



सत्यम् शिवम् सुन्दरम्

प्रसार भारती

PRASAR BHARATI

(Broadcasting Corporation Of India)

दूरदर्शन महानिदेशालय

Directorate General Doordarshan

दूरदर्शन भवन, कोपरनिकस मार्ग,

Doordarshan Bhawan, Copernicus Marg,

नई दिल्ली - ११०००१

New Delhi - 110001

Specification No. : DD/Tx/500W LPT (1+1)/E-V/2008

Dated: 26/02/2009

Subject: Specifications of 500W VHF/UHF Analog TV Transmitter (Which are Digital ready) (Low Power Transmitter)

Scope:

Doordarshan(DD) intends to procure Solid State 500 Watts VHF /UHF Analog TV Transmitter (which are also Digital ready) in 1+1 configuration (one transmitter in circuit and other as passive standby). These transmitters shall be based on latest technology and have provision for remote monitoring, operation and Control. The transmitters should be rugged, reliable, and stable in operation under very cold to hot, humid and dusty environmental conditions. Detailed specifications of the transmitters are given in this document. The Transmitters will be supplied along with Control unit and monitoring Rack as per clause 2.4 and 2.15

1.0 General

- 1.1 The bidder must either be an original equipment manufacturer (OEM) of Analog and Digital transmitters or their authorized representative. The authorized representative must have been in the business of sales/ supply, integration or turnkey execution of broadcast TV transmitter projects and must have executed similar orders in the past three years.
- 1.2 Documentary evidence related to past supply of analog and digital TV transmitters as well as the Transmitter System similar to that being offered, as per the specifications in the following paras must be included with the offer. This is mandatory requirement and bidders with proven relevant experience of supplying Analog / Digital transmitters will only be considered. The address/Tel. No. to whom the Transmitter has been supplied must be provided with the offer.
- 1.3 The transmitter manufacturer /bidder must have his local office / representative in India. The name, contacts, address of local office / representative along with manufacturer's authority letter in favour of local representative must be given in the offer. The local office / representative in India will be nodal point for resolving after sales issues. In case any module of transmitter requires repairs at factory, the same would be handed over to local office / representative in India, who would arrange repairs locally or export the defective modules to its O.E.M. and arrange its repair etc. The repaired item, will have to be delivered by the local representative at transmitter site in India.
- 1.4 The TV transmitters are to be supplied as a "Complete System" as per suggestive Bill of Material given in Annexure-I. The transmitter system includes 1+1 air cooled TV transmitters, Racks, Cooling system,

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interconnecting cables, Control unit and Software, installation materials etc. For commercial/ technical evaluation purposes complete group of items of Annexure-I excluding optional items will be evaluated and part supply offers shall not be acceptable. Any other item /equipment, which are essential for the completeness of the system, should also be included in the offer. It will be the responsibility of the tender to ensure that the system is complete in all respects.

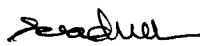
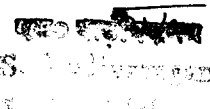
- 1.5 The Transmitter system should be quoted giving detailed specifications, data sheets, drawings and pamphlets of all units and sub units. A detailed block schematic diagram of the TV transmitter system with all its constituent items should be provided with the offer.
- 1.6 Dimensions of all equipment and racks etc. must be attached with the offer to assess the floor area required for the installation of TV transmitter system. Any special requirement for installation of transmitter 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.
- 1.7 All Equipment assemblies, sub assemblies, PCB's, devices and components should be of latest proven design. The TV transmitter system should be of Professional Broadcast quality and proven technology. The bidder must have supplied similar type transmitter system earlier to broadcasters.

Spares:-

- 1.8 The minimum recommended essential spares (modules, PCBs, Components etc.) required for maintaining continued service of transmitter in a reliable manner shall be quoted separately by the supplier positively failing which offer is liable to be ignored. The minimum recommended essential spares may be based on predicted rate of failure and requirement for three years. **The cost of spares shall not be taken into account for deciding the lowest bidder.**
- 1.9 The manufacturer shall also give a certificate attached with the offer for maintenance support of spares for Ten (10) years of the TV Transmitter System. The life of the TV transmitter should be more than ten years and it should be certified by the manufacturer.
- 1.10 The transmitter system shall be installed by Doordarshan as per instructions contained in manufacturer's installation manual. For this purpose the successful bidder will provide factory test reports and a detailed installation manual with each of the transmitter system.

Bill of Materials:-

- 1.11 A list of deliverables (Bill of Materials - BOM) with clear description of make, model and quantity of equipment including optional units, sub units included in the offered transmitter system should be provided with the offer to ensure completeness of the system. It will be the responsibility of the bidder to ensure completeness of the system. In case any item is not included in the offer and it is found essential for completing the transmitter system, the same shall be provided by the bidder without any extra cost. A suggestive BOM for each transmitter system is given at Annexure-I.

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1.12 Cost of all the items as listed in the BOM (1.11) above is to be provided separately in the Commercial Bid. A copy of the price bid, leaving price column blank, must be enclosed with the technical offer. The Bill of materials given in the Technical and Commercial Bids must be identical.

