



**Independent Communications Authority of South Africa**

350 Witch-Hazel Avenue, Eco Point Office Park  
Eco Park, Centurion.  
Private Bag X10, Highveld Park 0169  
Telephone number: (012) 568 3000/1

**2021/2022 Quarter 2:  
Voice Quality of Service  
Report  
Northern Cape Province**

## TABLE OF CONTENTS

1. EXECUTIVE SUMMARY .....	7
2. INTRODUCTION .....	8
3. METHODOLOGY .....	10
3.1. EQUIPMENT TEST SETUP AND CONFIGURATION.....	11
3.1.1. SYSTEM USED.....	11
3.1.2. DEVICE DESCRIPTION.....	11
3.1.3. SHORT & LONG CALL WINDOWS.....	11
3.2. ROUTE SELECTION.....	11
3.3. MEASUREMENT PARAMETERS AND TARGETS.....	13
3.3.1. PARAMETERS.....	13
3.3.1.1. CALL SETUP SUCCESS RATIO [%] .....	13
3.3.1.2. DROP CALL RATIO [%].....	13
3.3.1.3. CALL SETUP TIME [S].....	13
3.3.1.4. SPEECH QUALITY (MOS) .....	13
3.3.2. TARGETS.....	13
4. RESULTS AND ANALYSIS .....	14
4.1. ACCESSIBILITY, RETAINABILITY, CALL SETUP TIME AND QUALITY MEASUREMENTS .....	14
4.1.1. KPI RESULTS PER AREA .....	14
4.1.2. CALL ACCESSIBILITY (SHORT CALL) .....	15
4.1.3. DROP CALL RATIO (LONG CALL) .....	16
4.1.4. CALL SETUP TIME (SHORT CALL) .....	17
4.1.5. POLQA MOS (LONG CALL).....	18
4.1.6. RADIO TECHNOLOGY .....	19
4.1.7. CSFB.....	20
4.2. COMPARISON OF CURRENT RESULTS TO PREVIOUS RESULTS .....	21
5. CONCLUSION.....	22
6. APPENDICES .....	24
6.1. APPENDIX 1: MOBILE OPERATORS' FEEDBACK ON THE REPORT .....	24
6.1.1. VODACOM .....	24
6.1.2. MTN.....	24

---

6.1.3.	CELL C .....	25
6.1.4.	TELKOM .....	25
6.2.	APPENDIX 2: DETAILED TEST RESULTS PER PHASE .....	27
6.3.	APPENDIX 3 TECHNOLOGY MAPS .....	29
6.4.	APPENDIX 4 UMTS COVERAGE MAPS .....	30
6.5.	APPENDIX 4 UMTS QUALITY MAP .....	31

---

## List of Abbreviations

CD	Call Duration
CSFB	Circuit Switched Fall Back
CRR	Call Retention Ratio
CSSR	Call Setup Success Ratio
CST	Call Setup Time
DCR	Drop Call Ratio
GSM	Global System for Mobile Communications
HD	High Definition
ICASA	Independent Communications Authority of South Africa
IVR	Interactive Voice Response
KPI	Key Performance Indicator
LTE	Long-Term Evolution
LTE-A	Long-Term Evolution Advanced
R&S	Rohde & Schwarz
MOC	Mobile Originating Call
MOS	Mean Opinion score
POLQA	Perceptual Objective Listening Quality Analysis
WCDMA	Wideband Code Division Multiple Access
VoLTE	Voice over Long-Term Evolution

---

## List of Figures

Figure 1. Northern Cape Province Route Map with Population Distribution.....	8
Figure 2. Call Window Duration .....	11
Figure 3. CSSR KPI per Area .....	15
Figure 4. CSSR KPI Overall Results .....	15
Figure 5. DCR KPI per Area .....	16
Figure 6. DCR KPI Overall Results .....	16
Figure 7. Call Setup Time[s] KPI per Area .....	17
Figure 8. Call Setup Time[s] KPI Overall Results.....	17
Figure 9. Speech Quality per Area .....	18
Figure 10. Speech Quality Results .....	18
Figure 11. Serving Radio Technology per Area.....	19
Figure 12. Serving Radio Technology Overall Results.....	19
Figure 13. CSFB per Area .....	20
Figure 14. CSFB Overall Results .....	20
Figure 15. Radio Technology Maps .....	29
Figure 16. UMTS Coverage Maps .....	30
Figure 17. UMTS Quality Maps.....	31

