



*Reception Survey of 100kW  
MW AM-DRM Transmitter  
of Patna in Simulcast mode*

***Reception Survey of  
100kW MW AM-  
DRM  
Transmitter of Patna  
in Simulcast  
Mode***

***(Survey Period: 3/5/18 to 17/5/18)***

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**Report No. RD/2017/948**

**Section : Propagation Lab**

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## Basic Data and Transmitter details

### Transmitter Details:

- |   |   |  |
|---|---|--|
| 1. Name of Station                                | : | AIR-Patna  |
| 2. Location of the Transmitters                   | : | LAT: N 25.53302°<br>LON: E 85.28419°<br>Ht. above MSL-37 Meter |
| 3. Description of terrain around the Transmitters | : | Rural with presence of vegetation                              |
| Traffic   | : | Moderate   |
| 4. Classification(Large city/urban/rural)         | : | Urban  |
| 5. Rated power of the Transmitter                 | : | 100KW  |
| 6. Reflected Power                                | : | <b>0.66 KW</b>   |
| 7. DRM power back off ratio                       | : | 16 dB  |
| 8. Make   | : | Nautel   |
| 9. Model No.                                      | : | NX-100   |
| 10.Frequency of operation-AM                      | : | 621 KHz  |
| 11.Frequency of operation-DRM                     | : | 630 KHz  |
| 12.Date of Commissioning                          | : | 25-6-15  |

:

### Transmitting Antenna Details:

- |                           |   |                                       |
|---------------------------|---|---------------------------------------|
| 1. Type of Antenna        | : | Vertical mast, Omni-directional       |
| 2. Height of Tower        | : | 122 Meter                             |
| 3. Type of Polarization   | : | Vertical                              |
| 4. Feeder Impedance       | : | 120 ohm                               |
| 5. Impedance of TX output | : | <b>57.2+j -1.4 ohm (As on 4/5/18)</b> |

## 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-Patna for the purpose of obtaining coverage with the following configurations:

1. In Simulcast mode during normal transmission periods.
2. 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 Fatuha in (N 25.53302° E 85.28419°) Patna district. 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 Patna AM-DRM transmitter is very central in the state of Bihar, and suitable radials in eight different directions were clearly identified for the purpose of survey.

DRM frequency	(Fc+9) kHz i.e., 630 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-9.

#### 5. DATA ANALYSIS (SIMULCAST)

##### 5.1 North- (Table-1)(Map-1)

The survey started with the GPS marking of the radiating tower of HPT Patna. Initially we took measurements at an interval of 10 kilometers (L.O.S.) and increased it up to 20 kilometers or more 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 digital signal, a professional DRM 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. The North route from transmitting antenna goes up to Indo-Nepal international borders near Sitamarhi town of Bihar. The total radial distance was 148 Km.



Map-1

As terrain profile is very normal and land is fertile due to good level of water table, the field strength observed was 68db $\mu$ V/m. However due to various noise sources and other border related factors, the observed quality of analogue signal on Sony as well as on Philips portable radio was poor. Digital signal was not available at this point. The audio analogue quality at Muzaffarpur was good with audible noise etc. It may be due to external noise source in town areas.

## 5.2 North-East Direction (Table-2) (Map-2)



Map-2

This route is also going up to Indo-Nepal borders near Khutona via Darbhanga, Jhanjharpur and Phulparas towns of Bihar. The radial distance at Khutona was 155 Kilo meters. The field strength of analogue signal was 67db $\mu$ V/m with poor reception on portable radios. In Darbhanga town, the audio quality was VG on both Sony and Philips radio. Digital signal in simulcast was not available at this point. The terrain profile is very normal with terrain irregularity of 30 meters only. The digital (DRM) signal in this direction was available up to the radial distance of 51 Km only.

### 5.3 East (Table-3)(Map-3)

The Patna AIR-HPT lies near Ganga river banks and the East route goes parallel to the course of Ganga River. This route goes up to Bhagalpur town of Bihar. The ITU defined minimum field strength level was available up to Fulwaria on NH-31. The analogue reception was fair. Digital reception was available up to 75 kilo meters. The analogue quality in Begusarai town was good in Philips radio.



Map-3

### 5.4 South-East (Table-4)(Map-4 & 4A)

Important towns like Biharsharif, Jamui and Shaikhpura lies in this route. The minimum required field strength of 63db $\mu$ V/m was available at radial distance of 156 Km.



