सत्यम् शिवम् सुन्दरम्

प्रसार भारती
PRASAR BHARATI
(Broadcasting Corporation of India)
दूरदर्शन महानिदेशालय
Directorate General: Doordarshan
दूरदर्शन भवन, कोपरनिक्स मार्ग,
Doordarshan Bhawan, Copernicus Marg
नई दिल्ली - ११०००१
New Delhi – 110 001

File No. 19(2)2018-19E1 (P) TV

Dated: 20.05.2019
21

Subject: Draft Specification for SITC of RF Network Planning and Optimisation Software System

The Draft specification of the upcoming tenders is enclosed herewith to offer comments, if any by due date at e-mail address ddpurchase401@yahoo.co.in or on following Address:

Assistant Engineer
Room No. 403,
Directorate General: Doordarshan,
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Specification For: Draft Specification of SITC of RF Network Planning and Optimisation Software System.

Specification no: DG: DD/TxD/HPT/RF Planning Software System/EV-2019 dated 13.05.2019

Due Date to offer Comments: **04.06.2019**

Encl.: As above (31 Pages)

21/05/19

Prabhat Kumar Singh
Assistant Engineer
For DG: DD

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New Delhi - 110001

Specification No: DG:DD/TxD/HPT/RF Planning Software System/EV-2019
Dated: 13.05.2019

Specifications for Supply, Installation, Testing and Commissioning of RF Network Planning and Optimisation Software System

Supply, Installation, Testing and Commissioning of RF Network Planning and Optimisation Software System

Table of Contents

Technical Specifications for Supply, Installation, Testing and Commissioning of RF Network Planning and Optimisation Software System

1. Introduction

a. Doordarshan intends to procure one set of Radio Frequency (RF) Network Planning and Optimisation Software system with associated data, for the purpose of network and frequency planning, of its terrestrial TV broadcasting network for analogue TV (PAL B, G etc.) and digital terrestrial television(DVB-T2, T2 Lite etc.) standards.

b. The RF Network Planning and Optimisation software system shall also be future upgradable to other digital terrestrial television (DTT) standards such as ISDB-T, DTMB, ATSC 3.0 etc.

c. This Technical Specification outlines the features, technical provisions of RF Planning & Optimisation Software System and the terms & conditions for executing the work on turnkey basis.

d. The complete RF Network Planning and Optimisation Software system along with all supplied data have to be loaded in two different workstations (as part of supply) with independent license keys. The offered system is required to be installed at Directorate General: Doordarshan, Doordarshan Bhawan, Copernicus Marg, New Delhi-110001. However, the RF Network Planning and Optimisation Software system or any one of the workstations may be shifted to any other office of Doordarshan/ Prasar Bharati in Delhi as and when required and should get all the updates and support in that office also.

e. The hardware must be open standard and replaceable by off-the-shelf available hardware with similar or better configuration at a later date, even after expiry of guarantee period.

f. The offered software is to be licensed on perpetual basis to Doordarshan without any expiry date. The supplied licences should be scalable and portable to any other compatible hardware with similar or better configuration at a later date (even after expiry of guarantee period) fully loaded with this software using supplied CD/ DVDs or by connecting fully loaded external hard drive. There should not be any additional permission/interaction/intervention/cost requirement from software developer/supplier/bidder for this purpose, even after expiry of guarantee period.

g. The System must perform TV coverage prediction, Intermediation studies, comparison of field strength measurements, reception survey results, site

administration and all other functions & analysis mentioned in the specifications for existing and proposed transmitter sites of Doordarshan network.

h. A list of items/equipment which are treated essential for completeness of the system is provided with specifications in Annexure-II i.e. Suggestive Bill of Material. Any other item/equipment which are essential for the completeness of the system should also be included in the offer. **It is the responsibility of the bidder to ensure that the system is complete in all respects.**

i. The data of existing and planned transmitters of Doordarshan will be provided in excel sheet to the successful bidder for integration with the R F Network Planning and Optimisation Software System. The entry and integration of the same has to be done by the bidder/ OEM for further use by Doordarshan.

2. Scope

a. The scope of this tender is Supply, Installation, Testing and Commissioning (SITC) of RF Network Planning and Optimisation Software System required for carrying out coverage prediction, intermediation studies, comparing field strength measurement, reception survey and all other functions and analysis mentioned in the technical specifications for various existing and proposed analogue (PAL B, G etc.) and digital (DVB-T2, T2 Lite etc.) TV transmitters of Doordarshan.

b. The offer should also include data such as digital maps, terrain & clutter data, vector maps, satellite imagery maps of all the States & Union Territories of India including Andaman & Nicobar and Lakshadweep Islands along with the neighbouring countries up to 100 km from Indian border, Population & their language/dialect spoken data (as per census of India- 2011 and latest) and various databases and its integration with the offered software as mentioned in the technical specifications.

c. The software and data (as mentioned above at clause 2b) should be loaded in two different work stations. The offered work stations along with Colour Monitors, Laser Printers and Uninterrupted Power Supplies should meet the configuration as mentioned in the technical specifications.

d. One set of copies of all software and data (as mentioned above at clause 2b) installed in both the workstations for RF Network Planning and Optimisation Software system should be provided in the form of CD/DVD/Pen Drives besides being loaded in to the system.

e. One set comprising of two numbers of Portable SSD Hard Drive (External Solid State Drive, Capacity 4 TB, SATA with USB 3.0 Ports) loaded with software and

all associated data, compatible with any other hardware configuration meeting the software requirements to complete the system in all respect shall be provided as a backup.

f. The bidder shall arrange on-line training as well as training at site for DD Engineers as mentioned in the technical specifications.