## List of Tables

Table 1. Test timeline for area covered.....	12
Table 2. Distance and time driven per area .....	12
Table 3. Summary of KPI Results per Area .....	14
Table 4. Comparison of previous results .....	21
Table 5. CSSR & Call Setup Time Phase 1 & Phase 2 .....	27
Table 6. (DCR) & POLQA MOS Phase 1 & Phase 2 .....	28

---

## 1. Executive Summary

The Independent Communications Authority of South Africa (ICASA) contracted Metro Global Telecom Services (Pty)Ltd. (MetroTelworks) to conduct Quality of Service (QoS) measurements on the networks of mobile operators; Cell C, MTN, Telkom and Vodacom. The measurements were performed to monitor performance of mobile voice services offered by the operators in the Northern Cape Province. The measurements were carried out between the 4<sup>th</sup> of September and the 26<sup>th</sup> of September 2021, covering a total distance of over 2906 kilometres.

The purpose of performing QoS measurements was to monitor and analyse the quality of mobile voice service as experienced by the end-user. The results were later benchmarked against the QoS standard set by the Authority. The measurements were conducted in areas and in circumstances where mobile voice service is likely to be accessed. These areas include towns, townships, farm areas, rural areas, and economic activity nodes. The sampled areas within the Northern Cape Province were Barkly West, Galeshewe, Hopetown, Jan Kempdorp and Kimberley.

A vehicle equipped with Rohde and Schwarz Smart Benchmarker II testing system, and 8 mobile phones were used to collect data in mobility conditions. The four Key Performance Indicators (KPIs) used to assess QoS are Accessibility, Retainability, Call Setup Time and Speech Quality. The Drop Call Ratio (DCR) KPI is used to measure a user's ability to successfully complete a call and Call Setup Success Ratio (CSSR) KPI measures a user's ability to make a phone call.

According to the End-User and Subscriber Service Charter Regulations of 2016, the average DCR should be less than 3% and the average CSSR should be greater than 98%. The average Call Setup Time must be less than 20 seconds and the score for the average Speech Quality must be greater than 3.

The results show that in terms of overall Call Setup Success Ratio, all operators achieved less than 98% CSSR, thus failing to meet the Accessibility target. All the operators achieved the overall Drop Call Ratio target of less than 3%, thus achieving the Retainability target. All operators met the Call Setup Time target of less than 20 seconds. Cell C is the only operator that didn't meet the Speech Quality Target of greater than 3.

## 2. Introduction

ICASA's mission is to regulate electronic communications, broadcasting, and postal services in the public interest. The Authority ensures the quality of service through its Quality of Service (QoS) monitoring activities. The Authority contracted Metro Global Telecom Services (Pty) Ltd. (MetroTelworks) to conduct drive testing in selected areas of the Northern Cape Province. The test was focused on monitoring the cellular voice telephony service being offered by MTN, Vodacom, Cell C, and Telkom within the Northern Cape Province of South Africa.

The QoS monitoring was conducted in areas that fall under the following District Municipalities: Francis Baard and Pixley ka Seme. The areas of interest that were selected within these municipalities were Barkly West, Galeshewe, Hopetown, Jan Kempdorp and Kimberley. The areas consist of major towns, townships, farm areas, rural areas, major road arteries, economic activity nodes and areas of previous complaints.

