

***Field Strength Survey
Of 10kW FM (Vividh Bharti)
Radio Transmitter Located At
HPT (TV) Tower, Pitampura
New Delhi.***

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Tower Pitampura
New Delhi.*



FM Vividh Bharti Transmitter

Make: RVR

Model: TXF 10K 0161

Frequency: 100.1 MHz

Date of commissioning-14/04/2015



Combiner Unit

Field Strength Measurement/Reception Survey Team

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Introduction:

A new FM transmitter operating on 100.1MHz of All India Radio is being recently installed in the premises of HPT (TV) Pitampura. The rated power of this transmitter is 10kW, currently broadcasting Vividh Bharti (VB) programme. The output of this transmitter is fed to the transmitting antenna through a combiner, mounted at a height of 200 meters segment of the 241 meter concrete TV tower. The antenna tower is located in a dense population having high rise building all around. Being a new transmitter commissioned on dated 14/04/2015, propagation studies are therefore required to be carried out to access its coverage contour. This task was given to the propagation lab of the Research Department by AIR Directorate. The field strength survey work initiated accordingly from dated 16/11/2015 and completed on dated 04/12/2015. Before initiating the survey work, staff of FM Vividh Bharti were contacted & discussed. They were requested for their co-operation & co-ordination during the entire survey period.

Objectives:

1. To carry out field strength measurement for assessment of coverage area.
2. To carry out subjective assessment using professional, commercial and cell/mobile phone FM radio receivers.
3. To localize an area having interference due to co-channel or adjacent channel transmission.
4. To draw coverage contour for Primary coverage area.

Measuring Instrument Used:

Following measuring Instrument/equipments have been used during the survey.

1. Field Strength Meter, Make: Anritsu, Model: MS2035B & MS 2713E.
2. Standard calibrated Dipole Antenna, Make Anritsu, Model:ML534 B
3. GPS, Make: Garmin, Model: Montana 650
4. Radio Receivers (Professional: Sangean, Commercial: Philips, Mobile Phone: Branded.
5. Power Supply backup system.
6. Mobile Propagation Lab equipped with survey equipments with 10Mtrs Electro-mechanical telescopic mast.

Transmitter & Antenna Details: Given in next page.

Basic Data and Transmitter details

Transmitters Details:

1. Name of Station : FM(Vividh Bharti), New Delhi
2. Location of the Transmitters : LAT- N 28° 41'51.0"
(In 6 figure coordinates) LON- E 77° 09'01.8"
MSL-218 Meter
3. Description of terrain around the : Urban, dense population, high
Site of Transmitters rise buildings, heavy Traffic
4. Classification(Large city/urban/rural) : Large City
5. Rated power of the Transmitter : 10kW
6. Forward radiated Power : 9.0kW
7. Reflected Power : 21-30W
8. VSWR : 1.09
9. Transmission Mode : Stereophonic
10. Make : RVR
11. Model No. : TXF 10K 0161
12. Frequency of operation : **100.1MHz**
13. Date of Commissioning : 14/04/ 2015

:

Transmitting Antenna Details:

1. Type of Antenna : NA
2. Height of Tower : 241 Meter
3. Effective height of antenna(Midbay) : NA
4. Type of Polarization : Circular
5. Antenna Gain(in dB) : NA

Measurement Set Up:

The field trials were carried out by utilizing mobile propagation lab of Research Department having 10 meter Electro-mechanical telescopic mast. Field strength measurement/survey work was carried out, using Anritsu make Field strength meter & antenna. The whole system was assembled in a mobile van with power back up system (portable generator set). The two main components of the reception setup are FM Radio receivers and a field strength meter. A calibrated dipole antenna is used to receive the signal whereas for subjective assessment of the received signal was performed by using professional radio receiver “Sangean”, commercial radio receiver & a Cell/mobile phone FM radio receiver. A 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, the urban measuring locations are usually randomly selected by using reference to a town map, the density of measurements nevertheless being varied according to the population distribution. At each measuring location, a single sample value of field strength may be obtained or alternatively, cluster of some four or five point measurements may be made at point separated by only a few meters, and the estimated mean of these four or five values recorded as the “sample location” measurement. It is often found that there is substantial correlation between field strength measurement separated by only a few meters but much greater variation between those widely separated e.g. over different areas of a town. Instead of cluster measurement, 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 field strength survey van while the antenna is fully erected.

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. While taking static reception measurement LAT/LONG, MSL & radial distance of each & every location was also recorded. 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. Due care has been taken to record the field strength data at an open location. After data collection is over the FSM data are tabulated & interpreted on the basis of the findings. The quality of received audio was also analyzed using the professional/commercial/mobile phone FM radio 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.

FM Broadcast Signal Propagation:

FM 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. 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, etc.) and the man-made environment. The received signal must be considered as the vector sum of the desired 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.

Broadcast Service Area:

The objective of broadcasting is to provide quality reception free from interference & noise in a commercial domestic receiver, either fixed or mobile., to cover as much population and area of the country as possible, The 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 standard, cheap domestic receivers. Also to ensure interference free reception of the wanted transmitter, a protection ratio (Minimum ratio of the wanted field strength to the unwanted field strength) should be maintained to prevent co-channel interferences from other transmitters which are allocated the same channel frequency. In case of FM transmission the co-channel protection ratio is 40 dB. Field strength measurements provide an efficient but definitive method of assessing station coverage. Following table illustrates the minimum field strength value require for satisfactory reception of FM broadcast signal under different terrain conditions are

Types of Terrain	Mono Transmission Mode	Stereophonic Transmission Mode
Urban	70 dB μ V/m	74 dB μ V/m
Sub Urban	60 dB μ V/m	66 dB μ V/m
Rural	48 dB μ V/m	54 dB μ V/m

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 10 Mtrs telescopic mast was expanded upto 10 Mtrs from the ground level keeping the dipole antenna first horizontally & then vertically as the polarization of the radiated beam is circularly 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 for horizontal & vertical position of the receiving antenna are thus recorded. In addition to this the terrain details of each & every spot/location was also recorded along with the subjective assessment of the received audio quality on the basis of listening on professional/commercial/mobile phone FM radio receivers. 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 quality on radio receiver is graded as E-Excellent, VG-Very Good, G-Good, F-Fair & P-Poor. Furthermore 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 (audio) reception quality with distance. In this report the received field strength & subjective assessment data collected along eight radials are tabulated accordingly in Table No. (1-8). In addition to this the radial distances corresponding to field strength value (equivalent to 54dB μ V/m) along all eight radials are recorded & 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 primary coverage (54dB μ V/m) was drawn on map as shown in Annexure-II. Effort are also made to explore the radial distances up to which satisfactory reception on Professional, commercial & mobile phone FM radio receivers can be ascertained & co-related (Table No.-10). Annexure III & Annexure IV is a graphical representation of collected field strength data (Table No.:1-9) showing variation of field strength with respect to distance. The code used for grading of the received signal is illustrated as follows.

