



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

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Location Map (3D View) of TV Tower Jalandhar (Punjab)



6.0kW DVB-T2 Transmitter



HPT (TV) Antenna Tower

Introduction:

Modern broadcasting scenario is changing so rapidly that viewer of today wants something more in addition to what is being received through analogue mode of TV transmission. Innovative efforts in the field of broadcast technologies and new habits of audio-visual content have driven the need to define new broadcasting standards that allow for such a social evolution. Earlier digital transmission began with DVB (H) & DVB (T) transmission that made possible for reception of broadcast signal through hand held (Mobile Phone) or fixed/mobile TV receiving devices. Further due to its limitation (spectral efficiency, bandwidth & robustness), in 2009, DVB finalized the development of the second generation terrestrial transmission system DVB-T2 which is the new DVB standard for DTT. 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. 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 HPT (TV) Tower Jalandhar (Punjab) & commissioned for DD National Transmission on UHF Band Ch#33(570MHz). 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 25/06/2016 to 02/07/2016 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 envisaged minimum field strength value for satisfactory reception.

Equipment Used:

1. Spectrum Analyzer(Make: Anritsu, Model: MS 2035B & MS 2013E)
2. UHF Dipole antenna(Make: Anritsu, Model: MP663A)
3. GPS Navigator(Make: Garmin, Model: Montana 650)
4. DVB-T2 Set Top Box
5. LED TV Receiver(Make: Sony,)
6. IRD(Make: Ericsson)
7. Survey Van fitted with 10 Meters Mast & Portable Generator etc)

Basic Data and Transmitter details

Transmitters Details:

1. Name of Station : HPT(TV) Tower, Jalandhar
Punjab
 2. Location of the Transmitters : LAT- N 31° 17'19.9"
(In 6 figure coordinates) LONG- E 75° 33'19.5"
MSL-227 Meter
 3. Description of terrain around the : Urban, dense population,
Transmitters heavy traffic
 4. Classification(Large city/urban/rural) : Urban
 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 : 570MHz(Ch#33)
 13. Date of Commissioning : 24/02/ 2016
- :

Transmitting Antenna Details:

1. Make : SIERA
2. Type /Model of Antenna : Panel Type /UTV-01/16(4X4)
3. Antenna Gain : 13dB
4. Height of Tower : 210 Meter
5. Effective height of antenna(Midbay) : Not available
6. 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	1.7,5,6,7,8,10MHz
Typical data rate(UK)	29 Mbit/second	40 Mbit/second
Max data rate @20dB	29 Mbit/Second	47.8 Mbit/second
Required C/N Ratio @	16.7 dB	8.9dB

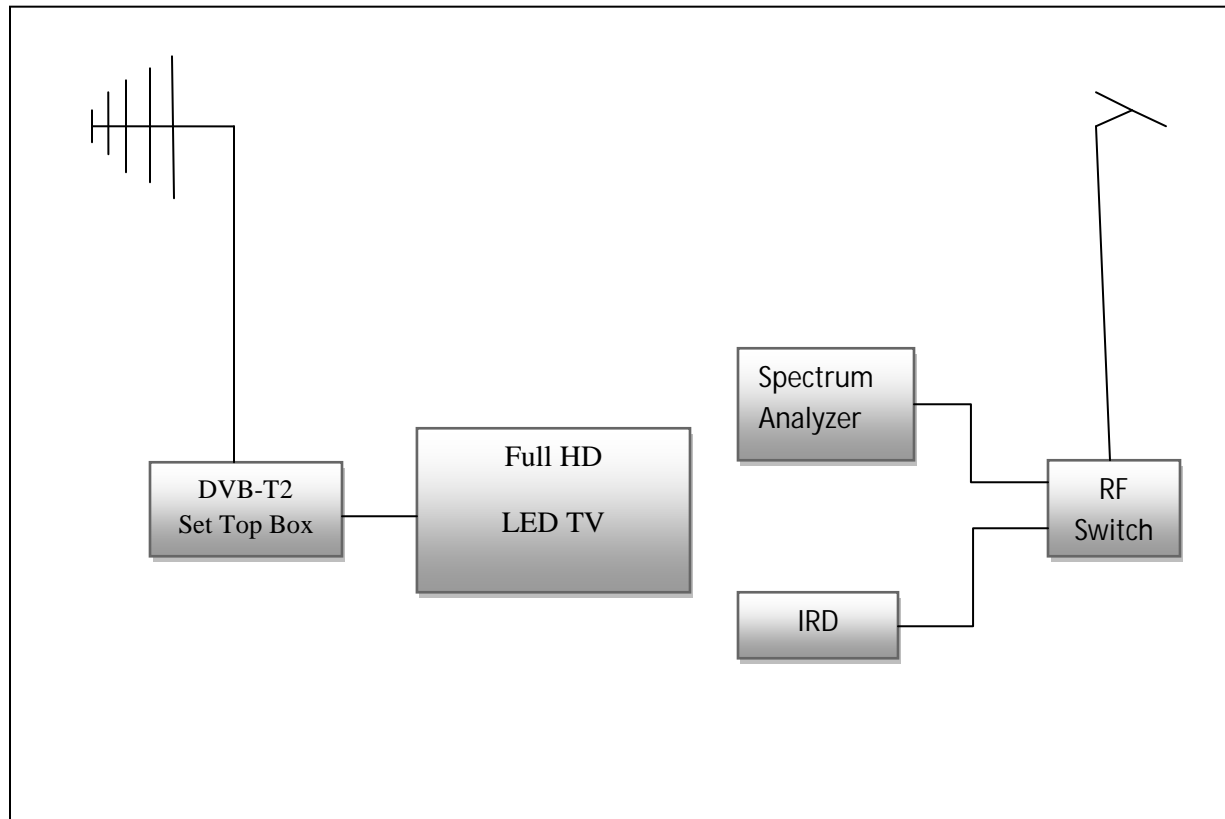
Modulation Parameters:

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, Jalandhar operating with following set of Modulation parameters targeted for fixed antenna & handheld portable (smart phone) reception mode.

