



## ORIGINAL RESEARCH ARTICLE

## COMPARATIVE ANALYSIS OF RECEIVED GSM SIGNAL STRENGTH NETWORK IN UNIVERSITY OF MAIDUGURI, BORNO STATE, NIGERIA

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## ARTICLE INFORMATION

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## ABSTRACT

*GSM Network in Nigeria in recent times has been epileptic due to drop in signal strength, which causes customer dissatisfaction with the quality of service delivery by network operators. University of Maiduguri has experience low signal quality in recent years due to frequent dropped calls, poor network interconnectivity, echoes and network congestion, therefore this work presents a detail analysis of the received GSM signal strength in university of Maiduguri. An android application program known as network cell info Lite was used for the measurement of signal strength for three different network in the university at random sampling points. The three network considered are: Network A, Network B and Network C, in three different locations; Academic area, student hostel and staff quarters within the university. The data collected were analyzed using SPSS Statistical tool. The mean value of the signal strength received using the software application shows that Network A with HSPA -91.91dB and GPRS -73.59Db is the best network in the academic area, Network B with HSPA -87.27dB and GPRS -73.43dB has the best network quality in the staff quarters and Network C with HSPA -88.73dB and GPRS -69.85dB is the best network in the student hostel, results above shows that the quality of signal strength depends on location within the university.*

**Keywords:**

Global System for Mobile Communication (GSM)  
General Packet Radio Service (GPRS)  
High Speed Packet Access (HSPA)  
Enhanced Data GSM Evolution EDGE  
Base Trans receiver Station (BST).

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### 1.0 Introduction

From time immemorial, information and communication have fashioned the basis of human existence. People want to communicate with their family and friends and to be communicated. This desire has been a driving force, inspiring people to continuously seek for a new and effective means of dissemination of information to one another on real time basis irrespective of distance. The development in technology ushered in this desire with advent of the first generation cellular telephone systems that enable people to communicate with one another irrespective of time and place. This first generation cellular telephone system, which was analog system, was launched in 1960s before digital communication became prevalent (Hillebrand, 2001, Popoola et al., 2009, Codebreaker, 2011).

The penetration of telecommunications has been found to have a significant positive impact on growth. Mobile penetration in particular, being easier and cheaper to supply than fixed telephony, can be expected to play a crucial role in the economic growth of Africa and other developing countries (Sridhar, 2004).

Cellular phones have become an indispensable part of our everyday life. We continuously make use of them in voice calls, sending short message services (SMS), sending e-mails, in e-commerce, e-banking, e-learning and watching movies. These cellular phones operate through cellular networks, which are responsible for generating and distributing of radio signals that are used by cellular phones over wide geographic areas (Emeruwa, 2015).

Wireless mobile communication system has grown from the first generation (1G) of analogue system, through the second generation (2G) of digital system to the ever maturing third generation (3G) high speed multiple service system, the fourth generation (4G) Long Term Evolution (LTE) standard and has transformed the ease of communication (Yong, 2006). However, the widespread use of mobile communications has heightened consumer demand for better quality service. Thus, network operators the world over, face the challenges of improving the quality of service (QoS) while increasing capacity and rolling out new services.

The rollout of global system for mobile communication (GSM) services across Nigeria has positively altered the socioeconomic landscape of the country and has brought huge revenues to the operators as well as the government through tax and license fees (Popoola et al., 2009).

GSM network in Nigeria is currently faced with the challenges of customers' dissatisfaction in the quality of service offered by the existing network operators due to frequent dropped calls, poor network interconnectivity, echoes and network congestion encountered (Ogbutezie et al., 2013).

Similarly, the citizenries have benefited immensely from the services, not only as a means of communication but it has also provided job opportunities for thousands of people in the country. The objective of this study was therefore to determine the signal strength of three GSM service providers at different locations in the University of Maiduguri.

## **2. Materials and Method**

### **2.1 Measurement Equipment**

The measurement equipment used for this study are:

Techno Y6 Mobile phone

Network cell info lite

Subscriber identification module (SIM)

SPSS Statistical software

### **2.2 Method**

The study was divided into two phases. The first phase involved measurement of signal strength while the second phase was statistical data analysis base on phase one. An android software (Network Cell Info Lite) installed on a Techno Y6 mobile android phone was used to monitor the signal strength for the three leading mobile operators of GSM (Network A, Network B and Network C). The signal strength generated for each of the mobile operators can easily be displayed. It is also important to note that the signal strength for each of the mobile network was recorded daily for a period of 60 days.

