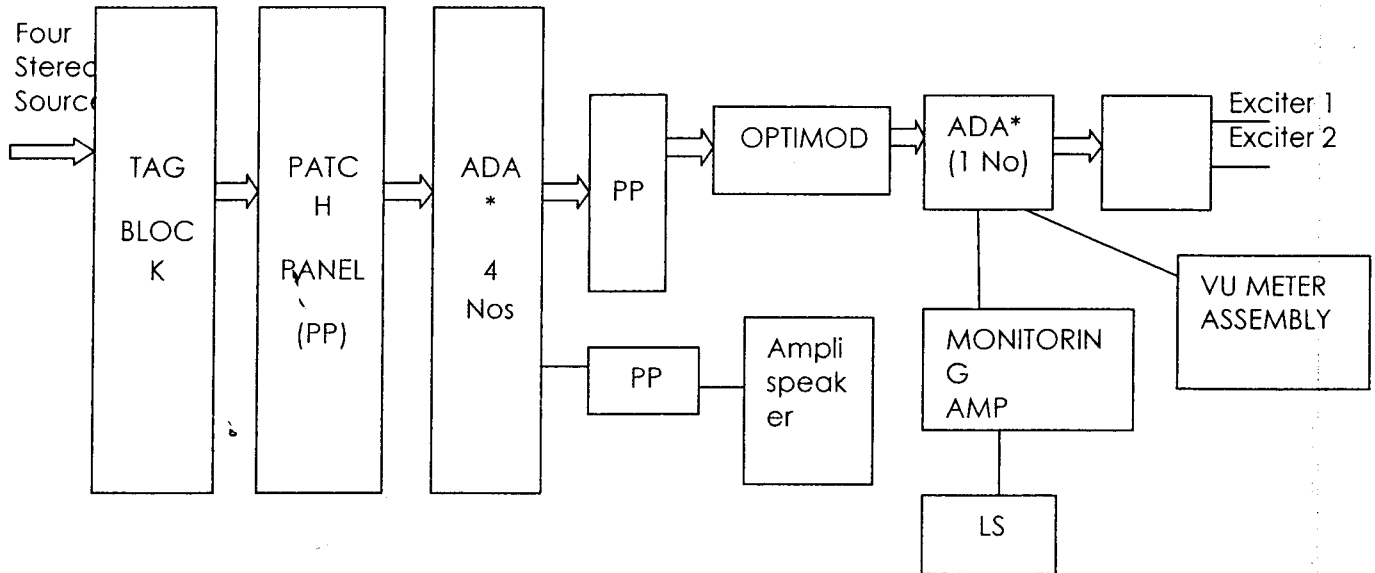
Suggestive Video Chain for Input & Monitoring Equipment Racks



Note: (a) A detailed inter connection diagram of this chain with levels at various input & output is to be provided with the offer
 (b) Please read para No. 6.0.a General of this specification.

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Suggested Audio Chain for Input and Monitoring Equipment Racks

* 5 Nos of ADA (Stereo Audio Distribution Amplifiers) are to be housed in a suitable frame with redundant power supply

Note:-

1. Same as in Annexure III
2. The number of Audio & Video patch points required to achieve this inter connection are to be provided along with four spare points for audio & video
3. The input & monitoring rack must be up for stereo chain.

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Ravinder Kumar

RAVINDER KUMAR

Director General
All India Radio
New Delhi

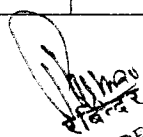
TECHNICAL SPECIFICATIONS OF UHF TV DEMODULATOR

TV Demodulators are required for measurements and monitoring the quality of transmission of the TV Transmitter. The detailed technical specifications are given blow:

1	GENERAL
1.1	It should be capable of operation in TV band IV, V(470 MHz to 860MHz). (CCIR PAL G)
1.2	Channel change should be possible by DIP switch / Hex switch or Electronically by push buttons.
1.3	It should have capability for RF and IF measurements.
1.4	It should have zero reference pulse facility to measure visual modulation depth.
1.5	It should have switch selected sound trap 'ON' & 'OFF' facility.
1.6	It should have switch selected envelope detection & synchronous detection.
1.7	It should have squelch for noise suppression in case of absence of sound carrier failure.