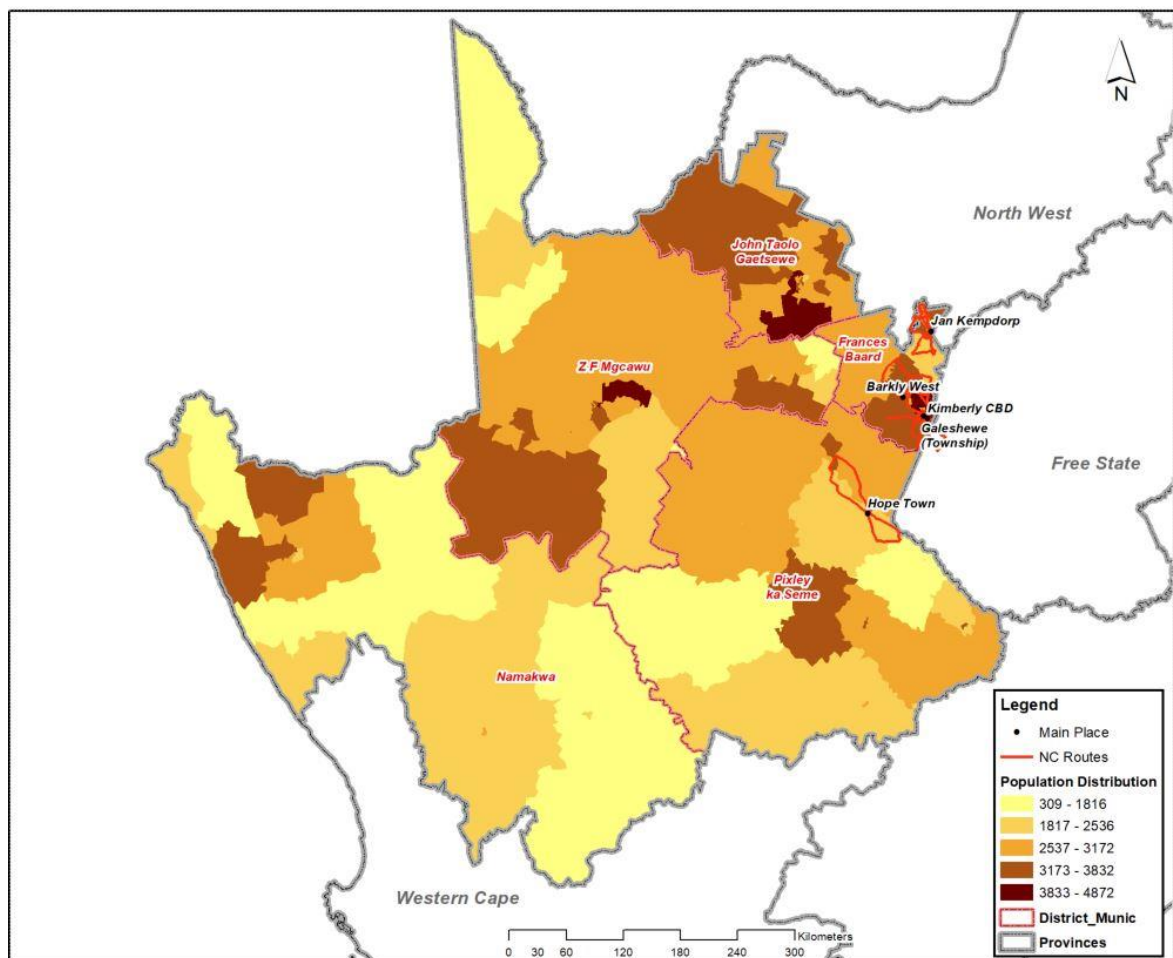


Figure 1. Northern Cape Province Route Map with Population Distribution



---

QoS is defined as the collective effect of service performance that determines the degree of satisfaction a user derives from a service. It provides an indication of what a customer experiences when using a mobile network and is evaluated in terms of Call Accessibility, Call Setup Time, and Call Retainability and Speech Quality parameters.

- a) Call Accessibility is reported as a percentage and is a measure of the number of times a user can successfully establish a call as a ratio of the total calls attempted. It is measured using Call Setup Success Ratio (CSSR).
- b) Call Setup Time is the time interval from the instant a user initiates a mobile call request until a complete message indicating call disposition is received by the calling terminal. It is measured from the time a user presses the dial button until the user gets connected to the dialled party.
- c) Retainability is defined as the ability for a call to stay connected through to a normal call tear-down process, without abnormally disconnecting from the cell site that carries the call. It is measured using Drop Call Ratio (DCR).
- d) Speech Quality is the condition of conversational speech without noise and echo interference. It is measured using the Mean Opinion Score (MOS).

---

### 3. Methodology

A minimum of 120 test samples per network operator were collected except in the areas where services were limited on most part of the drive test route. A drive-test sampling methodology which provides a snapshot view of the mobile operator's quality of service was adopted. It provides a realistic picture of network performance from a user's point of view. The method adopted provides a snapshot of an operator's network performance on the selected routes and particular time of the day, which may not be a true representation of the mobile service provider's overall network performance, however, it is considered statistically relevant.

