

## **Determination of the Location of the Strongest and Lowest GSM Signal Strength in Oleh, Delta State, Nigeria**

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### *Abstract*

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*This paper presents the location in Oleh town in Delta State, Nigeria with the strongest and lowest Global System for Mobile Communication (GSM) signal strength using Globacom network operator as a case study.*

*In this work, seven locations were randomly chosen in Oleh town in Delta State. The locations are (i) Oleh main market (ii) Isoko Community Bank (iii) Hotel de Forest (iv) Delta State University, Oleh Campus Faculty of Law main gate (v) Delta State University, Oleh Campus, Faculty of Engineering main gate (vi) Delta State University, Oleh Campus, Administrative Block and (vii) Hotel de Olive. The distances from these locations were computed from the existing Globacom Base Transceiver Station (BTS) at Oleh and measurements of GSM signal strength were taken at these locations three times a day (morning, afternoon and evening) for four weeks using a blackberry handset. The measurements were recorded in tables and the magnitude of the single strength in degrees were determined.*

*The study revealed that Oleh main market has the strongest GSM signal strength and Hotel de Olive has the lowest GSM signal strength in Globacom network.*

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**Keywords:** GSM, signal strength, BTS, network operator

### **1.0 Justification for the Work**

In Oleh town in Delta State, GSM services have been very poor in some locations in the town. This study was therefore undertaken to find out the locations where GSM signal strength are strong and poor using Globacom network operator as a case study. This research will be of immense benefit to residence of Oleh as those residing in locations where Globacom services are poor will have to switch their simcard to other available network provider in the area. This research will assist the Globacom network service provider to provide another BTS for locations experiencing poor services in Oleh town.

### **1.1 Introduction**

Global System for Mobile Communication (GSM) is a standard set developed by the European Telecommunications Standard Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones. The GSM standard was developed as a replacement for first generation (1G) analog cellular networks and originally described a digital circuit switched network optimized for full duplex voice telephony. This was expanded overtime to include data communications first by circuit switched transport then packet data transport via General Packet Radio Service (GPRS) and Enhanced Data rates for GSM Evolution (EDGE)[1].

Nigeria embraced the global system for mobile communication in 2001. Since the launch of GSM in Nigeria, mobile telephony has rapidly become the most popular method of voice and data communication in Nigeria. Growth in this sector has been so rapid that Nigeria has been rightly described as one of the fastest growing GSM market in the world[2].

A mobile phone signal (or reception) is the strength (measured in dBm) of the connection to the mobile phone with its network. Depending on various factors, such as proximity to a tower, obstructions such as buildings or trees, the signal may vary[3]. Most mobile devices use a set of bars of varying heights to display the strength of the signal where the device is located. Traditionally, five bars are used.

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Generally, a stronger mobile phone signal is easy to obtain in an urban area, though urban areas do have “dead zone” where no reception can be obtained[4]. On the contrary, many rural or minimally inhabited areas have very weak signal reception. Many mobile phone providers are attempting to set up towers in many parts of the rural areas occupied by residence to improve signal reception.

**1.2 Previous Work**

Adegoke and Babalola [5] carried out a research on quality of service analysis of GSM telephone system in Nigeria. their work was based on quality of service. Their research did not focus its interest on GSM signal strength but on service performance factors.

Fajewonyomi [6] carried out a research on comparative study of Network performance of Gloacom and MTN in Nigeria. The researcher adopted an interview method on the study but measurements were not taken.

Shalangwa et al [7] in a work titled “An evaluation of global system for mobile communication signal strength at 900MHz in Mubi, Adamawa State in Nigeria.” This research was on GSM signal strength and measurements were undertaken but was only from one location. All these previous work reviewed did not actually give a good description of causes of poor signal strength.

**2.0 Data Collection**

GSM signal strength measurements were made using a blackberry handset. A net monitor software was installed in a blackberry handset and used to measure the received signal level at different distances from the chosen seven locations three times a day (morning, afternoon and evening) for four weeks at Oleh town. The net monitor software has parameters like cell ID of site, local area code, network operator name, base station ID, mobile country code and mobile network code which represents the received signal strength in decibel.