2.0	INPUTS	
2.1	RF Input, impedance	BNC female connector, 50 Ohms
2.2	RF Input voltage	Two switches are required for selection of input voltage ranges for RF input
2.2.1	RF Input voltage selection range with 30 dB attenuation	(a) 300 mV to 3.0 V (sync. Peak) (b) 0.5 dBm to 20.0 dBm (rms black picture)
2.2.2	RF Input voltage selection range with 15 dB attenuation	(a) 80 mV to 800 mV (sync. Peak) (b) -10 dBm to +8 dBm (rms black picture)
2.3	RF Input Return loss	≥ 15 dB
2.4	IF Input Connector & impedance	BNC female, 50 Ohms
2.5	IF Input level	(a) 5 mV to 150 mV (Sync) Peak (b) -30 dBm to -3 dBm (rms black picture)
2.6	IF Input Return loss	≥ 20 dB
2.7	Gain control facility	Manual or Automatic: is to be specified
3.0	OUTPUTS	
3.1	Video Output Connectors & impedance	(a) Two BNC female outputs are required (b) 75 Ohms
3.2	Video Output level	1 Volt peak to peak (adjustable ± 1.5 dB)
3.3	Video Output Return loss	≥ 20 dB (from 0 to 5.0 MHz)
3.4	Sound Output Connectors	Two outputs with 3 Pin XLR female connectors
3.5	Sound Output level (at 30 KHz deviation and F mod=500 Hz)	+6 dBm +/- 0.5 dBm across 600 Ohms (adjustable +/- 3 dB)
3.6	Sound Output Source impedance	≤ 30 Ohms

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4.0	Display Indications On Front Panel	
4.1	A Bar graph display is required for indications.	
4.1.1	RF level indications	(i) Low (ii) Normal (iii) High
4.1.2	IF level indications	Within normal
4.1.3	Frequency deviation (after de-emphasis).	0 to 50 KHz (linear)
4.1.4	There should be a facility available for the selection of RF, IF & frequency Deviation indications on the front panel.	
5.0	Transmission Characteristics	
5.1	Specifications for Video Channel	
5.1.1	Amplitude Vs frequency response	(a) +/- 0.5 dB from 100 KHz to 4.43 MHz (with sound trap) (b) +/- 0.5 dB from 100 KHz to 5.0 MHz (without sound trap)
5.1.2	Group delay vs frequency characteristics	a) +/- 30 ns upto 4.43 MHz (with sound trap) b) +/- 15 ns upto 5.0 MHz (without sound trap)
5.1.3	Differential gain	$\leq 3\%$
5.1.4	Differential phase	$< \pm 2$ deg.
5.1.5	Tilt at 50 Hz	$\leq 2\%$
5.1.6	Luminance bar amplitude error	$\leq 2\%$
5.1.7	Base line distortion	$\leq 2\%$
5.1.8	2T amplitude error	$\leq 5\%$
5.1.9	Signal to noise ratio (At an input level of 10 dBm)	≥ 55 dB

6.0	Sound Channel	
6.1	Inter carrier frequency	5.5 MHz
6.2	Frequency response	+/- 1.0 dB wrt 50 μ s de-emphasis from 50 to 15 KHz
6.3	Harmonic distortion (At 50 KHz deviation and F mod=500 Hz)	$\leq 1\%$
6.4	Inter-carrier S/N ratio (At 50KHz deviation)	≥ 55 dB
7.0	Power Supply	230 V +/- 10%,50 Hz, single phase
7.1	Dimensions/Weight	To be mentioned by the supplier
7.2	Mounting	19" Rack mountable
7.3	Temperature for operation	0 degree to 45 degree centigrade
7.4	Relative humidity	90%
7.5	Maximum altitude	3000 Meter

The TV demodulator must be supplied with Mounting Arrangement Hardware (19" Rack Mount Kit) and all other standard Cables and other accessories.

