



*Combined Reception Survey Report of
200kW MW AM-DRM Transmitter
(Kolkata-A) in Simulcast mode & 100kW
MW AM-DRM Transmitter (Kolkata-B)
in Simulcast mode*

Combined Reception Survey
Report of 200kW MW AM-DRM
Transmitter (Kolkata-A) in
Simulcast mode & 100kW MW
AM-DRM Transmitter
(Kolkata-B) in Simulcast mode

(Survey Period: 1/4/18 to 14/4/18)

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Report No. RD/2018/ 946

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Basic Data and Transmitter details

Kolkata-A,

Transmitters Details:

1. Name of the Station : AIR-KOLKATA
2. Location of the Tx Active Antenna : N 22.36106 E 88.28426
3. Ground height above msl : 14 Meters
4. Terrain around Tx Antenna : Open Areas and vegetation
5. Traffic : Low
6. Classification of Area : Urban
7. Rated Power of the Transmitter : 200 kW
8. Make & Model : Nautel NX-200
9. Frequency of Operation : 657 KHz (AM) 666 KHz (DRM)
10. Date of Commissioning : 08/9/2015

Transmitting Antenna Details

1. Type of Antenna : Vertical Self Radiating Mast
2. Height of Antenna : 122 meters
3. Mast base impedance : $77+j115$
4. Feeder impedance : 120 ohm
5. DA System : Passive element at a distance of 110 Meters in South-West direction from Active mast

Basic Data and Transmitter details

Kolkata-B,

Transmitters Details:

1. Name of the Station : AIR-KOLKATA
2. Location of the Tx Active Antenna : N 22.36169 E 88.29256
3. Terrain around Tx Antenna : Open Areas & Vegetation
4. Traffic : Low
5. Classification of Area : Urban
6. Rated Power of the Transmitter : 100 kW
7. Make & Model : Nautel NX-100
8. Frequency of Operation : 1008 KHz (AM) 1017 KHz (DRM)
9. Date of Commissioning : 30/11/2016

Transmitting Antenna Details

1. Type of Antenna : Vertical Self Radiating Mast
2. Height of Antenna : 122 meters
3. Mast base impedance : 455-j60.7
4. Feeder impedance : 120 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

Directorate General, AIR has directed the Research Department to monitor the reception of the AM-DRM signal originating from the medium-wave transmitter (200kW & 100 kW) of AIR, Kolkata for the purpose of obtaining coverage with the following configurations:

1. In simulcast mode during the normal transmission periods in case of Kolkata 'A' transmitter.
2. In simulcast mode during the normal transmission timings in the case of Kolkata 'B' transmitter.

3. EQUIPMENTSUSED

- 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 & PARAMETERS

AIR's medium wave transmitter is situated in Chandi in Amtala areas of Kolkata. The antenna is a self-supported radiating mast with DA system in case of Kolkata A transmitter. The passive element of DA system is grounded and lies in South-West direction from active mast (Distance-110 meters) in case of Chennai-A 200 kW transmitter. The transmitter is new with R.F. analog power of 200 kW. 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 Kolkata-B transmitter is also installed in Amtala area. This transmitter is also working in Simulcast mode. The self radiating mast of this transmitter is radiating RF power of 100kW power.

The geographical location of Kolkata is not central in the state of West Bengal, and suitable radials only in seven different directions were clearly identified which includes two routes towards Bangladesh border for the purpose of survey.

AIR-Directorate has set the parameters for Kolkata which is as follows:

- DRM back off ratio in Simulcast : -16 dB
- Frequency of operation in Simulcast Service : F_c+9 kHz
- Robustness Mode : A
- MSC QAM : 16
- SDC QAM : 4

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-XII.

In each selected route, spots were identified for field strength measurement as well as digital parameters like MER & SNR on a professional receiver. In order to avoid results influenced by time variations, median field strength was observed at each location. At many spots, 4 to 5 measurements were carried out within a small defined area to calculate mean field strength keeping in consideration the location probability factors. While taking measurements along different radial directions from the transmitter on suitable motorable roads, field strength in dB μ v/m has been observed at suitable intervals. Simultaneously the quality of the AM reception was also monitored on an ordinary cheap Radio receiver and as well as on good quality Sony receiver and the subjective quality was noted. Similarly subjective reception of digital signal was also observed on professional and cheap digital receivers. Our main objective was to obtain day time primary coverage areas in each route as per latest ITU recommendations.

Similarly many DRM parameters like Doppler/ Delay, Channel estimation, MER &

SNR values also checked to assess the quality of received DRM signal. As DRM technology is very new in our network, understandings of key received parameters (As received on Win Radio and DT 700) are very useful. Few such parameters are described below:

- I Doppler / Delay: The Doppler frequency of the channel is estimated using Wiener filter design of channel estimation in time direction. If linear interpolation is set for channel estimation in time direction, this estimation is not updated. The Doppler frequency is an indication of how fast the channel varies with time. The higher the frequency, the faster the channel changes are.
- I Protection level (B/A): The different protection levels are defined in the DRM standard. Protection level 0 has the highest protection where level 4 has the lowest protection. The letters A & B are the names of the higher and lower protected parts of a DRM block when Unequal Error Protection is used. If Equal Error Protection is used, only the protection level of part B is valid.
- I DRM Mode / Bandwidth: In a DRM system, four possible robustness modes are defined to adapt the system to different propagation channel conditions. As per DRM standard:
 - ✓ Mode A: Gaussian channels, with minor fading.
 - ✓ Mode B: Time and frequency selective channels, with longer delay spread.
 - ✓ Mode C: As Robustness mode B, but with higher Doppler spread.
 - ✓ Mode D: As Robustness mode B, but with severe delay and Doppler spread.

Audio services are transmitted in the main service channel (MSC) of the DRM multiplex. For all robustness modes two different modulation schemes (16- or 64-QAM) are defined for the MSC, which can be used in combination with one or two (16 QAM) or four (64 QAM) protection levels, respectively.

Each protection level is characterized by a specific parameter set for the two (16-QAM) or three (64-QAM) convolutional encoders, resulting in a certain average code rate for the overall multilevel encoding process in the modulator. For 16-QAM protection level, No. 0 corresponds to an average code rate of 0.5; No. 1 to 0.62.

For DRM robustness mode A (QAM-16) minimum S/N should be 12 dB to achieve BER of 1×10^{-4} . This will give uninterrupted high quality digital audio. The required minimum field strength value for DRM reception depends upon man made noise and some other factors also.

