R&D ***TECHNICAL REPORT***

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AIR & DDI

Reception Survey of 100kW MW AM-DRM Transmitter at Trichy in Simulcast mode

PRASAR BHARATI

RESEARCH DEPARTMENT

ALL INDIA RADIO & DOORDARSHAN

Reception Survey of

100kW MW AM-DRM

Transmitter at Trichy

in Simulcast

Mode

(Survey Period: 8/8/17 to 15/8/17)

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O/o Additional Director General (R&D)
Research Department
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Report No. RD/2017/

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Basic Data and Transmitter details

Transmitters Details:

1.	Name of Station	:	HPT(AIR), Trichy
2.	Location of the Transmitters	:	LAT:N 10.70644° LON:E 78.53029° Ht. above MSL-114 Meter
3.	Description of terrain around the Transmitters	:	Urban with presence of vegetation
	Traffic		Moderate
4.	Classification(Large city/urban/rural)	:	Urban
5.	Rated power of the Transmitter	:	100kW
6.	Make	:	Nautel
7.	Model No.	:	NX-100
8.	Frequency of operation	:	936 kHz
9.	Date of Commissioning	:	13-9-15

:

Transmitting Antenna Details:

1.	Type of Antenna	:	Vertical mast, Omni-directional
2.	Height of Tower	:	170.68 Meter
3.	Type of Polarization	:	Vertical
4.	Feeder Impedance	:	120 ohm
5.	Height of Antenna in terms of Wavelength	:	0.534 λ
6.	Impedance of Antenna	:	88.77-j 213 ohm

1. INTRODUCTION

Digital Radio Mondiale (DRM) is one of the worldwide digital radio standards accepted by the ITU. The DRM standard has configurations (modes) suitable for frequencies up to 30 MHz and additional modes (DRM+) for frequencies up to band III. In order to migrate from analog AM transmission to digital (DRM), simulcast technology will be used for suitable migration for a few years. Later, full DRM or DRM only transmission will be on air from the vast network of AIR radio transmitters spread across India.

2. OBJECTIVES

Director General, AIR has directed the Research Department to monitor the reception of the DRM signal originating from the medium-wave transmitter (100kW) of AIR-Trichy for the purpose of obtaining coverage with the following configurations:

1. In Simulcast mode during normal transmission periods.
2. in pure DRM mode during provided hours.
3. Survey to be done using professional as well as commercial receivers.

3. EQUIPMENTS USED

- Field strength meter and tripod make: Anritsu model MS2713E with Antenna (Loop) make: Schwarzbeck model FMZB 1513.
- Professional DRM receiver
  Make: Fraunhofer
  Model: DT700
- Garmin make Montana 650, GPS
- Avion commercial receiver
- Dell Studio laptop computer
- Su-Kam sine wave inverter (1400 VA)
- Philips commercial receiver
- DRM-PC radio, Make: WIN RADIO, Model:G313e
- Active Antenna, Schwarzbeck
- Passive 1 meter length antenna
- Tools- assorted
- Mobile set

4. METHODOLOGY

AIR's medium wave transmitter is situated near Trichy (N 15.41387° E 75.04145°). The antenna is a self-supported radiating mast. The transmitter is new with R.F. analog power of 100kW. It is capable of radiating Simulcast as well as pure DRM signals. In Simulcast mode, DRM power can be set @12dB, 14dB and 16dB down of full analog power.

The geographical location of Trichy is very central in the state of Tamil Nadu, and suitable radials in eight different directions were clearly identified for the purpose of survey.

For full DRM reception route South-West on Trichy to Dindigul road has been selected. For Simulcast transmission, AIR-Directorate has set the parameters for Trichy which is as follows:

DRM frequency	(Fc+9) kHz i.e., 945 KHz
Mode	A
MSC	16 QAM
SDC	4 QAM

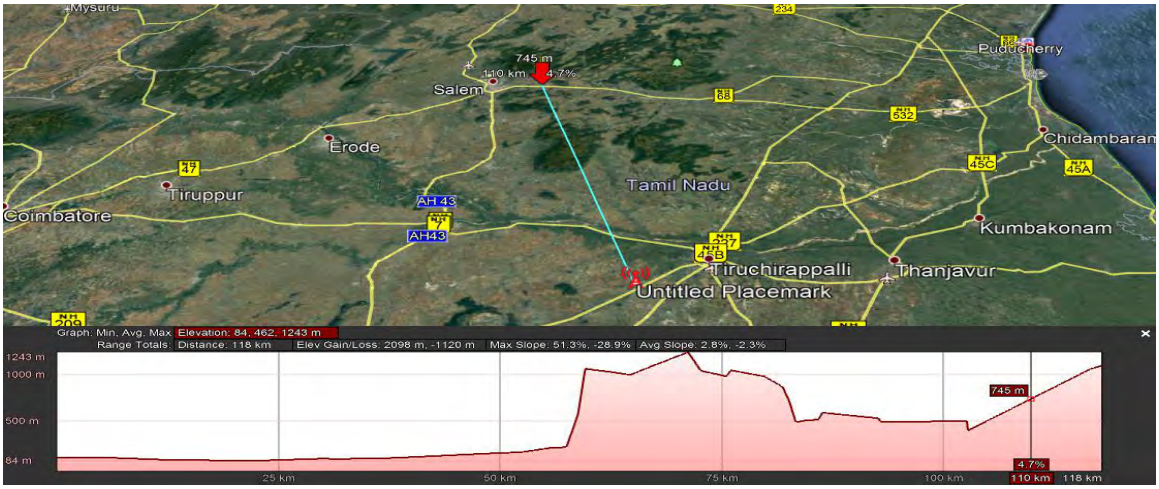
One commercial vehicle (Innova) has been equipped with all relevant equipments with one passive antenna of one meter length installed on rooftop of the vehicle. The route map is annexed as Map-X.