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**PRASAR BHARATI
(BROADCASTING CORPORATION OF INDIA)
DIRECTORATE GENERAL: DOORDARSHAN
NEW DELHI-110001.**

Specification of 2 Channel 100 MHz Oscilloscope

Scope:

1.0 Doordarshan Requires 100 MHz 2 Channel Oscilloscopes for its TV Transmitters. These oscilloscopes will be as per the technical specifications of Doordarshan. The oscilloscope should be rugged, reliable and stable in operation.

1.1 The oscilloscopes should be quoted with product's detailed specifications datasheet pamphlets & operation Manual. It will be the responsibility of the tenderer to ensure that the equipment is complete in all respects. All connectors and cable etc required for taking measurements should be supplied with the equipment

2.0 TECHNICAL SPECIFICATIONS of 100 MHz OSCILLOSCOPE

The instrument shall have dual channel measurement facilities. It shall provide facilities for measurement of rise time, fall time, positive width, negative width, frequency, period, mean, cycle RMS, minimum, maximum, peak to peak etc. It shall provide facilities for automatic measurements of peak to peak voltage, frequency, period, rise time and fall time functions.

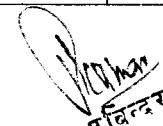
S.No	Parameter	Required Performance
1	Bandwidth	DC to 100 MHz (at- 3dB)
2	Vertical Operating Modes	CH1, CH2, Add, Subtract and FFT
3	Deflection Accuracy	3% or better
4	Sensitivity	5mV/Div to 5V/Div in steps
5	Rise Time	less than or equal to 3.5n sec
6	Channel to Channel CMR	At least 100:1 at 60Hz
7	Maximum Input	300V rms Cat. II;
8	Input Coupling	AC, DC and Ground
9	Input Impedance	1 MΩ ± 2% in parallel with 20 pF ±3 pF

2.2 HORIZONTAL SYSTEM

1	Sweep display modes	Y-T and X-Y mode
2	Sweep Mode	Auto, Normal and Single Sequence
3	Time base Accuracy	50 PPM

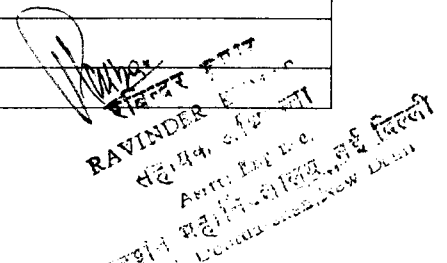
4	Range	5 ns/div to 50 sec/div
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New Delhi

5	X-Y Mode	
5(a)	X-axis BW	DC to 100 MHz
5(b)	Y-axis BW	Same as for the vertical system
2.3 TRIGGERING SYSTEM		
1	Source	CH1, CH2, AC line & external
2	Trigger Operating modes	Auto Normal & Single Sequence
3	Time Base Range	5ns/div to 50 sec/div
4	Trigger Coupling	AC, DC , HF reject & LF reject, Noise Reject
5 Triggering Types		
5(a)	Edge	Conventional level driven trigger. Positive or negative slope on any channel coupling selection
5(b)	Video	Trigger on all lines or individual line, odd/even or all fields from composite video, or broadcast standards (NTSC, PAL, SECAM)
5(c)	Pulse Width	Trigger on a pulse width less than, greater than, equal to, or not equal to a selectable time limit ranging from 33 ns to 10 sec
2.4 DIGITAL STORE SYSTEM		
1	Real time Sample Rate maximum	500 Mega samples per second per channel (simultaneously in both channels)
2	Acquisition Modes	Average, Sample and Peak detect (Minimum 75 MHz analog BW)
3	Resolution	Vertical 8 bit
4	Record Length/memory	Upto 2500 points or more per channel in dual channel mode
5	Memory	2 Waveforms 10 front panel setups
6	Display refresh rate (Update rate)	180 waveform/sec
2.5 CURSORS READOUT		
1	Cursor measurement	[Δ]T, 1[Δ]T (frequency), [Δ]V.
2.6 ACCESSORIES		
1	Power cord/ probes etc.	Power Cord = 1no. Probe (10:1) = 2 Nos. (1 no. per Channel). And any other connectors required for normal functioning of the Oscilloscope.
2.7 DISPLAY		
1	Display	LCD
2	Type	Rectangular
3	Useful Display area	8 cm x 10 cm