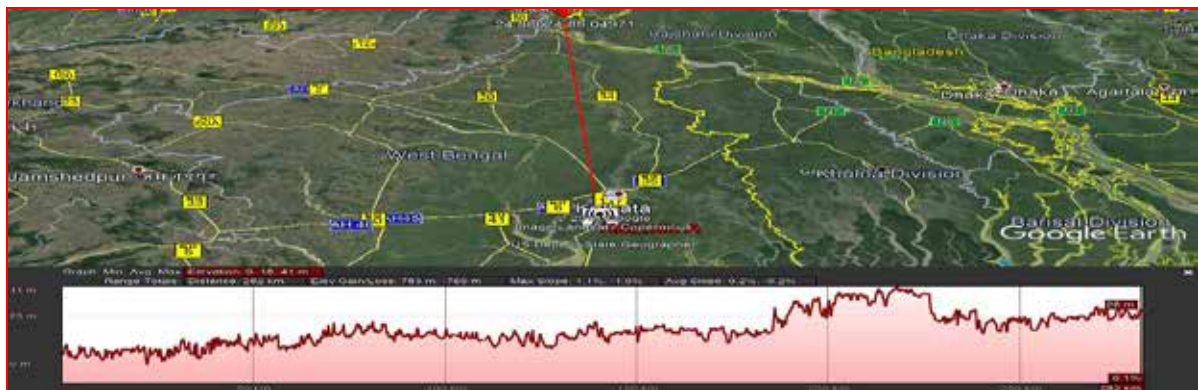
The ITU recommended minimum field strength value for day time primary coverage for AM is 63 dB μ V/ m.

As a standard practice before the start of detailed survey, it is essential to ascertain the actual radiated power. The field strength readings thus obtained, at a

distance of 1 KM in clear line of sight from the antenna, was recorded and tabulated.

5. DATA ANALYSIS OF SIMULCAST TRANSMISSION OF Kolkata 'A' & 'B'

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



Map-I

The survey started with the GPS marking of the radiating tower of AIR Kolkata 'A' and Kolkata 'B'. Initially we took measurements at an interval of 10 kilometers (L.O.S.) and increased it up to 20-30 or more 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. In case of AM signal, commercial cheap Philips receiver as well as good quality Sony receiver was used for subjective reception. For obtaining MER/ SNR value of the digital signal, a professional receiver, DT 700, was used. The same receiver was also used for checking the audio quality and other related parameters of digital signal.. 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 signal. At each survey location, the corresponding GPS data was also saved for obtaining the LOS distance from the Antenna of the concerned transmitters alongwith the terrain profile.

In simulcast (Kolkata-A) digital transmission, MER of 12 dB with field strength of 83-85 dB μ V/m was available up to the aerial distance of 20 to 30 Kms in North direction. However breaks with low MER were observed up to 180 radial Kms. It may be due to the high level of manmade noise in city environment and other unidentified problem on highways. Analogue transmission of Kolkata-A was available up to the LOS distance of 281 Km as per ITU standard.

In case of Kolkata-B simulcast transmission, the coverage was available up to the LOS distance of 90 Kms in Ranaghat. In DRM, the coverage was only up to 20 Km only.

B. North-East Direction (Table-2) (Map-II)

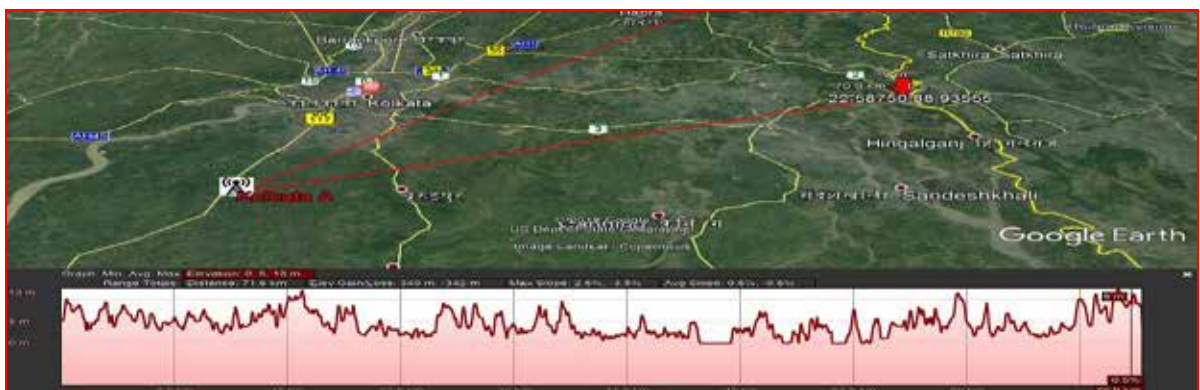


Map-II

This route lies in North-West direction from transmitter and covers some parts of Kolkata city areas. It further moves towards Bangladesh border up to Petra Pol. The terrain profile is normal with minor variation in elevation. The analogue Kolkata-A transmission was available up to the LOS distance of 97 Km where field strength was 82.4 dB μ V/ m. The analogue transmission of Kolkata-B was available up to the LOS distance of 50 Km only. It may be due to the very high manmade noise and thick vegetation coupled with low field strength value.

C. East (Table-3) (Map III)

This route goes to the Bangladesh up to Taki borders via Ramnagar Bazar and Canning. The terrain profile is normal with thick vegetation along the route. The radial distance up to the border is just 71.5 Km.



Map-III

The field strength in respect of Kolkata A & B was 93 and 75 dB μ V/m. Similarly digital transmission of Kolkata-A & B was available up to LOS distance of 71 and 56 Km

respectively. Interpolation of field data along with terrain profile clearly suggests minimum signal reception up to the city of Dhaka in Bangla Desh.

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



Map-IV

The South route goes towards Kalkdweep via Netra and Bakhali. The terrain profile clearly shows the normal elevation throughout the route

The Kolkata-A, analogue transmission was available up to the LOS distance of 88.7 Km with signal level of 86 dB μ V/m. The Digital transmission in Simulcast mode was also available up to the same distance as further movement was not possible due to sea shore.

The Kolkata-B, Digital transmission was well decoded up to the LOS distance of 88.7 Km. At this location the field strength was 61 dB μ V/ m. The good reception at low field level was due to very low manmade noise. Analogue signal in respect of Kolkata-B transmitter was good with field strength of 70 dB μ V/m.

E. South West (Table-5) (Map-V)



Map-V

The direction South-West goes towards Cuttack in Orissa. The terrain in this direction was perfect for MF transmission with sea on one side. The elevation profile was also normal with

minor variation. The analogue coverage of Kolkata-A was up to an aerial distance of 260 Km, whereas in the case of Kolkata-B, it was 170 Km. DRM in simulcast for Kolkata-A was up to 115 Km with few audio drops. In case of Kolkata-B, it was up to 60 Km.

F. West (Table-6) (Map-VI)



Map-VI

This route goes up to Ghatshila in Jharkhand via Kharagpur city. The quality of AM signal was very good inside the city of Kharagpur. DRM in simulcast was not working within city of Kharagpur even though field strength was 73 dB μ V/m. The coverage of Kolkata-A in analogue mode was up to an aerial distance of 180 Km whereas in DRM it was up to 76 Km. For Kolkata-B, the required analogue signal was available up to 76 Km and DRM in simulcast was available up to 40 Km only. The terrain profile is upward elevation type and reached a level of 152 meters in Jharkhand. The ground was also rocky in those areas.