Operating Frequency	570 MHz
Channel No.	#33(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 & UHF 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 DVB-T2 receiving system and field strength measuring system (Spectrum Analyzer). A calibrated UHF dipole antenna is 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 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 & 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 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 DVB-T2 Set Top Box & 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. 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 μ V/m
Portable/Outdoor/Urban	50.2dB μ V/m
Mobile/Rural	42.5 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 Surra Nassi- Tanda Nangli-Dasuya-Mukerian-Musahibpur-Bhangala & Jandwal up to a radial distance of 82kM . Satisfactory reception of DVB-T2 Transmission was observed to be up to a radial distance of 75kM (Phattuwal (Mukerian))
2. **Radial-2 (North-East):** Along this radial field strength measurement done at location like Mubarakpur-Gazipur(Sattowali)-Mandial-Piplanwala-Dhawali-Chohal-Gagret(HP) & Mubarikpur (Una) up to a radial distance of 67 km . Satisfactory reception of DVB-T2 Transmission was observed to be up to a radial distance of 58kM (10km.ahead Chohaal)
3. **Radial-3(East):** Along this radial field strength measurement done at location like Ghuman-Dansiwal-Shahpur-Bhadiar-Bathri (HP)-Sukhsal & Nangran Kalmot up to a radial distance of 80 km . Satisfactory reception of DVB-T2 Transmission was observed to be up to a radial distance of 65kM (Bhadiar).
4. **Radial-4(South- East):** Along this radial field strength measurement done at location like Badala-Kasabad-Doraha (G.T.Road)-Khanna-Dahedu-Bhattian & Malerkotla Chowk up to a radial distance of 90 km . Satisfactory reception of DVB-T2 Transmission was observed to be up to a radial distance of 83kM (Dahedu, Khanna)
5. **Radial-5(South):** Along this radial field strength measurement done at location like Nurmahal-Rasulpur-Swaddi Khurd-Bassian-Kalal Majra-Kalala-Chaunke Kalan & Thikriwala up to a radial distance of 95 km . Satisfactory reception of DVB-T2 Transmission was observed to be up to a radial distance of 85kM (Chhiniwal Kalan).
6. **Radial-6(South-West):** Along this radial field strength measurement done at location like Khiwa (Nakodar)-Saidpur Jihri-Dharamkot- Moga-Purana Bagha-Kothe & Nirbhai Singh up to a radial distance of 95 km . Satisfactory reception of DVB-T2 Transmission was observed to be up to a radial distance of 80kM (Purana Bagha Chowk).
7. **Radial-7(West):** Along this radial field strength measurement done at location like Bhoopur-Goindwal Sahib-Zanardar-Kulla-Kalsian Kalan-Madar Mathra Bhagi & Rajok(Indo-Pak Border) up to a radial distance of 96 km . Satisfactory reception of DVB-T2 Transmission was observed to be up to a radial distance of 90kM (Madar Mathra Bhagi).
8. **Radial-8(North-West):** Along this radial field strength measurement done at location like Kapurthala-Ghuluwal-Kathu Nangal-Hamza-Pandher-Khatrai Kalan & Makam up to a radial distance of 92 km. Satisfactory reception of DVB-T2 Transmission was observed to be up to a radial distance of 83kM (Pandher).

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.

1. The coverage along South-East, South, South-West, West & North-West direction is up to a radial distance of 80-90 kM. In North-East & East direction coverage is up to 58 kM & 65kM respectively whereas along North direction it is up to a radial distance of 75 kM
2. The coverage along West direction is found to be maximum(Upto 95 kM.)
3. The coverage along North-East & East direction is the least .This shrinkage in coverage is mainly due to the existence of irregular terrain/ pockets of low or medium height hills. 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. From the field strength & MER data collected along all eight radials, it is being observed that the reception is quite satisfactory for minimum field strength value of 60 dB μ V/m & MER over 12.0dB under existing environment condition. The predicted coverage contour itself reveals that DVB-T2 reception is satisfactory within the predicted coverage area (up to 75-90 kM) with fixed roof top antenna mounted at a height of 10Mtrs from the ground.
5. 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:

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 with the sincere support & cooperation of the shift duty staff of HPT (TV) Tower, Jalandhar. Survey team also extends their gratitude to Sh. A.P.Singh (DDE) who has provided necessary equipment & actively cooperated 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 motivation, suggestion & cooperation at every step helped in the successful completion of the survey.

Reception survey for satisfactory coverage of DVB-T2 Transmitter (570MHz,Ch#33), Jalandhar

Direction: North (Radial-1)

Table-1

Route: TV tower (Khurla Kingra)-Surra Nassi- Tanda Nangli-Dasuya-Mukerian-Musahibpur-Bhangala-Jandwal