**2.1 Computation of Distance from Chosen Locations to the Globacom Base Transceiver Station at Oleh**

The seven chosen locations used in this research work are not on a smooth path from the base transceiver station. Therefore, a motor bike was used to access the chosen locations from the base transceiver station. The time taken to access each of the locations to the BTS was determined with the aid of a wristwatch. A constant speed of 60km/h was assumed from the chosen locations to the BTS. The time taken by the motor bike from the BTS to the chosen locations and the constant speed are shown in Table 1.

**Table 1: The time taken and constant speed from Oleh BTS to the chosen locations**

S/No	Chosen locations	Constant speed of motor bike from BTS to chosen locations	Time taken by motor bike from BTS to chosen locations
1.	Globacom BTS to Oleh main market	60km/h	85.5 seconds
2.	Globacom BTS to Isoko Community Bank	60km/h	145.5 seconds
3.	Globacom BTS to Hotel de Forest	60km/h	119 seconds
4	Globacom BTS to Faculty of Law main gate of Oleh Campus	60km/h	186 seconds
5.	Globacom BTS to Faculty of Engineering main gate of Oleh Campus	60km/h	243.5 seconds
6.	Globacom BTS to Oleh Campus Administrative Block	60km/h	283 seconds
7.	Globacom BTS to Hote de Olive	60km/h	274 seconds

The computation of distances of chosen locations from the BTS was done using the equation of motion and substituting the values of speed and time taken in Table 1 into the equation of motion. The equation of motion was computed as follows[8]:

i) Location one  $V = u + at$  (1)

Where V = speed of motor bike from BTS to chosen locations

u = initial velocity, which is usually taken as 0

a = acceleration from BTS to chosen locations

t = time taken from BTS to chosen locations

s = Distance taken from BTS to chosen locations

Using values in Table 1, we shall have for location one,

$$V = 60km/h = \frac{60 \times 100}{3600} = 16.67m/s$$

Therefore  $V = u + at$  since  $u = 0$

$$a = \frac{V}{t} = \frac{16.67}{83.5} = 0.1950m/s^2$$

$$V^2 = u^2 + 2as \quad - \quad - \quad - \quad - \quad - \quad - \quad (2)$$

$$V^2 = 0^2 + 2as = 2as \quad \text{Since } u = 0$$

$$S = \frac{V^2}{2a} = \frac{(16.67)^2}{2 \times 0.1950} = 7125.54m \approx 0.171km$$

Following this same procedure, the computations for all locations were determined and tabulated in Table 2.

**Table 2: Acceleration and distance of Oleh BTS to chosen locations**

Location	U(m/s)	V(m/s)	T(seconds)	$a = \frac{V}{t} (m/s^2)$	$S = \frac{V^2}{2a} (km)$
One	0	16.67	85.5	0.1950	0.171
Two	0	16.67	145.5	0.1146	1.20
Three	0	16.67	119.0	0.1401	0.99
Four	0	16.67	186.0	0.0896	1.55
Five	0	16.67	243.5	0.0685	2.03
Six	0	16.67	283.0	0.0589	2.36
Seven	0	16.67	274.0	0.0608	2.29

**Table 3: Summaries of chosen locations and their distances from Oleh Globacom BTS**

S/N	CHOSEN LOCATIONS	DISTANCE (km)
1	Oleh Main Market (OMM)	0.71 from Oleh BTS
2	Isoko Community Bank (ICB)	1.20 from Oleh BTS
3	Hotel de Forest (HDF)	0.99 from Oleh BTS
4	Faculty of Law Main Gate (FLMG)	1.55 from Oleh BTS
5	Faculty of Engineering Main Gate (FEMG)	2.03 from Oleh BTS
6	Delsu Oleh-Campus Administrative Block (FEAB)	2.36 from Oleh BTS
7	Hotel de Olive (HDO)	2.29 from Oleh BTS

### 3.0 Data Presentation

The data obtained from the Globacom network signal strength from the seven chosen locations in Oleh town are shown in Tables 4 to 7.