5. DATA ANALYSIS (SIMULCAST)

A. North- (Table-1)(Map-I)

The survey started with the GPS marking of the radiating tower of HPT Trichy. Initially we took measurements at an interval of 10 kilometers (L.O.S.) and increased it up to 20 kilometers as per requirements. The land soil in this direction is fertile and possesses good water content. As such, we expected a good range in this direction. For obtaining MER value of the received signal, a professional receiver, DT 700, was used. The same receiver was also used for checking the audio quality and other related parameters. One commercial DRM radio manufactured by AVION was also used for checking the audio quality of the digital signals.

As per the ITU guidelines, magnetic loop antenna is preferred over active Rod antenna for the purpose of obtaining field strength. Accordingly, Shwarzbeck's magnetic loop antenna was used to measure the correct field strength of the analogue signal. Two commercial portable radios were also used to check the analogue audio quality of the AM transmission. At each survey location, the corresponding GPS data was also saved for obtaining the LOS distance from the Antenna of the concerned transmitter.



Map-I

The terrain profile (Map-1) is very normal except hillock of more than 1000 meter height w.r.t nearby ground level. As medium wave signal travels over the conductive ground hence the attenuation was not much in terms of field strength.

Professional receiver DT700 worked very well in Simulcast mode and decoded the audio (Digital) of the DRM signal on 945 kHz frequency faithfully without audio drops up a distance of 80 Km.

The minimum signal requirement for Analog Medium Wave is 63 dbµV/ m as per the ITU recommendations. In this route the minimum signal level was observed near Thumbal at an aerial distance of around 110 Km.The analog audio reception on Sony's portable receiver was good whereas on commercial Philips small portable receiver, it was Fair. Bad spot also observed at LOS distance of 30 Km in DRM reception.

B. <u>North-East Direction (Table-2)(Map-II)</u>

This survey route towards North-East direction goes up to Pudduchery. The total route length was more than 200 Km. Soil conductivity was more as compared to the North route. The terrain profile in that route is very normal as compared to the earlier one.

Due to the high conductivity of soil in this route, the minimum required signal of 63

dBµV/m was available at LOS distance of 200 Km. Compared to other routes, this was the maximum.

The DRM signal received without any significant loss of audio packets up to a range of 140 Km in simulcast mode.

C. East (Table-3 & Map III)

This route goes to the Nagapattinam town of Tamil Nadu near Bay of Bengal.

Map-III

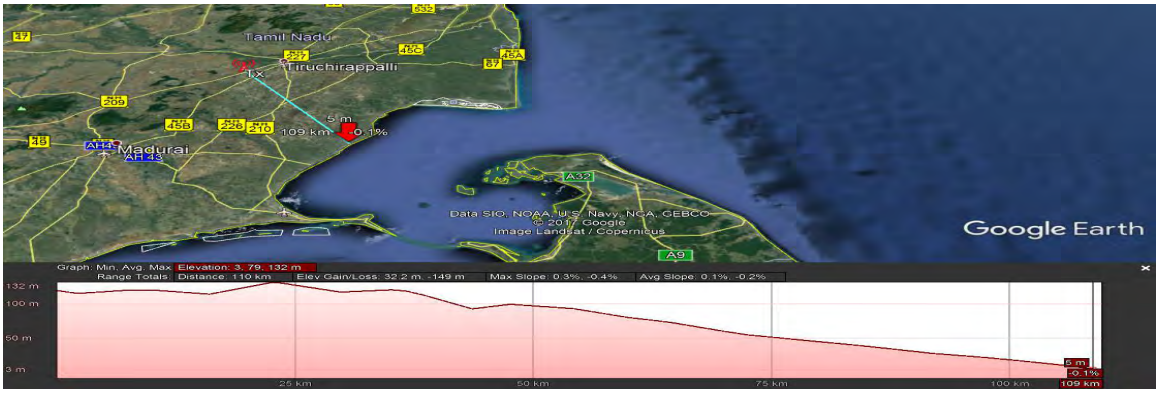
Due to the presence of sea shore in this route, we could not proceed further to check the field strength. At LOS distance of 144 Km, the field strength reading was 71 dBµV/ m. The coverage in this direction could be more if the limit of sea shore was not there.

The DRM receiver DT 700 worked well up to the LOS distance of 100 Km. Also the Avion commercial receiver in DRM mode worked well only up to the LOS distance of 40 Km with few bad spots within this covered areas.

D. South-East (Table-4 & Map IV)

This route also goes towards Bay of Bengal and the LOS distance is limited to 109 Km only. At this point the field strength of transmission on 936 KHz was 79 dBµV/ m, much higher than the minimum signal requirements. Coverage in this route is calculated on the basis of availability of motorable road.

The DRM signal worked well at the LOS distance of 109 Km (With few breaks) with no signal condition at 70 Km and 80 Km LOS distance in between the route. It may be due to the presence of high electrical noise (Man Made) as elevation profile is very normal in this direction. Additional study is required to analyze such area specific problems.



Map-IV

E. South (Table-V)(Map-V)

This route to South direction goes up to the LOS distance of 120 Km. At this point the RF level of 936 KHz AM transmission was varying between 70 and 64 dBµV/ m. Moreover due to the onset of night timings, we could not proceed further to check the reducing field strength. As such figure of 120 Km was considered for coverage in this route.