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4	Interpolation	Sinx/x
2.8 GENERAL		
1	Test Certificate of the instrument shall accompany each instrument on delivery	
2	The Equipment should have minimum 1 no. USB 2.0 Port. USB port should support USB flash drives/ connection to PC.	
3	The Software for PC Communications should be provided to work between a Windows PC and the oscilloscope via USB. It should be able to Transfer and save settings, waveforms, measurements and screen images. Matching cables must be supplied with each oscilloscope	
4	Autoset menu	Single - button, automatic setup of all channels for vertical, Horizontal and trigger systems with undo autoset.
5	Power Supply	The Oscilloscope shall work on 220V \pm 10%, 50-60 Hz AC supply. The power supply unit of the equipment shall be protected against overload short circuit and over-voltage etc.
6	Environmental	The equipment shall be capable of performing satisfactorily in the temperature range from 0 deg Cel to 40 deg Cel and humid conditions of 85% at 40 deg Cel

2.9 ACCESSORIES

All the essential accessories such as probes, carrying case etc. are also to be included in the offer.



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Specification for portable RF Analyzer1. SCOPE:

The RF Antenna Analyser should be a precision portable instrument, suitable for making direct measurements and analysis on transmission lines of a "T.V. Transmitting antenna system" installed at a T.V. tower, in proximity of high radiation. It should also perform Spectrum Analysis, Field Strength measurement RF power monitoring and provide GPS co-ordinates information. It should be a stand-alone integrated unit, rugged in construction, light weight, battery operated, portable and tropicalised to be used in open to air space on T.V. tower platforms.

2. Features and Measurements required:

- (i) VSWR and Return Loss
- (ii) Cable Loss
- (iii) Gain, Loss or isolation of antenna and devices such as filters, attenuators, amplifiers etc.
- (iv) Distance-to-Fault- (DTF) using frequency domain reflectometry, with facility of comparison of electrical length of two cables.
- (v) Field Strength Measurements
- (vi) RF power measurement
- (vii) Spectrum Analysis
- (viii) GPS co-ordinate measurements

3.0 Technical Specifications:-3.1 Antenna Testing:

3.1.1 Sweep Frequency Range: 25MHz to 3000MHz

3.1.2 Freq. Resolution: ≤ 100 KHz for the full freq. range so that the level corresponding to each TV channel can be measured.

3.1.3 Display Points: ≥ 500 points for accurate measurements of Distance to fault.

3.1.4 Measurement Range:

VSWR:

- (a) 1.00 to 6.00 (Resolution: 0.01)

Return Loss

- (b) 0.00 to 50.00 dB (Resolution: 0.01dB)

Cable Loss

- (c) 0.00 to 20.00dB (Resolution: 0.01dB)

3.1.5 Distance-to-Fault Parameters: - Horizontal Range: 0 to 1000 meters

3.1.6 The fault detection in a transmission line/cable with air and foam as dielectric should be possible for minimum 600 meters over full frequency range.

3.1.7 Dynamic Range: ≥ 54 dB

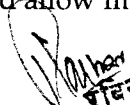
3.1.8 Directivity (corrected for vector errors using precision OSL calibration components): ≥ 42 dB

3.1.9 Test port available on analyser: N-type; 50 ohms

3.1.10 R.F. immunity: The analyser should be immune to strong R.F. field atleast upto +15dBm.

3.1.11 The built-in signal source should allow measurement of loss, gain, or isolation

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 New Delhi

(freq. 10MHz to 3GHz)

- 5.2.5 Display Scale units : dBm, dBV, dBmV, dB μ V, μ V, mV, nW, μ W, mW and W.
- 5.2.6 Display Range : 1 to 10dB/division, in 1dB steps, 10 division display
- 5.2.7 Detection System : RMS Average, Positive Peak, Negative Peak, Sample Mode.
- 5.2.8 Input Attenuator Range : 0 to +50dB
- 5.2.9 Power Measurement : -80dBm to +20dBm at the coupled ports of the transmitter

6.0 GPS Receiver:

The instrument should have GPS receiver to provide the Longitude, Latitude in six figure co-ordinates and Altitude in meters. It should be possible to save the GPS information with trace in the internal memory. Suitable GPS antenna with min. 5m cable should be offered.

