

Through PB website

**PRASAR BHARTI
(India's Public Service Broadcaster)
Directorate general of Doordarshan
Doordarshan Bhawan, Copernicus Marg
New Delhi -110001.**

File No. 19(2)2023-24EI(P)TVDraftspecifications

Dated :27/12/2024

Subject: Technical Specification along with Suggestive Bill of Material (BOM) for SITC of Upgradation & Replacement of Earth Stations at DDK Guwahati, Shillong and Aizwal.

The Technical specification of the upcoming tender is enclosed herewith to offer comments/Industry Feedback if any by prospective bidders/Firms on or before due date at e-mail ddpurchase401@yahoo.co.in or on following Address:

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Specification For: SITC of Upgradation & Replacement of Earth Stations at DDK Guwahati, Shillong and Aizwal.

Specification no: SATD/Upgradation & Replacement of Earth Stations at DDK Guwahati, Shillong and Aizwal/Dec_2024, Dated 20/12/2024.

Due Date to offer Comments: 10.01.2025 at 17.00 hrs.

Encl.: As above (81 Pages)

Signed by Narendra Kumar
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Date: 27.12.2024 10:33:43
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Prasar Bharati
(India's Public Service Broadcaster)
DIRECTORATE GENERAL: DOORDARSHAN

**Specifications for SITC of
Upgradation & Replacement of Earth Stations at
DDK Guwahati, Shillong and Aizwal**

Specification No.: SATD/Upgradation & Replacement of Earth Stations at
DDK Guwahati, Shillong and Aizwal/Dec_2024

Dated: 20/12/2024

Himanshu Goyal
20/12/24

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1. Introduction

This project envisages Supply, Installation, Testing & Commissioning (SITC) for Upgradation & Replacement of C Band Earth Station at DDK Guwahati, Shillong and Aizwal comprising of Compression System, IF System, RF System, Monitoring System and Power Supply system under plan scheme Upgradation & Replacement of 2x(1+1) Earth Station for SD and HD TV Channels.

Compression System, IF System, RF System, Monitoring System and Power Supply system of these earth stations is proposed to be replaced for uplinking of SDTV & HDTV channels (Anyone standard on any given point of time) with MPEG-2/MPEG-4 compression and Uplink in DVB-S/DVB-S2 standard.

Configuration of major equipment for the proposed Earth Station Chain

S. No.	Configuration of Equipment	Uplink Standard	Proposed Configuration of Equipment
1.	2x(1+1) Stand-alone Encoder for SDTV in MPEG-2 & MPEG-4 and HDTV in MPEG-4 compression in 4:2:0, 4:2:2 format for both SDTV and HDTV (Anyone standard on any given point of time)	SDTV& HDTV	SITC of 2x(1+1) encoders.
2.	Satellite Modulators 2x(1+1)	DVB-S & S2 Systems	SITC of 2x(1+1) Satellite Modulators
3.	C band RF Up-converters 2x(1+1)	-	SITC of 2x(1+1)Up converter system
4.	High Power Amplifier	C Band frequency	(1+1) Redundant configuration
5.	Monitoring System consisting of: <ul style="list-style-type: none"> • Uplink to L band converter (TLT) • Downlink to L band converter • L band IRD • AV Monitors • 70 to L Band converter 	SDTV& HDTV	SITC of Monitoring System
6.	Power Supply System consisting of: <ul style="list-style-type: none"> • 2x20KVA UPS • 30 KVA Isolation Transformer • 30 KVA AVR 	-	SITC of Power Supply System

Table 1

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2. Scope of Work

The scope of the work at Digital Earth Station at DDK Guwahati , Shillong and Aizwal on turnkey basis shall include the following but not limited to (refer drawing no. 1 to 5).

- 2.1 All the concerned equipment shall capable to take SDTV &HDTV channel without any limitation or requiring any upgradation by way of hardware or software.
- 2.2 The bidder shall Supply, Installation, Testing & Commissioning of the Digital Earth Station for two carrier up-link configuration consisting of HD/SD-SDI router and compression chain having MPEG-2 and H.264/MPEG-4 AVC Encoders in 2x(1+1) mode.(refer drawing no. 1).
- 2.3 The bidder shall supply, install, test & commission (SITC) one set of 32 x 32 or better matrix HD-SDI/ASI router with dual redundant power supply, X-Y remote panel and single Bus panel(refer drawing no. 1).
- 2.4 The bidder shall Supply, Installation, Testing & Commissioning of DVB-S2 compliant Digital Modulators in 2x(1+1) configuration with IF redundancy switch (inbuilt or external).(refer drawing no. 1).
- 2.5 The bidder shall Supply, Installation, Testing & Commissioning of RF chain consisting of (1+1) Up-converters with RF redundancy switch (inbuilt or external), RF combiner, splitters etc.(refer drawing no. 1).
- 2.6 The bidder shall supply, install, test & commission (SITC) High Power Amplifier (HPA) in (1+1) configuration (based on Travelling Wave Tube) along with waveguide switch, dummy load, dehydrator and associated accessories (refer drawing no. 2).
- 2.7 The bidder shall Bidder shall supply, install, test & commission (SITC) 24 port IP Network Switch and Work Station/ Control Computer for control and monitoring of IF & RF System (refer drawing no.1 & 2).
- 2.8 The bidder shall supply, install, test & commission (SITC) of Uplink to L band converter (TLT), 70 to L Upconverter, C band D/L to L Down convertor, 17" HD Monitor, dual 9" HD Monitors rack mount, 8 channel Audio (Bar Graph) Monitor, Ampli-speaker and IRDs (IP ASI and L Band Input) for confidence monitoring points, Monitoring of ASI output of Encoders, IF Monitoring, RF Uplink Monitoring and RF Downlink Monitoring (refer drawing no.1 & 2).
- 2.9 The system shall be designed to meet the International standards for digital Satellite Broadcasting having MPEG-2 & H.264/MPEG-4 AVC compression and DVB-S, S2 modulation (one at a time).
- 2.10 The bidder shall provide fully wired 42 RU, 19", 1000 mm (depth) standard equipment racks for mounting all the offered indoor equipment along with interconnecting power/signal/audio/ video/RF cables. All the racks are to be provided with minimum two nos. single phase MDUs and one no. single phase automatic power transfer/static switch connected between two sources of power supply routed through physically isolated routes.

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- 2.11 The bidder has to integrate and configure the new equipment chains and commission the system as per the scope of the project and configuration mentioned in table-1 at clause 1.
- 2.12 The bidder shall provide assorted items required for the project like Rack Frames, MDUs, interconnecting material including Audio, Video, Power supply and control Cables with associated connectors, 1:4 IF splitter, 1:4 RF splitter, 2:1 RF combiner etc. are also to be provided and install.
- 2.13 The Bidder shall supply, install, test & commission (SITC) minimum Ten sets of earth pits (4 nos. for Isolation Transformer, 2 nos. for UPS, 2 nos. for Input and baseband, 2 nos. for IF & RF System). All earth pits shall be extended up to earth terminals mounted on the wall in their respective equipment room. All electrical equipment and racks shall be directly connected at two points (without loop formation) to Earth Terminals with insulated multi strand copper wire (refer drawing no. 4 & 5).
- 2.14 The bidder shall provide Power supply system which includes three phase 2x20 KVA parallel redundant, true on-line double conversion continuous operation (defined in VFI in the IEC62040-3 UPS Specifications), solid state Uninterrupted Power Supply (UPS) along with battery bank, battery bank change over switch, switches and interconnecting cables for (1+1) parallel redundant load sharing mode and Standalone operation of UPS, each UPS operating with a minimum 15 minutes battery backup at full rated capacity, 30 KVA Isolation Transformer, 30 KVA Automatic Voltage Regulator (AVR), Power Distribution Panel (PDP) and Sub Distribution Boards etc. The suggestive single line diagram of Power Supply System is enclosed in Drawing No 3.
- 2.15 The Power Supply System has to operate in conjunction with the Existing LT Panel of Mains/DG AMF, 3Ø LT Panel to provide power conditioning, back-up power protection, and power distribution for the critical load.
- 2.16 The bidder should provide and install Power Distribution Panel (PDP), Suitable rating Power Supply Cables and lugs for the new equipment. However, it is advisable to the bidders to visit the site for their assessment of existing facilities before bidding.
- 2.17 The Bidder should install remote Monitoring Panel for monitoring of UPS system in the Control room.
- 2.18 Assorted items required for the project like inter connecting copper power supply cables with copper connectors/thimbles (Flat/bottle type) etc. from output of Isolation Transformer to AVR, from output of AVR to Input of UPS, from output of UPS to PDP and inter connecting cables of various change over switches of mains and battery bank etc. are also to be provided by the successful bidder.
- 2.19 Bidder shall provide furniture for installation of various monitoring equipment in monitoring and control area.

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3. Work Experience for Vendor and OEM

3.1 Work Experience for Selection of the vendor:-

3.1.1 Bidder must have his local office/authorized representative/dealer in India for after sales service support.

3.1.2 The Bidder shall have to meet the following Work experience:-

Work Experience- (Self - certified with relevant documents*)-	One Similar work** of minimum value of 80% of estimated cost of the project. or Two Similar works** each of minimum value of 60% of the estimated cost of project, or Three Similar works** each of minimum value of 40% of the estimated cost of project.
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Note:

- a) *Self-certified with Relevant document means to provide copies of work order/orders clearly mentioning the cost of the project/projects and Receipt Certificate/successful completion certificate/Factory dispatch document/Delivery Challan/Copy of Invoice of the project/projects to various organizations along with the bid.

In case of work executed by the bidder for its own organisation, bidder has to provide Self-certified declaration by authorised signatory, about the number of works i.e. One, Two or Three, along with documents clearly mentioning the cost of the work/works/project/projects; and Factory dispatch document/Delivery Challan/Copy of Invoices (addressed to the bidder's organisation) of the project/projects, certified by authorised signatory/Company Secretary/Chartered Accountant along with the bid.

- b) **Similar works is defined based on scope of the work or SITC of Earth Station/Teleport for DTH/Digital Earth Station/ DTH System/Compression System (MCPC)/DTT/DVB-C/VSAT/DSNG/IT Based Broadcasting Equipment/ Broadcast Equipment (i.e. as a standalone/their Part or in combination of these works) in any past ten financial years during the period 2011-2012 to 2023-2024. Similar Work may be executed with any Central and State Government agency, PSUs, Private organizations including for its own organisation. Bidder shall provide list of all the self-certified relevant document of such work experience along with their cost in Rupees as per Annexure-VI of Appendix-D.

3.2 Work Experience for OEM of Professional IRD and Encoder:-

Bidder shall offer Professional IRDs and Encoders of only those OEMs who are having past experience of at least five years of manufacturing and supplying of similar Professional IRDs and Encoders. List of past supply record of OEM of such equipment to various organizations must be provided.

3.2.1 OEM of the offered equipment must have manufactured and supplied the offered equipment to the leading broadcaster as mentioned in the table below in any past five financial years during the period FYs 2011-12 to FY 2023-2024:

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S. No.	Offered Equipment	Qty
1	Professional IRDs	60 Nos.
2	Encoder	40 Nos.

3.2.2 Copies of supply order and receipt certificate/Factory dispatch document/delivery challan/Copy of invoice of above said quantity of professional IRDs and Encoders provided in para 3.2.2 to various organizations in any past five financial years during the period FYs 2011-12 to FY 2023-2024 should essentially be submitted along with the bid document.

3.3 Work Experience for OEM of Satellite Modulator, C/Ku band RF Upconverter and Down Converter

3.3.1 Bidder shall offer Satellite Modulator and C Band RF Upconverter of only those OEMs who are having past experience of at least five years of manufacturing and supplying of similar Satellite Modulator and C/Ku Band RF Upconverter. List of past supply record of OEM of such equipment to various organizations must be provided.

3.3.2 a) OEM of the offered equipment must have manufactured and supplied the offered equipment to the leading broadcaster as mentioned in the table below in any past five financial years during the period FYs 2011-12 to 2023-2024:

S. No.	Offered Equipment	Quantity
1	Satellite Modulator	25 Nos.
2	C Band RF Upconverter	10 Nos.
3	C Band (Downlink Frequency) to L band Down Converter	10 Nos.

3.3.3 Copies of supply order and receipt certificate/Factory dispatch document/delivery challan/Copy of invoice in respect of above said quantity of Satellite Modulator and C/Ku Band RF Upconverter provided in para 3.3.2 in any five financial years during the period from FYs 2011-12 to 2023-24 to various organizations should essentially be submitted along with the bid document.

3.4 Work Experience for OEM of High Power Amplifier

3.4.1 Bidder shall offer RF system of only those OEMs who are having past experience of at least five years of manufacturing and supplying of similar RF System. List of past supply record of OEM of such equipment to various organizations must be provided.

3.4.2 OEM of the offered equipment must have manufactured and supplied the offered equipment to the leading broadcaster as mentioned in the table below in any past five financial years during the period FYs 2011-12 to FY 2023-2024:

S. No.	Offered Equipment	Quantity
1	High power amplifier (HPA)	10 Nos.

3.4.3 Copies of supply order and receipt certificate/Factory dispatch document/delivery challan/Copy of invoice of above said quantity of equipment provided in para 3.4.2 to various organizations in any past five financial years during the period FYs 2011-12 to FY 2023-2024 should essentially be submitted along with the bid document.

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3.5 Work Experience for OEM of 2x20KVA UPS System

Bidders shall offer UPS system of only those OEMs who are having past Experience of:

- 3.5.1 At least five years of manufacturing and supplying 20 KVA or higher rating of ON LINE UPS system for critical load like 24x7 operation of transmission, Data Centre, Earth Station etc. The bidder shall submit documentary evidence in this regard. The list of such supply record of OEM of UPS system to various organizations in proceeding past five years must also be provided.
- 3.5.2 OEM of the offered equipment must have manufactured and supplied at least 10 numbers of offered 20 KVA UPS system for critical load like 24x7 operation of transmission, Data Centre, Earth Station etc in any five financial years during the period from FYs 2011-12 to 2023-24.
- 3.5.3 Copies of supply order and receipt certificate of 10 (ten) nos. 20 KVA or UPS system provided in any five financial years during the period from FYs 2011-12 to 2023-24 should essentially be submitted along with the bid document.
- 3.6 In addition to above said technical eligibility criteria, Vender/bidder shall also see and ensure to meet the commercial and Financial eligibility criteria pertaining to the a) company existence, b) Annual turnover/Net worth, c) Positive net worth/Profitability, d) Non-Blacklisting certificate, e) ISO certification (If required), f) GFR restrictions/Norms (if required), g) PMA and h) relaxation for Start-up as mentioned in the Appendix A, Appendix B & Appendix C of the bid document.
- 3.7 Bidder must have a valid Dealer Possession License (DPL) at the time of submission of bid. A copy of valid DPL should be submitted along with bid.
- 3.8 **For Consortium/Joint Venture (If applicable):** In case of Consortium/Joint Venture, Vender/bidder shall follow the instructions provided at Appendix-A of the bid document.

4. Turnkey Implementation and Commissioning:-

The complete project will consist of Supply, Installation, Testing and Commissioning (SITC) of Upgradation & Replacement of C Band Earth Station at DDK Guwahati, Shillong and Aizwal. The project will be carried out on turnkey basis.

4.1 Input and Base Band System

- 4.1.1 The bidder has to integrate, test and commission OFC Link to transport HD-SDI & SD-SDI signal from MSR to Earth Station. Bidder shall lay, integrate and test pair of armored optical fiber cable with matching connectors between Single channel Optical Transmitter unit and single channel Optical receiver unit. Bidder shall install, integrate and test Rack Frame Mounting (Chasis) including Analog Audio & HD/SD-SDI Video Multiplexer Unit (Embedder), Analog Audio & HD/SD-SDI Video De-multiplexer unit (De-Embedder) and HD-SDI & SD-SDI Distribution Amplifier (DA) with suitable breakout cables.
- 4.1.2 Bidder shall lay, integrate and test HD video cables with matching connectors to route all video sources through 32 port HD SDI patch panel (Input). The patch panels should be 75 ohm normal through type. Refer to DRG No. 1.
- 4.1.3 Bidder shall lay, integrate and test HD video cables with matching connectors from 32 port HD-SDI patch panel (Input) to 32 port termination panel (Input) of 32x32 HD-SDI/ASI Router and 32 port termination panel (Output) of 32x32 HD-SDI/ASI Router,

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to 32 port HD-SDI patch panel (Output). All the 32 port (Input & Output) of 32x32 HD SDI/ASI Router Output shall be connected to 32 port HD SDI patch panel (Input & Output as per DRG No. 1.

4.2 Compression and IF System:

- 4.2.1 Bidder shall lay, integrate and test HD video cables with matching connectors from 32 port HD SDI patch panel (Output) to inputs of all Encoders in 2x(1+1) configuration.
- 4.2.2 Bidder shall lay, integrate and test HD video cables with matching connectors between output of Encoders and DVB-S2 compliant Modulators in (1+1) configuration including IF redundancy switch as per DRG. No. 1.
- 4.2.3 The offered system shall meet the International standards for digital satellite broadcasting having DVB-S and DVB-S2 modulation (one at a time).
- 4.2.4 The offered system would also include the standard accessories supplied by the Manufacturer along with the modulator and IF redundancy switch.
- 4.2.5 Bidder shall lay, integrate and test RF Cables from Satellite Modulators to IF Redundancy switch and to IF Splitter as per DRG. No. 1.
- 4.2.6 Bidder shall lay, integrate and test Cat-6 cables or better for control interfaces through RS 232/ RS 422/ RS 485/ RJ45 etc so that all the Encoders, Modulators and IF redundancy switch should interfaced with a Control Computer through 24 port Network Switch as per DRG No. 1.
- 4.2.7 For Integration of equipment, Video Cable, Audio Cable and CAT-6 or better cable (Indoor type) for audio/Video/data/networking should be used. The colour of Audio/Video cables, IP control & data cable should be different and fitted with colour coded ferrule for ease of identification in equipment racks.

4.3 RF System (Up convertors, RF Redundancy Switch and HPA System):

- 4.3.1 Bidder shall lay, integrate and test RF cables with matching connectors between IF Splitter to 2x(1+1) C Band up convertors and up converter to RF Redundancy switch as per DRG. No. 1.
- 4.3.2 Bidder shall lay, integrate and test RF cables with matching connectors between RF Redundancy Switch and RF Combiner, RF Combiner to RF Splitter and RF Splitter to the input of High Power Amplifiers (HPAs) in (1+1) configuration. High Power Amplifiers (HPAs), dummy load and associated accessories shall be installed and test in 19" fully wired ventilated racks. The rack is to be provided with minimum two nos. single phase MDUs and one no. single phase automatic power transfer/static switch connected between two sources of power supply routed through physically isolated routes as per DRG.No.2.
- 4.3.3 Bidder shall lay, integrate and test rigid waveguide between outputs of High Power Amplifiers and waveguide switch. The output of waveguide switch shall be connected to Elliptical Waveguide through flexible waveguide. Automatic Waveguide Dehydrator shall also be fitted with Elliptical waveguide. Automatic Waveguide Dehydrator shall also be fitted with Elliptical waveguide.
- 4.3.4 The bidder shall integrate the offered RF System with the existing uplink antenna system and commission it. Bidder has to offer the solution accordingly.

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4.3.5 Bidder shall lay, integrate and test Cat-6 cables or better for control interfaces through RS 232/ RS 422/ RS 485/ RJ45 etc so that C Band up converters and HPAs should interface with a Control Computer through 24 port Network Switch as per DRG No. 2.

4.4 Confidence level Monitoring System:

4.4.1 Bidder shall install, integrate and test C-Band Uplink frequency to L band converter (TLT), 70 MHz to L Band Upconverter, C band D/L to L Band Down convertor, 17" HD Monitor, dual 9" HD Monitors rack mount, 8 channel Audio (Bar Graph) Monitor, Ampli-speaker and IRDs (IP ASI and L Band Input) for confidence monitoring points. Bidder shall lay, integrate and test RF cables, Video Cable, Audio Cable and CAT-6 or better cable with matching connectors at the following locations for the Earth Stations mentioned below (refer drawing no.1 & 2).

(i) **Monitoring of SDI Input Source:** Bidder shall lay, integrate and test required HD Video Cables with matching connectors for monitoring of SDI (Audio embedded) inputs through SDI/ASI router with 17" Video monitor and 8 channel Audio (Bar Graph) Monitor.

(ii) **Monitoring of ASI output of Encoders (In case of Hardware Encoders) :** Bidder shall lay, integrate and test required HD Video Cables with matching connectors for monitoring of ASI SDI/ASI routers using IRD (with ASI input), 17" TFT monitor with speaker, 8 channel Audio (Bar Graph) Monitor.

(iii) **IF Monitoring:** Bidder shall lay, integrate and test required RF cables and HD Video cables with matching connectors for monitoring of 70 MHz output of Modulators through 16port IF Patch panel, which is to be converted to L-Band using an Up-converter (70MHz to L-band), IRD (L band input), SDI/ASI router and 17" TFT monitor and 8 channels Audio (Bar Graph) Monitor.

(iv) **RF Uplink Monitoring:** Bidder shall lay, integrate and test required RF cables and Video cables with matching connectors for monitoring of output of Up-converters and HPA through 16 port RF Patch Panel, Test Loop Translator (TLT- C-band U/L to L-band converter), IRD (L-band input), SDI/ASI router and 17" TFT monitor and 8 channels Audio (Bar Graph) Monitor.