G. North West (Table-7) (Map-VII)



Map-VII

The North West route goes up to Dhanbad in Jharkhand state. Parts of Kolkata City, Bardhaman, Durgapur and Raniganj were major populated areas in this direction. The elevation profile shows increase of height above mean sea level from 14 meter to 145 meters. The analogue coverage in respect of Kolkata-A was up to the radial distance of 220 Km, whereas for Kolkata-B, it was 120 Km. In case of DRM in simulcast for Kolkata-A, it was 150 Km and for Kolkata-B, it was 60 Km only.

7. R.F. POWER AT 1 KILOMETRE

Several 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 not same in all the directions. The Kolkata-A transmitter is working in DA mode and major power is going in the direction of North-East direction towards Bangladesh (**Map-VIII**). In case of Kolkata-B, the antenna is Omni directional but it is effected by nearby disused umbrella antenna. The major power of this transmitter is going towards North and North West direction (**Map-IX**).

Field strength in case of both the transmitters is shown in map itself.

8. Performance of commercial DRM Radio

Performance of Avion Make DRM commercial Radio was also tested. In comparison to Professional receiver, coverage in case of 200 Kw Kolkata-A transmitter was up to 20 Km in few directions and 50 to 80 Kms in other directions. Details are available in tables 1 to 7.

8. Conclusion

Coverage of Analogue & DRM Signal in Simulcast mode Kolkata-A (200 KW) (DRM 16 dB ↓)(Map-X)

Direction from AIR Transmitter Antenna Kolkata-A	LOS Distance from Tx (KM)	
	Analogue 63dB μ V/ m	DRM Excellent Audio on DT 700 Professional Receiver
NORTH	281	20
NORTH-EAST	97 International Border	50
EAST	71.5 International Border	71.5
SOUTH	88.7 Sea Side	88.7
SOUTH WEST	260	115
WEST	180	76
NORTH WEST	220	150

**Coverage of Analogue & DRM Signal in Simulcast mode
Kolkata-B (100 KW)
(DRM 16 dB ↓)(Map-XI)**

Direction from AIR Transmitter Antenna Kolkata-B	LOS Distance from Tx (KM)	
	Analogue 63dB μ V/ m	DRM Excellent Audio on DT 700 Professional Receiver
NORTH	90	20
NORTH-EAST	50	50
EAST	71.5 International Border	56
SOUTH	88.7 Sea Shore	88.7
SOUTH WEST	170	60
WEST	76	40
NORTH WEST	120	60

The additional disused umbrella antenna near Kolkata-B 100 KW transmitter is to be investigated for effect on coverage.

The operating officials of Kolkata-A&B transmitters are required to be trained in DRM operations in more depth so that other critical parameters can be changed as and when required and for better understanding and requirement of system.

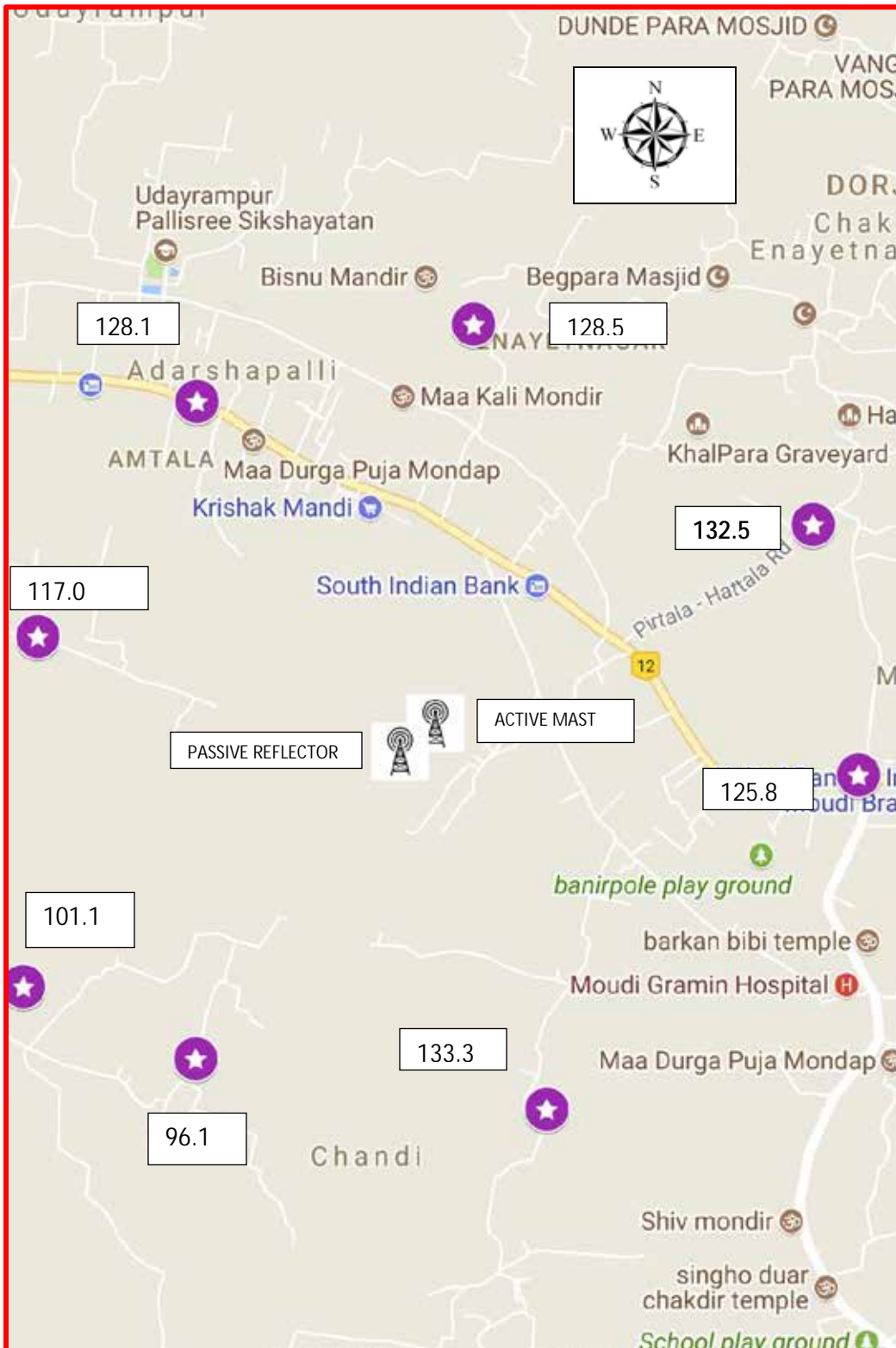
Acknowledgement

The completion of this detailed survey would not have been possible without the support and the help extended by our colleagues of R&D and AIR Kolkata. We would also like to thank Mr. S M T Alam-DE of Zonal office for providing logistics well in time. We would like extend our special thanks to Mr. Swarup Banerjee, AE and Mr. Inderanil Banerjee, SEA for help in survey.