Map-V

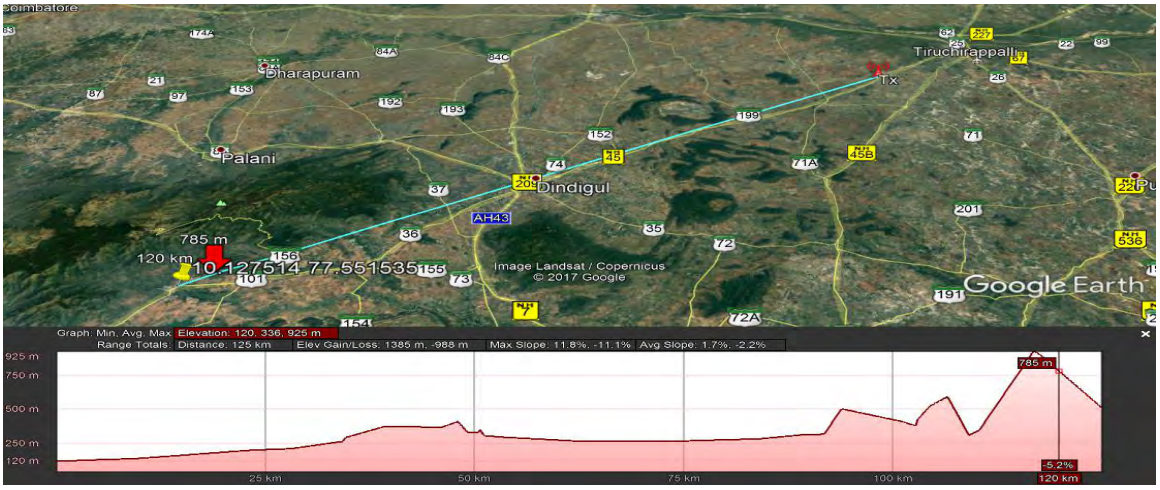
A difference of 8 dB observed in the city areas of Madurai compared to outskirts of the town.

The DRM transmission on 945 KHz (Simulcast 16 dB ↓) worked well up to the LOS distance of 80 Km. The commercial receiver worked only up to the 20 Km. The maximum MER in case of DT 700 professional receiver was 32 db at the LOS distance of 20 Km from transmitting antennas.

F. South-West (Table-VI) (Map-VI)

The terrain in this route was different from Eastern sides. Hill forest are situated

at the LOS distance of 100 Km and onwards. This type of terrain greatly reduces the coverage in all the bands of Radio transmission depending upon many related factors.

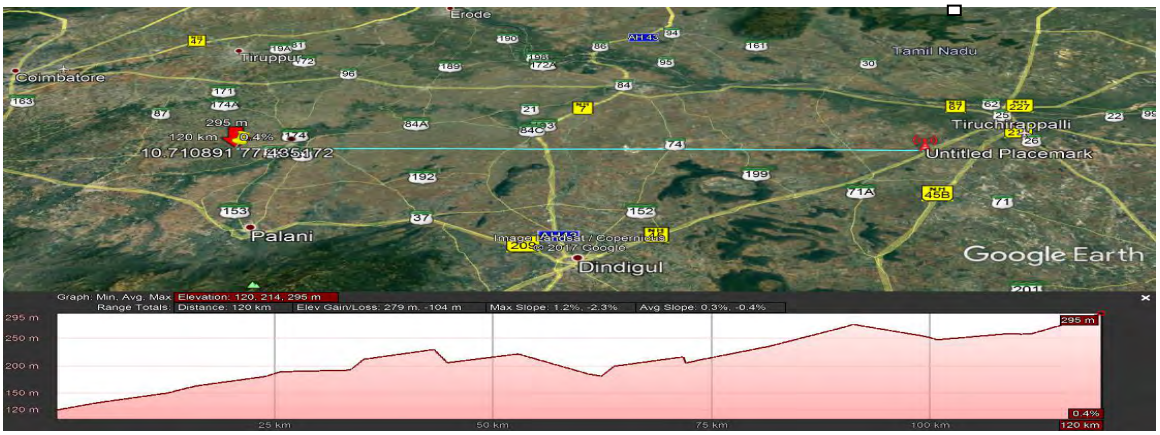


Map-VI

The terrain profile and elevation map (VI) clearly shows the same. The minimum required signal strength was observed up to the LOS distance of 125 Km. Similarly the DT 700 DRM professional receiver worked well up to the LOS distance of 60 Km.

G. West (Table-VII) (Map-VII)

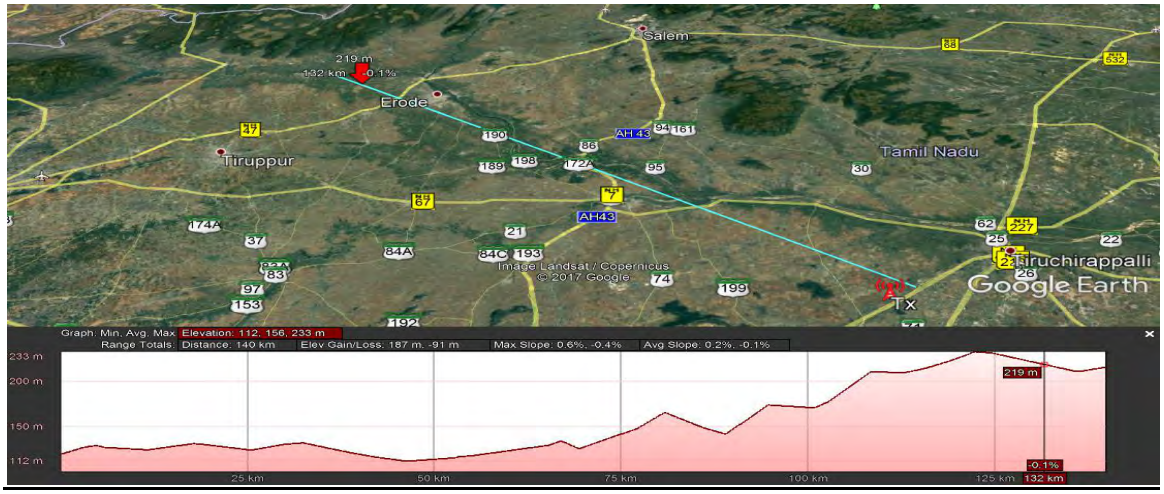
The route in the West direction goes up to the small town of Tamil Nadu, Dharapuram and further onwards at the LOS distance of 135 Km.The terrain and elevation profile is very normal except near Dharapuram. Here the ground height above msl increases mildly. The coverage range in AM transmission was up to the LOS distance



Map-VII

of 120 Km only. Similarly for DRM in Simulcast the range was 100 Km.