(v) **RF Downlink Monitoring:** Bidder shall lay, integrate and test required RF cables and Video cable with matching connectors for monitoring of downlink signal coming from LNA (both V & H) and down converters through RF Patch Panel and IRD (with L band input) via SDI/ASI router with 17" Video monitor, 8 channels Audio (Bar Graph) Monitor and dual 9" Monitors rack mount.

4.4.2 Bidder shall lay, integrate and test CAT-6 or better cable for control interfaces through RS 232/ RS 422/ RS 485/ RJ45 etc so that Uplink to L band converter (TLT), 70 to L Upconverter, C band D/L to L Down convertor, 17" HD Monitor, dual 9" HD Monitors rack mount, 8 channel Audio (Bar Graph) Monitor, Ampli-speaker and IRDs (IP ASI and L Band Input) should interfaced with a Control Computer through 24 port Network Switch as per DRG No 1.

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4.5 Power Supply System:

- 4.5.1 Bidder shall supply, install, test & commission (SITC) Power Distribution Panel (PDP) fitted with industrial MCCB, MCBs, Change over switch, Busbar with Voltage and Current metering and indication in power supply room which caters the load of all equipment as per DRG No. 3.
- 4.5.2 Bidder shall supply, install, test & commission (SITC) Isolation Transformer of 30 KVA (3 Phase delta to Star). Bidder shall supply and lay down 4 core armored copper power supply cables of suitable rating between (i) DD LT panel & 100A 4 pole MMCB, (ii) 100A 4 pole MMCB & Isolation Transformer system in Power Supply room as per DRG No.3.
- 4.5.3. Bidder shall supply, install, test & commission (SITC) AVR of 30 KVA (3 Phase + Neutral) and Power Distribution Panel (PDP). Bidder shall supply and lay down 4 core armored copper power supply cables of suitable rating between (i) Isolation Transformer & AVR (ii) AVR & PDP (iii) PDP & UPS System (iv) UPS output & PDP (v) PDP & Existing U/L Antenna Panel (vi) PDP & SDB 1 to 2. Bidder shall supply and lay down copper power supply cables of suitable rating between SDB 1 to 2 & all racks as per DRG No. 3.
- 4.5.4 Bidder shall supply, install, test & commission (SITC) 2x20 KVA UPS operating in (1+1) redundant, parallel load sharing mode with 15 minutes (minimum) battery back-up for each UPS with internal isolation transformer of min. capacity 20 KVA at the output of each UPS in the power supply room.
- 4.5.5 Bidder shall supply, install, test & commission (SITC) the Sub Distribution Boards (SDBs) fitted with industrial MCBs in Earth Station in which caters the load of all equipment as per DRG No. 3.
- 4.5.6 Bidder shall supply, install, test & commission (SITC) minimum two nos. MDUs in each rack having inbuilt or external, dual input, single phase automatic power transfer/static switch for providing redundant power supply to equipment as per DRG No. 3.
- 4.5.7 Bidder shall provide power supply in each rack and terminated on industrial type 3 Pin female connector to be mounted near each rack and shall be connected to MDUs for further feeding to equipment.
- 4.5.8 Bidder shall assess the electrical load of equipment installed in Power Supply Room, Earth Station, required length & rating of power supply cables. Bidder shall provide assorted length of copper power supply cables with minimum 50 percent (nominal) load margin for interconnecting/integrating equipment as mentioned in point no 4.5.2.
- 4.5.9 Bidder shall supply, install, test & commission (SITC) minimum 10(Ten) no. of earth pits. All earth pits shall be extended upto earth terminals mounted on the wall with insulated copper strip (75 Sq.mm minimum) in their respective equipment room i.e. Earth Station. All electrical equipment and racks shall be directly connected at two points (without loop formation) to Earth Terminals with insulated multi strand copper wire (25 sq mm minimum) with copper lugs at both ends as per DRG No. 4 &5.
- 4.5.10 Bidder shall affix permanently in a conspicuous position a danger notice in Hindi or English adequate number of Danger/Caution board on all the PDP/SDB etc. to effectively warn individuals of high-voltage electrical hazards and promote safety.
- 4.5.11 The offer shall include supply, installation, testing and commissioning (SITC) of the setup, complete in all respects. A suggestive block schematic is provided to give a general idea about the intended configuration. A complete schematic of actually

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proposed implementation including power supply system should be submitted by the bidder along with the quote.

4.6 System Requirements:

- 4.6.1 The bidder must ensure completeness of the offered system in all respects. The system should be completed and fully wired for all the indoor equipment fitted in 19" standard racks. The offered system must have enough flexibility in adapting the changing requirements from the technical and operational point of view. The bidder should submit detailed schematics and layouts for proposed solution based on the offered equipment along with the offer.
- 4.6.2 In order to ensure the completeness of the system, any additional equipment/accessories which bidder feels necessary to complete the configuration should also be quoted. However, in such case they should provide proper justification for the additional equipment required.
- 4.6.3 Bidder shall submit only one solution (Single BOM) for the offered system. Bid with multiple options against any requirement is liable to be rejected. BOM shall not contain any optional items as an alternative for any line entry item. However, bidder can offer additional accessory items as options for performance improvement of main line entry item of same make.
- 4.6.4 Each offer should be complete in all respect. Incomplete & non-compliant offers will be rejected summarily, without making any references to bidder.
- 4.6.5 In the process of technical evaluation, Doordarshan may ask for any clarification/ query as required through e-mail/FAX/Post, which shall be treated as a part of tender and invariably attended and replied by the bidder within the time stipulated therein.
- 4.6.6 Cross reference in respect of supporting documents, should be given with proper page number and volume no. etc. If required Doordarshan may also ask for any other supporting document to ascertain the claim of bidder and their OEM.
- 4.6.7 All software being offered, are to be licensed to Doordarshan on perpetual basis without specifying any time limit or without specifying any end of life of the software. Software upgrades within five years of installation i.e. warrantee period should be supplied free of cost.
- 4.6.8 The bidder may visit the site before the submission of the bid. The bidder may also ensure the soil composition, moisture content, and temperature etc. for earth resistance measurements. The bidder desiring to visit the site must submit the request one week in advance with the details of the persons. All visits will take place only during working days from 1500 to 1700 hours only.
- 4.6.9 Cost of any other work, consultancy and material required for completing the installation & commissioning of the Input, compression, IF, RF, monitoring and Power Supply system should be taken into account and clearly mentioned while submitting the bid.
- 4.6.10 The local office/authorized representative/dealer will be the nodal point for resolving issues related to installation, commissioning and after sales support. Details of the OEM office and its location are to be provided along with bid.
- 4.6.11 The offer should clearly specify the list of equipment hardware, interfaces, cables etc and associated software provided with the Remote Computer System for interfacing it with different components of the chain.

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- 4.6.25 All interconnecting material including cables and connectors shall be provided by the successful bidder to complete the project. The bidder will be required to use only high quality HD-SDI video and audio cables, Data cables, Power Supply Cables, connectors and other accessories from reputed manufacturers. Suitable length of Video cable with matching connectors and Audio cable with matching XLR connectors should be used for rack wiring and long distance applications.
- 4.6.26 The routing of wiring between racks to be done from the Top of the racks.
- 4.6.27 The bidder should specify the hardware limitation if any.
- 4.6.28 The system must offer an intuitive user interface as well as remote configuration of all modules, simplifying system deployment and reducing operational routines.
- 4.6.29 The layout plan of equipment of Input and Base band system, Compression system and Monitoring system, IF, RF System, Power Supply system, racks, electrical diagram, PDP, SDB layout and other drawings need to be submitted for approval of Directorate General, Doordarshan before execution of SITC work at site.
- 4.6.30 A suggestive block schematic is provided in annexure –VII of Appendix-D (DRG No. 1 to 5) to explain the full scope of the work and give a general idea about the intended configuration. A complete schematic of actually proposed implementation should be supplied along with the quote. Physical topography may be different than the suggestive block diagram but it should meet the project objectives.
- 4.6.31 The successful bidder will be required to print and display the Final laminated Technical Block diagram and detailed Line diagrams (in color) of adequate (A1 or bigger) size for all the modules of the final solution in the facility after the completion of the installation. One set shall be mounted on wall and other for record at Station. The soft editable copy of the Technical Block diagram and detailed Line diagrams (in color) shall also be provided.

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- 4.6.12 To avoid any delay due to inter-dependent activities like site readiness, providing power supply etc, the bidder should submit time frame for completing the activities up to the commissioning of the set-up on a PERT chart starting from date of issue of Purchase Order (P.O.)(i.e. DD/MM/YYYY)+ along with bid.
- 4.6.13 As an SITC contract, all supplied equipment are to be installed, tested and commissioned at site mentioned above, by the Bidder. The cost of any other interconnecting material and labour required for laying of cables, Earthing etc. should be included in the tender.
- 4.6.14 Each and every offered equipment and accessories including software should be from reputed manufacturer and the quoted model should be high class, high MTBF, field proven and in use by leading broadcasters/ organizations.
- 4.6.15 The bidder has to comply with BIS (Bureau of Indian Standard) certification on invoke to all the offered equipment.
- 4.6.16 The successful bidder will be solely responsible for commissioning and operationalisation of Input and Baseband System, Compression System, Monitoring System, IF& RF System and Power Supply System to the satisfaction of Doordarshan.
- 4.6.17 System/equipment (Equipment, Panels, Board, etc.) should be offered along with its frame/housing and other accessories which are necessary to meet the specifications/requirement and for the full exploitation of the equipment.
- 4.6.18 The transition period for shifting/ integration and commissioning with existing equipment is likely to take 5 working days.
- 4.6.19 The successful bidder must submit the firm's self-certified copies of import license at the time of commissioning in respect of RF Equipment for issuance of operating license from WPC.
- 4.6.20 For facilitating maintenance issues, bidder must also submit firm's self-certified copies of Bill of Entry/Custom Invoice of all imported items to DG: DD for release of PBG.
- 4.6.21 All invoices shall bear Serial Numbers of the equipment to meet the requirement of WPC.
- 4.6.22 The successful bidder will be responsible for providing after sales service support of all the offered equipment for Seven years from the date of commissioning including five (5) years warranty period. The bidder must submit undertaking for providing after sales support for additional Two (2) years after the end of warranty period along with bid.
- If bidder is not the OEM of the offered equipment, then after sales service support for the repairs/ maintenance for 5 years warranty period and for 2 years after the completion of guarantee/ warrantee period shall also be **extended** by the OEM **through the bidder**. A certificate, on the letterhead, in this regard duly signed by the OEM must be submitted with offer by the bidder.
- 4.6.23 If required, bidder may have to give a presentation to explain their technical offer within one week from the date of issue of letter, as part of technical evaluation.
- 4.6.24 Bidder may have to demonstrate (within 15 days) the features of equipment offered as and when asked as part of technical evaluation of Tender. However it will not bestow any right of acceptance of the bid.

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5. Technical Specification of Major Equipment

5.1 Digital Video Distribution Amplifier, Analog Audio & SD/HD-SDI Video Embedder, De-Embedder, and Optical Fiber Link from MSR to Earth Station.

Digital Video Distribution Amplifier, Analog Audio & SD/HD-SDI Video Embedder, De-embedder, and OpticalFiber Link are envisaged to be used for processing the input signal and then fed to HD/SD-SDI router through Patch Panel. The Audio Video processing equipments consists of following equipment:

- A. Digital Video Distribution Amplifier (DVDA)
- B. Analog Audio & SDI Video Multiplexer Unit (Embedder)
- C. Analog Audio & SDI Video De-multiplexer unit (De-embedder)
- D. 19" Rack Frame mounting with hot swappable redundant power supply unit to hold minimum 10 nos. of different cards
- E. Optical Fiber Link for SD&HD SDI with embedded audio signal

General Features for Embedder, De-embedder, Distribution Amplifier and Rack Frame:

- (a) In order to keep the symmetry and to maintain inter-changeability, all the items must be from same manufacturer. Items from different manufacturers will not be acceptable.
- (b) The offered Embedder, De-embedder and Digital Video Distribution Amplifier shall be modular in construction and card type. It should be offered along with the 19" Rack Frame/housing with hot swappable redundant power supply unit.

5.1.1 Digital Video Distribution Amplifier (DVDA)

A. General

- 1) It should provide automatic equalized output.
- 2) The offered product should auto detect the defined standard of video input signal.
- 3) Monitoring software should allow management of all the signal paths.
- 4) It should ensure no cross channel loading effects.
- 5) Visual indicators should also give its status about power supply, input etc.

B. Technical Specifications

S. No.	Parameter	Performance
1	Input	1 x HD/SD- SDI, BNC
2	Output	7 or more x HD/SD- SDI, BNC
3	Processing	
	i) Input Equalisation	Minimum 100 m @1.5 Gb/s & minimum 300m @270 Mb/s
	ii) Return Loss	>15 dB up to 1.5 Gb/s

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5.1.2 Analog Audio & SDI Video Multiplexer Unit (Embedder)

A. General

- 1) The offered product should auto detect the defined standard of video input signal.
- 2) It should be able to provide programmable audio delay for lip sync issues.
- 3) The offered Embedder should have excellent performance features like "high Input impedance", "flat frequency response", "very low total harmonic distortion" and "extremely high signal to noise ratio (S/N)".
- 4) It should be able to remove all available audio before embedding or allow overwriting with channel shuffling.
- 5) It should be able to provide high quality cable equalization to the input signal up to the length of minimum 100 m @1.5 Gb/s & 300m @270 Mb/s.
- 6) Monitoring software should allow configuration and status of the card.
- 7) Visual indicators should also give its status about power supply, input etc.

B. Technical Specifications

S. No.	Parameter	Performance
(a)	Input:	
i.	Analog Audio Inputs	4 or more analog balanced audio with high input impedance >10 K Ω and maximum inputs level of +24 dBu
ii.	Serial digital video Input	1 no. HD/SD-SDI
(b)	Output:	
i.	No. of Outputs	1 or more HD/SD-SDI signal with Embedded audio
(c)	Processing:	
i.	Audio processing	24 bits or more, 48 kHz sampling
ii.	Audio Frequency Response	± 0.2 dB (20 Hz to 20KHz) or better
iii.	Distortion (Audio)	-90 db(20Hz to 5kHz) or better
iv.	Channel phase difference	$\pm 1^\circ$ or better
v.	Audio Delay	Equal to Video Delay
vi.	Serial input & output return loss	> 15 dB up to 1.5 GHz

5.1.3 Analog Audio and SDI Video De-multiplexer unit (De-Embedder)

A. General

- 1) The offered product should auto detect the defined standard of video input signal.
- 2) It should be able to provide audio delay for lip sync issues.
- 3) It should give balanced audio output with low impedance.
- 4) It should be able provide high quality cable equalization to the input signal up to the length of Minimum 100 m @1.5 Gb/s & 300m @270 Mb/s.
- 5) Monitoring software should allow configuration and status of the card.

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6) Visual indicators should also give its status about power supply, input etc.

B. Technical Specifications

S. No.	Parameter	Performance
(a)	Input	
i.	Input	1 or more HD/SD-SDI SDI signal
(b)	Output:	
i.	SDI Video Outputs	1 or more
ii.	Analog Audio Outputs	4 or more balanced output
(c)	Processing:	
i.	Audio processing	24 bits or more, 48 kHz sampling
ii.	Audio Frequency Response	<±0.2 dB (20 Hz to 20KHz) or better
iii.	S/N Ratio	>90 dB
iv.	Cross talk	<-80 dB (20 Hz to 20KHz) or better
v.	Audio Signal Level	+22dBm on 600 Ω or better
vi.	Serial input & output return loss	> 15 dB up to 1.5 GHz

5.1.4 Rack Frame

A. General

- 1) The offered product should have redundant hot swappable power supply.
- 2) It should be capable of monitoring the performance of individual module/card by using SNMP or any other industry accepted interface.
- 3) It should be possible to adjust parameters of individual module/card mounted in the rack frame from a remote PC or any other similar device.
- 4) Standard 19 inches Rack Mounting frame/ housing to hold minimum 10 different cards with hot swappable redundant power supply unit

B. Technical Specifications

S. No.	Parameter	Performance
1.	Control	RS-422 or RJ-45
2.	Operating temperature	5° to 40° Celsius
3.	Mount	Standard 19 inches Rack Mounting frame/ housing
4.	Number of slots	10 or more slots to hold different peripheral cards
5.	Height of frame	3 RU maximum
6.	Power Supply	230±5% Volts, 50 Hz

5.1.5 General Features for Optical Fiber Link:

- (a) The offered solution should be scalable and modular in design and architecture.
- (b) The system should have built-in 1:1 dual redundant & hot-swappable power supply units.

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- (c) The SD&HD SDI optical transmitter & receiver modules should have facility to pass 4 stereo/4 AES embedded audio, Dolby E audio etc without any limitation or upgradation by way of hardware or software licenses.
- (d) Trans & Receive unit shall be configurable locally through front-panel or remotely via Web-Interface (Web-GUI, SNMP etc).

(i) **Optical Fiber Transmitter (SD & HD SDI with embedded Audio to optical fiber conversion):**

S. No.	Parameter	Specification
Input Parameter		
1.	Input type	SD & HD-SDI with 4 stereo/4 AES embedded audio
2.	Standard	SMPTE 292 M & SMPTE 259-M
3.	Input impedance	75 Ohm
4.	Input Connector type	BNC Type
5.	No. of Input	1 No.
6.	Cable Equalization	75 m @1.485 Gbps & 300m @270 Mbps
7.	Return loss	> -14dB @1.485 Gbps
Output parameters		
8.	Output type	One Optical SMPTE297-2006 or latest One SD & HD- SDI SMPTE-259M & 292M
9.	SDI output connectors	BNC
10.	No. of SDI connector	Min. 1
11.	Optical output connectors	SC/PC or LC
12.	No. of Optical connector	Min 1
13.	Operating wavelength	1310 nm OR 1550 nm
14.	Optical power	-8 dBm (min)
15.	Mode	Single mode or Multimode

(ii) **Optical Fiber Receiver (Optical fiber to SD & HD SDI with embedded audio conversion) :**

S. No.	Parameter	Specification
Input parameter		
1.	Input type	One Optical SMPTE297-2006 or latest
2.	Optical input connectors	SC/PC or LC
3.	No. of Optical connector	Min 1
4.	Operating wavelength	1270 nm to 1610nm
5.	Mode	Single or Multi mode
6.	Optical input level	-18 dBm or better
Output Parameters		
7.	Output Type	SD & HD-SDI with 4 stereo/4 AES embedded audio
8.	Standard	SMPTE 292 M & SMPTE 259-M

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9.	Output impedance	75 Ohm
10.	Connector Type	BNC
11.	No. of Output	2 No
12.	Return loss	> -14dB @1.485 Gbps

(iii) **SD&HD-SDI to fiber optical transmitter & receiver link (Chassis):**

S. No.	Parameter	Specification
1.	Size/Dimensions (per chassis)	Max. 3RU / 19" rack-mount
2.	Capacity	Min. 8 slots
3.	Power-supply	1:1 dual redundant (hot-swappable)
4.	Control	Front panel or remotely via Ethernet Interface (Web-GUI, SNMP etc.)

5.2 Equipment of Compression System:

Compression system consists of the following:

- A. 32x32 HD/SD-SDI/ASI router
- B. Encoders in 2x(1+1) redundant configuration

The base band SDI signals received directly from MSR/PCR to the patch panel through Digital Distribution Amplifiers/Embedder then from patch panel to input of HD/SD-SDI/ASI router through HD-SDI 32 port termination panel, from output of HD/SD-SDI/ASI router to patch panel through HD-SDI 32 port termination panel and finally from patch panel to input of the offered encoders in 2x(1+1) configuration.

5.2.1 HD/SD-SDI/ASI Routing Switcher

A. General

32x32 HD/SD-SDI/ASI Routing switcher should be very reliable and able to be used for selection of any one of the 32 HD/SD-SDI/ASI input signals to 32 different destinations. The equipment offered should be for 24x7 hours use in Broadcast applications. The router has to be quoted with XY and single bus control panels.

B. Essential features

- i. The routing switcher electronics should be capable of being mounted in a standard 19" rack frame.
- ii. The routing switcher shall handle HD/SD-SDI/ASI signal for routing from input to output destinations. The switching should take place during the vertical interval period.
- iii. The routing switcher shall have facility to pass SD-SDI & SD-SDI with embedded audio, HD-SDI & HD-SDI with embedded audio (including Dolby Digital (AC-3) 5.1, Dolby digital plus 5.1 & Dolby E audio) and ASI signal for routing from input to output destinations of their respective port.
- iv. The routing switcher should have storage facilities for control information, so that in case of power supply failure, the status of the switcher output should remain unchanged after the power supply is restored.
- v. The routing switcher should have auto-switchable dual redundant power supplies.

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- vi. The routing switcher quoted against this specification should be complete in all respect and should have the desired features.
- vii. Any of the 32 HD-SDI and SD-SDI input shall be capable of being switched to any or all of 32 outputs port.
- viii. All the requisite drivers, software and licenses required for meeting the DD specifications must necessarily be pre-loaded and configured by the OEM before supplying equipment to DD.

C. Technical Specifications

i)	Matrix size	32 HD/SD-SDI/ ASI inputs. 32 destinations (output buses) output HD/SD-SDI/ASI
ii)	Input	SDI (75 ohms, BNC Female either directly mounted on chassis or with suitable adopter) SMPTE 259-M, SMPTE 292M, MPEG-2 TS over DVB ASI
iii)	Equalization for SD-SDI signal	Automatic: 150 Meters at 270 Mbps,
iv)	Equalization for HD-SDI signal	Automatic: 80 Meter at 1.485 Gbps
v)	Output	One or more HD-SDI with embedded audio (including Dolby AC-3 5.1 audio & Dolby E) and SD-SDI with embedded audio for each of 32 HD & SD SDI destinations; (75 ohms, BNC Female either directly mounted on chassis or with suitable adopter)
vi)	Return Loss	≥10 dB on data rate upto 1485 Mb/s throughout the switching chain.

