



**Reception survey for  
assessment of coverage area  
for satisfactory reception of  
DVB-T2 Transmitter  
*Located at Aurangabad  
Maharashtra***

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**(Survey Period: 21/12/2016 to 30/12/2016)**

## **Field Strength Measurement/Reception Survey Team**

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**TV Transmitter Hall, HPT(TV) Aurangabad**



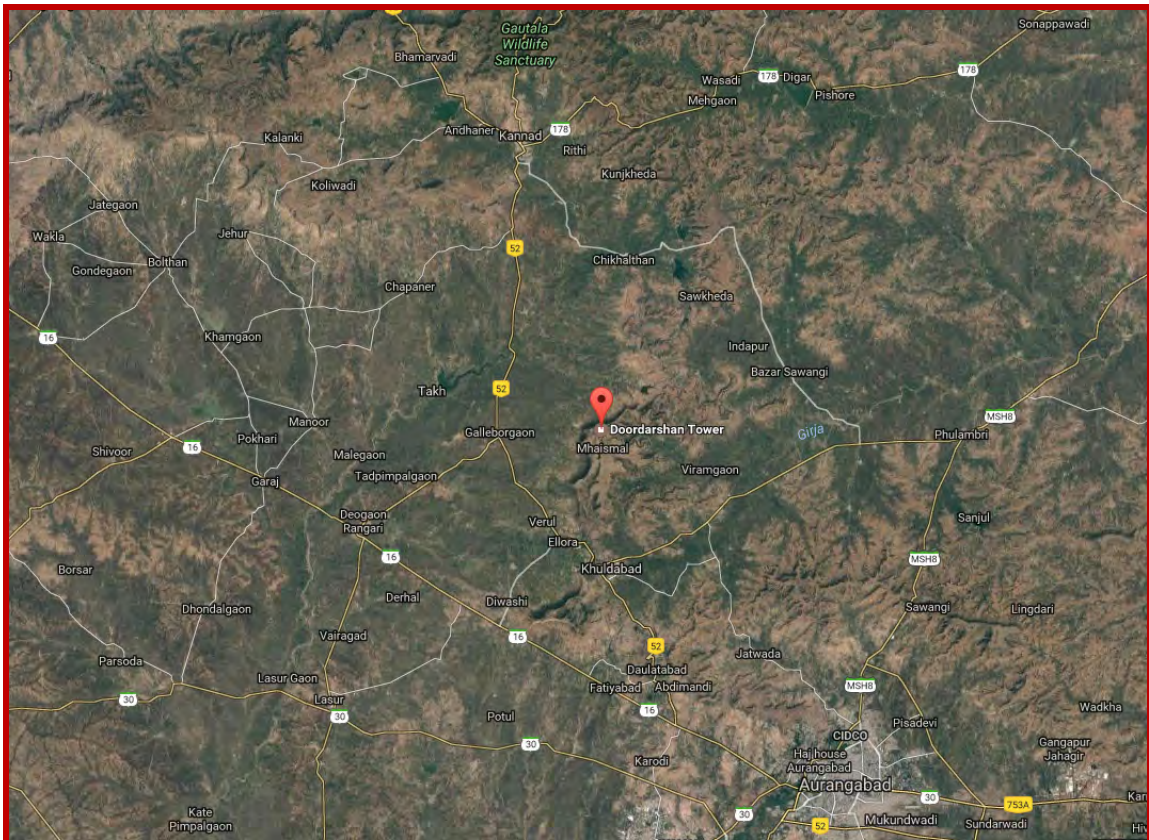
**Transmitting Antenna Tower**



**6kW DVB-T2 Transmitter**



**Transmitter Control Unit**



**Location Map (3D View) of HPT (TV) Aurangabad (Maharashtra)**

## **Introduction:**

Digital technology has already made its way into vast areas of the information and communications landscape. In all areas of application, the conversion of information into strings of zeroes and ones allows data to be compressed on modern storage media without sacrificing its quality. The transition to digital technology results in an improved spectrum efficiency, where more program channels can be broadcast within the same bandwidth. It allows the simultaneous transmission of multiple services, each one with a different configuration, and thus, with different robustness and quality. This permits new type of reception scenarios for these digital terrestrial signals, like mobile and handheld pedestrian reception scenarios. DVB-T2 has been designed to fulfill these requirements, increasing spectral efficiency and robustness in a flexible way so that a variety of reception scenarios can be covered, with the same system by choosing the best configuration options available. So DVB-T2 can be used for providing both fixed and mobile services within the same channel with number of configurations supported. Although, this new standard has been fundamentally designed for fixed reception (receiver devices with rooftop and set-top antennas) but now the DVB-T2 reception is also feasible in portable and mobile devices (Smart Mobile Phones, PCs, laptops or in-car receivers). In the process of modernization, Doordarshan India has established DVB T2 Transmitters in its network with future plan to replaced analogue transmitters with such DVB-T2 Transmitters. One of such transmitter is being established at Aurangabad(Maharashtra) & commissioned for DD National Transmission on UHF Band Ch#23(490MHz). The HPT (TV) DVB-T2 Transmitter, Aurangabad is situated at the hill top (MSL-916 Meter) of Mahaismal Hill (Pimpri) & its topography consist of irregular hilly terrain, large vegetation & mostly low populated rural areas. In this context Research Department is involved in carrying out propagation studies on DVB-T2 transmission to assist fixing of planning parameters/transmission configuration under existing terrain condition. The scope of work for the survey team of Research Department is to carry out field trial for prediction of coverage area for satisfactory reception. For this work a four member survey team carried out field strength survey during the period 21/12/2016 to 30/12/2016 along eight radials around the location of DVB-T2 Transmitter. 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. Log Periodic antenna(Make: Rhode & Schwartz, Model: HL-223)
3. GPS Navigator(Make: Garmin, Model: Montana 650)
4. DVB-T2 Set Top Box & IRD(Make: Ericsson)
5. LED TV Receiver(Make: Sony) & Smart Phone (Samsung Galaxy J7 Prime)

## Basic Data and Transmitter details

### Transmitters Details:

1. Name of Station : HPT(TV) Tower, Aurangabad  
Maharashtra
2. Location of the Transmitters : Mahaismal Hill (Pimpri)  
LAT- N 20° 05'30.9"  
(In 6 figure coordinates) LON- E 75° 11'09.1"  
MSL-916 Meter
3. Description of terrain around the Transmitters : Rural, Hilly, Vegetation,  
No Traffic
4. Classification(Large city/urban/rural) : Rural
5. Rated power of the Transmitter : 6.0kW
6. Forward radiated Power : 5.91kW
7. Reflected Power : 10.0W
8. VSWR : 1.12
9. Transmission Mode : SDTV
10. Make : Harris
11. Model No. : MAXIVA ULX-6500 T2
12. Frequency of operation : 490MHz (Ch#23)
13. Date of Commissioning : 25/02/ 2016

:

### Transmitting Antenna Details:

1. Make : SIERA
2. Type /Model of Antenna : Panel Type /UTV-01/16(6X4)
3. Antenna Gain : 12.59dB
4. PAPR : 13dB
5. Height of Tower : 150 Meter
6. Type of Tower : RCC & Steel structure
7. Effective height of antenna(Midbay) : Not available
8. Type of Polarization : Horizontal



## DVB-T2 Broadcast System:

DVB-T2 is the world's most advanced digital terrestrial transmission (DTT) system, offering more robustness, flexibility and at least 50% more efficiency than any other DTT system. It supports SD, HD, mobile TV, or any combination thereof. Like its predecessor, DVB-T2 uses OFDM (orthogonal frequency division multiplex) modulation with a large number of sub-carriers delivering a robust signal, and offers a range of different modes, making it a very flexible standard. DVB-T2 uses the same error correction coding as used in DVB-S2 and DVB-C2: **LDPC (Low Density Parity Check)** coding combined with **BCH (Bose-Chaudhuri-Hocquengham)** coding, offering a very robust signal. The number of carriers, guard interval sizes and pilot signals can be adjusted, so that the overheads can be optimized for any target transmission channel. The key new technologies in DVB-T2 are:

- Multiple Physical Layer Pipes allow separate adjustment of the robustness of each delivered service within a channel to meet the required reception conditions (for example in-door or roof-top antenna). It also allows receivers to save power by decoding only a single service rather than the whole multiplex of services.
- Alamouti coding is a transmitter diversity method that improves coverage in small-scale single-frequency networks.
- Constellation Rotation provides additional robustness for low order constellations.
- Extended interleaving, including bit, cell, time and frequency interleaving.
- Future Extension Frames (FEF) allows the standard to be compatibly enhanced in the future.

As a result, DVB-T2 can offer a much higher data rate than DVB-T or a much more robust signal. For comparison, the two bottom rows show the maximum data rate at a fixed C/N ratio and the required C/N ratio at a fixed (useful) data rate.