1.13 **Inspection:**

a.) Transmitter units: Inspection shall be done on First four TV Transmitter units, 500W (1+1, with Automatic change over and Control unit) at the manufacturer's works as per the "Acceptance Test Procedure" (ATP). Out of the four, two will be VHF & two will be UHF transmitter units. The inspection will be carried out by two DD Engineers for a period of Seven days before dispatch of the transmitters. The firm has to provide "Acceptance Test Procedure" (ATP) for testing the TV Transmitters. Prior intimation along with draft ATP for carrying out inspection at works is to be given by the bidder to DD at least Six weeks in advance. The final ATP shall be based on mutual agreement. The charges of inspection and also for power supply, measuring equipments, test setup and any other item required for inspection etc shall be borne and arranged by the supplier. The Expenditure towards To and Fro journey, lodging, boarding and Daily allowance in respect of inspector will be born by DD. For the remaining Transmitter units Test Reports as ATP shall be submitted by the Manufacturer of the Transmitters.

b.) Monitoring Rack and other items: The monitoring rack and the equipments installed in it, AVR, UPS and all other items can be inspected either with Transmitter units at the manufacturer's works or separately at the bidders end.

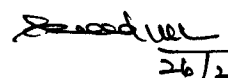
However the bidder will be responsible for Integrating transmitter units, monitoring rack, AVR, UPS and all other items.

1.14 The successful bidder will have to provide backup copies of the Software loaded into the transmitter system, allied equipment in the form of CD. Any Future upgrade of Software within guarantee/ warrantee period of the equipment shall be made available free of cost to Doordarshan.

1.15 The transmitter system quoted must conform 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. **The transmitter manufacturer must be ISO 9001-2000 certified for the manufacturing of TV transmitters. Valid copies of ISO certificates should also be provided with the offer.**

1.16 The supply of transmitter may require after sales services. Therefore full details of facilities for carrying out after sales service may be given.

1.17 **Training:-** A proposal for training for Four Doordarshan engineers at manufacturer' works for five working days 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, if any. To & fro airfare, per diem allowances, lodging, boarding charges etc. shall be borne by Doordarshan and not to be quoted by supplier. **Training fee, if any, shall be included in the main bill of material for deciding lowest offer.**


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1.18 Guarantee:-The manufacturer shall guarantee for 24 months from the date of receipt, satisfactory 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 by the manufacturer free costs at the transmitter site. A certificate from all OEMs may be attached with the offer that they will to guarantee clause as above.

2.0 GENERAL TECHNICAL REQUIREMENT FOR TRANSMITTER SYSTEM

2.1 The 500W (1+1) TV Transmitter System shall consist of 2 nos. of 500W VHF/UHF solid state air cooled transmitters, one in circuit and other transmitter in passive stand by configuration. The transmitter will be modular in nature for easy maintenance.

2.2 The transmitters and other station equipment like IRDs (IRD is not to be included in the tender), Input /Monitoring equipment will be housed in industry standard 19 inch racks. The racks will have proper air cooling provision, power supply distribution arrangement for the equipment with necessary cabling and earthing.

2.3 Each VHF/UHF Transmitter shall have its own synthesized exciter capable of operation in any channel (with off set facility) in the frequency band "174 to 230 MHz" for VHF band OR "470 to 860 MHz" for UHF band. The channel conversion should be possible at site without any change of component except output Channel filter. The exciter will be 100% solid-state and self contained unit including regulated power- supply, base-band circuit, modulator, IF&RF Circuit & master oscillator. It will have full digital processing of the signal.

2.4 Remote operation,Monitoring and Control of the TV Transmitter (LPT) :-

2.4.1 **The Transmitter system is required to be operated manually as well as from Remote location.** It should therefore have provision of local display, keypad panels etc. for local operation and monitoring. All essential parameters and working status of modules should also be available locally. Detailed information on the parameters and features available for local monitoring and Control of the transmitter is to be submitted with the offer. The Control/operation/monitoring Software would run on normal PC with Windows platform. The transmitter system shall have Control/operation/monitoring of the parameters locally as well as at remote-location by Personal Computers through web interface. The transmitter should have a "WEB"GUI interface using TCP/IP. All transmitter functions, Control & monitoring shall be provided via the remote "WEB" GUI interface.

It should therefore have provision for remote monitoring or Control capability. A suitable Software & interfaces to operate, monitor & Control the transmitters from remote locations must be possible. Full detailed description with diagrams; block schematic etc must be attached with the offer.


This is mandatory requirement. For this purpose the bidder is required to provide a detailed description indicating the remotely Controllable parameters and features of the transmitter with the offer.

