



NATIONAL COMMUNICATIONS AUTHORITY

Quality of Service (QoS) Monitoring of Cellular Mobile Voice Services-WESTERN REGION

[June 2015]

[Communications for Development]

**QUALITY OF SERVICE (QoS) MONITORING OF CELLULAR MOBILE VOICE SERVICES IN WESTERN
REGION, JUNE 2015**

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Background

In pursuance of Annexure D1 and D2 of the Cellular Mobile Licence of Telecommunication Operators, the consumer perspective of the quality of voice services are tested to ensure the compliance of Operators to the obligations on service quality to the user.

The report is based on findings on quality of service in Western region in June 2015 for all Operators except for Espresso due to their technical challenges. Also, Glo Mobile had no coverage at Sefwi-Wiawso and Bibiani.

What we measure

The Quality of Service monitoring system measures many parameters including coverage signal strength and voice quality. These parameters are in the 3G licence, a complementary licence to the Cellular Mobile Licence. The Voice Quality is measured by an ITU standard P.863 fondly called (POLQA) Perceptual Objective Listening Quality Assessment.

As per the Cellular Mobile licence obligations, the QoS indicators and their respective threshold for compliance under assessment considering the user's perspective are as below;

- **Stand-alone Dedicated Control Channel (SDCCH) Congestion Rate**
- **Call Setup Time (CST)**
- **Call Congestion Rate**
- **Call Drop Rate (CDR)**
- **Voice Call Audio Quality**
- **Coverage Signal Strength**

Findings

The results for the cities and towns tested during the period are as below:

a) Stand-alone Dedicated Control Channel (SDCCH) Congestion Rate

SDCCH Congestion Rate should be equal or less than one per cent (1%).

SDCCH Congestion is defined as the probability of failure of accessing a stand-alone dedicated control channel during call set up.

For analysis and calculations,

$$\text{SDCCH Congestion}[\%] = \frac{\text{Number of connect fails due to Immediate Assignment Failures}}{\text{MOC call attempts}} \times 100\%$$

Table 1. Signalling Congestion Rate Cellular Mobile Voice Service, June 2015

Month	City/Town	MTN	Vodafone	Tigo	Airtel	Glo
JUNE	Sekondi/Takoradi	0	0	0	0	0
JUNE	Tarkwa	0	0	0	0	0
JUNE	Half Assini	0	0	0	0	0
JUNE	Bibiani	0	0	0	0	No Network
JUNE	Sefwi Wiawso	0	0	0	0	No Network

REMARK:

- ❖ All Operators were in compliance in tested cities and towns with the signalling congestion threshold of less than 1 percent (1%).

b) Call Setup Time (CST)

CST should be less than ten seconds (<10secs) in 95% of cases.

Call Setup Time is the period of time elapsing from the sending of a complete destination address (target telephone number) to the setting up of a call to the receiving terminal;

$$\text{Call set - up time [s]} = t_{\text{alerting - signal}} - t_{\text{address - sending}}$$

$t_{\text{alerting signal}}$ – Moment when an alerting signal is sent to the called terminal

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$t_{address\ sending}$ – Moment user presses the SEND button on the calling terminal

Table 2. Call Setup Time of Cellular Mobile Voice Service, June 2015

Month	City/Town	MTN	Vodafone	Tigo	Airtel	Glo
JUNE	Sekondi/Takoradi	6	11.29	8.02	11.47	9.59
JUNE	Tarkwa	6.28	5.87	6.44	8.38	14.81
JUNE	Half Assini	6	5.34	6.75	4.34	5.05
JUNE	Bibiani	7.49	12.19	6.5	5.31	No Network
JUNE	Sefwi Wiawso	10.93	13.17	6.17	4.15	No Network

REMARK:

- ❖ All Operators except TIGO failed to meet the parameter threshold in certain localities.

c) Call Congestion Rate

Traffic Channel Congestion should be equal or less than one per cent (1%).

Call Congestion Rate is the probability of failure of accessing a traffic channel during call setup;

$$\text{Call Congestion [\%]} = \frac{\text{Number of Connect failed calls}}{\text{Total number of call attempts}} \times 100\%$$

Table 3. Call Congestion Rate Cellular Mobile Voice Service, June 2015

Month	City/Town	MTN	Vodafone	Tigo	Airtel	Glo
JUNE	Sekondi/Takoradi	0	0	0	0	0.22
JUNE	Tarkwa	0	0	0	0	1.0
JUNE	Half Assini	0	0	0	0	0
JUNE	Bibiani	0	0	0	1.5	No network
JUNE	Sefwi Wiawso	0	0	0	0	No network

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REMARKS:

- ❖ All Operators except Airtel remained compliant with the licence threshold of less than one percent (1%) in all the tested locations.
- ❖ There is high traffic congestion on Airtel at Bibiani.

d) Call Drop Rate (CDR)

Call drop rate should be equal or less than three per cent (3%).

Voice Call Drop Rate is the probability of a call terminating without any of the users' will;

$$\text{Drop Rate [\%]} = \frac{\text{Number of calls terminated unwillingly}}{\text{Total number of call attempts}} \times 100\%$$

Table 4. Call Drop Rate Cellular Mobile Voice Service, June 2015

Month	City/Town	MTN	Vodafone	Tigo	Airtel	Glo
JUNE	Sekondi/Takoradi	0	0	0	0	0
JUNE	Tarkwa	0	0	0	0	0
JUNE	Half Assini	0	0	0	0	0
JUNE	Bibiani	0	0	0	0	No Network
JUNE	Sefwi Wiawso	0	0	0	0	No Network

REMARK:

- ❖ All operators were in compliance with the Call Drop Rate licence threshold of less than three percent (3%) in all localities tested.

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Voice Call Audio Quality - perceptibility of the conversation during a call. Voice Call Audio Quality is measured using a parameter called the Mean Opinion Score (MOS) which categorizes speech samples in ranges from 1 to 5. See legend below. This parameter is machine measured.

Range	Rating
(Min,1)	Very bad
(1,2)	Bad
(2, 3.2)	Poor
(3.2, 3.5)	Fair
(3.5, 3.9)	Good
(3.9, 5.01)	Very good
(5.01, Max)	Excellent

Table 5. Speech Quality Mean Opinion Score Western Region, June 2015

Western Region	MTN	Vodafone	Tigo	Airtel	Glo
MOS	3.58	3.8	3.24	3.13	3.43

REMARKS:

- ❖ Vodafone and MTN were assessed to give GOOD speech quality.
- ❖ Glo and Tigo were assessed to offer FAIR speech quality.
- ❖ Airtel was rated POOR on speech quality.

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REMEDIES

- ❖ The NCA has notified Operators of publication of these findings and has directed all Operators to improve their coverage in some localities by December 2015.
- ❖ Airtel has been directed to cure the traffic congestion at Bibiani.




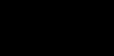
COVERAGE SIGNAL STRENGTH

COVERAGE AND SPEECH MAPS

The Maps below show the coverage level and speech quality in various towns where monitoring was performed. The coverage map is a combination of both 2G and 3G network signal strength. In each plot is a legend to indicate definitions of signal strength and quality range attain by operators during measurement.

Coverage levels in green falls in the range of -85dBm and above are considered good. Those between -85 and -95dBm are considered fair and are indicated in yellow. The red samples represent poor coverage in the range of -95 to -110dBm. The black samples represent areas with no coverage. The speech quality was assessed with Mean Opinion Score (MOS) which ranges from 5 to 1.