Transmission Parameter	DVB-T	DVB-T2 (New improved option in Red)
FEC	Convolutional Coding + Reed Solomon(1/2,2/3,3/4,5/6,7/8)	LDPC + BCH(1/2,3/5,2/3,3/4,4/5,5/6)
Modes	QPSK, 16QAM, 64QAM	QPSK, 16QAM, 64QAM, 256QAM
Guard Interval	1/2, 1/8, 1/16, 1/32	1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
FFT Size	2k, 8k	1k, 2k, 4k, 8k, 16k, 32k
Scattered Pilot	8% of Total	1%, 2%, 4%, 8% of total
Continual Pilot	2.6% of total	0.35% of total
Bandwidth	6, 7, 8 MHz	1.7, 5, 6, 7, 8, 10 MHz
Typical data rate(UK)	29 Mbit/second	40 Mbit/second
Max data rate @ 20dB C/N	29 Mbit/Second	47.8 Mbit/second
Required C/N Ratio @ 22	16.7 dB	8.9dB

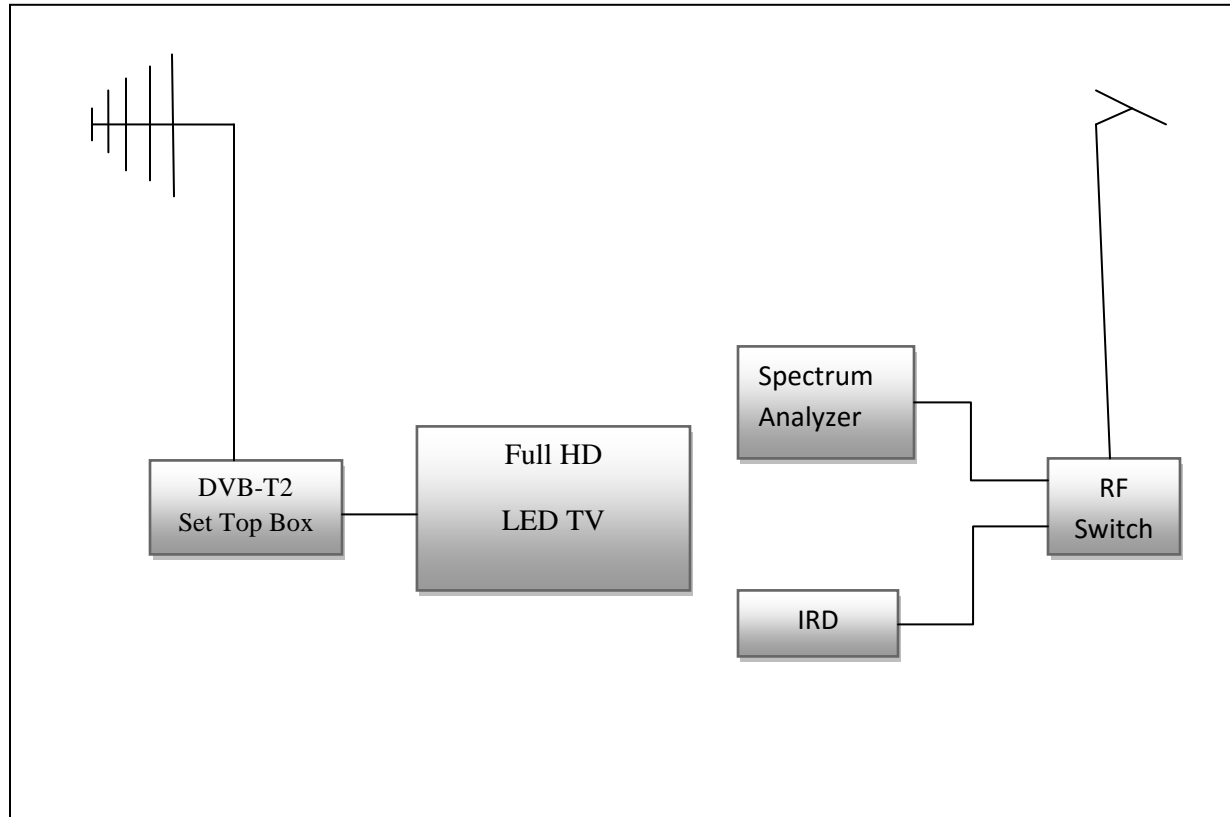
## Modulation Parameters:

DVB-T2 standard offers a bigger choice of the OFDM parameters and modulation schemes depending upon application & reception mode. Combining various modulation schemes with FFT sizes and guard intervals allows construction of MFN and SFN networks designed for different applications: from low bit-rate but robust mobile reception to the high bit-rate fixed reception for domestic and professional use. Currently DVB-T2 transmitter, Aurangabad operating with following set of Modulation parameters targeted for fixed antenna & handheld portable (smart phone) reception mode.

Operating Frequency	490 MHz
Channel No.	#23(UHF, Band-IV)
Bandwidth	8 MHz
Number of Programme Content	TV : Five Services Radio: Nil
PLP Bit Rate:	6.17 M Bit/s
FFT	1K
Guard Interval	1/8
PLP Constellation	QPSK
PLP Rotation	Rotated
PLP Code Rate	1/2
Pilot Pattern	PP3
SISO/MISO	SISO
FEC Frame Length	Normal

## System configuration:

The field trials system mainly consists of field strength measuring equipment, standard calibrated UHF 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 & R&S make UHF Log Periodic 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 DVB-T2 receiving system and field strength measuring system (Spectrum Analyzer). A calibrated UHF Log Periodic Antenna was used to receive the signal whereas for subjective assessment of the received signal was performed by using DVB-T2 set top box & a Sony make LED TV. To record Pre LDPC/BCH & MER data an Ericsson make professional IRD was used. In addition to this Garmin make GPS navigator was used for determination of the spot/location co-ordinate 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 motorable road side), or because of the hazards in moving the survey vehicle while the antenna is fully erected. High tension overhead wires, close to high rise buildings & elevated flyovers/underpasses were avoided while collecting field strength data along a radial route.

## **Measurement Methodology:**

A map of the largest available scale may be 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 & MER value. 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 drive 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 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 DVB-T2 Set Top Box & SONY make receiver under given terrain conditions. The environment classification criteria are:

<b>Rural</b>	Areas with scarce isolated buildings, open fields.
<b>Suburban</b>	Small towns; residential areas with low building density and buildings not higher than two stories; wide roads or streets between buildings.
<b>Urban</b>	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
<b>Large Cities</b>	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. DVB T2 reception is largely affected by multipath, which changes along time due to the receiver travelling around the buildings. 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/MER 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 a 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 DVB-T2 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 OK, FF-Frequent Freezing, F-Freeze & NT- Not Traceable. 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/MER & 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, MER/BER & 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 DVB-T2 transmission has been drawn & annexed as in Annexure-II. Annexure III to Annexure VI represents variation of Field strength & MER 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	OK	No impairment in received audio/video quality.
	FF	Received frame simultaneously appearing-disappearing leading to irritable reception.
	F	Received frame freeze permanently.
	NT	Not Traceable or No Signal.

## 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 but in digital terrestrial transmission one more transmission parameter(MER) is required along with the minimum field strength value for prediction of the coverage area. Studied has been carried out worldwide to determine the minimum required field strength & MER value for satisfactory reception of DTT signal. Rec. ITU-R BT.2254 give minimum equivalent field strength at receiving location for satisfactory reception of DVB-T2 transmission are as illustrated in following table.

