

RECEPTION PROFILE ANALYSIS FOR NIGERIA TELEVISION AUTHORITY STATIONS (NTAS) ENUGU AND AWKA SOUTH-EAST NIGERIA

C.O. Ohaneme, V.E. Idigo, A.C.O. Azubogu and Akpado, K.A.

Department of Electronic and Computer Engineering, Nnamdi Azikiwe University Awka

Abstract

Non-reception of signals from Nigeria Television Authority (NTA) stations is the inability of the transmitted signals from these stations to reach their target areas. A lot of problems causing these non-receptions are enumerated and transmitter metering results for three months in these two stations were collected and analyzed. Also, signal strengths of the transmitted signals are measured from selected sites to ascertain the strength of the signal transmitted from these stations in these selected sites. This paper also suggests various ways of solving these problems which if adequately adhered to will ensure proper reception of these stations in their catchment areas.

Keywords: *Non-reception, line of sight, television broadcasting, NTA Enugu, NTA Awka, Effective Radiated Power (ERP)*

1.0 Introduction

The ultimate aim of every television transmitting station is to disseminate their programmes to their respective teeming viewers throughout their catchment areas. Once the signals are transmitted, it is the expectation of the station that its viewers receive the signals loud and clear. Unfortunately, there is a tendency that these transmitted signals could be received by some while other viewers within these catchment areas may not be able to receive the signals at all. Hence, this research work is on the problem of non-reception of the NTA stations: Channel 8 Enugu and Channel 5 Awka in the vast areas of Enugu, Ebonyi, Abia, Imo, Delta, Anambra and Rivers states of Nigeria. In most part of Enugu state and Anambra state, the reception of NTA Enugu and NTA Awka are superb. The quality of the TV pictures and sound were so nice that a large number of homes hook up to the stations all through the day. However, people residing in some remote areas of these states together with the rest of the people in most parts of Enugu, Anambra, Abia, Imo, Ebonyi, Delta and Benue states were not fortunate to view programmes from these NTA stations due to absence of the signals in these states. In fact, none of these locations is situated at a distance of

up to 250km radius from the transmitting stations in Enugu and Awka. Results obtained from various site survey of the areas surrounding the existing stations revealed that many people in the neighboring states desire to have additional remote stations of NTA to hook up to. This is because people around these areas of non-reception are no longer satisfied with the centralization of these NTA stations where they cannot receive the transmitted signals. Hence, this paper tends to investigate on the problems of non-reception of these NTA stations in their catchment areas with a view to suggesting various ways to overcome these problems.

The analyses of this paper is begun by first appraising the NTA channel 8 and channel 5 transmitter antennas on top of hills at Abor in Enugu State and Enugwu-Agidi near Awka in Anambra state respectively. The metering charts for a period of three months were obtained and analyzed to determine the actual average transmitter output power. Based on this, the Effective Radiated Power (ERP) of the transmitters are determined from the measurement done at the transmitting station. Also the actual height of the transmitting antenna was recorded.

Secondly, specific sites were systematically selected up to an average distance of 200km radius from the transmitter in eight cardinal points of direction. The strength of the TV signals-radio frequency fields were measured at these sites using the radio field strength meter previously done by the station because of lack of the radio field strength in these stations. The results of the measurement, i.e., signal strength against distance are plotted.

Finally from all these, some findings were made as per the reasons for non-reception problem of these NTA stations in some vital areas. Also, suggestions were advanced as to how to remedy the situation.

2.0 Reception Profile for NTA Channels 8 and 5

This is a survey analysis meant to establish reasons for non-reception, by residents of some neighboring towns and states of NTA channel 8 Enugu and neighboring towns and states of NTA channel 5 Awka Nigeria. In appraising the NTA Channels 8 and 5 transmitter performance, the measurements were carried out to determine:

- The actual output power of the transmitter installed
- The actual gain of antenna in use
- The total height of the transmitting antenna
- The peak synchronous output power of the transmitter by analyzing the available transmitter-metering chart for the period of three (3) months.
- The Effective Radiated Power (ERP).

The output power of the transmitter and its peak synchronous output are as shown in tables 1 and 2.