H. North-West (Table-VIII) (Map-VIII)



Map-VIII

This route covers some important towns of Tamil Nadu like Erode, Karur and Salem. The elevation profile clearly shows the rising land mass, which goes up to the height of 233 meters above msl from 112 meter near AIR transmitting station. The AM coverage in this route was found up to the LOS distance of 114 Km. Similarly DRM coverage in Simulcast worked well up to the LOS distance of 60 Km only. The low range in DRM transmission in this mode may be due to the high level of echo signal.

6. Data analysis Full DRM

As timings of operation in Full DRM was only for two hours, our team could not made full comprehensive coverage measurement of Full DRM transmission on 936 KHz. However we had tested the performance of Full DRM in one particular direction (South-West) and very good quality reception of digital signal was available up to the LOS distance of 127 Km. Whereas AM transmission was available up to the LOS distance of 125 Km.

The transmitter power during Full DRM transmission was 40 KW compared to 95 KW in Simulcast mode. In big towns like Trichy and Madurai the echo signal in DRM creates problem in reception in certain areas. In those areas, after a limit, the COFDM decoder is not able to correct bit errors as per requirement.

7. R.F. POWER AT 1 KILOMETRE (Table-9)

Seven locations, having a LOS distance of 1 Km from the radiating mast, were selected to ascertain the radiation pattern and the power of the transmitter. The field strength was nearly same in all the directions.

8. Conclusion

Coverage by Analogue & DRM Signal in Simulcast mode (16 dB ↓)(Map-IX)

Direction from AIR Tx Trichy	LOS Distance from Tx (KM)	
	Analogue 63dBµV/ m	**DRM** Excellent Audio on DT 700 Professional Receiver
NORTH	110	80
NORTH-EAST	200	140
EAST	144	100
SOUTH-EAST	109	109
SOUTH	120	80
SOUTH-WEST	125	60
WEST	120	100
NORTH-WEST	120	60

Coverage in Pure DRM mode

The 200 KW AM-DRM transmitter of AIR Trichy was operated in pure DRM mode with a power of 40 KW to assess the coverage in any one direction. Trichy to Dindigul route was selected for this purpose. The DRM reception was very good up to the LOS distance of 127 Km.

Acknowledgement

Completing this rigorous report would not have been possible without the support and the help extended by our colleagues of R&D and AIR Trichy.
We would also like to thank the officials of the Transmitter design section of AIR Directorate in Delhi.
We are also grateful to the Office of the ADG (E), South Zone, at Chennai for providing

logistical support to our team.
We would also like to thank the Engineering Head of AIR Trichy Smt. M Vasuki, DDG (E) and Mr. C Kandasamy, AE for extending necessary help during the survey period.

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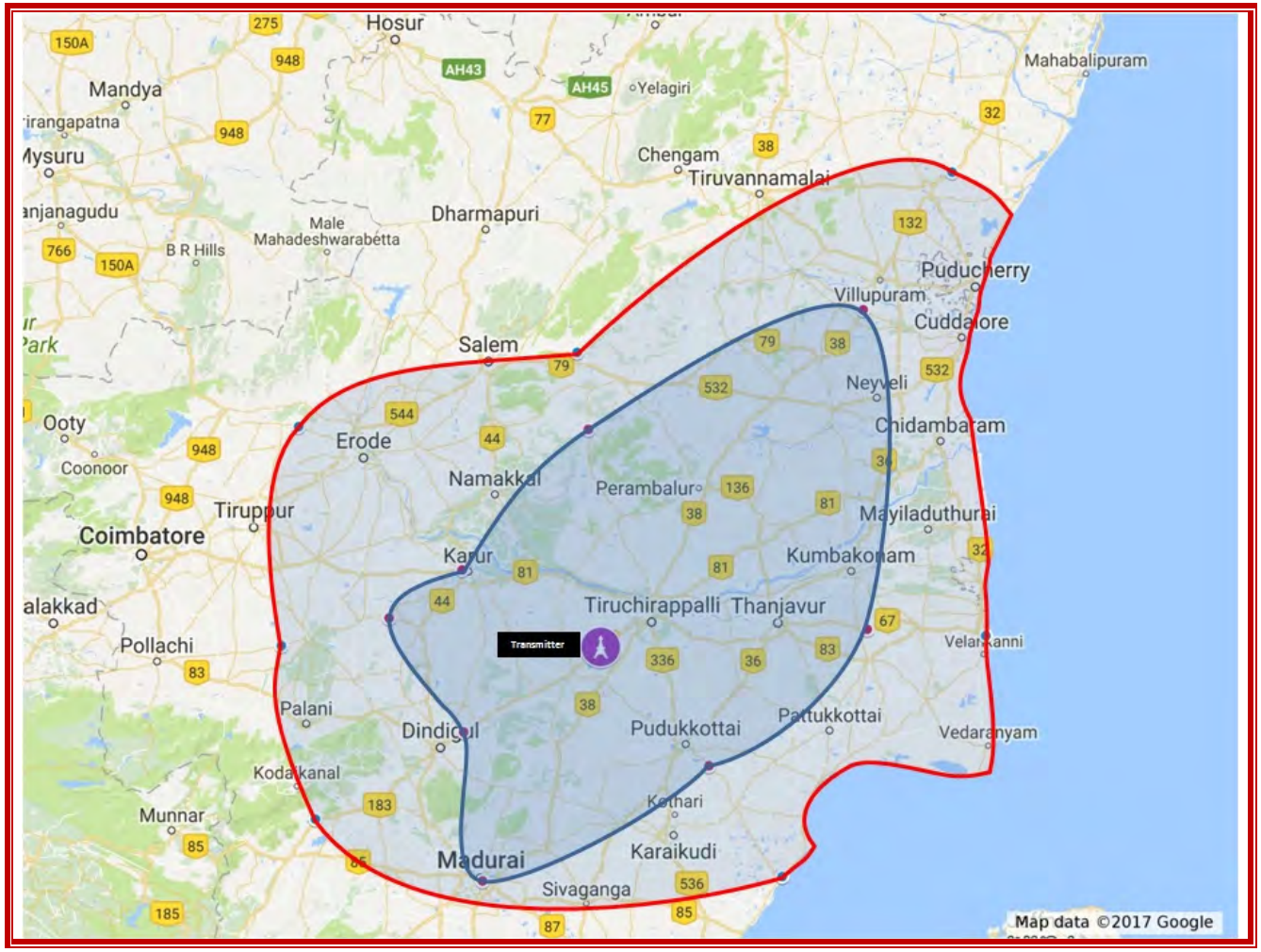
Coverage map of AIR Trichy MW Transmission in Simulcast mode

Map-IX



1. Area under Red line denotes coverage of AMreception (936 KHz) in Simulcast mode.
2. Area under Blue line denotes coverage of DRM reception (945 KHz, 16 db ↓) .