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FIELD STRENGTH OF KOLKATA- A (200 KW) TRANSMITTER ON 657 KHz AT 1 KM DISTANCE

MAP-VIII

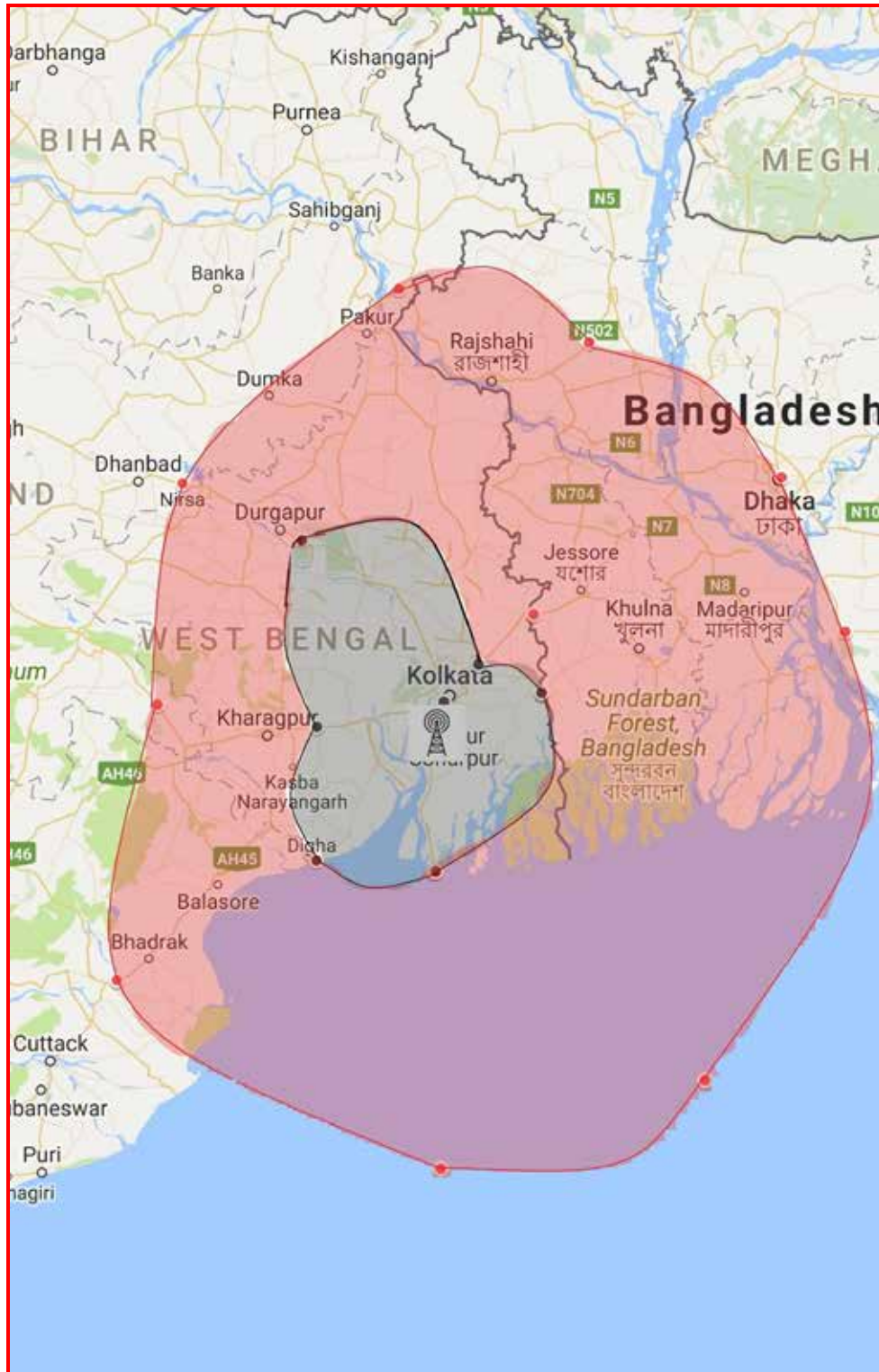


FIELD STRENGTH OF KOLKATA-B (100kw) TRANSMITTER ON 1008 KHz AT 1 KM DISTANCE

MAP-IX



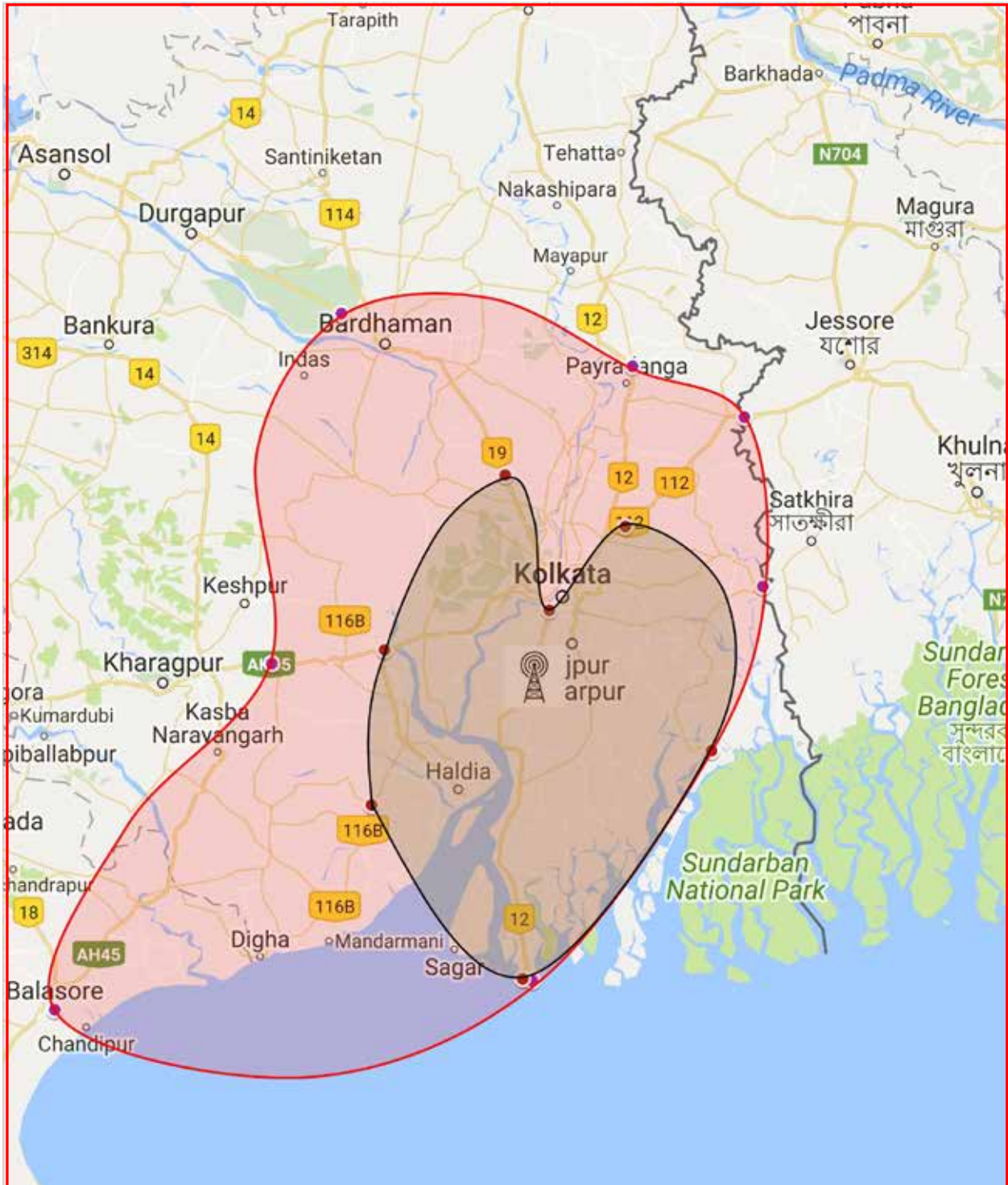
Coverage Map of Kolkata-A Transmitter MAP-X