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**Table 4: Breakdown of GSM signal strength monitored in the first week (M = Morning, A = Afternoon, E = Evening, T = Total signal strength)**

DAY	TEST LOCATIONS	GLO BTS TO OMM				GLO BTS TO HDF				GLO BTS TO ICB				GLO BTS TO FLMG				GLO BTS TO HDO				GLO BTS TO DOCAB				GLO BTS TO FEMG										
		DISTANCE (KM)				0.71				0.99				1.20				1.55				2.29				2.36				2.03						
		M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T			
1	Signal strength in decibel (dbm)	-61	-55	-59	-58	-76	-80	-71	-76	-82	-85	-66	-78	-82	-87	-95	-88	-97	-93	-99	-96	-79	-82	-87	-83	-95	-90	-91	-92							
	Time	8.15 am	1.00 Pm	4.47p m		8.06a m	12.50 Pm	4.50 pm		8.00a m	12.44 Pm	4.42 pm		7.53 am	12.39 Pm	4.37 pm		7.37 pm	12.24 Pm	4.18 pm		7.28 am	12.15 Pm	4.09 pm		7.20 am	12.07 Pm	4.00 pm								
2	Signal strength in decibel (dbm)	-67	-65	-57	-63	-71	-69	-78	-73	-80	-62	-75	-72	-76	-74	-79	-76	-85	-91	-95	-90	-83	-74	-79	-79	-100	-90	-87	-92							
	Time	8.15 am	1.13 Pm	4.51p m		8.09a m	1.06 Pm	4.45 pm		8.03 am	12.56 Pm	4.39 pm		7.58 am	12.50 Pm	4.32p m		7.44a m	12.32 Pm	4.18 pm		7.35 am	12.13 Pm	4.09p m		7.28 am	12.16 Pm	4.03 pm								
3	Signal strength in decibel (dbm)	-64	-55	-47	-55	-68	-80	-72	-73	-81	-84	-85	-83	-83	-82	-78	-81	-81	-88	-94	-88	-87	-85	-80	-84	-78	-88	-89	-85							
	Time	8.16 am	12.53 Pm	5.03 pm		8.09a m	2.46 Pm	4.53 pm		8.03 am	12.39 Pm	4.47 pm		7.57 am	12.33 Pm	4.40p m		7.43a m	12.17 Pm	4.23 pm		7.34 am	12.07 Pm	4.13p m		7.28 am	12.01 Pm	4.04 pm								
4	Signal strength in decibel (dbm)	-46	-58	-50	-51	-73	-72	-74	-73	-88	-83	-88	-86	-84	-77	-80	-80	-100	-98	-95	-98	-78	-86	-76	-80	-91	-76	-90	-86							
	Time	10.03 am	1.28 Pm	5.02 pm		9.56a m	1.22 Pm	4.57 pm		9.49 am	1.16 Pm	4.52 pm		9.44 am	1.11 Pm	4.46 pm		9.31a m	12.38 Pm	4.34 pm		9.23 am	12.25 Pm	4.25p m		9.17 am	12.16 Pm	4.19 pm								
5	Signal strength in decibel (dbm)	-60	-63	-55	-59	-72	-77	-65	-71	-83	-79	-73	-78	-82	-93	-76	-84	-91	-100	-96	-96	-82	-85	-78	-82	-91	-91	-94	-92							
	Time	8.17 am	12.29 Pm	5.09 pm		8.07a m	12.37 Pm	4.59 pm		8.05 am	12.42 Pm	4.42p m		7.59 am	12.40 Pm	4.47p m		7.45 am	12.55 Pm	4.32 pm		7.36 am	1.08 Pm	4.22 pm		7.29 am	1.05 Pm	4.15 pm								
6	Signal strength in decibel (dbm)	-43	-51	-40	-45	-71	-75	-69	-72	-62	-61	-81	-68	-77	-84	-72	-78	-96	-91	-98	-95	-80	-90	-84	-85	-75	-86	-77	-79							
	Time	8.06 am	12.48 Pm	5.06 pm		7.57a m	12.42 Pm	5.00 pm		7.52 am	12.35 Pm	4.53 pm		7.47 am	12.30 Pm	4.48p m		7.38a m	12.15 Pm	4.33 pm		7.25 am	12.10 Pm	4.25 pm		7.18 am	1.02 Pm	4.13 pm								
7	Signal strength in decibel (dbm)	-54	-48	-59	-54	-77	-73	-75	-75	-55	-76	-67	-66	-71	-79	-90	-80	-90	-94	-96	-93	-75	-80	-83	-79	-72	-90	-78	-80							
	Time	8.02 am	1.15 Pm	5.14 pm		7.55a m	1.09 Pm	5.07 pm		7.50 am	1.02 Pm	5.00 pm		7.45 am	12.57 Pm	4.53p m		7.30a m	12.44 Pm	4.36 pm		7.22 am	12.37 Pm	4.24 pm		7.15 am	12.31 Pm	4.12 pm								
		<b>OVERALL TOTAL</b>				<b>-385</b>	<b>OVERALL TOTAL</b>				<b>-513</b>	<b>OVERALL TOTAL</b>				<b>-531</b>	<b>OVERALL TOTAL</b>				<b>-567</b>	<b>OVERALL TOTAL</b>				<b>-656</b>	<b>OVERALL TOTAL</b>				<b>-572</b>	<b>OVERALL TOTAL</b>				<b>-606</b>