5.2.2 SDTV Encoder in MPEG-2 & H.264/MPEG-4 AVC compression and HDTV Encoder in H.264/MPEG-4 AVC compression configuration with 4:2:0 & 4:2:2 format for both SDTV & HDTV.

A. Essential Features:

- (i) The offered encoder should be a standalone unit having capability of MPEG-2 and H.264/MPEG-4 AVC compression with easy to use either front panel control through front panel keys and front panel display or through web browser.
- (ii) There should be dual redundant power supply units per Chassis. These encoder chassis shall be configurable to operate in 2X(1+1) redundant mode without any limitation or requiring upgradation/downgrading by way of Hardware and Software.
- (iii) Doordarshan is planning to implement DVB-Subtitling, Audio description, EPG, closed captioning etc services in future. Hence, the equipment offered by the bidder shall be capable of carrying these services without any limitation or requiring upgradation by way of hardware, software and their license.
- (iv) It should also have the preprocessing hardware and software facility for the efficient encoding process viz; adaptive noise reduction.
- (v) The encoder should have facility to support BISS -1 and BISS-E encryption mode. The hardware and software for encryption should be provided in all the encoders.

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- (vi) The encoder should have facility to support internal multiplexing of external ASI input signal on BNC. All the hardware and software including provision for accepting ASI input for multiplexing should be provided in all the encoders.
- (vii) It should have multi-pass encoding hardware and software.
- (viii) It should have interface for Remote Control.
- (ix) It should have facility for PSI generation.
- (x) On loss of Video input, it should have option to auto switch to either last freeze frame or pre-recorded video frame/test Pattern (format JPEG/PNG or GIF). There should however be a facility to configure the encoder for NO output on the loss of video input.
- (xi) The encoder shall be MPEG-2 and MPEG-4 AVC standard compliant without any limitation or up-gradation by way of hardware or software licenses.
- (xii) It should have either front panel display or Keys for configuration of various parameters of encoder or through web browser.
- (xiii) There shall have facility for 4 stereo/4 AES audio with MPEG-1 Layer-II & HE AAC v1 & v2, 5.1 Audio encoding in each encoder. There should also be provision for Dolby Digital (AC-3) 5.1 decoding in each encoder and encoding audio in Dolby Digital (AC-3) 5.1 & Dolby Digital Plus 5.1 audio along with down-mix of one MPEG-1 Layer-II at any given point of time.
- (xiv) The Encoder shall have audio loudness control for maintaining uniform audio level in spite of changes from different input feeds and programs meeting the ITU-BS-1770-2/ITU-BS-1770-3 standard for loudness control.
- (xv) The Encoder shall have facility for ancillary data like closed captioning with EIA 608/708, DVB-subtitling, audio descriptor and digital program insertion compliant with SCTE-35 insertion via SCTE-104 triggers without any limitation or up-gradation by way of hardware or software licenses & keys.
- (xvi) There should have facility to insert ancillary data through IP data port.
- (xvii) The output of chassis should be MPEG-2 TS over IP on RJ-45 connector and MPEG-2 TS on BNC connector either directly mounted on Chassis or with suitable adopter.
- (xviii) The Encoder should have facility to insert Dynamic Logo for each channel.
- (xix) In case of failure of main/redundant encoder chain, audio/visual alarm should be generated to indicate the failure of main/ redundant encoder chain. If the bidder offer Hardware encoder, it should be capable of generating alarm and control signal on GPI port for compression chain redundancy and IF redundancy which shall be controlled by the IF redundancy switch.
- (xx) The encoder should support 10 bit encoding in 4:2:2 mode for better video quality.

B. Video Inputs

- (i) The Encoder shall be capable of accepting HD/SD-SDI and HD/SD-SDI with embedded audio Inputs with a facility to select between different inputs either through front panel keys or through browser on remote computer.

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C. Serial Digital Input Specifications

S. No.	Parameters	Specification
1	Video Inputs	SD-SDI & HD-SDI with embedded audio
2	Serial Interface	i) SMPTE 292M/299M, 1485 Mb/s (10 bit) with embedded audio. ii) SMPTE 259M/272M, 270 Mb/s (10 bit) with embedded audio.
3	Format	ITU(R)-BT.601 & ITU-R BT.709
4	Connector	BNC/HD BNC/Micro BNC/DIN/Mini DIN Female, 75 ohm
5	Input Level	800 mV p-p nominal +/- 10%
6	Return Loss	≥15 dB from 5 MHz - 1.5 GHz/ or ≥10 dB on data rate upto 1485 Mbps

D. TS Inputs Specifications for Re-Muxing in Output:

S. No.	Parameter	Specification
A	IP Input	
1	Type	Gigabit Ethernet
2	MPEG Format	MPEG-2 TS over IP (SPTS & MPTS)
3	No. of Bi-directional physical ports dedicated for IP Data Input	Minimum 1 no.
4	IP Data Port Speed	1000 Mbps or better per port
5	Ethernet IP Connector type	RJ45
B	ASI Input	
1	Format	MPEG-2 TS over ASI on BNC
2	Quantity for ASI Input	Minimum 1 no. on BNC/HD BNC/Micro BNC/DIN/Mini DIN Female, 75 ohm
3	Speed	Minimum 100 Mbps

E. Video Compression Parameters

S. No.	Parameters	Specification
1	Video Resolutions (PAL)	For SDTV: 720 x 576, 544 x 576, 480 x 576 For HDTV: 1920 x 1080, 1440 X 1080

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2	Profiles and Levels	SD MPEG-2 MP@ML, 4:2:0, 8 bit i) SD MPEG-2 Hi422P@ML, 4:2:2, 8 bit ii) SD H.264 MP@L3.0/Hip@L3.0 4:2:0, 8 bit iii) SD H.264 Hi422P@L3.0/Hi422PL3.1, 4:2:2, 8 bit iv) SD H.264 Hi4:2:2P@L3.1, 4:2:2, 10 bit v) HD H.264 HIP@L4.0, 4:2:0, 8 bit vi) HD H.264 HI422P@L4.0 / Hi422P@L4.1 4:2:2, 10 bit
3	Video Bit-rate	1.5 to 20 Mbps for SD MPEG 2 4:2:2 profile depending upon Resolution 1.5 to 15 Mbps for SD MPEG 2 4:2:0 profile depending upon Resolution 1.0 to 12.5 Mbps for SD MPEG 4 4:2:0 profile depending upon Resolution 1.0 to 25 Mbps for SD MPEG 4 4:2:2, profile depending upon Resolution 3.0 to 20 Mbps for HD MPEG 4 4:2:0, profile depending upon Resolution 3.0 to 80 Mbps for HD MPEG 4 4:2:2, profile depending upon Resolution
4	Temporal Processing	Dynamic GOP structure support such as IP,IBP,IBBP,IBBBP etc.
5	Coding of Interlaced Video	Adaptive field & frame Processing support
6	Spatial Redundancy	Discrete Cosine Transform (DCT) Reduction
7	Chrominance Format	4:2:2 and 4:2:0 for SDTV and HDTV
8	Aspect Ratio	4:3 and 16:9

F. Embedded Serial Digital Audio Input specifications

S. No.	Parameters	Specification
1	Serial Interface	SMPTE 272M, SMPTE 299 M, 1485 Mbps, 270 Mbps (20 bit)
2	Format	AES/EBU, 8 channels
3	Connector	BNC/HD BNC/Micro BNC/DIN/Mini DIN Female, 75 ohm

G. Audio Compression Technique

S. No.	Parameters	Specification
1	Audio Encoding Method	i) MPEG-1 layer II ii) HE AAC(MPEG 4)v1 & v2 5.1 audio iii) Dolby Digital 5.1 AC-3 audio iv) Dolby Digital Plus 5.1 E-AC-3 audio
2	Audio decoding Method	Dolby Digital 5.1 AC-3 audio Dolby Digital Plus 5.1 audio Dolby E

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3	Audio through	Pass	Dolby Digital 5.1 AC-3 audio Dolby AC-3 digital plus 5.1 AC-3 audio Dolby E Linear PCM
4	Data rate		i) 64-192 kbps (MPEG-1, layer II) ii) 32-72 kbps (MPEG-4, HE AAC v1 audio encoding) iii) 16-48 kbps (MPEG-4, HE AAC v2 audio encoding) iv) 224-640kbit/s (Dolby Digital 5.1 audio encoding) v) 192-640kbit/s (Dolby Digital Plus 5.1 audio encoding)

H. Encoder Output

S. No.	Parameter	Specification
1	Format	MPEG-2 TS over IP
1(a)	No. of Bi-directional physical ports dedicated for IP output	Minimum 1 no. per chassis
1(b)	IP Data Port Speed	1000 Mbps or better per port
1(c)	Ethernet Connector Type	RJ 45
2	Format	MPEG-2 TS/DVB-ASI (with MPEG-2 TS over IP to DVB-ASI adapter if required)
2(a)	Output	2 no per chassis (min)
2(b)	Speed	Minimum 100 Mbps
2(c)	Connector Type	BNC/HD BNC/Micro BNC/DIN/Mini DIN Female, 75 ohm

I. Control (for remote access and monitoring)

S. No.	Parameter	Specification
1	Control port for remote access and monitoring	Min. 1 no. 10/100/1000 Base-T Ethernet port (RJ 45)

J. Hardware of Server in case of software compression solution

A) General Feature of Hardware:

- i. CPU/Chipset of server should have facility to enable an environment where applications can run within their own space, protected from all other software on the system.
- ii. CPU/Chipset of server should have security feature that can reduce exposure to viruses and malicious-code attacks and prevent harmful software from executing and propagating on the server or network.
- iii. CPU/Chipset of server should have facility of Secure Key consisting of a digital random number generator that creates truly random numbers to strengthen encryption algorithms.
- iv. CPU/Chipset of server should have Thermal Monitoring facility to protect the processor package and the system from thermal failure.

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- v. The offered processor of server should be scalable, high quality, robust with efficient performance.
- vi. Each server of software compression solution should be designed with 85 percent (Max.) CPU loading.
- vii. CPU of server shall be similar to Intel Xeon Gold series/ Intel Xeon W series/ AMD EPYC 3rd Generation Series or better and the launch date of CPU of offered server should not be prior to year 2021.

B) Technical Feature of Hardware:

S. No.	Parameter	Specification
A	Performance of Central Processing Unit	
1	No. of Core	16 (Min.) per CPU
2	No. of Thread	32 (Min.) per CPU
3	Processor Base Frequency	2.60 GHz or better
4	No. of CPU	One or more
B	Memory Specification	
5	RAM	DDR4, 64 GB or more
6	Storage Memory	SSD, 240 GB (Min.) in Raid 1 Configuration
C	Operating System	
7	Operating system	Linux
D	Ethernet Network	
8	No. of Ports (Duplex) in server	<ul style="list-style-type: none"> i) One no. of 1 Gigabit port for Input or more ii) One no. of 1 Gigabit port for Output or more iii) One no. of 1 Gigabit port for Management & Control iv) One no. of 1 Gigabit port for Ancillary services
E	PCI slot	
9	PCI slot	2 nos. or more
F	Operating Environment	
10	Operating Temperature	+10 to +35 °C
11	Humidity	10% to 90% non-condensing

5.3 IF System

The IF System consists of the following equipment:

- a) Satellite Modulator in 2x(1+1) redundant configuration
- b) IF Redundancy switch.
- c) 1:4 IF Splitter.

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5.3.1 Satellite Modulator

A. Essential Features:

- i) The offered modulator should be compact, reliable and have state of the art technology.
- ii) It should provide IF output (70 ± 18 MHz) as per DVB-S and DVB-S2 standards' modulation schemes based on the user requirement.
- iii) It should have facility to perform pre-equalization/pre-correction to signal before feeding upconverter so that downlink signal is kept within 36 MHz BW of the transponder. This should not affect the operation of the existing IRDs (MPEG-2, MPEG-4, HEVC and DVB-S & DVB-S2 compliant).
- iv) The offered modulators should have front panel display. It should be possible to configure the modulators through front panel keys and through browser on remote computer.
- v) The offered modulators should be compliant to the ETSI 103 129 DVB Carrier ID (DVB-CID) requirement.
- vi) Modulators will be used in 1+1 redundant mode.
- vii) The offered Modulators should have the facility to generate alarm on failure of ASI input stream and IF Redundancy Switch shall be capable to switch the services on redundant chain.
- viii) In case of failure of main/ redundant modulator, audio/visual alarm should be generated to indicate the failure of main/ redundant modulator.
- ix) The offered Modulators should have facility to take ASI input through BNC port and MPEG2 TS over IP input through IP data port.
- x) All the requisite drivers, software and licenses required for meeting the DD specifications must necessarily be pre-loaded and configured by the OEM before supplying equipment to DD.

B. Technical Specifications:

S. No.	Parameter	Specifications
I. ASI Inputs		
1	Compliance	DVB Document A010 rev. 1, May 1997: Section 4.4
2	Byte stuffing modes	Byte and single packet burst mode.
3	Connector	BNC
II. IP Input Data Port {External IP to ASI converter is not acceptable.}		
1	Input data format	MPEG-2 TS over IP
2	Ethernet interface	1000 base T
3	Ethernet Connector	1xRJ45
III. Forward Error Correction and Modulation Scheme as per DVB-S standard		
1	Multiplex Adaptation and Energy Dispersal	As per ETSI EN 300 421 (DVB-S)

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2	Outer Coding	Reed-Solomon (204,188,T=8)
3	Interleaving Depth	12
4	Inner coding	QPSK : Convolution R=1/2, 2/3, 3/4, 5/6 or 7/8
5	Spectrum Roll off factor	20%, 25 % and 35% selectable
6	Modulation	QPSK
7	Transmission rates	variable, 1.0 to 45.0 M symbol/s (min.)

IV. Forward Error Correction and Modulation Scheme as per DVB-S2 standard

1	Multiplex Adaptation and Energy Dispersal	As per EN 302 307 (DVB-S2)
2	Modulation	QPSK, 8PSK
3	Modulation mode	Should be capable of emitting signals on the following mode 1. Backward compatible mode (DVB-S/ DVB-S2 one at a time) 2. Constant Coding and Modulation mode (CCM)
4	Outer Coding	BCH
5	Inner coding	LDPC R= 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (for DVB-S2, QPSK), R= 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 (for DVB-S2, 8PSK)
6	Spectrum Roll off factor	5%, 10%, 15%, 20%, 25% and 35% selectable
7	Transmission rates	Variable, 1.0 to 45 M symbol/sec (min.)

V. IF output Interface Specifications

1	Output Frequency Range	70 +/- 18 MHz
2	Output Impedance	75 ohms unbalanced
3	Connector	BNC, female
4	Output Return Loss	15 dB (min.)
5	Output Level Range	-20 dBm to 0 dBm
6	Level Step Size	0.2 dB max.
7	Spurious Outputs	≤ -55 dBc/4 kHz at 0 dBm output power level in Band. or ≤ -60 dBm outside Band
8	Synthesizer Phase Noise	Should meet the requirements of IESS-308
9	CW mode	Selectable
10	Noise floor (No/ C)	< -120 dBc/Hz

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VI. Internal 10 MHz clock & Synchronization		
1	Frequency stability with respect to temperature	<+2.5ppm over 0°C to 50°C

5.3.2 IF Redundancy switch

IF redundancy switch would be used for the compression chain redundancy in 1+1 configuration for Modulators.

A) Essential Features:

- (i) The offered IF redundancy switch must be from the OEM of offered satellite modulator or endorsed/authorised by the OEM of offered satellite modulator to ensure compatibility of the offered IF redundancy switch with the offered modulator system.
- (ii) The switch should be able to accept alarm signal from main and redundant Chain equipment i.e. Encoders (if hardware encoders offered) and Modulators for redundancy.
- (iii) In case of failure of main / redundant chain, audio or visual alarm should be generated to indicate the failure of main/ redundant chain.
- (iv) The offered IF redundancy switch should have dual redundant power supplies.
- (v) Facility for automatic, Manual and remote (through web interface) switching of the modulators should be available through the IF Switch.
- (vi) The switch should have high reliability, robustness and should be of professional type.
- (vii) All the requisite drivers, software and licenses required for meeting the DD specifications must necessarily be pre-loaded and configured by the OEM before supplying equipment to DD.

B) Technical Specifications

S.No.	Parameter	Specifications
i)	Operating frequency range	50 to 90 MHz
ii)	Insertion loss	≤ 3 dB
iii)	Isolation	
	a) Input to input	45dB min
	b) input to output	50dB min
iv)	Input return loss	13 dB min
v)	Output return loss	13 dB min
vi)	IF connector	BNC/SMA type
vii)	Impedance	75 Ohms
viii)	Remote control	RS232 or RS422/485 or RJ 45

5.3.3 1:4 IF Splitter

S. No.	Description	Specifications
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(i)	Impedance	75 Ohm
(ii)	Connector	BNC/ SMA type
(iii)	Frequency	50MHz to 90MHz
(iv)	VSWR	1.3:1 or better
(v)	Isolation	28 dB or better
(vi)	Insertion loss	1 dB or better

5.4 RF System

The RF System consists of the following equipment.

- C-Band Up-converter (U/C) in 2x (1+1) redundant configuration.
- RF Redundancy Switch for U/C Redundancy (external or internal).
- 2:1 RF Combiner
- 1: 2 RF Splitter
- HPA (C-Band, 400 W) in (1+1) redundant configuration with RF waveguide switch and Dummy load.
- Semi Rigid Elliptical Waveguide
- Automatic waveguide Dehydrator

Output of IF Redundancy Switch will be connected to the input of Upconverters in 2x (1+1) redundancy configuration through IF Splitter. Output of RF Redundancy Switch will be fed to the HPAs using 2:1 RF Combiner and RF Splitter.

5.4.1 C-Band Up-converter:

A. Essential Features:

- The offered RF Redundancy Switch (in case of external RF Redundancy Switch) must be from the OEM of the offered upconverter or endorsed/authorised by the OEM of offered upconverter to ensure compatibility of the offered RF redundancy switch with the offered upconverter.
- In case of failure of main Up-converter, the RF Redundancy Switch should be able to provide RF signal output from redundant Up-converter.
- In case of failure of main/redundant Up-converter, alarm should be generated to indicate the failure of main/ redundant Up-converter.
- If the offered C band Up-convertors are having built in redundancy controller then the built in redundancy controller should meet the technical specification mentioned at clause no. 5.4.2.

B. Technical Specifications :

Sl. No.	Parameters	Specifications
(i)	Input Frequency	70 MHz \pm 18 MHz
(ii)	Input Connector	BNC(F)
(iii)	Input Power	-20 dBm to 0 dBm
(iv)	Input return loss	18 dB minimum
(v)	Input Impedance	75 Ohms
(vi)	Frequency Steps Size	Synthesized 125 KHz
(vii)	Frequency Stability	$\pm 1 \times 10^{-8}$ over 0 to 50°C

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(viii)	Output Frequency range	5.85 GHz to 6.425 GHz
(ix)	Output Bandwidth	±18 MHz
(x)	Output Connector	N Type(F)/ SMA(F)
(xi)	Output Impedance	50 Ohms
(xii)	Output return loss	18 dB minimum
(xiii)	Output Power	+10 dBm (min.) at P1 dB
(xiv)	Gain	30 dB (min.)
(xv)	Third order intermodulation at 0 dBm	-45 dBc or better
(xvi)	Amplitude response/ Gain Flatness	± 1.0 dB per 36 MHz (Max)
(xvii)	Gain Adjustment step size	0.2 dB (Max)
(xviii)	Phase Noise	IESS308/309 compliant or better
(xix)	Spurious	-60 dBc at 0 dBm output carrier related or better -65 dBm Non carrier related or better
(xx)	Remote Control	RS232 or RS422/485 or RJ 45 or any other port. This should be connectable to LAN using required format converters.

5.4.2 RF Redundancy Switch:

A. Essential Features:

- (i) Built-in RF Redundancy controller or external RF Redundancy switch for Up-converters in 1+1 redundant configuration.
- (ii) The offered RF Redundancy Switch (in case of external RF Redundancy Switch) must be from the OEM of the offered upconverter or endorsed by the OEM of offered upconverter to ensure compatibility of the offered RF redundancy switch with the offered upconverter.
- (iii) The switch should be able to accept alarm signal from both main and redundant Up-converter.
- (iv) In case of failure of main Up-converter, the RF Redundancy switch (In case of external RF Redundancy Switch) should be able to provide RF signal output from redundant Up-converter.
- (v) Facility for Automatic, Manual and Remote switching should be available.
- (vi) In case of failure of main / redundant Up-converter, alarm should be generated to indicate the failure of main/ redundant Up-converter.
- (vii) The switch should have high reliability and should be of professional type.

B. Technical Specifications:

Sr. No.	Parameters	Specifications
(i)	Operating Frequency Range	5.85 GHz to 6.425 GHz
(ii)	Insertion loss	≤ 0.5 dB
(iii)	Isolation	60 dB or better

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(iv)	Input return loss	13 dB min
(v)	Output return loss	13 dB min
(vi)	RF Input/Output Connector	SMA/N-Type
(vii)	Impedance	50 Ohm
(viii)	Remote control	RS232 or RS422/485 or RJ 45 or any other port. This should be connectable to LAN using required format converters.