Coverage Legend

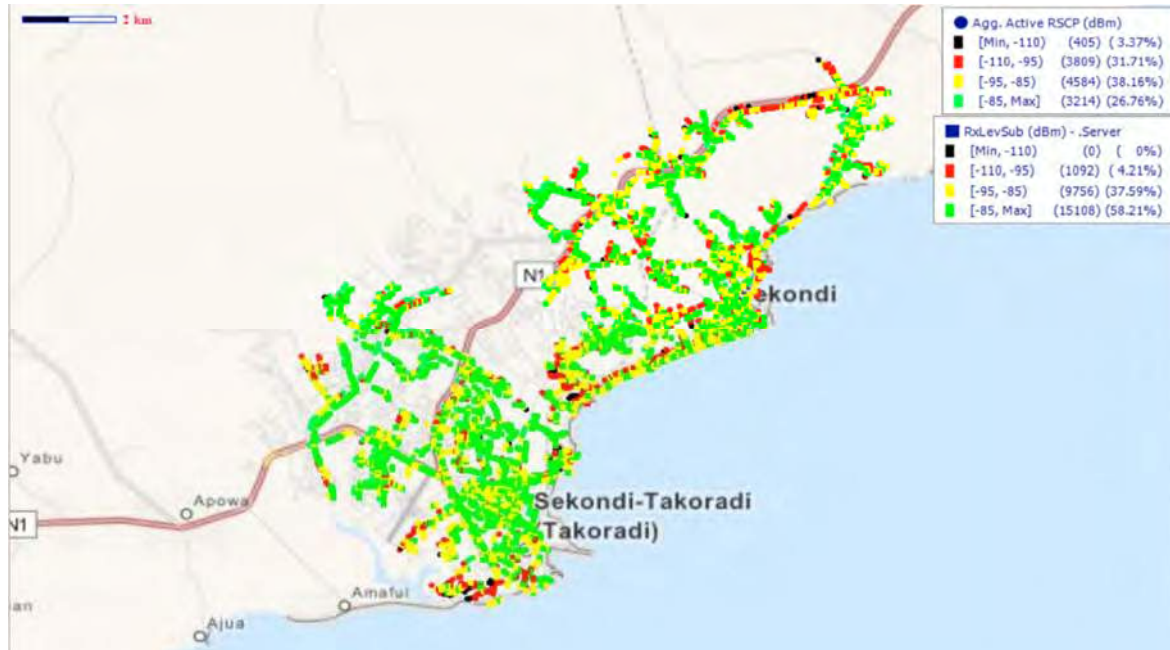
<i>Colour</i>	<i>Area Coverage Rating</i>
	Good Coverage Areas
	Fair Coverage Areas
	Poor Coverage Areas
	None Existent Coverage Areas

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APPENDIX I

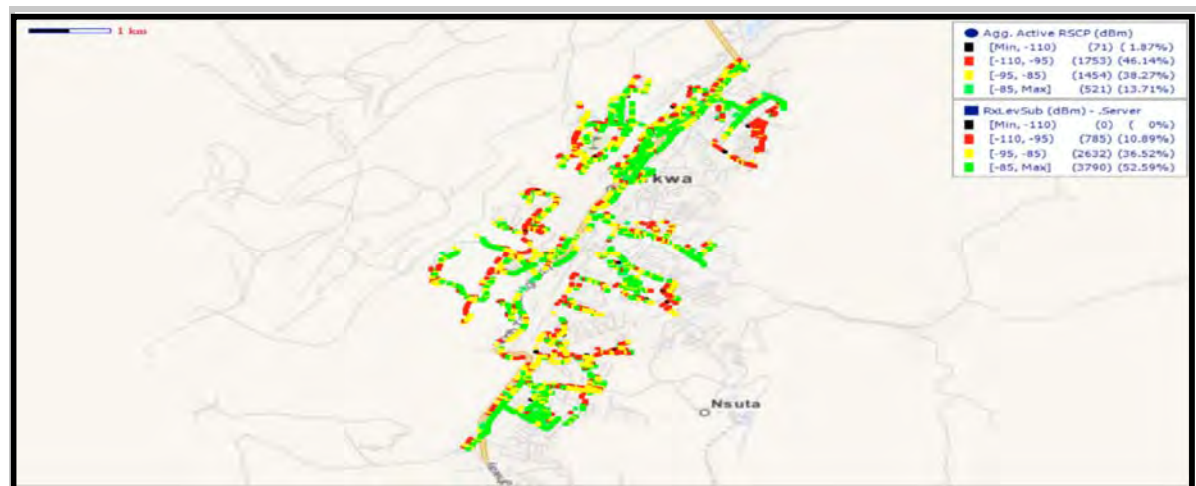
AIRTEL

Figure 1, Airtel Coverage, Sekondi/Takoradi, June 2015



Remarks: Good coverage with scattered spots of poor coverage within Sekondi and Takoradi.

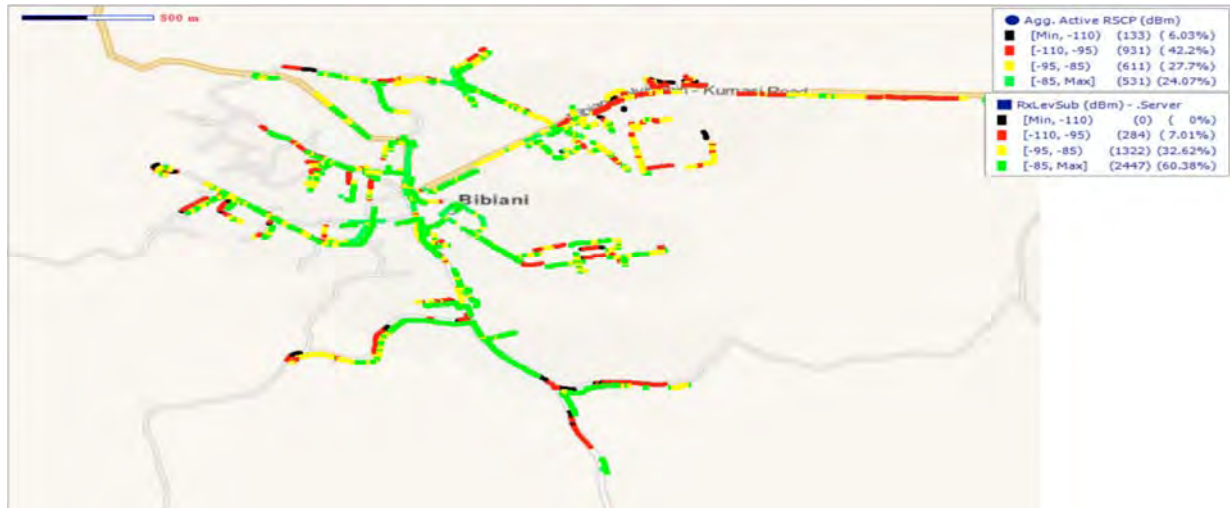
Figure 2, Airtel Coverage, Tarkwa, June 2015



Remark: Good coverage in Tarkwa but needs improvement in some parts of Tamso and Bankyim.

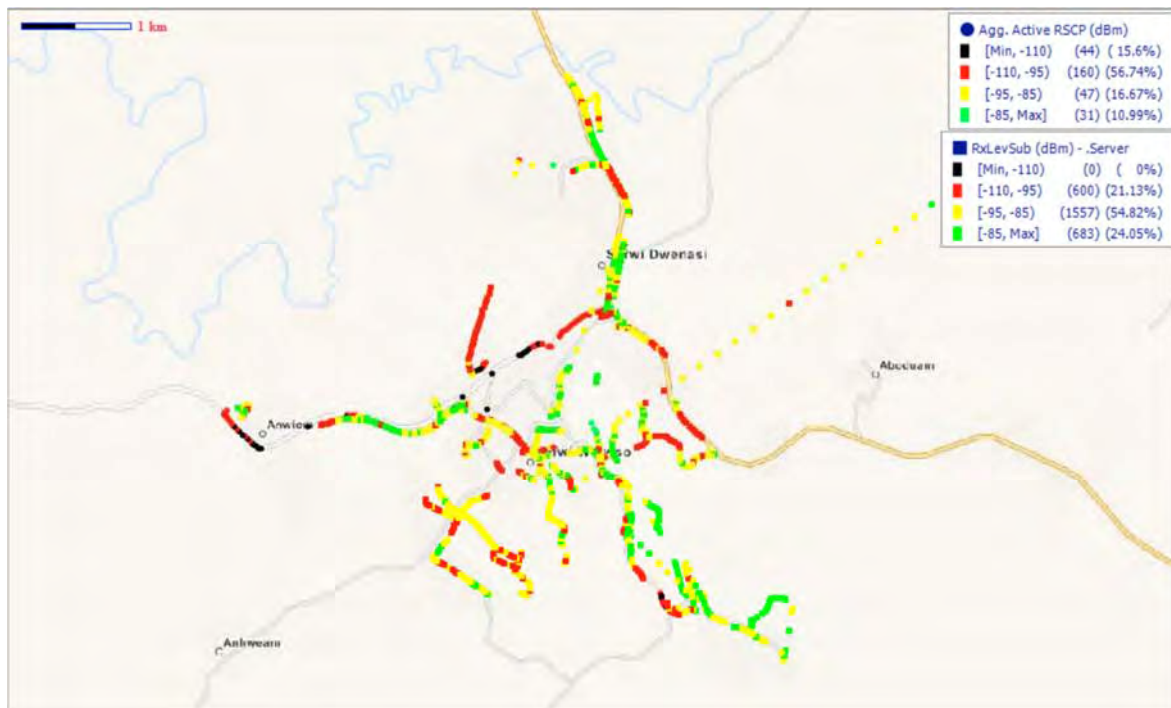
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Figure 3, Airtel Coverage, Bibiani, June 2015



Remarks: Good coverage within Bibiani yet coverage improvement is needed at Akuta on the Kumasi road

Figure 4, Airtel Coverage, Sefwi-Wiawso, June 2015



Remarks: Poor coverage which requires drastic improvement.