2.4.2.0 Automatic Changeover Unit (ACU)

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- 2.4.2.1** One automatic changeover unit(ACU) for operating the Transmitter in (1+1) mode to facilitate automatic switch "ON" of the second Transmitter unit in case of failure of RF output of the first Transmitter unit shall be supplied with each set.
- 2.4.2.2** When power of operating transmitter goes down by 3 dB, it should be sensed as a failure to switch to second transmitter automatically. Provision is to be made in the transmitter so as to enable operating personnel to operate the transmitter in the manual mode also in case of failure of remote operation system.
- 2.4.2.3** Arrangement shall be made for bypassing the ACU incase of its failure so as to enable operating personnel to operate the transmitter in the manual mode.
- 2.4.2.4** Power supply to the ACU shall be fed through the UPS.
- 2.4.3** The bidder has to provide complete switching sequence of transmitters and associated equipment along with all monitoring and Control features of the transmitter system.
- 2.4.4.0 Remotely Controllable parameters:**
- 2.4.4.1** For transmitter.
- Transmitter 1 ON/OFF.
 - Transmitter 2 ON/OFF.
 - Auto change over of Transmitter 1 & Transmitter 2.
- 2.5 Remotely Monitorable parameters:**
- Following parameters are to be made available for monitoring on the PC at the remote location as well as on local PC. In addition to these, individual parameters are to be monitored within the units. Details about all the individual screens may be provided with the offer.
- 2.6.0** A/C mains .
- 2.6.1** Transmitter 1/transmitter 2 running status.
- 2.7.0** RF Power Output
- 2.7.1** Total Vision RF power output in watt.
- 2.7.2** Total Aural RF power output in watt.
- 2.8.1** Transmitter Vision RF forward and reflected Power in watts
- 2.8.2** Transmitter Aural RF forward and reflected Power in watts
- 2.8.3** DC Voltage/Current of SMPS of PA
- 2.8.4** PA's VSWR, Temperature and overdrive alarms (Over current, over voltage).
- 2.8.5** Individual Unit faults and indications
- 2.8.6** Exciter output level
- 2.8.7** Exciter alarm
- 2.8.8** Any other parameter which the manufacturer thinks essential for proper functioning of a remote-Controlled LPT Station.

MANUAL OPERATION OF THE TRANSMITTERS:-


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- 2.9 The transmitters and other equipment can be switched ON from the front panel. The 'Transmitter ON' button will switch on the Transmitters by following the Switch on Sequence as per the design proposed by the bidder (The ON and OFF switching sequence must be provided by the bidder). It also automatically changes over the transmitters when one becomes faulty. Equipment can also be switched "ON" individually by the TX 1 /TX 2, Video selection is to be done manually by the input 1/input 2 keys. The Transmitter OFF button switches OFF Transmitter sequentially.

Requirement of Analog Transmitters (which are Digital ready):-

- 2.10 The transmitters at present will work in analog mode. **It must however be Digital ready for operation in DVB-T standard.** It should therefore have a provision for both Analog and Digital (ASI) signal inputs. It should be possible to change the mode of operation from Analog to Digital with suitable Hardware / Software. The bidder have to clearly spell out the Procedure for changing the Mode of Operation from Analog to Digital Operation in their offer. The quoted Transmitter must have the capability of operations in Analog as well as in Digital mode.

The change of Operational Mode from Analog to Digital should be easily implementable at the site. DD may ask bidder for demonstration of the change over procedure required during the inspection. The bidder will provide technical specifications and performance Parameters that can be achieved by the transmitter in Digital mode However, Broad specs. for Digital mode Transmitter are provided at Para No 3.6 . The Single Transmitter output power in watts in Digital Mode may please be specified at the output of the Band pass filter against the 500W (peak Sync) Analog power of the quoted Transmitter.

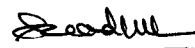
It is a mandatory requirement for deciding the technical suitability of the offered Transmitter system. All the Hardware / Software for operation in Digital mode is to be supplied along with the offer.

Central Technical Operation and Control :- (Optional)

- 2.11 Doordarshan is interested to establish a central technical operation, monitoring and Control facility centre (in any part of India e.g. Delhi) which can monitor, Control and operate all these 500 Watts VHF /UHF Analog TV Transmitter (digital ready) as per specs (2.4.1). The bidder is to provide detailed breakup of all the hardware & Software etc. which will be required to be added to the above transmitter for carrying out the central technical operation, monitoring and Control facility.

TRANSMITTER:-

- 2.12 The individual transmitter will be of combined amplification type. The Power Amplifiers will be modular and power efficient. It will be based on latest RF/ LDMOS devices of reputed manufacturers. The data sheet and the quantity of the devices used for the PA should be provided with the offer. The 500 W Power Amplifier (PA) should be preferably housed in a single housing. Inside layout of the PA, Driver Amplifier, divider, amplifier, and combiner should be such that to avoid power loss, complexity & reflections etc.


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- 2.13 Each PA will have independent SMPS based power supply unit. The SMPS should have adequate margins for satisfactory working under overloading.
- 2.13.1 Each PA will be fully broadband
- (a) 174 MHz to 230 MHz for VHF-Tx.
- (b) 470 MHz to 860 MHz for UHF- Tx.
- 2.14 The transmitter shall be forced air cooled and fan unit must be a part of transmitter. The efficiency of the single transmitter in analog mode & Digital mode must be specified in % by the OEM. The Total power consumption in watts in Analog mode & Digital mode must also be specified by the OEM for single Tx.