Date: 25/06/2016

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)				
							LDPC	BCH			
0900	Sura Nussi	N 31° 22' 44.0" E 75° 32' 30.8"	231	10	80.9	27.4	1.0E-6	1.0E-8	OK	Rural.Open. No Traffic. Vegetation	
1030	Kartarpur Kartarpur-Bholath Road	N 31° 27' 48.5" E 75° 29' 37.8"	227	20	96.2	29.9	1.0E-6	1.0 E-8	OK	Rural,Open, NoTraffic Vegetation	
1130	Bholath Bholath-Begowal Road	N 31° 33' 25.8" E 75° 30' 09.3"	223	30	85.4	27.7	1.0 E-3	1.0 E-8	OK	Rural.Open. No Traffic. Vegetation	
1210	Tanda Nangli Tanda Road	N 31° 39' 10.9" E 75° 32' 11.8"	223	40	79.6	25.9	1.0E-6	1.0 E-8	OK	Rural,Open, NoTraffic Vegetation	
1515	Aalampur Dasuya Road	N 31° 44' 30.8" E 75° 35' 10.3"	233	50	73.7	23.2	1.0E-6	1.0E-8	OK	Rural.Open. No Traffic. Vegetation	
1615	Dasuya Dasuya-Pathankot Road	N 31° 49' 25.7" E75°39' 29.2"	246	60	72.2	19.9	1.0 E-4	1.5 E-8	OK	Rural , Open,LowTraffic, Vegetation	
1700	Bishanpur Jalandhar-Pathankot Rd	N 31° 55' 06.7" E 75° 37' 20.3"	248	70	58.4	15.2	1.1 E-1	3.0 E-7	OK	Rural , Open,Low Traffic, Vegetation	
1720	Phattuwal (Mukerian) Jalandhar-Pathankot Rd	N 31° 58' 03.7" E 75° 36' 39.2"	247	75	56.9	11.4	1.0 E-2	1.0 E-8	OK	Rural , Open,Low Traffic, Vegetation	
1740	Musahibpur, Jalandhar-Pathankot Rd	N 31° 59' 39.4" E75° 36' 44.1"	248	78	56.2	1.0	-	-	F	Rural , Open,Low Traffic, Vegetation	
1810	Bhangala, Jalandhar-Pathankot Rd	N 32° 00' 47.3" E75° 36' 45.7"	249	80	57.1	3.1	2.2 E-2	1.0 E-8	FF	Rural , Open,Low Traffic, Vegetation	
1825	Jandwal Jalandhar-Pathankot Rd	N 32° 01' 46.9" E75° 36' 47.8"	252	82	56.3	1.5	-	-	F	Rural , Open,Low Traffic, Vegetation	

Reception survey for satisfactory coverage of DVB-T2 Transmitter (570MHz,Ch#33), Jalandhar

Radial: North East

Table-2

Route: TV tower (Khurla Kingra)-Mubarakpur-Mandial-Piplanwala-Dhawali-Chohal-Gagret (HP)-Mubarikpur(Una)

Date: 26/06/2016

Time (Hrs.)	Spot/Location	Location Co-ordinates	MSL (Mtrs)	Radial Distance (kM)	Field Strength (dB μ V/m)	COFDM (IRD) Parameter			Subjective Assessment	Terrain	Remarks
						MER (dB)	BER(Pre)				
							LDPC	BCH			
0830	Mubarakpur Hoshiarpur Road.	N 31°21' 36.8" E 75° 37' 40.4"	231	10	95.4	28.1	1.0E-6	1.0 E-8	OK	Urban , Low Traffic, Highway, Vegetation	
0915	Gazipur(Sattowali), Hoshiarpur Rd NH-3)	N 31° 25' 23.5" E 75° 42' 14.6"	233	20	92.4	28.0	1.0 E-6	1.0 E-8	OK	Urban , Low Traffic, Highway, Vegetation	
0935	Mandial, Hoshiarpur Rd NH-3)	N 31° 28' 32.6" E 75° 47' 41.9"	251	30	68.7	23.1	7.7E-5	1.0 E-8	OK	Urban , Low Traffic, Highway, Vegetation	
1010	Piplanwala, Hoshiarpur Rd NH-3),	N 31° 31' 11.6" E 75° 53' 02.9"	280	40	76.5	20.9	4.8E-4	1.0E-8	OK	Urban , Low Traffic, Highway, Vegetation	
1045	JCT Ltd.(Chohal) , Daramshala Rd.(NH3)	N 31° 34' 58.5" E 75° 57' 23.6"	340	50	71.1	24.3	3.3E-4	1.0E-8	OK	Urban , Low Traffic, Highway, Vegetation	Hilly Terrain
1105	5km.ahead Chohal, Daramshala Rd.(NH3)	N 31° 36' 57.1" E 75° 59' 32.7"	445	55	57.5	16.0	2.4E-4	1.0 E-5	FF	Rural(Hilly) , Low Traffic, Vegetation	Hilly Terrain
1140	10km.ahead Chohaal, Daramshala Rd.(NH3)	N 31° 37' 58.3" E 76° 00' 56.9"	524	58	80.2	25.4	5.7E-5	1.0 E-5	OK	Rural(Hilly) , Low Traffic, Vegetation	Hilly Terrain
1205	Near Dhawali,(Una HP)Bharvaey Rd(NH3).	N 31°38' 58.5" E 76° 02' 30.8"	537	61	57.4	2.1	-	-	F	Rural(Hilly) , Low Traffic, Vegetation	Hilly Terrain
1220	Gagret (Una HP) Bharvaey Rd.	N 31° 40' 00.9" E 76° 03' 52.9"	460	64	57.1	1.7	-	-	F	Urban(Hilly) , Low Traffic, Vegetation	Hilly Terrain
1240	Mubarikpur (Una HP) Bharvaey Rd,	N 31° 41' 37.2" E 76° 04' 46.0"	468	67	57.3	1.1	-	-	F	Urban(Hilly) , Low Traffic, Vegetation	Hilly Terrain

Reception survey for satisfactory coverage of DVB-T2 Transmitter (570MHz,Ch#33), Jalandhar

Radial: East

Table-3

Route: TV tower (Khurla Kingra)-Paragpur-Ghuman-Dansiwal- Shahpur-Bhadiar-Bathri (HP)-Sukhsal-Nangran Kalmot

