

**Reception survey for
assessment of coverage area
for satisfactory reception of
HPT (TV) Transmitter
(Analogue) *Located*
at
*Agra (Uttar Pradesh)***

**Reception survey for
assessment of coverage area
for satisfactory reception of
HPT (TV) Transmitter
(Analogue) *Located*
at
Agra (Uttar Pradesh)
(Survey Period: 25/07/2016 to 02/08/2016)**

Field Strength Measurement/Reception Survey Team

PROPAGATION LAB

Team Leader : **Sh. G.P.Srivastava (AE)**

Team Members : **Sh. Bani Singh (AE)**
Sh. Kartar Singh (Sr.Tech)
Sh. Chandraballabh (Sr.Tech)

Assisted By : **Md. Javed Shams (AE)**

Staff Car Drivers : **Sh. H.N. Mishra (SCD)**

Guided By : **Sh. Deepak Kumar (DDG)**

Inspired By : **Mrs. Anuradha Agarwal (ADG)**

Table of Content

Sr.No	Particulars	Page
1	Introduction	1
2	Objective of survey	1
3	Measuring Instrument Used	1
4	Basic data & transmitter details	2
5	System Configuration	3
8	Measurement set up	3
9	Selection of sites for measurement	4
10	Measurement Methodology	4
11	TV Broadcast signal propagation	5
12	Collection of field strength data	5
13	Broadcast service area	6
14	Interpretation of the collected data along radials	7
15	Conclusion	8
16	Scope of further study	8
17	Acknowledgement	8
18	Table-1 (Direction: North,Radial-1)	9
19	Table-2,(Direction: North-East, Radial-2)	10
20	Table-3,(Direction: East, Radial-3)	11
21	Table-4,(Direction: South-East, Radial-4)	12
22	Table-5,(Direction: South, Radial-5)	13
23	Table-6,(Direction: South-West, Radial-6)	14
24	Table-7,(Direction: West, Radial-7)	15
25	Table-8 (Direction: North-West, Radial-8)	16
26	Table-9, Coverage contour for satisfactory reception of DVB-T2 Transmission	17
28	Annexure-I, Radial route map originating from the location of the transmitter	18
29	Annexure-II, Contour map for primary coverage	19
30	Annexure-III, Variation of Field Strength & MER with distance along North & North-East Directions	20
31	Annexure-IV, Variation of Field Strength & MER with distance along East & South-East Directions	21
32	Annexure-V, Variation of Field Strength & MER with distance along South & South-West Directions	22
33	Annexure-III, Variation of Field Strength & MER with distance along West & North-West Directions	23

Introduction:

A decade ago most of the TV transmitters in India were either valve based or semi-solid state based. Later on valve based transmitters were replaced with new solid state transmitters which are more power efficient, robust & easy to manage them. In this process one of the transmitter located at historical city Agra carrying DD National Programme was replaced with new R&S make solid state VHF TV transmitter in December 2014 however another one carrying DD NEWS Programme are through NEC make transmitter. Both the transmitters are of 10kW rated power which combines in a combiner & thus using single radiator mounted at a height of 150 meter concrete TV tower. In respect of the new R&S transmitter coverage of satisfactory reception is to be predicted. This task was given to Propagation Lab unit of The Research Department. A four member survey team was constituted & deployed for carrying out field strength survey for assessment of coverage area. The survey work was carried out during the period 26/07/2016 to 02/08/2016. The scope of this field trial was to assess the primary coverage area of R&S make TV transmitter broadcasting DD National Programme. The survey was carried out for fixed antenna reception mode mounted at a height of 10 Meters

Objective:

1. Ascertaining the coverage area for satisfactory reception of DVB-T2 Transmission.
2. To envisage minimum field strength value for satisfactory reception.

Equipment Used:

1. Spectrum Analyzer(Make: Anritsu, Model: MS 2035B & MS 2013E)
2. VHF Dipole antenna(Make: Anritsu, Model: MP534B)
3. GPS Navigator(Make: Garmin, Model: Montana 650)
4. LED TV Receiver(Make: Sony,)
5. Survey Van fitted with 10 Meters Mast & Portable Generator etc)

Basic Data and Transmitter details

Transmitters Details:

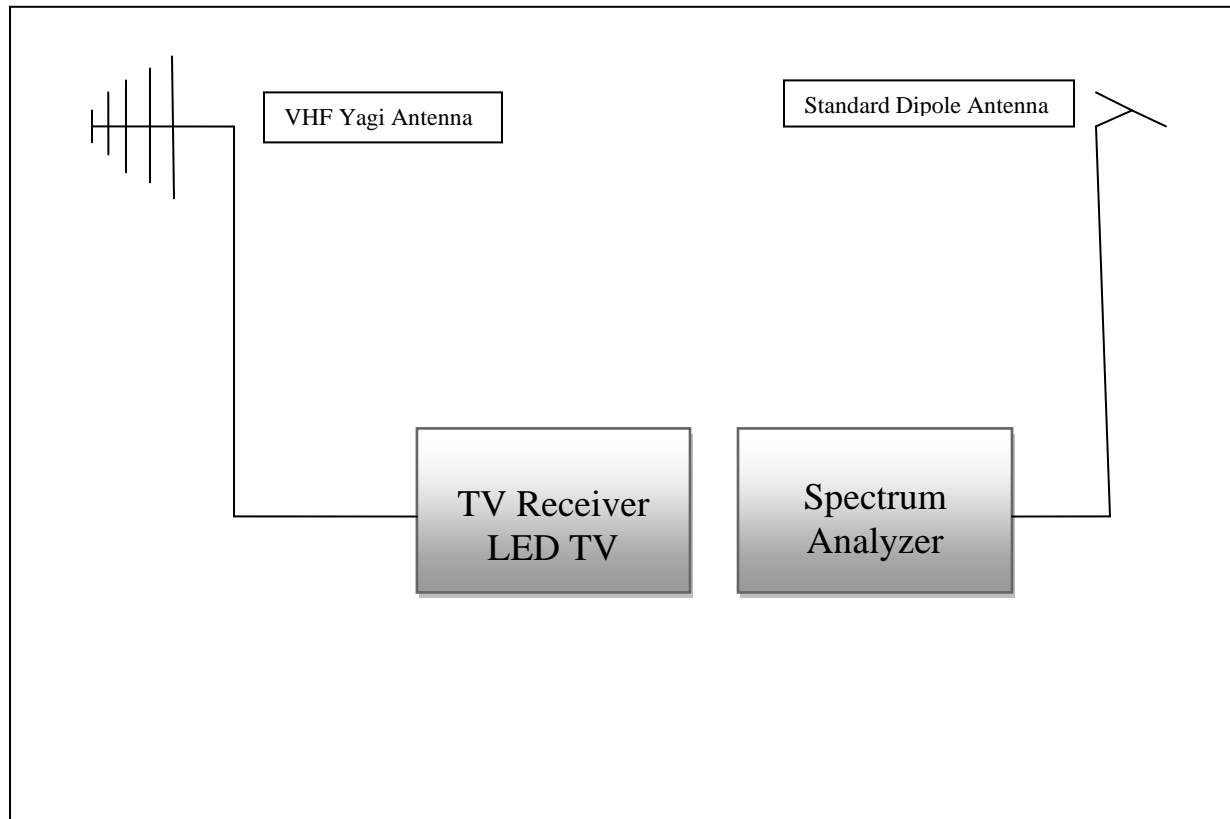
1. Name of Station : HPT(TV) Tower, Agra(UP)
2. Location of the Transmitters : LAT- N 27° 07'05.5"
(In 6 figure coordinates) LON- E 78° 03'00.4"
MSL-169 Meter
3. Description of terrain around the Transmitters : Urban, Moderate Traffic,
4. Classification(Large city/urban/rural) : Urban
5. Rated power of the Transmitter : 10.0kW
6. Forward radiated Power : 9.41kW
7. Reflected Power : 0.0W
8. VSWR : 1.10
9. Transmission Mode : Analogue(PAL)
- 10.Make : Rohde & Schwarz
- 11.Model No. : NM850 X E/V
- 12.Frequency of operation : Vision:203.2396 (CH#9)
Aural: 208.7396
Offset (-)
- 13.Date of Commissioning : December-2014