5.4.3 1:2 RF Splitter/(2:1) Combiner:-

S. No.	Description	Specifications
(i)	Impedance	50 Ohm
(ii)	Connector	SMA
(iii)	Frequency	5.850 GHz to 6.425 GHz
(iv)	VSWR	1.3:1 or better
(v)	Isolation	15 dB or better
(vi)	Insertion loss	1 dB or better

5.4.4 High Power Amplifier {Travelling Wave Tube (TWT) based C-Band Linear Power Amplifier}

A. Essential Features:

- (i) The High Power Amplifier (TWTA HPA) is to be used for the final power amplification of the digital RF signal in C-band (from 5.850 GHz to 6.425 GHz) that would be fed to the antenna system.
- (ii) These HPAs are required to be configured in (1:1) redundant system. It should be indoor type and 19" rack mountable.
- (iii) The amplification has to be carried out in two stages i.e. Solid State Intermediate Pre-Amplifier (SSIPPA) and Traveling Wave Tube Amplifier (TWTA).
- (iv) It should have integrated (internal) linea rizer.
- (v) It should have control and monitoring hardware interface ports along with software, which can monitor as well as operate the HPA system from a remote computer.
- (vi) It should have front panel display to monitor forward RF power, Reflected RF Power or VSWR, Helix voltage & current, heater voltage, TWT Temperature.
- (vii) The offered HPAs should have the facility to protect the HPA in case abnormal rise of temperature, high reflected power or VSWR, over voltage, over current etc, available in the amplifier and it's functioning.
- (viii) During the failure of the Main HPA, it should generate audible alarm and the Output is to be switched automatically to the Backup HPA. The system shall work in Manual Mode also.

B. Technical Specifications:

S. No	Parameters	Specifications
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1.	Type of amplifier	TWTA (Indoor type, rack mountable) with integrated (internal) linearizer
2.	Frequency range	5.850 GHz to 6.425 GHz
3.	Bandwidth	Minimum 575.00 MHz
4.	Output power at TWT (Peak Power)	400 W min (56.02 dBm)
5.	Output power at Amplifier Flange	350 W min. (55.44 dBm)
6.	Gain (a) At rated power (b) At Small Signal	75 dB min. at rated power output; 78 dB min. at small signal
7.	RF level adjust range	0- 20 dB (Min)
8.	Gain variation	1.0 dB (max.) for 40 MHz (Any narrow band) 3.0 dB for 575 MHz bandwidth
9.	Gain Stability Over temp, constant drive	± 0.25 dB/ 24 hrs. (Max.) ± 1.0 dB max. over operating temperature range
10.	Gain Slope	± 0.02 dB/MHz (Max.)
11.	Input VSWR	1.3: 1 max
12.	Output VSWR	1.3: 1 max
13.	Load VSWR	1.7: 1 max operational; any value for operation without damage.
14.	Residual AM noise (Max.)	-50 dBc to 10 KHz -20(1.5+logf) dBc to 500 kHz -85 dBc above 500 kHz.
15.	Phase Noise (Max.)	10 dB below IESS 308/309 compliant or better AC fundamental related – 50 dBc Sum of all spurs-47 dBc
16.	AM/PM conversion at 6 dB below rated output power	2.5 Degree/dB Max.
17.	Harmonic Output	-60 dBc Max
18.	Spurious/Noise Power at rated output power	<-130 dBW / 4 KHz (Max.) for Receive band <-65 dBW / 4 KHz (Max.) for Transmit band
19.	Intermodulation	-24 dBc or better with two equal carriers at 4 dB Output Back Off (OBO) (with linearizer) -18 dBc or better with two equal carrier at 4 dB Output Back Off(OBO) (without linearizer)
20.	Group delay, maximum (a) Linear (b) Parabolic (c) Ripple (peak to peak)	0.01 ns /MHz (linear) over any 40 MHz band 0.005 ns /square MHz over any 40 MHz band 0.5 ns over any 40 MHz band

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21.	Power consumption at rated o/p	5 KVA Typical.
22.	Power factor	0.90 Min
23.	Operating temp:	-10° C to + 50° C
24.	Relative humidity	95% non condensing
25.	Altitude	Should operate upto 10,000 Feet AMSL
26.	Cooling	Forced air
27.	RF Input connector	N type female
28.	RF Output connector	CPR 137 F/G waveguide flange
29.	RF power monitor connectors	N Type female
30.	Remote monitoring Port	RS 232/422 or 485, RJ 45 Ethernet
31.	Fail over Switching	Auto and Manual
32.	Operating Voltage	230 V AC (Nominal)
33.	Front panel display	LCD/TFT

5.4.5 Semi Rigid Elliptical Waveguide

S. No.	Description	Requirement
i.	Conductor Material	Corrugated Copper
ii.	Operating Frequency Band	5.85 GHz - 6.425 GHz
iii.	Jacket Material	PE
iv.	Weight	1.1 Kg/m (maximum)
v.	Cut-off frequency	3.65 GHz
vi.	VSWR	≤1.15 dB at full freq. range
vii.	Attenuation at 6 GHz	≤ 4.0 dB/100 m

5.4.6 Automatic waveguide Dehydrator

Essential Features:

1. Maintenance free, Harsh Duty, Automatic waveguide Dehydrator to Provide Clean & Dry pressurized air to ensure signal quality of antenna Waveguide
2. Pressure level 1-5(min) PSI user configurable (adjustable output pressure)
3. Brushless dual-diaphragm and Oil-less compressor for long life includes a pressure regulator and air filter.
4. Remote monitoring and control by Ethernet RJ-45, RS-422/485, RS-232 and alarm relay outputs
5. Provisions for dry-contact alarms for Low pressure alarm (< 5psi) and excessive run time alarm.
6. Air reservoir to store dry compressed air.
7. Display allows for IP configuration and status monitoring with or without network connection
8. 19" Rack mountable.
9. Environmental Noise Level: < 70 dB(A)
10. Operating voltage 230 ±5% VAC,

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5.5 Confidence Level Monitoring System

Confidence level monitoring system consists of:

- a) Up-converter(70MHz to L-band)
- b) Test Loop Translator (TLT for C-band U/L to L-band)
- c) C-band downlink to L Band Down Converter
- d) 17"(Nominal) LCD (TFT) SD & HD Colour Monitor
- e) 8 Channel Audio Monitor
- f) Dual 9 inch HD/SD-SDI Colour Video Monitor
- g) IRD with L-Band, ASI and IP input
- h) High Quality Digital Audio Ampli-speaker

5.5.1 Up-converter (70 MHz to L-band)

70 MHz to L-band Up-converter is to be used to check the monitoring output of modulators. Output of this Up-converter will be fed to IRD through RF Patch panel. The Specifications are detailed below:

S.No.	Parameter	Specifications
a)	Input Frequency	70 MHz \pm 18 MHz
b)	Output Frequency range	950 MHz to 1450 MHz
c)	Input return loss	15 dB minimum
d)	Output return loss	15 dB minimum
e)	Phase Noise	IESS308/309 compliant
f)	Spurious	-55 dBc carrier related -65 dBm Non carrier related

5.5.2 Test Loop Translator (TLT for C-band U/L to L-band)

Test Loop Translator (C-band uplink frequency to L-band) is to be used to check the monitoring output of Up- converters & HPAs. Monitoring ports of Up-converter and HPAs will be fed to TLT using a RF patch panel. Output of TLT will be fed to IRD (with L-band input) through patch panel. The Specifications are detailed below:

Sl.No.	Parameter	Specification
a)	Input Frequency	5.925 GHz to 6.425 GHz
b)	Output frequency	L-Band
c)	Conversion loss	Better than 20 dB+2 dB
d)	Level Control	25 dB Minimum
e)	Return loss (input)	15 dB or better
f)	Return loss(output)	15 dB or better
g)	Phase noise	IESS 308/309 Compliant

5.5.3 C Band downlink to L Band Down Converter

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S. No.	Description	Specifications
i.	Input Frequency Band	3.7 GHz to 4.2 GHz
ii.	Output Frequency Band	950 – 1450 MHz
iii.	RF Input Return Loss	18 dB minimum
iv.	Output Return Loss	15 dB minimum
v.	Noise Figure	20 dB maximum
vi.	Impedance	a) 50 Ohms input b) 50 Ohms output
vii.	Frequency stability	a) Daily $+5 \times 10^{-9}$ max b) Yearly $+1 \times 10^{-7}$ max c) $+2 \times 10^{-8}$ max over entire operating Temp.
viii.	Spurious	a) -60 dBm maximum (Non Carrier) b) -55 dBc maximum (Carrier)
ix.	Phase Noise	As per IESS 308/309 (phase noise profile)
x.	Output Power at P1dB	$+5$ dBm minimum
xi.	Conversion Gain	20 dB $+1$ dB minimum
xii.	Gain Stability	$+1.0$ dB over temperature range
xiii.	Gain Flatness	± 0.5 dB across any 40 MHz at constant temperature
xiv.	Input Connector	N type
xv.	Output Connector	Suitable for terminating at F Type Patch panel

5.5.4 17 inch (Nominal) LCD (TFT) SD & HD Colour Monitor

A. Essential Features:

- i) The offered monitor should incorporate high intensity, high contrast wide screen 17"(nominal), wide viewing angle LCD/TFT/OLED Panel to view stable images from various angles: both horizontally and vertically, with no reduction in picture contrast, brightness and colour saturation.
- ii) The LCD/TFT/OLED panel of the offered monitor should have resolutions of 1920x1080 pixels in 16:9 aspect ratio. The offered monitor should support 16:9 and 4:3 aspect ratios of the video signal. The monitor should also support 1920X1080/50I (HD) and 720X576/50I (SD) video formats.
- iii) LCD/TFT/OLED colour monitor should accept SD and HD SDI input (detected automatically) as well as analog composite video input.
- iv) The offered monitor should support embedded audio. It should also have analogue audio input and built in speaker for audio monitoring.
- v) The offered monitor should have 10-bit signal processing.

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- vi) The monitor should have 1:1 pixel mapping to display the pictures in the original resolution (subject to the native resolution of the LCD/TFT/OLED panel) and aspect ratio of the input signal without any stretch and distortion.
- vii) It should be possible for the user to select the industry standard colour temperature through menu for matching colours and gradation of the monitor.
- viii) The LCD/TFT/OLED panel should be coated with Anti-Reflection protection layer to provide high transmission rate of the internal light source and to keep the reflection from ambient light to a minimum.
- ix) The monitor should have an external remote control capability via Ethernet, serial or similar interface.
- x) The offered monitor should have front panel controls to control the display parameters like brightness, contrast, color saturation etc.
- xi) The offered monitor should be rack mountable and hence necessary 19" mounting brackets should be supplied.

B. Technical Specifications:

S. No.	Parameter	Specification
1.	Display size	17" diagonally (nominal)
2.	Screen type	LCD/TFT/OLED
3.	Resolution	1920 x 1080 pixels or better
4.	Colour reproduction	16 million or better
5.	Contrast ratio	300:1 or better
6.	Viewing Angle	176 degrees in Horizontal & 176 degrees in Vertical or better
7.	Brightness	250 cd/sq.m or better
8.	Supported aspect ratios of video input	16:9 and 4:3 (auto detection)
9.	Video Inputs	(i) HD/ SD SDI: 2 or more HD SDI SMPTE 292, 1.485Gb/s, 0.8V pp across 75 ohms (1080/50I) and SD SDI SMPTE 259 in BNC, 270Mb/s, 0.8V pp across 75 ohms, auto detection (ii) Analog: 1 or more Composite (PAL), 1 V p-p across 75 ohms
10.	Video input connectors	HD/ SD SDI: 2 or more BNC Analog: 1 or more BNC
11.	Analog Audio Inputs	XLR/RCA Jack/Phone Jack/ Mini Jack
12.	Video Format	SD: 720 x 576, 704 x 576, 544 x 576, 480 x 576, 352 x 576 HD: 1920X 1080/50I

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13.	Video Outputs	(i) HD/ SD SDI: 1 or more SDI SMPTE 292 in BNC, 1.485Gb/s, 0.8V pp across 75 ohms (1080/50I) or 1 or more SDI SMPTE 259 in BNC, 270Mb/s, 0.8V pp across 75 ohms active loop through of selected input (ii) Analog O/P: 1 or more Composite (PAL) in BNC, 1 V p-p across 75 ohms and Component in BNC across 75 ohms loop through.
14.	Audio Outputs	XLR/RCA Jack/Phone Jack/ Mini Jack and built-in speaker
15.	Control I/O	Serial (RS 232/422/485)/ Ethernet RJ-45

5.5.5 8 channel Audio Monitor with Bar-graph & internal speakers.

A. Essential Features:

- i) High quality auto sensing 3G/HD/SD-SDI multi-channel audio monitoring system.
- ii) It should have high quality internal stereo loudspeakers.
- iii) 8 channel monitoring with ability to monitor any channel on either speaker, including combinations & groups.
- iv) 53 segment tri-color LED/ Screen bar graph display.
- v) Headphone output with loud speaker mute.
- vi) Dolby E, Dolby Digital 5.1 audio and Dolby Digital Plus 5.1 audio decoding from HD SDI and AES signal sources.
- vii) Multi-channel outputs for external stereo or 5.1 loudspeaker system integration.
- viii) Front panel controls for any combination of up to 8 channels.
- ix) Premium quality drivers and power amplifier.
- x) Excellent frequency response and low distortion.
- xi) It must have premium quality drivers and power amplifiers.
- xii) It should be of professional quality, 19" rack mountable and of reputed make.

B. Technical Specifications:

S. No.	Parameters	Specifications
1	Inputs	8 Balanced analogue 4 Balanced AES/EBU pairs 4 unbalanced AES pairs 2 HD/SD-SDI
2	Outputs	8 Balanced analogue 4 Balanced AES/EBU pairs 4 unbalanced AES pairs 1 HD/SD-SDI re-clocked
3	Connectors	Analogue : XLR/D-type (with breakout cables for XLR) Balanced AES/EBU : XLR/D-type (with breakout cables for XLR) Unbalanced AES : BNC 75 Ohms 3G/HD/SD-SDI re-clocked : BNC 75 Ohms

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4	Computer Interface	RS-485/RS 232/RJ-45
5	Sample rate for Digital input	48KHz
6	Analog O/P	
	a) Frequency Response	± 1 dB (20Hz to 20KHz)
	b) Noise + THD	Better than -60dB w.r.t. max O/P
7	Peak acoustic output at 2 feet	100 dB SPL
8	Mount	19" rack mount

5.5.6 Dual 9" HD/SD-SDI Colour Video Monitor

A. Essential Features:-

- i) The video & audio monitor should have ability to monitor both audio & video from selectable HD/SD-SDI (video & embedded audio) and composite analog video source.
- ii) Analog audio inputs should also be available for use with analog video monitoring.
- iii) Monitor should have LCD/TFT/OLED display of size dual 9" (nominal) diagonal.
- iv) Rack adaptor unit should also be offered for mounting dual 9" video monitors in a standard 19" rack.
- v) It should have audio monitoring along-with bar-graph display facility.
- vi) It should have direct control for brightness, contrast, Colour & input selection.
- vii) It should have low power consumption.

B. Technical Specifications:-

S. No.	Parameters	Specifications
1.	Display Size	9 inch diagonally (Nominal)x2
2.	Screen type	LCD/TFT/OLED
3.	Resolution	1920X1080 or more
4.	Colour reproduction	16 millions or better
5.	Contrast Ratio	750 : 1 or more
6.	Viewing Angle	160 degree horizontal , 160 degree vertical
7.	Brightness	350 cd/m ² min
8.	Aspect Ratio	16:9 and 4:3 (auto detection)
9.	Video Inputs	(i) HD/SD SDI: 2 or more in HD/SD-SDI (with embedded audio) in BNC 0.8 V across 75 ohms with loop through output. (ii) Analog: 1 or more Composite (PAL) in BNC, 1V across 75 ohms.

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10.	Video input connectors	HD/ SD SDI: 2 or more BNC Analog: 1 or more BNC
11.	Video Format	SD: 720 x 576, 704 x 576, 544 x 576, 480 x 576, 352 x 576 HD: 1920X 1080/50I
12.	Video Outputs	(i) HD/ SD SDI: 1 or more SDI SMPTE 292 in BNC, 1.485Gb/s, 0.8V pp across 75 ohms (1080/50I) or 1 or more SDI SMPTE 259 in BNC, 270Mb/s, 0.8V pp across 75 ohms active loop through of selected input (ii) Analog O/P: 1 or more Composite (PAL) in BNC, 1 V p-p across 75 ohms and Component in BNC across 75 ohms loop through.
13.	Audio Outputs	XLR/RCA Jack/Phone Jack/ Mini Jack and built-in speaker
14.	Control I/O	Serial (RS 232/422/485)/ Ethernet RJ-45

5.5.7 Integrated Receiver Decoder (IRD)

A. Essential Features:

- i) The professional IRDs should receive ASI and L band input signal and provide analog base band (Video and audio), digital SD-SDI, SD-SDI with Embedded audio, AES/EBU, HD-SDI, HD-SDI with Embedded audio, ASI outputs and MPEG-2 TS over IP output with multiple services filtering facility.
- ii) One SD-SDI down converted output of HD-SDI should be available.
- iii) IRD should be able to carry out multi service filtering on IP output port.
- iv) IRD should have provision to enter or edit all the parameters for perfect reception of the signals either through front control panel display or through web browser.
- v) There should be at least one vacant slot (CI slot) for conditional Access System for descrambling all MPEG-2 & MPEG 4 and DVB-S & DVB S2 services.
- vi) There shall be a provision for observing BER & signal level or C/N & C/N margin or Eb/No & Link Margin for DVB-S mode of operation and PER & signal level or C/N & C/N margin or Es/No & Link Margin for DVB-S2 mode of operation either through front control panel display or through web browser.
- vii) IRD should be able to descramble BISS mode 1 and BISS-E signals.
- viii) There should be direct decompression of ASI to SDI i.e. not through analog to Digital conversion.
- ix) IRD should have facility to pass ancillary data like closed captioning, EIA 608/708, DVB-Teletext, DVB- subtitle, DPI SCTE-35 etc.
- x) The IRD should be able to store at least 10 preset configurations in its memory.

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- xi) IRD should have facility to decode and pass ancillary data like closed captioning EIA 608/708, DVB-Teletext, DVB- subtitle, DPI SCTE-35 etc.
- xii) It should be possible to configure and monitor the IRD through Control Computer.

B. Technical Specifications:

S. No.	Parameters	Specifications
I. ASI input Parameter		
1	Format	MPEG-2 DVB-ASI
2	Quantity for ASI Input	Minimum one no. on BNC
II. RF input Parameter		
1	Input Frequency Range	950 - 2150 MHz
2	No. of Inputs	2
3	Tuning Step Size	125 kHz, Max.
4	Satellite Frequency Band	C- Band & Ku-Band, Selectable
5	Input Impedance	75 Ohms
6	Input Connector	F Type female
7	Input Power Range	-30 to -65 dBm per carrier
8	Image Rejection	>30 dB
9	Input Return Loss	9 dB, Min.
10	Noise Figure	15 dB, Max.
11	AFC Tuning Range	± 5 MHz
12	De-Modulation Method	DVB-S QPSK, DVB-S2 QPSK and 8PSK demodulation
13	Variable Symbol Rates	1.0 to 40 M symbol/sec for DVB-S 1.0 to 40 M symbol/sec for DVB-S2
14	Convolution Inner FEC selectable	R= 1/2, 2/3, 3/4, 5/6, 7/8 (DVB-S, QPSK), R= 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (DVB-S2, QPSK) R= 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 (DVB-S2, 8PSK)
15	IF Filter Bandwidth	Automatic Selection (dependent on Symbol Rate)
III. Audio and Video Decompression Parameters:		
1	Video Resolution (all resolutions shall be capable of I, P & B frame decoding, other standard resolution should be selectable)	For SDTV : 720 x 576, 704 x 576, 544 x 576, 480 x 576 For HDTV : 1920 x 1080, 1440 X1080
2	Video Decompression Type	a) SD MPEG-2 MP@ML, 4:2:0, 8 bit b) SD MPEG-2 Hi422P@ML, 4:2:2, 8 bit c) SD H.264 MP@L3.0/Hip@L3.0 4:2:0, 8 bit d) SD H.264 Hi422P@L3.0/Hi422PL3.1, 4:2:2, 8 bit e) SD H.264 Hi4:2:2P@L3.1, 4:2:2, 10 bit f) HD H.264 HIP@L4.0, 4:2:0, 8 bit g) HD H.264 HI422P@L4.0 / HI422P@L4.1, 4:2:2, 10 bit
3	Television Standard	PAL-B (EN50083-9)

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4	Audio Decompression Type	<ul style="list-style-type: none"> i) MPEG-1 Layer-II audio ii) HE AAC(MPEG 4) v1 & v2 5.1 Audio iii) Dolby Digital (AC-3) 5. 1 audio iv) Dolby Digital plus 5.1 (E-AC-3) (Pass through) v) Linear PCM (Pass-through) vi) Dolby E (Pass through)
IV. Transport Stream O/P:		
1	Format	<ul style="list-style-type: none"> i) MPEG-2 TS over ASI on BNC ii) MPEG-2 TS over IP on Ethernet with service filtering.
2	Quantity	<ul style="list-style-type: none"> i) Minimum one no. on BNC ii) Minimum one no. on RJ 45
V. Video Output Specifications		
1	Connector Type	BNC (75 Ohm)
2	Video Output Format	SD-SDI and HD-SDI
3	Video Outputs	HD/SD-SDI Output- Two Nos.
4	SD-SDI and HD-SDI O/P Serial Interface	SMPTE 292M-1485 Mbps SMPTE 259M-(10 bit) 270 Mbps
5	SD-SDI with Embedded Audio	SMPTE 272M
6	HD-SDI with Embedded Audio	SMPTE 299 M
7	Digital Video O/P Level	800 mV p-p for SDI As per ITU-R BT.601 (part A)
8	Gen lock Input	One
VI. Digital Audio Output Specifications		
1	Output Format	<ul style="list-style-type: none"> i) AES/EBU or AES-3 id ii) HE AAC(MPEG 4) v1 & v2 5.1 Audio iii) Dolby Digital (AC-3) 5.1 audio iv) Dolby Digital plus 5.1 (E-AC-3) (Pass through) v) Dolby E (Pass through)
2	Load Impedance	110 Ohms balanced OR 75 Ohms Unbalanced
3	Connector Type	BNC Female/ XLR male Socket or with suitable XLR adapter (i.e. no terminal block)
4	Number of Output	4 Stereo Channels
VII. LNB Power Supply & Control		
1	LNB Voltage	Off, +13 V(Vertical), +18 V(Horizontal)
2	Over Current & Short Circuit protection	Fold back current limiting.
3	LNB Control (Low/High Band)	22 +2 KHz Tone
VIII. Mount		
1	Mount	19" Rack Mount

IX. Hardware of Server in case of Server Based Professional IRDs**A. General Feature:**

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- (i) Bidder may offer server based professional IRDs in place of Hardware based professional IRDs. Each Chassis may accommodate two to four professional IRDs.
- (ii) CPU/Chipset of server should have facility to enable an environment where applications can run within their own space, protected from all other software on the system.
- (iii) CPU/Chipset of server should have security feature that can reduce exposure to viruses and malicious-code attacks and prevent harmful software from executing and propagating on the server or network.
- (iv) CPU/Chipset of server should have facility of Secure Key consisting of a digital random number generator that creates truly random numbers to strengthen encryption algorithms.
- (v) CPU/Chipset of server should have Thermal Monitoring facility to protect the processor package and the system from thermal failure.
- (vi) The offered processor of server should be scalable, high quality, robust with efficient performance.
- (vii) Each server of software based professional IRDs should be designed with 85 percent (Max.) CPU loading.
- (viii) CPU of server shall be similar to Intel Xeon Gold series /Intel Xeon W/ AMD EPYC 3rd Generation Series or better and the launch date of CPU of offered server should not be prior to year 2021.
- (ix) Facility to store the last configuration in the software based professional IRDs.