3. Essential eligibility criteria for OEM and Bidder

a. The bidder should be the Original software developer (OEM) or their authorized representative/dealer.

b. The Original software developer (OEM) must also have **at least last five years'** experience of developing and supplying of at least five numbers of similar RF Network Planning and Optimisation Software for different kind of analogue(PAL B, G etc.) and digital (DVB-T2) TV standards to broadcasters or broadcast network operators.

c. In case the bidder is the authorized representative, it must be in the business of sales, supply and integration or turnkey execution of similar solutions to broadcaster or telecom operator **for at least last two years**. The bidder must have supplied at least two numbers of such solutions.

d. Details of past supply record and completion certificates of the similar RF Network Planning and Optimisation Software to broadcasters or broadcast network operators for clauses 3b must be provided in the format given below:

S. No.	Order No. with date, reference	Name of RF Network Planning and Optimisation Software (with version)	Qty.	Name of the broadcaster/ broadcast network operator with full postal address to whom R F Network Planning and Optimisation Software is supplied.	Name, Telephone, Fax, Email ID of concerned personnel, purchaser, for getting feedback on R F Network Planning and Optimisation Software performance.
	(1)	(2)	(3)	(4)	(5)
1.					

2.					

e. Details of past supply record and completion certificates of the similar RF Network Planning and Optimisation Software to broadcasters or telecom network operators for clauses 3c must be provided in the format given below :

S. No.	Order No. with date, reference	Name of the similar software (with version)	Quantity	Name of the broadcaster/telecom operator with full postal address to whom the similar software is supplied.	Name, Telephone, Fax, Email ID of concerned personnel, purchaser, for getting feedback for the similar software performance.
	(1)	(2)	(3)	(4)	(5)
1.					
2.					

f. Doordarshan reserves the right to get performance feedback from any of the user(s) as mentioned in past supply record against DD Specifications clause 3d and 3e.

g. The bidder must have its local office/ authorized representative in India for after sales support. The local office/ authorized representative will be the nodal point for resolving issues related to installation, integration testing, commissioning and after sales support.

h. The cut-off date for the experience shall be the publishing date of NIT.

4 Technical Specifications

4.1 R F Network Planning and Optimisation Software: The Software must perform all the functions of field strength predictions, field strength analysis and network planning using different propagation models, latest recommendations and summation methods required for optimum coverage planning, determination of multi-path effects, interference & cell calculation of analogue and digital TV transmitters.

4.1.1 Field Strength Prediction

a. The Software must include various propagation models based on the basic mechanism of signal strength that are reflections, penetrations, diffraction, scattering, rain & snow attenuations etc. in the frequency range from 30 MHz to 3 GHz such as Terrain propagation models, point to point propagation, urban-suburban propagation, city propagation etc. Some examples of Propagation models are listed below:
   (i) Free Space model, Line of Sight with Fresnel Check, Longley & Rice etc.
   (ii) Diffraction models such as Deygout, Bullington, Delta Bullington, Multiple Knife edge method, Epstein Peterson, Fresnal Integrals, etc.
   (iii) Empirical Models such as Durkin, Okumura Hata etc.
   (iv) ITU-R propagation recommendations such as ITU-R P.370, ITU-R P.452, ITU-R P.525, ITU-R P.528, ITU-R P.526, ITU-R P.530, ITU-R P.617, ITU-R P.833, ITU-R P.844, ITU-R P.1058, ITU-R P.1406, ITU-R P.1411, ITU-R P.1546, ITU-R P.1812, ITU-R P.2001, ITU-R P.2040, ITU-R 2108 and any other latest recommendations.

b. Other equivalent propagation models required for carrying out network & frequency planning, field strength prediction and analysis, interference calculation, contour calculation, path profile calculations and all other analysis mentioned in this specification may also be included.

4.1.2 Field Strength Prediction Summation Method

a. For various interference calculations (including multiple interferences), the following methods should be available:
   (i) Power sum method
   (ii) Simplified multiplication method
   (iii) Log-normal method
   (iv) Simplified Log-normal method
   (v) Schwartz & Yeh summation method

b. Other equivalent summation methods required for prediction and analysis mentioned in this specification for all the standards of analogue and digital TV transmitters may also be included.

4.1.3 FIELD STRENGTH ANALYSIS

The offered RF Network planning and optimisation software system must provide the following field strength analysis as key functional requirements according to latest recommendations:

a. Prediction of field strength coverage for selected transmitter(s) from the transmitter database for analogue and digital TV transmitters individually as well as combined for both VHF and UHF range.

b. Population and Area Coverage analysis for selected transmitter(s) from transmitter databases giving the covered, uncovered, total population in figures as well as percentage for the geographical boundaries like country, state, district, tehsil and any other user defined polygon, rectangle etc. as per the latest Census of India (Census 2011).

c. Signal strength contour calculation analysis for the selected transmitter(s) along with the comparison with other calculations.

d. Calculation of coordination contour such as International Telecommunication Union (ITU) coordination, Regional coordination etc. supporting GE-06 conformity check, Usable Field Strength (UFS)-Nuisance Field Strength (NFS) method etc.

e. Path profile information in graphical and tabular form providing following features:

   (i) Fresnel zone with user defined & default value of K factor.

   (ii) Indicating range of calculation, path of diffraction, direct line & clutter information.

   (iii) Details like Antenna Height, AMSL, Longitude & Latitude, Clearance Angle for both Transmitter & Receiver and path information like Line of Sight, Fresnel distance, morpho (clutter) type &height, Delta H, effective height etc. must be available.