Transmitting Antenna Details:

1. Make : Dielectric
2. Type /Model of Antenna : Turnstile Pol/Air Dielectric
3. Antenna Gain : 12.5dB
4. Height of Tower : 210 Meter
5. Effective height of antenna(Midbay) : Not available
6. Type of Polarization : Horizontal
7. Tower : RCC &SS

System configuration:

The field trials system mainly consists of field strength measuring equipment, standard calibrated VHF Dipole antenna & Yagi receiving antenna for receiving horizontally polarized TV Broadcast signal, Portable Generator, 10 Meters electromechanically operated telescopic mast housed in a customized Survey Van of Research Department. A pictorial diagram is given below.



Measurement Set Up:

The field trials were carried out by utilizing mobile survey van of Research Department having 10 meter pneumatic telescopic mast. Field strength measurement was carried out, using Anritsu make Spectrum Analyzer & VHF Dipole Antenna. The whole system was assembled in a mobile van with power generating system (portable generator set). The two main components of the reception set up are analogue TV receiving system and field strength measuring system (Spectrum Analyzer). A calibrated VHF dipole antenna is used to receive the signal whereas for subjective assessment of the received signal was performed by using Sony makes LED TV. In addition to this Garmin make GPS navigator was used for determination of the spot/location coordinate in six figures & radial distance from the transmitter location.

Selection of sites for measurement:

As far as practicable an open & safe spot/ location (overhead power and telephone cables, trees and other hazards were avoided) was chosen for the measurement of received field strength. Instead of cluster measurement (measurement at four to five spot for a given location), single sample method in this survey is preferred, because of the additional time that may be taken in making cluster measurements (due to the frequent raising or lowering of the receiving antenna & insufficient space along the motor able road side), or because of the hazards in moving the measuring vehicle while the antenna is fully erected. High tension overhead wires, close to high raise buildings & elevated flyovers/underpasses were avoided while collecting field strength data along a radial route.

Measurement Methodology:

A map of the largest available scale was used to mark the location of the transmitters. From the transmitter location eight radials are drawn passing through the transmitter location along North, East, South, West, North-East, North-West, South East & South West directions. For prediction of the coverage area, field strength measurement along a radial is carried out by employing mobile survey van having 10Mtrs telescopic mast with rotor & tilt facility. For field strength measurement the survey vehicle was mostly parked in open space, raising the telescopic mast up to the required height of 10 meters & then rotating the antenna to align it along the direction of transmission source for getting optimum value of field strength. While taking static reception measurement LAT/LONG, MSL & radial distance of each & every location was also recorded. Once all measurements have been undertaken, mast is fully retracted & then driven away for the next location. Since the purpose of the survey was to determine the primary coverage area for satisfactory reception so the measurement was carried out in static condition along motorable roads. The same procedures for field strength measurement/reception survey are adopted along all other eight radials. After data collection is over the FSM data are tabulated & interpreted on the basis of the findings. The quality of received audio/video was also analyzed by using SONY make receiver under given terrain conditions. The environment classification criteria are:

Rural	Areas with scarce isolated buildings, open fields.
Suburban	Small towns; residential areas with low building density and buildings not higher than two stories; wide roads or streets between buildings.
Urban	Big to medium sized cities, residential areas with high density of buildings; areas where buildings are higher than two stories and close distances between them
Large Cities	Densely populated cities having cluster of township with high rise building & skyscrapers

TV Broadcast Signal Propagation:

TV broadcast signal propagates from the transmitter by space wave propagation mechanisms i.e. Line of sight Propagation & travel straight way in propagating medium & undergoes all optical phenomena like Reflection, Refraction, Scattering, Diffraction etc while travelling through the medium. It is also important to point out other factors typical of urban reception environment such as traffic, speed change due to traffic lights and pedestrian crossings, etc. The field strength level, at a given point, not only depends on its distance from the transmitter, the frequency of transmission and the antenna heights but also on the long-term and short-term interferences caused by reflections of the natural environment (terrain configuration, vegetation) and the man-made environment. Thus the received signal must be considered as the vector sum of the wanted signal and many reflected signals. Due to the effect of reflected signals, the Field Strength along a route shows severe fluctuation. Since, the measurements are made on public roads the reflected signals coming from other vehicles cannot be foreseen. The field strength test results therefore very rarely match the results of measurements obtained at the same place, at a different time.