B. Hardware Feature:

S. No.	Parameter	Specification
a. Performance of Central Processing Unit		
1	No. of Core	10 (Min) per CPU
2	No. of Thread	20(Min.) per CPU
3	Processor Base Frequency	2.40 GHz or better
4	No. of CPU	One or more
b. Memory Specification		
5	RAM	DDR4 or better, 64 GB or more
6	Storage Memory	SSD, 240 GB (Min.) in Raid 1 Configuration
c. Operating System		
7	Operating System	Linux
d. Ethernet Network		
8	No. of Ports (Duplex) in Server	i. Minimum one physical (RJ 45) bi-directional port of 1 Gigabit for Input

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		ii. Minimum two physical (RJ 45) bi-directional port of 1 Gigabit for output
		iii. Minimum one physical (RJ 45) bi-directional port of 1 Gigabit for Management & Control
e.	PCI slot	
9	PCI slot	2 nos. or more
f.	Operating Environment	
10	Operating Temperature	10 to +35 °C
11	Humidity	10% to 90% non-condensing

5.5.8 High Quality Digital Audio Ampli-speaker

A. Essential Features:

- i) The offered ampli-speaker should have wide dynamic range, low distortion, flat frequency response and high SPL capability.
- ii) The offered ampli-speaker should have two way speaker system consisting of a woofer and a tweeter. It should be a bi-amplified active monitor system.
- iii) It should have 8" Low Frequency Transducer (woofer) and approximately 1" High Frequency Transducer (tweeter).
- iv) The transducers/ drivers should be magnetically shielded for exceptional transient response and superb power handling. There should be no interference when these ampli-speakers are placed in the close proximity of other audio and video equipment especially CRT-type monitors.
- v) It should incorporate two high power amplifiers to provide 150 Watts (RMS) or more power to the low frequency transducer and 70 Watts (RMS) or more power to the high frequency transducer. These amplifiers should be highly efficient and should withstand long hours of uses.
- vi) It should be equipped with a precise cross-over network for smooth transition between transducers.
- vii) The ampli-speaker should disperse sound across the frequency spectrum evenly and consistently along the horizontal and vertical window of consistency.
- viii) It should be possible to network multiple ampli-speakers to control their various parameters such as volume, equalizers/ filters etc. It should also be possible to calibrate various parameters of the ampli-speaker in accordance with the acoustic environment. Necessary hardware and software required for this purpose must also be included in the offer.
- ix) The ampli-speaker should have volume control arrangements for standalone operations. It should also indicate signal overloading.
- x) The ampli-speaker should employ Digital Signal Processing (DSP).
- xi) The offered ampli-speaker should accept balanced analog audio on 3-pin XLR female connector. It should also accept balanced AES/EBU digital audio input on 3-pin XLR female connector.
- xii) The offered ampli-speaker should be suitable for horizontal and vertical mounting.

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xiii) The offered ampli-speaker should also be capable of ceiling, wall and stand mountings.

B. Technical Specifications:

Sl. No.	PARAMETER	PERFORMANCE
1	INPUTS	
1.1	Digital Audio Input	AES/EBU, 24 bit, 48 kHz on XLR
1.2	Analogue Audio Input	Balanced on XLR with 10K Ω input impedance
2	DRIVERS	
2.1	Bass (woofer)	8 inch
2.2	Treble (Tweeter)	approx. 1 inch
3	FREQUENCY RESPONSE	
3.1	Lower cutoff frequency	\leq 43 Hz
3.2	Upper Cutoff Frequency	\geq 20 KHz
4	AMPLIFIER POWER	
4.1	Bass (woofer)	150 Watts or better
4.2	Treble (tweeter)	70 Watts or better
4.3	Gain	X1, X5 and variable
5	SOUND PRESSURE LEVEL	
5.1	Short term RMS SPL @ 1 Meter	Better than 110 dB
5.2	Continuous Max SPL @ 1 Meter	Better than 100 dB
6	DIMENSION	
6.1	Width	\leq 300 mm
6.2	Height	\leq 450 mm
6.3	Depth	\leq 400 mm
7	TOTAL WEIGHT	\leq 15 Kg
8	NETWORKING	Via RJ 45 port

5.5.9 4K/ UHD TV Display Units

Sr. No.	Features	Specifications for 4K/UHD, size -55 inch or more Display / TV / Panel
1	Display Size	55 inches or above
2	Panel Technology	In plane Switching (IPS)

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3	Native Resolution	3840 x 2160 (UHD) 4K
4	Brightness	400 cd/ m ² or above
5	Contrast Ratio (Dynamic)	4500:1 or better
6	Viewing Angle	178°x178°
7	Response Time	15 ms or less
8	Maximum Bezel Width (Left/Right/Top /Bottom)	13/13/13/20 mm or less
9	Input Ports	HDMI - 3 Nos., USB 2.0-1 no., RS232C - 1 no., RJ45 -1 No., RF-1 No.
10	Output Ports	Optical output-1 for digital audio
11	Special features	Smart Share / Screen Share, Failover, Wake on LAN, Wireless access point/Hotspot, Pre-loaded YouTube app, Play via URL, SOC Player
12	Wi-Fi	Built-in Wi-fi required
13	Blue-tooth	Yes
14	Audio	20W (10W * 2)
15	Power Supply	100-240V~, 50/60Hz
16	Power Type	Built-In Power
17	Power Consumption	145 W or Less (Typical)
18	Certificates	BIS
19	Accessories	Table stand / Wall mount, Remote, IR remote, user manual
20	OEM Warranty	5Years

5.6 Measuring Equipment

5.6.1 Spectrum Analyzer

A. Essential Features

- i) The instrument should be bench top, rack mounted model, AC operated and supplied complete with all accessories like input probes, Cables, Adapters and power cords, etc.
- ii) The instrument should have full set of marker functions including delta Marker, peak search marker, Zone marker, centre marker, multi marker (>6nos) and features like Spectrogram, Zoom/Zone Span.
- iii) The Instrument should have time and Data storage functions with internal memory to store minimum of 500 traces and 500 measurement setups.

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- iv) The instrument should have remote control operation facility and should be programmable for automatic measurements with pre installed operating System preferably Windows.
- v) The instrument should have auto-calibration function.
- vi) The Spectrum Analyser should be capable of making following measurements and display results:
- Noise power (in dBm / Hz or dBm/ Ch.)
 - C/N (in dBc/ Hz or dBc/ Ch.)
 - Occupied Band Width and Adjacent channel power
 - Average power of burst signal
 - Spurious Emission
 - Frequency Counter (min. resolution: 0.001Hz)
 - 2-tone, 3rd order intermodulation distortion
 - Power vs. Time, Frequency vs. Time, Phase vs. Time, CCDF, Amplitude Probability Distribution, Spectrogram
 - Spectral Emission Mask with Limit Lines
 - Offered Spectrum Analyser should be able to analyse DVB-S(QPSK) , DVB-S2(8PSK) Modulations as used for satellite communication at Earth Stations. It should be able to provide following measurement trace modes for:
Constellation, EVM vs Symbol, Equalizer Amplitude, Equalizer Phase, Equalizer Group Delay, Equalizer Impulse Response, Custom Numeric, Magnitude Error vs Symbol, Phase Error vs Symbol, Frequency vs Symbol, Trellis, Eye Diagram, Numeric, I and Q vs Symbol, Magnitude vs Symbol, Phase vs Symbol, Signal Monitor, Symbol Table & others.
Software provided if any for the above measurements should be perpetual license with free upgrades during warranty period and for entire life time of the equipment
- vii) Spectrum Analyser should have superior XGA coloured LCD/TFT Display 8 inch or better.
- viii) The equipment should have internal (built-in) hardware and software for transfer of screen shot measurement data. USB & Ethernet/ LAN port should be provided for the remote control operation and connecting peripherals like Keyboard and printer or external PC/Laptop.

B. Technical Specifications:

1	Frequency Range (DC coupled)	9KHz to 26.5GHz or better
a)	Aging Rate	$<1 \times 10^{-7}$ /year
b)	Temp. stability (5 to 40 deg.C)	$\leq \pm 5 \times 10^{-8}$
c)	Frequency span	0 Hz - (Zero Span), 1KHz to 26.5GHz or Better.
2	Spectral Purity	
a)	SSB Phase Noise @ 100KHz offset	-107 dBc/Hz @ 1GHz or better
3	Bandwidths	

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a)	Resolution Bandwidth (3dB)	1Hz to 3MHz (3dB), in 1-3 sequence or (10% steps), 4, 5, 6, 8 MHz
b)	Video Bandwidths	1 Hz to 3MHz, in 1-3 Sequence or (10% steps). 4, 5, 6, 8 MHz
c(i)	Analysis Bandwidth	1KHz to 40MHz or better
c(ii)	Sampling Rate	50MHz or better
4	Amplitude	
a)	Max. Input level(continuous)	+30 dBm or better (Suitable external Attenuator can be provided to meet this requirement, if required.)
b)	Third Order Intercept Point	+12 dBm or better across specified frequency range
c)	Displayed average noise level at 0dB attenuation (RBW 10 Hz and 10 Hz VBW) at 25 GHz or Higher frequency	$\leq -134\text{dBm/Hz}$
d)	RF input attenuation range	0dB to 60 dB in 2 dB steps (manual or automatic).
e)	Input Connector/ impedance	N type/50 ohm
f)	Total Absolute Amplitude Accuracy	$\leq 1.0\text{dB}$ (Frequency @ 3GHz); $\leq 4\text{dB}$ @ 25GHz
5(a).	Sweep Trigger	Free run, Video, External
5(b).	Sweep Time	1ms to 1000 Sec(Span> 1KHz) 1 μS to 1000 Sec (Span = 0Hz) or time domain mode
6	Display	
a.	Modes	Normal, Max/Positive Peak, Min./negative Peak, Average, RMS etc.
b.	Scales	Log Scales-dBmV, dB μV , dB $\mu\text{V/m}$, dBm, Linear Scale-V 1dB/div to 10dB/Div. in suitable steps.
7	Interface	Ethernet or LAN -RJ45 & USB port.

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8	Accessories	<p>a) Standard accessories including Low Loss Test Port extension Cable (Min. 1 mtr length with suitable connectors & adaptors (if required)) to connect with the RF IN port of Spectrum Analyser should be supplied from OEM.</p> <p>Optional accessories shall be offered to complete all the measurement applications. Additional items to be offered if required</p> <p>b) Internal Memory 40 GB or Higher.</p>
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5.7 Power Supply System

The Power Supply System consists of the following equipment:-

- a. 30 KVA 3 Phase Isolation Transformer
- b. 30 KVA 3 Phase Oil Cooled Automatic Voltage Regulator (AVR)
- c. 2x20 KVA 3 Phase UPS operating in (1+1) parallel redundant load sharing mode with 15 minutes battery backup for each UPS
- d. Power Distribution Panels (PDPs), Sub distribution Boards (SDBs) for power distribution to the various equipment chains.
- e. Mains Distribution Units (MDUs).
- f. Earthing for the power supply system.

5.7.1 Isolation Transformer

The Isolation Transformer should be Three Phase, naturally cooled type, housed in steel cubical provided with cast iron wheels at bottom and should have Hooks for lifting the unit. The cubical enclosing the Isolation Transformer should have sufficient openings (doors and removable covers) for ease of operation and maintenance of the system.

S. No.	Parameter	Specification
1.	AC Input	Delta 3-phase, 415V \pm 10% (phase to phase)
2.	AC output	Star 3-phase, 415V \pm 5% (phase to phase) 240V \pm 5% (phase to neutral)
3.	Frequency	47 to 53 Hz
4.	Capacity	30 KVA
5.	Duty cycle and use	24x7 Continuous, Indoor
6.	Common mode noise rejection	Better than 110 dB
7.	Inter winding capacitance	Less than 0.005 pF

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8.	Load regulation	<4%
9.	Insulation resistance	More than 500 Mega Ohms at 500V
10.	Terminals	Studs on fiber glass plate at rear
11.	Cable entry	Bottom

5.7.2 Automatic Voltage Regulator

The unit should be self-contained, compact, efficient and highly reliable for 100% duty cycle, 365 days a year and based on field proven design using modern technology.

S. No.	Parameter	Specification
1	Input Voltage Range	340 V - 460 V 3 phase , 4 wire AC
2	Capacity	30KVA
3	Output voltage and rated operating frequency	400V +/- 1% three phase AC (230 V Phase to neutral) Voltage should be adjustable to +/-5% with control located on front panel
4	Voltage regulation	+/-1 % from no load to full load
5	Frequency	AVR should work satisfactorily with input frequency range of 50±3 Hz
6	AVR Type	Indoor, servo controlled
7	Speed of correction	6 volt per second or better
8	Metering	(i) Digital meters shall be provided with selector switches for measurement of phase to phase and Phase to neutral voltage on all three phases for input and output (ii) Digital ammeter in output on all three phases (iii) Indications, on control panel should be provided for input/ output voltage status
9	Electrical protection	Protection against overload, short circuit surge voltage due to system faults, switching operations and hotspot temperatures
10	Main selector switch	Four position heavy duty control switch shall be provided for the following operations (i) OFF- The input is cut off (ii) Test - Input is through but output is cut off (iii) ON- Input and output both are through By Pass- AVR gets isolated and input gets directly connected to output
11	Input output connection	Terminal for connection
12	Cooling	Natural Air-cooled
13	Manual control	Provision for manual control of each phase in case of failure of automatic controls system
14	Efficiency	90% or better

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5.7.3 UPS System

A. General Features:

1.	<p>a) The UPS system should be fully DSP controlled in all respects (i.e. rectifier control, inverter control, display, digital diagnostics.), solid-state type, utilizing On Line Double Conversion technology (high frequency PWM using IGBT Rectifier & inverter section)</p> <p>b) The UPS system should be capable of providing continuous high quality sinusoidal waveform power for electronic equipment loads.</p> <p>c) The UPS system should conform to voltage frequency independent technology.</p>
2.	<p>The DSP based controller should have following characteristics:</p> <p>a) Diagnostic monitoring achieved by Fast Fourier Transform (FFT) of spectrum analysis</p> <p>b) Adaptive control by having the speed to monitor and control the system concurrently</p> <p>c) Real time generation of smooth, near optimal reference profiles and move trajectories</p> <p>d) Control power switching and inverters and generate high resolution outputs.</p>
3.	<p>The UPS should offer low input current harmonic distortion (THDI), good regulation, excellent transient response and high stability.</p>
4.	<p>The UPS system should have a monitoring panel (LCD Based) with various types of fault alarms and metering functions including:</p> <p>a) Output voltage, current & frequency.</p> <p>b) Input voltage, current & frequency.</p> <p>c) Bypass Voltage, Current & frequency.</p> <p>d) Battery capacity, backup time left & bad battery indication.</p> <p>e) Temperature of System, Inverter section and Rectifier section.</p> <p>f) The UPS system should display RMS value of load current.</p> <p>g) The UPS system should have facility to generate aural alarm for bad Battery condition.</p>
5.	<p>a) The UPS system should have wide input voltage and input frequency tolerance as specified in Rectifier section.</p> <p>b) In built Transient Voltage Surge Suppressor (TVSS) should be provided at the input of the UPS System.</p>
6.	<p>The UPS system should have provision for controlling all the three phases individually, even in case of 100% unbalancing at the output with even 0% load on one phase.</p>

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7.	In case of failure of parallel operation, automatic and manual override for the system to work in 1+1 hot standby should be available. (Firm should enclose single line diagram of mains changeover panel).
8.	The UPS system should be capable of supplying energy to load from commercial mains without any break in case of phase reversal at the input. It should also generate aural and visual alarm in such a case.
9.	<p>a) The system should have provision of protection for</p> <ul style="list-style-type: none"> (i) Input under voltage (ii) Input Over Voltage (iii) Output Over Voltage (iv) Output Over load (v) Output short circuit (vi) Battery under Voltage (vii) Over temperature (viii) DC Over current <p>b) The system should generate aural and visual alarms for above-mentioned conditions.</p>
10.	<p>The UPS system should have Controls as</p> <ul style="list-style-type: none"> (i) Input Circuit Breaker (ii) Bypass Circuit Breaker (iii) Maintenance Bypass Switch (iv) Inverter ON / OFF Switch (v) Alarm acknowledge switch
11.	<p>a) The system should have facility to store the Logs of the events being monitored by monitoring system.</p> <p>b) The UPS system should have the capability to store a minimum of last 100 events.</p> <p>c) The UPS should have in – built digital fault diagnostic through stored events in UPS system.</p>
12.	<p>a) The UPS OEM should specify the nos. & type of desired batteries, which shall be part of the system to be offered. [The batteries of known & reputed world – class manufacturer will only be accepted.] The maintenance free-batteries VRLA type shall only be acceptable. The detailed technical specification of batteries with their working life is also to be specified and provided with the offer.</p> <p>b) The firm should also provide battery change over unit for battery banks so that any bank can be connected to any UPS system.</p>

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13.	The battery charger should have provision of (i) Monitoring battery temperature and accordingly adjusting the charging level to enhance the battery life. (ii) Programmable battery charging which can be programmed to enhance battery life.
14.	The UPS system should have communication port RS 232/RJ45 and should be configurable by Control computer. Suitable software for monitoring & diagnostics etc. should be supplied.
15.	The UPS system should be designed with scientific forced air-cooling for proper ventilation. Acoustic noise level should be kept at minimum.
16.	The UPS system output should be isolated from the DC circuit of the UPS.
17.	The UPS 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. A certificate issued to OEM by authorized international/ national agencies should be submitted along-with the declaration from OEM in this regard. In general, following standards should be met:- a) Safety: IEC 62040-1 / EN 50091-1 b) Emission and Immunity: IEC 62040-2, Class A / EN 50091-2 (Class A) c) Performance: IEC 62040 -3/ EN 50091 - 3 d) CE-Marked in accordance with EEC directives 73/23 "low voltage" and 89/336 "electromagnetic compatibility"
18.	The UPS manufacturer must be ISO 9001-2015 certified company. A copy of the certificate should be enclosed with the offer.

B. Operational Features and Technology of UPS

1.	Technology:	The UPS shall be designed to operate as true on-line, double conversion DSP controlled type UPS strictly as per the definition of IEC 62040-3 as follows:
<p>a) Normal Operation:</p> <p>The UPS inverter should continuously supply the critical AC load. The rectifier & charger should take power from the AC input source, convert it to suitable DC and supply to the inverter as well as charge the Batteries on Automatic Float cum Boost Mode.</p>		
<p>b) Upon Mains Failure:</p> <p>Upon failure of AC input power, the critical AC load should continue to be supplied by the inverter, which should obtain power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the AC input source (Mains/ DG).</p>		
<p>c) Upon Mains Restoration:</p> <p>Upon restoration of AC input power, the Rectifier/Charger should automatically restart walk-in and gradually take-over the supply to inverter and charging to the battery.</p>		

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d) Static Bypass:

Each UPS Module should have in-built 100% rated static Bypass Line. In two UPS Modules connected in Parallel redundant Current Sharing Mode, in the event of any fault in one UPS, the faulty UPS should isolate itself and the healthy UPS, which normally shares the load 50%, should take-over the full load.