Control & Monitoring Rack:-

- 2.15 The Control/Monitoring Rack will house, IRDs, 10x2 Audio-Video Vertical Interval switchers, Waveform monitor ,Colour Pattern Generator, low distortion audio oscillator and monitoring amplifier . Blank space(atleast 12 RU) is to be provided in the rack for mounting IRDs and other equipment.
- 2.16. **UPS and AVR:-**
- 2.16.1 6 KVA online U.P.S with Maintenance Free Batteries for half hour back-up at full load of both 500W(peak sync.) (Analog) Transmitter Systems is to be provided by the supplier. As soon as the AC main fails, load is transferred to UPS to take care of momentary interruptions. The UPS must have R.F shielding provisions to work satisfactorily in R.F. field environment. The SMF Batteries must be installed on standard rack of required size & wired-up properly.
- 2.16.2 At a number of sites in India, Stable, interruption free, clean power supply is not available. Therefore, a 10 KVA automatic voltage regulator is also provided by transmitter supplier ensuring its suitability for operation with transmitter. Specification of AVR is attached at Annexure-IV. The AVR is to be provided with surge protection system of comparable capacity with AVR (integrated or separate) so that transmitter is fully protected.

3.0 TECHNICAL SPECIFICATION FOR THE (1+1) AUTO 500 W VHF/UHF TV TRANSMITTER SYSTEM (LPT) (Analog Transmitter)

3.1	AC power supply requirements	
3.1.1	Power supply	230V \pm 10%, 50Hz \pm 2 Hz Single phase.
3.1.2	Power factor	>0.9
3.1.3	(a)Total AC power consumption of (1+1) TV transmitter system at black level	To be mentioned by the manufacturer (in KW)
3.2.0	Environmental Requirements	
3.2.1	Ambient Temperature (For operation)	(0°C to 45° C)
3.2.2	Ambient Temperature (for storage)	(-10°C to +60° C)
3.2.3	Max Altitude	2500 m above sea level

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3.2.4	Relative Humidity	90% (max) at 40° C (non condensing)
3.2.5	Requirement of Air conditioning	Any special requirement of air conditioning of the transmitter hall should be specified clearly by the manufacturer.
3.2.6	Environmental regulation	In compliance of keeping green Environment, the Transmitter built with hazardous materials & use of Toxic substances will not be accepted. WEEE/ROHS(Waste Electrical & Electronic Equipment/Reduction of Hazardous substances) regulations shall be strictly adhered to
3.3.0	System parameters	
3.3.1	Frequency Range	Any assigned channel between 174 Mhz to 230 Mhz (VHF Band III) with facility of frequency offset by $\pm 2/3$ of line frequency. For VHF Tx. OR Between 470 to 860 MHz (UHF Band IV,V) with facility of frequency offset by $\pm 2/3$ of line frequency. For UHF Tx.
3.3.2	TV standard	PAL – 625 lines, ITU-R Standard –B for VHF PAL – 625 lines, ITU-R Standard –G for UHF
3.3.3	IF Carriers	a. Vision : 38.9 MHz b. Aural : 33.4 MHz
3.3.4	Amplification	Combined vision and aural amplification with negative Sync.
3.3.5	Carrier frequency stability	± 200 Hz over a period of three months
3.3.6	Output power (for single transmitter) (a) Visual (sync peak) (b) Aural	500 W [At the output of the band pass filter of the Tx.] 50W [At the output of the band pass filter of the Tx.]
3.3.7	Output connector of Transmitter.	N type Female
3.3.8	RF output impedance	50 Ohms unbalanced with return loss better than 30 dB
3.3.9	Harmonic level	60 dB below carrier level (minimum)
3.3.10	Spurious emission.	60 dB below carrier level (minimum)
3.3.11	Automatic Level Control	Less than +.5 dB output variation with 3 dB change in amplification.
3.3.12	Dimension of transmitter (L x B x H)	This may be specified by the suppliers in meters.
3.3.13	Weight of transmitter	This may be specified by the suppliers in Kgs.
3.4.0	Performance specifications for visual transmitter : (As per ITU-R Standard) PAL-B for VHF,PAL-G for UHF	
3.4.1	Type of modulation	Negative AM (C3F) with colour PAL-B/G
3.4.2	Video input level	Sync 0.3V, video 0.7V (from .5V to 1.5 V P-P)
3.4.3	Video input return loss	≥ 30 dB(up to 5.5 Mhz)
3.4.4	Video input impedance (Connector)	75 ohms unbalance (BNC)
3.4.5	No of Video input	One for Analog / Two ASI
3.4.6	Amplitude Vs frequency Response of the vision transmitters:	