Date: 26/06/16

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)				
							LDPC	BCH			
0900	Paragpur village , G.T.Rd. Punjab	N 31° 17' 11.5" E 75° 39' 50.8"	229	10	92.5	28.0	1.0E-6	1.0E-8	OK	Urban, Moderate Traffic	
0950	Ghuman Ghuman Road	N 31° 15' 35.5" E 75° 51' 36.3"	246	30	80.9	24.4	1.0E-6	1.0E-8	OK	Rural. Open. No Traffic. Vegetation	
1100	Jhaj Mahilpur-Kot Fatuhi Rd	N 31° 17' 12.0" E 75° 58' 40.2"	254	40	70.8	16.7	1.0E-6	1.0 E-8	OK	Rural,Open,No Traffic Vegetation	
1240	Dansiwal, Garhshankar-Hoshiarpur Rd.	N 31° 17' 07.6" E 76° 05' 02.7"	268	50	71.6	22.9	1.0 E-3	1.0 E-8	OK	Rural. Open. No Traffic. Vegetation	
1320	Shahpur Garhshankar-Nangal Rd	N 31° 13' 48.2" E 76° 10' 57.4"	266	60	78.2	28.6	1.0E-6	1.0 E-8	OK	Rural,Open,No Traffic Vegetation	
1345	Bhadiar, Garhshankar-Nangal Rd .	N 31° 16' 12.2" E 76° 14' 18.8"	433	65	66.4	18.5	1.0E-6	1.0E-8	OK	Rural. Hilly, No Traffic. Vegetation	Hilly Terrain
1415	Bathri, Una, (H.P). Garh Shanker Nangal Rd.	N 31° 18' 50.2" E 76° 17' 26.6"	364	70	56.7	--	1.0 E-4	1.5 E-8	No Signal	Rural, Hilly, ,Low Traffic, Vegetation	Hilly Terrain
1540	Sukhsal (H.P). Santokhgarh-Bhallri Rd	N 31° 18' 32.6" E 76° 20' 36.9"	329	75	56.2	--	1.1 E-1	3.0 E-7	No Signal	Rural, Hilly, ,Low Traffic, Vegetation	Hilly Terrain
1555	Nungran Kalmot (H.P). Santokhgarh-Nangal Rd	N 31° 17' 34.7" E 76° 21' 24.7"	324	80	56.0	--	1.0 E-2	1.0 E-8	No Signal	Rural, Hilly, ,Low Traffic, Vegetation	Hilly Terrain

Reception survey for satisfactory coverage of DVB-T2 Transmitter (570MHz,Ch#33), Jalandhar

Direction: South-East (Radial-4)

Table-4

Route: TV tower (Khurla Kingra)-Badala-Kasabad-Doraha (G.T.Road)-Khanna-Dahedu-Bhattian-Malerkotla Chowk

Date: 28/06/2016

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)				
							LDPC	BCH			
1030	Jamsher Jamsher-Hardaspur Rd	N 31° 13' 41.5" E 75° 38' 00.5"	222	10	95.3	28.0	1.0E-6	1.0E-8	OK	Urban, H/way No traffic,	
1140	Badala, Goraya Rd.	N 31° 08' 08.5" E 75° 39' 58.8"	232	20	85.5	28.8	1.0E-6	1.0E-8	OK	Rural, Open , No traffic, Vegetation	
1220	Bada Pind(Dalewal) G.T Road	N 31° 05' 53.6" E 75° 46' 45.4"	237	30	87.4	29.2	1.9E-6	1.0E-8	OK	H/way, Open , Moderate traffic	
1310	Kasabad Village Dana Mandi Road	N 30° 58' 42.7" E 75° 50' 26.2"	231	44	75.7	28.4	1.0E-6	1.0E-8	OK	Rural, Open , No traffic	
1330	New Subhash Nagar G.T Road	N 30° 55' 43.2" E 75° 52' 20.6"	233	50	68.5	19.6	3.3E-3	1.0E-8	OK	H/way, Open , Heavy traffic	
1500	Jugiana(Sahniwal) G.T Road	N 30° 51' 28.3" E 75° 56' 15.4"	245	60	60.4	17.5	3.3E-4	3.0E-8	OK	H/way, Open , Heavy traffic	
1515	Near Dreamland Park (Sahniwal) G.T Road	N 30° 49' 50.1" E 75° 58' 56.8"	250	65	60.2	18.3	2.2E-3	1.0E-8	OK	H/way, Open , Heavy traffic	
1540	3Km.ahead Dream land park(G.T Road)	N 30° 48' 38.9" E 76° 00' 43.5"	253	68	57.5	19.2	1.3E-4	1.5E-8	OK	H/way, Open , Heavy traffic	
1550	Doraha,(Ludhiana) G.T Road	N 30° 47' 45.9" E 76° 02' 03.0"	253	71	57.3	10.2	1.2E-3	1.0E-8	FF	H/way, Open , Heavy traffic	
1615	5Km.ahead Doraha G.T Road	N 30° 46' 25.6" E 76° 03' 59.4"	262	75	58.1	19.7	3.6E-3	1.0E-8	OK	H/way, Open , Heavy traffic	
1645	Pizza,Khanna G.T Road	N 30° 44' 56.1" E 76° 07' 08.1"	258	80	57.4	9.0	2.3E-3	1.0E-8	FF	H/way, Open , Heavy traffic	
1650	Dahedu, Khanna G.T Road	N 30° 44' 15.9" E 76° 08' 43.5"	259	83	60.4	13.2	2.2E-4	1.0E-8	OK	H/way, Open , Heavy traffic	
1715	Daudpur(Libra), Khanna, G.T Road	N 30° 43' 31.1" E 76° 10' 28.6"	260	86	58.2	7.0	2.7E-3	1.0E-8	No signal	H/way, Open , Heavy traffic	
1730	Bhattian(Khanna) G.T Road	N 30° 42' 58.8" E 76° 11' 46.3"	262	88	57.3	10.1	1.1E-3	1.8E-7	No signal	H/way, Open , Heavy traffic	
1745	Malerkotla Chowk ,Khanna,G.T Road	N 30° 42' 28.8" E 76° 12' 53.3"	261	90	57.1	--	--	--	No signal	H/way, Open , Heavy traffic	

Reception survey for satisfactory coverage of DVB-T2 Transmitter (570MHz,Ch#33), Jalandhar

Direction: South (Radial-5)

Table-5

Route: TV tower (Khurla Kingra) - Nurmahal-Rasulpur-Swaddi Khurd-Bassian-Kalal Majra-Kalala-Chaunke Kalan-Thikriwala Date: 29/06/2016