Map-4

In Biharsharif town, which is just 42 Km away from transmitter, the quality of analogue reception was very good. Digital signal was also decoded properly without the loss of audio packets. In Shaikhpura town which is 72 Km away (Radial), the analogue quality was good in both the receivers. Digital signal was not received at this location. The terrain in this direction is a mix of farm land and



rocky surface. The terrain map of Jamui area clearly shows the rocky elevation in this route.



Jamui Area (Map-4A)

Due to such terrain, the reception coverage in this route is reduced if compared with East direction.

### 5.5 South (Table-5)(Map-5)

The terrain in south Bihar is again mix of rocky surface and farm land. Certain areas in this direction lie in Jharkhand state of India.



Map-5

The coverage in this direction was further reduced compared to South-East direction. The field strength value of 60dB $\mu$ V/m was observed at an aerial distance of 125 Kilo meters only. Audio reception in analogue mode was fair for Sony as well as Philips radios. In historic town of Bodh Gaya, the field strength of analogue signal was 90dB $\mu$ V/m only. Reception quality was very good at this location. The terrain is flat up to radial distance of 110 to 120 Km and elevation increases to more than 400 meters beyond this point. The digital signal was available up to 50 Km with clear audio and up to 75 Km with regular drops in simulcast mode. At radial distance of 150 Km, the field strength

was 59db $\mu$ V/m with fair reception in radios.

### 5.6 South-West (Table-6)(Map-6)

Aurangabad is the major town in this direction. It is 175 Km away (Radial) from HPT-Patna. Up to the radial distance of 150 Km, the terrain is good for medium wave signal propagation. From this location up to Garhwa Road, the terrain is rocky with irregular elevation rising up to 341 meters.



Map-6

The analogue coverage as per ITU plan was observed up to the radial distance of 200 Kilo meters. The digital signal was available up to the 50 Km radial distance from transmitting antenna.

### 5.7 West (Table-7)(Map-7)

This route is very similar to East route as route lies parallel to Ganga River. Arrah, Buxar, Ghazipur and Varanasi are the major urban settlements in this route. The coverage in this route was up to Chaubeypur near Varanasi, which is 220 Km away from transmitting antenna of AIR-Patna.



Map-7

The terrain profile is very normal with terrain irregularity of 25 meters only. The subjective audio quality in analogue was good to fare at Chaubeypur. The digital reception was available in this direction was up to the radial distance of 100 Km only. In Ghazipur town, the subjective analogue audio reception was very good in Sony as well as Philips portable radios. Similar was the case in Buxar town of Bihar.

### 5.8 North-West (Table-8)(Map-8)



Map-8

Chapra, Gopalganj and Gorakhpur are the major towns in this route. The analogue audio reception in Chapra town was poor with field strength of 83dB $\mu$ V/m. It may be due to very high level of external noise in the town areas. In Gopalganj town, audio analogue reception was very good on Sony and good on Philips radio. The field strength near Air Force area in Gorakhpur was 61dB $\mu$ V/m with good to poor reception in portable radios. The terrain profile is normal with 25 to 35 meters of terrain irregularity.

## 6. Data analysis Full DRM

Due to some audio routing problem from DRM modulator and content server, full DRM operation was not working at the station during the survey period.

## 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-10)

Direction from AIR Tx Patna	LOS Distance from Tx (KM)	
	Analogue 63dB $\mu$ V/ m	DRM Excellent Audio on DT 700 Professional Receiver
NORTH	148	50
NORTH-EAST	155	51
EAST	210	75
SOUTH-EAST	156	45
SOUTH	125	50
SOUTH-WEST	200	49
WEST	220	100
NORTH-WEST	230	50

## 9. Carrier Impedance and major breakdown

Major break down occurred at transmitter during survey period. High voltage ceramic disc capacitor were found burst in output section of Nautel 100 KW. The main reason of such breakdown was traced to the high carrier impedance as seen from transmitter side. In this case, the carrier impedance was  $57.1 \Omega + j5.8$ . The total reflected power was 0.65 KW. During check up of ATU and feeder line, it was observed that entire feeder line requires re-alignment for obtaining equal and correct impedance.

The ATU room was also inspected for irregularity. It was found that copper screening plate near exhaust fan is oozing out molten copper. Droplets of copper found scattered below the wall of ATU room. This may be due to open electrical earthing. It also requires proper checking of all screening components.