   (iv) Profile parameters and details for various calculation modes must be available at regular path intervals and at any other point of the path.

f. Frequency scanning calculation to find out gaps in the frequency spectrum where new TV transmitters or green field planning could be made. The offered software should suggest automatically the optimum number, power, height, directivity of antenna for new transmitters.

g. For planning of uncovered area with existing TV transmitter setup consisting of either Analogue or Digital or both (given in Transmitter

database), the offered software should suggest automatically the optimum number, power, height, directivity of antenna for gap filler transmitters.

h. Prediction of interference limited coverage which can be determined in terms of a coverage probability i.e. the probability that the wanted signal is higher than a required minimum field strength and additionally, that the wanted signal is higher than the 'sum' of all interference signals.

i. Calculation of Carrier to Interference (C/I) based on the available protection ratios for required analogue and DTT television standards.

j. System must have coverage calculator defined by users' mathematical functions for example:
   (i) Difference between coverage areas.
   (ii) Identification of single or multi overlap areas etc.
   (iii) Exclusive coverage of each transmitter i.e. area which is not covered by any other transmitter in case of multi overlap areas.

k. For performing multiple network analysis based on the input parameters, some of the analysis that the RF Network Planning and Optimisation Software System must support are:
   (i) Transmitter(s) with highest positive C/I in each pixel, maximum field strength level in dBμV/m etc.
   (ii) Strongest interferer, Strongest Interference Level & sum of total interferences Level.
   (iii) SFN coverage probability including Self interference, network gain, receiver modelling, SFN gap filler planning, Monte carlo simulations with different receiving conditions such as fixed, portable, outdoor, portable indoor, mobile etc.
   (iv) Group Covered Area: If transmitters are assigned to individual groups, the complete coverage area of each group must be marked in different colours.
   (v) Number of Groups: If a pixel is covered by several transmitter groups, this result should indicate the number of serving transmitter groups per pixel.
   (vi) Calculation modules that allow determining the optimum down tilt angle for a certain reception area.

l. Calculation of the distance between two points in terms of their longitude & latitudes and measurement of the signal strength at any point along with its longitude & latitudes, angle and distance from transmitter.

4.2 Key Features of the Software:

4.2.1 The RF Network Planning and Optimisation Software must have number of databases, all accessible via the database menu for easy operation. Some mandatory databases are given below as example:

a. **Transmitter database**: System must have following types of transmitter databases that contains all information of transmitting stations required for carrying out network & frequency planning, field strength prediction and analysis, interference calculation, contour calculation, path profile calculations and all other analysis and functions as mentioned in the specification.

(i) **Type-1 Database:** The database consisting of a complete set of existing and proposed analogue and digital transmitter network of Doordarshan. Editing in the Type-1 Database should be password protected and therefore allowed for authorized person like Administrator only.

(ii) **Type-2 Database:** The user's database, where transmitters can be added, changed or deleted without any permission or password from administrator. Most analysis functions get their information directly from a selection of transmitters from this database.

(iii) **User Configurable Database**: Additions of multiple Type-2 databases with different names should also be possible. These databases will be created and used by different users, for different projects, so should have exclusive password protection. Export and import of transmitter's data from one database to another and vice versa should be possible by using their respective password.

b. **Result Database:** There should be a provision for Result database providing a list giving a reference to all the result files related to the selected transmitter database.

c. **Antenna Database:** A library of more than 100 directional patterns of analogue and digital Terrestrial TV broadcasting antennae with linear and circular polarisation (Right hand circular and Left hand circular)/ slant

polarisation (with different polarisation ratios) from various leading antenna manufacturer including those used by Doordarshan such as Sira, Kathrein, RFS, etc. should be stored and be available in the system for allotting any transmitter. There should be a provision to store the antenna pattern from other external sources like internet and CD/DVD/pen drive etc. according to the widely used international broadcast standards. Provision for antenna pattern diagrams (export/ import) in all common available formats like .ant, .pat, .vup etc. should be available.

d. **Transmission line Database:** A library of details of more than 100 models of Transmission line for Terrestrial TV broadcasting from various leading Transmission Line manufacturer including those used by Doordarshan such as RFS, Andrew, Hitachi, etc. should be stored and be available in the system for allotting any transmitter. There should be provision to store the details of Transmission line from other external sources like internet and CD/DVD/pen drive etc.
e. **Recycle Bin Database:** There should be a provision for Recycle bin database that provides a list of all deleted entries/ details of any database so that necessary entries/ details can be recovered.
f. **Vector database:** A vector database consisting of all available Vector datasets for India and its neighbouring countries up to 100 km as described in the specifications.
g. **Population and Area Database:** The population and area data of India consisting of its States and all Union Territories in respect of their language/dialect spoken, districts, Administrative divisions/ Tehsils etc. as per the latest Census of India (Census 2011) must be provided by the bidder fully loaded in the RF Network Planning and Optimisation Software System.
h. **Protection Ratio Database:** There should be a database consisting of protection ratios with all possible combinations of parameters based on C/I model for Analogue and Digital terrestrial television standards.
i. **Digital Map Databases:** A database consisting of all the maps of India, its states and all Union Territories as described in the DD specs. para no. 5.
j. Any other Databases which are essential for planning of terrestrial analogue and DTT network, coverage analysis and frequency planning must also be included.

4.2.2 There must be an option for selecting transmitter from transmitter databases on the basis of any of the fields such as analogue, digital, name, unique ID, country, state, program, channel, frequency, power, tower height, status, SFN ID etc. Transmitter can be displayed by using different symbols/ legends with selectable colour & size. The font colour & size of text displaying the name of transmitter must be selectable and editable. Relocation and resizing of the text and/or symbol to avoid conjunctions or over lapping for closely located transmitters must also be available.