Mode of reception	Minimum Field Strength
Fixed Scenario	45.3 dB $\mu$ V/m
Portable/Outdoor/Urban	50.2dB $\mu$ V/m
Mobile/Rural	42.5 dB $\mu$ 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 Kannad- Nagad-Kothali-Waghare-Amod-Budhagaon-Satrasen & Devsingpada up to a radial distance of 150 kM Satisfactory reception of DVB-T2 Transmission was observed for TV Receiver (10 meter) to be up to a radial distance of **140 kM** (Satrasen) whereas for TV ON Go (Dongle) on smart mobile phone at a height of 1.5 Meter it was up to a radial distance of **135 kM** (Near Lasur).
2. **Radial-2 (North-East)**:Along this radial field strength measurement done at location like Kanhuri-Aland-Chinchkheda-Palod-Golegaon-Ajanta-Tondapur-Pimpala & Fattepur up to a radial distance of 95 kM . Satisfactory reception of DVB-T2 Transmission was observed for TV Receiver (10 meter) to be up to a radial distance of **75 kM** (Ajanta) whereas for TV ON Go (Dongle) on smart mobile phone at a height of 1.5 Meter it was up to a radial distance of **70 kM** (Golegaon-Balapur)
3. **Radial-3 (East)**:Along this radial field strength measurement done at location like Purbawada-Dabhdi-Rajur-Deulgaon-Phata Mehuna Raja-Pambulwadi-Budhana & Lavhala up to a radial distance of 130 kM . Satisfactory reception of DVB-T2 Transmission was observed for TV Receiver (10 meter) to be up to a radial distance of **120 kM** (Buldhana) whereas for TV ON Go (Dongle) on smart mobile phone at a height of 1.5 Meter it was up to a radial distance of **106 kM** (Mandapgaon Gavthan).
4. **Radial-4 (South- East)**: Along this radial field strength measurement done at location like Adgaon-Tapti Tanda-Lembhewadi (Ambad)-Parner-Bhatkheda-Panewadi & Shevgal up to a radial distance of 105 kM. Satisfactory reception of DVB-T2 Transmission was observed for TV Receiver (10 meter) to be up to a radial distance of **90 kM** (Bhatkheda-Ambad)) whereas for TV ON Go (Dongle) on smart mobile phone at a height of 1.5 Meter it was up to a radial distance of **85 kM** (Musai).
5. **Radial-5 (South)**:Along this radial field strength measurement done at location like Pradnyapuri-Chittegaon-Dhangaon-Paithan-Shevgaon-Pathardi-Borsewadi-Deolali & Devinimgaon up to a radial distance of 130 kM . Satisfactory reception of DVB-T2 Transmission was observed for TV Receiver (10 meter) to be up to a radial distance of **120 kM** (Deolali) whereas for TV ON Go (Dongle) on smart mobile phone at a height of 1.5 Meter it was up to a radial distance of **115 kM** (Borsewadi).
6. **Radial-6 (South-West)**:Along this radial field strength measurement done at location like Dhamuri-Itawa-Malunja-Devgarh (Newasa)-Bhokar-Mamdapur-Babhaleshwar-Loni & Konchi up to a radial distance of 95 kM. Satisfactory reception of DVB-T2 Transmission was observed for TV Receiver (10 meter) to be up to a radial distance of **85 kM** (Mamdapur-Rajur) whereas for TV ON Go on smart mobile phone at a height of 1.5 Meter it was up to a radial distance of **70 kM** (Bhokar).

7. **Radial-7(West)**: Along this radial field strength measurement done at location like Jambarkheda-Khandala-Suregaon Rasta-Kotamgaon-Erandgaon-Deshmane Bk-Vinchur & Niphad up to a radial distance of 110 km . Satisfactory reception of DVB-T2 Transmission was observed for TV Receiver (10 meter) to be up to a radial distance of **95 km** (Bharvas Phata) whereas for TV ON Go on smart mobile phone at a height of 1.5 Meter it was up to a radial distance of **75 km** (Angangaon-Yeola).
8. **Radial-8 (North-West)**: Along this radial field strength measurement done at location like Loni Khurd-Ganeshnagar-Hirennagar-Nimgaon-Mehune-Malegaon-Savtawadi & Dyane up to a radial distance of 110 km . Satisfactory reception of DVB-T2 Transmission was observed for TV Receiver (10 meter) to be up to a radial distance of **100 km** (Near Savtawadi) whereas for TV ON Go on smart mobile phone at a height of 1.5 Meter it was up to a radial distance of **85 km** (Sangmeshwar-Malegaon).

## **Conclusion:**

On the basis of received field strength & MER values at the spot/location along eight radials & coverage contour(Annexure-II) drawn on the basis of table prepared/compiled for satisfactory reception of DVB-T2 transmission following conclusions can be stipulated.

### **A. Satisfactory coverage on conventional TV receiver (Antenna at a height of 10 Meter)**

1. The coverage along North & North-East region varies from 140 km to 75 km, along North-East & East region it is 75 km to 120 km. Along East & South-East region coverage extended up to 120 km to 90 km. The coverage along South-East & South region is up to a distance of 90 km to 120 Km.Coverage along South & South-West region is restricted up to a distance of 120 km to 85 km. Whereas along South-West & West region coverage is up to a distance of 85 km & 95 km. Along West & North-West region coverage is 95 km to 100 km & along North-West & North region extended up to a distance of 100 km to 140 km.
2. The coverage along North direction was found to be maximum (Up to 140 km).Though there was a long stretch of hilly region (20km to 40 km) & forest reserve (Gautala Wild Life Sanctuary), being very close to the transmitting tower installed at the hill top as such no appreciable effect of hill penetration & vegetation loss was observed along this direction/radial.
3. The coverage along North-East direction was found to be minimum (Up to 75 km). This shrinkage in coverage is mainly due to the existence of irregular terrain/ pockets of low or medium height hills (MSL: 638 M to 324 M) after 75 km stretched between Ajanta (caves) to Fardapur. This leads to random variation of received field strength & MER value due to multipath reflected signal & penetration losses consequently shrinkage in coverage along these direction was observed.



4. The coverage along East & South direction is up to a distance of 120 km. Along East direction there was a hilly region of moderate height at a radial distance of 85 km bisecting the radial & along south radial hilly region stretched between 100 km to 125 km.
5. The coverage along other four direction(South-East, South-West, West & North-West) varies from 85 km to 100 km.
6. Along North-West radial there is a shadow zone extended from 40 km up to 60 km. This is due to hilly terrain stretched between 45 km to 70 km along this radial.

#### **B. Satisfactory coverage on smart mobile phone (Antenna at a height of 1.5 Meter)**

1. The coverage for mobile reception is very close to the coverage stipulated for stationary reception on conventional TV receiver when receiving antenna is placed at height of 10 meters from the ground level. This is due to the location of the transmitting antenna at highest hill top & the surrounding nearby areas are mostly rural areas containing no cluster of high rise building(HRB) etc & irregular hilly terrain at lower height comparatively that of the transmitting tower.
2. The coverage for satisfactory reception on smart mobile phone is merely 5 km to 15 km less than that of the coverage area for reception on TV receiver.

From the field strength & MER data collected along all eight radials, it is being observed that the reception is satisfactory for minimum field strength value of 45 dB $\mu$ V/m for conventional TV receivers (with DVB-T2 set top box) measured at a receiving antenna height of 10 Meters whereas for smart mobile phone reception it is 50 dB $\mu$ V/m with MER greater than 10.0dB under existing environment condition. The predicted coverage contour itself reveals that DVB-T2 reception is satisfactory within the predicted coverage area (up to 75-150 km) with fixed roof top antenna mounted at a height of 10Mtrs from the ground & up to 70 km to 135 km in case of smart mobile phone at a height of 1.5 Meters.

No interference of unwanted signal in reception of DTT transmission has been observed within its coverage area.

#### **Scope of further study:**

The purpose of this field trial is to determine the coverage contours for satisfactory reception of DVB-T2 Transmission under existing environmental condition. A comprehensive field strength survey of the said transmitter for reception in portable devices like smart mobile phone in densely populated areas, narrow lanes etc. to assess poor pocket zone & inside different types of building falling within the coverage contour & also reception on go inside moving vehicles is suggested for further propagation study under different environment conditions.

## **Acknowledgement:**

In true sense field trial is like a bridge between theoretical & practical working & the outcome is a team effort that involves hard work, dedication & sincere interest exhibited by the team member. Before we get into thick of things survey staff would like to add a few words of appreciation for Sh.D.S.Bagul (ADE) & the staff of HPT (TV) Aurangabad who have been a part of this field trial right from its inception. Survey team owes a deep sense of gratitude to Sh.S.Hyder (DDG) & Sh.V.K.Verma (DDE) for his keen interest at every stage of this survey work. Presentation inspiration & motivation have always played a key role in the success of any project work, with this sense survey team feel to acknowledge their indebtedness & deep sense of gratitude to Smt.Anuradha Agarwal (ADG) whose encouraging guidance, elevating inspiration & kind supervision leads to successful completion of this survey.