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Figure 5, Airtel Coverage, Half-Assini, June 2015



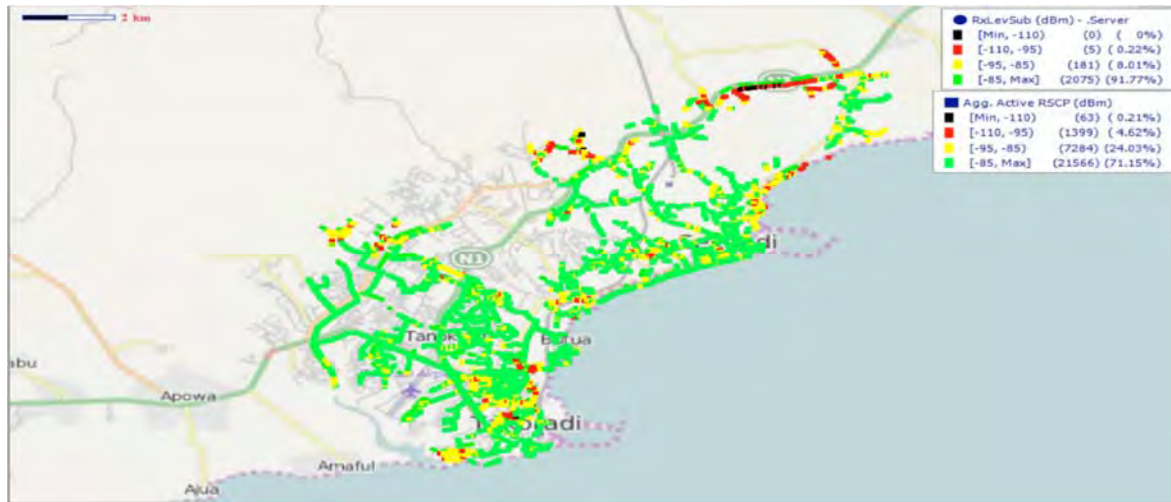
Remarks: Good Coverage at certain parts of Half Assini yet requires coverage improvement at outskirts especially.

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APPENDIX II

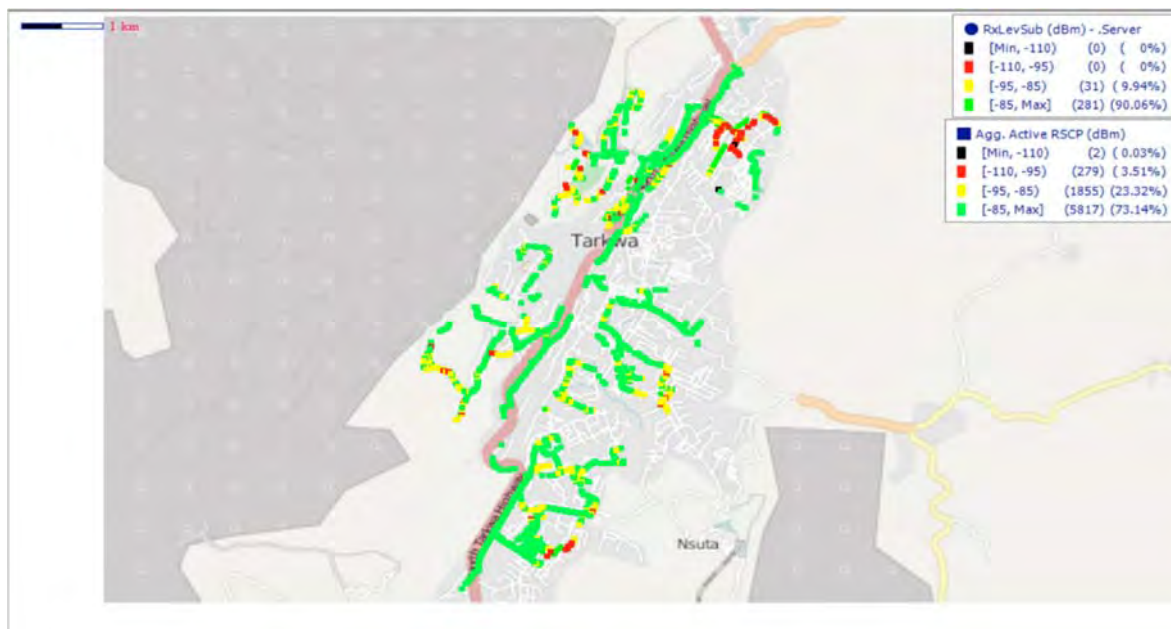
VODAFONE

Figure 6, Vodafone coverage, Sekondi/Takoradi, June 2015



Remarks: Good 3G & 2G network coverage. However areas around Sofokurom and its environs will need both 2G and 3G coverage improvement.

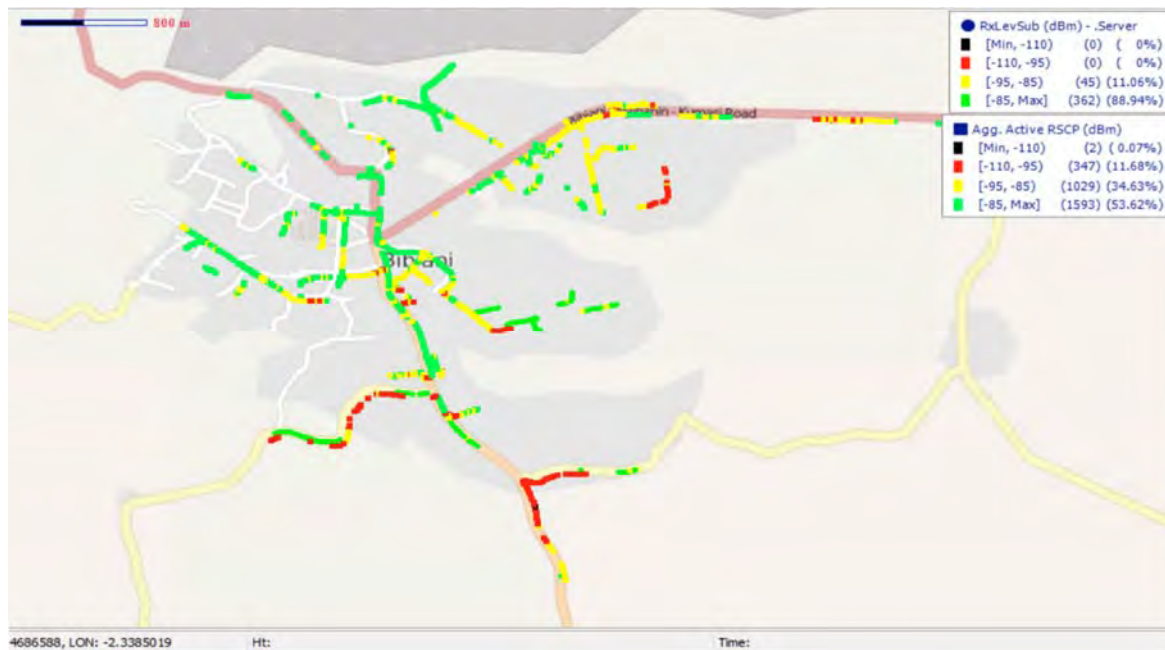
Figure 7, Vodafone coverage, Tarkwa, June 2015



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Remarks: Good 2G and 3G coverage except for Bankyim/ Duapem area which has poor coverage.