COVERAGE ALSO INCLUDE AREAS OF BANGLADESH AND BAY OF BENGAL. IT IS BASED ON INTERPOLATION OF DATA IN OTHER AREAS AND GROUND CONDUCTIVITY OF BANGLADESH. THE INNER IRREGULAR AREA IS DRM COVERAGE IN SIMULCAST AND OUTER RED BOUNDARY IS FOR 200 KW ANALOGUE TRANSMISSION OF KOLKATA-A

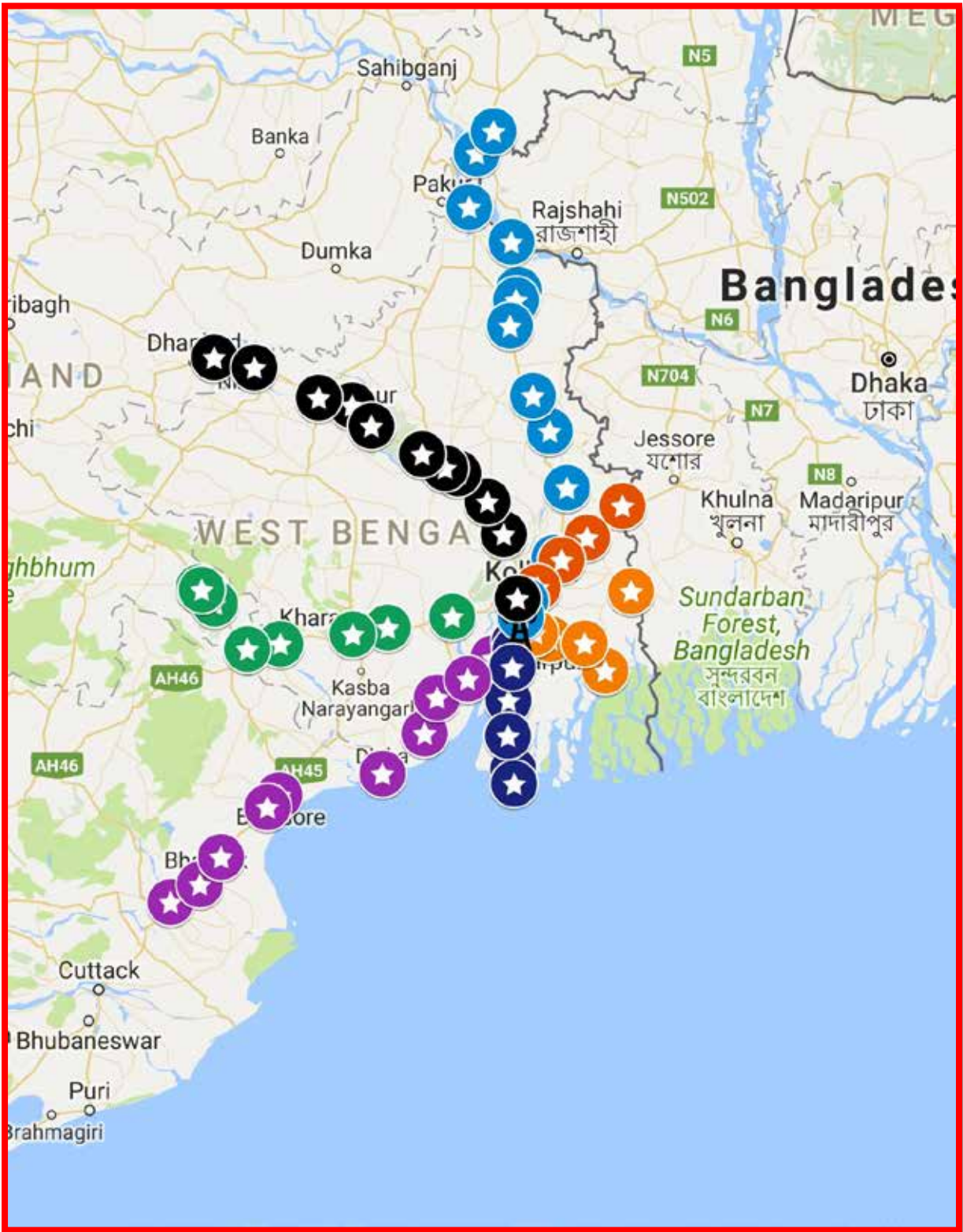
Coverage Map of Kolkata-B Transmitter

Map-XI



Areas within black line is the coverage of DRM in Simulcast mode whereas areas within red line is the coverage of AM transmission of 100 KW Kolkata-B transmitter

Survey locations of 200 KW/100 KW AM-DRM TRANSMITTER OF AIR KOLKATA Map-XII



Reception Survey of 200 KW (A) & 100 KW (B) MW AM-DRM TRANSMITTERS OF AIR KOLKATA
DIRECTION: North