All the loads should be transferred to the Static Bypass Line of the UPS without any break if the input frequency is within 50 Hz and with a break below 20 milliseconds if the input frequency is beyond 50 Hz for the following conditions:

- i. If both the UPS fails simultaneously
- ii. If overload beyond 150% for 1 minute is faced by the UPS
- iii. If both UPS sense over temperature (i.e. inverter exceeding 85 Deg Celsius simultaneously).

If both the UPS inverters are put-off

2.	MTBF of the System:	Minimum 150000 Hrs
3.	Capacity:	20 KVA at power factor 0.9
4.	Overall Efficiency: (From I/P to O/P of the U.P.S. system)	>94% (for all loads from 50% to 100%)

C. Feature of Rectifier Section of UPS

S. No.	Parameters	Specifications
1.	Technology	DSP Controlled IGBT Rectifier to reduce the harmonics.
2.	Input	3-phase, 4-wire plus Ground
3.	Input Voltage	320 to 475 V (at full load)
4.	Input Frequency	47 – 53 Hz
5.	Input Power factor	≥0.99
6.	Input Current Harmonic Distortion (THDi)	≤ 3%
7.	Soft Start (0-100%)	> 10 Sec

Note: Bidder should Specify the following Parameters for quoted UPS system

i)	Rectifier Input current (Max.)	
ii)	Max. Rectifier output current	
iii)	Rated Output current (with battery in fully charged state)	
iv)	Max. Output Voltage	

D. Feature of Inverter of UPS:

1.	Technology	Fully DSP based IGBT/PWM Inverter
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2.	Output Voltage a) Nominal: b) Static:	3-phase, 4-wire plus Ground 380V- 415V AC (adjustable), 50Hz 400 \pm 1% V AC, 50Hz
3.	Output voltage regulation: a) 100% Balanced load b) 100% Unbalanced load c) Transient response (100% step loading) d) Recovery time to steady state (\pm 1%)	< \pm 1% \pm 2% < 5% < 5 msec.
4.	Output frequency regulation a) Line Connection: b) Self-Connection:	\pm 1% (meeting input frequency range of 47-53 Hz.) \pm 0.05%
5.	Output voltage Distortion: (at rated load)	< 1% linear load, <3% non-linear load with 3:1 crest factor
6.	Audible noise level at 1 meter	58 dBA or better
7.	Overload capacity: (a) Inverter (b) Bypass Mode	Upto 110% --10 min, Upto 133% --1 min Upto 110% continuously at rated current 110% to 150% 10 min > 150% 2 seconds
8.	RFSuppressions:	As per BIS & EMC standard.
9.	Computer Interface:	RS 232/RJ45 Interface
10.	On- Line Battery testing:	Required
11.	(a) Mains failure, (b) Battery Low, (c) UPS Fault	Bidder to provide Audio/Visual alarm at remote location.

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12.	Front panel Display (Please submit the details of front panel display)	LED mimic with LCD display. The LCD should display the following: a) Input side: i) Voltage ii) Current iii) Frequency b) Output side: i) Voltage ii) Current (RMS value) iii) Frequency c) Intermediate DC: i) Voltage ii) Current iii) Remaining time (in minutes) d) Bypass: i) Voltage ii) Current iii) Frequency e) Alarm History
<p>Note: Bidder should Specify the following Parameters for quoted UPS system</p> <p>i) Total system losses at nominal load (with charged battery)</p> <p>ii) Size of LCD panel for monitoring should be 50 x 100 mm minimum</p>		

E. Battery Bank & Battery of UPS System

The bidder should submit battery sizing calculation from Battery OEM justifying following points:

- No. of Cells
- Capacity of Cell (Ah), (By considering the K factor, efficiency of system, Temperature correction factor, Ageing correction factor, etc.)
- DC bus voltage
- Minimum surface area required for installation of battery bank

1.	Battery Bank Capacity	Minimum 18000 VAH (for each UPS)
2.	Nominal output current capacity	Minimum 42 AH
3.	No. of Battery String	1 no. for each Battery Bank (one battery bank with each UPS)
4.	DC Voltage of the battery bank	Should be Minimum 360 V

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5.	Type:	12 V of Maintenance Free Valve Regulated Lead Acid (VRLA) . (Please submit the catalogue of offered battery) with its detailed specifications along with the charging & discharging characteristics (Graphs from the OEM).
6.	Backup time:	Minimum 15 minutes (at the End of Life (EOL) of Battery) for 100 % load with each UPS system
7.	Charging Voltage	Float: 2.23-2.27 V per Cell at 27°C
8.	Cutoff Voltage	1.70-1.75 V per Cell (should be Selectable)
9.	Floating Voltage regulation between no load & full load.	< 2% or better.
10.	CODES & STANDARDS	The supplying battery manufacturer shall be ISO 14001:2015 certified. The battery design shall be of proven technology. The manufacturer shall have 5 years of field experience. ISO 14001:2015. Certificate Copy for 'VRLA Battery' must be attached with the offer.
11.	DESIGN	All cells within the battery string shall be of the same manufacturer and model. The cells shall be "valve-regulated" (maintenance free) type.
12.	Life	4 Years minimum designed life at 27 degrees C on full float.
13.	Life Cycling Characteristics	Each battery shall be designed to provide 1700 cycles at 20% depth of discharge (DOD) at 27 degrees C and 400 cycles at 80% DOD at 27 degrees C.
14.	Recharge Rate	The battery shall be capable of a 90% recharge within 12 hours.
15.	Operating Temperatures and altitude	The battery shall be capable of operating in temperatures ranging from 0°C to +40°C. Battery shall withstand hard freezing without damage to the alloy, plates, or cell container assembly. The battery shall be capable of operating at a maximum of 2000m from ground level (AMSL).
16.	Gassing	No special ventilation shall be required under normal operating conditions. No specialized "battery room" shall be required to house the battery unit.
17.	Battery Orientation	Battery shall have front or Top accessible terminals with clear removable covers to facilitate visual inspections and allow ease of service.
18.	Self-Discharge	The battery shall have a maximum self-discharge rate of 0.5-1.0% per week at 27°C.
19.	Housing	The Battery system should be installed & supplied with M S Racks (stand).

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20.	Product Identification Label	Each battery shall have a self-adhering label identifying the product manufacturer, model and nominal Amp/Hour capacity. The label must be readily visible from the front of the battery. The label shall not wear out throughout the life of the battery.
21.	Capacity Testing	Each cell shall be capacity tested at the manufacturing facility as per standard battery testing procedure. For each battery, battery performance tables and curves shall be submitted with the supply. The curves may be obtained by test or by calculation.
22.	Leak Detection	Integrity of the container and post seals shall be verified in the cell manufacturing process using an automated helium leak detection process.
23.	Seismic Requirements	Cells shall be packaged in steel modules that meet Seismic requirements when stacked horizontally.
24.	Accessories	<p>Each battery shall be furnished with the following accessories:</p> <ol style="list-style-type: none"> 1. Each battery system shall include the necessary inter-module connectors and terminal plates. The connectors shall be lead-tin plated copper and shall include stainless steel hardware. 2. Assembly and connection drawings. 3. Each module shall include an easily removable transparent "snap on" safety shield to cover all connectors.

5.7.4 Power Distribution Panel (PDP) & Sub Distribution Board (SDB)

Essential Features:

- i. PDP shall have 100 A 440V 4 pole MCCB for control of input Power Supply.
- ii. PDP shall have 3 Phase TPN input busbar (one input and 4 outputs through 4 pole industrial MCBs).
- iii. PDP shall have 100 A, 3 Phase 4 pole UPS bypass changeover switch (two input and one output).
- iv. PDP shall have 3 Phase TPN output busbar (one input and 4 outputs through 4 pole industrial MCBs).
- v. PDP shall have provision of digital Volt meter, CT based digital current meter, phase indicator and double earthing connection points.
- vi. SDB shall have one incoming power supply controlled by 4 pole industrial MCB and outgoing power supply shall be connected to all Racks to meet the requirement of all supplied equipment, controlled by suitable industrial MCBs

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with 30% spare capacity to connect additional load in future. SDB shall have provision of double earthing connection points.

- vii. Bidder shall affix permanently in a conspicuous position a danger notice in Hindi and English adequate number of Danger/Caution board on all the PDP/SDB etc. to effectively warn individuals of high-voltage electrical hazards and promote safety.
- viii. Successful bidder shall submit schematic diagram in advance before installation of PDP and SDB for approval.

5.7.5 Mains Distribution Units (MDU)

- i) Every rack should have minimum two nos. of Mains Distribution units (MDUs) with sequential delayed output on start up, output status LED and IEC-3 pin for each equipment installed in the rack. Each MDU shall have inbuilt or external, dual input, single phase automatic power transfer/static switch.
- ii) All Equipment which have dual power supply unit shall be connected directly from both MDUs

S. No.	Parameter	Specification
1	No. of fused outlets with IEC 3-Pin Connectors in each MDU	12 nos. or more
2	Primary Power Supply	220/240 V AC nominal, Single phase, (50 +/- 2)Hz
3	Current (Max)	16 Amp

5.7.6 Earthing System

- a. Earth pits should consist of Copper Earth electrode (diameter 20 mm (min)), insulated copper strip/wire (75 Sq. MM (Min)), Chemical earth fill compound with fast discharge characteristics, water absorbing gel, perforated Hard HDPE pipe (diameter 40 mm (min)), funnel, water supply provision upto each earth pit (preferably from A/c condenser), 10 feet depth (min) and 1 feet diameter (min.). Earth pit should be prepared so that earth resistance is less than 1 ohms –typical depth of earth pit is 10 feet minimum. (Sample picture is enclosed at DRG No. 4).
- b. All earth pits shall be extended upto earth terminals mounted on wall with insulated copper strip (75 Sq.mm (Min)) in the equipment room. All equipment racks shall be directly connected to Earth Terminals with insulated multi strand copper wire (25 sq mm (Min)) with copper lugs at both ends. (Sample picture is enclosed at DRG No. 5).
- c. The earth resistance should be less than 1 ohm. In case of hilly terrain/Rock area, etc. If earth resistance of new pit is more than 1 ohm, Bidder shall make upto four similar earth pits and connect it parallel to achieve minimum possible earth resistance.

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6. Physical, Environmental and Mechanical Specifications

6.1 Power Supply :

Equipment shall operate from a wide range of power supply voltages without interruption or damage.

6.2 Environmental Specifications (wherever not mentioned)

Sl.	Parameter	Specification
1	Operating Temperature (Indoor)	5°C to 35°C
2	Operating Temperature (Outdoor)	-10°C to 50°C
3	Storage Temperature	-10°C to 60°C
4	Humidity (Indoor)	5 to 85% non-condensing
5	Humidity (Outdoor)	10 to 95%
6	Altitude	2 to 1000 m

6.3 Mechanical Specifications

Sl.	Parameter	Specification
1	Construction	Modular approach, EIA RS-310C, 19" rack mount
2	Cooling	Internal circulation fan wherever applicable
3	Mounting	Equipment shall be rack mounted and required number of racks shall be supplied pre-wired to house all the supplied equipment.

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7. COMPLEMENT OF EQUIPMENT:

- a) The make and model/part no. of each and every equipment/item/installation material etc. should be clearly mentioned in the offered Bill of Material (BOM).
- b) The suggestive Bill of Material (BOM) has been provided in **Annexure-I of Appendix-D**. The bidder is required to provide the complete list of equipment, software and accessories etc. offered to meet the requirement as per DD specifications. The quantity of each item including sub-module, licenses etc. are to be specified clearly and compulsorily, failing which the bid is liable to be rejected summarily. The following is the proforma for the BOM:

Sr. No.	Description of the item as per specification (suggestive BOM)	Description of items offered by bidder	Quantity as per suggestive BOM	Quantity offered by the Bidder	Make Offered	Model Offered
1.	2.	3.	4.	5.	6.	7.

- c) The bidder should provide the offered un-priced Bill of Material in electronic form with the priced bid for ease of technical evaluation.

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8. GENERAL

8.1 Compliance and OEM Authorisation

- a) Bidder must submit a point-by-point compliance statement in respect of all the points, sub-points and pares laid down in this specification from page 1 in the format as indicated below along with bid.

Sr. No. of DD specs.	DD specs.	Compliance (Yes/No)	Performance fig. of equipment offered.	Deviations, in case of non-compliance	Optional items if any required to make the system Compliant to DD specs.	Features in the system offered Which exceed DD specs.	Page No.	Remarks
1	----							
2	----							
3	----							

- b) In addition to the above, compliance from respective OEMs (not from their Indian representatives) in respect of the equipment as listed below should necessarily be given, in respect of all the points, sub-points and pares laid down in the Technical Specification of the respective equipment in the format as given above. The OEM should necessarily record the performance figure of the equipment offered in the quote for which the compliance statement is required.

A	Input and Base Band System
1.	Analog Audio & HD/SD-SDI Video Multiplexer Unit (Embedder)
2.	Analog Audio & HD/SD-SDI Video De-multiplexer unit (De-Embedder)
3.	HD-SDI & SD-SDI Distribution Amplifier (DA) and Rack frame (Chassis)
4.	OFC Link from MSR to ES (Optical transmitter, receiver and optical fiber cable)
B	Digital Compression System
1.	32x32 SDI Router
2.	Encoder
3.	IP Data Switch
C	Satellite Modulator
1.	Digital satellite Modulator
2.	IF Redundancy Switch
D	RF System
1.	C Band Up convertor
2.	RF Redundancy Switch
3.	High Power Amplifier (HPA)

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4.	Waveguide
5.	Waveguide Switch
6.	Automatic Waveguide Dehydrator
E	Monitoring system
1.	Professional IRD
2.	70 to L Band Up Converter
3.	C Band Uplink to L Band Converter (TLT)
4.	C Band Downlink to L Band Converter
5.	17 inch (nominal) TFT Monitor
6.	8 Channel Audio/Video Monitor
7.	Dual 9" video monitor
F	Measuring Equipment
1.	Spectrum Analyser
E	Power Supply System
1.	Isolation Transformer
2.	AVR
3.	UPS system including Battery Bank

- c) Mere signature on a copy of Doordarshan specifications shall not be accepted as a compliance statement.
- d) The compliance statement in respect of Technical Specifications of the equipment should be supported by highlighted record of these in the relevant technical literature/data sheets of respective equipment enclosed with the tender and a clear reference (with volume number and page number of tender documents) to the attached supporting document should be given in the remarks column against each & every specs. Any offer without proper supporting document of each & every specs and containing only a commercial hand out/pamphlet is liable to be rejected.
- e) Data sheets in respect of all offered equipment should be submitted. Any deviation from the specification detailed in the compliance statement is to be highlighted separately. Page no. of location of data sheet should be given in page no. column of the compliance statement.
- f) Offers without proper & duly completed compliance statement are likely to be rejected with the sole responsibility of bidder and no further claim/correspondence will be entertained.
- g) The bidder is also required to submit authorization in respect of the equipment as listed above at Sl. No. 8.1(b) in their favour from respective OEMs (not from their Indian representatives) on their letter heads along with the bid **as prescribed in Annexure II of Appendix-D.**

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[Signature]

[Signature]

8.2 Documentation:

- a) One set of technical manual for all the equipment are to be provided along with the tender to facilitate the technical evaluation, otherwise the tender is liable to be ignored.
- b) The successful bidder will have to supply set of printed technical & user manuals along with factory test report of all the offered equipment.
- c) Operation Manual for all equipment should also be supplied on DVD/USB with search facility.
- d) All offered software should have perpetual validity and should be in the name of Doordarshan. All software backups should also be supplied on DVD/USBs.
- e) For facilitating maintenance issues, the bidder must submit the firm's self certified copies of Bill of Entry/Bill of Laden/Custom Invoice of all imported items to DG:DD.
- f) The successful bidder must ensure that all Invoices bear serial numbers of equipment to meet the requirement of WPC.

8.3 Guarantee/Warranty and After Sales Support:

The Guarantee, warranty of material and workmanship will be covered by General Terms and Conditions (GTC) at APPENDIX-B of the Bid document except the following:

- a) All the offered equipment shall be guaranteed against any manufacturing defect for a period of **5 (Five)** years from the date of Commissioning.
- b) Any part failing during the guarantee period shall be repaired/replaced free of charge by the successful bidder at site. For repairing of any defective equipment during guarantee period, the defective module or equipment requiring repairs will be handed over to local office/local authorized representative/ dealer who will arrange repairs locally at site or send/export the defective modules to OEM factory and re-import/send back after repairs.
- c) It is the responsibility of local office/ Authorized representative/ dealer of the bidder to arrange the repair/ replacement of faulty items for Doordarshan i.e. no transportation charges would be paid by DD for transporting the defective/ repaired items, if required to be removed from site, during the guarantee period.
- d) Guarantee period of Equipment or spare parts thereof replaced is to be extended for individual Earth Station as follows:
 - i. If the failure rectification takes more than 30 days time for any one or more equipment listed in table A, Guarantee period of all equipments offered with the tender is to be extended corresponding to the outage period from the date of acceptance.

Sr.No..	Equipment
A	32x32SDI Router
B	Encoder
C	Digital Satellite Modulator
D	IF Redundancy Switch
E	C Band Up convertor
F	RF Redundancy Switch

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G	2:1 C band Combiner
H	HPA System
I	Waveguide

- ii. If the failure rectification takes more than 30 days time for any equipment among the remaining offered equipment (i.e. other than mentioned in Table-A) , Guarantee period of only those equipment is to be extended corresponding to the outage period from the date of acceptance.
- iii. Further, in the above mentioned cases in para a & b, Equipment or spare parts thereof replaced shall have further warranty for a period of 12 months from the date of acceptance or as per para 8.3.4.(i) & 8.3.4.(ii) , which ever be later.
- e) If bidder is not the OEM, then the guarantee/ warrantee in respect of the equipment as mentioned in Clause 8.1(b) shall be provided by the bidder through respective OEMs. **A certificate, duly signed by the OEM on the OEM letterhead, in this regard of the respective equipment must be submitted with the offer by the bidder as prescribed in Annexure III of Appendix-D.**
- f) If bidder is not the OEM, then after sales service support for additional **2 (Two) years** for the repairs/ maintenance in respect of the equipment as mentioned in Clause 8.1(b) after the completion of guarantee/ warrantee period shall also be provided by the OEM either directly or through his representative in India. **A certificate, duly signed by the OEM on the OEM letterhead, in this regard of the respective equipment must be submitted with the offer by the bidder as prescribed in Annexure IV of Appendix-D.**

8.4 Inspection and Commissioning:

The inspection of material will be carried out by the authority specified in the Purchase order. The material will be accepted only after the same has been found satisfactory after inspection and duly marked and sealed by the Inspection Authority, In addition to "General Terms and Conditions" (GTC) at Appendix-B of the Bid document, the inspection of material/equipment will be carried out as follows:

- 8.4.1 All the equipment to be supplied against this A/T (Purchase Order) for this tender shall be subjected to pre-installation inspection at Doordarshan Site by Doordarshan Officer appointed by Doordarshan Directorate. The pre-installation inspection shall be based on manufacturer's factory test results and physical verification of make and model of equipment. The successful bidder should produce the factory test reports of the offered equipment to facilitate inspection
- 8.4.2 Post installation inspection and commissioning of the system will be carried out by a team of Doordarshan Officers authorized by Doordarshan Directorate and based on approved Acceptance Test Procedure (ATP).
- 8.4.3 A draft copy of ATP (Acceptance Test Procedure) must be submitted by the successful bidder one month in advance of the proposed date of inspection of the installed system to Doordarshan Directorate for approval. ATP should describe the standard test procedure of individual equipment and overall system. The factory test report will not be treated as ATP.

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- 8.4.4 The approved ATP with or without changes shall be sent back to the successful bidder to be used for inspection and commissioning of the installed system by DD Engineer(s) at site. All the equipment required for the inspection as per the approved ATP are to be provided by the successful bidder.
- 8.4.5 The SITC certificate will be issued by the team of Officers appointed at S.N. 8.4.2 above.

8.5 Delivery Period:

Six months from the date of issue of purchase order(AT) by Doordarshan to the successful bidder.

8.6 Pre-Bid Conference:

- a) A pre bid conference on technical Specifications and other issues shall be held on date and time specified in the NIT. All prospective bidders may attend the pre bid conference to discuss their queries and suggestions.
- b) All the queries and suggestions should be sent to Doordarshan at least 2 days before the date of pre bid conference. No queries/ suggestions shall be entertained after pre bid conference.
- c) Amendments subsequent to the pre bid conference shall be sent to prospective bidders, who have purchased tender document by e-mail/fax/post/uploaded on website.
- d) It shall be bidder's responsibility to check for any amendments/addendum on the website before submitting their duly completed bids.

8.7 Check List and Enclosures:

The bidders may ensure the following check list while submitting the bid including some important list of enclosures for ease of technical evaluation (**Annexure V of Appendix-D**).

- a) Whether documents related to fulfilment of the eligibility criteria as per Clause 3 have been submitted.
- b) Whether the BOM has been submitted in the prescribed format as given in Clause 6.
- c) Ensure that all equipment and accessories as given in Annexure-1 have been included in the offered BOM.
- d) Whether the compliance statement from the bidder as required in Clause 8.1 (a) has been submitted.
- e) Whether the compliance statements from the respective OEMs for equipment/system mentioned in Clause 8.1 (b) have been included.
- f) Whether the Authorization as required vide clause no. 8.1(g) in respect of equipment as mentioned in Clause 8.1 (b) from respective OEMs have been included.
- g) Ensure that the relevant technical brochures/manuals containing all the parameters of technical specifications of all the offered equipment and accessories have been included with proper indexing for ease of identification.