Three (3) locations which are the Academic area (Complex), University Staff Quarters and Student Hostel area respectively were observed. In each of the location, the signal strength (HSPA and GPRS) for each of the three leading GSM network were monitored at the same time

using the same mobile phone in the morning within the hours of 7am – 8am, in the afternoon 1pm – 2pm and in the night 7pm – 8pm with a distance of at least 100m given from the location measured the previous day. This was done from 3rd March, 2017 to 1st May, 2017.

These signal values were then analyzed using SPSS to calculate the mean value of the signal strength of the networks, after which comparison of the signal strength for the various networks was done and line graphs were also used to compare and determine the network with the best signal strength within the University environment.

### 3. Results and Discussion

Table 1 shows average daily HSPA and GPRS signal strength for the three networks. The results indicate that in Academic area, Network B has the highest signal strength for HSPA with -86.21dB followed by Network C and Network A with -89.58dB and -91.91dB respectively, while Network C has the highest GPRS network with -66.25dB followed by Network B and Network A with -72.68dB and -73.59dB respectively.

In the Student hostel, Network B has the highest signal strength with -80.97dB followed by Network A and GLO with -87.15dB and -88.73dB respectively, while Network B also has the highest GPRS network with -67.84dB followed by Network A and Network C with -68.52dB and -69.85dB respectively.

In the Staff quarters, Network C has the highest signal strength with -83.65dB followed by Network A and Network B with -86.75dB and -87.27dB respectively, and Network C also has the highest GPRS network with -67.51dB followed by Network B and Network C with -73.43dB and -73.53dB respectively.

Table 1: Average Daily HSPA and GPRS Signal for the three Locations from (March to May)

S/No	LOCATION	SIGNAL STRENGTH (dB)					
		Network A		Network B		Network C	
		HSPA	GPRS	HSPA	GPRS	HSPA	GPRS
1	Academic Area	-91.91	-73.59	-86.21	-72.68	-89.58	-66.25
2	Student Hostel	-87.15	-68.52	-80.97	-67.84	-88.73	-69.85
3	Staff Quarters	-86.75	-73.53	-87.27	73.43	-83.65	-67.51

Mat lab simulation software is used to graphically compare the signal strengths of the three networks. Figures 1 to 6 show the signal strengths (dB) for both HSPA and GPRS signals of the three leading mobile networks, in the academic area, student hostel and staff quarters area of the University of Maiduguri. Figures 1 and 2 shows that Network B has the best HSPA signal and Network C with the best GPRS signal in the academic area. Figure 3 and 4 shows that Network B has the best HSPA and GPRS signal in the student hostel. Figures 5 and 6 shows that Network C has the best HSPA and GPRS signal in the staff quarters area of the University of Maiduguri.

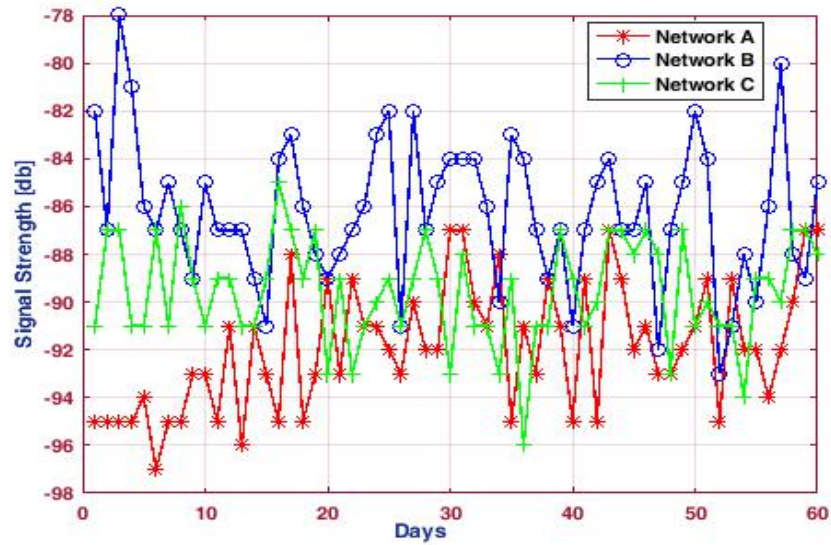


Figure 1: Comparison of HSPA Signal Strength for the three Networks in Academic Area