\*\*\*\*\*

# Reception survey for satisfactory coverage of DVB-T2 Transmitter (490MHz, Ch#23), Aurangabad

Direction: North (Radial-1)

Table-1

Route: TV tower (Pimpri)-Kannad- Nagad-Kothali-Waghare-Amod-Budhagaon-Satrasen-Devsingpada

Date: 22/12/2016

Time (Hrs.)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dBµV/m)	COFDM (IRD) Parameter			Subjective Assessment		Terrain	Remarks
						MER (dB)	BER(Pre)		TV Receiver	Mobile Phone		
							LDPC	BCH				
1645	Shivnagar(Kannad) Sholapur-Dhule Road	N20°15'59.9" E75°07'57.5"	641	20	89.8	27.9	1.0E-6	1.0E-8	OK	OK	Rural. Low Traffic. Vegetation	
1800	Mehun Puranwadi Chalisgaon -Silod Road	N20°21'45.6" E75°10'09.9"	724	30	50.2	19.5	7.5E-5	2.8 E-6	OK	OK	Hilly, Dense Forest, No Traffic	
1845	Nagad Chalisgaon -Silod Road	N20°27'11.0" E75°10'14.9"	338	40	47.9	20.3	1.5 E-6	1.0 E-8	OK	F	Rural. Hilly, No Traffic. Vegetation	
1930	Takali Bk Chalisgaon -Silod Road	N20°32'37.3" E75°09'39.7"	289	50	48.6	26.1	3.9E-6	1.0 E-8	OK	F	Rural,, No Traffic Vegetation	
2020	Kothali Kajgaon-Bhadgaon Road	N20°38'06.4" E75°12'50.5"	282	60	60.5	26.9	1.0E-6	1.0E-8	OK	OK	Rural. No Traffic. Vegetation	
2115	Walwadi Kh Bhadgaon-Parola Road	N20°43'29.2" E75°11'47.7"	284	70	46.7	12.5	2.7E-4	1.0 E-8	OK	F	Rural , No Traffic, Vegetation	
2200	Waghare Bhadgaon-Parola Road	N20°48'52.9" E75°09'02.6"	287	80	49.4	23.5	1.4E-4	1.0E-8	OK	FF	Rural , No Traffic, Vegetation	
2230	Vanzari Kh Bhadgaon-Parola Road	N20°54'08.5" E75°06'27.5"	249	90	51.6	21.4	2.3 E-4	1.0 E-8	OK	OK	Rural , No Traffic, Vegetation	
2250	Khokar Pat Parola-Amalner Road	N20°59'26.9" E75°05'09.9"	208	100	51.9	24.3	1.2E-4	1.0E-8	OK	OK	Rural , No Traffic, Vegetation	
2315	Amode Amalner- Budhagaon road	N21°04'57.7" E75°05'40.4"	184	110	47.5	18.9	1.4E-4	1.0 E-8	OK	F	Rural , No Traffic, Vegetation	
2345	Budhagaon Amalner- Budhagaon road	N21°10'32.8" E75°09'01.7"	167	120	50.8	24.0	3.1E-5	1.0E-8_	OK	FF	Rural , No Traffic, Vegetation	
0015	Hatede Bk Budhagaon-Amba Road	N21°16'00.5" E75°10'25.0"	195	130	51.4	11.8	3.5E-5	1.0E-8	OK	OK	Rural , No Traffic, Vegetation	
0030	Near Lasur Budhagaon-Amba Road	N21°19'05.5" E75°11'38.2"	258	135	52.7	16.4	1.3E-4	1.0E-8	OK	OK	Rural , No Traffic, Hilly, Vegetation	
0050	Satrasen Budhagaon-Amba Road	N21°20'47.7" E75°10'00.8"	262	140	46.9	13.4	1.7E-5	1.0E-8	OK	F	Rural , No Traffic, Hilly, Vegetation	
0115	Khamkhed(Ambe) Budhagaon-Amba Road	N21°24'18.2" E75°07'48.4"	279	145	39.4	-	-	-	F	NT	Rural , No Traffic, Hilly, Vegetation	
0130	Devsingpada Amba-Sangvi Road	N21°26'44.8" E75°04'29.4"	288	150	27.2	-	-	-	-NT	NT	Rural , No Traffic, Hilly, Vegetation	

# Reception survey for satisfactory coverage of DVB-T2 Transmitter (490MHz, Ch#23), Aurangabad

Direction: North East(Radial-2)

Table-2

Route: TV tower (Pimpri)-Kanhori-Aland-Chinchkheda-Palod-Golegaon-Ajanta-Tondapur-Pimpala-Fattepur

Date: 25/12/2016

Time (Hrs.)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dBμV/m)	COFDM (IRD) Parameter			Subjective Assessment		Terrain	Remarks
						MER (dB)	BER(Pre)		TV Receiver	Mobile Phone		
							LDPC	BCH				
0900	Kanhori,Phulambri Phulambri-Sillod Road	N20°05'30.7" E75°25'33.8"	638	25	52.2	27.4	1.0E-8	1.0 E-8	OK	OK	Urban , Moderate Traffic, Vegetation	
0915	Mahal Kinhola Phulambri-Sillod Road	N20°08'44.1" E75°30'04.9"	578	30	65.4	25.7	1.2E-8	1.0E-8	OK	OK	Rural , Moderate Traffic, Vegetation	
0945	Aland Phulambri-Sillod Road	N20°11'52.8" E75°33'13.3"	636	40	70.8	24.8	2.7 E-6	1.0 E-8	OK	OK	Rural , Moderate Traffic, Vegetation	
1010	Chinchkheda Phulambri-Sillod Road	N20°15'35.7" E75°37'35.1"	584	50	46.7	24.1	2.2 E-5	1.0 E-8	OK	F	Rural , Moderate Traffic, Vegetation	
1115	Palod Sillod – Ajanta Road	N20°22'47.8" E75°40'24.1"	624	60	51.9	27.1	1.0 E-6	1.0E-8	OK	OK	Rural , Moderate Traffic, Vegetation	
1145	Golegaon,Balapur Sillod – Ajanta Road	N20°28'45.5" E75°43'04.6"	654	70	50.8	26.9	5.3E-5	1.0E-8	OK	OK	Rural , Moderate Traffic, Vegetation	
1215	Ajanta Sillod – Ajanta Road	N20°31'45.9" E75°45'06.8"	576	75	46.9	23.1	2.5E-5	1.0E-8	OK	F	Rural , Moderate Traffic, Vegetation	Behind the Hill
1630	Warkhedi Fardapur-Tondapur Road	N20°35'28.0" E75°44'35.1"	377	80	37.2	-	-	-	NT	NT	Rural(Hilly) , Low Traffic, Vegetation	Behind the Hill
1700	Tondapur,Jalgaon Tondapur-Fattepur Road	N20°35'06.2" E75°48'22.0"	374	85	34.8	-	-	-	NT	NT	Rural(Hilly) , Low Traffic, Vegetation	Behind the Hill
1720	Pimpala Tondapur-Fattepur Road	N20°36'30.3" E75°51'09.0"	352	90	34.9	-	-	-	NT	NT	Rural(Hilly) , Low Traffic, Vegetation	Behind the Hill
1745	Fattepur Tondapur-Fattepur Road	N20°38'44.9" E75°52'50.2"	324	95	33.4	-	-	-	NT	NT	Urban(Hilly) , Low Traffic, Vegetation	Behind the Hill

# Reception survey for satisfactory coverage of DVB-T2 Transmitter (490MHz, Ch#23), Aurangabad

Direction: East (Radial-3)

Table-3

Route: TV tower (Pimpri)-Waregaon-Pirbawada-Dabhdi-Rajur-Deulgaon-Phata Mehuna Raja-Pambulwadi-Budhana-Lavhala Date: 26/12/2016

Time (Hrs)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dBµV/m)	COFDM (IRD) Parameter			Subjective Assessment		Terrain	Remarks
						MER (dB)	BER(Pre)		TV Receiver	Mobile Phone		
							LDPC	BCH				
0925	Waregaon Khuldabad-Phumbri Road	N20°05'03.1" E75°21'46.9"	612	20	65.9	26.3	1.0E-6	1.0E-8	OK	OK	Rural, Low Traffic, Vegetation	
1010	Lahanyachiwadi Phulambri-Silod Road	N20°06'41.5" E75°27'32.9"	638	30	71.1	28.7	1.0E-6	1.0E-8	OK	OK	Rural, Low Traffic, Vegetation	
1045	Pirbawada Link Road	N20°05'31.6" E75°34'13.3"	640	40	68.8	28.1	1.0E-6	1.0E-8	OK	OK	Rural, Low Traffic, Vegetation	
1200	Ridhora, Link Road	N20°04'34.4" E75°37'50.8"	610	50	63.5	27.5	1.0E-6	1.0E-8	OK	OK	Rural, Low Traffic, Vegetation	
1230	Dabhdi Link Road	N20°02'06.0" E75°43'25.8"	614	60	47.8	24.0	6.1E-4	1.0 E-8	OK	FF	Rural, Low Traffic Vegetation	
1310	Rajur (Cross Road) Sillod-Jalna Road	N20°03'18.8" E75°51'12.9"	633	70	70.4	27.3	1.0 E-6	1.0 E-8	OK	OK	Urban. Low Traffic. Vegetation	
1400	Pokhari Link Road	N20°02'34.3" E75°57'00.0"	604	80	54.3	27.3	1.0E-6	1.0 E-8	OK	OK	Rural, Low Traffic Vegetation	
1450	Deulgaon Raja Deulgaon Raja-Jafrabad Rd	N20°01'09.8" E76°02'07.1"	577	90	36.5	-	-	-	NT	F	Urban. Hilly, Low Traffic. Vegetation	Hilly Terrain
1520	Dagadwadi Nagpur-Aurangabad Hwy	N20°02'15.3" E76°05'34.5"	612	95	50.2	25.9	3.7 E-5	1.5 E-8	OK	OK	Rural, Hilly, ,Low Traffic, Vegetation	Hilly Terrain
1640	Phata Mehuna Raja Nagpur-Aurangabad Hwy	N20°03'22.9" E76°08'28.8"	551	100	44.9	24.1	1.5 E-6	1.0 E-8	OK	F	Rural, Hilly, ,Low Traffic, Vegetation	Hilly Terrain
17.45	Mandapgaon Gavthan Nagpur-Aurangabad Hwy	N20°05'47.8" E76°12'01.1"	541	106	53.3	26.7	1.0 E-6	1.0 E-8	OK	OK	Rural, Hilly, ,Low Traffic, Vegetation	Hilly Terrain
1900	Pambulwadi Mehekar Road	N20°18'43.1" E76°15'48.8"	689	115	47.1	22.5	1.4E-6	1.0E=8	OK	F	Rural, Hilly, ,Low Traffic, Vegetation	
1920	Buldhana Mehkar Road	N20°04'14.4" E76°20'22.0"	627	120	45.8	18.2	2.2E-4	1.0E-8	OK	F	Rural, Hilly, ,Low Traffic, Vegetation	
1950	Ambashi Mehekar Road	N20°17'36.5" E76°21'59.0"	616	125	42.7	-	-	-	F	NT	Rural, Hilly, ,Low Traffic, Vegetation	
2015	Lavhala(Mohokhed) Mehekar Road	N20°16'16.0" E76°25'06.1"	591	130	37.7				No Signal	NT	Rural, Hilly, ,Low Traffic, Vegetation	