Survey Locations & Radials from Transmitting Antenna Map-X

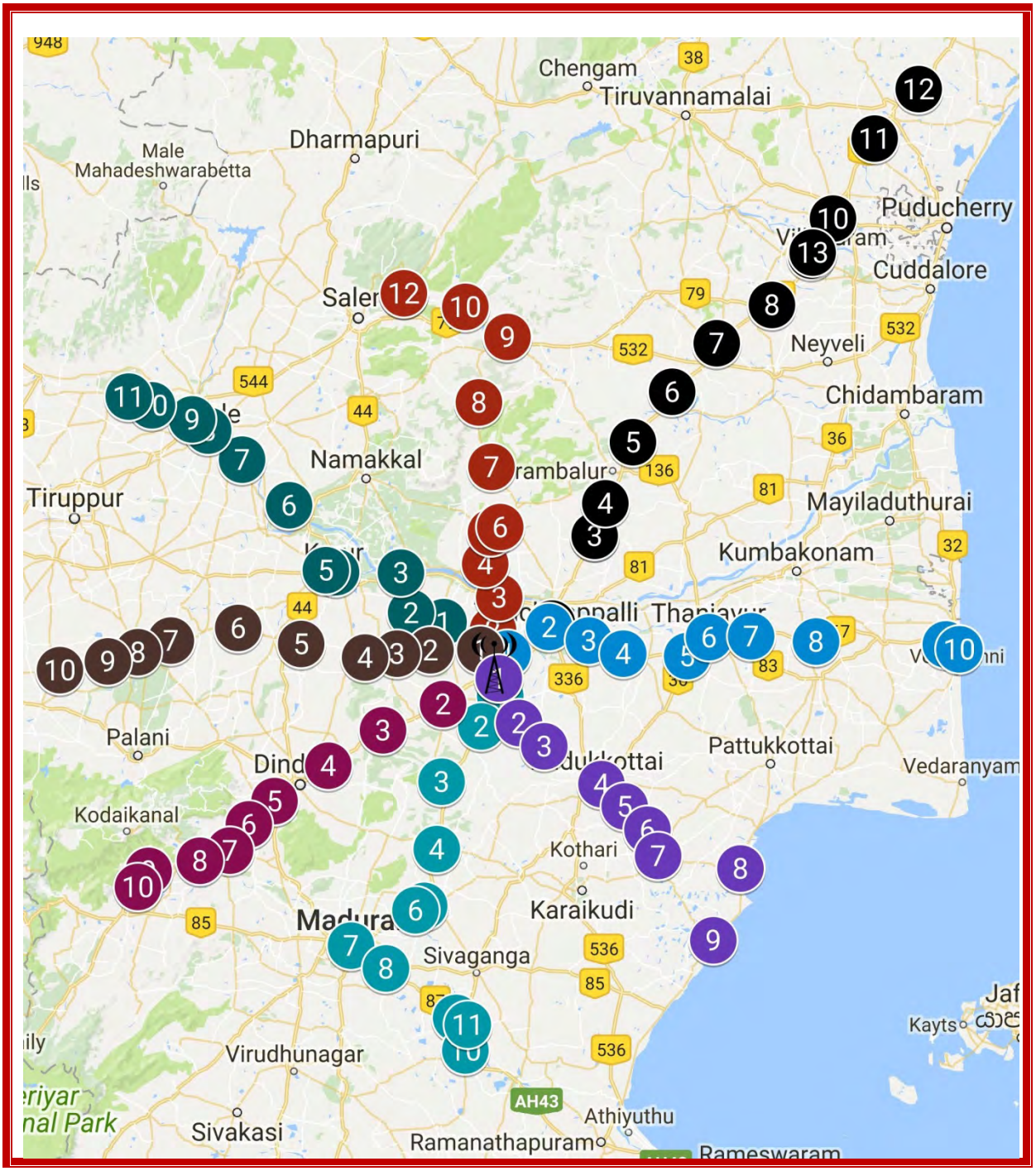


Table No.1

Reception Survey of 100kW AIR (MW), DRM Transmitter (Trichy) (936 KHz) in Simulcast transmission mode (16db↓)