However, there are certain factors that should be taken into consideration when siting a TV station. Most importantly among several of these factors is the topography of the area. When TV stations are built in the area where mountains/hills, tall trees and high rise buildings, their

receivers at some distances away from the transmitter will not receive very clear signals because these topographical features will form blockages to the signals transmitted. It is therefore advisable that TV station transmitters be installed on the highest hill around the area or a very tall antenna mast will be installed to provide highest altitude for the transmitting antenna. Secondly, the effect of trees, high rise mountains/hills and building structures on the transmitted signal apart from poor reception is the production of multiple images called "Ghosting" which is always displayed on the screen at the right hand side of the main image. This makes the video image to be blurred and unacceptable. These multiple images are due to reflections of the transmitted signals from the high lands, tall buildings and trees which arrive some fractions of a second later than the direct signals from the transmitter antenna. Many structures can reflect TV signals much like they reflect light. This can result to TV receiver seeing more ghost images when a TV signal arrives at the receiver via more than one path. If ghosting is caused by single structure that creates one distinct ghost image, a medium or large multidirectional antenna may be useful with careful signal. However, the antenna may require different positioning for each channel [1]. Directional antennas are the most ghost resistant antennas available since they see in only in one direction and have the tendency of not seeing the reflected ghost signal. Many factors such as the structure total surface area, the direction it faces and neighborhood terrain will influence how much effect the structure will have on TV reception.

Poor TV signal can often be caused by transmission lines which sometimes are neglected. These include wire pairs, microwave; free space and cables that carries the signal between the transmitter and the antenna. Transmission lines deteriorate with age. So if the transmission line is worm-out, the signal being sent out

looks snowy at the receiver end and ghost image signal may occur even if the antenna is brand new. In TV station, if a new transmission line is to be installed, it is important to select a quality cable to minimize signal loss. Before now, round coaxial cables and flat twin lead cable were being deployed as transmission line to carry information. But recent developmental research shows that microwave microstripe and stripe transmission lines provide most acceptable medium of transmission between the transmitter and its transmitting antenna. Minimal signal losses are experienced by the microwave transmission line [2]. Though the twin lead cable and coaxial cable are cheaper, the signal transmitted within them deteriorates faster and more susceptible to interference. Microwave transmission lines are preferable as they provide reliable signals at the receiver because of low losses that are attributed to them. However, all transmission lines should be free from splices and sharp bends.

Reception problems in most times can be attributed to low signal strength which causes major problems of non-reception. This kind of problem really occurs only in about 15%-20% of cases while the remaining 80%-85% are due to other factors like signal overloads, electromagnetic interference and ghosting. With this common cause of non-reception, boosting the signal strength with a masthead amplifier can easily make the problem worse as the amplifier will in addition amplify the interfering signals. In this case higher gain antenna is required to improve the quality of the received signals. Besides, if signals from a TV station are too weak for good reception, it can be due to a number of causes which may include distance of the receiver from the transmitter because the strength of the radiated signal depreciates with distance. But it is always expected that a reasonable clear line of sight between the receiving antenna and the transmitting antenna is

maintained if a distance of not more than 80km from the transmitting antenna is maintained. In this case, there is likely to be strong enough for good reception in most conditions using a decent outdoor antenna [3]. The Electromagnetic Interference (EMI) also known as radio frequency interference (RFI) is another source of reception problems. Like multipath reception, EMI is another example of reception of signal from TV station(s) being disturbed by other signal picked up by TV antenna(s). But instead of the extra signal being reflected and delayed versions of the main signal, in this case, they are from a different source of radio wave altogether. They may be coming from a big motor driver system, or a medical diathermy machines or a nearby computer, power tools or appliance motors, or from corona discharge from high voltage power lines or radiation from a commercial two-way radio transmitter. Solar radiation contributes largely to the poor reception of TV/radio signals by the receiver. With solar radiation on transmission, the total electron content of the ionosphere is affected. Also affected is the various radio frequencies used in transmission. These radio waves which are affected by solar radiation are used for wireless transmission of sound, messages, images or information communication as well as maritime and aircraft navigation. Transmission therefore involves not single frequency electromagnetic wave but rather a frequency band whose width is proportional to the information density [4]. Therefore, the effects of the ionosphere disturbances on radio waves as the ultimate wave used in telecommunication suffer lots of disturbances as a result of radiation from the sun. During solar quiescent periods, ionosphere condition can be assumed to be nearly constant with respect to time. Hence ionosphere conditions change rather rapidly during and following solar disturbances [5].