Carrier Impedance



Molten copper

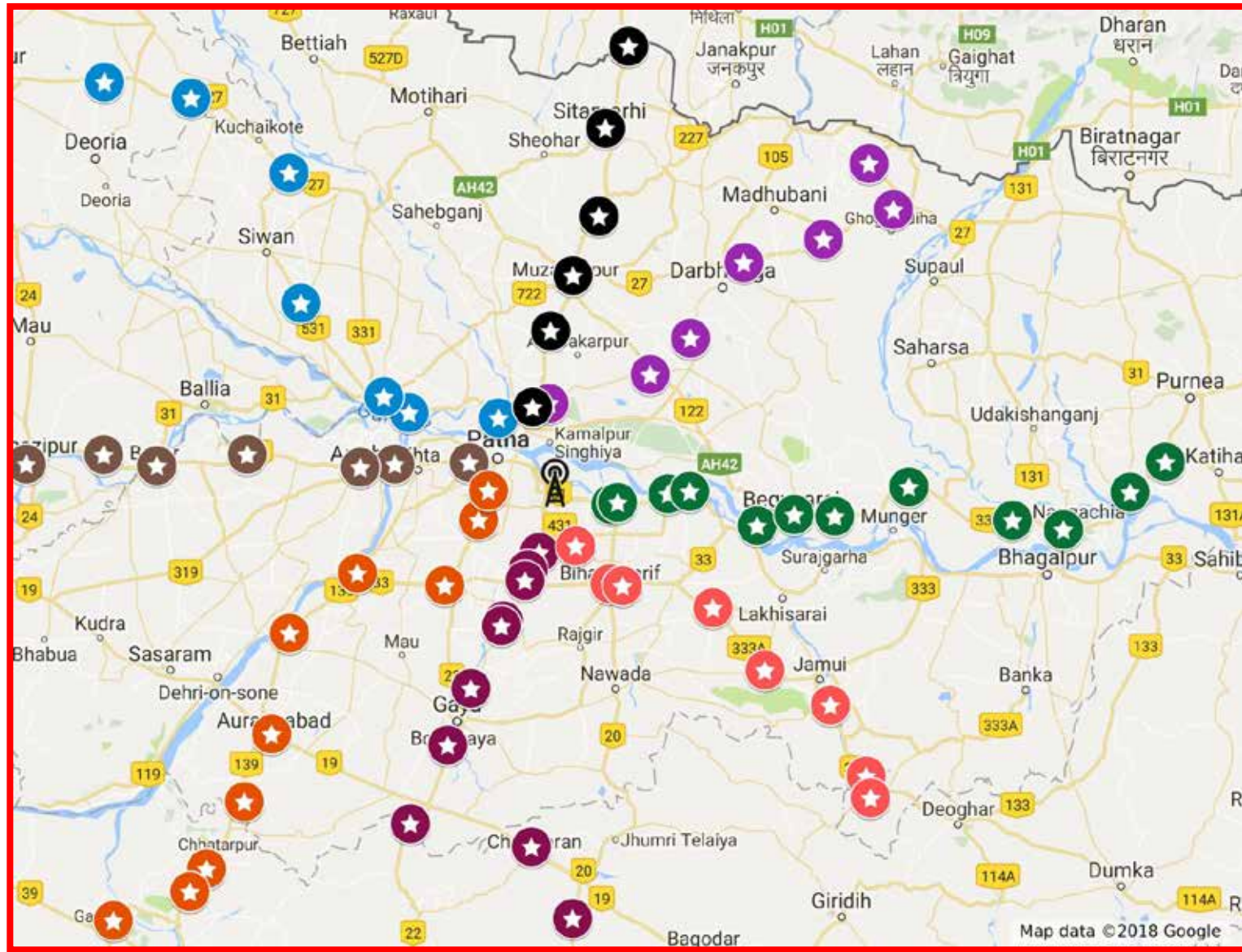
As ceramic disc capacitors were not available at Patna AIR centre, same was obtained from Kolkata-B transmitting station. It is recommended to provide critical spares at station itself. This will save precious break down time when required.

## 10. 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 Patna. We would also like to thank Mr. S M T Alam, DE of Zonal office and Mr. P K Thakur, DE of AIR Patna for providing logistics well in time. We would like to extend our special thanks to Mr. Imteyaz Ahmed, AE and Mr. Ajeet Kumar, EA for technical as well as non-technical help in the survey.