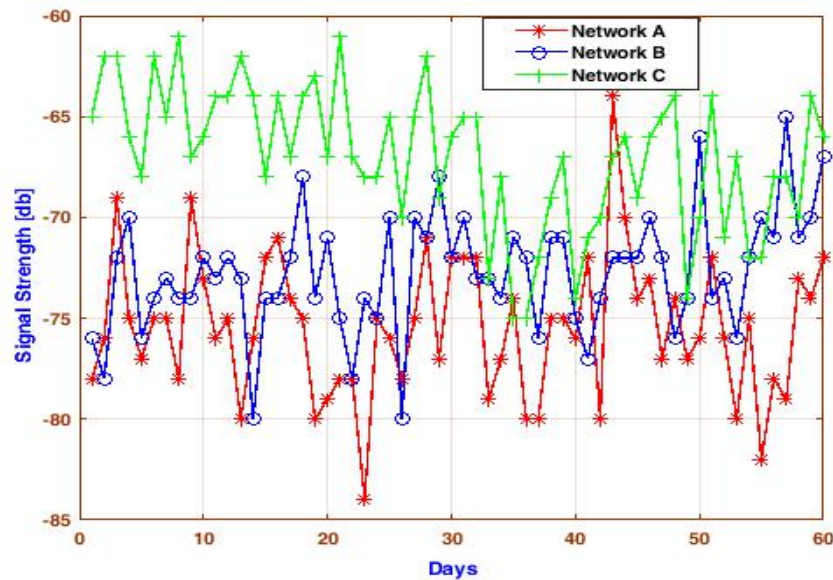


Figure 2: GPRS Signal Strength (dB) against Time (days) for the three networks in Academic Area

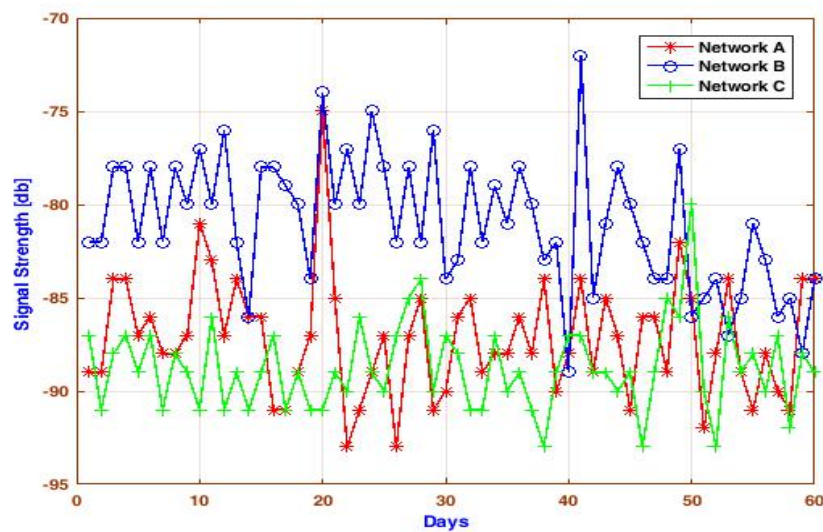


Figure 3: HSPA Signal Strength (dB) against Time (days) for the three Networks in student Hostel



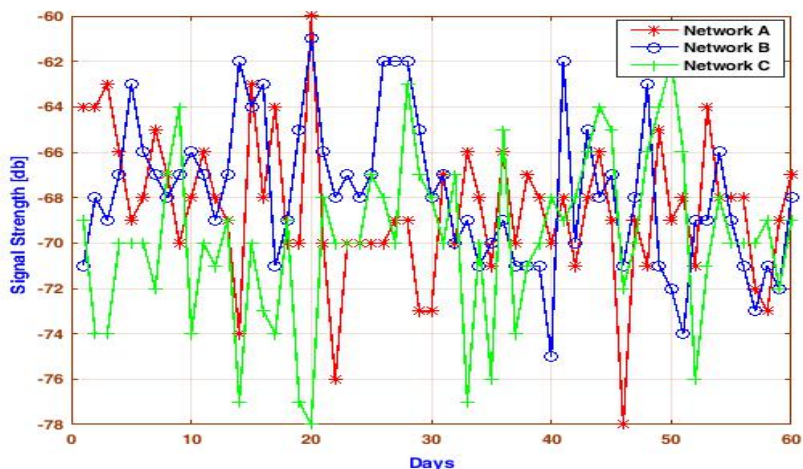


Figure 4: GPRS Signal Strength (dB) against Time (days) for the three Networks in Student Hostel