Direction: North Route: TRICHY-SALEM Date: 14/08/2017

	Time	Spot/Location	Radial Distance (km)	Field Strength (dBµV/m)		MER (dB)		Subjective Quality				Terrain	Remark & SNR in dB
				Analog 936 KHz	Digital 945 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1100	RACHANDRA TRIMALA	5	117	106	32	0	OK	NT	OK	VG	VEG/LT	
2.	1125	PILLAYAR KOVIL	10	110	101	25	18	OK	OK	VG	VG	VEG/OA/LT	38
3.	1155	PERUGAMANI	20	100	91	20	0	OK	NT	VG	VG	LRB/RS/LT	38
4.	1235	MUSIRI THANDALAIPURTHUR ROAD	30	98	88	7	0	NT	NT	VG	VG	OA/LT	
5.	1300	ATTUR MUSIRI ROAD SH#161	40	94	84	23	0	OK	NT	VG	VG	VEG/LT	27
6.	1315	MARKET, TOWN KANNANUR	41.78	92	82	12	0	OK	NT	VG	VG	MKT/LRB/LT	13
7.	1435	ATTUR MUSIRI RD PELUR RESV FOREST	60	86	77	11-16	0	OK	NT	VG	VG	VEG/LT	15
8.	1505	SH#30 THAMMAMPATTI	**80**	78	69	12	0	**OK**	NT	VG	VG	VEG/LT/LRB	9
9.	1550	ATTUR	100	66	58	-	0	NT	NT	VG	G	VEG/LT/LRB	
10.	1622	THUMBAL ETHAPUR ROAD	**110**	**63**	55	-	0	NT	NT	G	F	VEG/LT/Hills	Nearby Forest Hills
11.	1730	SALEM	112	58	52	-	0	NT	NT	G	P	LRB/MT/Town	
12.	1800	SH18,PARUTHIKADU	117	65	58	-	0	NT	NT	G	P	Hill/LT/LRB/VEG	

***Terrain Legends**: 1.**LRB**-Low rise building, 2.**HRB**-High rise building, 3.**OA**-Open areas or fields 4.**NHW**-National Highways 5. **HDP**-High density population 6.**HT**-High Traffic 7.**MT**-Moderate traffic 8.**LT**-Low Traffic 9.**Veg**-Thick Vegitation 10. **MKT**-Market areas.*

Table No.2

Reception Survey of 100kW AIR (MW), DRM Transmitter (Trichy) (936 KHz) in Simulcast transmission mode (16db↓)

Direction: North East Route: Trichy-Pudduchery Date: 17/8/17

Sr. No	Time	Spot/Location	Radial Distance (km)	Field Strength (dBµV/m)		MER (dB)		Subjective Quality				Terrain	Remark SNR in dB
				Analog 936 KHz	Digital 945 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1015	TRANSMITTER RD	10	110	101	36	22	OK	OK	VG	VG	OA/NHW/MT	40
2.	1100	TRICHY MKT	21.7	102	92	25	7 to12	OK		VG	VG	MKT/CITY//HDP/HT	26
3.	1200	CHENNAI MEDICAL COLLEGE	37	92	82	17	3-4	OK	NT	VG	VG	NHW/HT/MRB	17
4.	1210	NH#38	50	90	79	24	3-4	OK	NT	VG	VG	NHW/HT/OA	25
5.	1222	NEAR ELAMBALUR	60	89	80	24	3	OK	NT	VG	VG	NHW/HT/OA	
6.	1250	NH#38	80	82	73	16	0	OK	NT	VG	VG	NHW/HT/OA	
7.	1310	KACHAKUDI NH#38	100	81	71	16	0	OK	NT	VG	VG	NHW/HT/OA	
8.	1415	NH#38	120	79	68	14	0	OK	NT	VG	VG	NHW/HT/OA	14
9.	1435	--DO--	140	76	66	11.5	0	OK	NT	VG	VG	NHW/HT/OA	10.7
10.	1500	--DO--	160	70	60	6-7	0	NT	NT	VG	G	NHW/HT/OA/VEG	4.8
11.	1524	VILIPURAM	172	71	60	-	0	NT	NT	VG	G	CITY/HDP/MRB/MT	
12.	1617	MANDAPM	180	68	59	-	0	NT	NT	VG	VG	MT/VEG/NHW	
13.	1650	NH#38	200	67	59	-	0	NT	NT	VG	G	MT/VEG/NHW	
14.	1715	--DO--	220	55	44	-	0	NT	NT			MT/VEG/NHW	

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Table No.3

Reception Survey of 100kW AIR (MW), DRM Transmitter (Trichy)(936Khz) in Simulcast transmission mode (16db↓)

Direction: East Route: TRICHY-NAGAPATTINAM Date: 12/08/2017

	Time	Spot/Location	Radial Distance (km)	Field Strength (dBµV/m)		MER (dB)		Subjective Quality				Terrain	Remark SNR in dB
				Analog 936 KHz	Digital 945 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1035	NH#83	5	118	109	28	27	OK	OK	VG	VG	OA/NHW/MT	42
2.	1115	RADIO COLONY	20	103	94	19.4	12	OK	OK	VG	VG	Radio colony HRB/ WELL/HDP	19
3.	1215	NEAR BHEL TOWNSHIP	30	102	92	24	0	OK	NT	VG	VG	NHW/HT/LRB	25
4.	1240	TRICHY-TANJORE RD	40	99	90	24	6-11 F	OK	OK/F	VG	VG	NHW/HT/Shrub	34
5.	1305	NEAR THANJAVUR	60	91	82	22	0-4	OK	NT	VG	VG	NHW/MT/Factory	24
6.	1330	RAILWAY STADIUM THANJAVUR	67	90	79	12-13	0	OK	NT	VG	VG	LRB/CITY/MKT	14
7.	1505	POONDI NH#67	80	87	78	16	0	OK	NT	VG	VG	NHW/LT/VEG	17
8.	1550	NH#67 NEAR NIDAMANGALM	100	79	70	13 15	0	OK	NT	VG	VG	NHW/VEG/LT	14
9.	1640	THIRURARUR	120	74	66	10	0	NT	NT	VG	VG	SH/VEG/MT//town	6
10.	1730	SIKKAL	140	68	59	-	0	NT	NT	VG	G	VEG/HT/Town Area	-
11.	1800	NAGAPATTINAM	144	**71**	62	-	0	NT	NT	VG	G	Sea Shore OA/Town	-

***Terrain Legends**: 1.**LRB**-Low rise building, 2.**HRB**-High rise building, 3.**OA**-Open areas or fields 4.**NHW**-National Highways 5. **HDP**-High density population 6.**HT**-High Traffic 7.**MT**-Moderate traffic 8.**LT**-Low Traffic 9.**Veg**-Thick Vegitation 10. **MKT**-Market areas.*

Table No.4

Reception Survey of 100kW AIR (MW), DRM Transmitter (Trichy)(936Khz) in Simulcast transmission mode (16db↓)