4.2.3 The RF Network Planning and Optimisation Software System must include an antenna editor which allows the user to create, edit, view and store the antenna patterns in graphical manner. Antennae can be created either manually by entering the attenuations for each one-degree step or can also be entered or modified in a graphical antenna pattern editor. The pattern should be kept in 1^{o} (one degree) resolution (360 values) in the azimuth and elevation cut. The azimuth cut can be split up in a horizontally and a vertically polarized part (e.g. for mixed polarization). Furthermore, it should be possible to read custom antennae formats (e.g. from RFS, Katherine, Sira etc.), which are normally based on quite simple ASCII-text files.

4.2.4 The offered RF Network Planning and Optimisation Software system must be integrated with the offered data such as digital map database, digital terrain & clutter database, population and their language/dialect spoken data to allow the user to analyse and quantify the size of population and their language/dialect spoken served in a user defined area.

4.2.5 The system must have integrated GIS module supporting various types of online maps like Bing, World Street, world imagery, world shaded map, Google Earth etc. to be used as background maps/ layers for presentation of various results. It should have effects like transparency, contrast, brightness, dim, rotation and tools like zoom in, zoom out, select, measure distance/azimuth, layout view design geographical database contour, slope creation etc.

4.2.6 It must be possible to clearly visualize the Digital Terrain Model (DTM) together with stations and overlaid coverage predictions in a 2-D and 3-D way.

4.2.7 System should support the printing of raster map in high resolution quality up to A_0 (A zero) raster size. There should be high resolution printing mode, so when sending the print information from print preview window to printer, system should rebuild the raster image but using the original pixel resolution of the map as it is available on hard disk.

4.2.8 For all maps and coverage results, mentioned in the specifications, it should be possible to add a text of commonly available selectable font size & colour with some symbols along with straight line or polygon of selectable commonly available thickness, design and colour. Information like name, Longitude & Latitude, state, power of transmitter, site elevation and height of antenna, Polarization, Receiver height, calculation model etc. should be available during all printing options. The data may be taken either from database or editing by user as per selection.

4.2.9 Importing and visualization of field measurement data from various field strength measuring equipment like TV analyser, Video Network analyser, Portable Field meter cum spectrum analyser, or any other equipment with field strength measuring facility from reputed manufacturers like Anritsu, R&S, Keysight etc. with suitable text, symbol, legend etc. entering facility must also be available. System should support kmz, .kml, .xml and other relevant formats for this purpose.

4.2.10 The results related to coverage maps, contour maps, path profile plots and any other graphics results must be available to import & export in specific formats such as .tiff, .kml, .xml, .kmz, .bmp, .jpeg, .pdf, .png etc. format.

4.2.11 The results related to analysis such as population analysis, area coverage analysis and any other similar types of results must be available to import & export in specific formats such as .xslx, .doc, .docx, etc.

4.2.12 The transmitter details must be available to import and export in standard formats such as .xml, .xlsx, .xls etc.

4.2.13 Vector maps data must also be available for import and export in standard & specific formats such as .dxf, .shp, .kml, MapInfo, .xml, ASCII etc.

4.2.14 Lattice planning or Lattice calculator tools should also be available based on latest ITU recommendations.

4.2.15 The RF Network Planning and Optimization Software system should support various latest ITU recommendations, standards and plans necessary for analog terrestrial television such as ITU-R BT.655, ITU-R BT.417, ITU-R BT.419 etc.

4.2.16 The RF Network Planning and Optimization Software system must also support various latest ITU recommendations, ETSI standards etc. necessary for digital terrestrial television such as ETSI EN 302755, ETSI TS 102773, ETSI TS 102831, ITU-R BT.798, ITU-R BT.1368, ITU-R BT.2016, ITU-R BT.1877, ITU-R BT.2033, ITU-R BT.2052 etc.

5 DIGITAL MAPS DATABASE

5.1 The RF Network Planning and Optimisation Software system must be integrated with the digital map database including digital terrain, clutter and population database, language/dialect spoken in the area to allow the user to perform all the functions as mentioned in the DD specifications para 4.

5.2 The software must support various geographical projections such as Longitude-Latitude, UTM, Gauss Krueger etc. based on different reference datum's, e.g. WGS84 G1762.

5.3 The digital map database of the country produced from 1:250,000 or better scale topographic maps or latest satellite images in resolution up to 50meters or better must be provided and integrated with the RF Network Planning and Optimisation Software System. The bidder shall indicate the Geographical Interface System (GIS) engine and data formats supported.

5.4 There should be a provision in the RF Network Planning and Optimisation Software System to carry out all the analysis and functions as mentioned in DD Specifications in user defined resolutions for example 50m, 100m, 200m, 500m etc.

5.5 Map format: The digital map must be provided in Planet, Planet EV and MapInfo formats. The digital maps should also be provided in format compatible with the RF Network Planning and Optimisation Software System supplied by bidder.

5.6 All administrative boundaries including country, state, district, tehsil and block duly marked on the maps should be provided along with population data as per Census 2011 or latest census with rural and urban divide.

5.7 **Digital maps must have following layers:**

5.7.1 **Terrain Database:**

1. Digital Terrain Model (DTM) produced from 1:250,000 or better scale topographic maps or latest satellite images in resolution up to 50 meters or better must be provided for India including Andaman and Nicobar and Lakshadweep Islands along with its neighbouring countries up to 100 Km, from Indian border.
2. Terrain database must have elevation (z) coordinate accuracy of 30 meters or better and latitude& longitude (x, y) coordinate accuracy of 50 meters or better.