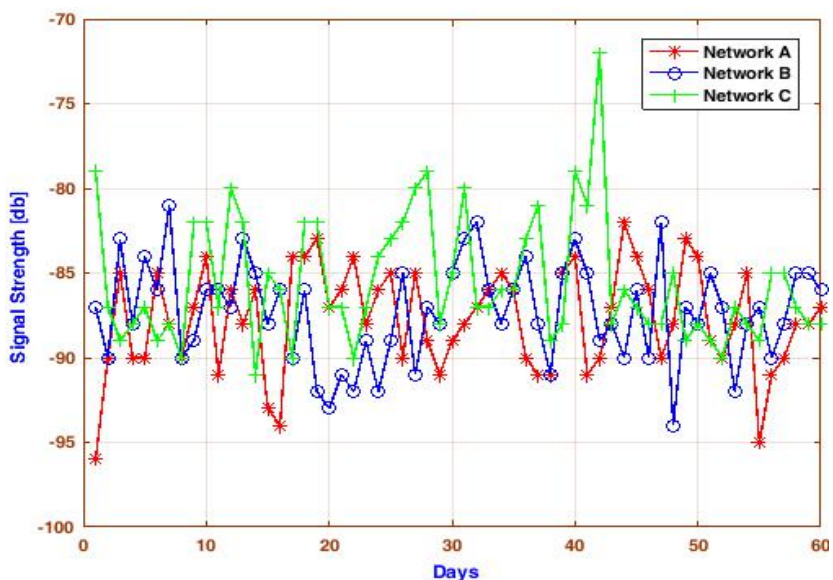


Figure 5: HSPA Signal Strength (dB) against Time (days) for the three Networks in Staff Quarters

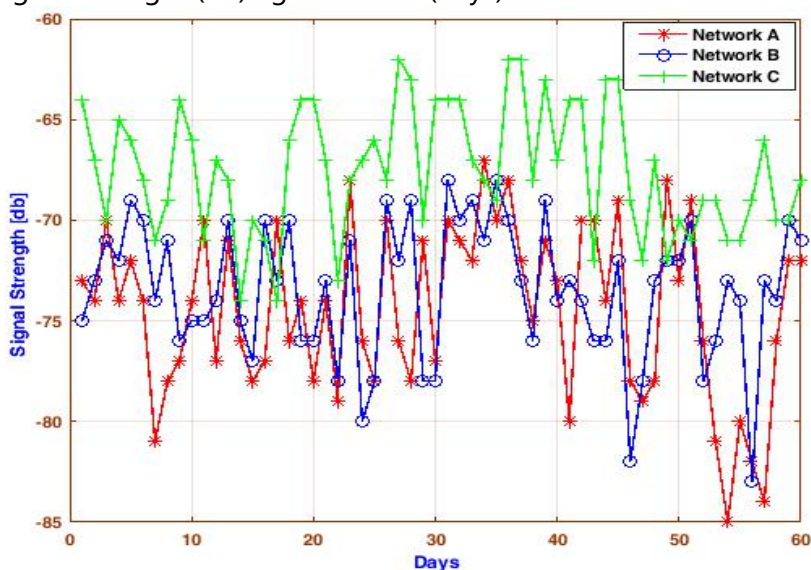


Figure 6: GPRS Signal Strength (dB) against Time (days) for Network A, Network B and Network C in Staff Quarters

#### 4. Conclusion

In this study, signal strengths of three major GSM networks in Nigeria were collected, analyzed and compared. The study revealed that signal strength from the three networks in University of Maiduguri varies with locations and time. It is observed from the three network under consideration Network A with HSPA -91.91dB and GPRS -73.59Db is the best network in the academic area, Network B with HSPA -87.27dB and GPRS -73.43dB has the best network quality in the staff quarters and Network C with HSPA -88.73dB and GPRS -69.85dB is the best network in the student hostel, results above shows that the quality of signal strength depends on location within the university. In choosing a network, the signal strength should be considered seriously since the quality of signal provided by a network is a function of the signal strength of that network.

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