# Reception survey for satisfactory coverage of DVB-T2 Transmitter (490MHz, Ch#23), Aurangabad

Direction: South-East (Radial-4)

Table-4

Route: TV tower (Pimpri)-Maliwada-Adgaon-Tapti Tanda-Lembhewadi (Ambad)-Parner-Bhatkheda-Panewadi-Shevgal

Date: 27/12/2016

Time (Hrs)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dBμV/m)	COFDM (IRD) Parameter			Subjective Assessment		Terrain	Remarks
						MER (dB)	BER(Pre)		TV Receiver	Mobile Phone		
							LDPC	BCH				
	Maliwada Khuldabad-Aurangabad	N19°55'09.2" E75°14'00.7"	594	20	62.3	21.1	1.0E-6	1.0E-8	OK	OK	Urban, ,Heavy Traffic	
0830	CIDCO Seven Hills Flyover Road	N19°52'38.8" E75°21'05.5"	605	30	59.6	18.3	1.0E-6	1.0E-8	OK	OK	Rural, Low traffic, Vegetation	
0900	Adgaon Solapur- Aurangabad	N19°49'44.3" E75°26'55.4"	554	40	68.4	14.8	3.8E-2	6.0E-8	OK	OK	Rural, Low traffic, Vegetation	
0925	Chetegaon Solapur-Dhulepur Road	N19°45'17.7" E75°30'09.5"	559	50	54.7	18.7	2.3E-3	1.5E-8	OK	OK	Rural, Moderate traffic, Hilly, Vegetation	
1010	Thapti Tanda Solapur- Aurangabad	N19°42'31.3" E75°35'12.0"	551	60	72.1	19.5	3.5E-4	1.0E-8	OK	OK	Rural, Low traffic, Hilly, Vegetation	
1100	Lembhewadi (Ambad) Link Road to Ambad	N19°39'30.0" E75°40'22.8"	527	70	37.8	-	-	-	F	NT	Rural, Low traffic, Hilly, Vegetation	
1130	Shiradhon Link Road to Ambad	N19°39'37.6" E75°44'17.7"	539	75	65.3	11.9	7.5E-4	1.0E-8	OK	OK	Rural, Low traffic, Vegetation	
1215	Parner Link Road to Ambad	N19°39'03.1" E75°47'39.2"	504	80	54.1	12.7	5.1E-3	4.0E-4	OK	OK	Rural, Low traffic, Vegetation	
1240	Musai Link road to Ambad road	N19°38'02.1" E75°49'44.2"	521	85	52.9	11.8	4.5E-4	1.3E-5	OK	OK	Rural, Low traffic, Vegetation	
1315	Bhatkheda (Ambad) Link Road	N19°36'25.0" E75°52'39.2"	510	90	47.2	10.9	1.3E-4	1.5E-8	OK	F	Rural, Low traffic, Vegetation	
1345	Krishnanagar Link Road Rani Uchegaon	N19°37'23.5" E75°56'50.7"	498	95	41.2	-	-	-	F	NT	Rural, Low traffic, Vegetation	
1410	Panewadi Link road to Yewala	N19°37'16.9" E76°00'25.5"	475	100	36.6	-	-	-	F	NT	Rural, Low traffic, Vegetation	
1435	Shevgal Link road to Yewala	N19°37'14.1" E76°01'50.7"	464	105	35.1	-	-	-	F	NT	Rural, Low traffic, Vegetation	

# Reception survey for satisfactory coverage of DVB-T2 Transmitter (490MHz, Ch#23), Aurangabad

Direction: South (Radial-5)

Table-5

Route: TV tower (Pimpri)-Pradnyapuri-Chittegaon-Dhangaon-Paithan-Shevgaon-Pathardi-Borsewadi-Deolali-Devinimgaon

Date: 23/12/2016

Time (Hrs.)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dBμV/m)	COFDM (IRD) Parameter			Subjective Assessment		Terrain	Remarks
						MER (dB)	BER(Pre)		TV Receiver	Mobile Phone		
							LDPC	BCH				
1400	Pradnyapuri Aurangabad-Nandgaon Rd	N19°54'32.8" E75°13'44.9"	582	20	74.6	24.7	2.3E-5	1.0E-8	OK	OK	Urban, Low Traffic,	
1530	Kanchanwadi Paithan Road	N19°50'23.6" E75°17'30.0"	548	30	74.1	17.9	2.2E-3	1.0E-8	OK	OK	Urban, Low Traffic	
1645	Chittegaon Aurangabad Road	N19°44'30.5" E75°17'33.9"	511	40	74.8	27.5	1.0E-6	1.0E-8	OK	OK	Rural, Low Traffic Vegetation	
1705	Kaudgaon Dhorkin Road	N19°39'36.1" E75°19'48.3"	501	50	73.9	28.1	1.0E-6	1.0E-8	OK	OK	Rural, Vegetation No traffic,	
1745	Dhangaon Dhorkin Road	N19°34'41.0" E75°22'25.1"	478	60	74.4	27.1	1.0E-6	1.0E-8	OK	OK	Rural, Vegetation No Traffic,	
1810	Paithan Dhorkin Road	N19°29'22.0" E75°23'22.2"	451	70	68.6	26.5	1.0E-6	1.0E-8	OK	OK	Rural, Vegetation No Traffic,	
1930	Near Shevgaon Paithan-Shevgaon Road	N19°22'13.6" E75°14'27.5"	489	80	75.1	27.5	1.0E-6	1.0E-8	OK	OK	Rural, Vegetation No Traffic,	
2010	Amrapur High School Pathardi- Shivgaon Road	N19°16'43.3" E75°11'03.4"	493	90	66.7	27.4	1.0E-6	1.0E-8	OK	OK	Rural, Vegetation No Traffic,	
2045	Pathardi Pathardi- Shivgaon Road	N19°11'14.1" E75°10'25.1"	536	100	62.5	17.7	1.6E-6	1.0E-8	OK	OK	Rural, No Traffic, Hilly, Vegetation	
2115	Manikdaundi Pathardi-Manikdaundi Rd	N19°05'52.2" E75°08'31.2"	776	110	68.7	27.5	1.6E-6	1.0E-8	OK	OK	Rural, No Traffic, Hilly, Vegetation	
2140	Borsewadi Pathardi-Kada road	N19°03'55.3" E75°08'57.1"	782	115	64.2	25.4	1.6E-6	1.0E-8	OK	OK	Rural, No Traffic, Hilly, Vegetation	
2215	Deolali Pathardi-Kada road	N19°01'36.9" E75°07'20.0"	731	120	48.5	16.7	2.1E-4	1.0E-8	OK	F	Rural, No Traffic, Hilly, Vegetation	
2230	Dhamangaon Pathardi-Kada road	N18°59'11.4" E75°07'51.7"	627	125	42.5	-	-	-	F	NT	Rural, No Traffic, Hilly, Vegetation	
2255	Devinimgaon Pathardi-Kada road Link	N18°55'10.0" E75°04'49.1"	604	130	41.2	11.0	-	-	F	NT	Rural, Vegetation No Traffic,	