2.1 Selection of Locations for Field Strength Measurements

In the selection of locations for field strength measurement, a suitable road drive test along some selected towns in Enugu and Anambra states were used and the following steps are taken:

- The town of Enugu and Awka were first identified and the routes to be taken is ascertained
- The location of these towns is based on the eight cardinal points of N, S, E, W, NE, SE, SW, and NW were carefully made to cover the towns around the omnidirectional areas of each base station.
- In the cardinal lines, a total land distance of about 200km was covered.
- Towns/locations at every 20km in all the eight directions were listed out and categorized under the ranges 0-20km, 20-40km, 40-60km, 60-80km, 80-100km, 100-120km, 120-140km, 140-160km, 160-180km and 180-200km, while the directions of these locations were stated.

2.2 Field strength Measurement Procedures

The field strength measuring meter used for the measurement was a Milano TES type model 661c. This meter has 60 channels and an outlet for sound signal. It has calibrations in decibels and microvolts. Other materials used for these measurements include:

- A very high frequency (VHF) TV antenna
- A radio frequency (RF) TV antenna
- A portable 17inch National coloured TV
- A metallic pole for antenna support
- A good earphone
- A small power generating machine

The procedures for taking the measurements include

- One end of the feeder cable was connected to the VHF antenna and the

later mounted on the metallic pole and finally the arrangement hoisted.

- The other end of the cable was connected to the TV input terminals.
- With power supply ensured, the television set was switched on and the TV channels selected on the VHF band.
- The antenna was oriented for maximum reception by rotating the metallic pole carrying the antenna.
- With good reception (full colour picture and sound) established the feeder cable was disconnected from the television and connected to the VHF terminals of the field strength meter. With the meter switched to channels 8 and 5 signals, the reading on the meter was recorded in decibels (dB) as shown in tables 4 and 5.

2.3 Topographical Analysis

This topographical analysis include

- The determination of the spot heights of the transmitter location and that of the likely locations for retransmitting equipment.
- The determination of both path distance and spot heights at every 2.5km from Enugu and Awka.
- Path profiling.

3.0 System Analysis and Results

The NTA Enugu transmitter at Abor hills in Udi area of Enugu state and the NTA Awka transmitter at Enugwu-Agidi hills near Awka in Anambra state transmit programmes on channels 8 and 5 respectively. The signal transmission is on VHF band of frequency between 196.25MHz-201.75MHz for NTA Enugu and 175.25MHz for NTA Awka. The Rohde and Schwarz 10kW solid state TV transmitter system, which is being used by NTA Enugu and Rohde Schwarz 5kW solid state TV transmitter which is being used by NTA Awka provide a complete transmitting system with the exception of the antenna and the necessary cooling and ventilation wave-guide equipment was

provided as part of the system. The equipment is capable of delivering a total output of 10kW and 5kW peak synchronous power. Tables 1 and 2 show the measured peak synchronous power and block power levels for the NTA Enugu and Awka respectively for the periods of three months. As the transmitted power levels from NTA Enugu were monitored in October 2005, July 2006 and January 2007; the transmitted power levels from

NTA Awka were monitored for the months of September 2006, June 2007 and July 2007 respectively. These measured data as recorded was obtained from the metering units of both the NTA Enugu and Awka. These results show how the transmitted signals vary at various days of the week thereby making it impossible for the same level of signals to be received at those stipulated sites at those different days of the month under study.

Table 1: Transmitter metering result for NTA Enugu for three months.