Signal	NT	Terrible signal. Barely detectable.
	P	Poor signal. Voices audible and sometimes understood. Most musical notes audible.
	F	Fair signal. Voices plainly audible and easily understood. Music plainly audible although lacking clarity.
	G	Good Signal ,Clearly audible with extended antenna
	VG	Very Good signal. Everything's plainly audible needs direction with just a little less than the best quality.
	E	Excellent signal. As strong as it gets.

Interpretation of the collected data along radials:

In this report efforts are being made for the interpretation & analysis of the collected FSM data in two following ways.

A) On the Basis of Quantitative Analysis(Field Strength Measurement):

1. **Radial-1(North)**: Route: Tivoli Resort- Kundli-Muruthal-Smalkha- DPS Panipat was followed. Along this radial required field strength value for satisfactory reception was observed to be at a radial distance of 60 **kM**. (Vilaspur (Smalkha).
2. **Radial-2(East)**: Route: YamunaVihar- Raj Nagar Bypass-Dasana-Pilkhuwa-Hapur was followed. Along this radial required field strength value for satisfactory reception was observed to be at a radial distance of 60 **kM** (Near Hapur NH-24).
3. **Radial-3(West)**: Route: Rohni- Bahadurgarh-Beri-CharkhiDadri Road-Eklauta (Bhiwani) was followed. Along this radial required field strength value for satisfactory reception was observed to be at a radial distance of 60 **kM** (Beri-Chrkhi dadri Road)
4. **Radial-4(South)**: Route: Kirtinagar- Vasant Kunj-Gurgaon-Alipur (Sohana) was followed. Along this radial required field strength value for satisfactory reception was observed to be at a radial distance of 45 **kM** (Alipur-Sohna Road, near Sohna)
5. **Radial-5(NE)**: Route: Ibrahimpur (Pushta) - Dhikauli-Blaine-Upper Ganga canal, Upper Ganga canal road was followed. Along this radial required field strength value for satisfactory reception was observed to be at a radial distance of 60 **kM** (Upper Ganga Canal Road)
6. **Radial-6(SE)**: Route: NDMC Palika Kendra- Apollo Hospital-Noida-Greater Noida Express Highway-Jewar was followed. Along this radial required field strength value for satisfactory reception was observed to be at a radial distance of 70 **kM**. (Chachura Village Jewar –Bulandshar Road)
7. **Radial-7(NW)**: Route: Aauchandi-Sisana-Kharkhauda-Gohana-Zind-Gohana Road was followed. Along this radial required field strength value for satisfactory reception was observed to be at a radial distance of 50 **kM** (Kharkhauda-Gohana Road)
8. **Radial-8(SW)**: Route: Vikaspuri- Kapuskhera Border-Ptaudi-Kakodia (Ptaudi-Rewari Road) was followed. Along this radial required field strength value for satisfactory reception was observed to be at a radial distance of 65 **kM**. (Pataudi-Rewari Road).

B) On the Basis of Qualitative Analysis (Subjective Assessment):

On the basis of Audio Quality listening on three different radio receivers namely Professional, Commercial & Mobile phone FM receiver following conclusion has been drawn-

1. The listening quality on professional & commercial radio receivers is evaluated to be satisfactory up to a distance more than 60 kM with minimum field strength 45-50 dB μ V/m except along South radial where it was up to 45 kM only.
2. Whereas in case of mobile phone FM radio receiver it is largely depends upon the terrain condition. On the basis of listening with a good quality overhead ear phone the audio quality was found to be satisfactory up to a distance of 50-60 kM with minimum field strength value 50-55 dB μ V/m.

Conclusion:

On the basis of received field strength values at the spot/location along eight radials & coverage contour(Annexure-II) drawn on the basis of table prepared/compiled for primary coverage of 54 dB μ V/m following conclusions can be stipulated.

1. The coverage along North, East, West & North-East direction is up to a radial distance of 60 kM. In South direction coverage is up to 45 kM whereas along South-East & South-West direction it is up to a radial distance of 65 kM.
2. The coverage along South direction is the least .This shrinkage in coverage might be due to the existence of huge densely populated urban area having skyscrapers & high rise buildings causing clutter losses (Building Penetration Losses).
3. The reception/coverage for the mobile phone FM radio receivers are restricted to 50-60 kM where field strength value is strong enough (more than 50 dB μ V/m) to demodulate the signal where as for professional & commercial receivers the coverage is observed to be more than 60 kM depending upon terrain condition.
4. No capture effect was observed over FM (Vividh Bharti) frequency 100.1 MHz except in North-West direction beyond 70kM where capture effect of AIR FM (100.2 MHz), Patiala (Haryana) was noticed.

Scope for further Study:

The purpose of this field trial is to determine the coverage contours of 54dB μ V/m & to access the areas for satisfactory reception of the signal on different types of radio receivers. Comprehensive building penetration loss (BPL) in different types of building & reception in densely populated locations falling within the coverage contour is recommended for further propagation study under different terrain 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 of the shift duty staff of FM (Vividh Bharti), Pitampura. The survey team expresses their deepest sense of gratitude to Mrs. Anuradha Aggrawal (ADG) & Sh. Deepak Kumar (DDG) whose motivation, suggestions & cooperation at every step helped in the successful completion of the survey.