3. The bidder shall also indicate the details and source of Digital Terrain Model.

5.7.2 **Clutter Database:**

a. Clutter database must be provided for India including Andaman and Nicobar and Lakshadweep Islands along with its neighbouring countries up to 100 Km, from Indian border.

b. Clutter database must be derived from topographic or latest satellite image data having elevation (z) coordinate accuracy of 30 meters or better and latitude& longitude (x, y) coordinate accuracy of 50 meters or better and should have minimum of 8 classes: Sea, Inland water, open, agricultural land, Urban built-up, rural settlements, High dense vegetation, Low dense vegetation.

5.7.3 **Vector Maps:**

a. Vector maps for India including Andaman and Nicobar and Lakshadweep Islands along with its neighbouring countries up to 100 Km, from Indian border.

b. Vector maps must be derived from 1:250,000 or better scale maps and further updated using 50 meter resolution satellite image or better of vintage (latest) for following 10 classes: Rivers, highways, Major Roads, Secondary Roads, un-metalled roads, coastline, railways, airports, State boundary, district boundary, Administrative division/ Taluka/ Tehsil boundary.

5.8 **System must have following types of satellite imagery based maps:**

5.8.1 **All India Map and its neighbouring countries:** System must have an integral satellite imagery map similar to political–geographical and road map of India including Andaman & Nicobar and Lakshadweep Islands along with its neighbouring countries up to 100 Km from Indian border, at the scale of 1:250,000 or better. Map must show all details like names of town, city, district, state, road, Rail and other geographical details like river, mountain, seam less multicolour terrain representation, the boundaries of country, state and districts prepared by survey of India.

5.8.2 **Map of States and Union Territories of India:** System must have an integral satellite imagery map similar to political-geographical-administrative and road map of each States and UTs separately, at the scale of 1:250,000 or better. Map should show all details like town, city, district,

state, road, rail and other geographical details, the boundaries of country, state, district, towns and sub towns. The borders should be clearly visible, State capitals, district HQ and cities should be shown by different symbols. A certificate of authenticity verifying the accuracy or correctness of map data from government agency like survey of India should be submitted with the offer. Latest Census Data shall be linked with State and District boundary databases.

5.9 For the maps and the layers as detailed in DD Specs para 5.7& 5.8, a certificate of authenticity verifying the accuracy or correctness of map data from government agency/ authenticating agency like survey of India should be enclosed by the bidder. The maps and layer from other reputed agencies may be accepted only for those areas where survey of India clearly states about non availability of map.

6 Work Station/ Server Hardware with UPS and Printer

6.1 Introduction:

a. Work Stations should be based on latest technology.
b. Work Stations should be rugged, reliable, and stable in operation under very cold to hot, humid and dusty environmental conditions.
c. Work Stations will be supplied along with Uninterrupted Power Supplies (UPS) and Laser Printers.
d. Work Stations manufacturer/ bidder must have his local office/ representative in India.

6.2 Technical Specifications:

6.2.1 Work Station

S.No.	Description	Specification
1.	CPU	Intel(R) Xeon Processor with 3.0 GHz or better
2.	Chipset	Intel OEM Motherboard
3.	Memory Slots	4 DIMM slots (minimum)
4.	Bus Architecture	Integrated Graphics, 2 PCI: i.e., 1 PCI Express x 1 and 1 PCI Express x 16
5.	Memory (RAM)	Minimum 16 GB DDR4(8GB x 2) or more
6.	Hard Disk Drive	4TB 7200 rpm SATA 6Gb/s Hard Drive
7.	Colour Monitor	24" LED (Full HD)
8.	Keyboard	104 keys (QWERTY)- wireless
9.	Mouse	Wireless Optical Scroll Mouse

10.	Bays	4 Nos. (2 Nos. 5.25 inches for Optical Media Drives and 2 Nos. 3.5 inches for Hard Disk Drives)
11.	Ports	Rear - 4 nos. USB 3.0, Network Port, Line in/out and HDMI out, 1No. DC power Front- 2 x USB 3.0
12.	DVD ROM Drive	8X or better DVD/RW Optical drive
13.	Networking facility	10/100/1000-Base-T Ethernet
14.	Wireless	Wi-Fi and Bluetooth (latest version)
15.	Operating System	Windows 10 or latest
16.	OS Certifications	Win Logo 10, professional OS Certification
17.	Power Management	Screen Blanking, Hard Disk and System Idle Mode in Power On, Set up Password, Power supply SMPS Surge protected
18.	Preloaded Software	a) Norton, McAfee, or equivalent Antivirus- Total Protection (Latest Version) Licensed for 5 years b)Licensed MS – office(latest version)
19.	Video Card	NVIDIA(R) QUADRO(R) P4000 or better
20.	Accessories	5-in-1 media card reader, Internal speakers and Headphone with Microphone facility

6.2.2 Laser Printer

S.No.	Description	Specification
1.	Output Type	Colour
2.	Resolutions	Selectable up to 1200 x 1200 dpi or better
3.	Print Speed (A4 size)	30 ppm or more
4.	Colour Pages Per Cartridge	15000 or more
5.	Paper size	A3, A4
6.	Interface	USB 2.0 or better
7.	Necessary cables & Utility Software to be supplied.	