Collection of field strength data:

The field strength data were collected along eight radials routes drawn (Annexure-I) around the transmitting antenna. At each & every spot/location along the radial the telescopic mast was expanded upto 10 Meters from the ground level keeping the dipole antenna horizontally as the polarization of the radiated beam is horizontally polarized. The antenna position is being continuously rotated for optimized value of field strength in the direction of line of sight with respect to the transmitting antenna. The optimum field strength values are thus recorded. In addition to this the terrain detail of each & every spot/location was also recorded along with the subjective assessment of the received audio/video quality on the basis of watching on TV receiving system. These collected data's are being tabulated in proper sequence to make it convenient for discussion & correlation with other parameters. The subjective assessment of received audio/video quality on TV receiver is graded as E(Excellent), VG(Very Good), G(Good), F(Fair) & P(Poor). The field strength measurement values along with subjective assessment at each & every spot/location are recorded in a tabular form giving at an instance the trend for variation in received field strength & signal reception quality with distance. In this report the received field strength & subjective assessment data collected along eight radials are tabulated accordingly in Table No.-1 to Table No.-8. In addition to this the radial distances & field strength value corresponding to satisfactory reception along all eight radials are compiled in tabular form (as in Table No: 9) to make it convenient to determine the primary coverage area of the said transmission. On the basis of Table -9, a coverage contour for analogue TV transmission has been drawn & annexed as in Annexure-II. Annexure III to Annexure VI represents variation of Field strength & MSL with distance along different radials. The code used for grading of the received signal is illustrated as follows.

Criteria for grading of received signal on the basis of subjective assessment:

Signal	E	Excellent	No impairment in received audio/video quality.
	VG	Very Good	Near to excellent with antenna direction
	G	Good	Light grains on screen but irritable of nature
	F	Fair	Moderate grains on TV screen but tolerable
	P	Poor	Huge grains causing irritation & intolerable

Broadcast Service Area:

The objective of broadcasting is to provide quality reception free from interferences & noise in a commercial domestic receiver, either fixed or mobile, to as much of population and area of the country as possible, In case of analogue transmission coverage area of broadcasting is decided by the minimum required received 'field strength' at the farthest end of the coverage area for satisfactory reception with commercially available domestic receivers. As per recommendation of ITU, minimum equivalent field strength value at 10Meters height for satisfactory reception of VHF/UHF transmission are as illustrated in following table.

Broadcast Band		Frequency	Minimum Field Strength			
VHF	Band-I	40-68 MHz	48 dB μ V/M			
	Band-II (Exclusively used for FM Radio Services)	88-108 MHz	Transmission Mode	Large Cities	Urban	Rural
			Mono	70 dB μ V/M	60 dB μ V/M	48 dB μ V/M
			Stereo	74 dB μ V/M	66 dB μ V/M	54 dB μ V/M
Band-III	174-230 MHz	55 dBμV/M				
UHF	Band-IV	470-606 MHz	65 dB μ V/M			
	Band-V	606-798 MHz	70 dB μ V/M			

Interpretation of the collected data along radials:

In this report efforts are being made for the interpretation & analysis of the collected FSM data along a radial & then a coverage contour based on compiled Table-9 for satisfactory reception of DVB-T2 transmission was drawn on a map.

1. **Radial-1(North)**: Along this radial field strength measurement done at location like Khandauli-Sadabad-Mitai-Hathras-Samamai Ruhai-Hashimpur- Mainath & Aligarh up to a radial distance of 80kM .Satisfactory reception of HPT(TV) Transmission was observed to be up to a radial distance of 75kM (Mainath near Aligarh Toll Plaza)
2. **Radial-2 (North-East)**: Along this radial field strength measurement done at location like Chhalesar- Nagla Raiya-Tundla-Ummernagar-Awagarh-Sawant Khera-Chamkari & Etah up to a radial distance of 75 km . Satisfactory reception of HPT(TV)Transmission was observed to be up to a radial distance of 65kM (Sawant Khera,10 km before Etah)
3. **Radial-3(East)**: Along this radial field strength measurement done at location like Raja Ka Tal-Dabrai-Nagla Bhudha (Aronj)-Shikohabad-Mandai-Baijuakhas & Ghiror(Mainpuri) up to a radial distance of 75 km . Satisfactory reception of HPT (TV) Transmission was observed to be up to a radial distance of 55kM (Shikohabad).
4. **Radial-4(South- East)**: Along this radial field strength measurement done at location like Mutawai-Rasulpur(Fatehabad)-Basai Arela-Bhadrauli-Bah-Rooppura & Gadhia Pratappura up to a radial distance of 80 km . Satisfactory reception of HPT(TV) Transmission was observed to be up to a radial distance of 60kM (Bah)
5. **Radial-5(South)**: Along this radial field strength measurement done at location like Hirner Newadakhara-Mithawali-Sahajpur-Dholpur-Jaitpur(Chambal)-Sikrauda-Morena & Chonda up to a radial distance of 75 km . Satisfactory reception of HPT (TV) Transmission was observed to be up to a radial distance of 65kM (Sikrauda).
6. **Radial-6(South-West)**:Along this radial field strength measurement done at location like Bad-Sarenda-Ata-Patparganj-Mewla-Deori-Tantpur-Kot-Jaisora&Bayana(Jaisora) up to a radial distance of 75 km . Satisfactory reception of HPT (TV) Transmission was observed to be up to a radial distance of 73kM (Jaisora).
7. **Radial-7(West)**: Along this radial field strength measurement done at location like Bahadur Ganj-Singarpur-Rasoolpur-Bharatpur-Madoli-Tatamar & Nadabai (Pahrsar Mor) up to a radial distance of 75 km . Satisfactory reception of HPT (TV) Transmission was observed to be up to a radial distance of 65kM (Tatamar).
8. **Radial-8(North-West)**: Along this radial field strength measurement done at location like Jawahar Nagar-Shehzadpur Pauri-Mahuan-Mathura-Jait-Ajhai Kalan-Akbarpur & Chhata up to a radial distance of 85 km . Satisfactory reception of HPT (TV) Transmission was observed to be up to a radial distance of 75kM (IVS Polytechnic, Akbarpur).

Conclusion:

On the basis of received field strength values & subjective assessment of the video quality at various spot/location along eight radials & coverage contour(Annexure-II) drawn on the basis of table prepared/compiled for satisfactory reception of analogue TV transmission following conclusions can be stipulated.

1. The coverage along North, South-West & North-West direction is up to a radial distance of 73-75 kM. In North-East, South & West direction coverage is up to 65 kM whereas along East & South-East direction it is up to a radial distance of 55 kM & 60 kM respectively.
2. The coverage along East & South-East direction is the least .This shrinkage in coverage is mainly due to the existence of pockets of low level land. The MSL level along these direction goes down up to 150-140 Meters beyond 40-50 kM radial distance from the location of HPT (TV) transmitting tower. This leads to variation in field strength due to height gain or loss. However along South-West direction beyond 50 kM from the HPT (TV) tower variation in field strength was observed mainly due to existence of hilly terrain.
3. Predicted coverage contour (Annexure-II) reveals that reception is satisfactory within the predicted coverage area (up to 55-75 kM) all around HPT (TV) Tower Agra with fixed roof top antenna mounted at a height of 10Mtrs from the ground.
4. No interference of unwanted signal in reception of analogue transmission has been observed within its coverage area.