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- h) Whether the page numbers of the relevant enclosed technical data sheet/manual against each parameter of the technical specifications have been given in the compliance statements.
- i) Whether the requisite undertakings for guarantee/warranty and after sales support by OEMs as required vide Clause no. 8.3 have been submitted.
- j) Ensure that no alternate item has been offered.
- k) Ensure that the Un-priced BOM has been included.
- l) Any other item mentioned elsewhere in the tender.

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OEM LETTER HEAD

CERTIFICATE FOR AUTHORIZATION

Date:

Tender No. :

We, M/s (Name and Address of the OEM), do hereby authorize M/s..... (Bidder's name), having its office at (Bidder's address) to submit the bid and sign the contract with Doordarshan for the products offered by us against the above tender.

Signature

Name & Designation of authorized signatory.....

Name of the OEM -

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Signature
20/12/24

Signature

Signature

OEM LETTER HEAD

CERTIFICATE FOR GUARANTEE/WARRANTY

Date:

Tender No. :

We, M/s (Name and address of the OEM), do hereby confirm that:

1. All the offered equipment shall be guaranteed against any defect for a period of **5 (FIVE)** years from the date of Commissioning.
2. Any part failing during the Guarantee/Warranty period shall be repaired/replaced free of charge by the successful bidder at site. For repairing of any defective equipment during Guarantee/Warranty period, the defective module or equipment requiring repairs will be handed over to local office/local authorized representative/ dealer who will arrange repairs locally at site or send/export the defective modules to OEM factory and re-import/send back after repairs.
3. It is the responsibility of M/s -----,(their local office/ Authorized representative/ dealer of the bidder) to arrange the repair/ replacement of faulty items for Doordarshan i.e. no transportation charges would be paid by DD for transporting the defective/ repaired items, if required to be removed from site, during the Guarantee/Warranty period.
4. Guarantee/Warranty period of Equipment or spare parts thereof replaced is to be extended corresponding to the outage period from the date of acceptance, if the failure rectification takes more than 30 days time.
5. All software being offered, are to be licensed to Doordarshan on perpetual basis without specifying any time limit or without specifying end of life of the software. Software upgrades within Guarantee/Warranty period will have to be supplied free of cost.

Signature

Name & Designation of authorized signatory.....

Name of the OEM-

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OEM LETTER HEAD

CERTIFICATE FOR AFTER SALES SERVICE SUPPORT

Date:

Tender No. :

We, M/s (Name and address of the OEM), do hereby confirm that after sales service support for additional **Two (2) years** for the repairs/maintenance of offered products after the completion of **Five (5) Years** guarantee/ warrantee period shall be provided through our representatives/authorized dealer/service provider for the offered equipment and accessories in India as mentioned below:

S. No.	Name of the authorized person	Name & Address of authorized After Sales & Support Office/Firm	Telephone/ Fax	Email of concerned personnel
1				

Signature

Name & Designation of authorized signatory

Name of the OEM-

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BIDDER LETTER HEAD

DECLARATION BY THE BIDDER

1. Bill of Material (BOM)- : [Yes/No]
2. Bidder's compliance (As per specs clause no. 8.1.(a)) : [Yes/No]
3. The copy of Dealer Possession License in case of possession of RF equipment (if applicable) : [Yes/No]
4. Copy of the Memorandum of Understanding (MOU) of Consortium/Joint Venture (If Applicable)(as per clause no. 3.8) : [Yes/No]
5. OEM Compliance for following equipment from their respective OEMs (as per clause no. 8.1.(b)):

S. No.	Name of equipment	Name of OEM	OEM compliance submitted (Yes/ No)
i			
ii			

6. Certificate for Authorization for following equipment from their respective OEMs:

S.No.	Name of equipment	Name of OEM	Authorization certificate submitted (Yes/ No)
i.			
ii.			
iii.			

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7. Certificate for Guarantee/Warranty for following equipment from their respective OEMs:

S.No	Name of equipment	Name of OEM	Guarantee certificate submitted (Yes/ No)
i.			
ii.			
iii.			

8. Certificate for After sales service support for following equipment from their respective OEMs:

S.No.	Name of equipment	Name of OEM	After sales service support certificate submitted (Yes/ No)
i.			
ii.			
iii.			

9. Datasheet for the offered equipment as per offered BOM: [Yes/No]

- i.
- ii.
- iii.

Signature

Name & Designation of authorized signatory.....

Name of the Bidder -

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BIDDER'S LETTER HEAD

CERTIFICATE FOR WORK EXPERIENCE

Date:

Tender No. :

We, M/s <Name and address of the bidder>, do hereby confirm that details of Work Experience are as follows:

S. No	Description of Work Experience of the Bidder	Details of Work Order No. with date	Copy of Work Order upload ed with bid (YES/NO)	Sr. No. of work/item of the uploaded work order to be considered for work experience of the bidder	Amount /Value in Rupees of the work to be considered for work experience of the bidder	Bidder's Work Experience Category (Please select anyone option i.e. (a)One work of 80% or (b)Two work of 60% or (c)Three work of 40% of Estimated Cost)
1						
2						
3						

Signature

Name & Designation of authorized signatory of the Bidder.....

Name of the Bidder.....

Stamp of the Bidder

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20/12/24

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Annexure VIII of Appendix-D

LIST OF TOOLS

S. No.	Tools	Qty.
(1)	Soldering and de-soldering station	1 Set
(2)	T-Handle Hex Allen Keys Set	1 Set
(3)	Flat & Star Head Screw driver Set	1 Set
(4)	Flat & Star watch maker Screw Driver Set	1 Set
(5)	Flat Plier	1 No.
(6)	Nose Plier	1 No.
(7)	Edge Cutter	2 No.
(8)	Wire Stripper	1 No.
(9)	Crimping Tool for RG11 and RG59U Cable	1 No.
(10)	Crimping Tool for RJ11 and RJ45 Cable	1 No.
(11)	BNC Puller	1 No.
(12)	Crimping Tool for Power Cable	1 Set
(13)	Box Spanner Set	1 Set
(14)	D-Spanner Set	1 Set
(15)	Ring Spanner Set	1 Set
(16)	Adjustable Wrench	1 No.
(17)	File Set	1 Set
(18)	Handheld Magnifying Glass	1 No.
(19)	Toolkit Box (Hard case type)	1 No.
(20)	Battery operated multifunctional (screw, unscrew, drilling etc.) hand machine with battery charger and other accessories.	1 Set
(21)	Digital Multi meter	1 No.
(22)	Digital clamp-on Meter	1 No.
(23)	Handheld Ethernet tester	1 No.
(23)	Any other special tool required as per offered equipment	1 Set

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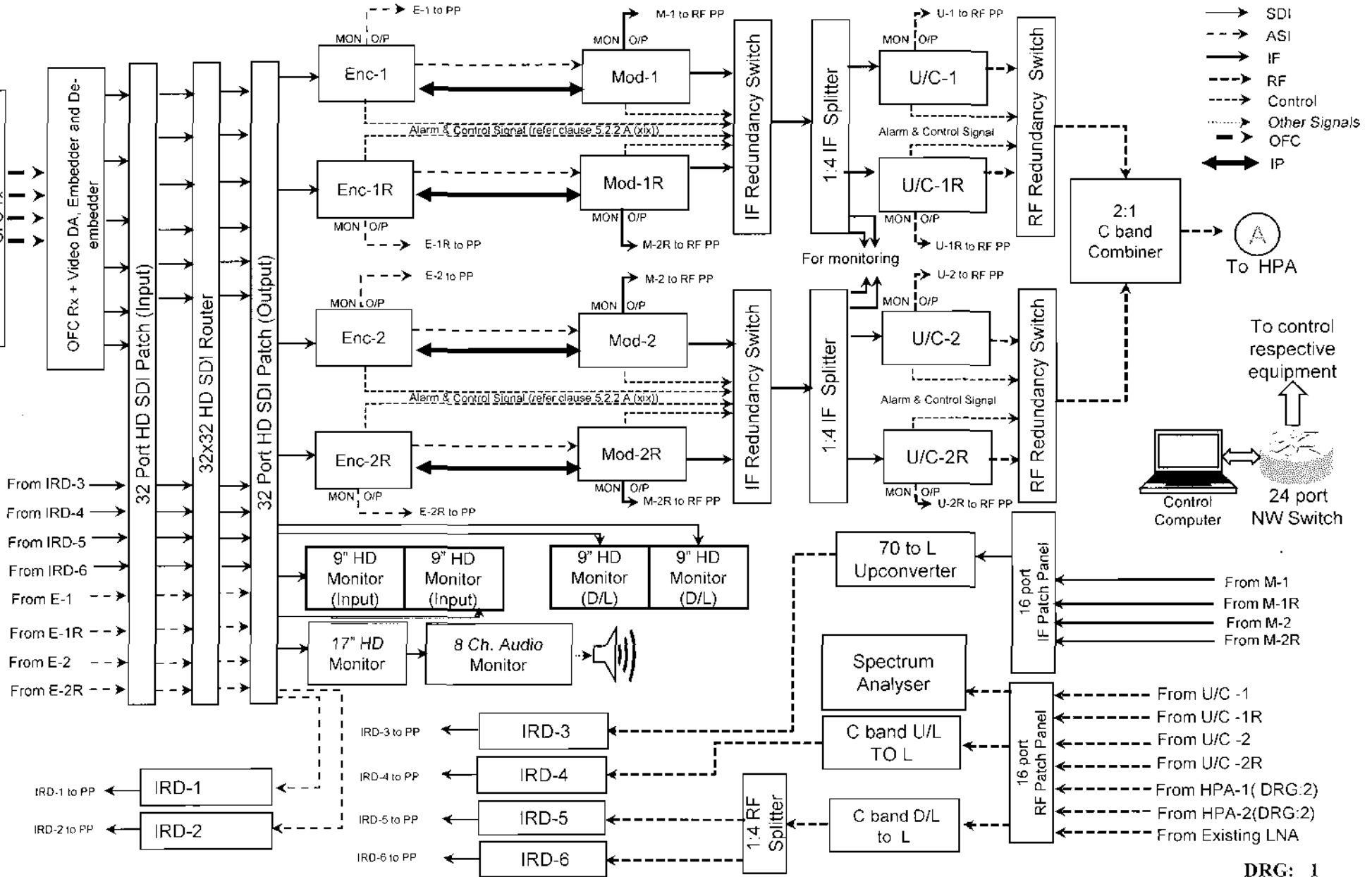
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Suggestive Block Schematic for Upgradation & Replacement of Earth Stations at DDK Guwahati, Shillong and Aizwal

Annexure VII of Appendix-D (DRG No. 1 to 5)

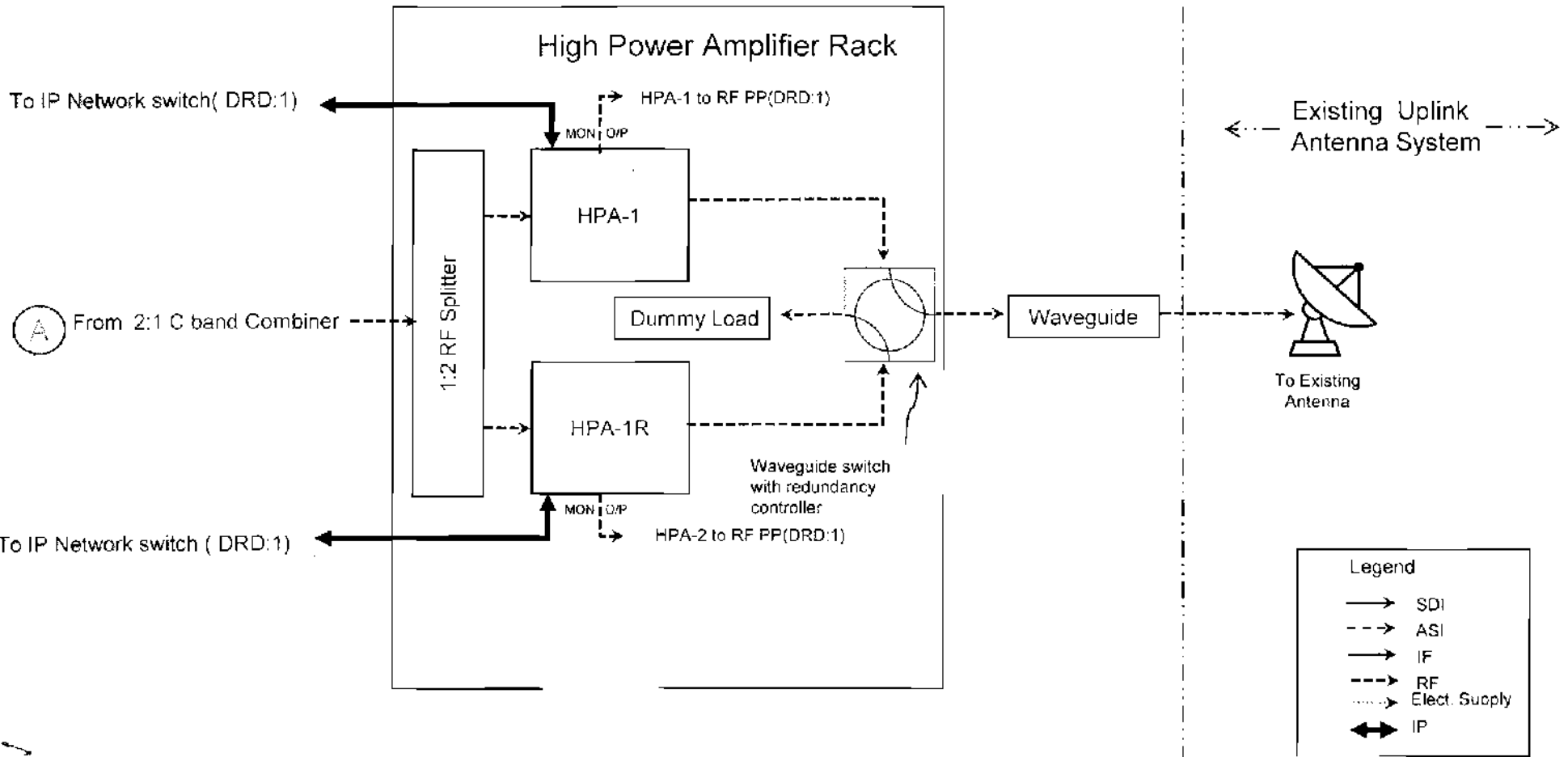
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12/2/24



DRG: 1

Suggestive Block Schematic Of HPA System for Upgradation & Replacement of Earth Stations at DDK Guwahati, Shillong and Aizwal

Amirulhaqul
20/11/24



(A) From 2:1 C band Combiner

To IP Network switch (DRD:1)

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Legend

- SDI
- - - ASI
- |— IF
- - -|— RF
- Elect. Supply
- ↔ IP

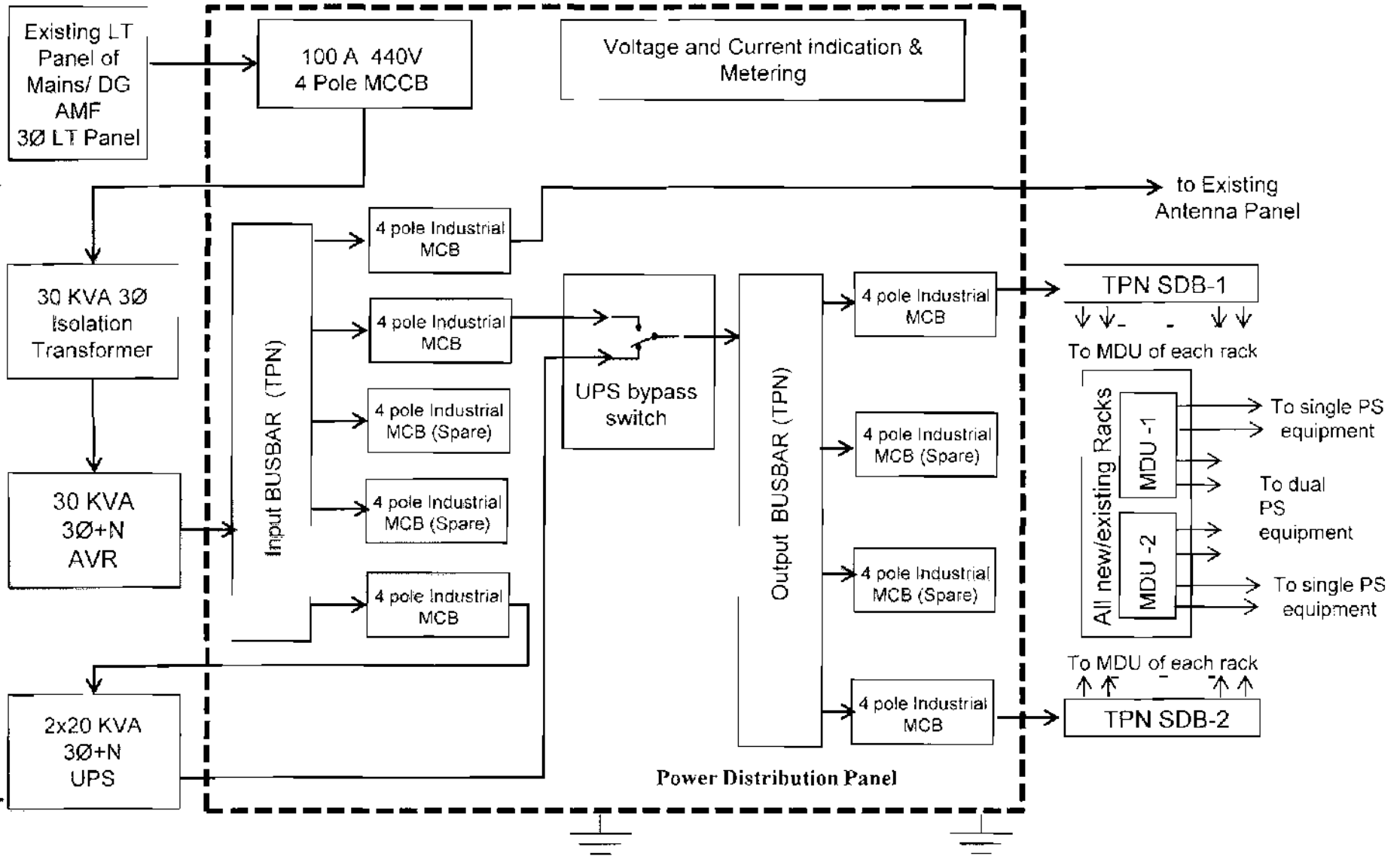
DRG: 2

Suggestive Block Schematic for Upgradation & Replacement of Earth Stations at DDK Guwahati, Shillong and Aizwal (Essential Power Supply System)

Handwritten note: Minimum 2m lead

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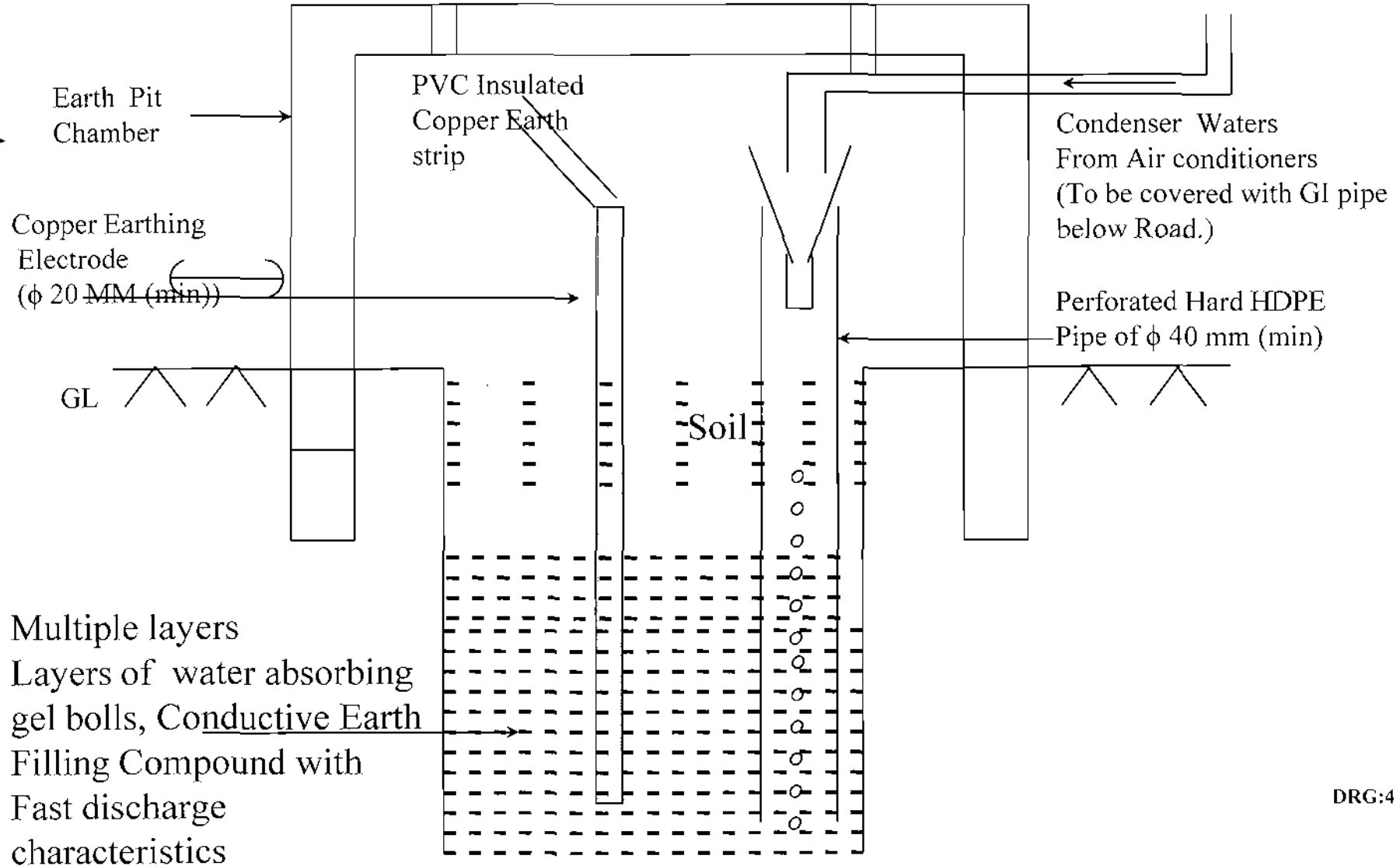
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DRG:3