October 2005			July 2006			January 2007		
Date	Peak sync power (kW)	Block power level (kW)	Date	Peak sync power (kW)	Block power level (kW)	Date	Peak sync power (kW)	Block power level (kW)
01/10/2005	3.3	1.2	01/07/2006	1.2	1.1	01/01/2007	5.5	3.1
02/10/2005	3.3	1.2	02/07/2006	1.3	1.1	02/01/2007	6.0	3.1
03/10/2005	3.3	1.2	03/07/2006	1.4	1.2	03/01/2007	6.1	4.0
04/10/2005	3.3	1.2	04/07/2006	1.3	1.1	04/01/2007	6.0	4.0
05/10/2005	3.3	1.2	05/07/2006	1.2	1.1	05/01/2007	6.0	4.1
06/10/2005	4.1	1.3	06/07/2006	1.3	1.1	06/01/2007	6.0	4.0
07/10/2005	4.0	1.3	07/07/2006	1.4	1.1	07/01/2007	6.0	3.9
08/10/2005	4.0	1.3	08/07/2006	1.2	1.1	08/01/2007	6.0	3.8
09/10/2005	4.1	1.3	09/07/2006	1.1	1.1	09/01/2007	6.1	3.1
10/10/2005	4.0	1.3	10/07/2006	1.2	1.1	10/01/2007	5.9	3.1
11/10/2005	3.9	1.3	11/07/2006	1.1	1.1	11/01/2007	6.1	3.1
12/10/2005	3.9	1.3	12/07/2006	1.1	1.0	12/01/2007	6.1	3.1
13/10/2005	4.0	1.2	13/07/2006	1.1	1.0	13/01/2007	6.1	4.0
14/10/2005	4.0	1.3	14/07/2006	1.1	1.0	14/01/2007	6.1	3.0
15/10/2005	4.0	1.4	15/07/2006	1.1	0.8	15/01/2007	5.8	3.0
16/10/2005	4.0	1.3	16/07/2006	1.2	0.8	16/01/2007	5.8	2.9
17/10/2005	4.0	1.3	17/07/2006	1.1	0.8	17/01/2007	5.8	2.9
18/10/2005	3.9	1.3	18/07/2006	1.1	0.8	18/01/2007	5.8	2.9
19/10/2005	4.0	1.3	19/07/2006	1.1	0.8	19/01/2007	5.9	3.0
20/10/2005	4.0	1.3	20/07/2006	1.1	0.8	20/01/2007	5.9	3.1
21/10/2005	4.0	1.3	21/07/2006	1.2	0.8	21/01/2007	6.0	3.2
22/10/2005	3.9	1.3	22/07/2006	1.1	0.3	22/01/2007	6.0	3.1
23/10/2005	3.9	1.3	23/07/2006	1.1	0.3	23/01/2007	6.1	3.0
24/10/2005	3.9	1.3	24/07/2006	1.1	0.7	24/01/2007	6.2	4.0
25/10/2005	3.9	1.3	25/07/2006	1.1	0.8	25/01/2007	6.0	3.9
26/10/2005	3.9	1.3	26/07/2006	1.1	0.7			
27/10/2005	3.9	1.3	27/07/2006	1.2	0.8			
28/10/2005	4.0	1.3						

Source: NTA Enugu metering unit

Table 2: Transmitter metering result for NTA Awka for three months.

August 2006			June 2007			July 2007		
Date	Peak sync power (kW)	Block power level (kW)	Date	Peak sync power (kW)	Block power level (kW)	Date	Peak sync power (kW)	Block power level (kW)
01/08/2006	1.1	0.8	01/06/2007	1.3	1.0	01/07/2007	2.0	1.4
02/08/2006	1.1	0.8	02/06/2007	1.1	0.9	02/07/2007	1.9	1.3
03/08/2006	1.1	0.8	03/06/2007	1.2	1.0	03/07/2007	1.9	1.3

04/08/2006	1.0	0.8	04/06/2007	1.3	1.0	04/07/2007	2.0	1.3
05/08/2006	1.0	0.8	05/06/2007	1.2	1.0	05/07/2007	2.0	1.4
06/08/2006	1.1	0.8	06/06/2007	1.2	1.0	06/07/2007	2.0	1.4
07/08/2006	1.1	0.8	07/06/2007	1.2	1.0	07/07/2007	2.0	1.4
08/08/2006	1.1	0.8	08/06/2007	1.2	0.9	08/07/2007	2.0	1.4
09/08/2006	1.1	0.8	09/06/2007	1.2	1.0	09/07/2007	2.1	1.3
10/08/2006	1.1	0.8	10/06/2007	1.2	1.0	10/07/2007	1.9	1.3
11/08/2006	1.0	0.8	11/06/2007	1.1	0.9	11/07/2007	2.0	1.4
12/08/2006	1.0	0.7	12/06/2007	1.2	1.0	12/07/2007	2.0	1.4
13/08/2006	-	-	13/06/2007	1.2	1.0	13/07/2007	2.1	1.4
14/08/2006	-	-	14/06/2007	1.1	0.9	14/07/2007	3.2	2.2
15/08/2006	0.8	0.6	15/06/2007	1.1	0.9	15/07/2007	3.2	2.3
16/08/2006	0.8	0.7	16/06/2007	1.1	0.9	16/07/2007	3.1	2.1
17/08/2006	0.8	0.6	17/06/2007	1.1	0.9	17/07/2007	3.1	2.1
18/08/2006	0.8	0.6	18/06/2007	1.2	1.0	18/07/2007	3.1	2.0
19/08/2006	0.8	0.6	19/06/2007	1.1	0.9	19/07/2007	2.9	1.9
20/08/2006	0.8	0.5	20/06/2007	0.0	0.0	20/07/2007	2.9	1.9
21/08/2006	0.6	0.5	21/06/2007	0.0	0.0	21/07/2007	3.2	2.1
22/08/2006	0.6	0.5	22/06/2007	-	-	22/07/2007	3.1	2.0
23/08/2006	0.8	0.6	23/06/2007	0.2	0.0	23/07/2007	3.0	2.0
24/08/2006	0.8	0.5	24/06/2007	0.1	0.1	24/07/2007	2.9	1.8
25/08/2006	0.7	0.5	25/06/2007	0.1	0.0	25/07/2007	1.8	1.2
26/08/2006	0.7	0.5	26/06/2007	0.3	0.2	26/07/2007	2.8	1.8
27/08/2006	4.8	0.6	27/06/2007	0.1	0.0	27/07/2007	3.0	2.2
28/08/2006	1.7	1.5	28/06/2007	0.1	0.0	28/07/2007	3.2	2.3
29/08/2006	1.7	1.5	29/06/2007	0.1	0.0	29/07/2007	3.2	2.3
30/08/2006	1.7	1.6	30/06/2007	0.1	0.0	30/07/2007	3.1	2.0
31/08/2006	1.9	1.7				31/07/2007	3.1	2.1