Acknowledgement:

The propagation studies presented in this document are carried out by the Propagation Lab of Research Department of All India Radio & Doordarshan, New Delhi. The field trial was successfully done & the entire team acknowledges the sincere support, contribution & cooperation of the shift duty staff of HPT (TV) Tower, Agra (UP). Survey team also extends their gratitude to Sh. S.P.Jaiswal (DDE) who has extended all possible help to the survey team of research department. The survey team expresses their deepest sense of gratitude to Mrs. Anuradha Agarwal (ADG) & Sh. Deepak Kumar (DDG) whose enthusiastic supervision, motivation, suggestion & cooperation at every step helped in the successful completion of the survey.

Reception survey for satisfactory coverage of HPT (TV) Transmitter (203.2396MHz), Agra (UP)

Direction: North (Radial-1)

Table-1

Route: TV Tower (Agra) - Khandauli-Sadabad-Mitai-Hathras-Samamai Ruhai-Hashimpur- Mainath-Aligarh

Date: 26/07/2016

Time (Hrs)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dB μ V/m)	Subjective Assessment	Terrain	Remarks
1230	Foundary Nagar Hathras Road	N 27°13'44.6" E 78°02'45.2"	166	10	82.3	E	Suburban, Vegetation, Low Traffic. Cloudy,	
1330	Khandauli Khandauli-Baldeo Road	N27°19'00.7" E78°01'42.0"	169	20	67.2	E	Rural, Vegetation, Low Traffic, Cloudy.	
1515	Bohare (Jarau) Kursanda-Sadabad Road	N27°21'43.3" E78°01'58.4"	162	25	68.5	E	Rural, Vegetation, Low Traffic. , Cloudy.	
1625	Kuktai (Wedai) Kursanda-Sadabad Road	N27°24'22.1 E78°02'16.6"	173	30	75.1	E	Rural, Vegetation, Low Traffic. , Cloudy.	
1700	Sadabad Sadabad-Hathras Road	N27°27'06.2" E78°02'25.7"	166	35	71.8	E	Rural, Vegetation, Low Traffic. , Cloudy.	
1726	Santikara Sadabad-Hathras Road	N27°29'55.5" E78°02'48.6"	167	40	62.4	E	Rural, Vegetation, Low Traffic. , Cloudy.	
1740	Mitai Hathras Bypass Road	N27°32'28.3" E78°02'42.8"	167	45	67.3	E	Rural, Vegetation, Low Traffic. , Cloudy.	
1810	Khonda Hajari Hathras Bypass Road	N27°35'01.0" E78°01'12.8"	167	50	68.4	E	Rural, Vegetation, Low Traffic. , Cloudy.	
1830	Nagla Ummed, Hathras Hathras Bypass Road	N27°37'57.7" E78°03'34.4"	166	55	60.5	VG	Rural, Vegetation, Low Traffic. , Cloudy.	
1900	Kanya Gurkul Sasni Hathras-Aligarh Road	N27°40'33.4" E78°04'19.1"	164	60	59.7	VG	Rural, Vegetation, Low Traffic. , Cloudy.	
1915	Samamai Ruhai Hathras-Aligarh Road	N27°43'18.5" E78°05'11.0"	168	65	56.8	VG	Rural, Vegetation, Low Traffic. , Cloudy.	
1930	Hashimpur Hathras-Aligarh Road	N27°45'50.7" E78°05'16.1"	168	70	55.6	VG	Rural, Vegetation, Low Traffic. , Cloudy.	
1945	Mainath Near Aligarh Toll Plaza	N27°48'37.8 E78°05'11.5"	169	75	53.8	VG	Rural, Vegetation, Low Traffic. , Cloudy.	
2000	Rustampur Sakatkhan Near Aligarh	N27°50'09.4" E78°04'46.5"	172	78	50.4	G	Rural, Vegetation, Low Traffic. , Cloudy.	
2030	R.K.Puram (Sasni Gate) ,Aligarh	N27°51'34.0" E78°04'32.3"	171	80	40.3	F/P	Urban, Moderate Traffic, cloudy	

Reception survey for satisfactory coverage of HPT (TV) Transmitter (203.2396MHz), Agra (UP)

Direction: North- East (Radial-2)

Table-2

Route: TV Tower (Agra)-Chhalesar- Nagla Raiya-Tundla-Ummengarh-Awagarh-Sawant Khera-Chamkari-Etah

Date: 27/07/2016

Time (Hrs)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dB μ V/m)	Subjective Assessment	Terrain	Remarks
1300	Chhalesar(Kuberpur) Firozabad road	N27°12'59.8" E78°05'17.1"	156	10	98.8	E	Rural , Heavy Traffic, Cloudy	
1415	Satauli (Tundla) Firozabad road	N27°13'54.8" E78°13'11.0"	160	20	86.5	E	Rural , Heavy Traffic, Cloudy	
1525	Nagla raiya (Tundla)		166	30	76.2	E	Rural, Vegetation, Cloudy.	
1600	Radau Pahar Pur Tundla-Etah Road	N27°19'21.3" E78°19'50.2"	162	35	68.5	E	Rural, Vegetation, Cloudy.	
1615	Ummengarh Tundla-Etah Road	N27°21'31.3" E78°22'21.0"	160	40	72.4	E	Rural, Vegetation, Cloudy.	
1630	Jarani Hanspur, Chauki Tundla-Etah Road	N27°23'10.4" E78°24'14.5"	164	45	71.3	E	Rural, Vegetation, Cloudy.	
1700	Churthara Tundla-Etah Road	N27°25'04.6" E78°26'48.4"	164	50	63.6	E	Rural, Vegetation, Cloudy.	
1730	Awagarh Tundla-Etah Road	N27°26'25.5" E78°29'02.8"	160	55	60.4	E	Rural, Vegetation, Cloudy.	
1745	Nawali Tundla-Etah Road	N27°28'04.0" E78°31'28.5"	160	60	59.4	VG	Rural, Vegetation, Cloudy.	
1800	Sawant Khera Tundla-Etah Road	N27°29'55.9" E78°33'52.1"	159	65	55.4	VG/G	Rural, Vegetation, Cloudy.	
1830	Jawara Tundla-Etah Road	N27°31'34.1" E78°36'14.3"	158	70	52.2	G	Rural, Vegetation, Cloudy.	
1845	Chamkari Tundla-Etah Road	N27°32'40.0" E78°37'52.1"	157	73	46.3	F	Suburban, Low Traffic, Cloudy.	
1950	Mhila Thanaa (Etah) Tundla-Etah Road	N27°33'17.7" E78°38'46.0"	155	75	45.4	F/P	Urban, Low Traffic, Cloudy	