High Power TV Transmitting Tower having transmitting antenna of FM (Vividh Bharti (100.1 MHz))

TV Tower ,Pitampura,New Delhi



Location Map (3D View) of TV Tower Pitampura, Delhi

Reception Survey of 10kW FM (Vividh Bharti) AIR Transmitter located at Pitampura, New Delhi

Radial-1

Table-1

Route: Kirtinagar- Vasant Kunj-Gurgaon-Alipur (Sohana)

Direction: South

Date: 18/11/2015

Sr.No	Spot/Location	MSL (Mtrs)	Radial Distance (km)	Field Strength dB μ V/m			Subjective Assessment			Terrain Condition	Remark
				H	V	Mean	Professional Radio Receiver	Commercial Radio Receiver	Mobile Phone Radio Receiver		
1	Kirti Nagar	218	5	88.2	85.2	86.7	E	E	E	Urban, Heavy Traffic, Vegetation	
2	Near Brar Square Rly Stn	221	10	71.2	69.4	70.3	E	E	E	Urban, Moderate Traffic, Vegetation	Metro Rail Site
3	Vasant Vihar(DPS School)	248	15	73.8	74.6	74.2	E	E	E	Urban, Moderate Traffic, Vegetation	
4	Vasant Kunj	256	20	71.0	69.7	70.4	E	E	E	Urban, Vegetation, Low Traffic	
5	Gadaipur Farm(Jonapur)	245	25	60.2	59.8	60.0	E	E	VG	Rural, Vegetation, Low Traffic	
6	Gurgaon-Faridabad Road	237	30	60.2	53.8	57.0	E	E	VG	Rural, Vegetation, Low Traffic	
7	Badshahpur(Gurgaon- Badshahpur Road)	218	35	42.1	49.6	45.9	VG	G	P	Suburban, Heavy traffic	
8	Gurgaon- Badshahpur Road	212	40	56.4	56.6	56.5	E	VG	G	Rural, Vegetation, Low Traffic	
9	Alipur-Sohana Road (Near Sohana)	200	45	53.6	54.9	54.3	E	VG	F	Suburban, Heavy traffic	

Reception Survey of 10kW FM (Vividh Bharti) AIR Transmitter located at Pitampura, New Delhi

Radial-2

Table-2

Route: Yamuna Vihar- Raj Nagar Bypass-Dasana-Pilkhuwa-Hapur

Direction: East

Date: 19/11/2015

Sr.No	Spot/Location	MSL (Mtrs)	Radial Distance (km)	Field Strength dB μ V/m			Subjective Assessment			Terrain Condition	Remark
				H	V	Mean	Professional Radio Receiver	Commercial Radio Receiver	Mobile Phone Radio Receiver		
1	Yamuna Vihar Pushta Pushta road	192	10	86.4	84.6	85.5	E	E	E	Urban, Heavy Traffic,	
2	Mangal Pandey Marg Mondoli Extention	196	15	82.6	82.2	82.4	E	E	E	Urban, Heavy Traffic,	Metro Rail Site
3	Near Hindon Airport	202	20	77.2	77.7	77.5	E	E	E	Urban, Heavy Traffic	
4	Raj Nagar Bypass(NH-58) Ghaziabad	205	25	66.8	64.6	65.7	E	E	E	Urban, Heavy Traffic	
5	Kamla Nehru Nagar(NH-24) Near ITO, Hapur Road	211	30	62.3	59.6	61.0	E	E	VG	Urban, Heavy Traffic vegetation	
6	Dasana(NH-24)	212	35	56.8	54.7	55.8	E	VG	VG	Urban, Heavy Traffic vegetation	
7	Bankey Bihari Dental Dasana	212	40	53.9	55.7	54.8	E	VG	VG	Urban, Heavy Traffic vegetation	
8	Dasana Hapur Road	209	45	59.3	59.2	59.3	E	VG	VG	Urban, Heavy Traffic vegetation	
9	Pilkhuwa Hapur	208	50	48.4	48.9	48.7	VG	VG	G	Urban, Heavy Traffic vegetation	
10	Nizampur(NH-24)	207	55	57.8	57.6	57.7	E	E	VG	Urban, Heavy Traffic vegetation	
11	Near Hapur(NH-24)	208	60	53.6	55.7	54.9	E	VG	G	Rural, Heavy Traffic	
12	Hapur	204	65	46.6	46.3	46.5	VG	G	G/F	Urban, Heavy Traffic vegetation	

Reception Survey of 10kW FM (Vividh Bharti) AIR Transmitter located at Pitampura, New Delhi

Radial-3

Table-3

Route: Auchandi- Sisana-Kharkhauda-Gohana-Zind-Gohana Road

Direction: North-West

Date: 20/11/2015

Sr.No	Spot/Location	MSL (Mtrs)	Radial Distance (km)	Field Strength dB μ V/m			Subjective Assessment			Terrain Condition	Remark
				H	V	Mean	Professional Radio Receiver	Commercial Radio Receiver	Mobile Phone Radio Receiver		
1	Khera Khurd Road	209	10	89.9	88.5	89.2	E	E	E	Rural, Low Traffic, Vegetation	
2	Aauchandi	211	20	79.4	80.8	80.1	E	E	E	Rural, Low Traffic, Vegetation	
3	Kharkhauda	217	30	58.2	63.8	61.0	E	E	E	Urban, Low Traffic, Vegetation	
4	Sisana	215	35	64.8	67.7	66.6	E	E	E	Rural, Low Traffic, Vegetation	
5	Ridhau	214	45	63.8	65.5	64.7	E	E	VG	Rural, Low Traffic, Vegetation	
6	Kharkhauda-Gohana Road	214	50	53.7	55.4	54.6	E	VG	G	Rural, Low Traffic, Vegetation	
7	Kharkhauda-Gohana Road	216	60	42.7	49.3	46.0	G	G	F	Rural, Low Traffic, Vegetation	
8	Gohana	215	65	42.2	44.6	43.4	G	F	P	Urban, Vegetation, Low Tra	
9	Zind-Gohana Road	216	70	38.3	40.1	39.2	-	-	-	Rural, Low Traffic, Vegetation	100.2 Mhz FM(AIR) Patiala received(Capture)

Reception Survey of 10kW FM (Vividh Bharti) AIR Transmitter located at Pitampura, New Delhi

Radial-4

Table-4

Route: NDMC Palika Kendra- Apollo Hospital-Noida-Greater Noida Express Highway-Jewar