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Survey locations of 100 KW AM-DRM TRANSMITTER OF AIR PATNA  
MAP-9



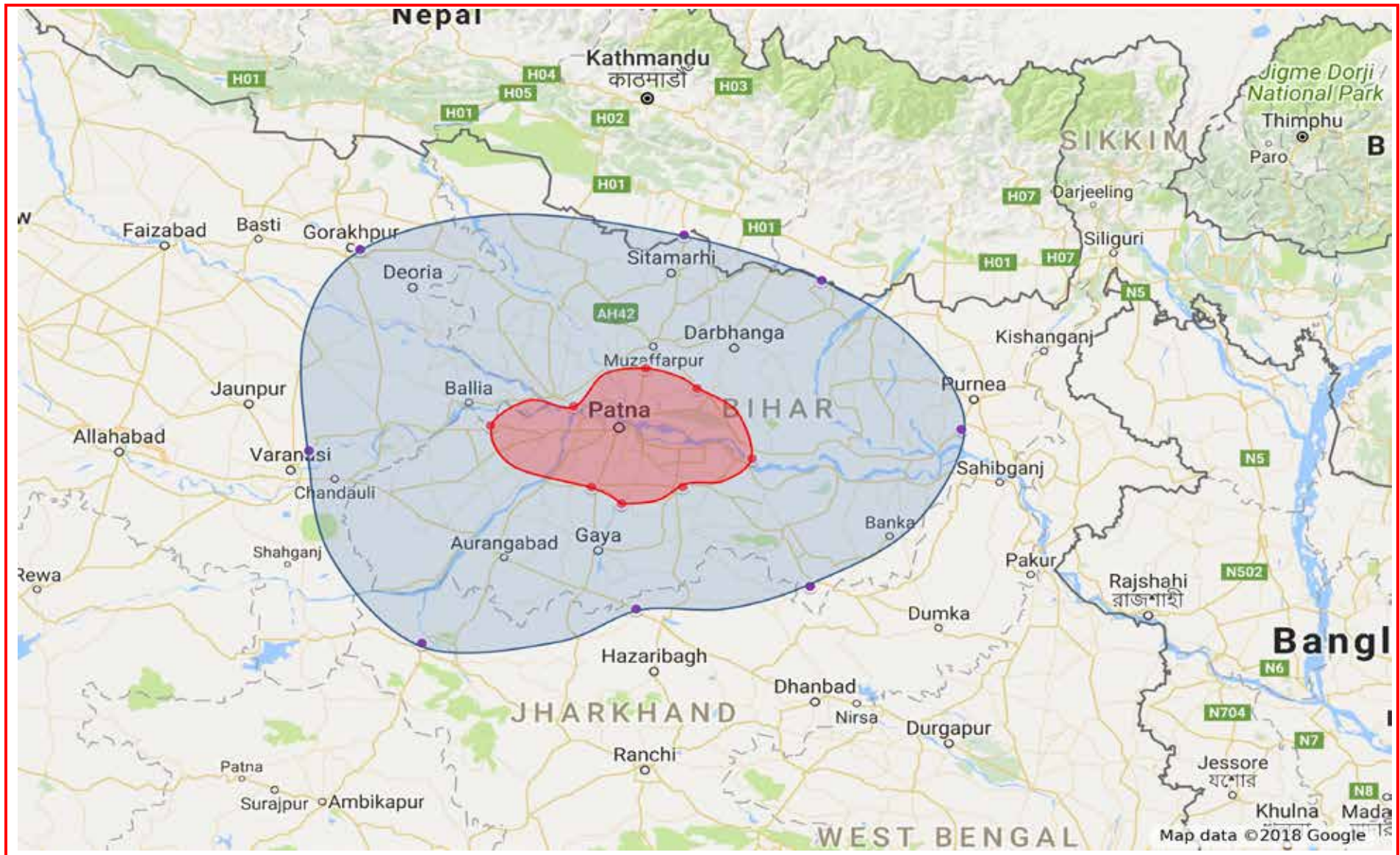


Table No.1

## Reception Survey of 100kW AIR (MW), AM-DRM Transmitter-Patna (621 KHz) in Simulcast transmission mode (16dB↓)

Direction: North

Route: Ganga Bridge-Muzaffarpur-Sitamarhi-Sonbarsa

Date: 8/05/2018

	Time	Spot/Location	Radial Distance (km)	Field Strength ( dB $\mu$ V/m)		MER (dB)		Subjective Quality				Terrain	Remark& SNR in dB
				Analog 621 KHz	Digital 630 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1000	EKARA, MUZAFFARPUR RD NH-22	25	104	88	18	12	E	E	VG	VG	HWY/OA/MT	
2.	1100	KURHANI NH-22	50	94	82	16	7	E	NT	VG	VG	OA/HWY/VEG	
3.	2120	ZERO MILE MUZAFFARPUR	70	85.3	63.7	0	0	NT	NT	G	G	MRB/HT/POP	
4.	2040	BEFORE RUNNI SAIDPUR	90	79.2	61.8	0	0	NT	NT	G	G	MRB/HT/POP	
5.	1530	MEHSAUL CHOWK SITAMARHI	120	78	68	8	0	NT	NT	G	G	POP/LWR/MRB	
6.	1750	SONBARSA BUS STOP	148	69.1	58.4	0	0	NT	NT	P	P	OA/LRB/LT	
7.	1640	NEPAL BORDER SONBARSA	148	68.5	65.5	0	0	NT	NT	P	P	OA/LRB/LT	International Borders

**Terrain Legends:** 1.LRB-Low rise building, 2.HRB-High rise building, 3.OA-Open areas or fields 4.HWY-National Highways 5. POP-High density population 6.HT-High Traffic 7.MT-Moderate traffic 8.LT-Low Traffic 9.Veg-Thick Vegetations 10. MKT-Market areas. 11. NT-Not Traceable 12. VG- Very Good 13. G- Good 14. F- Fair 15. P- Poor 16.LWR- Low Width Road



Table No.2

## Reception Survey of 100kW AIR (MW), AM-DRM Transmitter-Patna (621 KHz) in Simulcast transmission mode (16dB↓)

Direction: North East

Route: Ganga Bridge-Tajpur-Darbhanga-Nepal Border

Date: 13/05/2018

	Time	Spot/Location	Radial Distance (km)	Field Strength (dBμV/m)		MER (dB)		Subjective Quality				Terrain	Remark SNR in dB
				Analog 621 KHz	Digital 630 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1120	MAHUA ROAD	25	103	74	12	11	E	E	VG	VG	VEG/MT/LRB	
2.	1225	TAJPUR	50.9	94.4	64.2	13	5	E	NT	VG	VG	LRB/VEG	