Reception survey for satisfactory coverage of HPT (TV) Transmitter (203.2396MHz), Agra (UP)

Direction: East (Radial-3)

Table-3

Route: TV Tower (Agra)-Raja Ka Tal-Dabrai-Nagla Bhudha (Aronj)-Shikohabad-Mandai-Baijuakhas-Ghiror

Date: 28/07/2016

Time (Hrs)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dB μ V/m)	Subjective Assessment	Terrain	Remarks
1300	Dhirpur (Tundla) Link Road	N27°08'50.7" E78°17'02.4"	155	23	80.2	E	Rural, Vegetation Low Traffic Cloudy	
1340	Alinagar Kenjra Raaja ka Taal Road	N27°11'11.9" E78°20'41.5"	159	30	72.0	E	Rural, Vegetation Low Traffic Cloudy	
1425	Nagla Mirza Bara Firozabad Bypass Road	N27°09'17.3" E78°24'23.0"	164	35	63.6	E	Urban, Heavy Traffic, Cloudy	
1445	Dabrai Firozabad-Shikohabad Rd	N27°07'30.7" E78°27'27.0"	161	40	72.4	E	Suburban, Moderate Traffic, Cloudy	
1500	Mohammdpur Nawada Firozabad-Shikohabad Rd	N27°07'23.8" E78°30'24.4"	161	45	61.7	E	Rural, Vegetation Low Traffic Cloudy	
1600	Nagla Bhuda (Aronj) Firozabad-Shikohabad Rd	N27°06'58.7" E78°33'14.3"	153	50	61.3	E	Rural, Vegetation Low Traffic Cloudy	
1625	Shikohabad Shikohabad Bypass Road	N27°06'16.8" E78°36'12.6"	154	55	54.7	VG/G	Rural, Vegetation Low Traffic Cloudy	
1645	Mandai Mainpuri Link Road	N27°07'43.7" E78°39'24.1"	152	60	47.5	F	Rural, Vegetation Low Traffic Cloudy	
1700	Baijuakhas Mainpuri Road	N 27°07'00.1" E78°42'16.6"	149	65	45.4	F	Rural, Vegetation Low Traffic Cloudy	
1715	Bharaul Mainpuri Road	N 27°10'05.6" E78°45' 18.5"	146	70	44.1	P	Rural, Vegetation Low Traffic Cloudy	
1745	Ghiror (Mainpuri)	N 27°11'24.4" E78° 48' 19.8"	149	75	42.4	P	Urban, Moderate Traffic.	

Reception survey for satisfactory coverage of HPT (TV) Transmitter (203.2396MHz), Agra (UP)

Direction: South-East (Radial-4)

Table-4

Route: TV Tower (Agra)- Mutawai-Rasulpur(Fatehabad)-Basai Arela-Bhadrauli-Bah-Rooppura-Gadhia Pratappura

Date: 29/07/2016

Time (Hrs)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dB μ V/m)	Subjective Assessment	Terrain	Remarks
1330	Kachhpura , Kundol Fatehabad Road	N27°06'25.1" E78°08'53.7"	160	10	90.5	E	Rural Low Traffic. Cloudy, Vegetation	
1400	Mutawai Fatehabad Road	N27°03'36.0" E78°14'09.0"	155	20	84.3	E	Rural Low Traffic. Cloudy, Vegetation	
1515	Rasulpur (Fatehabad) Fatehabad-Arnota Road	N27°00'34.3" E78°19'10.9"	157	30	71.4	E	Rural Low Traffic. Cloudy, Vegetation	
1530	Nayapura (Khandar) Fatehabad-Arnota Road	N26°58'28.2" E78°21'21.7"	157	35	68.2	E	Rural Low Traffic. Cloudy, Vegetation	
1555	Basai Arela Arnota-Bah Road	N26°56'25.4" E78°23'29.3"	160	40	62.5	E	Rural Low Traffic. Cloudy, Vegetation	
1645	Sutahari Arnota-Bah Road	N26°54'55.5" E78°26'16.0"	155	45	58.2	E	Rural Low Traffic. Cloudy, Vegetation	
1715	Bhadrauli Arnota-Bah Road	N26°53'54.1" E78°28'52.8"	150	50	56.6	E	Rural Low Traffic. Cloudy, Vegetation	
1730	Pharaira Arnota-Bah Road	N26°53'01.2" E78°31'47.6"	146	55	56.2	VG	Rural Low Traffic. Cloudy, Vegetation	
1740	Bah Arnota-Bah Road	N26°52'20.0" E78°34'51.8"	145	60	54.6	VG	Rural Low Traffic. Cloudy, Vegetation	
1800	Badagaon Bah-Udi Road	N26°51'24.4" E78°37'41.4"	146	65	50.7	G	Rural Low Traffic. Cloudy, Vegetation	
1830	Rooppura Bah-Udi Road	N26°50'17.5" E78°40'27.1"	144	70	45.6	G/F	Rural Low Traffic. Cloudy, Vegetation	
1900	Pyarampura Bah-Udi Road	N26°49'26.1" E78°43'15.5"	144	75	46.2	G/F	Rural Low Traffic. Cloudy, Vegetation	
1920	Gadhia Pratappura Bah-Udi Road	N26°48'23.6" E78°46'12.2"	142	80	37.4	Poor	Rural Low Traffic. Cloudy, Vegetation	Ch#12(DD NEWS)- Good

Reception survey for satisfactory coverage of HPT (TV) Transmitter (203.2396MHz), Agra (UP)

Direction: South (Radial-5)

Table-5

Route: TV Tower (Agra)-Hirner Newadakhhera-Mithawali-Sahajpur-Dholpur-Jaitpur Chambal-Sikrauda-Morena-Chonda