Direction: South-East

Date: 23/11/2015

Sr.No	Spot/Location	MSL (Mtrs)	Radial Distance (km)	Field Strength dB μ V/m			Subjective Assessment			Terrain Condition	Remark
				H	V	Mean	Professional Radio Receiver	Commercial Radio Receiver	Mobile Phone Radio Receiver		
1	NDMC Palika Kendra Parliament street	206	10	76.7	69.5	73.1	E	E	E	Urban, Heavy Traffic,	
2	Apollo Hospital(Jasola Metro Station)	211	20	70.2	69.4	69.8	E	E	E	Suburban, Heavy Traffic,	
3	Noida-Greater Noida Express Highway	198	30	64.9	66.7	65.8	E	E	E	Suburban, Heavy Traffic,	
4	Noida Sector 140 Express highway	195	35	61.2	62.8	62.0	E	VG	VG	Suburban, Heavy Traffic, Vegetation	
5	Express Highway Noida	191	41	58.8	61.5	60.2	E	VG	VG	Rural, Heavy Traffic, Vegetation	
6	Greater Noida B1,Block B	186	45	58.4	60.5	59.5	E	VG	VG	Suburban, Moderate Traffic, Vegetation	
7	Kasana Road Greater Noida	187	50	53.8	58.6	56.2	E	VG	G	Rural, Low Traffic, Vegetation	
8	Panchaytan Suraj-Kasana Road	191	55	52.8	55.6	54.2	VG	VG	G	Rural, , Low Traffic Vegetation	
9	Sadakpur-Jever Road Sadakpur	193	60	60.2	61.8	61.0	E	VG	VG	Rural, Low Traffic, Vegetation	
10	Jewar Road	191	65	41.4	44.2	42.8	VG	G	G	Rural, Low Traffic, Vegetation	
11	Jewar –Bulandsahar Road	186	70	52.8	54.2	53.8	VG	G	F	Rural, Low Traffic, Vegetation	

Reception Survey of 10kW FM (Vividh Bharti) AIR Transmitter located at Pitampura, New Delhi

Radial-5

Table-5

Route: Vikaspuri- Kapuskhera Border-Pataudi-Kakodia (Pataudi-Rewari Road)

Direction: South-West

Date: 30/11/2015

Sr.No	Spot/Location	MSL (Mtrs)	Radial Distance (km)	Field Strength dB μ V/m			Subjective Assessment			Terrain Condition	Remark
				H	V	Mean	Professional Radio Receiver	Commercial Radio Receiver	Mobile Phone Radio Receiver		
1	Vikaspuri	219	10	75.7	77.1	76.4	E	E	E	Urban, Moderate traffic, Vegetation	
2	Kapuskhera Border	224	20	68.6	72.4	70.5	E	E	E	Urban, Heavy traffic,	
3	Kapuskhera Border Road	202	30	65.2	66.2	65.7	E	E	E	Urban, Heavy traffic	
4	Pharukh Nagar	210	40	70.7	72.6	71.7	E	E	E	Rural, Low Traffic, Vegetation	
5	Ptaudi	221	55	57.4	60.6	59.0	E	VG	VG	Rural, Low Traffic, Vegetation	
6	Pataudi-Rewari Road	224	65	53.4	55.7	54.6	E	VG	VG	Rural, Low Traffic, Vegetation	
7	Kakodia Pataudi-Rewari Road	227	70	44.2	44.6	44.4	VG	VG	P	Rural, Low Traffic, Vegetation	

Reception Survey of 10kW FM (Vividh Bharti) AIR Transmitter located at Pitampura, New Delhi

Radial-6

Table-6

Route: Rohni- Bahadurgarh-Beri-CharkhiDadri Road-Eklauta (Bhiwani)

Direction: West

Date: 01/12/2015

Sr.No	Spot/Location	MSL (Mtrs)	Radial Distance (km)	Field Strength dB μ V/m			Subjective Assessment			Terrain Condition	Remark
				H	V	Mean	Professional Radio Receiver	Commercial Radio Receiver	Mobile Phone Radio Receiver		
1	Rohni (Sector-2&3)	201	5	77.2	73.4	75.3	E	E	E	Urban, Moderate traffic,	
2	Bahadurgarh	197	20	75.8	72.4	74.1	E	E	E	Suburban, Moderate traffic, Metro Flyover	
3	Chara(Haryana)	201	40	69.4	66.4	67.9	E	E	E	Rural, Low traffic Vegetation	
4	Near Dojhara	202	50	63.4	60.8	62.1	E	E	VG	Rural, Low Traffic, Vegetation	
5	Beri-Charkhi Dadri Road	202	60	55.2	53.7	54.5	E	VG	G	Rural, Low Traffic, Vegetation	
6	Godhari(Jorasingh Akhara) Beri-Charkhi Dadri Road	205	65	48.4	47.2	47.8	VG	G	F/P	Rural, Low Traffic, Vegetation	
7	Eklauta,Bhiwani	203	70	45.7	43.2	44.5	VG	G	P	Rural, Low Traffic, Vegetation	

Reception Survey of 10kW FM (Vividh Bharti) AIR Transmitter located at Pitampura, New Delhi

Radial-7

Table-7

Route: Ibrahimpur (Pusta) - Dhikauli-Blaine-Upper Ganga canal, Upper Ganga canal road

Direction: North-East

Date: 01/12/2015

Sr.No	Spot/Location	MSL (Mtrs)	Radial Distance (km)	Field Strength dB μ V/m			Subjective Assessment			Terrain Condition	Remark
				H	V	Mean	Professional Radio Receiver	Commercial Radio Receiver	Mobile Phone Radio Receiver		
1	Ibrahimpur(Pusta) Bagpat Road	200	10	96.4	99.5	98.0	E	E	E	Rural, Low traffic, Vegetation	
2	Mundola Bagpat Road	198	20	81.9	82.4	82.2	E	E	E	Rural, Low traffic, Vegetation	
3	Dhikauli Pilani-Bagpat Road	200	30	70.4	71.6	71.0	E	E	E	Rural, Low traffic Vegetation	
4	Blaine Bagpat-Merrut Road	211	40	68.6	65.6	67.1	E	E	E	Rural, Low Traffic, Vegetation	
5	Upper Ganga Canal	217	50	59.4	61.4	60.4	E	E	VG	Rural, Low Traffic, Vegetation	
6	Upper Ganga Canal Road	213	60	54.8	55.3	55.0	E	E	VG	Rural, Low Traffic, Vegetation	
7	Upper Ganga Canal Road	212	70	46.2	45.1	45.7	VG	G	F	Rural, Low Traffic, Vegetation	

Reception Survey of 10kW FM (Vividh Bharti) AIR Transmitter located at Pitampura, New Delhi