3.	1325	KALYANPUR PS SH-50	80	82	70	0	0	NT	NT	VG	VG	OA/VEG/LRB	
4.	1425	DARBHANGA NH-27	100	80	69	0	0	NT	NT	VG	VG	OA/VEG/HWY	
5.	1600	BEFORE JHANJHARPUR NH-27	125	78	66	0	0	NT	NT	VG	VG	OA/VEG/HWY	
6.	1720	BEFORE PHULPARAS	150	74	52.5	0	0	NT	NT	VG	G	HWY/OA/MT	
7.	1805	KHUTONA NEPAL BORDER	155	67	---	0	0	NT	NT	F	F	LRB/OA	CRACKINGS

**Terrain Legends:** 1.LRB-Low rise building, 2.HRB-High rise building, 3.OA-Open areas or fields 4.HWY-National Highways 5. POP-High density population 6.HT-High Traffic 7.MT-Moderate traffic 8.LT-Low Traffic 9.Veg-Thick Vegetations 10. MKT-Market areas. 11. NT-Not Traceable 12. VG- Very Good 13. G- Good 14. F- Fair 15. P- Poor 16.LWR- Low Width Road

Table No.3

## Reception Survey of 100kW AIR (MW), AM-DRM Transmitter-Patna (621 KHz) in Simulcast transmission mode (16dB↓)

Direction: East

Route: Patna-Bakhtiarpur-Begusarai-Naugachia

Date: 7/05/2018

	Time	Spot/Location	Radial Distance (km)	Field Strength (dBμV/m)		MER (dB)		Subjective Quality				Terrain	Remark SNR in dB
				Analog 621 KHz	Digital 630 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	0900	NH-31	25	101.6	72	28	<u>17-20</u>	E	E	VG	VG	OA/HWY/MT	REFLECTED POWER- 600W
2.	0915	BAKHTIARPUR TOWN	27	99.4	69	29	3	E	NT	VG	VG	LRB/MT/VEG/POP	RF POWER- 90 TO 100 KILOWATT
3.	1005	BARH TOWN	43.4	95.7	68	14	0	E	NT	VG	VG	LT/POP/LRB	
4.	1030	PUNDARAKH NH-31	50	90	67.1	13	0	E	NT	VG	VG	OA/MT/VEG	
5.	1145	RAJENDRA BRIDGE RAILWAY STATION	75	89.9	67.3	<u>13</u>	0	E	NT	VG	VG	OA/HWY/HT/POWER PLANT	
6.	1310	BEGUSARAI	86.7	82.3	59.9	0	0	NT	NT	VG	G	HWY/POP/MRB/ <b>INDUSTRIAL AREA</b>	
7.	1345	SADANAND PUR NH-31	100	82.7	60.3	0	0	NT	NT	VG	G	HT/VEG/OA/LRB	
8.	1513	NEAR KHAGARIA NH-31	125	79.9	56.7	0	0	NT	NT	VG	VG	HWY/MT/VEG	
9.	1710	NH-333B BEFORE BIHPUR	161	75.9	55.2	0	0	NT	NT	G	G	HWY/VEG/OA/MT	
10.	1740	TOLL PLAZA NAUGACHIYA	178	73.7	52.6	0	0	NT	NT	G	G	HWY/VEG/MT	
11.	1840	SAMELI AFTER KURSELA	200	68	50	0	0	NT	NT	F	F	HWY/OA/HT	
12.	1900	FULWARIA NH-31	210	<u>64</u>	55	0	0	NT	NT	F	F	HWY/OA/MT	