Freq. relative to carrier in MHz		Limits(dB) Maximum	Limits (dB) Minimum
-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		-20	-
3.4.7. Video Noise (100KHz to 5MHz)			
a)	Unweighted continuous (Random Noise) upto 5 MHz	-54 dB or better (color sub carrier trapped)	
b)	Weighted continuous (Random Noise)	-58 dB or better	
c)	Hum (1KHz peak value)/Periodic Noise	-46dB (p-p) or better	
3.4.8.	Incidental carrier Phase modulation	Phase modulation less than +/- 3°	
3.4.9	Waveform response (50 Hz square wave Tilt)	a) 2T pulse : within 2% K-rating b) Line Tilt : within 2.0% (1% K rating) c) Field Tilt : within 2 % (1% K-rating)	
3.4.10	Non Linear Distortion at 4.43 MHz a) Differential gain b) Differential phase	Within 5% (at 4.43 MHz at APL 50%) Within 3 deg. (at 4.43 MHz and modulation 10 to 87.5%)	
3.4.11	Black level stability	2% or better	
3.4.12	Group delay. Transmitter with receiver pre-correction and test demodulator with slanted receiver curve and sound trap ON	a) +/- 35 ns (upto 3.7 MHz) b) +/- 20 ns (At 4.4 3MHz) c) +/- 80 ns (At 4.8 MHz)	
3.4.13	Base –line distortion of 20T pulse	Less than 3%	
3.4.14	Output power variation (Black to white transition)	Within +/- 2%.	
3.4.15	Inter modulation products	-54 dB or better with respect to Peak sync Power	
3.4.16	Modulation depth	Sync/black/white 100%/75%/12.5%	
3.5.0	Specifications for Aural Transmitter Parameter		
3.5.1	Class of emission	Freq. Modulation (F3E)	

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3.5.2	Output power	1/10 th of the output power of Visual transmitter.
3.5.3	Output impedance	50 Ohms with VSWR <1.3
3.5.4	Input level	-6 dBm to +20 dBm balance (-6dBm to +6dBm)
3.5.5	Input Impedance	600 Ohms balanced
3.5.6	Input return loss	30dB minimum (between 30Hz to 15KHz)
3.5.7	Pre-emphasis	50 microsecond
3.5.8	Amplitude Vs Freq. Response	±1 dB between 30Hz to 15KHz
3.5.9	Harmonic distortion	Less than 1% within 30 Hz to 15KHz for 100% modulation i.e. 50KHz deviation.
3.5.10	FM Noise (Unweighted) At the rate 50 KHz deviation at 400 Hz modulation frequency	Better than -55dB with respect to 100% modulation
3.5.11	AM Noise (without modulation)	-50dB or Less
3.5.12	Freq. Deviation (for 100% Mod)	±50KHz nominal
3.5.13	Sound	Single Carrier/Mono sound System
<i>Note: In case separate analogue output filter is required at the output for analogue mode operation of the Transmitter. The same is to be offered and supplied with the system for the channel of operation of the transmitter.</i>		
3.6.0	<u>Broad Specifications for Digital Mode Operation of the Transmitter (DVB-T):-</u>	
3.6.1	Frequency Range	Any assigned channel between 174Mhz to 230Mhz for VHF and 470-862 MHz for UHF
3.6.2	Modulation/Constellation	COFDM, 2K/8K, QPSK/16QAM/64QAM
3.6.3	Bandwidth	DVB-T, Standard ETS 300744
3.6.4	Input	ASI Two Nos
3.6.5	Input Impedance	75 ohms unbalance
3.6.6	Average out power in Digital Mode	To be specified by OEM.
3.6.7	Crest Factor	Max 13 dB.
3.6.8	Efficiency of Tx	To be specified by OEM.
3.6.9	Power consumption of Tx	To be specified by OEM.
3.6.10	Shoulder Level	<-37 dB before out filter.
3.6.11	END	<0.7dB
3.6.12	MER	>34dB
3.6.13	Output Filter	To meet the standard of Digital mode operation for the channel of operation of the transmitter.

Compliance statement:-

- 4.1 A para by para compliance statement in the form of a format given below should be attached with the offer. The compliance must be provided by OEM on its letter head and signed by the OEM and by the bidder clearly indicating name & designation of the signatories.

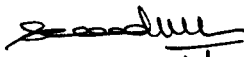
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- 4.2 The compliance statement for all technical as well as general specifications for all the paras listed in these specifications is a mandatory and essential requirement. **Any offer without the compliance statement for all paras as detailed above as well as compliance statement in respect of the items/equipment specifications provided in Annexure-II,III,IV& V shall be rejected in the first instance without making any reference to the bidder.** The compliance statement should be in the following format only.

Para No. of specification	DD Specification details and value	Details and parameter value of offered system	compliance or deviation	Page No where this information is available	Remarks if any
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4.3 **Information to be supplied with the tender**