Radial-8

Table-8

Route: Tivoli Resort- Kundli-Muruthal-Smalkha- DPS Panipat

Direction: North

Date: 03/12/2015

Sr.No	Spot/Location	MSL (Mtrs)	Radial Distance (km)	Field Strength dB μ V/m			Subjective Assessment			Terrain Condition	Remark
				H	V	Mean	Professional Radio Receiver	Commercial Radio Receiver	Mobile Phone Radio Receiver		
1	New Tivoli Resort	204	10	93.8	94.3	94.1	E	E	E	Urban, Heavy traffic, Vegetation	
2	Kundli	191	20	66.8	67.7	67.3	E	E	E	Urban, Heavy traffic, Vegetation	
3	Near Sonipat(NH_)	203	30	70.4	71.6	71.0	E	E	E	Urban, Heavy traffic, Vegetation	
4	Near Muruthal	204	40	51.3	54.2	52.8	E	VG	G	Rural, Vegetation	
5	Gannour	215	50	62.9	61.5	62.2	E	E	VG	Rural, Low Traffic, Vegetation	
6	Vilaspur(Smalkha)	216	60	53.5	55.6	54.6	VG	VG	P	Rural, Low Traffic, Vegetation	
7	Near DPS Panipat	216	65	45.7	42.4	44.1	VG	VG	NT	Suburban,, Heavy Traffic,	

Reception Survey of 10kW FM (Vividh Bharti) AIR Transmitter located at Pitampura, New Delhi

Table-9

Table for 54 dB μ V/m Coverage Contour:

Radials	Direction	Spot/Location	Latitude	Longitude	MSL	Radial Distance
1	North	Vilaspur(Smalkha)	N 29° 14' 26.2"	E 77° 07' 07.6"	216 Meter	60 kM
2	East	Near Hapur(NH-24)	N 28° 42' 20.1"	E 77° 45' 58.5"	208 Meter	60 kM
3	South	Alipur-Sohana Road (Near Sohana)	N 28° 17' 50.4"	E 77° 04' 00.6"	200 Meter	45 kM
4	West	Beri-Charkhi Dadri Road	N 28° 37' 33.6"	E 76° 32' 25.2"	202 Meter	60 kM
5	North-East	Upper Ganga Canal Road	N 29° 04' 13.8"	E 77° 35' 45.4"	213 Meter	60 kM
6	South –East	Jewer Road	N 28° 16' 26.4"	E 77° 40' 33.7"	191 Meter	70 kM
7	North-West	Kharkhauda-Gohana Road	N 29° 01' 16.6"	E 76° 47' 25.9"	214 Meter	50 kM
8	South-West	Pataudi-Rewari Road	N 28° 17' 01.3"	E 76° 40' 34.9"	224 Meter	65 kM

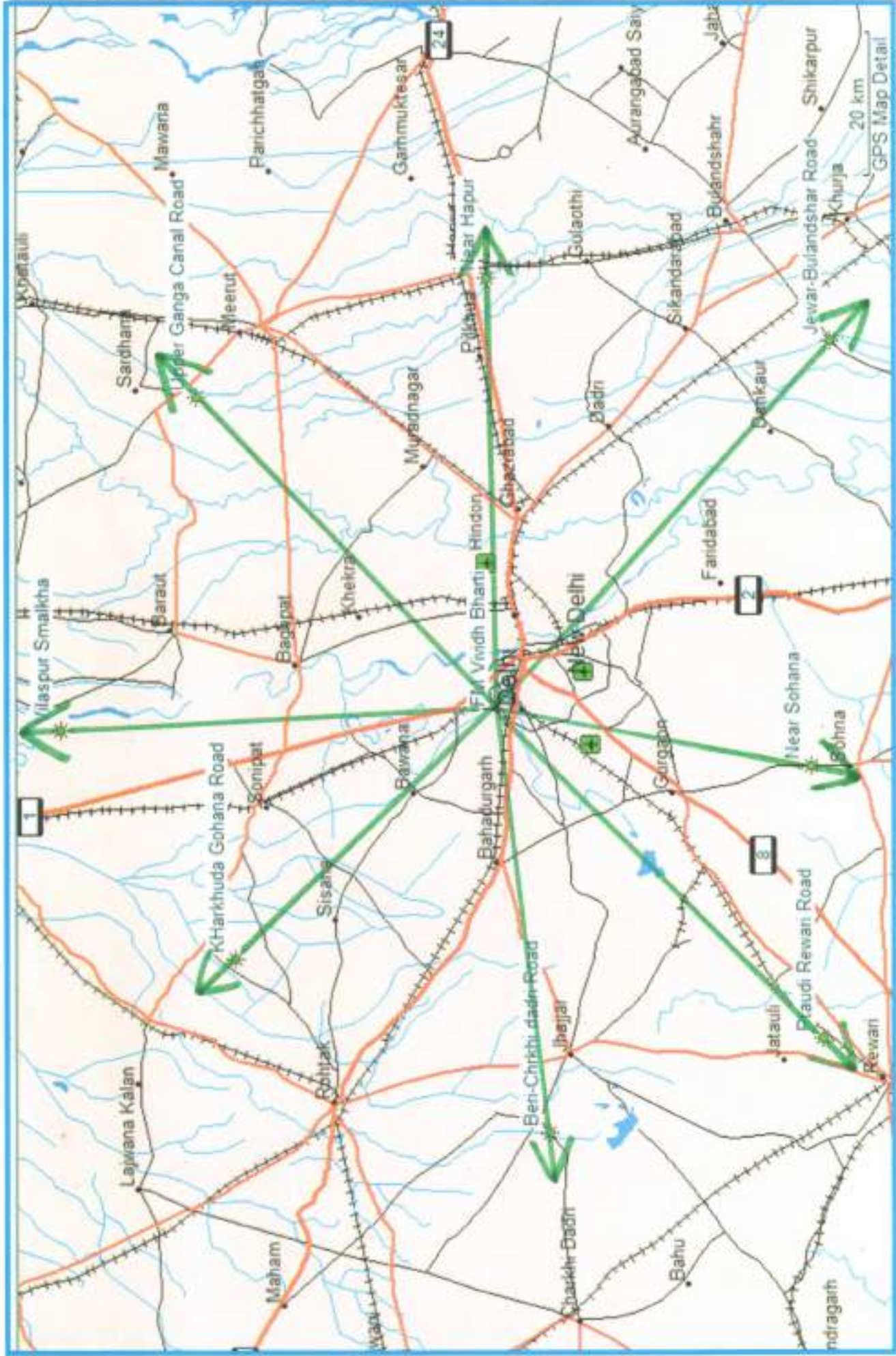
Reception Survey of 10kW FM (Vividh Bharti) AIR Transmitter located at Pitampura, New Delhi

Table-10

Reception Coverage for Various Types of Radio Receivers:

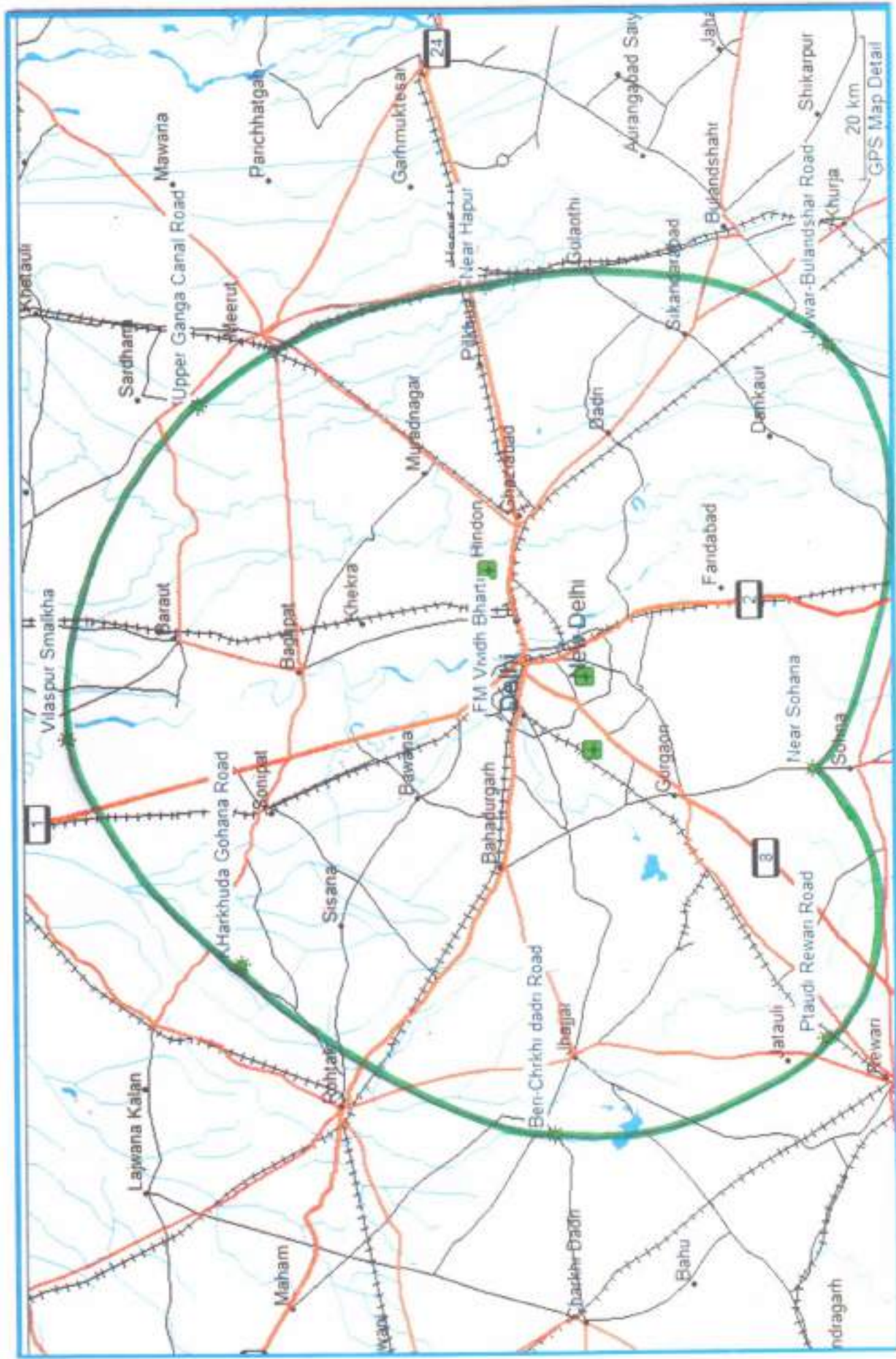
Radials	Spot/Location	Subjective Assessment(Distance for Good Listening)		
		Professional Radio Receiver	Commercial Radio Receiver	Mobile phone FM Receiver
North	Vilaspur(Smalkha)	65 kM	65 kM	50 kM
East	Near Hapur(NH-24)	70 kM	70 kM	60 kM
South	Alipur-Sohana Road (Near Sohana)	45 kM	45 kM	40 kM
West	Beri-Charkhi Dadri Road	70 kM	70 kM	60 kM
North-East	Upper Ganga Canal Road	70 kM	70 kM	60 kM
South –East	Jewer Road	70 kM	70 kM	65 kM
North-West	Kharkhauda-Gohana Road	70 kM	60 kM	50 kM
South-West	Pataudi-Rewari Road	70 kM	70 kM	65 kM

Annexure-I



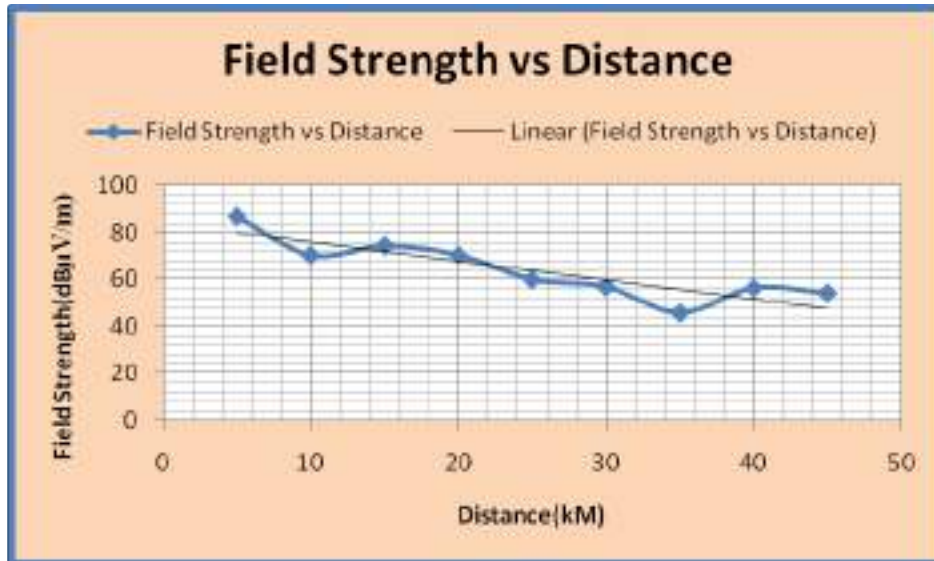
Radial Route Map originating from the Location point of Transmitting Antenna (FM Vividh Bharti)