**Table 5: Breakdown of GSM signal strength monitored in the second week (M = Morning, A = Afternoon, E = Evening, T = Total signal strength)**

	TEST LOCATIONS	GLO BTS TO OMM				GLO BTS TO HDF				GLO BTS TO ICB				GLO BTS TO FLMG				GLO BTS TO HDO				GLO BTS TO DOCAB				GLO BTS TO FEMG							
	DISTANCE (KM)	0.71				0.99				1.20				1.55				2.29				2.36				2.03							
DAY		M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T
1	Signal strength in decibel (dbm)	-45	-61	-65	-57	-69	-75	-82	-75	-58	-70	-81	-70	-71	-85	-84	-80	-79	-94	-97	-90	-82	-83	-82	-82	-91	-85	-92	-89				
	Time	8.14 am	.03 Pm	4.59 pm		8.08 am	2.57 Pm	4.47 pm		8.02 am	12.50 Pm	4.53 pm		7.56 am	12.44 Pm	4.42 pm		7.42 pm	12.30 Pm	4.28 pm		7.34 am	12.21 Pm	4.20 pm		7.26 am	12.13 Pm	4.04 pm					
2	Signal strength in decibel (dbm)	-61	-48	-63	-57	-75	-67	-74	-72	-56	-67	-59	-61	-77	-78	-78	-78	-97	-95	-93	-95	-95	-82	-87	-81	-86	-88	-87	-87				
	Time	7.58 am	.11 Pm	5.07 pm		7.50 am	1.04 Pm	4.59 pm		7.44 am	12.57 Pm	4.57 pm		7.38 am	12.55 Pm	4.43 pm		7.26 am	12.40 Pm	4.38 pm		7.15 am	12.28 Pm	4.29 pm		7.07 am	12.19 Pm	4.19 pm					
3	Signal strength in decibel (dbm)	-54	-54	-47	-52	-59	-57	-68	-61	-66	-74	-76	-72	-78	-76	-73	-76	-95	-96	-92	-94	-93	-77	-85	-85	-83	-85	-90	-86				
	Time	8.03 am	1.04 Pm	5.02 pm		7.54 am	2.59 Pm	4.52 pm		7.43 am	12.54 Pm	4.48 pm		7.38 am	12.46 Pm	4.42 pm		7.24 am	12.52 Pm	4.28 pm		7.17 am	12.23 Pm	4.20 pm		7.11 am	12.17 Pm	4.13 pm					
4	Signal strength in decibel (dbm)	-49	-65	-58	-57	-65	-61	-70	-65	-71	-73	-79	-74	-84	-83	-86	-84	-94	-98	-97	-96	-89	-84	-87	-87	-90	-92	-86	-89				
	Time	8.19 am	1.12 Pm	4.58 pm		8.13 am	1.09 Pm	4.50 pm		8.05 am	1.01 Pm	4.44 pm		8.02 am	12.56 Pm	4.35 pm		7.47 am	12.42 Pm	4.21 pm		7.38 am	12.34 Pm	4.13 pm		7.31 am	12.28 Pm	4.06 pm					
5	Signal strength in decibel (dbm)	-53	-49	-55	-52	-66	-71	-69	-69	-78	-83	-76	-79	-79	-82	-78	-80	-96	-94	-91	-94	-80	-84	-85	-83	-85	-91	-95	-90				
	Time	9.059 am	1.09 Pm	5.40 pm		8.46 am	1.02 Pm	5.31 pm		8.43 am	12.57 Pm	5.17 pm		8.36 am	12.51 Pm	4.56 pm		8.26 am	12.30 Pm	4.37 pm		8.19 am	12.27 Pm	4.27 pm		8.13 am	12.20 Pm	4.21 pm					
6	Signal strength in decibel (dbm)	-67	-63	-65	-65	-72	-73	-73	-73	-73	-84	-79	-79	-77	-84	-80	-80	-95	-98	-96	-96	-87	-89	-83	-86	-88	-89	-94	-90				
	Time	8.35 am	1.56 Pm	5.15 pm		8.28 am	1.49 Pm	5.09 pm		8.13 am	1.43 Pm	5.03 pm		8.11 am	1.36 Pm	4.57 pm		7.56 am	1.20 Pm	4.42 pm		7.47 am	1.09 Pm	4.33 pm		7.40 am	1.03 Pm	4.27 pm					
7	Signal strength in decibel (dbm)	-59	-47	-59	-55	-77	-69	-73	-73	-82	-75	-81	-79	-85	-79	-84	-83	-93	-100	-99	-97	-81	-88	-91	-87	-85	-92	-95	-91				
	Time	9.02 am	2.09 Pm	5.13 pm		8.53 am	2.01 Pm	5.02 pm		8.46 am	1.55 Pm	4.55 pm		8.43 am	1.47 Pm	4.48 pm		8.26 am	1.33 Pm	4.32 pm		8.17 am	1.26 Pm	4.23 pm		8.09 am	1.20 Pm	4.16 pm					
		<b>OVERALL TOTAL</b>			<b>-395</b>	<b>OVERALL TOTAL</b>			<b>-488</b>	<b>OVERALL TOTAL</b>			<b>-514</b>	<b>OVERALL TOTAL</b>			<b>-516</b>	<b>OVERALL TOTAL</b>			<b>-662</b>	<b>OVERALL TOTAL</b>			<b>-591</b>	<b>OVERALL TOTAL</b>			<b>-622</b>				