Table-1

Date: 10-11-12/4/18

Sr. No	TIME	LOCATION	RADIAL DISTANCE IN KM	FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 657 KHz		SUBJECTIVE AUDIO QUALITY & MER IN db (Digital) OF 666 KHz		FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 1008 KHz		SUBJECTIVE AUDIO QUALITY & MER (Digital) in db OF 1017 KHz		TERRAIN TYPE	REMARKS
				Kolkata-A		SONY	PHILIPS COMMERCIAL RADIO	DT 700 PROFESSIONAL	AVIONL COMMERCIAL	Kolkata-B		SONY	PHILIPS	DT 700	AVION		
				657 KHz	666 KHz					1008 KHz	1017 KHz						
1	1900	JOKA	10	115.5	105.4	VG	VG	E 13	NT 3-4	106.2	96.7	VG	VG	E 12	VG 22	HT/LWR/POP	
2	2018	NEAR ZOO	20	114.1	104.5	VG	VG	E 12	NT 0-4	104.5	94.5	VG	VG	E 13	BREAKS 4-17	VEG/MT/LRB/POP	
3	12/4/18	KHILKAPUR NH-12	50	92.3	83.1	G	G	NT 0-6	NT	72	64	F	F	NT	NT	MRB/HT/POP/VEG	CRACKLINGS IN 1017 KHz
4	11/4/18 2030	RANAGHAT	90	74.3	64.5	G	G	NT	NT	62.4	53.9	G	G	NT	NT	HWY/HT/OA/VEG	
5	11/4/18 1820	KRISHNA NAGAR	120	81	66.9	G	G	NT 5	NT	60	---	P	P	NT	NT	VEG/HT/HWY/LRB	
6	10/4/18 1220	NAKASHIPARA PS-NH 12	140	81	71.4	VG	VG	NT 7-8	NT	54	45	G	G	NT	NT	OA/HT/HWY	A-195 KW
7	10/4/18 1330	BHABTA NH 12	180	75.2	65.5	VG	VG	NT 4	NT	52.2	43.6	G	G	NT	NT	HWY/MT/VEG/OA	
8	10/4/18 1445	COSSIM BAZAR	195	76.2	66.6	VG	VG	NT	NT	---	---	---	---	---	---	MRB/VEG/T	
9	11/4/18 1320	NEAR MURSHIDABAD	200	----	----	----	----	----	----	46	----	NT	NT	----	----	LRB/VEG/LT/V	
10	10/4/18 1700	LALGOLA TOWN	230	68.2	58.4	G	G	NT	NT	----	----	----	----	----	----	MRB/OA/VEG/POP	
11	11/4/18 1210	BADSHAHI ROAD BEFORE NIMTITA	250	74.8	60.4	VG	VG	NT	NT	49.2	NF	NT	NT	NT	NT	HWY/MT/OA	
12	11/4/18 1030	BADSHAHI ROAD NH 12 NEAR JAMIRGHATA RS	281	65.8	56	VG	VG	NT	NT	NF	NF	NT	NT	NT	NT	HWY/HT/VEG/OA	
13	11/4/18 0848	MALDA CITY	293	59.1	52.9	F	F	NT	NT	NF	NF	NT	NT	NT	NT	LRB/POP/CITY/MT	

LEGENDS: 1. HRB- High rise buildings 2. LRB- Low rise buildings 3. OA- Open area 4. HT- High traffic 5. MT- Moderate traffic 6. LT- Low traffic 7. POP- Dense population 8. XFMR- Nearby transformer 9. VILL- Village area 10. HWY- National Highways 11. LWR- Low width road 12. E- Excellent 13. VG- Very Good 14. G- Good 15. F- Fair 16. P- Poor 17. VEG- Vegetation

Reception Survey of 200 KW (A) & 100 KW (B) MW AM-DRM TRANSMITTERS OF AIR KOLKATA
 DIRECTION: North-East

Table-2

Date: 10-11-12/4/18

Sr. No	TIME	LOCATION	RADIAL DISTANCE IN KM	FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 657 KHz		SUBJECTIVE AUDIO QUALITY & MER IN db (Digital) OF 666 KHz		FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 1008 KHz		SUBJECTIVE AUDIO QUALITY & MER (Digital) in db OF 1017 KHz		TERRAIN TYPE	REMARKS
				Kolkata-A		SONY	PHILIPS COMMERCIAL RADIO	DT 700 PROFESSIONAL	AVIONL COMMERCIAL	Kolkata-B		SONY	PHILIPS	DT 700	AVION		
				657 KHz	666 KHz					1008 KHz	1017 KHz						
1	12/4/18 0850	TETULTALA JESSORE RD	30	105.2	95.5	VG	VG	E 12	NT	81.9	71.6	G	G	E 13	NT 0-4	HRB/HT/POP/VEG	
2	12/4/18 1050	JESSORE RD	50	94.1	83.9	VG	VG	E 12	G 12	92.1	54.6	G	F	E 12	NT	VEG/MT/LRB	
3	12/4/18 1225	NH 112 AFTER HABRA	70	91.3	81.6	VG	VG	NT 6	NT	59.5	51.8	F	F	NT	NT	VEG/MRB/MT/POP	
4	12/4/18 1355	NEAR PETRAPOL INDO-BANGLA BORDER	97	82.46	73	VG	VG	NT	NT	60	51.7	F	F	NT	NT	MT/LRB/POP	ACTIVE JAMMER FOUND

LEGENDS: 1. HRB-High rise buildings 2. LRB- Low rise buildings 3. OA- Open area 4. HT-High traffic 5. MT- Moderate traffic 6. LT-Low traffic 7. POP- Dense population 8. XFMR- Nearby transformer 9. VILL- Village area 10. HWY- National Highways 11. LWR- Low width road 12. E-Excellent 13. VG-Very Good 14. G-Good 15. F-Fair 16. P-Poor 17. VEG-Vegetation

Reception Survey of 200 KW (A) & 100 KW (B) MW AM-DRM TRANSMITTERS OF AIR KOLKATA
 DIRECTION: East Date: 05/4/18

Table-3

Sr. No	DATE TIME	LOCATION	RADIAL DISTANCE IN KM	FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 657 KHz		SUBJECTIVE AUDIO QUALITY & MER IN dB (Digital) OF 666 KHz		FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 1008 KHz		SUBJECTIVE AUDIO QUALITY & MER (Digital) in dB OF 1017 KHz		TERRAIN TYPE	REMARKS
				Kolkata-A		SONY	PHILIPS COMMERCIAL RADIO	DT 700 PROFESSIONAL	AVIONL COMMERCIAL	Kolkata-B		SONY	PHILIPS	DT 700	AVION		
				657 KHz	666 KHz					1008 KHz	1017 KHz						
1	5/4/18	AMTALA BERUIPUR ROAD	10	113.8	103.7	VG	VG	E 35	E 25	110.9	99.8	VG	VG	E 35.8	E 22	LRB/T-VEG/POP/MT	
2	5/4/18 1800	RAMNAGAR BAZAR	20	95.4	85.2	VG	VG	E 22	NT 4-9	81.2	72.1	VG	VG	E 20	BREAKS 5-11	VEG/LRB/POP	
3	5/4/18 1705	CANNING	40	98.6	88.5	VG	VG	E 12	NT 0-3	75.2	74.8	VG	VG	E 12	BREAKS 0-10	HT/LRB/POP	
4	5/4/18 1545	GODKHALI FERRY GHAT	56	99.1	89.2	VG	VG	E 27	E 22	86.4	76.6	VG	VG	E 22	NT ---	OA/LT	
5	5/4/18 1235	TAKI BORDER	71.5	92.8	84.2	VG	VG	E 20	VG 11	75.6	65.4	VG	VG	NT	NT	VEG/RIVER/LRB/LT	