# Reception survey for satisfactory coverage of DVB-T2 Transmitter (490MHz, Ch#23), Aurangabad

Direction: South-West (Radial-6)

Table-6

Route: TV tower (Pimpri)-Dhamuri-Itawa-Malunja-Devgarh(Newasa)-Bhokar-Mamdapur-Babhaleshwar-Loni-Konchi

Date: 24/12/2016

Time (Hrs.)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dBμV/m)	COFDM (IRD) Parameter			Subjective Assessment		Terrain	Remarks
						MER (dB)	BER(Pre)		TV Receiver	Mobile Phone		
							LDPC	BCH				
1220	Dhamuri Lasur-Pimpalgaon Road	N19°56'26.1" E75°03'05.4"	540	20	85.7	28.6	1.0E-6	1.0E-8	OK	OK	Urban, .Low Traffic	
1330	Itawa Link Road	N19°49'34.4" E75°11'49.0"	525	30	81.4	27.5	1.0E-6	1.0E-8	OK	OK	Urban, .Low Traffic.	
1415	Malunja Lasur road	N19°46'09.8" E75°00'35.0"	489	40	64.6	24.1	1.2E-6	1.0E-8	OK	OK	Rural, Low Traffic. Vegetation	
1500	NavinKaigaon Aurangabad-Pune Hwy	N19°39'21.8" E75°03'12.9"	473	50	52.5	18.8	1.5E-6	1.0E-8	OK	OK	Rural, Low Traffic. Vegetation	
1520	Devgarh(Newasa) Aurangabad-Pune Hwy	N19°34'41.9" E74°57'49.2"	484	60	34.7	23.5	7.2E-5	1.0E-8	OK	OK	Rural, Low Traffic. Vegetation	
1630	Bhokar Shrirampur-Newasa Road	N19°36'57.4" E74°44'37.8"	490	70	52.1	17.8	9.2E-5	6.4E-7	OK	OK	Rural, Low Traffic. Vegetation	
1705	Rajankhol (Khandala) Loni-Shrirampur Road	N19°37'17.6" E74°36'26.3"	535	80	48.7	16.4	2.8E-4	1.0 E-8	OK	F	Rural, Low Traffic. Vegetation	
1725	Mamdapur (Rajur) Loni-Shrirampur Road	N19°36'45.8" E74°33'10.3"	531	85	47.4	16.3	1.7E-5	1.0E-8	OK	F	Rural, Low Traffic. Vegetation	
1750	Babhaleshwar Loni-Shrirampur Road	N19°35'43.5" E74°30'02.8"	539	90	33.2	-	-	-	NT	NT	Rural, Low Traffic. Vegetation	
1810	Loni Loni-Sangamner Road	N19°34'39.6" E74°27'28.8"	542	95	42.2	-	-	-	F	NT	Rural, Low Traffic. Vegetation	
1825	Chinchapur BK Loni-Sangamner Road	N19°34'07.0" E74°23'43.3"	560	100	41.0	-	-	-	F	NT	Rural, Low Traffic. Vegetation	
1835	Konchi Loni-Sangamner Road	N19°35'36.4" E74°20'25.0"	614	105	42.7	-	-	-	F	NT		



# Reception survey for satisfactory coverage of DVB-T2 Transmitter (490MHz, Ch#23), Aurangabad

Direction: West (Radial- 7)

Table-7

Route: TV tower (Pimpri)-Jambarkheda-Khandala-Suregaon Rasta-Kotamgaon-Erandgaon-Deshmane Bk-Vinchur-Niphad

Date: 28/12/2016

Time (Hrs)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dBμV/m)	COFDM (IRD) Parameter			Subjective Assessment		Terrain	Remarks
						MER (dB)	BER(Pre)		TV Receiver	Mobile Phone		
							LDPC	BCH				
0920	Jambarkheda Aurangabad-Nandgaon Rd	N20°02'55.0" E74°59'44.9"	531	20	53.8	26.5	1.0E-6	1.0E-8	OK	OK	Rural, No Traffic, Vegetation,	
1000	Sivral Vaijapur road	N20°04'48.6" E74°53'54.5"	576	30	73.5	17.8	5.2E-4	1.0E-8	OK	OK	Rural, No Traffic, Vegetation,	
1030	Khandala Vaijapur Rd	N20°01'48.8" E74°48'30.7"	599	40	52.6	19.2	5.4E-4	1.0 E-8	OK	OK	Rural, No Traffic, Vegetation,	
1120	Merchant Colony (Vaijapur)	N19°56'09.1" E74°44'09.9"	537	50	48.8	16.2	2.6E-4	1.0 E-8	OK	OK	Rural, No Traffic, Vegetation,	
1200	Suregaon Rasta Vaijapur-Yeola Road	N19°59'05.2" E74°37'19.2"	550	60	51.7	14.9	1.0E-1	1.0E-8	OK	OK	Rural, No Traffic, Vegetation,	
1245	Aandersul Aurangabad-Nasik Road	N20°00'46.8" E74°34'06.9"	560	65	39.8	13.6	1.0E-4	1.0 E-8	OK	OK	Rural, No Traffic, Vegetation,	
1325	Kotamgaon Aurangabad-Nasik Road	N20°01'44.8" E74°31'04.5"	554	70	57.1	14.1	1.5E-5	1.0 E-8	OK	OK	Rural, No Traffic, Vegetation,	
1355	Angangaon(Yeola) Aurangabad-Nasik Road	N20°02'28.2" E74°28'19.9"	559	75	50.2	20.2	1.2E-4	1.0E-8	OK	OK	Rural, No Traffic, Vegetation,	
1545	Erandgaon Kh Aurangabad-Nasik Road	N20°02'55.9" E74°25'14.9"	558	80	48.9	12.4	1.9E-4	1.5E-6	OK	F	Rural, No Traffic, Vegetation,	
1625	Purangaon Aurangabad-Nasik Road	N20°03'07.7" E74°22'20.2"	544	85	46.2	11.8	1.3E-5	1.0E-8	OK	F	Rural, No Traffic, Vegetation,	
1640	Deshmane Bk Aurangabad-Nasik Road	N20°03'08.2" E74°19'08.2"	545	90	47.3	12.7	1.4E-6	1.0 E-8	OK	F	Rural, No Traffic, Vegetation,	
1715	Bharvas Phata Aurangabad-Nasik Road	N20°04'24.0" E74°16'30.9"	558	95	49.8	17.8	3.2 E-5	4.1E-5	OK	FF	Rural, No Traffic, Vegetation,	
1735	Vinchur Aurangabad-Nasik Road	N20°06'15.1" E74°13'37.7"	591	100	44.6	-	--	--	FF	NT	Rural, No Traffic, Vegetation	
1805	Naitale Aurangabad-Nasik Road	N20°04'29.2" E74°10'47.6"	573	105	41.9	-	--	-	F	NT	Rural, No Traffic, Vegetation	
1825	Near Niphad Aurangabad-Nasik Road	N20°04'44.7" E74°07'37.1"	547	110	40.2	-	-	-	NT	NT	Rural, No Traffic, Vegetation	

# Reception survey for satisfactory coverage of DVB-T2 Transmitter (490MHz, Ch#23), Aurangabad

Direction: North-West (Radial- 8)