Source: NTA Awka metering unit

Table 3: Summary of NTA Transmission Parameters		
Parameters	NTA Stations	
	NTA Enugu	NTA Awka
Video Frequency (MHz)	196.25 MHz	175.25 MHz
Audio Frequency (MHz)	201.75 MHz	180.75 MHz
Frequency Separation (MHz)	5.5 MHz	5.5 MHz
Effective Radiated Power (ERP) (kW)	100kW	50 kW
Antenna Height (m)	193 m on hill top	136 m
Antenna gain (dB)	10dB	10dB
Polarization	Vertical	Vertical

Source: NTA Enugu and Awka

4.0 Site Selection and Field Strength Measurements

Site selection for possible location of a booster station is guided by the fact that satisfactory signal reception from NTA channel 8 Enugu and channel 5 Awka by a viewer at any given location depends upon the strength of the signal radiated from antenna and on the distance between the transmitting antenna and the point of reception.

The NTA channels 8 and 5 transmitters are located at Enugu and Awka respectively. Different and well distributed sites were selected for actual radio field strength measurements. The sites are located at varying displacements from the transmitter. The research confirms the presence of very strong signal of these stations throughout the major towns and villages in Enugu and Anambra states. Furthermore, some towns in other neighboring states of Anambra, Imo and

Ebonyi receive NTA Enugu station. Tables 1-3 summarize the result of the radio

survey at different locations in the catchment areas.

Table 4: Results of field signal strength measurement for NTA Enugu, Enugu State

From Transmitting Station at Agu-Abor to Nsukka (North of the transmitting station)

Location	Distance (km)	Reception mode	Measured value (dB)	Remarks
Agu-Abor	5	Receive	55	Very good reception with indoor antenna
Ozougwu Comp. Sec. Sch.	15	Receive	53	Good reception recorded
Egede	30	Receive	25	Reception with high antenna
Ekwegbe	40	Receive	40	Good reception
Ukehe	43	Receive	40	Good reception
Ogbede	49	Receive	30	Good reception with outdoor antenna
Ozalla	55	Receive	32	Good reception with outdoor antenna
Opi	60	Receive	45	Very clear signal
Edeoballa	80	Receive	48	Good reception
Nsukka	100	Receive	38	Good reception with outdoor antenna

From Transmitter Station at Agu-Abor to Abakaliki in Ebonyi state (East of the transmitting station)

Agu-Abor	2	Receive	54	Superb reception
Abakpa Junction	10	Receive	53	Good reception
Eke Obinagu	20	Receive	48	Good reception
Nkalagu	30	Receive	35	Good reception
Izziamgbo	45	Receive	28	Good reception with outdoor antenna
Ishielu	70	Receive	25	Good reception with outdoor antenna
	80	Receive	26	Good reception with outdoor antenna
Abakaliki (Police barracks)	90	Receive	30	Surprised reception

From Transmitter Station at Agu-Abor to Asaba in Delta state (West of the transmitting station)