Voice test set-up consisted of two test scenarios namely, short calls, and long calls which are defined in this section. The short calls were used to measure Call Accessibility whilst the long calls were used to measure Call Retainability and Speech Quality. The Long call scenario required the use of two test mobiles per Operator i.e., call initiating side (A-side) and call receiving side (B-side). The Short call scenario required the use of a single test mobile for each Operator making calls to the Operators IVR system. This set-up results in three mobile devices per operator bringing the total number of devices used for the test to twelve with three for each Mobile Operator. The Call Windows were set up as follows: Call duration + 30 seconds, (for the setup and release phases) + 30 seconds (for the minimum pause interval after call termination). The call duration for the long call was set at 120 seconds bringing the total call window size to 180 seconds with the short call duration set at 10 seconds resulting in a total call window of 70 seconds. The audio quality of speech samples was evaluated using the HD-voice capable and ITU standardized POLQA wideband algorithm with 10 samples being recorded during each call.

The devices were set to select the best available technology whilst the test SIMs in use were not activated for VoLTE services. With this setup, in areas where operators had LTE, they performed Circuit Switched Fall Back (CSFB) calls.

Voice testing was done in two phases with a measurement window gap of at least seven days in between both measurements.

### 3.1. Equipment test setup and configuration

#### 3.1.1. System used



The Test Equipment used was the Rohde & Schwarz SwissQual Benchmarker II platform with Sony XZ Premium smartphones installed inside the car using the R&S Phone Mount Walls. 4 mobile devices were used for Short Call & 8 mobile devices were used for Long Call. The mobile devices were configured to automatically select a mobile network and radio access technology.

#### 3.1.2. Device Description

The Sony XZ Premium Smartphone was selected as the measurement User Equipment (UE) for Voice Services. It uses the Qualcomm Snapdragon 835 chipset and supports the following technologies: GSM, WCDMA, LTE & LTE-A.

#### 3.1.3. Short & Long Call Windows

Figure 2 shows the call windows for the long and short calls as highlighted in the methodology section.

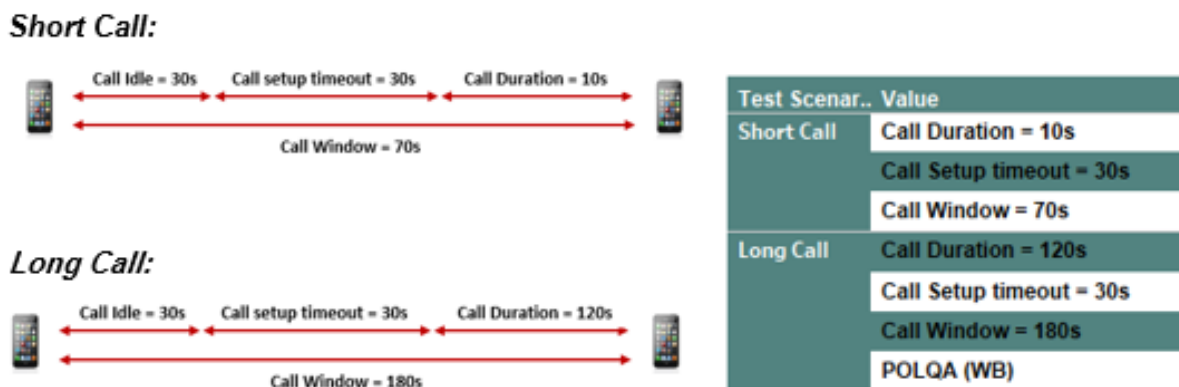


Figure 2. Call Window Duration

### 3.2. Route selection

Measurement routes were selected so that they would reflect end user distribution at different geographical locations in areas where people live and use mobile phones - major towns, townships, farm areas, rural areas, major road arteries, economic activity nodes and areas of previous

complaints. The selected five areas in which the QoS measurements were conducted are within two district municipalities as indicated in Table 1.

Table 1. Test timeline for area covered

Routes and Dates			
District	Area	Dates	Phase
Frances Baard	Kimberley	04/08/2021 - 05/08/2021	Phase1
		19/08/2021 - 20/08/2021	Phase 2
	Galeshewe	6/8/2021 - 11/8/2021	Phase1
		23/8/2021 - 24/08/2021	Phase 2
	Barkly West	12/8/2021	Phase1
		25/08/2021	Phase 2
	Jan Kempdorp	17/08/2021 - 18/08/2021	Phase1
		27/08/2021 - 28/08/2021	Phase 2
Pixley Ka Seme	Hope Town	13/08/2021	Phase1
		26/08/2021	Phase 2