Table-8

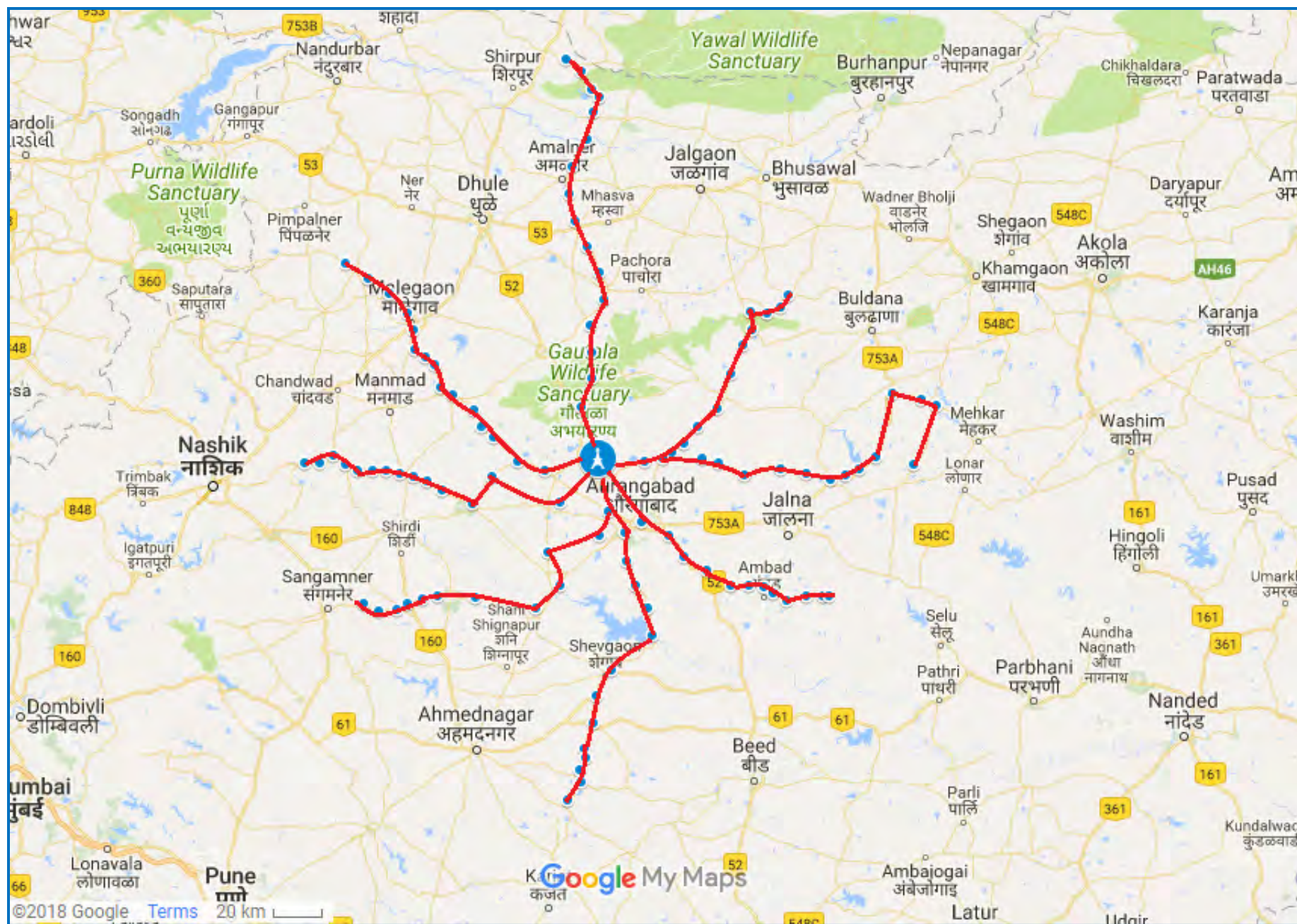
Route: TV tower (Pimpri)-Loni Khurd-Ganeshnagar-Hirennagar-Nimgaon-Mehune-Malegaon-Savtawadi-Dyane

Date: 29/12/2016

Time Hrs.	Location	Location Co-ordinates	MSL (Meters).	Radial Distance (kM.)	Field Strength (dBµV/m)	COFDM (IRD) Parameter			Subjective Assessment		Terrain	Remarks
						MER (dB)	BER(Pre)		TV Receiver	Mobile Phone		
							LDPC	BCH				
945	--	--	--	20	--	--	--	--	--		Rural Hilly	No approach Road
1030	--	--	--	30	--	--	--	--	--		Rural Hilly	No approach Road
1100	Loni Khurd Aurangabad-Malegaon Rd	N20°09'45.3" E74°48'32.8"	581	40	51.9	19.4	1.9E-4	1.0E-8	OK	OK	Rural, Moderate Traffic	
1125	Pohi Aurangabad-Malegaon Rd	N20°11'55.8" E74°46'10.1"	539	45	32.3	-	-	-	NT	NT	Rural, Low traffic, Hilly	
1140	Ganeshnagar Aurangabad-Malegaon Rd	N20°15'23.8" E74°44'25.3"	496	50	32.2	-	-	-	NT	NT	Rural, Low traffic, Hilly	
1220	Nandgaon Aurangabad-Malegaon Rd	N20°18'24.4" E74°39'40.4"	481	60	32.6	-	-	-	NT	NT	Rural, Low traffic, Hilly	
1300	Hirenagar Aurangabad-Malegaon Rd	N20°20'11.4" E74°37'12.8"	492	65	46.6	24.1	8.3E-5	1.0E-8	OK	F	Rural, Low traffic, Hilly	
1330	Jatpade Aurangabad-Malegaon Rd	N20°24'47.4" E74°35'43.4"	453	70	50.8	24.7	2.4E-6	1.0E-8	OK	OK	Rural, Low traffic, Hilly ,	
1400	Nimgaon Aurangabad-Malegaon Rd	N20°26'05.7" E74°33'46.0"	448	75	52.6	27.3	1.0E-6	1.0E-8	OK	OK	Rural, Low traffic, Hilly	
1415	Mehune Aurangabad-Malegaon Rd	N20°27'40.9" E74°31'34.6"	454	80	52.2	26.2	1.0E-6	1.0E-8	OK	OK	Rural, Low traffic,	
1530	Sangmeshwar(Malegaon) Aurangabad-Malegaon Rd	N20°31'54.4" E74°31'10.8"	422	85	50.1	20.0	1.9E-4	1.0E-8	OK	OK	Rural, Low traffic,	
1600	Bhayagaon Malegaon-Nampur Road	N20°35'06.9" E74°29'58.7"	451	90	46.1	5.0	1.7E-3	4.1E-8	OK	NT	Rural, Low traffic	
1630	Near Savtawadi Malegaon-Nampur Road	N20°39'12.3" E74°25'58.5"	480	100	48.4	24.2	3.8E-5	1.5E-8	OK	NT	Rural, Low traffic,	
1700	Ambasan Malegaon-Nampur Road	N20°42'25.9" E74°21'22.4"	533	110	34.4	-	-	-	NT	NT	Rural, Low traffic	
1720	Dyane Nampur-Taharabad Road	N20°45'23.7" E74°16'32.2"	579	120	34.2	-	-	-	NT	NT	Rural, Low traffic	

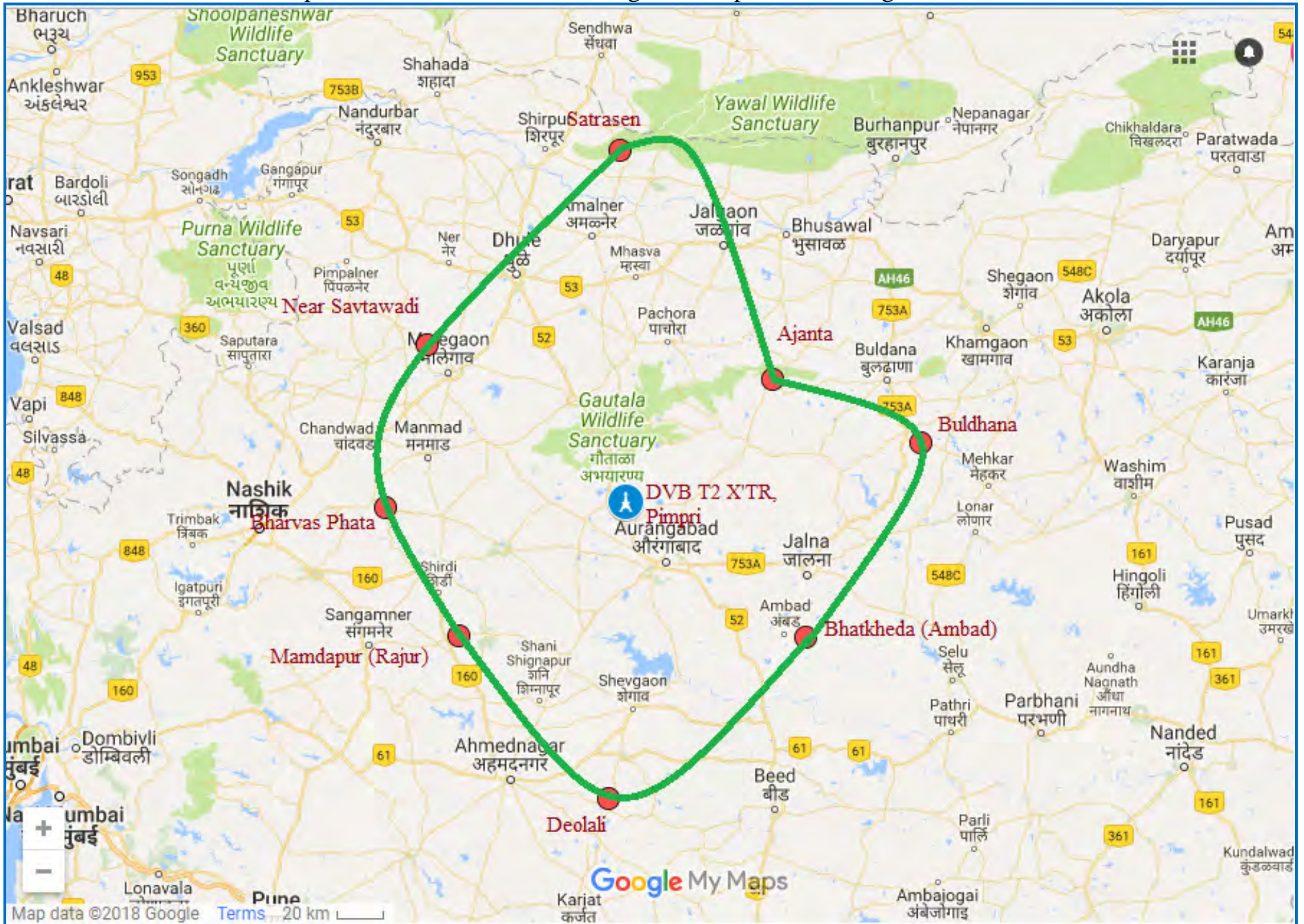
Reception survey for satisfactory coverage of DVB-T2 Transmitter (490MHz, Ch#23), Aurangabad  
**Table for satisfactory coverage of DVB-T2 Transmission in QPSK Mode** **Table-9**