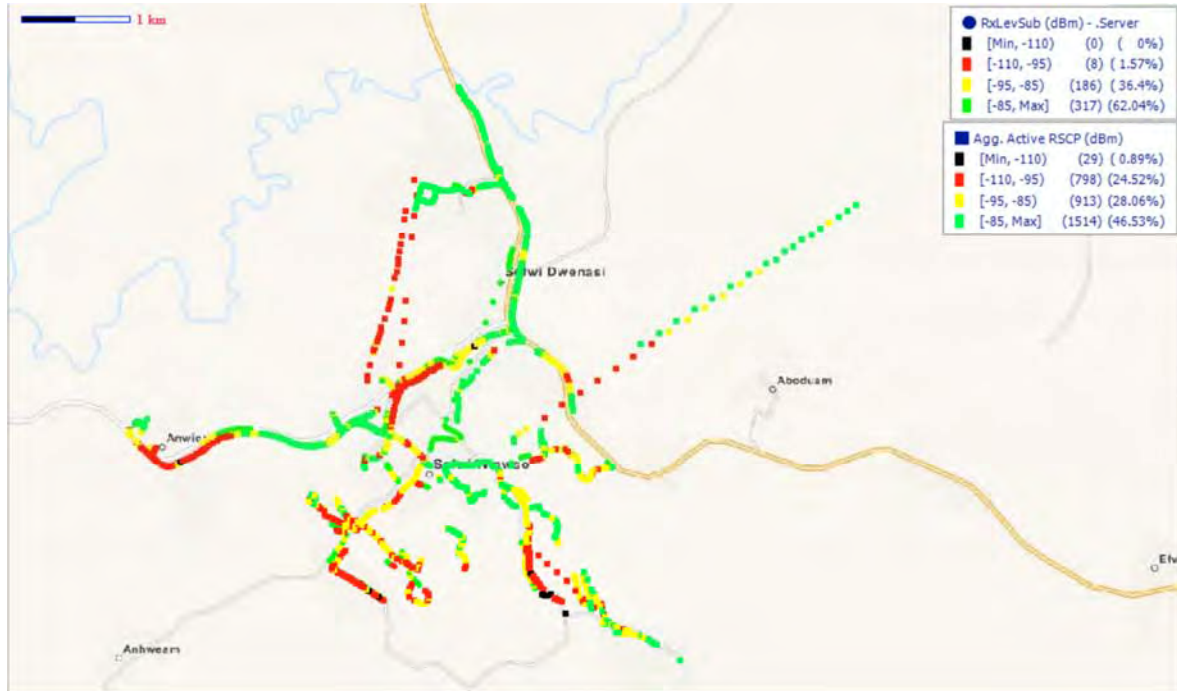
Figure 8, Vodafone coverage, Bibiani, June 2015



Remarks: Poor coverage on the Awaso and Akuta road which requires improvement.

Figure 9, Vodafone coverage, Sefwi-Wiawso, June 2015

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Remarks: Poor coverage at Nsawora, Anhwem, Nyamegyeso and parts of Bosomoiso which requires improvement.

Figure 10, Vodafone coverage, Half Assini, June 2015



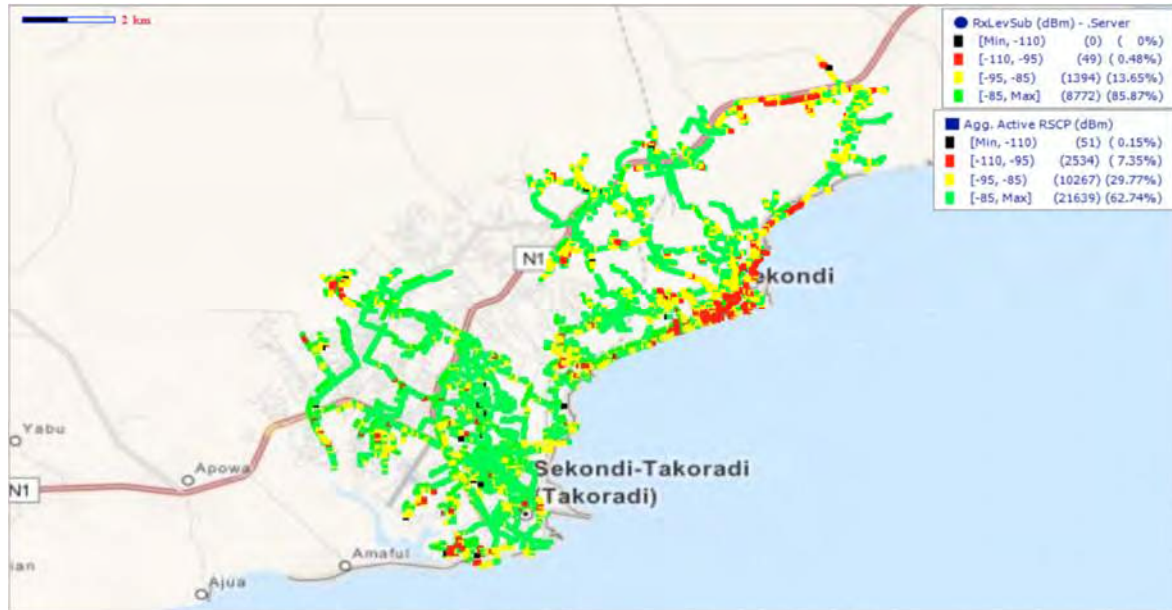
Remarks: Fair coverage in Half Assini which requires improvement especially at Ekpu.

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APPENDIX III

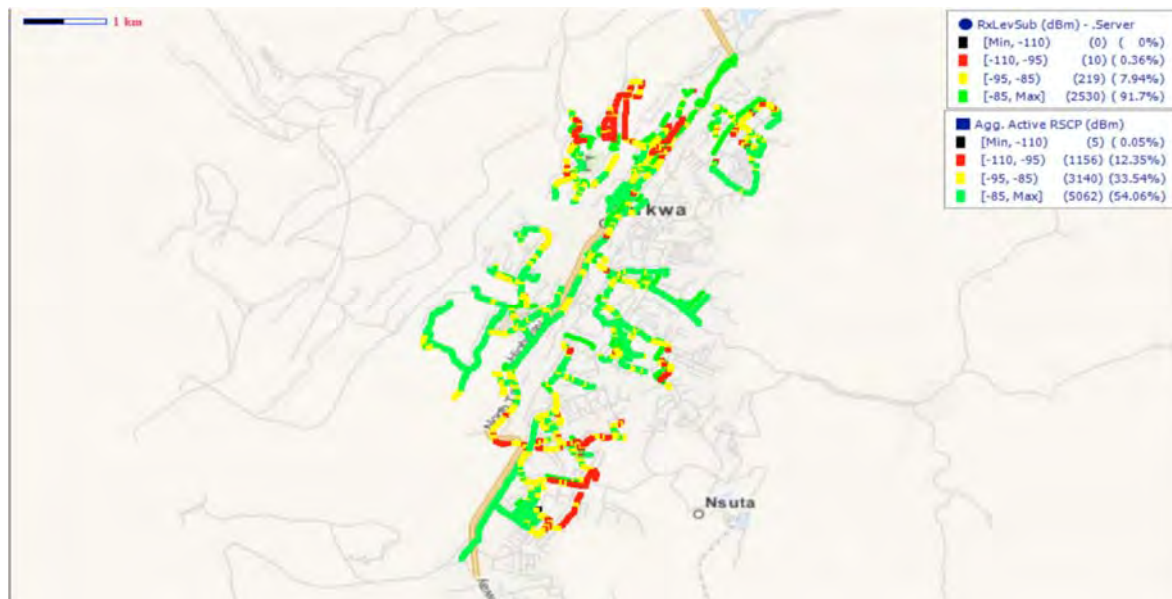
TIGO

Figure 11, Tigo coverage, Sekondi/Takoradi, June 2015



Remarks: Good coverage in Sekondi-Takoradi yet some areas such as the Naval Base in Sekondi and Mpintsin require coverage improvement.

Figure 12, Tigo coverage, Tarkwa, June 2015



Remarks: Good coverage yet requires improvement at Bakyim and Akoon.