**Terrain Legends:** 1.LRB-Low rise building, 2.HRB-High rise building, 3.OA-Open areas or fields 4.HWY-National Highways 5. POP-High density population 6.HT-High Traffic 7.MT-Moderate traffic 8.LT-Low Traffic 9.Veg-Thick Vegetations 10. MKT-Market areas. 11. NT-Not Traceable 12. VG- Very Good 13. G- Good 14. F- Fair 15. P- Poor 16.LWR- Low Width Road

Table No.4

## Reception Survey of 100kW AIR (MW), AM-DRM Transmitter-Patna (621 KHz) in Simulcast transmission mode (16dB↓)

Direction: South East

Route: PATNA-BIHARSHARIF-SHAIKHPURA-JAMUI-CHAKAI

Date: 12/05/2018

Serial number	Time	Spot/Location	Radial Distance (km)	Field Strength (dBμV/m)		MER (dB)		Subjective Quality				Terrain	Remark
				Analog 621 KHz	Digital 630 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Phillips Analogue		
1.	1210	CHANDI NH 431-78 XING	25.5	104.4	81.5	19	4-12	E	BREAKS	VG	VG	MRB/MT/POP	
2.	1330	BIHAR SHARIF TOWN	42.5	99.4	75.8	14	0-3	E	NT	VG	VG	HRB/MT/POP	
3.	1405	OUTSKIRTS OF BIHARSHARIF	45.5	99.1	76.5	16	0-4	E	NT	VG	VG	OA/VEG/LT	
4.	1520	SHAIKHPURA TOWN	72.85	88.6	66.2	4	0	NT	NT	G	G	HILLOCK/MT/MRB/POP	
5.	1650	SIKANDRA NH-333A	100	90.4	67.9	0	0	NT	NT	VG	G	LRB/OA/LT/HILLOCK	
6.	1945	NEAR JAMUI	125	70	57	0	0	NT	NT	F	F	HILLOCKS/MT/LRB	
7.	1815	NEAR SBI KHANDAICH NH-333	150	74-77	58	0	0	NT	NT	VG	G	FOREST/MT/HILLOCK	
8.	1840	CHAKAI X-ING	156	54-70 (64)	52	0	0	NT	NT	F	F	MT/OA/VEG/VALLEY	

**Terrain Legends:** 1.LRB-Low rise building, 2.HRB-High rise building, 3.OA-Open areas or fields 4.HWY-National Highways 5. POP-High density population 6.HT-High Traffic 7.MT-Moderate traffic 8.LT-Low Traffic 9.Veg-Thick Vegetations 10. MKT-Market areas. 11. NT-Not Traceable 12. VG- Very Good 13. G- Good 14. F- Fair 15. P- Poor 16.LWR- Low Width Road