LEGENDS: 1. HRB-High rise buildings 2. LRB- Low rise buildings 3. OA- Open area 4. HT-High traffic 5. MT- Moderate traffic 6. LT-Low traffic 7. POP- Dense population 8. XFMR- Nearby transformer 9. VILL- Village area 10. HWY- National Highways 11. LWR- Low width road 12. E-Excellent 13. VG-Very Good 14. G-Good 15. F-Fair 16. P-Poor 17. VEG-Vegetation

Reception Survey of 200 KW (A) & 100 KW (B) MW AM-DRM TRANSMITTERS OF AIR KOLKATA
 DIRECTION: SOUTH Date: 03/4/18

Table-4

Sr. No	TIME	LOCATION	RADIAL DISTANCE IN KM	FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 657 KHz		SUBJECTIVE AUDIO QUALITY & MER IN db (Digital) OF 666 KHz		FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 1008 KHz		SUBJECTIVE AUDIO QUALITY & MER (Digital) in db OF 1017 KHz		TERRAIN TYPE	REMARKS
				Kolkata-A		SONY	PHILIPS COMMERCIAL RADIO	DT 700 PROFESSIONAL	AVIONL COMMERCIAL	Kolkata-B		SONY	PHILIPS	DT 700	AVION		
				657 KHz	666 KHz					1008 KHz	1017 KHz						
1	1850	SHIRAKOL NEAR RAJARHAT	5	112.7	102.9	VG	VG	E 25	NT	109.1	99.1	VG	VG	E 25	NT	HT/MRB/LTW/POP	
2	1820	USTHI ROAD	10	108	98	VG	VG	E 30	NT	95	85.7	VG	VG	E 24	NT	VEG/LT	
3	1740	NETRA ROAD	20	104.4	94.6	VG	VG	E 15	NT	100	100	VG	VG	NO AUDIO 24	NT	VEG/LT	
4	1700	BELPUKUR	40	91.4	81.5	VG	VG	E 12	NT	82.4	72.4	VG	VG	E 13	NT	VEG/LRB/MT	
5	1530	UKILERHAT	60	90	80	VG	VG	E 18	NT	80	71	VG	VG	E 17	NT	LRB/LT/XFMR	
6	1420	BAKHALI ISLAND	80	70.5	60.9	G	G	NT 6	NT	63	53.6	G	G	NT 5	NT	VEG/OA	
7	1400	BAKHALI LAST POINT	88.7	86	76	VG	VG	E 15	NT	70	61	VG	VG	E 11	NT	OA/SEA SIDE	

LEGENDS: 1. HRB- High rise buildings 2. LRB- Low rise buildings 3. OA- Open area 4. HT- High traffic 5. MT- Moderate traffic 6. LT- Low traffic 7. POP- Dense population 8. XFMR- Nearby transformer 9. VILL- Village area 10. HWY- National Highways 11. LWR- Low width road 12. E- Excellent 13. VG- Very Good 14. G- Good 15. F- Fair 16. P- Poor 17. VEG- Vegetation

Reception Survey of 200 KW (A) & 100 KW (B) MW AM-DRM TRANSMITTERS OF AIR KOLKATA
DIRECTION: SOUTH-WEST

Table-5

Date: 6-9-13/4/18

Sr. No	TIME	LOCATION	RADIAL DISTANCE IN KM	FIELD STRENGTH IN dBµV/m		SUBJECTIVE AUDIO QUALITY OF 657 KHz		SUBJECTIVE AUDIO QUALITY & MER IN db (Digital) OF 666 KHz		FIELD STRENGTH IN dBµV/m		SUBJECTIVE AUDIO QUALITY OF 1008 KHz		SUBJECTIVE AUDIO QUALITY & MER (Digital) in db OF 1017 KHz		TERRAIN TYPE	REMARKS
				Kolkata-A		SONY	PHILIPS COMMERCIAL RADIO	DT 700 PROFESSIONAL	AVIONL COMMERCIAL	Kolkata-B		SONY	PHILIPS	DT 700	AVION		
				657 KHz	666 KHz					1008 KHz	1017 KHz						
1	9/4/18 1712	NOORPUR ROAD	20	83	73	VG	VG	E	BREAKS 8-14	75.5	66.2	VG	VG	E	E 15-16	VEG/MT/LRB	
2	13/4/18 1042	HALDIA PORT ROAD	40	99	89	VG	VG	E 15	NT	85	76	VG	VG	E 20	E 11	HT/VEG/OA/LRB	1017 DRM @ +10K???
3	13/4/18 1333	BAJKUL NH 116B	60	89.7	80	VG	VG	E 12	NT	74	64.9	VG	VG	BREAKS 8-11	NT	MT/LRB/OA	
4	13/4/18 1345	NEAR CONTAI	80	87.3	77.5	VG	VG	NT	NT	67	57.6	G	G	NT	NT	VILL/VEG/LT	
5	6/4/18 2209	DIGHA BEACH	115	79.1	69.8	VG	VG	BREAK 9-10	NT	54.4	56.1	VG	G	NT	NT	MRB/LT/SEA BEACH	KOLKATA A-195 KW
6	6/4/18 1858	BALASORE CITY	170	78.3	65.8	P	F	NT	NT	67	62	F	F	NT	NT	HT/MRB/POP/HTL	HIGH MAN MADE NOISE
7	6/4/18 1420	BALASORE BYPASS	180	71	61	G	G	NT	NT	47	41	NT	NT	NT	NT	OA/MT/LRB	
8	6/4/18 1516	BADSHAHI ROAD NH 16 NEAR BHADRAK	220	64.8	55.5	F	F	NT	NT	50	42	F	P	NT	NT	VEG/OA/MT	
9	6/4/18 1600	CUTTACK ROAD	240	65	55	G	G	NT	NT	45	40	P	P	NT	NT	MT/VEG/OA/LRB	
10	6/4/18 1630	NH 16 BEFORE CUTTACK	260	63-64	54	G	G	NT	NT	46	42	NT	NT	NT	NT	MT/HWY/OA/VEG	

LEGENDS: 1. HRB-High rise buildings 2. LRB- Low rise buildings 3. OA- Open area 4. HT-High traffic 5. MT- Moderate traffic 6. LT-Low traffic 7. POP- Dense population 8. XFMR- Nearby transformer 9. VILL- Village area 10. HWY- National Highways 11. LWR- Low width road 12. HTL-High tension line nearby 13. E-Excellent 14. VG-Very Good 15. G-Good 16. F-Fair 17. P-Poor