- a) A compliance statement to the complete specifications
- b) Complete printed information in support of compliance statement should be furnished with the tender to assess the full merit of the offer. Similar information should be furnished in respect of auxiliary items, accessories and spares
- c) Descriptive information giving complete details of equipment offered.
- d) Detailed bill of materials offered. This list should be in the same format as in the price bid with out indicating the prices.
- e) Make and type number of individual units along with details
- f) Layout and construction details of Transmitter and external units including dimensions, weights, overall sizes and photographs of the interior of the transmitter.(this should include characteristics affecting the environment, for example: heat dissipation and acoustic noise, tentative accommodation plan with elevations for Transmitter and its accessories).
- g) Details and extent of ventilation and air conditioning requirements, if any , for main transmitter and its accessories.
- h) Information and characteristics of all high power semiconductor devices used in the equipment
- I) Details of MTBF(Mean time between failure) along with the basis of calculation for LDMOS and the TV Transmitter
- j) Details of failure of individual devices, components based upon field feedback reports.
- k) An up to date list of customers along with complete set of actual performance figures taken on the Transmitter in support of tenderer's claim.
- l) A supply record of similar Transmitters year wise along with the Names,Addresses, E-mail and fax numbers of the customers.
- m) A guarantee to make good with in 30 days at his own expence any component/module which becomes defective under normal operating conditions with in 24 months from the date of acceptance of equipment at respective site.
- n) A guarantee to supply all components for a period of ten years from the date of acceptance of Transmitter at site, at rates which these are being supplied by him to other customers and also should match prices of original manufactures of these components prevailing at that time.
- o) The complete set of operation, maintenance and installation manuals are to be attached with the offer. It is mandatory
- p) Arrangement for by passing including the control circuit with details and diagram should be provided with the offer.
- q) The full tender document / offer must be numbered for all the pages and a certificate is to be attached by the tenderer stating the total number of pages in the tender document / offer.


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ANNEXURE-I

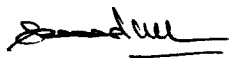
(1+1) 500W VHF / UHF TV TRANSMITTER: SUGGESTIVE BILL OF MATERIAL

Sl. No..	Description	Make/ Model No.	Qty.	Remarks
1.0	500 W VHF / UHF Air cooled TV Transmitter System in (1+1) Mode complete with all items as required to meet DD specifications, including all HW/SW required for Digital operation of Transmitter. Note: The bidder is to provide detailed breakup of all the items, Software etc. which shall be part of the system and will be supplied with 1+1 Transmitter System. The make, model and quantity are to be specified.		1 Set	
1.0.1	Output Filter		1	To meet the standard's of Digital mode operation
1.1	Option-1 Essential Spares for 1+1 500W LPT setup (Components and Modules) which are essential as per the manufacturer.		1 set	The cost will not be included for deciding the lowest tenderer. (Please see clause 1.8 of Specs.)
1.2	Option-2 Setting up of a Central Technical Operation and Control facility for all the transmitters under procurement. Note: The bidder is to provide detailed breakup of all the items, like computers, annunciation system, Software etc. which will be required setting up a central Operation and Control facility for the above transmitters		1 System	The cost will not be included for deciding the lowest tenderer. (Please see clause 2.11 of Specs.)
2.0	Input and Monitoring Equipment Rack & its items:-			
2.1	19" Wired Rack		1	
2.2	Amplispeaker Sonadyne make		2	Model No.(SM50AKM)
2.3	Audio/Video (married) vertical interval Switcher 10x2) (For switching of programs/ monitoring)		1	As per spec sheet enclosed (annexure -II)
2.4	14"/15" Colour TV sets with A/V inputs. (Make SONY/Philips/ONIDA / LG/ Samsung)		2	
2.5	Color test pattern Generator (19" Rack mountable)		1	Tektronix SPG 300 OR R&S Make model No SGP
2.6	Low Distortion Audio Oscillator		1	As per spec sheet enclosed

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				(annexure-III)
2.7	Wave Form Monitor (check model Number) with side by side adapter and rack mount kit.		1	Tektronix make, Model No.17141C (LCD Based). Or Leader make, model LV5800 (LCD Based).
3.0	Miscellaneous Items:			
3.1	Dummy-Load 50 Ohms for 600W (Bird make, model 8401) with suitable connecting chord and reducer to connect with transmitter.		1	
3.2	10 KVA AVR (140V to 260V)		1	As per spec sheet enclosed (annexure -IV)
3.3	6 KVA ONLINE UPS with sealed Maintenance Free batteries for Half hour backup at full load. Emerson Liebert /Mitsubishi /Merlin Gerin/ Gutor/APC/Sukam make)		1 set	
3.4	Patch Cords consisting of:- (a) Co-axial cable BNC to BNC		6 Sets	
3.5	Co-Axial cable assembly(N to N)		1 Set	
3.6	Through Line Power meter (Bird make, model 43) with (a) Crystal – 25 Watt (b) Crystal – 100 Watt (c) Crystal – 500 Watt.		1 set	
3.7	Step Attenuator 0-110dB (in 1 dB steps)		1 No.	
3.8	1 5/8" EIA flange (female) to N (male) connector (Reducer)		Two Nos.	
3.9	Coaxial switch for connecting transmitter's output to antenna and dummy load for change over.		1 No.	
3.10	Installation material for installing transmitter system(List of all the items to be provided by bidder)		1 Set	As per requirement
4.0	Items of Remote Control/Monitoring			
4.1	Desk Top Computer system (IBM/HP/COMPAQ/Acer/Dell) Intel Pentium core 2 Duo Processor, Min 2.8 GHz, with Intel Chipset, 1 GB DDR II RAM/ 320 GB SATA HDD/ DVD Combo Drive, 17" TFT Color Monitor, Integrated Intel Graphics Media Accelerator Integrated Intel Audio with premier Internal Speakers, Integrated Gigabit Ethernet, 8 USB 2.0, 1 standard Serial, Parallel, PS2,1 RJ45,1 VGA, audio in/out, 104 keys keyboard and two button scroll optical mouse, 56.6 kbps dial up Modem, Windows XP professional OS, Anti Virus. With 800 VA Offline UPS with 30 minutes backup.		1 Set	
4.2	Laser Printer of HP/Samsung/Canon		1 No.	