Date: 30/07/2016

Time (Hrs)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dB μ V/m)	Subjective Assessment	Terrain	Remarks
1030	Hirner Newadakhhera Agra-Shamsabad Road	N27°03'18.3" E78°06'10.0"	158	10	87.7	E	Rural, Vegetation, Cloudy	
1100	Thana Shankar Dwari Chandipura Road	N26°57'21.9" E78°06'06.5"	150	20	75.2	E	Rural, Vegetation, Cloudy	
1600	Mithawali RajaKhera-Dholpur Road	N26°52'11.7" E78°07'31.6"	162	30	72.2	E	Rural, Vegetation, Low Traffic, Rainy	
1645	Pahari RajaKhera-Dholpur Road	N26°48'54.2" E78°03'06.5"	166	35	69.4	E	Rural, Vegetation, Low Traffic, Rainy	Rajasthan
1725	Sahajpur RajaKhera-Dholpur Road	N26°46'04.7" E77°59'27.2"	168	40	65.9	E	Rural, Vegetation, Low Traffic, Rainy	Rajasthan
1800	Kharagpura RajaKhera-Dholpur Road	N26°44'09.9" E77°55'15.2"	171	45	65.2	E	Rural, Vegetation, Low Traffic, Rainy	Rajasthan
1830	Dholpur Agra-Dholpur Road	N26°41'47.3" E77°53'27.5"	174	50	57.5	VG	Urban, Flyover, Heavy Traffic,	Rajasthan
1850	Jaitpur Chambal Dholpur-Morena Road	N26°38'59.2" E77°54'41.2"	149	55	59.6	E	Rural, Vegetation, Low Traffic, Rainy	M.P
1900	Bandha Dholpur-Morena Road	N26°35'39.2" E77°56'29.9"	168	60	58.7	VG	Rural, Vegetation, Low Traffic, Rainy	M.P
1930	Sikrauda (Hingona Khurd) Dholpur-Morena Road	N26°32'58.2" E77°57'22.0"	166	65	55.3	VG	Rural, Vegetation, Low Traffic, Rainy	M.P
1945	Morena Dholpur-Morena Road	N26°30'05.8" E77°58'31.8"	166	70	45.7	F	Urban ,Moderate Traffic, Cloudy	M.P
2030	Chonda (Toll Plaza Morena)	N26°28'0.07" E78°00'30.7"	170	75	44.2	Poor	Rural, Moderate Traffic, Cloudy	M.P

Reception survey for satisfactory coverage of HPT (TV) Transmitter (203.2396MHz), Agra (UP)

Direction: South-West (Radial-6)

Table-6

Route: TV Tower (Agra)-Bad-Sarenda- Ata-Patparganj-Mewla-Deori-Tantpur- Kot-Jaisora-Bayana(Jaisora)

Date: 31/07/2016

Time (Hrs)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dBµV/m)	Subjective Assessment	Terrain	Remarks
1020	Bad Agra-Mumbai NH-44	N27°03'42.1" E77°58'55.4"	154	10	92.4	E	Suburban, Moderate Traffic. Vegetation Cloudy	
1100	Gahara Khurd, Agra-Jagner Road	N27°02'47.7" E77°52'06.8"	158	20	82.2	E	Rural, Low traffic Vegetation, Cloudy	
1130	Nagla Vishnu (Sarenda) Agra-Jagner Road	N26°59'07.2" E77°47'14.1"	160	30	63.8	E	Rural.. Low Traffic. Vegetation, Cloudy	U.P
1200	Kolua (Ata) Agra-Jagner Road	N26°57'16.2" E77°45'00.4"	164	35	72.5	E	Rural.. Low Traffic. Vegetation, Cloudy	Rajasthan
1230	Naripura (Patparganj) Agra-Jagner Road	N26°56'06.0" E77°42'26.2"	169	40	65.4	E	Rural.. Low Traffic. Vegetation, Cloudy	Rajasthan
0100	Nangla Imli Agra-Jagner Road	N26°54'35.8" E77°39'30.7"	168	45	64.2	E	Rural.. Low Traffic. Vegetation, Cloudy	Rajasthan
1330	Chaprai Estate (Mewla) Agra-Jagner Road	N26°52'52.3" E77°37'22.5"	174	50	55.4	VG	Rural.. Low Traffic. Vegetation, Cloudy	Rajasthan
1400	Deori Jagner-Tantpur Road	N26°51'27.1" E77°35'03.1"	178	55	57.2	VG	Rural.. Low Traffic. Vegetation, Cloudy	Rajasthan
1415	Nayagaon Jagner-Tantpur Road	N26°50'47.2" E77°31'57.3"	186	60	61.6	E	Rural, Hilly Cloudy Vegetation	Rajasthan
1430	Tantpur Jagner-Tantpur Road	N26°50'21.0" E77°28'28.0"	206	65	60.7	E	Rural, Hilly Cloudy Vegetation	Rajasthan
1500	Bangra (Kot)	N26°48'57.3" E77°26'05.0"	231	70	57.1	VG	Rural, Hilly Cloudy Vegetation	
1515	Jaisora Khatnawli-Jheel Road	N26°46'37.9" E77°25'41.1"	214	73	55.2	VG	Rural, Hilly Cloudy Vegetation	
1530	Bayaana (Jaisora) Khatnawli-Jheel Road	N26°45'20.6" E77°25'41.5"	220	75	52.4	Good	Rural, Hilly Cloudy Vegetation	

Reception survey for satisfactory coverage of HPT (TV) Transmitter (203.2396MHz), Agra (UP)

Direction: West (Radial-7)

Table-7

Route: TV Tower (Agra)-Bahadur Ganj-Singarpur-Rasoolpur-Bharatpur-Madoli-Tatamar-Nadabai (Pahrsar Mor)

Date: 01/08/2016

Time (Hrs)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dB μ V/m)	Subjective Assessment	Terrain	Remarks
1020	Bahadur Kunj Jagner Road	N 27° 08' 12.2" E 77° 56' 44.0"	151	10	86.2	E	Suburban, Low Traffic, Cloudy, Vegetation	
1040	Gharhsani(Baroda Sadar) Agra-Fatehpur Sikri Road	N 27° 08' 47.2" E 77° 50' 38.6"	160	20	77.6	E	Rural, Low Traffic, Rainy ,Vegetation	
1100	Singarpur Agra-Fatehpur Sikri Road	N 27° 07' 29.7" E 77° 44' 43.5"	170	30	75.3	E	Rural, Low Traffic, Rainy ,Vegetation	
1130	Sarsa Kiravali Agra-Fatehpur Sikri Road	N 27° 06' 29.0" E 77° 41' 40.9"	166	35	68.4	E	Rural, Low Traffic, Rainy ,Vegetation	
1145	Rasoolpur(Fatehpur Sikri) Fatehpur -Bharatpur Road	N 27° 07' 06.2" E77° 38' 45.1"	167	40	69.2	E	Rural, Low Traffic, Rainy ,Vegetation	
1200	Tehra Lodha Fatehpur -Bharatpur Road	N 27° 08' 53.7" E 77°35' 26.4"	166	45	60.4	E	Rural, Low Traffic, Cloudy ,Vegetation	
1215	Ghasaula Fatehpur -Bharatpur Road	N 27° 10' 46.0" E 77° 32' 44.5"	169	50	62.3	E	Rural, Low Traffic, Cloudy ,Vegetation	
1230	Pachhi ka Nagla Bharatpur	N 27° 11' 56.0" E77° 29' 48.8"	172	55	58.2	E/VG	Rural, Low Traffic, Cloudy ,Vegetation	
1239	Madoli Bharatpur-Bayana Road	N 27° 11' 04.2" E 77° 26' 33.5"	173	60	61.7	E	Rural, Low Traffic, Cloudy ,Vegetation	
1249	Tatamar Jaipur Road	N 27° 10' 18.9" E 77°23' 32.4"	181	65	54.6	VG	Rural, Low Traffic, Cloudy ,Vegetation	
1300	Bansi Khurd, Jaipur Rd	N 27° 09' 59.4" E 77° 20' 24.2"	188	70	42.3	F	Rural, Low Traffic, Cloudy ,Vegetation	
1330	Nadabai, Pahrsar mor Jaipur Rd	N 27° 09' 17.9" E 77° 17' 20.7"	190	75	40.4	Poor	Rural, Low Traffic, Cloudy ,Vegetation	