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)				
							LDPC	BCH			
0910	ChakVendhal Chanian Rd.	N 31° 11' 55.7" E 75° 32' 25.7"	224	10	104.1	24.2	1.0E-6	1.0E-8	OK	Rural, Vegetation No Traffic,	
0945	Nurmahal Bhandala-Nurmahal Rd	N 31° 06' 32.9" E 75° 34' 58.0"	232	20	96.3	28.9	1.0E-6	1.0E-8	OK	Rural, Vegetation No Traffic,	
1115	Rasulpur, Nakoder-Jagraon Rd.	N 31° 01' 26.6" E 75° 28' 57.8"	222	30	93.2	29.4	1.9E-6	1.0E-8	OK	Rural, Vegetation No Traffic,	
1145	Sidhvan Bet, Nakoder- Jagraon Rd.	N 30° 55' 58.4" E 75° 28' 41.3"	223	44	85.7	28.8	1.6E-4	1.0E-8	OK	Rural, Vegetation No traffic,	
1210	Sawaddi Khurad, Nakoder-Jagraon Rd	N 30° 50' 32.1" E 75° 28' 24.7"	230	50	81.6	28.8	1.0E-6	1.0E-8	OK	Rural, Vegetation No Traffic,	
1245	Dholan , Jagraon –Rajkot Rd	N 30° 44' 52.0" E 75° 30' 08.2"	230	60	73.5	25.6	1.9E-4	3.0E-8	OK	Rural, Vegetation No Traffic,	
1305	Bassian Jagraon –Rajkot Rd	N 30° 39' 22.6" E 75° 32' 26.4"	232	70	67.8	24.4	1.2E-4	1.0E-8	OK	Rural, Vegetation No Traffic,	
1330	Boparai Khurd, Ramgarh Sivion –Boparai Rd.	N 30° 36' 42.4" E 75° 32' 26.9"	231	75	64.4	20.3	1.2E-4	1.5E-8	OK	Rural, Vegetation No Traffic,	
1400	Kalal Majra Boparai-Kalal Majra Rd	N 30°34' 01.2" E 75° 33' 05.0"	231	80	62.4	20.7	1.0E-2	1.0E-8	OK	Rural, Vegetation No Traffic,	
1430	Chhiniwal kalan Mehal Kalan Rd	N 30° 31' 21.6" E 75° 31' 25.1"	229	85	58.2	13.6	1.6E-2	1.0E-8	OK	Rural, Vegetation No Traffic,	
1445	Kalala, Chhiniwal Kalan – Kalala Rd	N 30° 29' 42.3" E 75° 32'05.5"	228	88	58.4	11.0	–	–	FF	Rural, Vegetation No Traffic,	
1510	Chaunke kalan Sehjra-Chaunke Kalan Rd	N 30° 28' 32.4" E 75° 32' 53.8"	226	90	58.5	12.2	1.1E-2	1.0E-8	FF	Rural, Vegetation No Traffic, ,	
1525	Near Thikriwala Thikriwala Rd	N 30° 26' 51.7" E 75° 32' 09.6"	226	93	57.2	11.1	1.1E-2	1.0E-8	No signal	Rural, Vegetation No Traffic,	
1545	Thikriwala Phrini Rd	N 30° 25' 54.1" E 75° 31' 44.8"	225	95	56.4	4.2	–	–	No signal	Rural, Vegetation No Traffic,	

Reception survey for satisfactory coverage of DVB-T2 Transmitter (570MHz,Ch#33), Jalandhar

Direction: South-West (Radial-6)

Table-6

Route: TV tower (Khurla Kingra)-Khiwa (Nakodar)-Saidpur Jihri-Dharamkot- Moga-Purana Bagha-Kothe Nirbhai Singh

Date: 30/06/16

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)				
							LDPC	BCH			
0845	.Chahar bagh Jalandhar-Nakodar Rd	N 31° 12'24.6" E 75° 30' 26.9"	221	10	108.2	28.5	1.0E-6	1.5E-8	OK	Urban .Open. Moderate Traffic. Vegetation	
0915	Khiwa(Nakodar) Jalandhar-Moga Rd	N 31° 07'28.0" E 75° 27' 45.2"	225	20	102.5	28.8	1.0E-6	1.0E-8	OK	Urban .Open. Moderate Traffic. Vegetation	
1000	Saidpur Jihri Malsian-Shahkot Rd	N 31° 05' 29.5" E 75° 20' 22.0"	220	30	84.3	27.2	1.0E-6	1.0E-8	OK	Urban .Open. Moderate Traffic. Vegetation	
1040	Gati-Kamalke Shahkot-Dharamkot Rd	N 31° 00' 23.0" E 75° 17' 33.0"	218	40	77.8	26.1	1.6E-5	1.0E-8	OK	Urban .Open. Moderate Traffic. Vegetation	
1100	Dharamkot Shahkot-Dharamkot Rd	N 30° 56' 11.1" E 75° 14' 02.8"	215	50	76.4	27.6	1.0E-5	1.0E-8	OK	Urban .Open. Moderate Traffic. Vegetation	
1125	Moga Jalandhar-Moga Rd	N 30° 51'04.6" E 75°10' 53.3"	216	60	72.3	25.3	1.3E-4	1.0 E-8	OK	Urban .Open. Moderate Traffic. Vegetation	
1215	Singhanwala Moga- Kotkapura Rd	N 30°46' 25.0" E 75° 07' 44.2"	211	70	66.4	22.4	1.1E-4	1.0 E-7	OK	Urban .Open. Moderate Traffic. Vegetation	
1245	Purana Bagha Chowk Moga- Kotkapura Rd	N 30° 41' 07.2" E75° 05' 37.4"	211	80	61.2	14.7	1.5 E-3	6.0 E-8	OK	Urban,Moderate Traffic	
1310	Rajiana village Moga- Kotkapura Rd	N 30° 39' 32.7" E75° 02' 45.7"	211	85	57.1	10.1	1.1E-2	1.3E-5	FF	Urban,Moderate Traffic	
1320	Mallike(Samalsar) Moga- Kotkapura Rd	N 30° 38' 12.3" E74° 59' 26.9"	210	90	56.2	11.0	1.4E-2	1.0E-8	No signal	Rural,Open,Vegetation, LowTraffic	
1330	Near Panjgrain Khurd Moga- Kotkapura Rd	N 30° 37' 31.5" E74° 57' 36.7"	208	93	57.1	10.2	1.0 E-3	1.7E-8	No signal	Rural,Open,Vegetation, Low Traffic	
1340	Kothe Nirbhai Singh Moga- Kotkapura Rd	N 30° 37' 11.6" E74° 56' 37.7"	210	95	57.0	8.0	1.0E-8	1.0E-3	No signal	Rural,Open,Vegetation, Low Traffic	