Suggestive Block Schematic for Upgradation & Replacement of Earth Stations at DDK Guwahati, Shillong and Aizwal : Earth Pit

Handwritten: Himanshu
20/12/24
Cool



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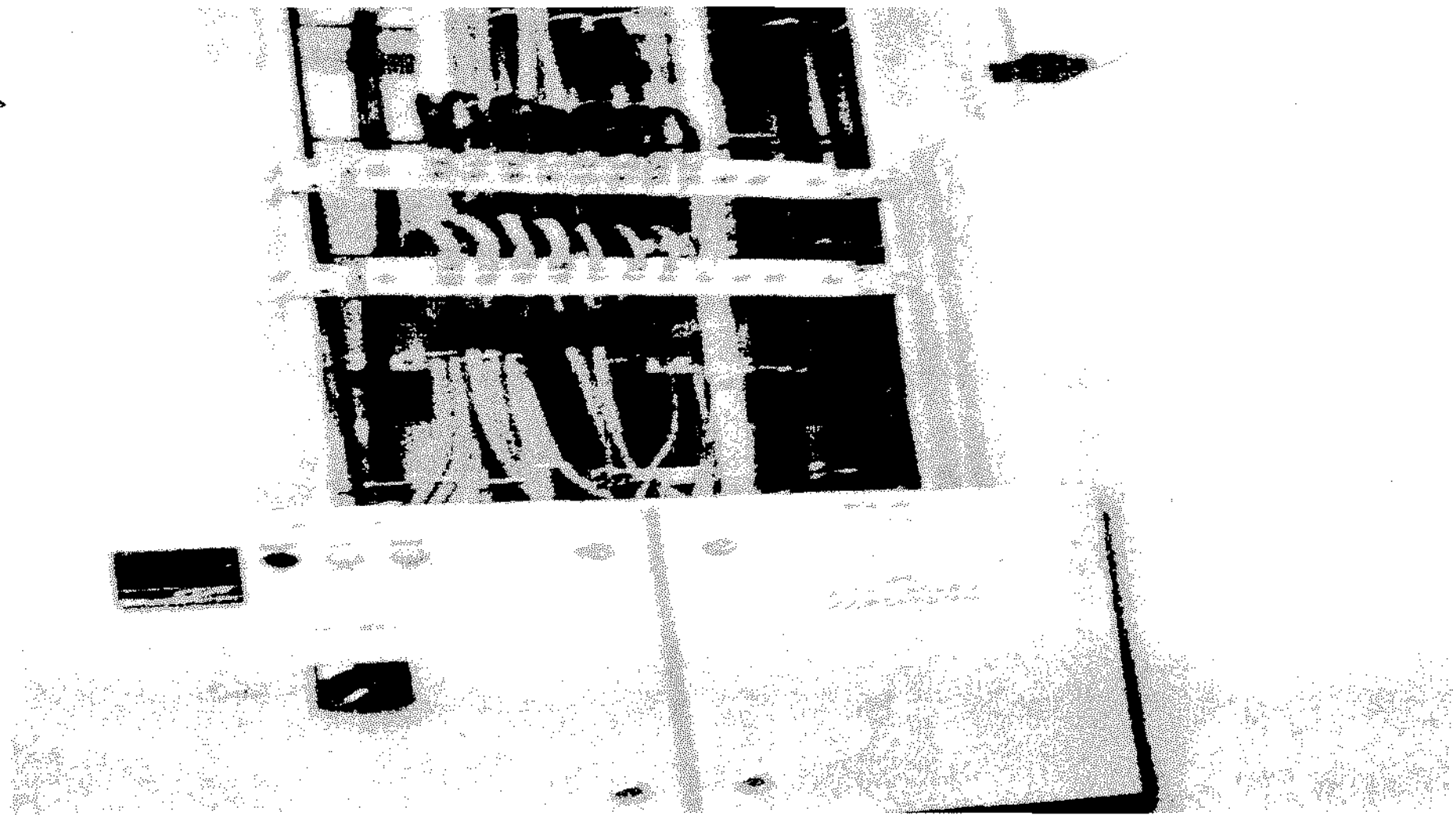
DRG:4

Suggestive Block Schematic for Upgradation & Replacement of Earth Stations at DDK Guwahati, Shillong and Aizwal : Earth Terminal

Amir Khan
20/12/24
Conf

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DRG: 5

No.	Description (Suggestive BOM)	Qty. per site	Total Qty.	Budgetary Quote Price
A. Link from MSR to Earth Station consisting of:				
1	Analog Audio & HD/SD-SDI Video Multiplexer Unit (Embedder) along with suitable breakout cables.	2 Nos.	6 Nos.	
2	Analog Audio & HD/SD-SDI Video De-multiplexer unit (De-Embedder) alongwith suitable breakout cables.	2 Nos.	6 Nos.	
3	HD-SDI & SD-SDI Distribution Amplifier (DA) with reclocking (i.e. 1:4 or more output).	2 Nos.	6 Nos.	
4	19 inch Rack Frame Mounting (Chassis) with auto switchable redundant Power Supply Unit.	1 No.	3 Nos.	
5	Digital Video Cable alongwith suitable connectors to be laid for redundancy between MSR and Earth Station to transport video with embedded audio and for interconnection upto input of 32x32 router	400M	1200M	
B. OFC Link from MSR to ES consisting of consisting of:				
6	Single channel Optical Transmitter unit.	4 nos.	12 nos.	
7	Single channel Optical receiver unit.	4 nos.	12 nos.	
8	Chassis to house the above OFC Link units with dual power supply units and control card (One chassis to be installed in MSR and one in Earth Station).	2 sets	6 sets	
9	Water resistant, Armoured optical fiber cable (8 core)	200 M	600 M	
10	Any other item found essential to meet DD specifications. Note: If offered, bidder must provide the detail.	1 lot	3 lots	
C. Compression System consisting of:				
11	32 x 32 SDI/ASI router with one XY Control panel and single bus remote control panel.	1 No.	3 Nos.	
12	32 port HD-SDI patch panel 1 RU, normal through, self terminating type suitable up to 3 Gbps bandwidth, 20 dB return loss and 75 ohm normal through type. (One for SDI/ASI Router I/P & one for SDI/ASI Router O/P)	2 Nos.	6 Nos.	
13	HD-SDI 32 port termination panel, 75 Ohm Impedence for all input and output ports of SDI Router	2 Nos.	6 Nos.	
14	MPEG 4 Encoders in (1+1) redundancy configuration consisting of : Digital Encoder operating in 4:2:0 and 4:2:2 mode with MPEG-4 & MPEG-2 compression (Noise reduction hardware/software for encoders BISS-1 & BISS-E Software for Encoders Internal Remux Option, Audio options Auxiliary data input option etc as per specs)	4 Nos.	12 Nos.	
15	Essential item to complete the installation of Compression system if any. Note. If offered, bidder must provide the detail	1 Set	3 Sets	
D. IF System and Up converter System in (1+1) configuration consisting of:				
16	Digital Satellite Modulators in (1+1) mode consisting of: Digital Satellite Modulators capable of Modulating in DVB-S and DVB-S2 (one at a time) .	4 Nos.	12 Nos.	
17	IF Redundancy switch for managing redundancy of above Modulators.	2 Nos.	6 Nos.	
18	1:4 passive IF splitter	2 Nos.	6 Nos.	
19	C Band Up converter	4 Nos.	12 Nos.	
20	RF Redundancy switch (C- band) for upconverters	2 Nos.	6 Nos.	
21	2:1 RF Combiner(C- Band)	1 No.	3 Nos.	
22	Essential item to complete the installation of IF and Up converter system if any. Note: if offered, bidder must provide the detail	1 lot	3 lots	
E. TWT High Power Amplifier system in 1+1 configuration consisting of:				
23	400 watt C-Band Linear Power TWTA with integral lineariser (Indoor type)	2 Nos.	6 Nos.	
24	Redundancy Controller for above 1+1 configuration of HPA	1 No.	3 Nos.	
25	1:2 low power RF Splitter (C-Band uplink frequency) (To be mounted in HPA Rack)	1 No.	3 Nos.	
26	Waveguide switch with rack mounting kit for 1+1 Redundant 400W Linear Power TWT HPA system	1 No.	3 Nos.	
27	Inter connecting rigid wave guide assembly with bends from each HPA to Waveguide switch.	1 lot	3 lots	
28	Dummy Load / Termination for 5.85 to 6.425 GHz Frequency (Min 1000 Watts, VSWR < 1.1) along with accessories	1 No.	3 Nos.	
29	Automatic Dehydrator (3-5 PSI user configurable) with required accessories and front panel Display with remote access through ethernet/SNMP etc and rack mounting kit.	1 set	3 sets	
30	Pre-wired Rack for 1+1 Redundant 400 W linear Power TWT/SSPA HPA system with MDU	1 set	3 sets	
31	Essential item to complete the installation of HPA System (if any) Note: If offered, bidder must provide the detail	1 Set	3 sets	
F. RF Rigid waveguide, Flexible waveguide, Waveguide E plane, H Plane, Twisted Waveguide, Connectors etc.				
32	C-Band, 90 degree rigid waveguide bend with CPR 137F/G Flange connector as below:			
	i) H-plane bend	1 No.	3 Nos.	
	ii) E-plane bend	1 No.	3 Nos.	
33	Cross Guide Directional Coupler for Frequency range 5.85 to 6.425 GHz with CPR 137 F/G Flange connector	2 Nos.	6 Nos.	
34	C-Band, Twisted rigid waveguide, clockwise with CPR 137 F/G Flange connector	2 Nos.	6 Nos.	
35	Supply of Flexible Waveguide with CPR 137G Flange connector at one end and CPR 137F Flange connector at other end as per detailed below:-			

Himanshu
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No.	Description of Item as per Specification (Suggestive BOM)	Qty. per site	Total Qty.	Budgetary Quote Price
	i) Length-0.6 mtr with gasket and screw kit	2 sets	6 sets	
	ii) Length 1.0 mtr with gasket and screw kit	2 sets	6 sets	
36	Supply of Flexible Waveguide with CPR 137 F/G Flange connector as per detailed below:			
	i) Length-0.6 mtr with gasket and screw kit	2 sets	6 sets	
	ii) Length 1.0 mtr with gasket and screw kit	2 sets	6 sets	
37	Aluminum duct or HDPE pipe as per site requirement of suitable size to take out hot air of each HPA from HPA room to outside the room (Minimum length-4 mtr).	1 No.	3 Nos.	
38	16 port or more C-band RF Patch Panel with N-type Female connector at both end having gold plated inner pin, 2 RU, 19" Rack mountable.	1 No.	3 Nos.	
39	20 port or more L-band Patch Panel with F-type Female connector having gold plated inner pin, 19" Rack mountable.	1 No.	3 Nos.	
40	Elliptical (Semi Rigid) RF Waveguide to connect existing uplink Antenna system as per site requirement (Length 2.0 mtr. Diameter 50 mm. Axial 175 mm)	1 Set	3 sets	
41	Suitable waveguide connector for connecting the Elliptical waveguide at both end having CPR 137G/F flange with gasket and screw kit and pressure window at both end	1 Set	3 sets	
42	Essential item to complete the installation of Waveguide System (if any) Note: If offered, bidder must provide the detail	1 Set	3 sets	
G.	Confidence Monitoring consisting of:			
43	TLT (C-Band uplink frequency to L-Band Down Converter) along with rack mounting kit.	1 Set	3 sets	
44	C Band Down converter (C-Band downlink frequency to L Band Frequency)	1 No.	3 Nos.	
45	Up-converter (70 MHz to L band)	1 No.	3 Nos.	
46	16 port or more C-band RF Patch Panel, with 50 Ohm N-type Female connector at both end having gold plated inner pin, 2 RU, 19" Rack mountable.	1 No.	3 Nos.	
47	16 port or more IF-Patch Panel, with 75 Ohms F-type Female connector having gold plated inner pin 19" Rack mountable.	1 No.	3 Nos.	
48	Prof. IRDs (with ASI and L-band inputs and with DVB-ASI), MPEG-2 TS over IP with service filter, SD-SDI, HD-SDI, AES/EBU, SD & HD SDI embedded stereo, Dolby digital (AC-3) 5.1 audio and Dolby Digital Plus 5.1 Audio) along with MPEG-2, 4:2:0, 4:2:2 and MPEG-4, 4:2:0, 4:2:2 decoding and Common Interface slot hardware and BISS mode -1 & BISS-E decryption facility	6 Nos.	6 Nos.	
49	LCD/TFT 17" Colour monitor with built-in Speaker with SD-SDI and CVBS & Analog Audio inputs with a suitable rack/till mount for proper installation in the monitoring desk.	1 Nos.	3 Nos.	
50	Dual 9" LCD/TFT Monitor with HD/SD-SDI (with embedded audio) and Composite (PAL) Video inputs and suitable power supply (19" Rack mountable)	4 Nos.	4 Nos.	
51	Eight Channel Audio Monitors	1 No.	3 Nos.	
52	4K/ UHD, size - 55 inch or more Display/TV/Panel Units along with Remote, Table Stand Wall Mount Operation manual/User Guide, maintenance manual etc. (in electronic or Printed form)	2 Nos.	6 Nos.	
53	High quality Digital Audio Ampli-Speaker having digital AES/EBU and Analog Audio input facility and suitable power supply	1 Nos.	3 Nos.	
54	L-band splitter (4-Way). One to be installed and one as cold standby	2 Nos.	6 Nos.	
55	Essential item to complete the installation of above monitoring system (if any) Note: If offered, bidder must provide the detail	1 Set	3 sets	
H.	Remote control Computer system Hardware and Software consisting of:			
56	19" Rack Mountable Foldable 17" or bigger display, keyboard (with Digipad & Mouse Switches) with PC (Intel i7 or better processor, 4 GB or More DDR RAM, 800 GB or more HDD, Windows 11 or latest operating system, minimum 4 nos. USB ports, 1 AGP and 3 PCI Slots, Integrated Audio with external speakers to remotely control all the supplied equipments through Ethernet ports and should be connected to all the equipment through Fast Ethernet Switch using properly rack wired CAT-5 or CAT-6 cable and RJ-45 connectors.	1 Lot	3 lots	
57	10/100 Fast Ethernet Switch (24-Ports, one -RU)	1 No.	3 Nos.	
58	Network Laser Printer (Heavy duty) with Ethernet Port	1 No.	3 Nos.	
59	UPS (ONLINE) 1KVA Capacity	1 No.	3 Nos.	
60	CAT-6 Cable with connector for wiring between all equipments and control computer through NW Switch as per site requirement and drawing no 1 & 2. 200 M (Min).	200M	200M	
61	Essential item to complete the installation of Remote Control Computer System (if any) Note: If offered, bidder must provide the detail	1 Set	3 sets	
I	Measuring Equipment consisting of:			
62	Spectrum Analyzer	1 No.	3 Nos.	
J.	Power Supply System consisting of:			
63	30 KVA, Three Phase, Naturally Air cooled type Isolation Transformer	1 No.	3 Nos.	
64	30 KVA, Three Phase, Indoor type, Air-Cooled, Servo Controlled, Automatic Voltage Regulator	1 No.	3 Nos.	
65	20KVA IGBT/PWM based (Rectifier & Inverter), Fully DSP based Double Conversion UPS system in (1+1) configuration (3 Phase input, 3 Phase Output) with synchronisation kit (including Transient Voltage Surge Suppressor (TVSS) in input & output (ANSI/IEEE C62.41 1991 C1 (6KV @ 3KA))).	1 Set	3 sets	

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20/12/24

Lot

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Sr.	Description of Item as per Specification	Qty. per site	Total Qty.	Budgetary Qty. Price
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66	Maintenance Free 12V, VRLA type Battery Bank suitable to provide 15 minutes (minimum) backup (EOL) with each UPS system-18000VAH minimum). Calculation sheet with following details to be provided with the bid. DC Voltage: Battery Capacity: No. of Batteries with each UPS:	2 Set	6 sets	
67	Remote panel with interface cables for monitoring of UPS system in Control Room	1 Set	3 sets	
68	Suitable Power distribution Panel (PDP) including MCCB, Industrial MCBs, Changeover Switch, Voltage & Current metering and bus bar as per drawing no. 3.	1 Set	3 sets	
69	Necessary Mains three phase Sub Distribution Boards (SDB-1 and SDB-2) with industrial MCBs for distributing UPS output to respective equipment racks as per drawing no. 3.	1 Set	3 sets	
70	3/4 core armored aluminium LT Power Supply cables with suitable rating and lugs at both end from existing LT Panel of Mains/ DG AMF LT Panel to PDP as per Drg no. 2. Note: Cable length 3.10m, 1.00 meter, 3.00 meter, 4.00 meter, 4.00 meter, 4.00 meter	1 Lot	3 lots	
71	Copper Power Supply cables with suitable length and rating along with copper lugs at both end between: (i) PDP & Isolation Transformer (ii) Isolation Transformer & AVR (iii) AVR & PDP (iv) PDP & Input of UPS (v) Output of UPS & PDP (vi) PDP & Existing U/L Antenna Panel (vii) PDP & SDB 1 & 2 (viii) SDB 1 to 2 & all racks as per DRG No. 2.	1 lot	3 lots	
72	Essential item to complete the installation of UPS System (if any) Note: If offered, bidder must provide the detail	1 Set	3 sets	
K. Miscellaneous Items for integration of system consisting of:				
73	Digital Video Cable alongwith suitable connectors for interconnection between equipment (Compression chain and Monitoring equipment)	1 lot	3 lots	
74	IF and RF Cable alongwith suitable connectors for interconnection between equipment as per drawing no. 1 & 2.	1 lot	3 lots	
75	10 nos of patch chords (each of one meter length) for by-passing the router in case of failure.	1 Lot	3 lots	
76	19" standard wired equipment racks for mounting all compression chain, IF and Monitoring chain equipment	3 Nos.	3 Nos.	
77	Required no of Mains Distribution Units (Min 2 nos of 12 Ports MDU per Rack) with sequential delayed output on start up, output status LED and IEC-3 pin for each equipment in every rack. Each MDU having inbuilt or external, dual input, single phase automatic power transfer/static switch.	4 nos.	4 nos.	
78	Earth pits should consist of Copper Earth electrode (diameter 20 mm (min)), insulated copper strip/wire (50 Sq. mm (Min)), Chemical earth fill compound with fast discharge characteristics, water absorbing gel, perforated Hard HDPE pipe (diameter 40 mm (min)), funnel, water supply provision up to each earth pit (preferably from A/c condenser), 10 feet depth (min) and 1 feet diameter (min.). Earth pit should be prepared so that earth resistance is less than 1 ohm. (refer 5.7.6 a, b, c of Technical specification) (2 nos. for Baseband and compression, 2 nos. for IF & RF System, 4 nos. for Isolation Transformer and 2 nos. for UPS, each with less than 1 ohm resistance)	10 Nos.	10 Nos.	
79	Earth Terminal as per DRG No 5	1 Lot	3 lots	
80	Set of tools(As per attached list - Annexure -VIII of Appendix-D	1 Set	3 sets	
81	Essential items (if any) required for completing the installation and commissioning work of the system as per Specifications, should be included and quoted. No extra cost will be paid for any extra item declared at a later date for completion of the project installation.	1 Set	3 sets	
L. Documentation Equipment manuals consisting of:				
82	Operation/User Manual Hard copy and Soft copy on CDs with Search facility for all the supplied equipment (2 Sets for each Kendra, 1 Set for DG:DD and 1 Set each for ADG(EZ) and ADG(NEZ))	1 Lot	3 lots	
83	All software backups are to be supplied on CDs.	1 Lot	3 lots	
84	Firm's self certified copies of import license in respect of RF Equipment (Modulators, Upconverter, HPA, Antenna etc) for issuance of operating license from WPC. - 4 Sets for each site	1 Lot	3 lots	
M. Training				
85	In India: Two separate Seminars (including Theoretical (alongwith basic study material) & Practical training, hands on experience) for Compression, IF, RF, HPA, Monitoring, UPS etc. (minimum for 5 working days) for Doordarshan personnel at each site. (Note: Training will not be treated as part of the delivery period)	1 Lot	3 lots	
N. Installation, Testing and Commissioning				
86	Installation, testing and commissioning of all the equipments as per DRG No 1,2,3,4 and 5 alongwith Dismantling the existing compression, monitoring & Power Supply equipment, if required.	1 Lot	3 lots	

Signature
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