Location	Distance (km)	Reception mode	Measured value (dB)	Remarks
Agu-abor	2	Receive	55	Good reception
Ngwo (9 th Mile)	5	Receive	52	Good reception
Nsude	10	Receive	40	Good reception
Owa-Imezi		Receive	25	Reception with high antenna
Oji-River	40	Receive	30	Good reception with outdoor antenna
Ugwuoba	50	Receive	35	Good reception
Awka (UNIZIK temporal site junction)	60	Receive	29	Good reception with outdoor antenna
Enugwu-Agidi	65	Receive	40	Superb reception. Located on top of a hill
Abba Junction	68	Receive	38	Good reception
Ukpo	70	Receive	35	Good reception
Awkuzu Junction	75	Receive	38	Good signal reception with outdoor antenna
Ogbunike	80	Receive	35	Clear signal
Nkpor	85	Receive	30	Clear signal
Onitsha	100	-	-	No reception (Town in a valley)
Asaba (Delta)	125	Receive	30	Good reception
Owashiuku	150	Receive	40	Very good reception

From Transmitting Station at Agu-Abor to Ekwulobia (South-West of the transmitting station)

Location	Distance (km)	Reception mode	Measured value (dB)	Remarks
----------	---------------	----------------	---------------------	---------

Agu-Abor	2	Receive	55	Received clearly
Nsude	10	Receive	54	Good reception
Orie Umumba	15	Receive	40	Good reception
Nkwo Ezeagu	25	Receive	35	Good reception
Oji River	30	Receive	30	Clear reception
Ugwuoba	40	Receive	33	Clear reception
Amausea	55	Receive	30	Good reception
Awka (Aroma junction)	60	Receive	35	Very good reception
Nibo	80	Receive	32	Reception confirmed with outdoor antenna
Mbaukwu	100	Receive	29	Reception with outdoor antenna
Agulu (Nwagu)	120	Receive	30	Good reception
Nanka	130	Receive	28	Reception with outdoor antenna
Ekwulobia	135	-	-	No signal received

From Transmitting Station at Agu-Abor to Aba, Abia State (South of the transmitting station)

Location	Distance (km)	Reception mode	Measured value (dB)	Remarks
Govt. house Enugu	5	Receive	45	Very clear signal received
Aghani	10	Receive	58	Very good reception with indoor antenna
Ishiagu	30	Receive	40	Very good reception
Okigwe	50	Receive	35	Good reception
Umunneochi	50	Receive	30	Good reception
Umuahia	85	Receive	28	Reception with very high antenna
Ihite	95	-	-	No reception
Isialangwa	110	-	-	No reception
Owerrinta	130	-	-	No reception
Aba (PH road)	157	-	-	No reception

Table 5: Result of field signal strength measurement for NTA Awka, Anambra State

From Transmitting Station at Enugwu-Agidi to Okigwe (South of the transmitting station)

Location	Distance (km)	Reception mode	Measured value (dB)	Remarks
Amawbia junction (Adam & Eve park)	4	Receive	44	Very good reception with indoor antenna
Nibo	10	Receive	35	Good reception
Mbaukwu	20	Receive	40	Good reception
Agulu (Nwagu)	25	Receive	35	Reception with high antenna
Nanka	28	Receive	32	
Oko	30	Receive	30	Very good reception
Ekwulobia	31	Receive	28	
Uga	35	Receive	25	Reception with high antenna
Unubi	36	Receive	20	Very weak reception
Umunze	55	Receive	25	Very weak signal received
Arondizuogu	60	Receive	20	Very weak signal received
Okigwe by (Express)	105	-	-	No reception
Okigwe (High Court)	109	-	-	No reception

From Transmitting Station at Enugwu-Agidi to Ebenebe Anambra State (North of the Transmitting Station)

Location	Distance (km)	Reception mode	Measured value (dB)	Remarks
Amawbia junction (Express)	2		47	Superb reception
Unizik temp. site	5		45	Superb reception
Okpuno-Awka	7		44	Good reception
Mgbakwu	10		40	Good reception

Ikwatocha	15		30	Good reception
Ebenebe	25		28	Good reception with outdoor antenna

From Transmitting Station at Enugwu-Agidi to Enugu, Enugu State (East of the Transmitting Station)

Location	Distance (km)	Reception mode	Measured value (dB)	Remarks
Amawbia junction by Express	2	Receive	47	Very good signal with indoor antenna
Unizik Temporary site	5	Receive	45	Very good reception
Aroma junction Awka	7	Receive	44	Very good reception
Amansea	15	Receive	40	Very good reception
Ugwuoba	20	Receive	35	Good reception
Oji-River by Express way	30	Receive	33	Good reception
Nkwo-Ezeagu	35	Receive	29	Received with high antenna
Orie-Umumba	37	Receive	25	Received with high antenna
Owa-Imezi	42	Receive	20	Very weak signal
Nsude	50	Receive	15	Partial signal received
Ngwo	60	-	-	No signal received
Enugu	70	-	-	No reception