Reception survey for satisfactory coverage of DVB-T2 Transmitter (570MHz,Ch#33), Jalandhar

Direction: West (Radial- 7)

Table-7

Route: TV tower (Khurla Kingra)-Bhoolpur-Goindwal Sahib-Zanardar-Kulla-Kalsian Kalan-Madar Mathra Bhagi-Rajok(Border) Date: 01/07/2016

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)				
							LDPC	BCH			
0840	Kohala (Link Rd) Nakodar-Kapurthala Rd	N 31° 17' 33.8" E 75° 26' 56.0"	226	10	91.7	28.2	1.0E-5	1.0E-8	OK	Rural, No Traffic, Open, Vegetation,	
1000	Bihariapur (Link Rd) Sidhwan Dona-Bihariapur Rd	N 31° 17' 17.4" E 75° 20' 40.1"	221	20	99.2	28.6	1.0E-6	1.0E-8	OK	Rural, No Traffic, Open, Vegetation,	
1030	Boolpur Talwandi Tibba-Bhoolpur Rd	N 31° 19' 04.5" E 75° 14' 26.2"	212	30	90.8	29.0	1.0E-6	1.0 E-8	OK	Rural, No Traffic, Open, Vegetation,	
1130	GoindwalSahib Taran Taran-Kapurthala Rd	N 31° 22' 21.8" E 75° 08' 37.0"	219	40	90.3	29.2	1.2E-4	1.0 E-8	OK	Rural, No Traffic, Open, Vegetation,	
1210	Dalawalpur Khadur Sahib (Sabrawan Branch Nahar)	N 31° 19' 43.5" E 75° 01' 55.2"	222	50	75.6	27.4	1.7E-6	1.0E-8	OK	Rural, No Traffic, Open, Vegetation,	
1240	Zanardar Sarholi Kalan-ZanardarRd	N 31° 16' 53.9" E 74° 55' 27.9"	217	60	56.4	23.1	1.0E-4	1.0 E-8	OK	Rural, No Traffic, Open, Vegetation,	
1250	ThehRajbah Patti Zanardar-Patti Rd	N 31° 16' 38.7" E 74° 52' 14.7"	216	65	65.2	22.5	1.8E-5	1.0 E-8	OK	Rural, No Traffic, Open, Vegetation,	
1420	Kulla (Theh-Chapal) Patti-Kacha Pakka LinkRd	N 31° 17' 33.0" E 74° 49' 09.6"	217	70	65.3	20.2	1.2E-4	1.5E-8	OK	Rural, No Traffic, Open, Vegetation,	
1445	Makhi Khurd Bhikiwan-Harika Rd	N 31° 17' 31.0" E 74° 46' 01.0"	211	75	62.7	17.4	1.9E-4	1.8E-4	OK	Rural, No Traffic, Open, Vegetation,	
1515	Kalsian Kalan Margindpura-KalsianKalan	N 31° 16' 56.8" E 74° 42' 53.9"	214	80	60.4	16.3	1.7E-4	1.0E-8	OK	Rural, No Traffic, Open, Vegetation,	
1540	Mari Nauabad(Link Road) Near State Highway-21	N 31° 16' 42.8" E 74° 39' 37.4"	217	85	75.5	26.6	1.9E-6	1.0 E-8	OK	Rural, No Traffic, Open, Vegetation,	
1600	Madar Mathra Bhagi	N 31° 16' 48.8" E 74° 36' 31.4"	208	90	63.2	22.2	1.0 E-3	1.0 E-8	OK	Rural, No Traffic, Open, Vegetation,	
1615	Rajok Border	N 31° 16' 49.2" E 74° 33' 22.4"	203	95	61.1	1.5	-	-	No Signal	Rural, No Traffic, Open, Vegetation	
1645	5kM before Indo Pak Int. Border	N 31° 16' 10.1" E 74° 31' 45.0"	207	96	56.3	1.2	-	-	No Signal	Rural, No Traffic, Open, Vegetation	

Reception survey for satisfactory coverage of DVB-T2 Transmitter (570MHz,Ch#33), Jalandhar

Direction: North-West (Radial- 8)

Table-8

Route: TV tower (Khurla Kingra)-Kapurthala-Ghuluwal-Kathu Nangal-Hamza-Pandher-Khatrai Kalan-Makam