Table No.5

## Reception Survey of 100 kW AIR (MW), AM-DRM Transmitter (Patna) 621 KHz in Simulcast Transmission Mode (16 dB↓)

Direction: South

Route: Patna-Hilsa -Islampur-Gaya-Hazaribagh Road

Date: 15/05/2018

	Time	Spot/Location	Radial Distance (km)	Field Strength ( dB $\mu$ V/m)		MER (dB)		Subjective Quality				Terrain	Remark SNR in dB
				Analog 621 KHz	Digital 630 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1305	NEAR HILSA	25	103.1	80	19	22-23	E	E	VG	VG	VEG/LT/POP	
2.	1320	HILSA-EKANGAR SARAI ROAD	30	---	---	28	22-25	E	E	---	---	VEG/LT/OA	LOCATION VARIATION
3.	1325	----DO----	35	---	---	22	13-17	E	E	---	---	----DO----	---DO---
4.	1510	ISLAMPUR-GAYA ROAD	50	95	72	<u>23</u>	<u>11-17</u>	E	E	VG	VG	OA/LT	
5.	1520	HULASGANJ PS	51.7	85	---	---	---	---	---	VG	VG	LRB/POP/LT	MANMADE NOISE
6.	1600	DELHA	75	80	66	3-4	9-15	NT	BREAKS	VG	VG	VILLAGE/LT/OA	
7.	1800	BODH GAYA	96	89.9	66.7	7-9	0	NT	NT	VG	VG	VEG/LT/MRB/POP/RIVER SIDE	
8.	1845	GT ROAD NH-19	125	<u>60</u>	50	0	0	NT	NT	G	G	HILLOCK/VEG/MT	
9.	1925	HAZARIBAGH ROAD	150	59	47	0	0	NT	NT	F	F	HILLOCK/VEG/MT	

**Terrain Legends:** 1.LRB-Low rise building, 2.HRB-High rise building, 3.OA-Open areas or fields 4.HWY-National Highways 5. POP-High density population 6.HT-High Traffic 7.MT-Moderate traffic 8.LT-Low Traffic 9.Veg-Thick Vegetations 10. MKT-Market areas. 11. NT-Not Traceable 12. VG- Very Good 13. G- Good 14. F- Fair 15. P- Poor 16.LWR- Low Width Road

Table No.6

## Reception Survey of 100 kW AIR (MW), AM-DRM Transmitter (Patna) 621 KHz in Simulcast Transmission Mode (16 dB↓)

Direction: South- West

Route: Patna-Jahanabad-Aurangabad-Daltonganj

Date 14/05/2018

Sr No.	Time	Spot/Location	Radial Distance (km)	Field Strength (dB $\mu$ V/m)		MER (dB)		Subjective Quality				Terrain	Remark
				Analog 621 KHz	Digital 630 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	2345	NADWAN	25	100.8	78.9	15	11	E	E	VG	VG	OA/LRB/LT	
2.	2215	OUTSKIRTS JAHANABAD	48.8	97	74.7	13	0-3	E	NT	VG	VG	OA/VEG	
3.	2120	ARWAL	70	78	64	7-8	0-4	NT	NT	VG	VG	POP/MT/MRB/OA	
4.	2030	DAUDNAGAR	100	80	65	5-6	0	NT	NT	VG	VG	HWY/OA/MT	
5.	1500	HARIHARGANJ	150	84.5	61.3	0	0	NT	NT	VG	VG	MRB/HT/POP	
6.	1615	AURANGABAD-DALTONGANJ ROAD	175	78.5	59.1	0	0	NT	NT	G	G	HILLY/OA/VEG/LT/HWY	
7.	1725	-----DO-----	185	73	52	0	0	NT	NT	G	F	----DO----	
8.	1630	GARHWA ROAD	200	61	48	0	0	NT	NT	G	F	HILLY/VEG/MT/HWY	

**Terrain Legends:** 1.LRB-Low rise building, 2.HRB-High rise building, 3.OA-Open areas or fields 4.HWY-National Highways 5. POP-High density population 6.HT-High Traffic 7.MT-Moderate traffic 8.LT-Low Traffic 9.Veg-Thick Vegetations 10. MKT-Market areas. 11. NT-Not Traceable 12. VG- Very Good 13. G- Good 14. F- Fair 15. P- Poor 16.LWR- Low Width Road