**Table 6: Breakdown of GSM signal strength monitored in the third week (M = Morning, A = Afternoon, E = Evening, T = Total signal strength)**

DAY	TEST LOCATIONS	GLO BTS TO OMM				GLO BTS TO HDF				GLO BTS TO ICB				GLO BTS TO FLMG				GLO BTS TO HDO				GLO BTS TO DOCAB				GLO BTS TO FEMG										
		DISTANCE (KM)				0.71				0.99				1.20				1.55				2.29				2.36				2.03						
		M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T			
1	Signal strength in decibel (dbm)	-66	-61	-70	-66	-76	-71	-74	-74	-88	-75	-79	-81	-82	-78	-81	-80	-97	-93	-99	-96	-95	-77	-79	-84	-88	-92	-96	-92							
	Time	9.05 am	1.22 pm	5.14 pm		8.59 am	1.13 pm	5.04 pm		8.53 am	1.07 pm	4.59 pm		8.46 am	1.02 pm	4.34 pm		8.30 pm	12.47 pm	4.38 pm		8.21 am	12.38 pm	4.27 pm		8.14 am	12.30 pm	4.19 pm								
2	Signal strength in decibel (dbm)	-75	-55	-67	-66	-80	-73	-76	-76	-87	-81	-85	-84	-85	-83	-87	-85	-103	-98	-94	-98	-78	-91	-97	-89	-94	-89	-92	-92							
	Time	8.43 am	1.17 pm	5.03 pm		8.37 am	1.07 pm	4.54 pm		8.31 am	1.01 pm	4.45 pm		8.25 am	12.47 pm	4.40 pm		8.12 am	12.32 pm	4.29 pm		8.04 am	12.23 pm	4.16 pm		7.58 am	12.17 pm	4.09 pm								
3	Signal strength in decibel (dbm)	-58	-62	-66	-62	-77	-74	-69	-73	-80	-76	-71	-76	-83	-85	-76	-81	-99	-104	-96	-100	-84	-91	-81	-85	-92	-94	-87	-91							
	Time	8.04 am	1.40 pm	5.07 pm		7.57 am	1.33 pm	4.56 pm		7.51 am	1.28 pm	4.49 pm		7.47 am	1.23 pm	4.45 pm		7.38 am	1.10 pm	4.31 pm		7.21 am	1.03 pm	4.23 pm		7.15 am	12.56 pm	4.15 pm								
4	Signal strength in decibel (dbm)	-70	-74	-67	-70	-73	-77	-70	-73	-79	-83	-80	-81	-82	-87	-79	-83	-105	-100	-98	-101	-86	-91	-86	-88	-87	-93	-91	-90							