	make only .			
4.3	Cables for remote Control/monitoring		1 Set	
4.4	Suitable Software for remote Control		1No.	
4.5	Any other item required for completing the remote Control & monitoring of transmitter system		As Required	
5.0. a	Installation Manual for all the above items as detailed below: a. Ultimate Consignee—2 sets to each consignee(for each Transmitter). b.DG Doordarshan—2 Sets Per order. c.Each Zonal Office—2 setsX5 Per order. d.Technical Bid---One set			
5.0. b	Operation /Maintenance Manual for all the above items as detailed below: a. Ultimate Consignee—2 sets to each consignee(for each Transmitter). b.DG Doordarshan—2 Sets Per order. c.Each Zonal Office—2 setsX5 Per order. d.Technical Bid---One set			
6.0	All connecting chords with suitable connectors to monitor various parameters must be provided.		2 Sets	
6.1	Training fee for training Four Doordarshan engineers at manufacturer' works for five working days for installation, testing, commissioning & operation of the TV Transmitter.(To & fro airfare, per diem allowances, lodging, boarding charges etc. shall be borne by Doordarshan and not to be quoted by supplier).		1	
6.2	Any other item required for completing the transmitter system		As Required	


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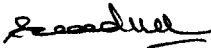
**TECHNICAL SPECIFICATIONS SHEET OF 10X2 VERTICAL INTERVAL DUAL BUS
VIDEO AUDIO SWITCHER**

The Video Audio switchers should consist of a video switching module & audio switching module with a Control logic board for audio to follow video operation with basic configuration of 10 inputs and 2 outputs (10x2). Buttons per cross point Control lines should be available to permit Control from front panel through illuminating momentary push button. Switching should be selectable between instantaneous (non vertical intervals) or as vertical interval reference. The audio, video and power supply connection should be on the back side of the unit. The switcher should have following technical specifications.

SL. NO.	Video inputs	
1.	Standard	PAL colour standard
2.0	Video inputs	
2.1	No. Of inputs	10 Nos. with loop through facility
2.2	Input signal level	1V p-p nominal (CCVS)
2.3	Input impedance	High impedance for loop through inputs, terminable into 75 Ohms through termination plug.
2.4	Return loss	Better than 40dB upto 5 MHz, across 75 Ohms
3.0	Video outputs	
3.1	No. of outputs	a) 2 (Two) buffered output b) 2 for monitor bus
3.2	Output signal level	1V p-p nominal (CCVS)
3.3	Output impedance	Ohms 75 Unbalanced
3.4	Isolation between buffered output	Better than 35 dB
4.0	Video Performance	
4.1	Gain	Unity, +/- 1.0 dB adjustable(internally)
4.2	Frequency response	+/- 0.1dB for DC to 5 MHz +/- 0.5 dB from 5 MHz to 8 MHz
4.3	Differential Gain	Better than 0.3%
4.4	Differential Phase	Better than 0.3 deg
4.5	Line frequency tilt	0.5%
4.6	Field frequency tilt	0.5%
4.7	Signal to noise ratio	Better than 75 dB (weighted) at rated input & output levels
4.8	Cross talk	Better than 60 dB referenced to 1V p-p at 5 MHz
4.9	Connectors	BNC (for inputs & outputs)
5.0	Audio inputs	


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5.1	No. of inputs	10 Nos balanced
5.2	Inputs signal level	+8dBm nominal, +20 dBm maximum at 600 Ohms
5.3	Input impedance	600 ohms, Balanced
5.4	Input connector	XLR female
6.0	Audio outputs	
6.1	No. of outputs	02 (Two) for program & 2 for monitor bus
6.2	Output signal level	+8 dBm nominal
6.3	Output impedance	600 Ohms balanced
6.4	Output connectors	XLR male
7.0	Audio Performance	
7.1	Gain	Unity, +/- 1.5dB adjustable
7.2	Frequency response	+/- 0.1 dB (20Hz to 20KHz)
7.3	Cross talk	Better than 70 dB (20 Hz to 15 KHz)
7.4	Signal to noise ratio	90 dB referenced to +8dBm
7.5	Harmonic distortion	Better than 0.1% (20Hz to 20KHz at +20dBm)
7.6	Control	Push button Control on front panel
9.0	General	
9.1	Power supply	Operational on both 24 Vdc and 230 Vac +/- 10% @ 50 Hz
9.2	Operating temperature	0 deg.C To 45 deg. C
9.3	Storage temperature	-30 to 60 deg. C
9.4	Relative humidity	95% at 40 deg. C (non condensing)
9.5	Dimensions	3U height 19 rack mount chassis

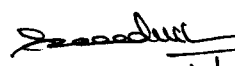

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SPECIFICATIONS FOR LOW DISTORTION AUDIO OSCILLATOR**SCOPE:-**

- 1.The required Frequency Range is from 20 Hz to 30 KHz
- 2.It should have Low Harmonic Distortion for Sine wave
- 3.It should have Sine & Square wave Output (Selectable)
- 4.It should have High AVC Gain and Flat frequency response
- 5.It should have Good frequency Stability
- 6.It should have Built-in Attenuator up to 60dB in 20,40,60 dB steps
- 7.It should have Sine Wave Output of 30V p-p
- 8.It should have Square Wave Output of 20V p-p with Rise and Fall Time $\leq 100\text{ns}$
- 9.It should be compact and portable.