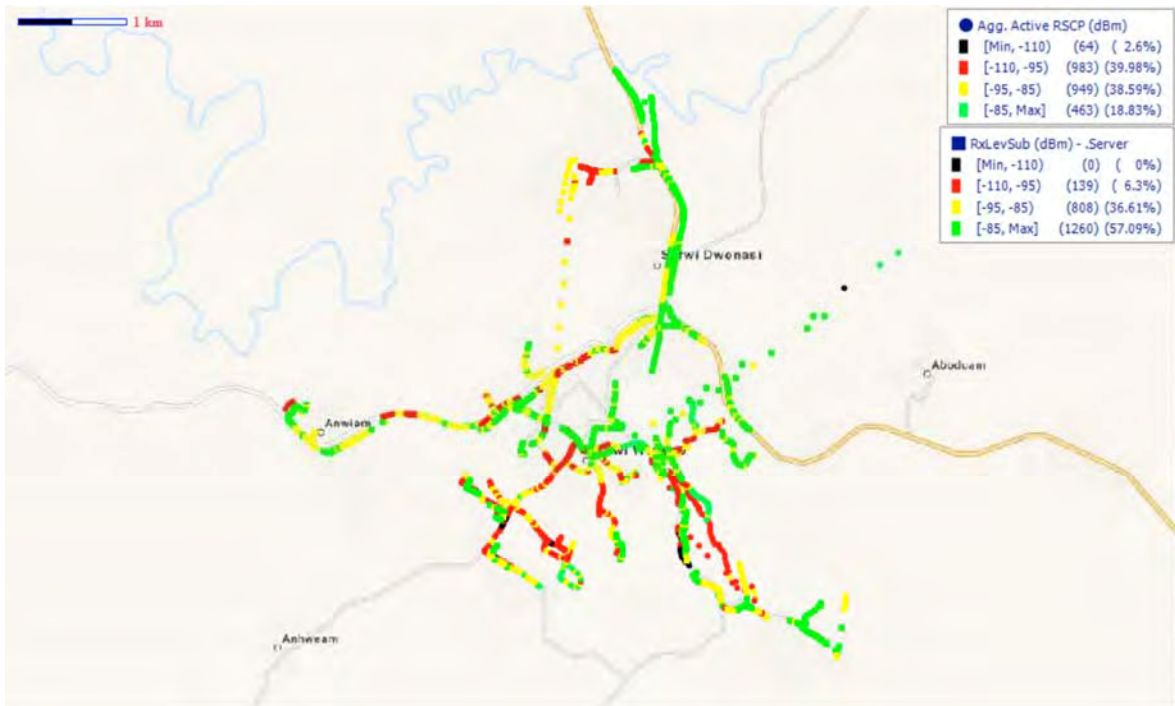
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Figure 13, Tigo coverage, Bibiani, June 2015



Remarks: Good 2G&3G coverage in Bibiani yet require improvement along the Kumasi road.

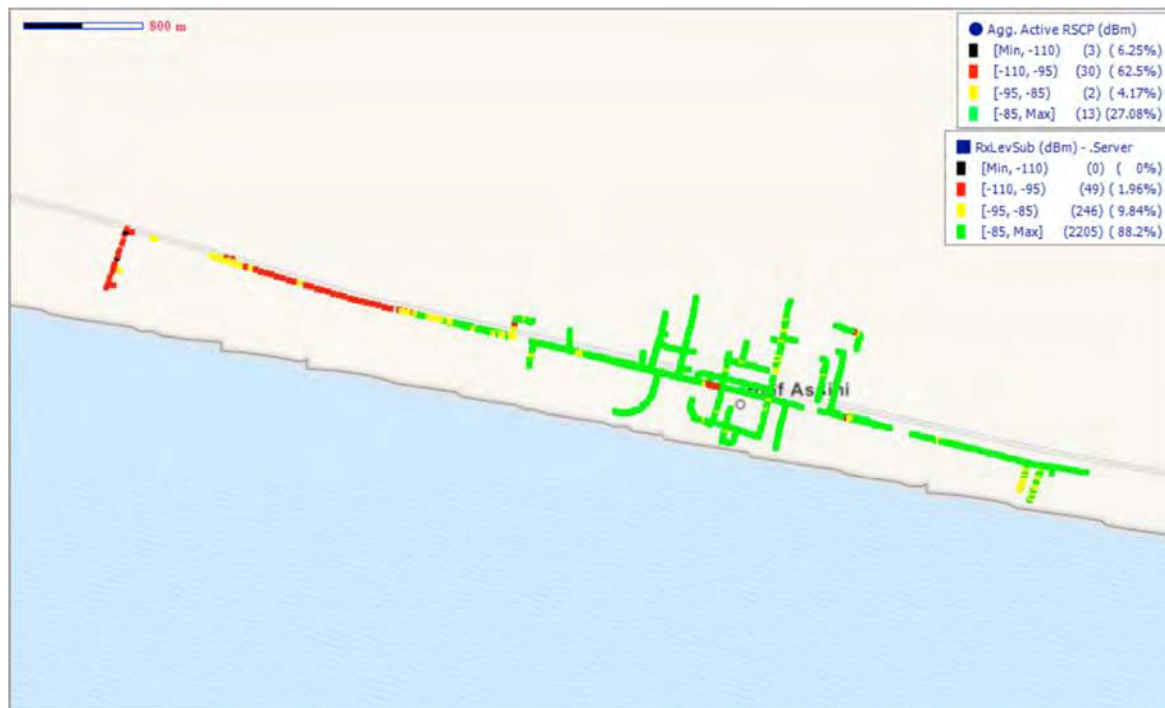
Figure 14, Tigo coverage, Sefwi Wiawso, June 2015



Remarks: Coverage in Sefwi Wiawso needs improvement.

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Figure 15, Tigo coverage, Half Assini, June 2015



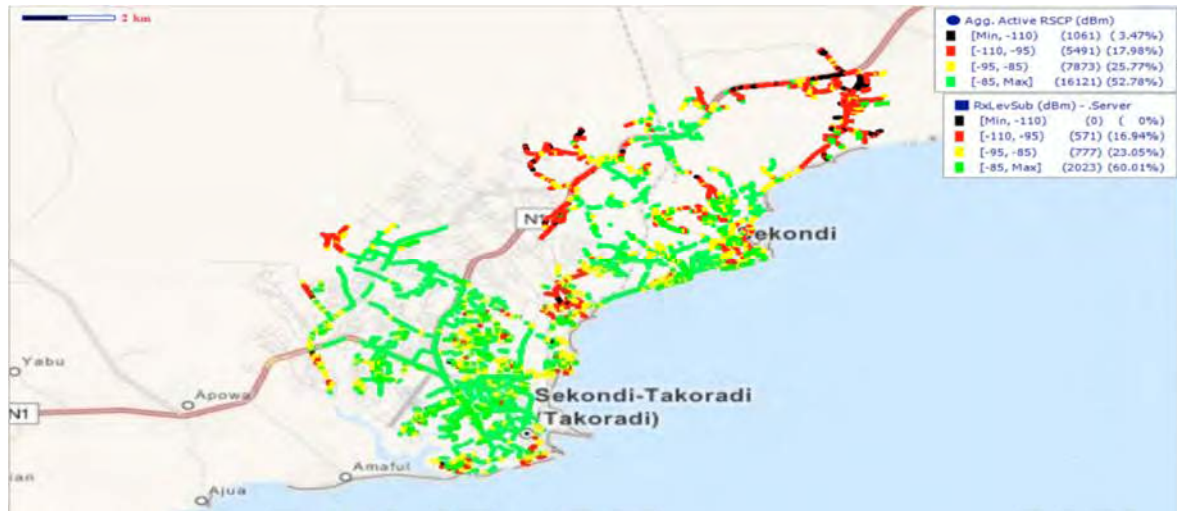
Remarks: Good coverage in Half Assini yet requires improvement on road towards Newtown.

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APPENDIX IV

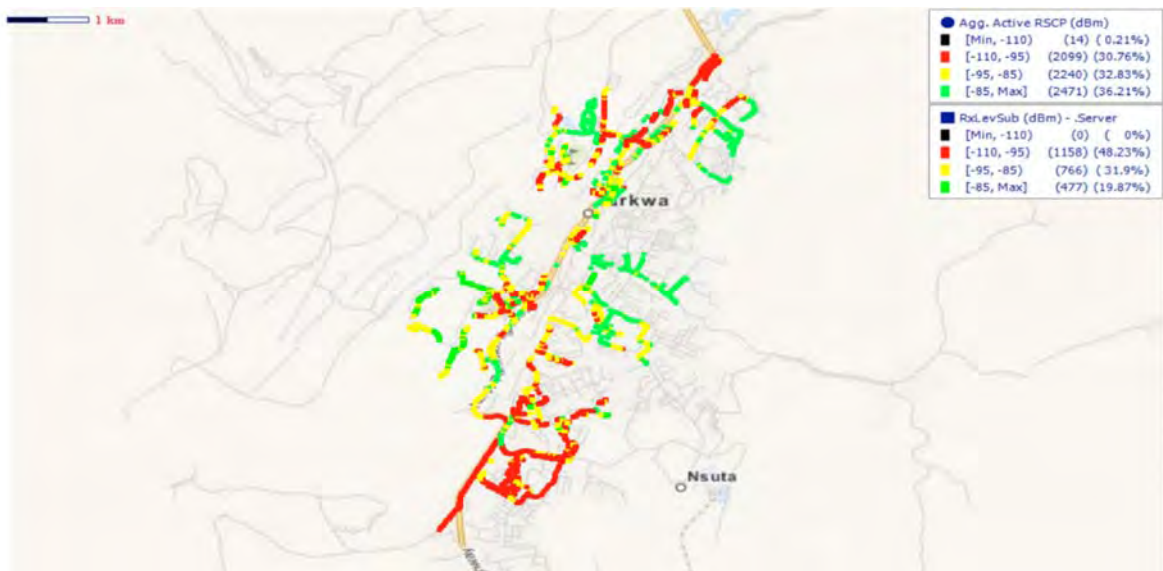
GLO

Figure 16, Glo coverage, Sekondi/Takoradi, June 2015



Remark: Good 2G&3G network coverage in Takoradi and parts of Sekondi. However coverage improvement is required at Essipon, Regimanuel Estate, Kojokrom and Sofokrom.