Table 2. Distance and time driven per area

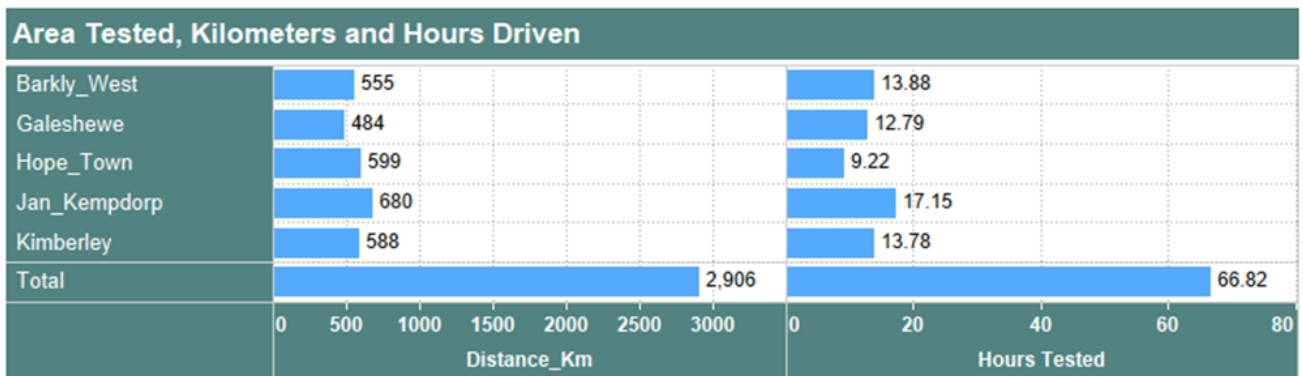


Table 2 shows the total distance covered in each area for two phases and active measurement duration.

### 3.3. Measurement parameters and targets

#### 3.3.1. Parameters

##### 3.3.1.1. Call Setup Success Ratio [%]

The Call Setup Success Ratio (CSSR) is the percentage of calls that are successfully set up as a percentage of the total call attempts. The formula to calculate CSSR is shown below:

$$\text{CSSR} = Y/X * 100$$

Where, Y represents the calls that are established, and X is the total number of call attempts.

##### 3.3.1.2. Drop Call Ratio [%]

Dropped Call Ratio (DCR) is the proportion of incoming and outgoing calls, which, once correctly established and therefore having been assigned a traffic channel, are dropped, or interrupted prior to the deliberate completion by the user. The formula to calculate DCR is shown below:

$$\text{DCR} = D/S * 100$$

Where, D = number of dropped calls and S = number of successful calls established

##### 3.3.1.3. Call Setup Time [s]

Call Setup Time is the time interval from the instant a user initiates a network connection request until a complete message indicating call disposition is received by the calling terminal. It is measured from the time a user presses the dial button until the user gets connected to the dialled party.

##### 3.3.1.4. Speech Quality (MOS)

Speech quality on call basis is an indicator representing the end-to-end speech transmission quality of the mobile telephony service. This parameter computes the speech quality on the basis of completed calls. Measurement made use of the POLQA Algorithm which compares the reference signal received from the transmitting side against an equivalent sample on the receiving side.

#### 3.3.2. Targets

According to the End User and subscriber Service Charter Regulations of 2016, the following voice parameters' targets are defined as follows:

1. Call Setup Success Ratio – Average Call Setup Success Ratio must be greater than 98%.
2. Call Setup Time Ratio – Average Call Setup Time must be less than 20 seconds.

3. Drop Call Ratio – Average Drop Call Ratio must be less than 3%.
4. Speech Quality – Average Speech Quality of MOS must be greater than 3.

## 4. Results and Analysis

This section provides a summary of the mobile operators' performance results based on the drive test route in the following test areas: Barkly West, Galeshewe, Hopetown, Jan Kempdorp and Kimberley.

### 4.1. Accessibility, Retainability, Call Setup Time and Quality Measurements

#### 4.1.1. KPI Results per Area

Table 3 shows KPI results per area. All operators show poor performance for Call Accessibility in all the tested areas, with the exception of MTN in Kimberley. Hopetown is the worst performing area for all operators where Retainability is concerned, with exception of Vodacom. Cell C has poor Voice Quality in all the tested areas. Detailed results are provided in the Appendix 1 and Appendix 2.