	Time	11.28 am	2.14 pm	5.02 pm		11.20 am	2.05 pm	4.47 pm		11.15 am	2.00 pm	4.59 pm		11.08 am	1.56 pm	4.42 pm		10.50 am	1.40 pm	4.26 pm		10.41 am	1.31 pm	4.17 pm		10.34 am	1.24 pm	4.11 pm								
5	Signal strength in decibel (dbm)	-65	-56	-59	-60	-72	-77	-71	-73	-77	-77	-66	-73	-81	-78	-95	-85	-93	-87	-99	-93	-83	-73	-87	-81	-89	-92	-91	-91							
	Time	8.27 am	1.07 pm	4.47 pm		8.21 am	2.50 pm	4.50 pm		8.15 am	12.54 pm	4.42 pm		8.09 am	12.46 pm	4.37 pm		7.55 am	12.52 pm	4.18 pm		7.47 am	12.23 pm	4.09 pm		7.41 am	12.15 pm	4.00 pm								
6	Signal strength in decibel (dbm)	-61	-68	-54	-61	-67	-72	-61	-67	-72	-75	-73	-73	-76	-85	-83	-81	-97	-100	-93	-97	-82	-87	-80	-83	-95	-97	-93	-95							
	Time	8.03 am	12.59 pm	5.14 pm		7.57 am	12.53 pm	5.00 pm		7.47 am	12.48 pm	4.55 pm		7.40 am	12.46 pm	4.39 pm		7.27 am	12.26 pm	4.28 pm		7.19 am	12.18 pm	4.13 pm		7.10 am	12.12 pm	4.06 pm								
7	Signal strength in decibel (dbm)	-64	-57	-72	-64	-74	-71	-77	-74	-75	-72	-84	-77	-78	-83	-88	-83	-96	-93	-98	-96	-81	-78	-77	-79	-91	-89	-95	-92							
	Time	8.08 am	1.03 pm	5.55 pm		8.00 am	12.49 pm	5.44 pm		7.53 am	12.41 pm	5.39 pm		7.48 am	12.36 pm	5.34 pm		7.27 am	12.30 pm	5.15 pm		7.17 am	12.22 pm	5.07 pm		7.11 am	12.15 pm	5.01 pm								
		<b>OVERALL TOTAL</b>				<b>-449</b>	<b>OVERALL TOTAL</b>				<b>-510</b>	<b>OVERALL TOTAL</b>				<b>-545</b>	<b>OVERALL TOTAL</b>				<b>-578</b>	<b>OVERALL TOTAL</b>				<b>-681</b>	<b>OVERALL TOTAL</b>				<b>-589</b>	<b>OVERALL TOTAL</b>				<b>-643</b>

**Determination of the Location of the... Otasowie, Efenedo and Oghenemarho J of NAMP**

**Table 7: Breakdown of GSM signal strength monitored in the fourth week (M = Morning, A = Afternoon, E = Evening, T = Total signal strength)**