6.2.3 1 kVA Offline Uninterrupted Power Supply (UPS)

S.No.	Description	Specification
1.	Capacity	1 kVA
2.	Output waveform	Sine wave
3.	Voltage on Mains	230 ± 50 VAC
4.	Frequency(Input)	50 Hz ± 3 Hz
5.	Backup time	30 minutes
6.	Transfer Time	<15milli seconds
7.	Over Load Indication	100% for 60 seconds, Indications Via LED & Audible alarm.
8.	Charger	Constant Power, 2 step charging Input voltage range 100 - 270V
9.	Protection	Overload, short circuit, low battery, Over charge, Main slow & High input voltage
10.	Battery (Built In type)	Sealed Maintenance free Cold Star

7 General Requirement

7.1 Compliance Statement and OEM Authorisation

a. A Para by Para, compliance statement in the format given below should be attached with the technical offer. The compliance duly signed by the software developer/ manufacturer on their letter head clearly indicating name and designation of signatory and countersigned by the bidder should be attached with the offer with all supporting documents and technical manual/data sheets.

Para No. of Doordarshan specification / Annexure	Doordarshan Specification details and value	Value, feature, provision, Information of offered system	Page No. of the Technical Bid where this value is specified/ Information is provided	Compliance or deviation	Remarks if any
(1)	(2)	(3)	(4)	(5)	(6)

b. The compliance statement for all the paras, sub-paras listed in these specifications, terms and conditions and all annexure is a mandatory and an essential requirement.

c. Any offer without proper compliance statement shall be rejected in the first instance without making any reference to the bidder.

d. All the required technical manual/data sheets and other supporting documents as mentioned in Clause 7.2 to verify the parametric values shown in the compliance statement must be attached with offer.

e. Cross-reference in respect of supporting documents should be given with proper page nos. and volume no. etc. If required Doordarshan may also ask for any other document to ascertain the claim of bidder and their OEM.

f. The bidder is also required to submit authorization in respect of the software developer and respective data provider in their favour from respective OEMs (not from their Indian representatives) on their letter heads along with the bid.

7.2 **Documentation**

a. The bidder must attach all relevant technical documents in English language like Technical pamphlets, Operation & Installation manuals, data sheets, drawings, photographs, screenshots etc. of all software/equipment offered with the RF Network Planning and Optimisation Software system that are essential to evaluate the offer for technical suitability with reference to Doordarshan technical specifications.

b. In addition, for ease of Technical evaluation one set of hard copies, of all the manuals, technical literature, pamphlets etc., same as uploaded with the e-bid, should also be provided by the bidder after opening of technical bids.

c. Any other documents required for verifying the authenticity as per DD Technical specifications.

7.3 **Guarantee/ Warranty and After Sales Support**

a. The respective manufacturers shall guarantee the satisfactory working of all the equipment included in RF Network Planning and Optimisation Software System, for five years from the date of completion of site acceptance test. Any defect/failure of RF Network Planning and Optimisation Software or hardware and its non-performance during this period is to be set right by the bidder and manufacturer(s) free of cost at the premises of the consignee.

b. A Guarantee certificate from the Original software developer (OEM) and Original equipment (Hardware) manufacturer on their letter heads, for all equipment/items offered with the RF Network Planning and Optimisation Software system, must be attached with the offer.

c. The Original software developer (OEM) and bidder should be responsible to inform and update the software installed at Doordarshan site as and when any modifications/ improvements in the standards and RF Network Planning and Optimisation Software are available.

d. Any Future upgrade of software or updates shall be made available free of cost by Original Software Developer to Doordarshan during guarantee period at site. The supplier will provide all upgrades, patches and latest new versions of software based on latest concerned standards, compatibility with latest operating system, recommendations, reports etc. from DVB, EBU, ITU, ETSI, ATSC etc. as soon as they are released and will also extend on line as well as manual support to install them satisfactorily during guarantee period.

e. The bidder should be responsible to inform and update all the pre-loaded software installed in both the work stations free of cost during guarantee period at site as and when any updates/ modifications/ improvements are available. The bidder shall also provide these updates/ modifications/ improvements even after guarantee period.

f. The digital map database including maps, clutter etc. must be updated every year and population data must be updated according to the latest census. The updates must be provided and integrated in the supplied system free of cost within the guarantee period.

g. Any problems/bugs observed during this guarantee period shall be promptly attended and fixed by the supplier with the support of Software Developer at their cost in the premises where system is installed. The transportation charges if any shall be borne by the bidder. The bidder/Original software developer (OEM)/authorized representative of Original software developer (OEM) have to provide maintenance and operational support on 24x7 basis. Necessary phone nos., mobile nos., addresses, email addresses of concerned persons must also be provided.

h. Any module/Assembly/Sub Assembly/software of the RF Network Planning and Optimisation Software system failing during the guarantee period must be repaired/replaced free of charge by the bidder/ OEM at site within three office working days. If the repair/replacement of the failed item/software takes more than three office working days in each instance or the consolidated downtime within the guarantee period exceeds 15 days, the Guarantee period of RF Network Planning and Optimisation Software system would be extended corresponding to the total outage period.

i. All software licenses and up-gradation/ patches supplied during guarantee period are to be provided to Doordarshan on perpetual basis without specifying any time limit or without specifying any end of life of the software and should be functional as last good working configuration.

j. The Original Software Developer (OEM) shall also certify to supply all spares and software updates for the RF Network Planning and Optimisation Software system in future.

k. The life time of all equipment/ items/ allied equipment supplied is to be specified by the respective Original Equipment (Hardware) manufacturer. These certificates duly signed are to be provided by the respective Original Equipment (Hardware) manufacturer only on their letter heads.

l. It will be the responsibility of software developer/supplier/bidder to provide replacement of supplied hardware dongles (license keys) in case of damage/defect/misplacement of dongle free of cost during guarantee period.

m. Documentary evidence about local after sales and support arrangement as per DD Specs Para 3g for the R F Network Planning and Optimisation Software system must be provided with the offer in the format given in Annexure I.