*Table 3. Summary of KPI Results per Area*

		Barkly West	Galeshewe	Hopetown	Jan Kempdorp	Kimberley
Call Setup Success Rate - [%]	Cell C	92.45%	94.25%	77.76%	84.98%	97.64%
	MTN	95.22%	95.60%	78.56%	88.96%	98.16%
	Telkom	91.18%	97.58%	84.84%	96.54%	92.12%
	Vodacom	92.07%	95.38%	90.94%	97.53%	97.95%
Drop Call Rate [%]	Cell C	1.28%	0.00%	3.15%	0.36%	0.00%
	MTN	1.27%	0.00%	3.52%	0.35%	0.00%
	Telkom	4.98%	2.35%	3.38%	0.99%	2.31%
	Vodacom	1.31%	1.37%	1.96%	0.33%	0.41%
Call Setup Time [s]	Cell C	3.61	3.87	3.63	4.21	3.74
	MTN	3.31	3.38	3.58	3.66	3.16
	Telkom	4.25	3.86	4.19	4.03	3.91
	Vodacom	3.35	4.56	3.62	3.56	4.13
POLQA MOS	Cell C	2.78	2.77	2.75	2.78	2.83
	MTN	3.53	3.52	3.48	3.52	3.61
	Telkom	2.99	3.01	2.95	3.04	2.98
	Vodacom	3.71	3.17	3.66	3.64	3.42

#### 4.1.2. Call Accessibility (Short call)

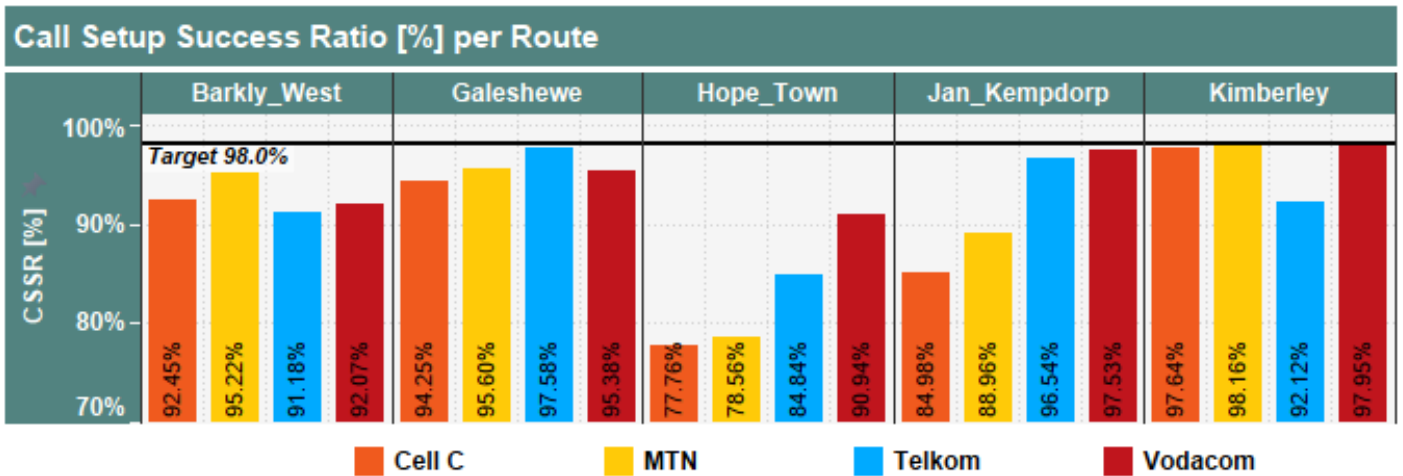


Figure 3. CSSR KPI per Area

Figure 3 shows that none of the operators met 98% CSSR target in any of the tested areas.