DAY	TEST LOCATIONS	GLO BTS TO OMM				GLO BTS TO HDF				GLO BTS TO ICB				GLO BTS TO FLMG				GLO BTS TO HDO				GLO BTS TO DOCAB				GLO BTS TO FEMG										
		DISTANCE (KM)				0.71				0.99				1.20				1.55				2.29				2.36				2.03						
		M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T	M	A	E	T			
1	Signal strength in decibel (dbm)	-58	-61	-65	-61	-69	-74	-72	-72	-77	-80	-82	-80	-84	-82	-79	-82	-98	-103	-93	-98	-86	-91	-82	-86	-94	-90	-86	-90							
	Time	8.03 am	2.11 pm	5.14 pm		7.56 am	2.02 pm	5.03 pm		7.50 am	1.57 pm	4.58 pm		7.44 am	1.49 pm	4.52 pm		7.30 am	1.28 pm	4.36 pm		7.22 am	1.15 pm	4.28 pm		7.16 am	1.09 pm	4.12 pm								
2	Signal strength in decibel (dbm)	-63	-64	-54	-60	-73	-73	-64	-70	-80	-83	-73	-79	-77	-82	-76	-78	-96	-95	-97	-96	-81	-85	-86	-84	-97	-93	-91	-94							
	Time	8.45 am	1.20 pm	5.12 pm		8.34 am	1.14 pm	5.04 pm		8.29 am	1.08 pm	5.01 pm		8.22 am	1.01 pm	4.54 pm		8.07 am	12.46 pm	4.39 pm		7.58 am	12.37 pm	4.30 pm		7.38 am	12.29 pm	4.23 pm								
3	Signal strength in decibel (dbm)	-59	-61	-68	-63	-71	-76	-78	-75	-75	-82	-86	-81	-83	-87	-84	-85	-94	-98	-102	-98	-81	-90	-93	-88	-90	-93	-97	-93							
	Time	8.18 am	12.58 pm	5.05 pm		8.12 am	12.46 pm	4.54 pm		8.06 am	12.39 pm	4.48 pm		8.00 am	12.34 pm	4.40 pm		7.46 am	12.18 pm	4.23 pm		7.36 am	12.10 pm	4.12 pm		7.29 am	12.01 pm	4.04 pm								
4	Signal strength in decibel (dbm)	-71	-74	-67	-71	-77	-76	-70	-74	-79	-83	-80	-81	-82	-87	-79	-83	-95	-100	-98	-98	-83	-91	-86	-87	-88	-93	-91	-91							
	Time	9.04 am	1.09 pm	5.38 pm		8.55 am	1.02 pm	5.30 pm		8.49 am	12.37 pm	5.17 pm		8.42 am	12.51 pm	4.56 pm		8.27 am	12.30 pm	4.37 pm		8.17 am	12.27 pm	4.27 pm		8.08 am	12.20 pm	4.21 pm								
5	Signal strength in decibel (dbm)	-61	-55	-59	-58	-76	-80	-71	-76	-82	-85	-76	-81	-82	-87	-95	-88	-97	-93	-99	-96	-79	-82	-84	-83	-95	-90	-91	-92							
	Time	8.15 am	1.00 pm	4.47 pm		8.06 am	12.50 pm	4.50 pm		8.00 am	12.44 pm	4.42 pm		7.53 am	12.39 pm	4.37 pm		7.37 am	12.24 pm	4.18 pm		7.28 am	12.15 pm	4.09 pm		7.20 am	12.07 pm	4.00 pm								
6	Signal strength in decibel (dbm)	-59	-64	-70	-64	-72	-74	-77	-74	-75	-78	-81	-78	-77	-83	-85	-82	-91	-95	-103	-96	-82	-86	-89	-86	-89	-93	-98	-93							
	Time	8.17 am	1.09 pm	5.25 pm		8.08 am	1.02 pm	5.19 pm		8.01 am	12.57 pm	5.14 pm		7.54 am	12.50 pm	5.09 pm		7.38 am	12.34 pm	4.49 pm		7.30 am	12.28 pm	4.41 pm		7.23 am	12.02 pm	4.35 pm								
7	Signal strength in decibel (dbm)	-63	-67	-65	-65	-75	-76	-73	-75	-80	-83	-79	-81	-81	-86	-80	-82	-98	-102	-96	-99	-85	-83	-98	-89	-92	-95	-94	-94							
	Time	8.28 am	1.34 pm	5.15 pm		8.20 am	1.26 pm	5.09 pm		8.15 am	1.21 pm	5.03 pm		8.07 am	1.12 pm	4.57 pm		7.53 am	12.57 pm	4.22 pm		7.44 am	12.49 pm	4.33 pm		7.37 am	12.40 pm	4.27 pm								
		<b>OVERALL TOTAL</b>				<b>-442</b>	<b>OVERALL TOTAL</b>				<b>-516</b>	<b>OVERALL TOTAL</b>				<b>-561</b>	<b>OVERALL TOTAL</b>				<b>-580</b>	<b>OVERALL TOTAL</b>				<b>-681</b>	<b>OVERALL TOTAL</b>				<b>-603</b>	<b>OVERALL TOTAL</b>				<b>-647</b>