Reception Survey of 200 KW (A) & 100 KW (B) MW AM-DRM TRANSMITTERS OF AIR KOLKATA
DIRECTIONS: WEST **Date: 8-9/4/18**

Table- 6

Sr. No	TIME	LOCATION	RADIAL DISTANCE IN KM	FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 657 KHz		SUBJECTIVE AUDIO QUALITY & MER IN db (Digital) OF 666 KHz		FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 1008 KHz		SUBJECTIVE AUDIO QUALITY & MER (Digital) in db OF 1017 KHz		TERRAIN TYPE	REMARKS
				Kolkata-A		SONY	PHILIPS COMMERCIAL RADIO	DT 700 PROFESSIONAL	AVIONL COMMERCIAL	Kolkata-B		SONY	PHILIPS	DT 700	AVION		
				657 KHz	666 KHz					1008 KHz	1017 KHz						
1	8/4/18 2345	KOLAGHAT	40	96	84	VG	VG	E 18	BREAKS 7-11	76.6	66.4	VG	VG	E 13	NT 0-6	HWY/HT/OA	
2	8/4/18 2220	KHARAGPUR RD MUMBAI-KOL HWY	76	88	81	VG	VG	E 14	NT	64.3	55.6	G	G	NT	NT	HT/LRB/OA	
3	8/4/18 2123	KHARAGPUR CITY	97.5	82	73	VG	VG	----	NT	56	53	F	F	----	NT	OA/LT/LRB	DT 700 DEFECTIVE
4	8/4/18 1715	NH-49 MUMBAI-KOL HWY	140	68	57	G	G	NT	NT	53	48.6	P	P	NT	NT	OA/MT/HWY	
5	8/4/18 1205	BAHARAGORA NH-49	160	62.5	52.4	G	G	NT	NT	46.6	38.2	F	F	NT	NT	MT/OA/HWY	
6	8/4/18 1330	DHALBHUNARH POLICE ST	180	62	52	G	G	NT	NT	48	47	NT	NT	NT	NT	VEG/OA/ROCKY	
7	8/4/18 1440	GHATSHILA TOWN	188	57.8	48	G/F	G/F	NT	NT	NF	NF	P	P	NT	NT	OA/LT/LRB/ROCKY	
8	8/4/18 1422	GANDHI MAIDAN GHATSHILA	190	55	---	G	G	NT	NT	NF	NF	P	P	NT	NT	OA/ROCKY	

LEGENDS: 1. HRB- High rise buildings 2. LRB- Low rise buildings 3. OA- Open area 4. HT- High traffic 5. MT- Moderate traffic 6. LT- Low traffic 7. POP- Dense population 8. XFMR- Nearby transformer 9. VILL- Village area 10. HWY- National Highways 11. LWR- Low width road 12. HTL- High tension line nearby 13. E- Excellent 14. VG- Very Good 15. G- Good 16. F- Fair 17. P- Poor 18. NF- Noise floor of the eqpt.

Reception Survey of 200 KW (A) & 100 KW (B) MW AM-DRM TRANSMITTERS OF AIR KOLKATA
DIRECTION: NORTH-WEST

Date: 4/4/18

Table-7

Sr. No	TIME	LOCATION	RADIAL DISTANCE IN KM	FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 657 KHz		SUBJECTIVE AUDIO QUALITY & MER IN db (Digital) OF 666 KHz		FIELD STRENGTH IN dB μ V/m		SUBJECTIVE AUDIO QUALITY OF 1008 KHz		SUBJECTIVE AUDIO QUALITY & MER (Digital) in db OF 1017 KHz		TERRAIN TYPE	REMARKS
				Kolkata-A		SONY	PHILIPS COMMERCIAL RADIO	DT 700 PROFESSIONAL	AVIONL COMMERCIAL	Kolkata-B		SONY	PHILIPS	DT 700	AVION		
				657 KHz	666 KHz					1008 KHz	1017 KHz						
1	4/4/18 2355	WAJID ALI SHAH MAUSOLEUM	21	110	103	VG	VG	E 16	NT	102	94	VG	VG	E 12	NT	MRB/LWR/POP	
2	4/4/18 2211	ATI GT ROAD	60	97.8	87.9	VG	VG	E 19	NT	71.8	70	VG /CT	F/CT	BREAKS 4-11	NT	HT/HWY/VEG/OA	CROSS TALK IN 1008KHz
3	4/4/18 2128	GT ROAD AH-1	80	92.2	80.7	VG	VG	E 18	NT 1.5-3.8	69.6	59.8	G/CT	F/CT	NT	NT	HWY/MT/VEG/OA	1017 DRM FROM 66 KM AND LESS
4	4/4/18 2041	AMRAH NH-19	102	84.8	75.7	G	G	E 12	NT	65.9	58.8	F	F	NT	NT	HWY/HT/LRB/VEG	
5	4/4/18	BARDHMAN TOWN	106	85.5	75.5	VG	G	NT	NT	68.4	59.6	F	F	NT	NT	HT/HRB/POP/MARKET	
6	4/4/18 1925	GT ROAD NH-19	120	83.5	73.5	VG	VG	E 12	NT	64.4	59.6	G	G/F	NT	NT	HWY/HT/OA/VEG	
7	4/4/18 1130	PANAGARH BYPASS	150	80.6	70.5	VG	VG	E 11-12	NT	60	50	G	G	NT	NT	HWY/MT/OA/VEG	
8	4/4/18	DURGAPUR	165	74.7	62.3	VG	VG	BREAKS 11-13	NT	53.4	49.8	G	G	NT	NT	MRB/POP/VEG	
9	4/4/18 1130	KAJORA RANIGANJ	180	71.5	61.7	VG	VG	NT	NT	60.0	50.6	G	G	NT	NT	OA/COAL FIELDS	INDUSTRIAL
10	4/4/18 1323	NIRSA JHARKHAND	220	65.9	55.4	G	G	NT	NT	42.5	38	P	P	NT	NT	HWY/MT/VEG/OA	
11	4/4/18	BAGSUMA DHANBAD	240	59.5	49.8	G	F	NT	NT	---	---	---	---	NT	NT	HWY/MT/VEG/OA /LRB	

LEGENDS: 1. HRB- High rise buildings 2. LRB- Low rise buildings 3. OA- Open area 4. HT- High traffic 5. MT- Moderate traffic 6. LT- Low traffic 7. POP- Dense population 8. XFMR- Nearby transformer 9. VILL- Village area 10. HWY- National Highways 11. LWR- Low width road 12. E- Excellent 13. VG- Very Good 14. G- Good 15. F- Fair 16. P- Poor 17. VEG- Vegetation