From Transmitting Station at Enugugwu-Agidi to Asaba, Delta State (West of the transmitting station)

Location	Distance (km)	Reception mode	Measured value (dB)	Remarks
Amawbia Junction by Onitsha Expressway	2	Receive	47	Superb reception
Igbariam	10	Receive	40	Good reception
Nando	16	Receive	39	Good reception
Awkuzu	18	Receive	35	Good reception
Aguleri	20	Receive	30	Signals received
Nkwere-Ezunaka	25		35	Good reception
Nkpor	30	Receive	38	Very good reception
Onitsha	40	Receive	20	Very weak signal received (Town in a valley
Asaba	50	Receive	40	Good reception

From Transmitting station at Enugwu-Agidi to Uli, Anambra State (South-West of the transmitting station)

Location	Distance (km)	Reception mode	Measured value (dB)	Remarks
Amawbia	2	Receive	47	Superb reception
Nawfia	4	Receive	43	
Enugwu-Ukwu	10	Receive	40	
Nimo	15	Fair reception	20	Very weak signal, (Town in a valley)
Neni	20	Receive	35	Good reception
Nnokwa	30	Receive	30	Good reception with outdoor antenna
Nnobi	40	Receive	28	Good reception with outdoor antenna
Nnewi	50	Receive	30	Signals received
Ozubulu	55	Receive	25	Signal received
Okija	60	Receive	35	Good reception
Uli	70	Receive	20	Very weak signal

The following conclusions were made after the survey for NTA Enugu and Awka stations.

- Most towns and villages in Enugu and Anambra states experience NTA channels 8 and 5 signals. The reception is excellent almost everywhere.
- Most towns and villages in Anambra state receive NTA Enugu and Awka signals especially towns in Awka areas.
- There is no reception recorded in Onitsha because Onitsha is in a valley and hills which block signals from Awka.
- Good reception was recorded at Asaba and environs because the area is higher in altitude than Onitsha though farther.
- Booster station(s) is/are needed to cover areas in Abia, Imo, Anambra and Ebonyi states. Moreso, NTA Awka transmitting antenna mast should be relocated to a higher altitude (hill) along Awka-Onitsha road to improve the signal quality. In particular another NTA booster station is required at Onitsha for proper coverage.

As stated earlier, an impressive signal reception of NTA Enugu and Awka by viewers at any given distance depend partly on the distance between the transmitting antenna and the point of reception. As can be observed from the result of the field strength measurements, locations nearer the transmitter enjoy full strength reception delivered by the antenna while the strength gradually decreases as the distance increases.

The observation of the reception modes as the distance increases is illustrated in figures 1 and 2 for distances between 0-40km, 40-80km, 80-120km and 120-160km in the eight cardinal point of directions of N, S, E, W, NE, NW, SE and SW. Figure 1 shows how the TV signals vary with distance and also with the topographical areas of the remote places for NTA Enugu. It show that between Agu-Abor (Enugu) and Aba in Abia state, the transmitted signals depreciate linearly

with distance. This infers that the transmitting antenna of the TV station is well above the highlands and hills between the two cities, thereby relegating the any effect of the hills on the transmitted signals. Here the signal is only affected by the distance unlike other cities where the signals are affected by both the distance of the receiving antenna and the distance between the transmitter and receiver. Similar situation is also noticed in figure 2 which shows the variation of signal strength with distance for NTA Awka in Anambra State. With this development this work has been able to establish that at various points where very low or no reception is experienced, TV booster stations can be installed to boost the signal for the teaming users of those areas.