7.0 General Features and Specifications:

- 7.1.1 Light Weight: Max. Weight should be ≤ 3 kg.
- 7.1.4 Temperature Range (for operation): 0°C to 50°C
Relative humidity (for operation): 90%
- 7.1.5 Power Supply:
 - (a) Operable on 230 V \pm 10% A.C., 50 Hz mains and also on
 - (b) 12 Volt dc/ chargeable battery , with back up of at least four hours, should also have facility of charging from car battery.
- 7.1.5 Display:


The analyzer should have coloured LCD screen to display the measured traces. The instrument should have multi-marker (min: 6) displayed on the screen to see the return loss and VSWR at different frequencies simultaneously. The segment limit lines feature should be available for pass - fail tests.
- 7.1.6 Plotter/printer:

The analyzer should have RS232C interface for printing on DeskJet/laser printers and PCs. Serial to USB adaptors should also be offered
- 7.1.7 Internal memory and Storage capacity:

Minimum 200 traces & 10 sets of instrument configurations.
- 7.1.8 Accessories and options:

All accessories/options required for measurements of VSWR, cable loss, return loss and DTF of T.V. transmitting antenna and R.F. feeder cables, spectrum analysis, GPS and field strength measurement are required to be quoted with the analyzer for above measurements may also be included in the offer. Standard accessories like calibration components (open/short), precision load, set of folded dipole antenna, tripod, pole, coaxial cable with standard accessories (user's guide operation & maintenance manual), Hand held software tools CD ROM, AC/DC adapter with power chord, automotive cigarette lighter/ 12 volt adapter, serial interface cable, built in options and calibration components & accessories and test port cable etc. to be supplied with the unit should be clearly specified in the offer. Carrying case shall be required for easy handling in the field and safer transportation and shall form part of the offer.

GPS


RAVINDER KUMAR
Asst. Engg. In-charge
of the instrument

Specification for R.F. Power Meter**1. SCOPE:**

The RF power meter is required for measurement of RF power of modulated signal. It should be a sensor based power measurement device having a good dynamic range. The equipment should be rugged in construction, light weight and easy to operate. The equipment must be supplied with the accessories like power chord, fuses and manuals.

2:0 Technical Specifications:-

SL. NO.	Parameters	Values
1.	Power measurement	Average power
2.	Power measurement Range	-67dBm to +44 dBm
3.	Operating Temperature Range	0 to 45°C
3.	Storage Temperature Range	-20 to 60°C
4.	Power Supply	230V \pm 10%, Frequency 50 Hz
5.	Frequency of operation	Up to 1GHz
6.	Number of readings	Up to 200 readings per second
7.	Dynamic Range	90 dB

The RF Power meter must be supplied with the power sensor to measure the power in the above specified range.

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 D.D. 01/01/2018, New Delhi

Specification for RF Step Attenuators (0dB to 110dB)

1.	Frequency Range	DC-1GHz
2.	DB Value	0-110dB by 1dB/10dB steps (Fine/Coarse steps)
3.	Connectors	BNC
4.	Impedance	50 Ohms
5.	VSWR	1.2:1 (DC-500MHz) 1.4:1 (500MHz-1GHz)
6.	Accuracy	± 0.2 dB (DC-500MHz) ± 0.3 dB (500MHz-1GHz)
7.	Insertion Loss	0.5dB upto 1 GHz
8.	Average Power	2 Watt
9.	Peak Power	1000W Peak
10.	Temperature	-20° C to 85° C

CP

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