Annexure-II

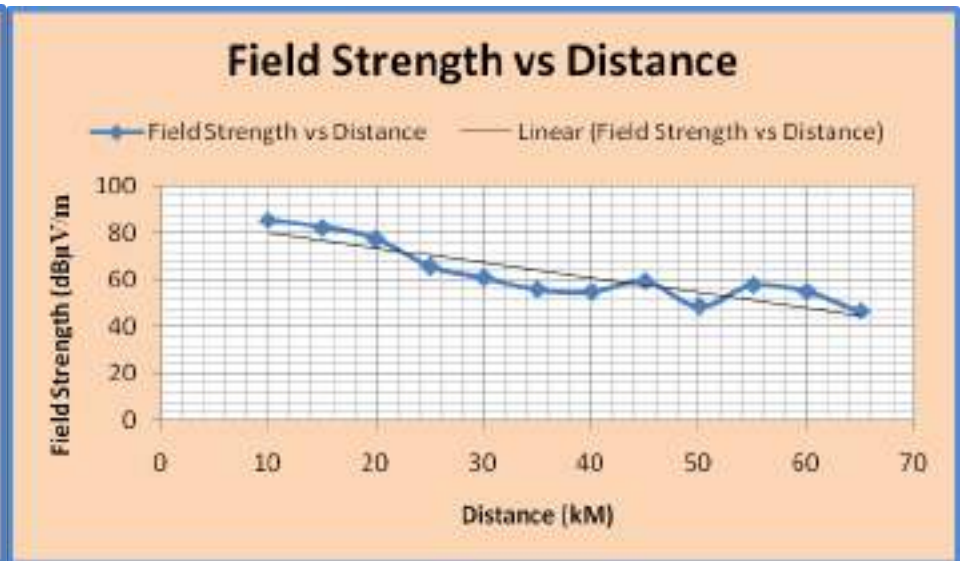


Coverage Contour Map (54dB μ V/m) of FM (100.1 MHz) Vividh Bharti Transmitter Located at Pitampura TV Tower Campus

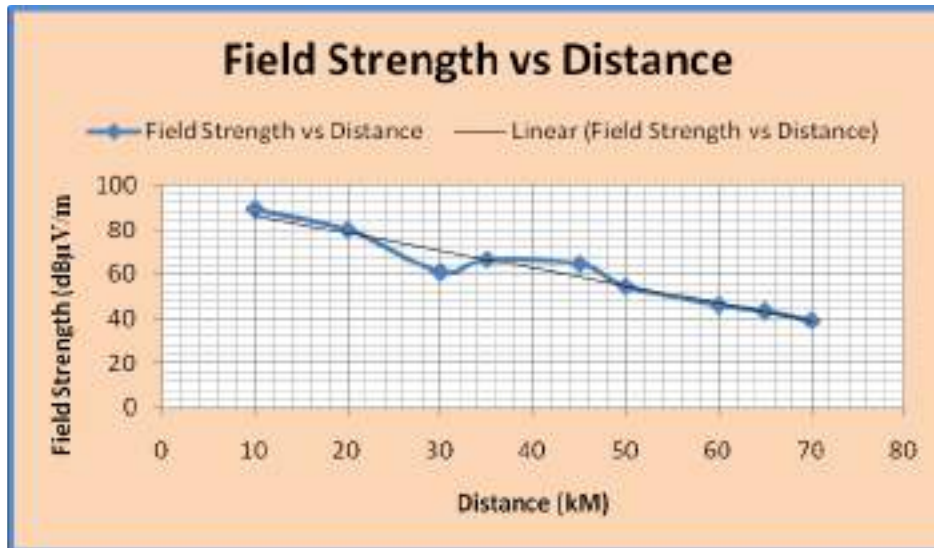
Graph showing variation of field strength with respect to distance along a radial direction



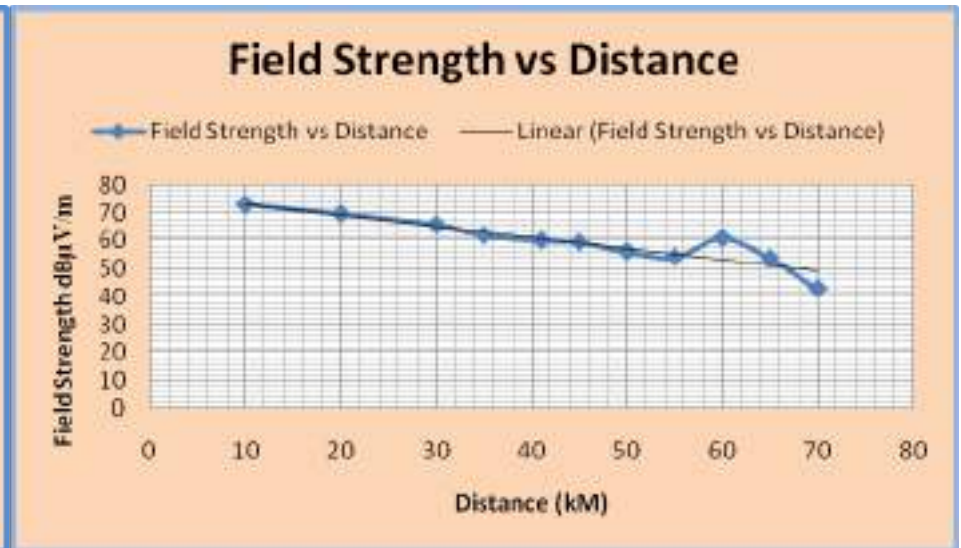
Radial-1(South Direction)



Radial-2(East Direction)

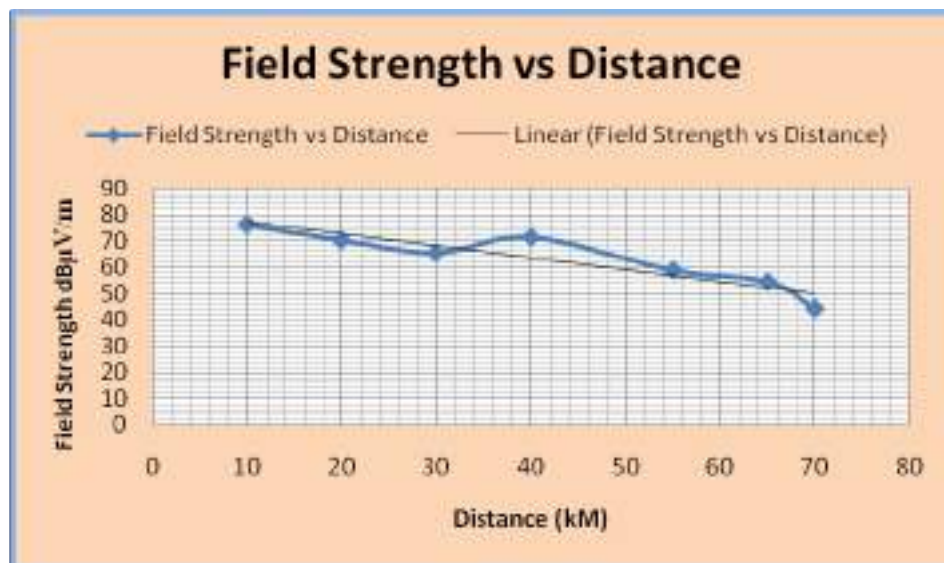


Radial-3(North-West Direction)