### 4.0 Data Analysis

The data collected were transformed into network signal strength angle information in order to determine the magnitude of the network service signal strength using the expression in equation (3)[9,10].

$$S_{GSM} = \frac{360}{N}n \tag{3}$$

Where  $SS_{GSM}$  = GSM signal strength in degrees

n = number of a network service signal strength that displays decibel at the instance of measurement

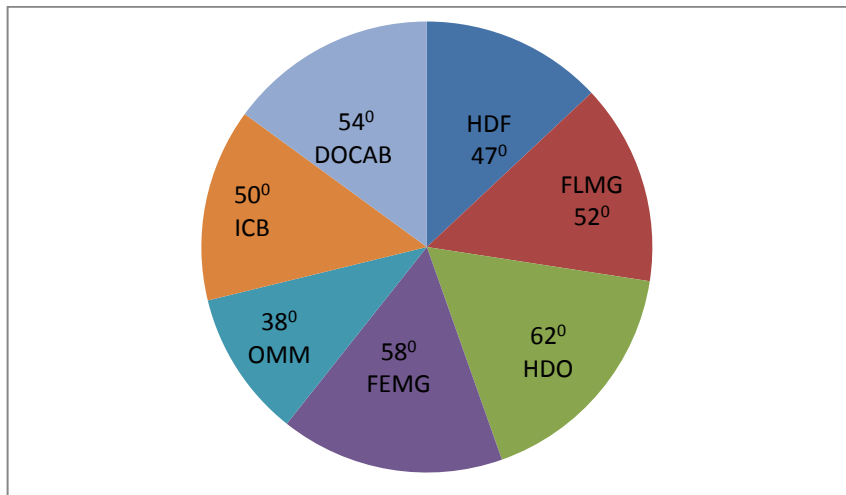
N = total number of network service signal strength in decibel for the period of the measurement

The computation of GSM signal strength in degrees is shown in Table 8 and Figure 1.0.

**Table 8: Breakdown of GSM signal strength in decibel and degrees**

S/N	Chosen locations	Distance from BTS to chosen locations (km)	Total signal strength (dBm)	SS <sub>GSM</sub> (degrees)
1	Globacom BTS to Oleh Main Market (OMM)	0.71	-1671	38
2	Globacom BTS to Isoko Community Bank (ICB)	1.20	-2151	50
3	Globacom BTS to Hotel de Forest (HDF)	0.99	-2027	47
4	Globacom BTS to Faculty of Law Main Gate (FLMG)	1.55	-2241	52
5	Globacom BTS to Faculty of Engineering Main Gate (FEMG)	2.03	-2518	58
6	Globacom BTS to Oleh Campus Administrative Block (FEAB)	2.36	-2355	54
7	Globacom BTS to Hotel de Olive (HDO)	2.29	-2680	62

### 5.0 Result



**Figure 1.0: SS<sub>GSM</sub> (degrees) of Globacom network in Oleh town**

### 6.0 Discussion

From Figure 1.0 and Table 8, we can say that (i) the strongest GSM signal strength is at Oleh main market with 38° and the lowest GSM signal is at Hotel de Olive with 62° (ii) the locations close to the BTS have strong signal strength while locations far from the BTS have poor signal strength



## 7.0 Ways to Improving Globacom GSM Signal Strength at Oleh Town

- 1) Globacom network operator should install additional base transceiver station in Oleh town to improve the signal strength in locations experiencing poor GSM services
- 2) Globacom network operator should upgrade and optimize the existing base transceiver station in Oleh town from Edge to 3G to improve GSM services in the town

## 8.0 Conclusion

This research work investigated the signal strength of Globacom network operator in Oleh town, Delta State. Seven locations were chosen for the research for a period of twenty eight days.

The result presented shows that locations close to the base transceiver station have good GSM services while locations that are far apart experience poor services. Some reasons were suggested that will improve GSM services in the town.

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