7.4 **Delivery:**

The complete set of the 'RF Network Planning and Optimisation Software system with all allied equipment is to be delivered in good condition, installed, tested and commissioned at DG: Doordarshan office including on-site training and Site acceptance tests (SAT) within 2 months from date of placement of purchase order. It will be the responsibility of the bidder to ensure this.

7.5 **Training:**

a. Training at site in Delhi.

b. The successful bidder shall arrange training for six Doordarshan Engineers for five office working days by the software developer/manufacturer (OEM). Training will be held at place of installation.

c. The training should cover basic training of installation and maintenance of system and comprehensive training of operation of software on the system with examples from existing and proposed Doordarshan Network. In addition to above, this training should also include some practical exercises (provided by Doordarshan 7 days before the training) for

practical exposure of Doordarshan staff on RF Network Planning and Optimisation Software.

d. The bidder will arrange six laptops with the same RF Network Planning and Optimisation Software installed in them, all Data as in the supplied system and six hardware keys (if needed) along with projectors etc. for the training.

e. Six hard copies & soft copy of training material must be supplied to consignee at least 15 days before the training. Training material will be provided to each Doordarshan engineer undergoing the above training.

f. Original software developer (OEM)'s representative(s) shall arrange two days on line operational/doubt clearing training sessions at sites, on complete RF Network Planning and Optimisation Software after one month of SAT or as intimated by Doordarshan. The bidder will arrange the same. The training fee if any shall be included in the main BOM for deciding lowest offer.

g. Training fee quoted by the bidder shall include all charges like training fee, travel, boarding, lodging and local transport charges for deputing the Original software developer (OEM)'s expert(s) for providing onsite training for five working days at Delhi. Doordarshan shall bear all touring expenses of Doordarshan engineers deputed for training and the same is not to be included by the bidder in their offer. The training fee if any shall be included in the main BOM for deciding lowest offer.

7.6 **Site Acceptance Test (SAT):**

a. The RF Network Planning and Optimisation Software shall be installed, tested and commissioned as per Doordarshan specification.

b. The Complete SAT Procedure will be prepared by the original system developer/bidder in respect of RF Network Planning and Optimisation Software system. The test procedure shall indicate full details of test set up for testing equipment required during the Acceptance Testing at the site. The SAT Procedure submitted shall be approved by Doordarshan. All the arrangements for site acceptance are to be made by the bidder.

7.7 **Suggestive Bill of Materials (Un-priced):**

a. A list of deliverables (Bill of Materials – BOM) with clear description of make, model and quantity of equipment and items including optional units,

sub units included in the offered RF Network Planning and Optimisation Software system must be provided with the technical bid (keeping price column blank). It will be the responsibility of the bidder to ensure completeness of the system. In case any item is not included in the offer and later found essential for completing the RF Network Planning and Optimisation Software system, the same shall be provided by the bidder without any extra cost. A **Suggestive BOM** for one such system is given in Annexure-II.

b. Cost of all the items as listed in the BOM is to be provided separately in the Commercial Bid. The Bill of materials given in the Technical and Commercial Bids must be identical. The bill of materials with make, model, options and quantity is most essential to evaluate the offers technically and must be submitted by the bidders with their technical bid (price blanked out). Offers without the same shall be rejected out rightly.

c. Any specific ordering information, required to be mentioned in purchase order, for including options, features, provisions to complete the offered system as per Doordarshan specification should also be indicated clearly by the bidder in the BOM.

7.8 **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.

b. All prospective bidders may attend the pre bid meeting to discuss their queries and suggestions. All the queries and suggestions should be sent to Doordarshan at least 2 days before the date of pre bid meeting.

c. No queries/suggestions shall be entertained after pre bid meeting.

d. Amendments subsequent to the pre bid meeting shall be sent to prospective bidders, who have purchased tender document by e-mail/fax/ post. Amendments shall be posted on Doordarshan website www.doordarshan.gov.in and http://tenderwizard.com/PB.

e. It shall be bidder's responsibility to check for any amendments on Doordarshan's website before submitting their duly completed bids.

7.9 **Other Items:**

The bidder has to compulsorily quote for any other items that may be required to be procured in future in connection with planning, operation and maintenance of terrestrial broadcast services and to carry out propagation measurement and

reception survey of various TV transmitters. **The cost of optional items shall not be taken into account for deciding the lowest offer.**

7.10 **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:

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 7.7.

c. Whether the compliance statement from the bidder as required in Clause 7.1 (a) has been submitted.

d. Whether the compliance statements from the respective OEMs for equipment/system mentioned in Clause 7.1 (a) have been included.

e. Whether the Authorization as required vide clause no. 7.1(e) in respect of equipment as mentioned in Clause 7.1 (a) from respective OEMs have been included.

f. Ensure that the relevant technical documents as mentioned in clause 7.2 containing the parameters of all the offered equipment and accessories have been included with proper indexing for ease of identification.

g. 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.

h. Whether the requisite undertakings for guarantee/warranty and after sales support by OEMs as required vide Clause no. 7.3 have been submitted.

i. A certificate of authenticity verifying the accuracy or correctness of map data from government agency/ authenticating agency like survey of India should be enclosed by the bidder.

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.