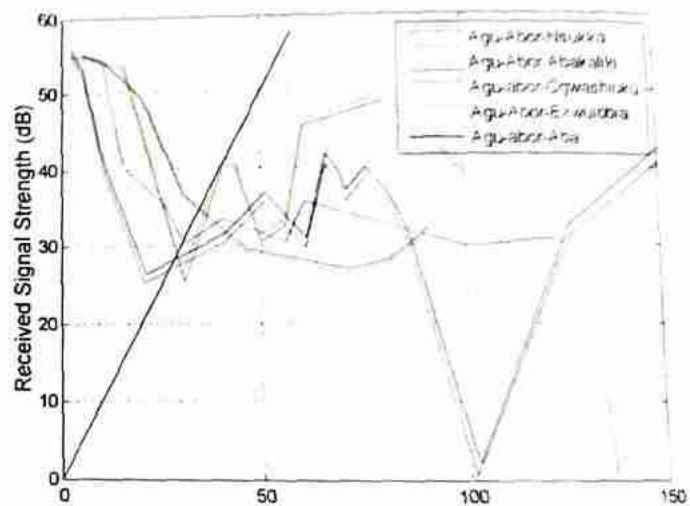


Fig 1: Plot of Received signal strength against distance for NTA Enugu

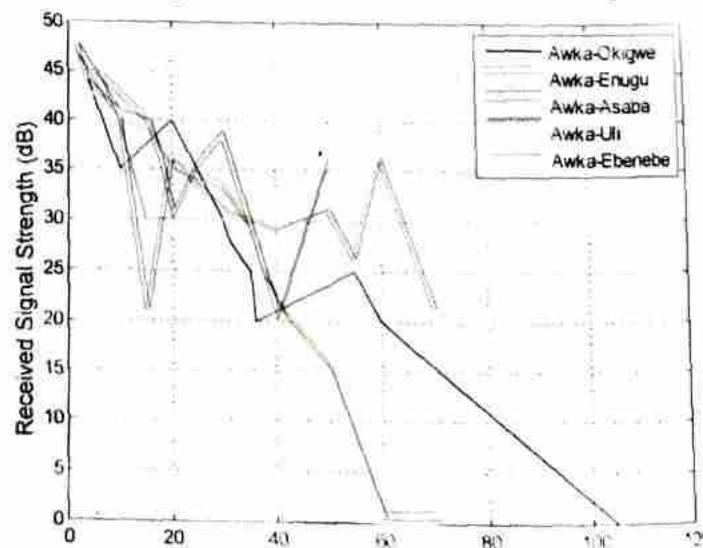


Fig 2: Plot showing the received signal strength (dB) Vs Distance (km) for NTA Awka.

5.0 Conclusion

From the field measurements carried out in the course of investigation, it was discovered that many towns and villages in the catchment areas of the two NTA stations find it extremely difficult to view the programmes transmitted from either or both stations. The cause of this problem ranges from; the transmitted signal power which at sometimes run short of the required transmitted power to serve the teaming users in remote areas of operation, the topographical nature of the environment through which the transmitted signals are propagated. In this case, the hilly nature of Enugu and Awka environs makes the signal to be highly disturbed so that they cannot reach some of the areas whose viewing centres are not on the reasonable line of sight with the transmitter antenna. Due to the fact that TV signals depreciates with increase in distance, it is therefore pertinent that TV booster stations be erected at those flash points where virtually small or no signal is received so that those viewers in those area will be given the sense of belonging.

References

- [1] Mutrooney A.T., "BBC Television London", a biennial report on TV reception for BBC London, 2004
- [2] Louis E. Freznel, "Principles of Electronic Communication Systems", Second Edition, MacGraw Hill Companies Inc. USA, 2000.
- [3] www.google.com, "Solving TV Reception Problems", Electus Distribution Tech. Note, TVRECEPEEPDF1 2002.
- [4] Davidson J, "Article on transmission line London", 2000.

- [5] Obodo R.M., "The effect of Ionospheres on radio waves", University of Nigeria Nsukka, Nigeria, June 2003.
- [6] Ezeokoye B.A., "The Effect of Solar Radiation on Transmitted Signals", BSc. Project, University of Nigeria Nsukka, 2001.
- [7] Wright, Bill, "Effect of trees on UHF reception", 2005.

Authors Profiles

Cletus Ogbonna Ohaneme holds B.Eng. in Electrical/Electronic Engineering in 1994 and M.Eng. in Telecommunication Engineering in 2000 respectively, both from Enugu State University of Science and Technology (ESUT) Enugu Nigeria. He is presently a lecturer in the Department of Electronic and Computer Engineering Nnamdi Azikiwe University Awka, Anambra State Nigeria. Also currently, he is pursuing his PhD program in the Department of Electrical/ Electronic Engineering Enugu State University of Science and Technology (ESUT) Enugu, Nigeria with research interest on Wireless Network Capacity Improvements and Spectrum Management Systems.

Victor Eze Idigo holds MSc. in Communications Engineering from University of Leningrad Russia in 1984. He also obtained PhD degree in Communication Engineering from Nnamdi Azikiwe University Awka in 2009. Currently, he is an associate professor and Head of Department of Electronic and Computer Engineering, Nnamdi Azikiwe University Awka, Nigeria. His research interest is on Wireless Communications.