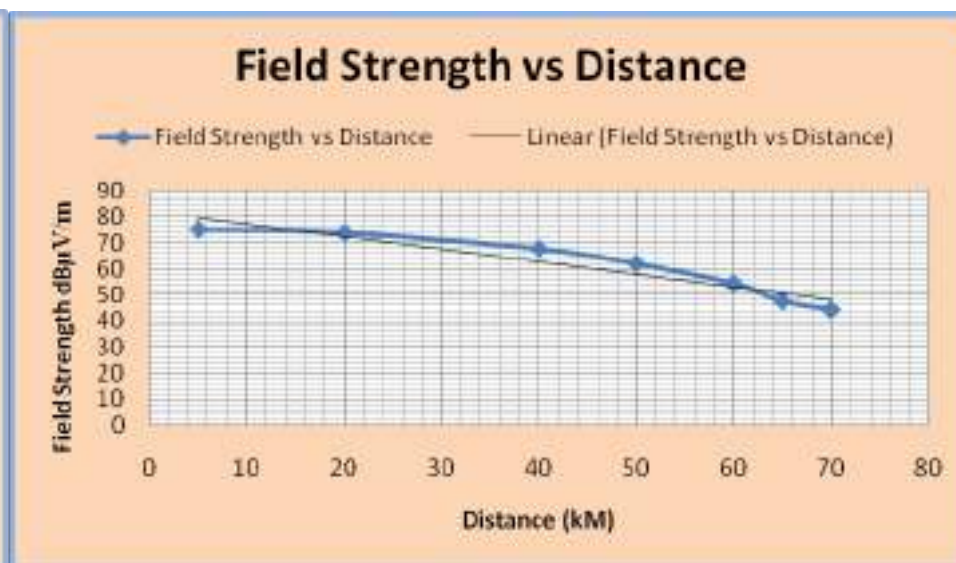


Radial-4 (South-East Direction)

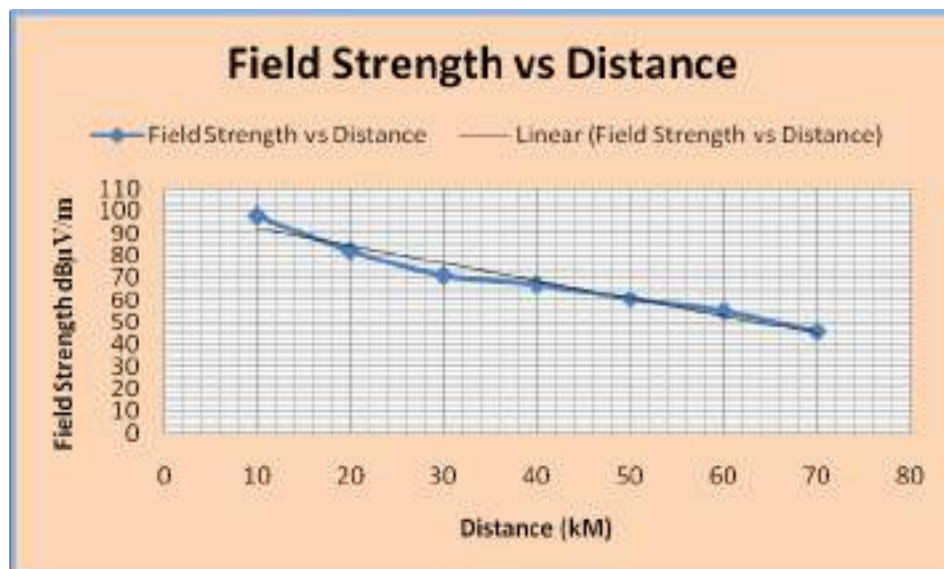
Graph showing variation of field strength with respect to distance along a radial direction



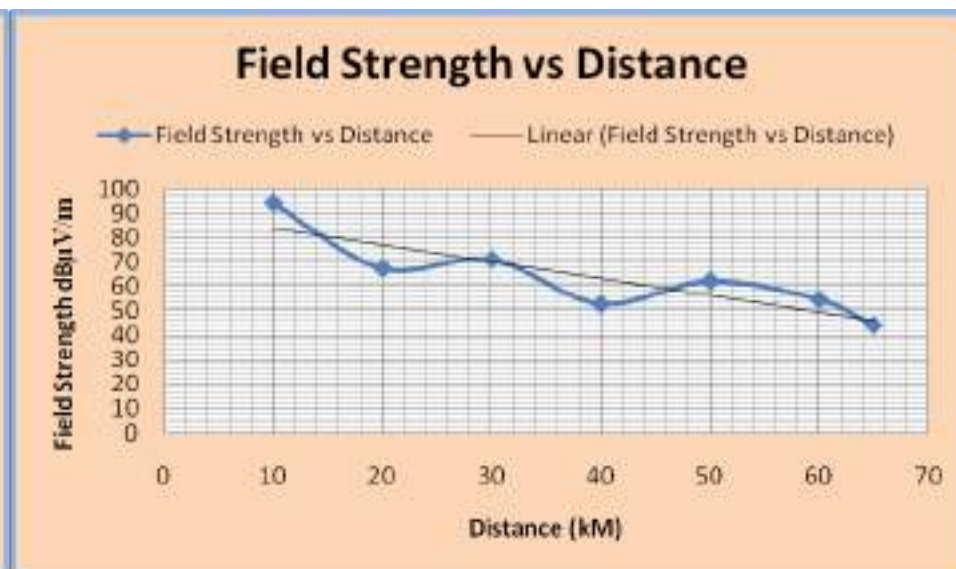
Radial-5 (South-West Direction)



Radial-6 (West Direction)



Radial-7 (North-East Direction)



Radial-8 (North Direction)