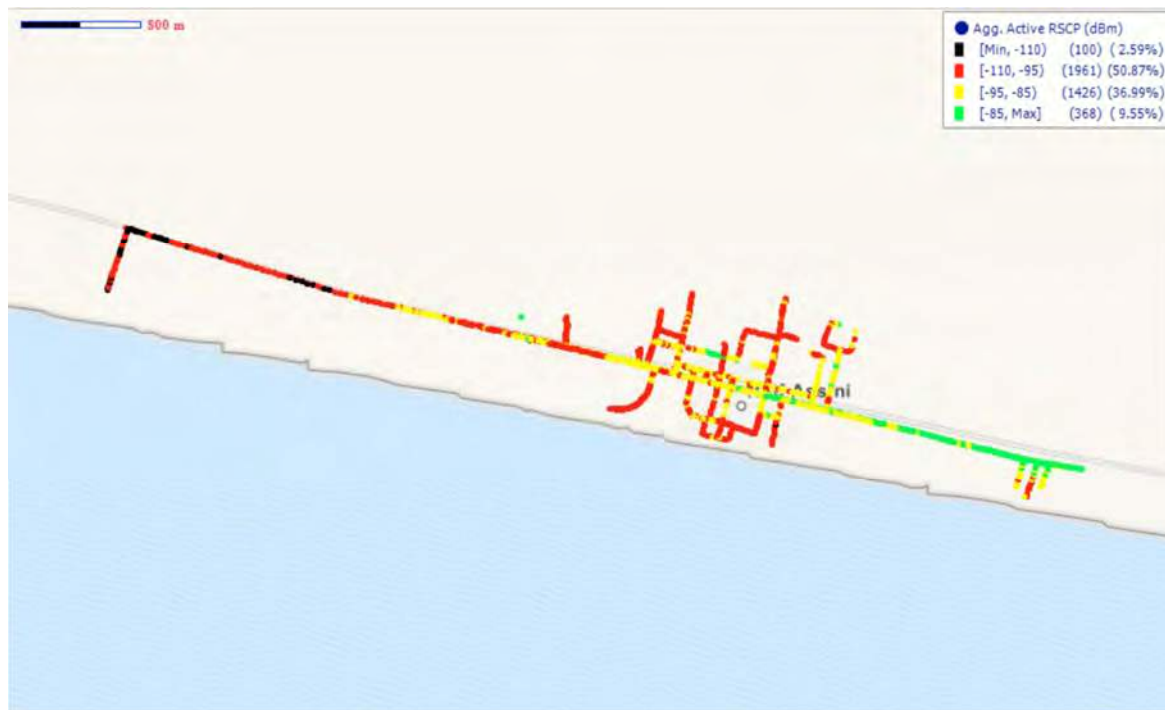
Figure 16, Glo coverage, Tarkwa, June 2015



Remarks: Fair coverage in Tarkwa which requires drastic improvement at the Ashantigold residential area, Bankyim and also at Tamso.

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Figure 18, Glo coverage, Half Assini, June 2015



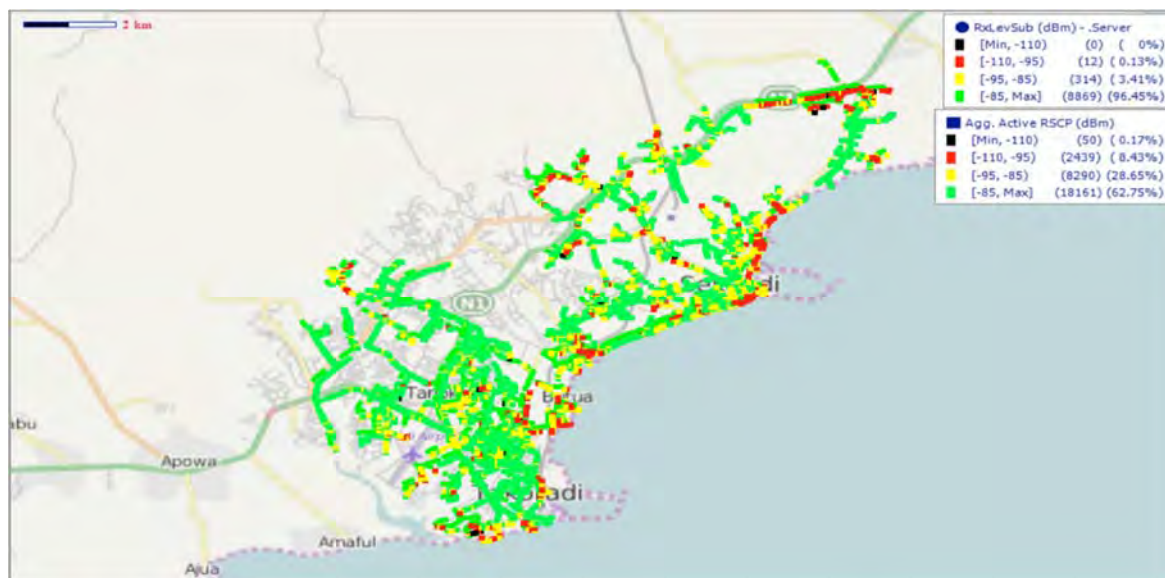
Remarks: Poor 3G-network coverage in Half Assini with no 2G coverage and therefore requires drastic improvement.

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APPENDIX V

MTN

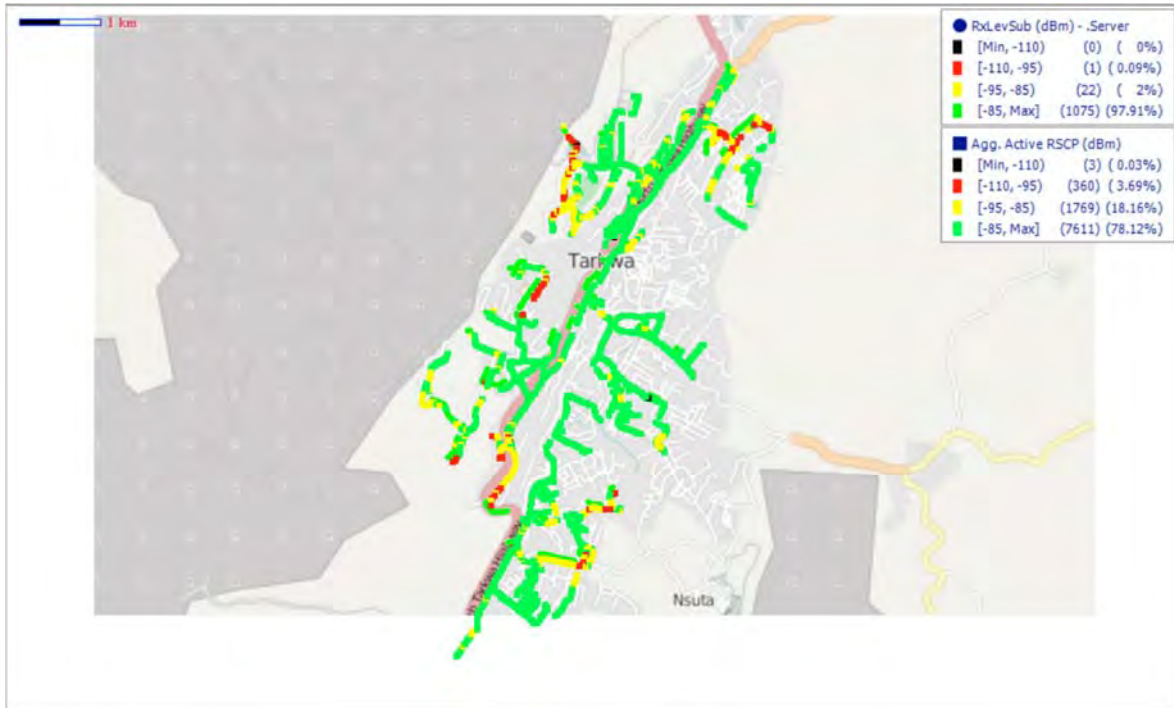
Figure 19, MTN coverage, Sekondi/Takoradi, June 2015