SPECIFICATIONS:

SL.NO	DESCRIPTION	SPECIFICATION
1.	Frequency Range	20 Hz to 30 KHz
2.	Frequency Indication	Dial or Digital
3.	Frequency Accuracy	Within $\pm 5\%$ of the setting.
Max. Output Voltage at 1KHz		
4.	Sine	10V rms ± 1 V rms.
5.	Square	20V p-p .
6.	Attenuator	4 steps corresponding to 0dB,20dB, 40dB,60dB. Accuracy within ± 1 dB at 1KHz.
7.	Attenuator Output Impedance	600 ohms $\pm 5\%$ (at 20dB, 40dB, 60dB attenuation).
8.	Amplitude Change with Frequency	For sine wave (at 10V rms w.r.t. 1KHz). 1Hz to 1MHz: ± 1.0 dB.
9.	Sine Wave Distortion	$\leq 0.5\%$ in the range from 30Hz to 30KHz
10.	Rise and fall time (Square Wave)	$< 100\text{ns}$ (at max. output).
11.	Input Supply	230V AC $\pm 10\%$, 50Hz.
12.	Dimensions	To be mentioned by the supplier
13.	Mounting	Standard 19" Rack Mount
14.	Weight	To be mentioned by the supplier
15.	Standard Accessories	1. Banana to Crocodile Cable-1No. 2. Operation Manual-1No.


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SPECIFICATION FOR 10 KVA, SingleØ Servo Controlled Automatic Voltage Regulator**1.0. INTRODUCTION:**

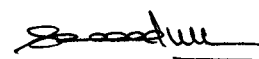
- 1.1. Servo Controlled Automatic Voltage Regulator (AVR) is to be used in TV Transmitters and other transmission equipment so that these sensitive equipments are protected from low voltage / high voltage and power supply fluctuations and surges.
- 1.2. The AVR should be rugged, reliable and stable for continuous operation.
- 1.3. It should be naturally air cooled type housed in one steel cubicle and having hook(s) at the top for lifting.

Technical Specifications

2.0	Input	
2.1	Nominal voltage	230 , Single Phase
2.2	Range	140 V to 260 V
2.3	Frequency	47 to 53 Hz
2.4	Waveform	Sinusoidal
3.0	Output	
3.1	Nominal voltage	230 V \pm 0.5 %,
3.2	Load regulation	\pm 1.0 %
3.4	Line regulation	\pm 1.0 %
3.5	Capacity	10 KVA
3.6	Waveform	Sinusoidal
4.0	Efficiency	> 95% at full load, unity power factor and at minimum input voltage
5.0	Correction speed	> 20 V/Second.
6.0	Protections:	
6.1	Over-load capacity	25% for half an hour.
6.2	Output under voltage (140 V)	Disconnecting the load through a
6.3	Over voltage (260 V)	Contactora with alarm bell.
6.4	Over load tripping	
6.5	Power factor effect	Nil.
6.6	Waveform distortion	Less than 1% at full load
7.0.	Metering	(a) Analog or digital voltmeter for input and output (b) Analog or Digital Ammeter for input and output (c) Frequency
7.1	Indications	(i) Input on (ii) Input OK (iii) Low input (iv) High input (v) Output on
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 inadvertently. (b) Earthling terminal is to be provided
7.4.	Dimensions	Weight & Dimensions (L x B x H) To be given by the vendor

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8.0.	Environmental specifications	
8.1.	Ambient temperature range	0 to + 45 C (operative).
8.2.	Storage	- 20 to +70 C.
8.3.	Relative Humidity	95% at +40 C.
8.4.	Type of cooling	Natural air cooling.
9.0.	Derating factor (adequate) should be applied to critical components while designing to improve life expectancy.	
9.1.	All the transformers and chokes should be vacuum impregnated.	
9.2.	All the components used should be of reputed make.	
9.3.	PCB should be of glass epoxy material and heavy components & high power dissipating components like transformers, chokes, high power transformers should not be mounted directly on the PCB.	
9.4.	AVR should be subjected to 100 hrs. burn-in test at max. load under normal ambient temperature condition. Pre-burn-in and post-burn-in test result should be supplied with equipment.	
9.5.	AVR should be compatible & according to latest National and international standards on safety & EMC. Standards followed should be stated.	
10.	Guarantee: Two years from the date of receipt of equipment.	
10.1	Past supply record of manufacturer in supplying similar capacity AVR to other organization may be attached.	
11.	Compliance: A point by point compliance statement in respect of all the parameters laid down in this technical specification is to be enclosed with the offer as detailed earlier.	



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