Direction: South East Route: TRICHY -PUDDUKKOTAI Date: 11/08/2017

Serial number	Time	Spot/Location	Radial Distance (km)	Field Strength (dBµV/m)		MER (dB)		Subjective Quality				Terrain	Remark
				Analog 936 KHz	Digital 945 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1100	INAMKULATHUR RD	5	118	107	35	28	OK	OK	VG	VG	OA/Shrubs/Forest Trees	
2.	1200	SH#71	20	105	95	24	0	OK	NT	VG	VG	VEG/SH/LT/LRB	SNR 36 dB
3.	1230	--DO--	30	98	88	23	0	OK	NT	VG	VG	VEG/SH/vice/LRB	
4.	1406	PUDDUKKOTAI	50	88	78	12	0	OK	NT	VG	VG	LRB /MT/CITY	
5.	1430	UDHRACHAA NAGAR	60	86	76	9 15	0	OK	NT	VG	VG	VEG/LT/LRB	Low noise area
6.	1505	SH#26	70	69	60	9	0	NT	NT	VG	VG	VEG/LT/LRB	Low noise area
7.	1530	ARANTHAGI	80	86	76	9-9	0	NT	NT	VG	VG	MT/LRB/TOWN/MKT	
8.	1635	SEA SHORE	99.8		61	1.15-21 2.10-11	0	OK OK	NT	VG	VG	Sea Shore/One Sided Veg	1.With loop antenna 2. With passive rod ant.
9.	1720	EAST COAST RD	109	**79**	69	11	0	OK	NT	VG	VG	Sea Shore/OA	

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Table No.5

Reception Survey of 100kW AIR (MW), DRM Transmitter (Trichy) (936 KHz) in Simulcast transmission mode (16db↓)

Direction: South Route: TRICHY-MADURAI Date: 15/08/2017

	Time	Spot/Location	Radial Distance (km)	Field Strength (dBµV/m)		MER (dB)		Subjective Quality				Terrain	Remark SNR in dB
				Analog 936 KHz	Digital 945 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1125	VIRALIMALAI	5.2	117	108	24	26	OK	OK	VG	VG	VEG/LT/Field	42
2.	1145	NH#38	10.3	106	96	25	8-12 14-26	OK/OK	NT/OK	VG	VG	VEG/LRB/Bushes	30
3.	1210	THUVARANKURUCHI NH#38	20	103	93	32/31	3/11	OK/OK	NT/OK	VG	VG	OA/NHW	37
4.	1240	NH#38	4.	90	80	21-25	3	OK	NT	VG	VG	OA/Nearby Forests Hills/MT	27
5.	1305	MELUR	60	81	71	12-8	0	OK	NT	VG	VG	OA/MT	13
6.	1400	MELUR OUTSKIRTS	77.8	74	66	6-7	0	NT	NT	VG	VG	LRB/Town/HDP	4.3
7.	1410	MADURAI RD	80	77	68	13	0	OK	NT	VG	VG	HT/VEG/OA	
8.	1620	MUNICHALAI MADURAI	97.75	69	60	-	0	NT	NT	G	G	City/DP/MT/Wide Road	
9.	1730	NH#85	100	71	58	8-10	0	NT	NT	VG	G	OA/LRB/HT	
10.	1810	MANAMADURAI	110	72	63	-	0	NT	NT	G	G	VEG/MT/NHW	
11.	1830	NH#87	120	**70-64**	61	-	0	NT	NT	G	G	VEG/NHW/MT	Large fluctuations in F/S

***Terrain Legends**: 1.**LRB**-Low rise building, 2.**HRB**-High rise building, 3.**OA**-Open areas or fields 4.**NHW**-National Highways 5. **HDP**-High density population 6.**HT**-High Traffic 7.**MT**-Moderate traffic 8.**LT**-Low Traffic 9.**Veg**-Thick Vegitation 10. **MKT**-Market areas.*

Table No.6

Reception Survey of 100kW AIR (MW), DRM Transmitter (Trichy)(936Khz) in Simulcast transmission mode (16db↓)

Direction: South West Route: Trichy-Dindigul Date10/08/2017

Sr No.	Time	Spot/Location	Radial Distance (km)	Field Strength (dBµV/m)		MER (dB)		Subjective Quality				Terrain	Remark
				Analog 936 KHz	Digital 945 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1050	NH#83	5	120	110	43	29	OK	OK	VG	VG	OA/NHW/MT	
2.	1130	CHENNAI-THENI HWY NH#83	20	107	96	37	21	OK	OK	VG	VG	OA/NHW/MT	
3.	1210	--DO--	40	88	80	29	8	OK	NT	VG	VG	VEG/NHW/LT	
4.	1305	--DO--	60	81	72	17.6	0/4-5	OK/OF	NT	VG	VG	VEG/NHW/MT	
5.	1505	NH#183 KOTTARAKKARA HWY	80	74	64	14	0	NT	NT	VG	G	NHW/MT/LRB	
6.	1525	--DO--	90	74	65	7-15	0	NT	NT	G	G		
7.	1545	--DO--	100	66	56	4-11	0	NT	NT	G	G	NHW/MT/VEG	
8.	1630	--DO--	110	58	49-50	-	0	NT	NT	G	G	NHW/MT/VEG	
9.	1700	--DO--	120	**61**	55	-	0	NT	NT	G	G	NHW/MT/VEG	
10.	1710	PERIYAKULUAM	125	60-61	49	-	0	NT	NT	G	F	NHW/MT/VEG/LRB	
11.	1725	NH#183	130	59-60	51	-	0	NT	NT	G	F	NHW/MT/LRB	

***Terrain Legends**: 1.**LRB**-Low rise building, 2.**HRB**-High rise building, 3.**OA**-Open areas or fields 4.**NHW**-National Highways 5. **HDP**-High density population 6.**HT**-High Traffic 7.**MT**-Moderate traffic 8.**LT**-Low Traffic 9.**Veg**-Thick Vegitation 10. **MKT**-Market areas.*