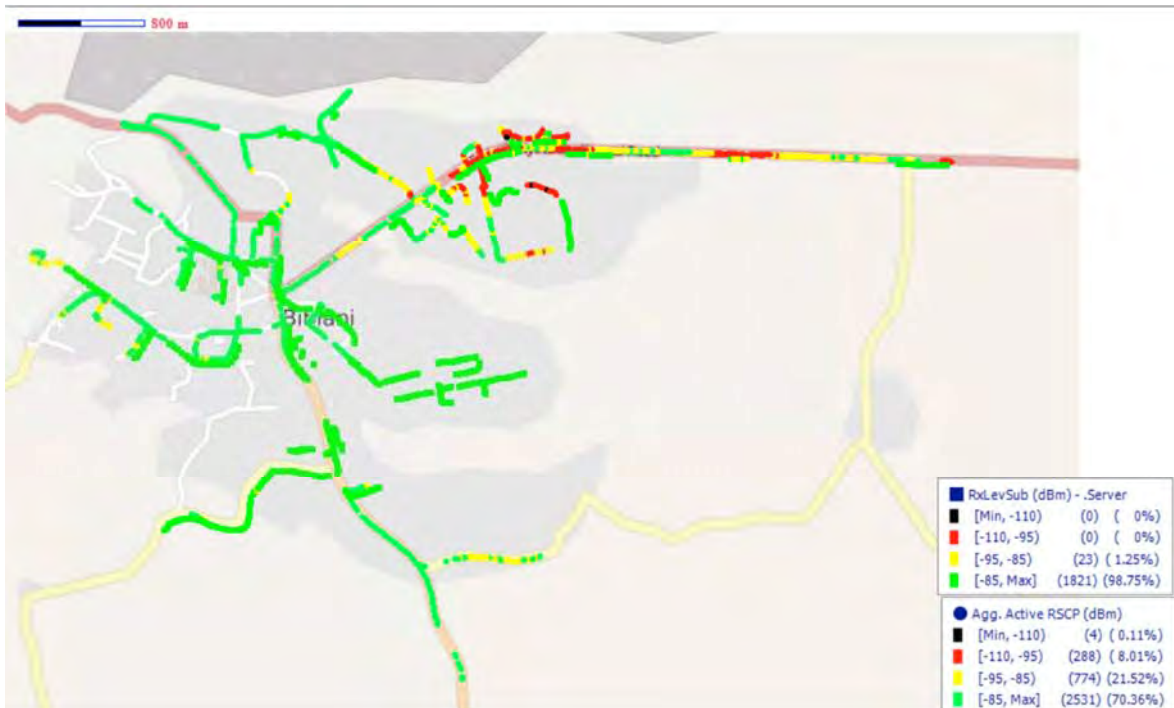
Remarks: Good 2G&3G network coverage in Takoradi. Coverage improvement is required on the Mpitsin road and Naval Base in Sekondi.

Figure 20, MTN coverage, Tarkwa, June 2015

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Remarks: Good 2G&3G network coverage in Tarkwa.
Figure 21, MTN coverage, Bibiani, June 2015



Remarks: Good 2G&3G network coverage in Bibiani yet requires improvement on the Nyinahin road

Figure 22, MTN coverage, Sefwi Wiawso, June 2015

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Remarks: Poor network coverage in Sefwi Wiawso which requires drastic improvement. Figure 23, MTN coverage, Half Assini, June 2015



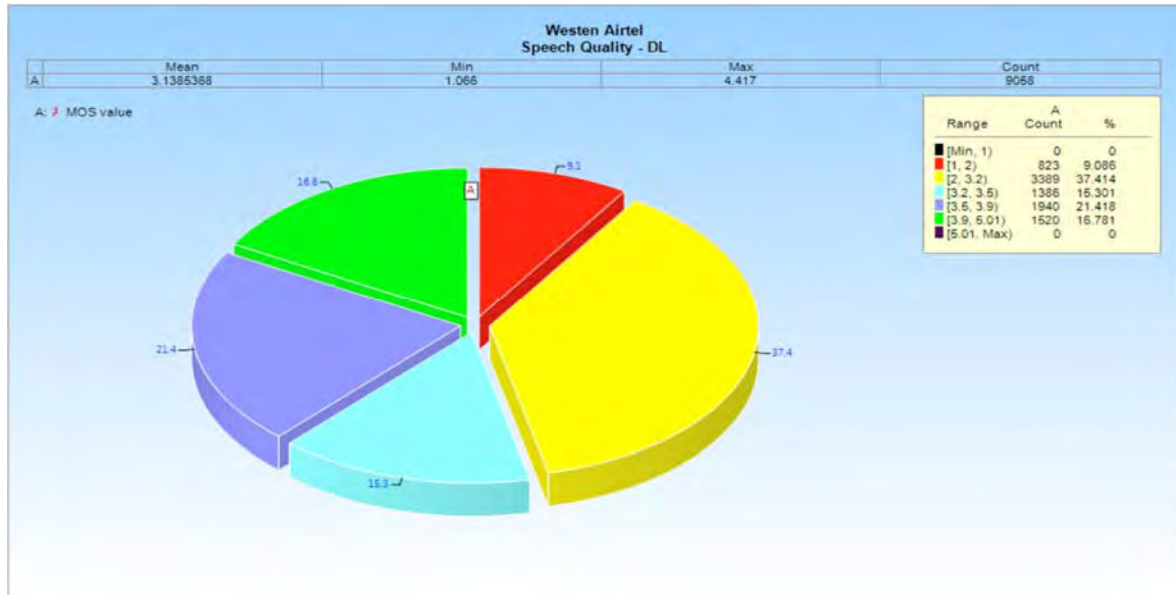
Remarks: Good coverage at Half Assini yet coverage improvement is required at the outskirts.

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APPENDIX VI

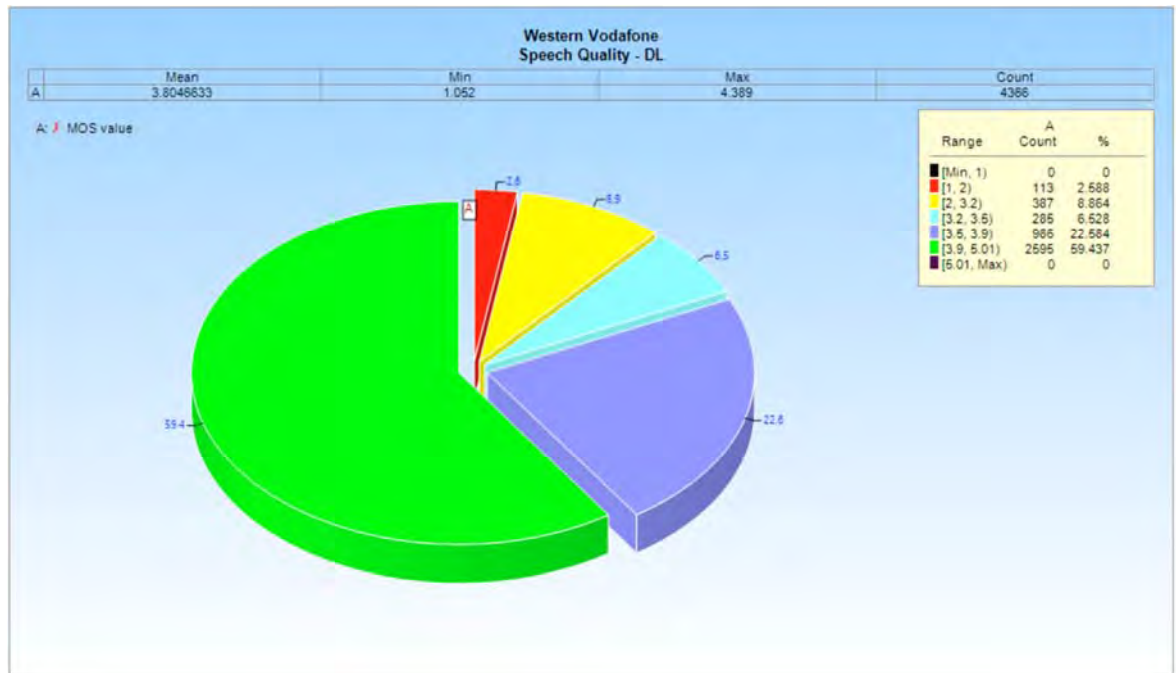
SPEECH QUALITY FOR OPERATORS

Figure 24 Airtel Speech Quality report in Western Region



Remark: Speech Quality Index rated “POOR”