8 Sample Coverage:

The bidder has to submit with the technical bid, the coverage map and other analysis like population and their language/dialect spoken, area covered etc. for the transmitters for which necessary parameters are mentioned in Annexure **III.**

Annexure I

PERFORMA FOR INFORMATION ABOUT LOCAL OFFICE FOR AFTER SALES SUPPORT

1.	Address of Office: Telephone : Fax No. : E-mail Address :	
2.	Address for communication (if different)	
3.	Legal Status (authorized Representative/ liaison office/ registered company etc.)	
4.	Name of the Address of Lead official	
5.	Brief details of Technical facilities available for after sales support	
6.	Main line of business, Specialization and number of years of operation	
7.	Total Number of permanent technical employees	
8.	Details of Agreement/ MOU for after sales support (copy must be provided with the offer)	No. Date Executed at: Executed by:

(Authorized Signatory of local office)

Name:

Signature :
Place and Date :

(Authorized Signatory of Original software developer (OEM))

Name:

Signature :
Place and Date :

Annexure-II

Suggestive Bill of Materials (BOM)

The suggestive items to be offered by the bidder are as follows: The bidder is required to indicate detailed breakup of each of the following items in their offer.

S.No	Description	Qty.	Make	Model	Price
1.	RF Network Planning and Optimisation Software for terrestrial broadcast network, fully loaded in two numbers of work stations having analogue (PAL B, G etc.) and digital (DVB-T2 and T2 Lite) TV Standards along with:	1 set			
A	Hardware Dongle (Software License Key) (1 set comprising of two nos. i.e. one for each work station)	1 Set			
2.	Digital Map Database for loading in both work stations (as per DD Specs Para 5) comprising of following:	1 Set			
A	Integrated digital map layers:				
	i. Digital Terrain Model (DTM) of India (including Andaman & Nicobar and Lakshadweep Islands) and its neighbouring countries up to 100 Km. from Indian border in 50 meter resolution or better and 30 metre vertical accuracy.				
	ii. Clutter layer up to 50 metre resolution or better, 30 metre vertical accuracy and having minimum of eight classes.				
	iii. Vector maps derived from satellite image of 50 metre resolution or better and 30 metre vertical accuracy.				
B	Integrated Satellite imagery based maps:				

	i. Satellite Imagery map of India (including Andaman & Nicobar and Lakshadweep Islands) and its neighbouring countries up to 100 km from Indian Border similar to political–geographical and road map, at the scale of 1: 250,000 or better.				
	ii. Map of States and all UTs of India (including Andaman & Nicobar and Lakshadweep Islands) similar to political–geographical and road map /administrative map of each states and UT separately, at the scale of 1: 250,000 or better.				
C	Population and area data along with their language/dialect spoken distribution as per Census of India-2011 or latest.				
3.	**Work Stations / Server Hardware:** (1 set comprising of two nos.) Intel Xeon processor with3.0 GHz or better Graphic Card: NVIDIA QUADRO P4000 or better Storage-Hard Disk Drive: 4 TB or more Memory RAM: minimum 16 GB DDR4 (8 GB x 2) or more; Colour Monitor:24 inch LED (Full HD); Wireless Keyboard and mouse; OS Microsoft Windows 10 (64-bit) Total Protection (Latest Version) Anti-Virus with five-year license. Microsoft Office licensed, etc. (As per DD Specs para 6.2.1)	1 Set			
4.	Colour Laser Printer (as per DD Specs	1 Set			

	6.2.2) (1 set comprising of two nos. i.e. one for each work station)				
5.	1kVA offline Uninterrupted Power Supply (UPS) with inbuilt SMF batteries for 30 minutes back up(as per DD Specs 6.2.3) (1 set comprising of two nos. i.e. one for each work station)	1 Set			
6	Portable SSD Hard Drive (External Solid State Drive, Capacity 4 TB, SATA III with USB 3.0 port) for backup only as per DD Specs Para 2c (1 set comprising of two nos. i.e. one for each work station)	1 Set			
7.	Installation, Testing and Commissioning of System.	1 Lot			
8.	Hard copies for all relevant documents such as operational/ user, technical, installation manual etc. (1 set comprising of two nos. i.e. one for each work station)	1 Set			
9.	Soft copies of all the software and data installed in both the workstations for RF Network Planning and Optimisation Software system (as per DD Specs para 2d). (1 set comprising of two nos. i.e. one for each work station)	1 Set			
10.	Training for six DD Engineers for five office working days (On site) and for two office working days (on line)trainings. (As per DD Specs para 7.5)	1 Set			
11.	Any other item required to complete the system (as per DD Specs para 7.3)	1 Set			
12.	**OPTIONAL ITEMS (quote for following items is mandatory)**				
A	DTMB module	1 Set			
B	ISDB-T module	1 Set			
C	ATSC 3.0 module	1 Set			

Annexure- III

Sample Coverage: The necessary parameters of transmitters required for coverage maps and other analysis as per DD specs para 8 are given below:

1. **Transmitter A (Digital)**
   a. Frequency: 578 MHz
   b. Channel: 34
   c. ERP: 88.7465
   d. Co-ordinates: 28N 41 51.000, 77E 09 05.040
   e. Antenna Height: 235 meter
   f. Standard: DVB-T2
   g. Constellation: QPSK
   h. Code Rate: ½
   i. Guard Interval: 1/8
   j. Pilot Pattern: PP3

2. **Transmitter B (Analogue)**
   a. Frequency: 543.25 MHz
   b. Channel: 30
   c. ERP: 91.04
   d. Co-Ordinates: 26N 52 22.080, 088E 16 41.880
   e. Antenna Height: 1514 meters