Date: 02/07/2016

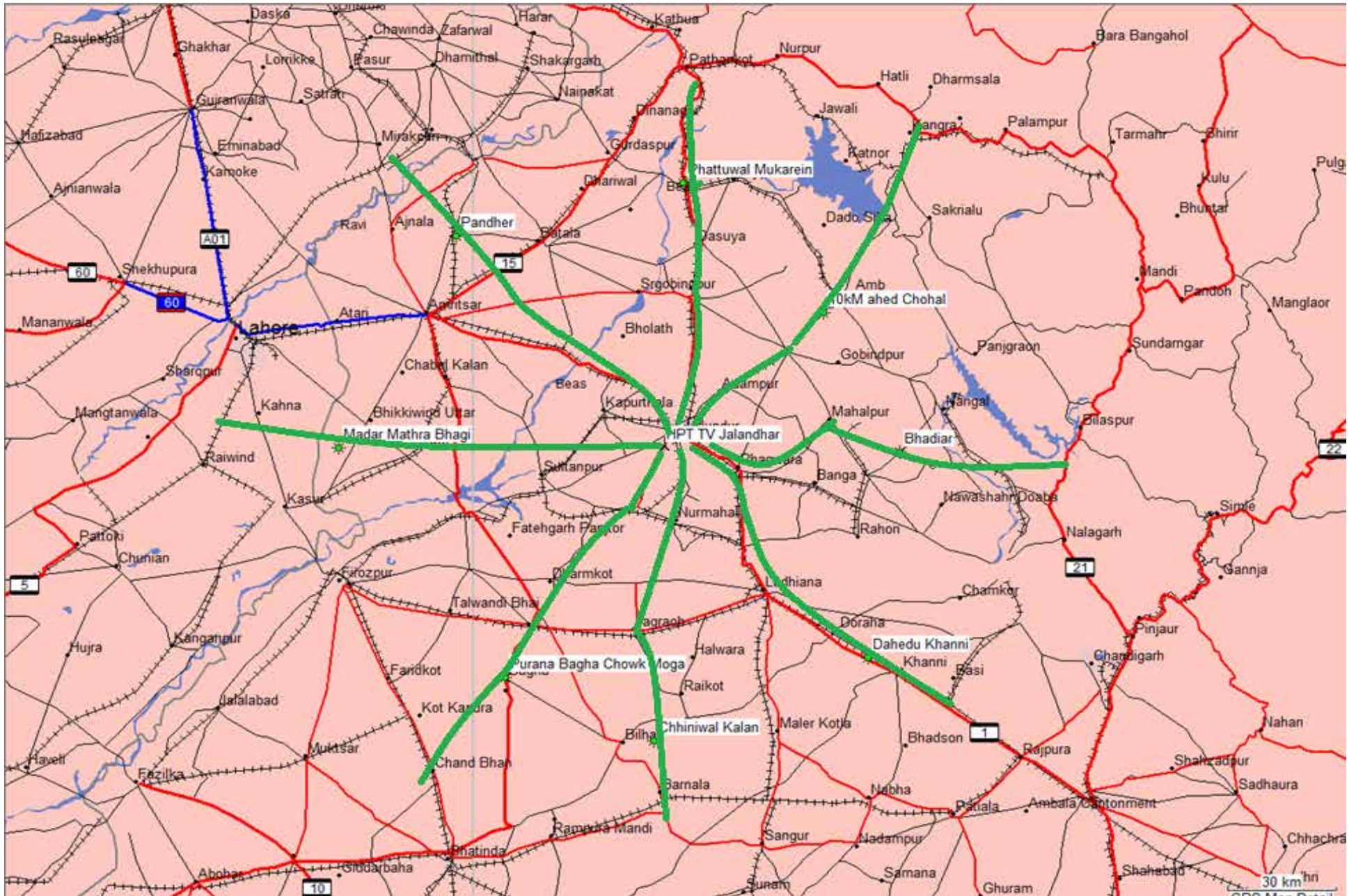
Time Hrs.	Location	Location Co-ordinates	MSL(Meter s).	Radial Distance (kM.)	Field Strength (dBµV/m)	COFDM (IRD) Parameter			Subjective Assessment	Terrain	Remarks
						MER (dB)	BER(Pre)				
							LDPC	BCH			
0925	Budo Punder	N 31° 20' 46.9" E 75° 28' 24.9"	227	10	93.8	25.4	2.7E-4	1.0E-8	OK	Urban,Moderate traffic	
1000	Mohalla Jattapura Kapurthala	N 31° 22' 49.8" E 75° 22' 43.7"	224	20	82.5	23.8	2.5E-4	1.0E-8	OK	Urban,Moderate traffic	
1030	Ghuluwal G.T.Road (NH-1)	N 31° 29' 35.4" E 75° 20' 49.1"	220	30	75.7	22.4	1.7E-4	1.0E-8	OK	Rural, Open,Moderate Traffic	
1105	Baba Bakala Batala Rd	N 31° 33' 08.1" E 75° 16' 03.1"	233	40	72.6	28.6	4.4E-5	1.0E-8	OK	Urban,Moderate traffic	
1140	Mahta, Beas-Batala Rd	N 31° 39' 46.7" E 75° 15' 33.3"	231	50	68.4	27.7	4.4E-5	1.0E-8	OK	Rural, Open, No traffic.	
1320	UchokeKhurd Link Road	N 31° 43' 22.6" E 75° 10' 36.9"	233	60	63.6	23.0	2.2E-4	1.0E-8	OK	Rural, Open, No traffic	
1450	Kathu Nangal Batala-Amritser Rd	N 31° 43' 55.5" E 75° 01' 42.8"	223	65	61.5	21.6	1.2E-2	1.0E-8	OK	Rural, Open, Moderate Traffic,	
1515	Sham Nagar Link Road	N 31° 45' 58.1" E 75° 01' 48.2"	229	73	60.9	11.7	1.2E-2	1.0E-8	OK	Rural, Open No Traffic,	
1545	Borewal Kang Link Road	N 31° 46' 48.8" E 75° 00' 42.0"	233	75	61.2	11.9	1.2E-2	1.0E-8	OK	Rural, Open, No Traffic, Vegetation	
1610	Hamza Link Road	N 31° 46' 59.8" E 74° 58' 12.0"	230	78	60.4	11.5	1.2E-2	1.0E-8	FF	Rural,Open,NoTraffic, Vegetation	
1620	Wadala Viram Link Road	N 31° 49' 07.4" E 74° 58' 58.8"	231	80	60.3	12.1	1.6E-4	1.0E-8	OK	Rural,Open,No Traffic, Vegetation	
1645	Pandher Link Road	N 31° 49' 52.8" E 74° 57' 04.8"	232	83	60.1	13.2	1.3E-4	1.0E-8	OK	Rural,Open,NoTraffic, Vegetation	
1710	Zhander Link Road	N 31° 48' 36.2" E 74° 53' 27.0"	231	86	58.2	11.0	1.4E-4	1.5E-8	F/F	Rural,Open,NoTraffic, Vegetation	
1720	Khatrai Kalan Link Road	N 31° 49' 33.7" E 74° 51' 27.0"	230	89	57.6	10.0	1.1E-2	1.0E-8	No signal	Rural,Open,NoTraffic, Vegetation	
1740	Makam Link road	N 31° 50' 11.9" E 74° 49' 51.4"	227	92	56.2	5.3	1.9E-2	1.5E-8	No signal	Rural,Open,NoTraffic, Vegetation	