Reception survey for satisfactory coverage of HPT (TV) Transmitter (203.2396MHz), Agra (UP)

Direction: North-West (Radial-8)

Table-8

Route: TV Tower (Agra) - Jawahar Nagar-Shehzadpur Pauri-Mahuan-Mathura-Jait-Ajhai Kalan-Akbarpur-Chhata

Date: 02/08/2016

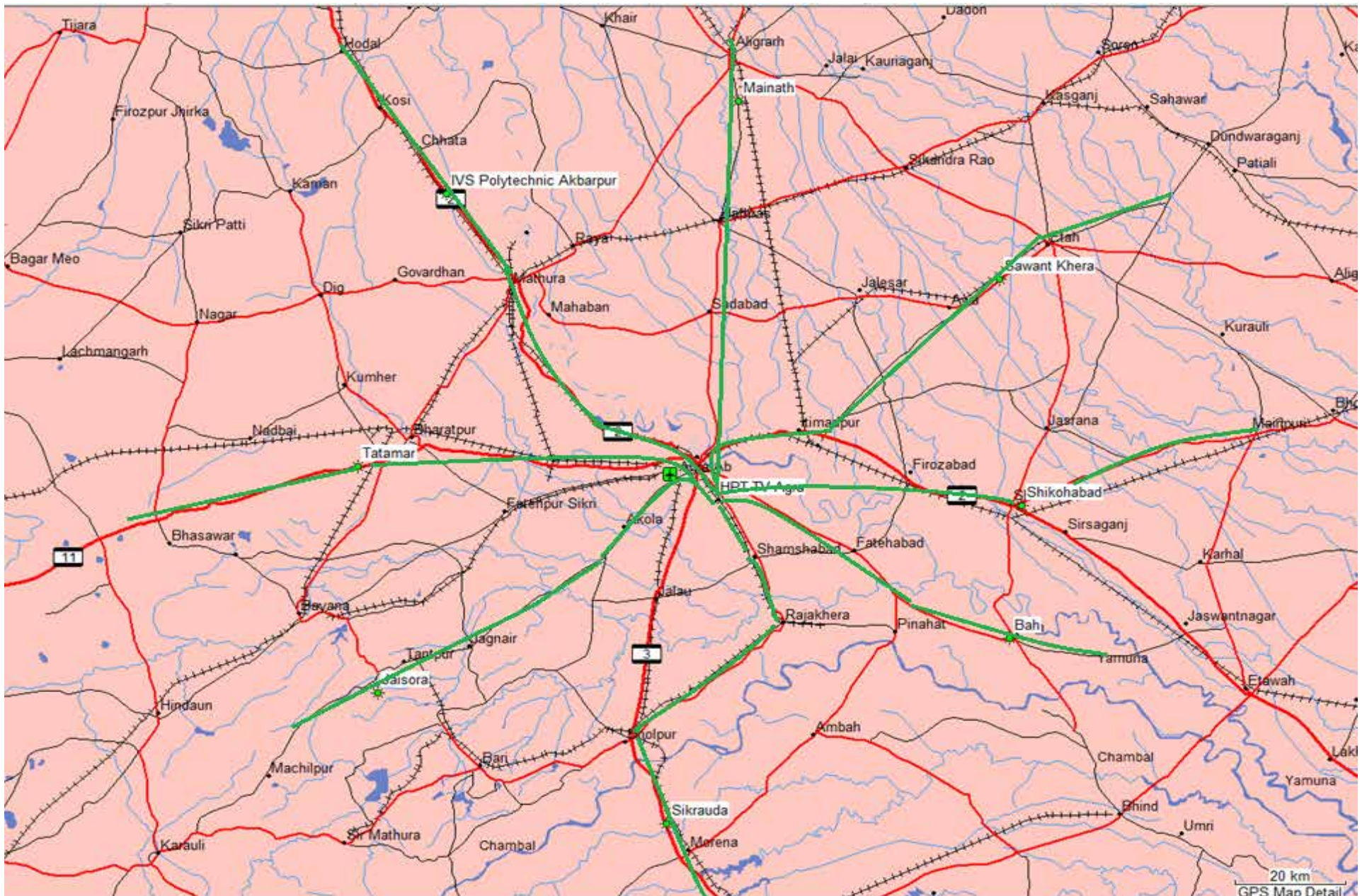
Time (Hrs)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dBµV/m)	Subjective Assessment	Terrain	Remarks
1010	Jawahar Nagar Mathura Bypass Road	N 27°12' 39.8" E 77°59' 48.8"	161	10	75.8	E	Urban. High Traffic. ,Cloudy, Vegetation	
1045	Runkata Mathura Road (NH-19)	N27°14' 00.4" E77°53' 44.9"	162	20	67.5	E	Suburban,. Low, Traffic Vegetation,	
1115	Shehzadpur Pauri Mathura Road	N27°17' 11.3" E77°47' 44.5"	162	30	74.2	E	Suburban,. Low, Traffic Vegetation,	
1145	Farah Mathura Road (NH-19)	N27°19' 06.4" E77°45' 37.6"	166	35	72.4	E	Rural, Low, Traffic Vegetation, Cloudy	
1200	Mahuan Mathura Road	N27°21' 04.0" E77°43' 26.3"	171	40	68.3	E	Rural, Low, Traffic Vegetation, Cloudy	
1215	Refinery (Maoli Khadar) Mathura Road	N27°23' 05.9" E77°41' 34.6"	170	45	61.4	E	Rural, Low, Traffic Vegetation, Cloudy	
1330	Techman Nilgiri Mathura Road (NH-19)	N27°26' 54.0" E77°41' 11.9"	172	50	63.2	E	Rural, Low, Traffic Vegetation, Cloudy	
1400	Mandi Samiti Mathura Delhi Road (NH-19)	N27°29' 08.8" E77°39' 21.5"	170	55	52.6	G	Rural, Low, Traffic Vegetation, Cloudy	
1525	Village Kota , Mathura-Palwal Road	N27°33' 24.9" E77°38' 52.3"	168	60	53.5	G	Rural, Low, Traffic Vegetation, Cloudy	
1325	Jait Mathura-Palwal Road	N27°34' 30.2" E77°36' 54.4"	179	65	57.1	VG	Rural, Low, Traffic Vegetation, Cloudy	
1600	Ajhai Kalan Mathura-Palwal Road	N27°36' 46.2" E77°35' 08.8"	179	70	55.6	VG	Rural, Low, Traffic Vegetation, Cloudy	
1615	I V S Polytechnic, Akbarpur , Delhi Road	N27°38' 53.4" E77°33' 16.1"	179	75	54.4	VG	Rural, Low, Traffic Vegetation, Cloudy	
1625	Semri Mathura-Palwal Road	N27°41' 01.9" E77°31' 23.1"	179	80	51.2	G	Rural, Low, Traffic Vegetation, Cloudy	
1639	Chhata Mathura-Palwal Road	N27°43' 34.3" E77°30' 00.4"	180	85	48.3	Fair	Rural, Low, Traffic Vegetation, Cloudy	