Table No.7

Reception Survey of 100kW AIR (MW), DRM Transmitter (Trichy)(936Khz) in Simulcast transmission mode (16db↓)

Direction: West Route: TRICHY-DHARAPURAM Date: 13/08/2017

POWER 95.4 KW VSWR 1.031 Ref Power 0.01 KW

	Time	Spot/Location	Radial Distance (km)	Field Strength (dBµV/m)		MER (dB)		Subjective Quality				Terrain	Remark SNR in dB
				Analog 936 KHz	Digital 945 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1115	KAVALKARANPATTI	5.5	116	106	36	24	OK	OK	OK	OK	OA/Fields/LT	42.8
2.	1150	BEFORE KOSUR	20	107	92	29	3-4	OK	NT	VG	VG	Village/LT/OA	32
3.	1212	AFTER KOSUR	30	96	86	23	0-3	OK	NT	VG	VG	VEG/LT/Vill Road	
4.	1235	BEFORE MALAPPATTY	40	90	81	24	0	OK	NT	VG	VG	Village/LT/OA	
5.	1320	NEAR MALAPPATY	60	83	73	17	0	OK	NT	VG	VG	OA/VEG	
6.	1435	BEFORE KANNIVADI	80	78	68	15	0	OK	NT	VG	VG	OA/LT	15.8
7.	1510	BEFORE DHARAPURAM	100	71	61	9	0	OK	NT	VG	G	Shrub/OA	5
8.	1550	DHARAPURAM	110	69	66	-	0	NT	NT	POOR	NT	Town/LRB/LT	
9.	1615	SH#21 AFTER DHARAPURAM	120	**64**	55	-	0	NT	NT	VG	G	OA/LT/SH	
10.	1630	BEFORE GUDIMANGALORE	130	56	46	-	0	NT	NT	G	POOR	SH/LT/OA	Heavey wind for us
11.	1645	SH#21	135	60	50	-	0	NT	NT	G	POOR	VEG/LT/SH	

***Terrain Legends**: 1.**LRB**-Low rise building, 2.**HRB**-High rise building, 3.**OA**-Open areas or fields 4.**NHW**-National Highways 5. **HDP**-High density population 6.**HT**-High Traffic 7.**MT**-Moderate traffic 8.**LT**-Low Traffic 9.**Veg**-Thick Vegitation 10. **MKT**-Market areas.*

Table No.8

Reception Survey of 100kW AIR (MW), DRM Transmitter (Trichy) (936 KHz) in Simulcast transmission mode (16db↓)

Direction: North West Route: Trichy-Erode-Kuhalur Date: 16/08/2017

	Time	Spot/Location	Radial Distance (km)	Field Strength (dBµV/m)		MER (dB)		Subjective Quality				Terrain	Remark SNR in dB
				Analog 936 KHz	Digital 945 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1030	BEFORE THOGAIMALAI	10	110	101	25	25	OK	OK	VG	VG	VEG/LT/Vill	
2.	1055	SH#71	20	103	94	24	16	OK	OK	VG	VG	VEG/OA/SH	37
3.	1125	NEAR PANJAPPATY	30	98	89	26	3-4	OK	NT	VG	VG	OA/LT/Fields	33
4.	1200	NH#81	40	94	84	22	0	OK	NT	VG	VG	MT/NHW/LRB	25
5.	1240	KARUR TOWN	56	80	70	-	0	NT	NT	VG	VG	City/HDP/LRB	
6.	1330	NH#44 OUT KARUR	60	87	78	22	0	OK	NT	VG	VG	Outside/City/NHW/HT	
7.	1410	KABILAR MALAI	80	69	60	-	-	NT	NT	VG	G	LRB/LT/VILL	
8.	1450	SH#198	100	66	55	-	-	NT	NT	VG	G	VEG/LRB/LT	
9.	1540	ERODE	114	**62**	52	-	0	NT	NT	VG	G	LRB/MT/HDP	
10.	1558	SH#15	120	64	55	-	0	NT	NT	G	G	LRB/MT/SH	
11.	1615	KAVINDAPADI	132	62	53	-	0	NT	NT	VG	VG	LRB/MT/SH	
12.	1635	KUHALUR	140	45	35	-	0	NT	NT	G	G	LRB/MT/SH	

***Terrain Legends**: 1.**LRB**-Low rise building, 2.**HRB**-High rise building, 3.**OA**-Open areas or fields 4.**NHW**-National Highways 5. **HDP**-High density population 6.**HT**-High Traffic 7.**MT**-Moderate traffic 8.**LT**-Low Traffic 9.**Veg**-Thick Vegitation 10. **MKT**-Market areas.*

Reception Survey of 100kW AIR (MW), DRM Transmitter (Trichy) in Simulcast transmission mode. Table:9

Transmitter Power: 100 kW (Analog power-95 KW) **Frequency: 936 KHz** **Date of measurement:** 09-08-2017

Field strength measurement, at 1kM distance around the radiating mast.

Sr.No.	Direction/Radial	Spot/Location	LAT/LONG	Field Strength (dBµV/m)	Terrain	Remark
1	NORTH		N 10.69753 E 78.52661	124	VEG/OA	
2	NORTH-EAST		N 10.71107 E 78.53845	124	NHW/OA/LT	
3	EAST		N 15.70762 E 78.53970	124	OA/IOC BOTTLE PLANT	
4	SOUTH-EAST		N 10.70083 E 78.53822	125	VEG/OA	
5	SOUTH		N 10.69753 E 78.52661	124	NHW/OA/LT	
6	SOUTH-WEST		-----	124	OA/VEG LOW HEIGHTS	
7	WEST		N 10.70677 E 78. 52111	124	OA/VEG LOW HEIGHTS	

Terrain Legends: 1. OA-Open areas 2. VEG-Thick vegetation of average heights 3. Low heights- Vegetation with low height 4. LT-Low Traffic 5.NHW-National highway