Reception survey for satisfactory coverage of DVB-T2 Transmitter (570MHz,Ch#33), Jalandhar

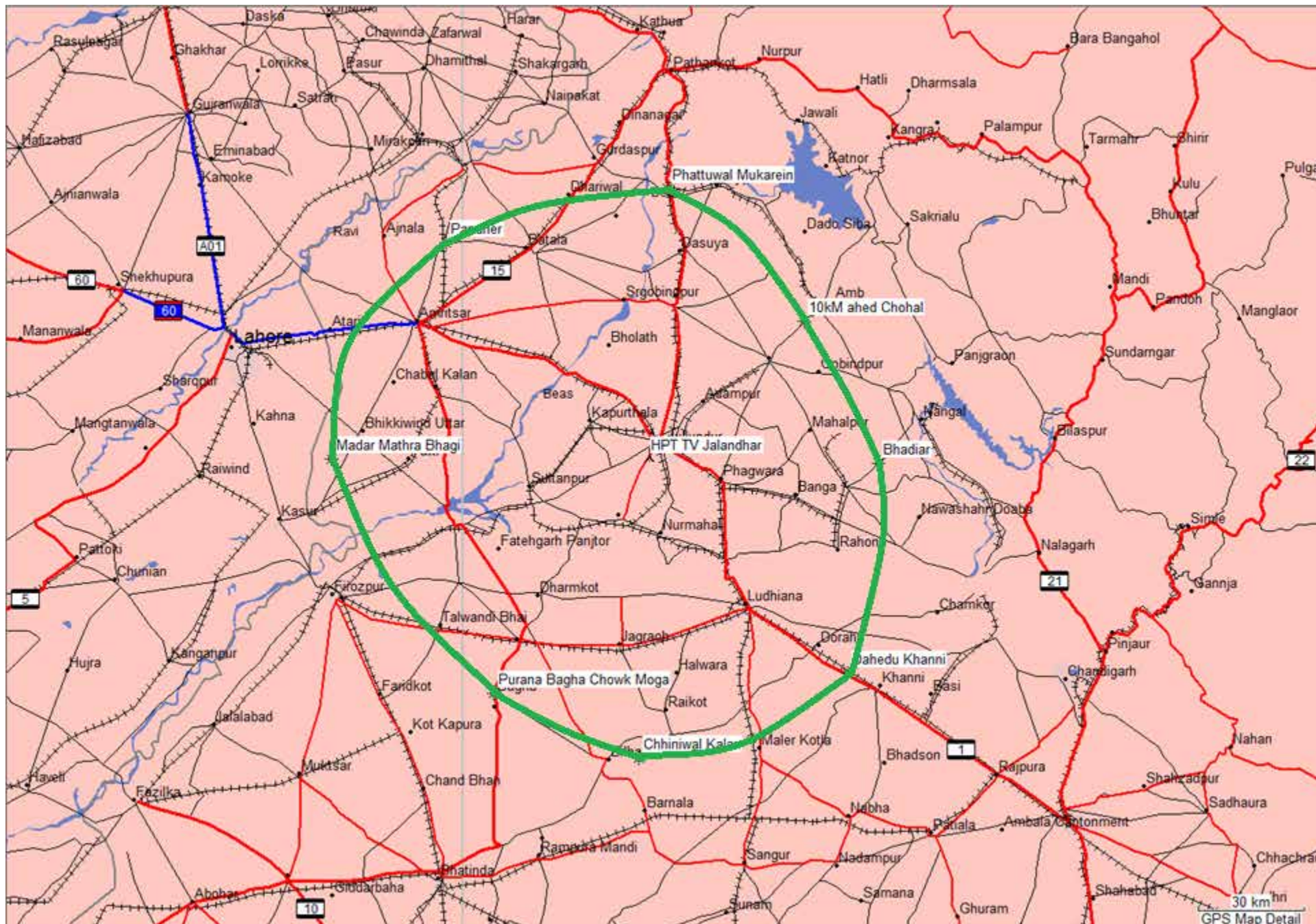
Table for satisfactory coverage of DVB-T2 Transmission in QPSK Mode

Table-9

Direction	Spot/Location	Location Co-ordinates	MSL (Meters)	Radial Distance (kM)	Field Strength (dBµV/m)	COFDM (IRD) Parameter			Subjective Assessment
						MER (dB)	BER(Pre)		
							LDPC	BCH	
North	Phattuwal (Mukerian) Jalandhar-Pathankot Road	N 31° 58' 03.7" E 75° 36' 39.2"	247	75	56.9	11.4	1.0 E-2	1.0 E-8	OK
North-East	10km.ahead Chohaal, Daramshala Road.(NH3)	N 31° 37' 58.3" E 76° 00' 56.9"	524	58	80.2	25.4	5.7E-5	1.0 E-5	OK
East	Bhadiar, Garhshankar-Nangal Road	N 31° 16' 12.2" E 76° 14' 18.8"	433	65	66.4	18.5	1.0E-6	1.0E-8	OK
South-East	Dahedu, Khanna G.T Road	N 30° 44' 15.9" E 76° 08' 43.5"	259	83	60.4	13.2	2.2E-4	1.0E-8	OK
South	Chhiniwal kalan Mehal Kalan Road	N 30° 31' 21.6" E 75° 31' 25.1"	229	85	58.2	13.6	1.6E-2	1.0E-8	OK
South-West	Purana Bagha Chowk Moga- Kotkapura Road	N 30° 41' 07.2" E 75° 05' 37.4"	211	80	61.2	14.7	1.5 E-3	6.0 E-8	OK
West	Madar Mathra Bhagi	N 31° 16' 48.8" E 74° 36' 31.4"	208	90	63.2	22.2	1.0 E-3	1.0 E-8	OK
North-West	Pandher Link Road	N 31° 49' 52.8" E 74° 57' 04.8"	232	83	60.1	13.2	1.3E-4	1.0E-8	OK



Radial Route Map originating from HPT (TV) Tower, Jalandhar (Punjab)



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