Reception survey for satisfactory coverage of HPT (TV) Transmitter (203.2396MHz), Agra (UP)

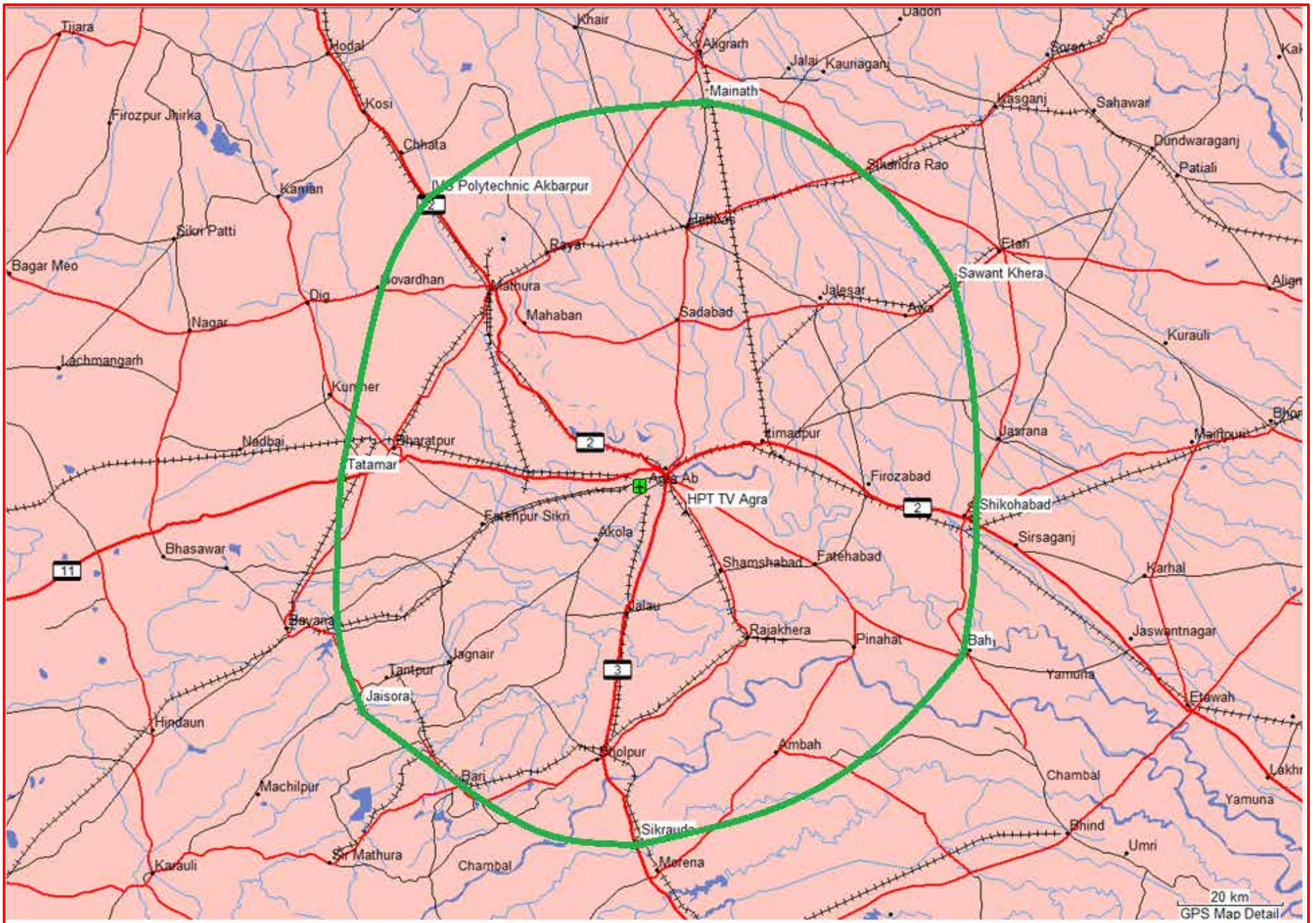
Table for satisfactory coverage of analogue TV Transmitter

Table-9

Direction	Spot/Location	Location Co-ordinates	Radial Distance (kM)	Field Strength (dB μ V/m)	MSL (Meters)	Subjective Assessment
North	Mainath Near Aligarh Toll Plaza	N27°48'37.8" E78°05'11.5"	75	53.8	169	VG
North-East	Sawant Khera) Tundla-Etah Road	N27°29'55.9" E78°33'52.1"	65	55.4	159	VG
East	Shikohabad Shikohabad Bypass Road	N27°06'16.8" E78°36'12.6"	55	54.7	154	VG
South-East	Bah Arnota-Bah Road	N26°52'20.0" E78°34'51.8"	60	54.6	145	VG
South	Sikrauda(Hingona Khurd) Dholpur-Morena Road	N26°32'58.2" E77°57'22.0"	65	55.3	166	VG
South-West	Jaisora Khatnawli-Jheel Road	N26°46'37.9" E77°25'41.1"	73	55.2	214	VG
West	Tatamar Jaipur Road	N27°10'18.9" E77°23'32.4"	65	54.6	181	VG
North-West	I V S Polytechnic, Akbarpur , Delhi Road	N27°38'53.4" E77°33'16.1"	75	54.4	179	VG



Radial Route Map originating from HPT (TV) Tower, Agra (Uttar Pradesh)



Coverage Contour Map Analogue HPT (TV) Transmitter, Agra (Uttar Pradesh)