Table No.7

## Reception Survey of 100 kW AIR (MW), AM-DRM Transmitter-Patna (621 KHz) in Simulcast Transmission Mode (16 dB↓)

Direction: West

Route: Patna-Danapur-Arrah-Buxar-Ghazipur-Varanasi

Date: 9/05/2018

Sr. No.	Time	Spot/Location	Radial Distance (km)	Field Strength ( dB $\mu$ V/m)		MER (dB)		Subjective Quality				Terrain	Remark SNR in dB
				Analog 621 KHz	Digital 630 KHz	DT-700 Professional	Avion Commercial	DT 700 Digital	Avion Digital	Sony Analogue	Philips Analogue		
1.	1000	DANAPUR RAILWAY STATION	25	102	73	18	16	E	E	VG	VG	HT/LRB/OA	
2.	1100	KOILWAR	50	88	65	14	3-7	E	NT	VG	VG	HT/VEG/LRB	
3.	1120	ARRAH TOWN	62	78	61	12	0	E	NT	VG	VG	POP/HT/MRB	
4.	1220	ARRAH-BUXAR ROAD	100	81	60	12	0	E	NT	VG	VG	OA/HT/LRB	
5.	1400	BUXAR	130	83	62	0	0	NT	NT	VG	VG	OA/HT/MRB/POP	
6.	1510	MOHAMMADABAD DISTT-GHAZIPUR	150	82.4	60	0	0	NT	NT	VG	VG	OA/VEG/VILLAGE	
7.	1605	GHAZIPUR TOWN	175	80	57	0	0	NT	NT	VG	VG	LRB/LT/POP/VEG	
8.	1715	NH-31 VARANASI ROAD	203	78.8	55	0	0	NT	NT	G	F	HWY/LRB/OA	
9.	1855	NH-31 BEFORE CHAUBEYPUR	215	73	52	0	0	NT	NT	VG	G	OA/HWY/LT	
10.	1850	CHAUBEYPUR	220	65	50	0	0	NT	NT	G	F	POP/VEG/MT/TOWN	

**Terrain Legends:** 1.LRB-Low rise building, 2.HRB-High rise building, 3.OA-Open areas or fields 4.HWY-National Highways 5. POP-High density population 6.HT-High Traffic 7.MT-Moderate traffic 8.LT-Low Traffic 9.Veg-Thick Vegetations 10. MKT-Market areas. 11. NT-Not Traceable 12. VG- Very Good 13. G- Good 14. F- Fair 15. P- Poor 16.LWR- Low Width Road

Table No.8 Reception

## Survey of 100 kW AIR (MW), AM-DRM Transmitter -Patna (621 KHz) in Simulcast Transmission Mode (16 dB↓)

Direction: North –West

Route: Patna-Chapra-Siwan-Gorakhpur

Date:11/5/18

Sr. No	Time	Spot/Location	Radial Distance (km)	Field Strength (dBμV/m)		MER (dB)		Subjective Quality				Terrain	Remark SNR in dB
				Analog621 KHz	Digital630 KHz	DT-Professional	AvionCommercial	DT 700Digital	AvionDigital	SonyAnalogue	PhilipsAnalogue		
1.	1010	BAKARPUR NH-31	24.9	103	81	24	22	E	E	VG	VG	OA/MT/LRB/VEG	
2.	1145	DORIGANJ	50	91.8	69	23	12-14	E	E	VG	VG	OA/MT/LRB/VEG	
3.	1230	CHAPRA TOWN	59.9	83	70.9	0	0	NT	NT	P	P	MRB/HT/POP	VERY HIGH LEVEL OF INDUSTRIAL NOISE
4.	1410	CHAPRA-GOPALGANJ ROAD	101	85.1	62.3	0	0	NT	NT	G	G	VEG/LT/OA	
5.	1620	GOPALGANJ	133	78.7	55.5	0	0	NT	NT	VG	G	MT/LRB/POP.VEG	
6.	1715	PATHERIA NH-27	175	69	54	0	0	NT	NT	VG	G	MT/LRB/OA	
7.	1800	TOLL PLAZA NH-27 GORAKHPUR ROAD	199	66.7	48.2	0	0	NT	NT	G	P	HT/OA/VEG	
8.	1825	AIRFORCE AREA GORAKHPUR	230	61	46	0	0	NT	NT	G	P	VEG/LRB/MT	

**Terrain Legends:** 1.LRB-Low rise building, 2.HRB-High rise building, 3.OA-Open areas or fields 4.HWY-National Highways 5. POP-High density population 6.HT-High Traffic 7.MT-Moderate traffic 8.LT-Low Traffic 9.Veg-Thick Vegetations 10. MKT-Market areas. 11. NT-Not Traceable 12. VG- Very Good 13. G- Good 14. F- Fair 15. P- Poor 16.LWR- Low Width Road

TABLE-9

ANALOGUE FIELD STRENGTH AT 1 KM DISTANCE FROM TRANSMITTING ANTENNA OF  
100 KW AM-DRM TRANSMITTER OF AIR PATNA

Direction From Antenna	FIELD STRENGTH IN dB $\mu$ V/m	Remarks
North-East	130.6	Open areas, river side
East	127.0	Open areas
South-East	121.1	Low rise buildings
Towards South	124.8	Near railway line
South-West	123.8	Open areas
Other areas could not be done due to water logging		