Direction	Mode of (DVB T2) Reception	Spot/Location	Location Co-ordinates	MSL (Meters)	Radial Distance (kM)	Field Strength (dB $\mu$ V/m)	COFDM (IRD) Parameter			Subjective Assessment
							MER (dB)	BER(Pre)		
								LDPC	BCH	
North	TV Receiver	Satrasen Budhagaon-Amba Road	N21°20'47.7" E75°10'00.8"	262	140	46.9	13.4	1.7E-5	1.0E-8	OK
	Mobile Phone	Near Lasur Budhagaon-Amba Road	N21°19'05.5" E75°11'38.2"	258	135	52.7	16.4	1.3E-4	1.0E-8	OK
North-East	TV Receiver	Ajanta Sillod – Ajanta Road	N20°31'45.9" E75°45'06.8"	576	75	46.9	23.1	2.5E-5	1.0E-8	OK
	Mobile Phone	Golegaon, Balapur Sillod – Ajanta Road	N20°28'45.5" E75°43'04.6"	654	70	50.8	26.9	5.3E-5	1.0E-8	OK
East	TV Receiver	Buldhana Mehkar Road	N20°18'12.0" E76°19'08.0"	627	120	45.8	18.2	2.2E-4	1.0E-8	OK
	Mobile Phone	Mandapgaon Gavthan Nagpur-Aurangabad Hwy	N20°05'47.8" E76°12'01.1"	541	106	53.3	26.7	1.0 E-6	1.0 E-8	OK
South-East	TV Receiver	Bhatkheda (Ambad) Link Road	N19°36'25.0" E75°52'39.2"	510	90	47.2	10.9	1.3E-4	1.5E-8	OK
	Mobile Phone	Musai Link road to Ambad Road	N19°38'02.1" E75°49'44.2"	521	85	52.9	11.8	4.5E-4	1.3E-5	OK
South	TV Receiver	Deolali Pathardi-Kada road	N19°01'36.9" E75°07'20.0"	731	120	48.5	16.7	2.1E-4	1.0E-8	OK
	Mobile Phone	Borsewadi Pathardi-Kada road	N19°03'55.3" E75°08'57.1"	782	115	64.2	25.4	1.6E-6	1.0E-8	OK
South-West	TV Receiver	Mamdapur (Rajur) Loni-Shrirampur Road	N19°36'45.8" E74°33'10.3"	531	85	47.4	16.3	1.7E-5	1.0E-8	OK
	Mobile Phone	Bhokar Shrirampur-Newasa Road	N19°36'57.4" E74°44'37.8"	490	70	52.1	17.8	9.2E-5	6.4E-7	OK
West	TV Receiver	Bharvas Phata Aurangabad-Nasik Road	N20°04'24.0" E74°16'30.9"	558	95	49.8	17.8	3.2 E-5	4.1E-5	OK
	Mobile Phone	Angangaon(Yeola) Aurangabad-Nasik Road	N20°02'28.2" E74°28'19.9"	559	75	50.2	20.2	1.2E-4	1.0E-8	OK
North-West	TV Receiver	Near Savtawadi Malegaon-Nampur Road	N20°39'12.3" E74°25'58.5"	480	100	48.4	24.2	3.8E-5	1.5E-8	OK
	Mobile Phone	Sangmeshwar(Malegaon) Aurangabad-Malegaon	N20°31'54.4" E74°31'10.8"	422	85	50.1	20.0	1.9E-4	1.0E-8	OK



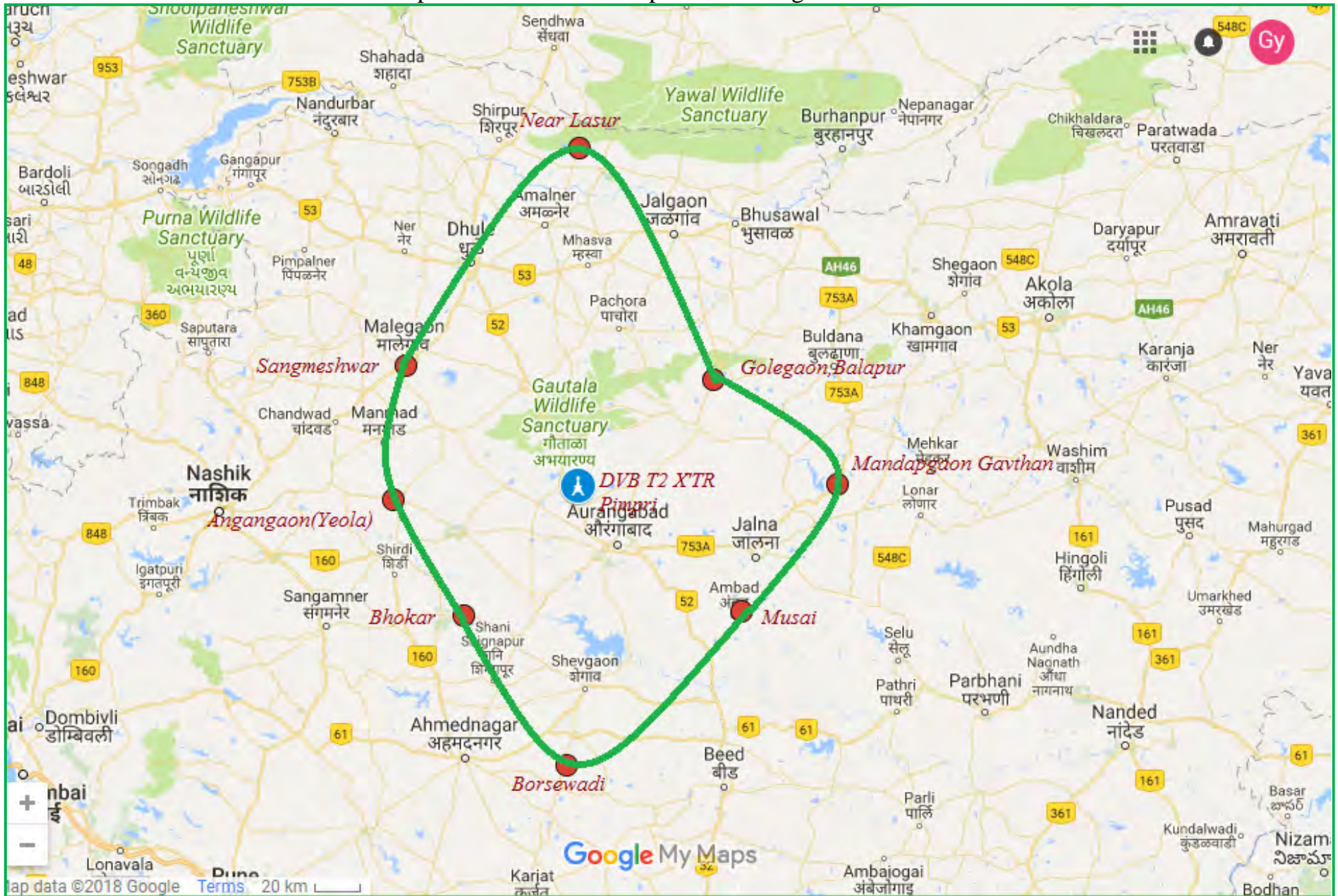
**Radial Route Map originating from HPT (TV) Tower, Pimpri, Aurangabad (Maharashtra)**

Reception on LED TV with receiving antenna placed at a height of 10 Meter



Coverage Contour Map of DVB-T2 Transmitter (QPSK Mode) Located at HPT (TV) Tower, Aurangabad

Reception on smart mobile phone at a height of 1.5 Meter



Coverage Contour Map of DVB-T2 Transmitter (QPSK Mode) Located at HPT (TV) Tower, Aurangabad