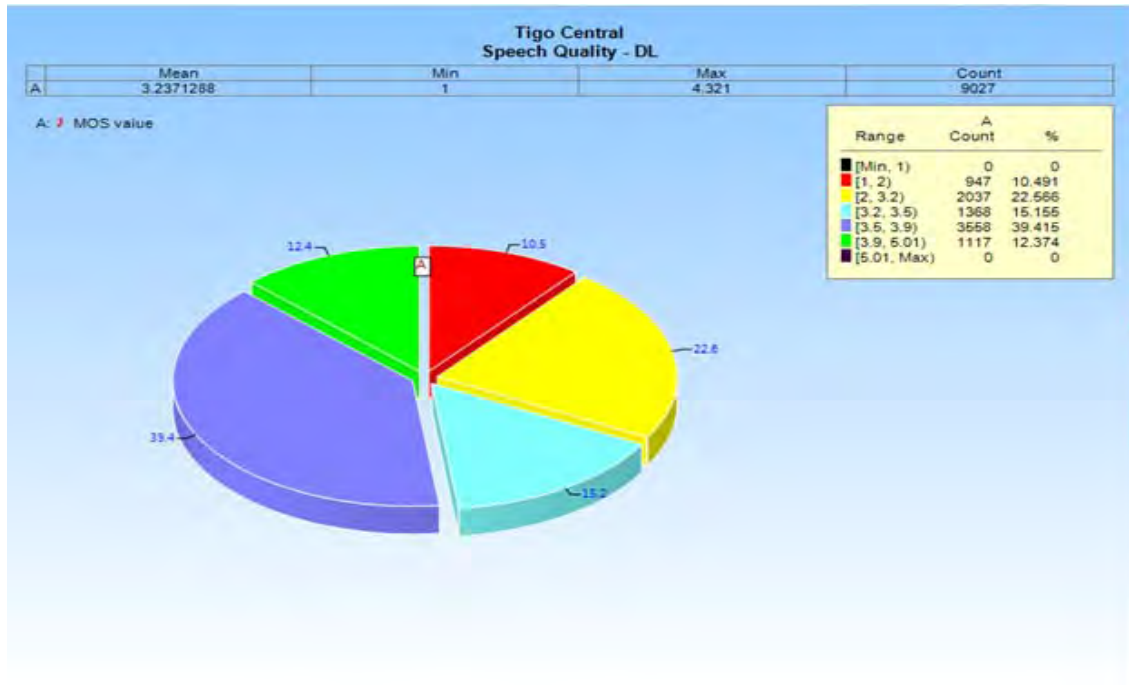
Figure 25 Vodafone Speech Quality report in Western Region



Remark: Speech Quality Index rated “GOOD”

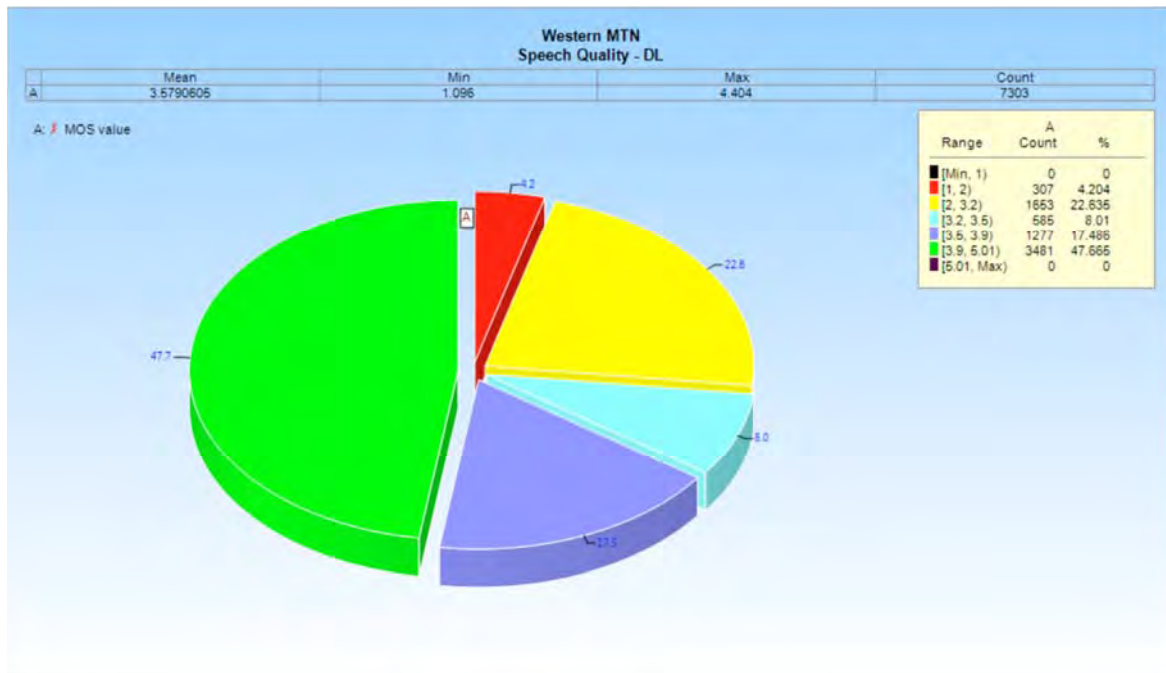
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Figure 26 Tigo Central Speech Quality report in Western Region



Remark: Speech Quality Index rated “FAIR”

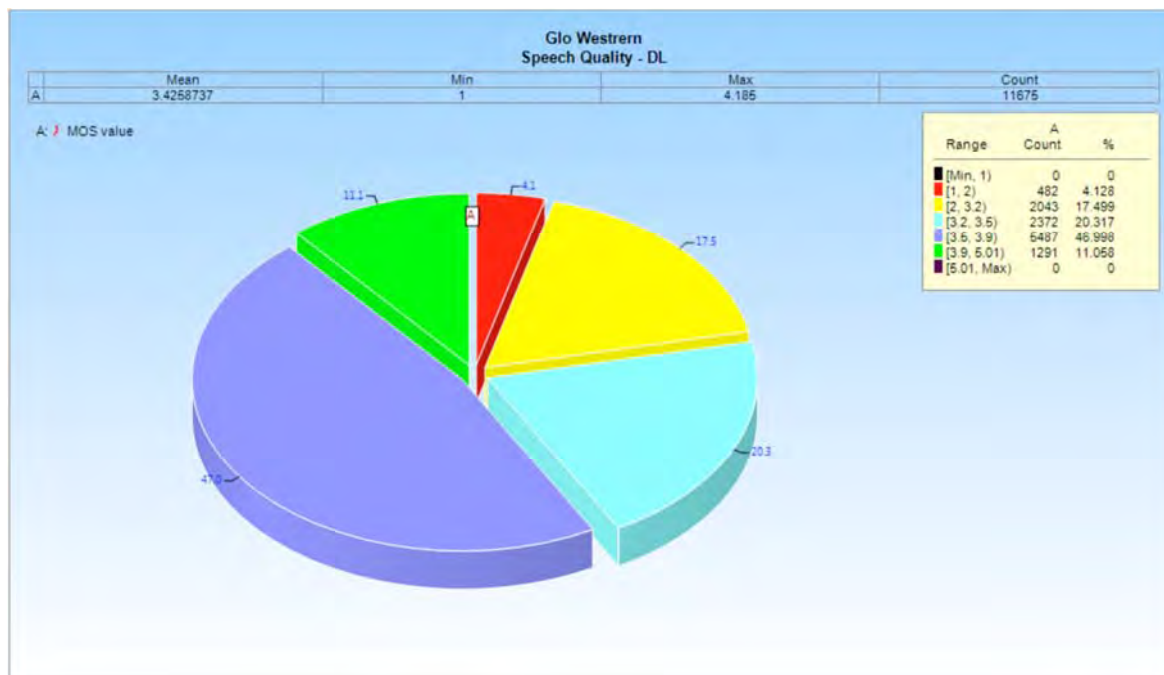
Figure 27 MTN Speech Quality report in Western Region



Remark: Speech Quality Index rated “GOOD”

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Figure 28 Glo Speech Quality report in Western Region



Remark: Speech Quality Index rated “FAIR”