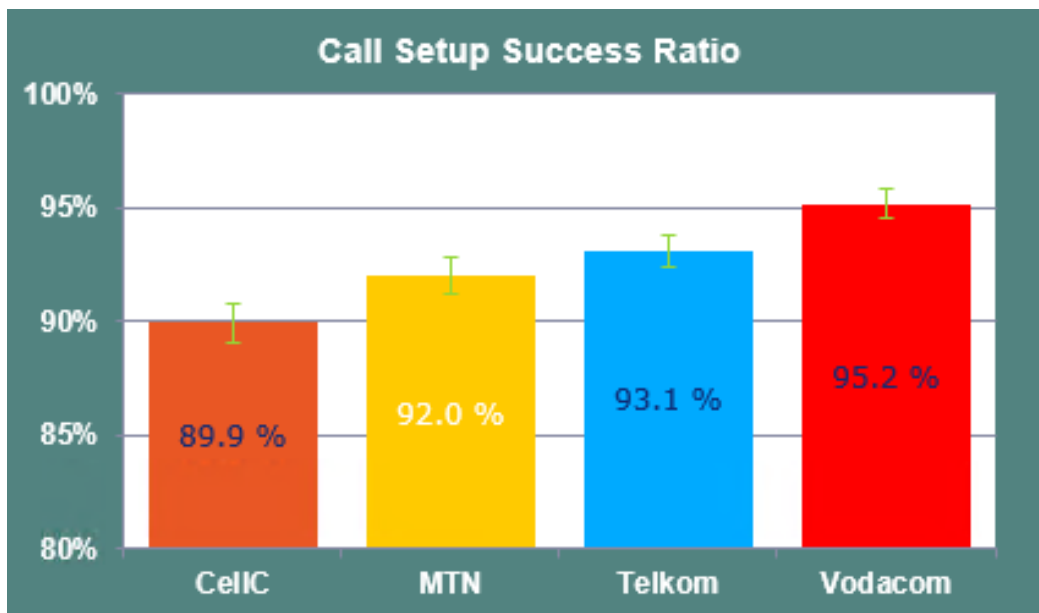


Figure 4. CSSR KPI Overall Results

Figure 4 shows all operators failed to achieve the overall CSSR target of 98%. Vodacom's Overall CSSR is the highest followed by Telkom, MTN and then Cell C. There is statistical significance difference recorded between MTN, Vodacom and Cell C. There is no statistical significance difference recorded between MTN and Telkom.

### 4.1.3. Drop Call Ratio (Long call)

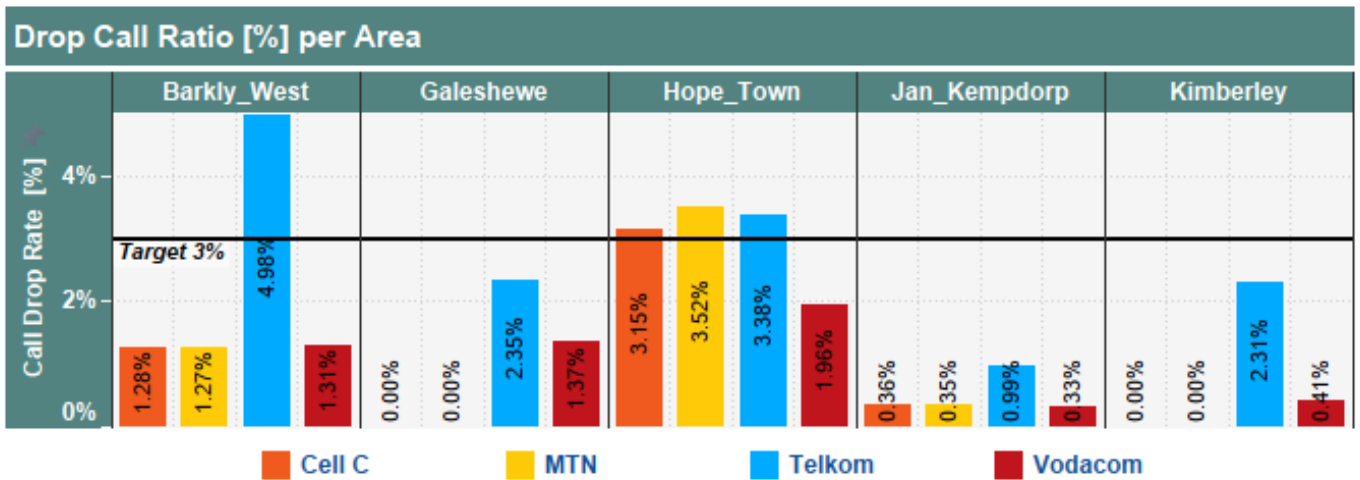


Figure 5. DCR KPI per Area

Figure 5 shows all the operators' DCR KPI results per area. All operators met the target in Galeshewe, Jan Kempdorp and Kimberley. Cell C, MTN and Telkom failed to achieve the target in Hopetown. Telkom also failed to achieve the target in Barkly West

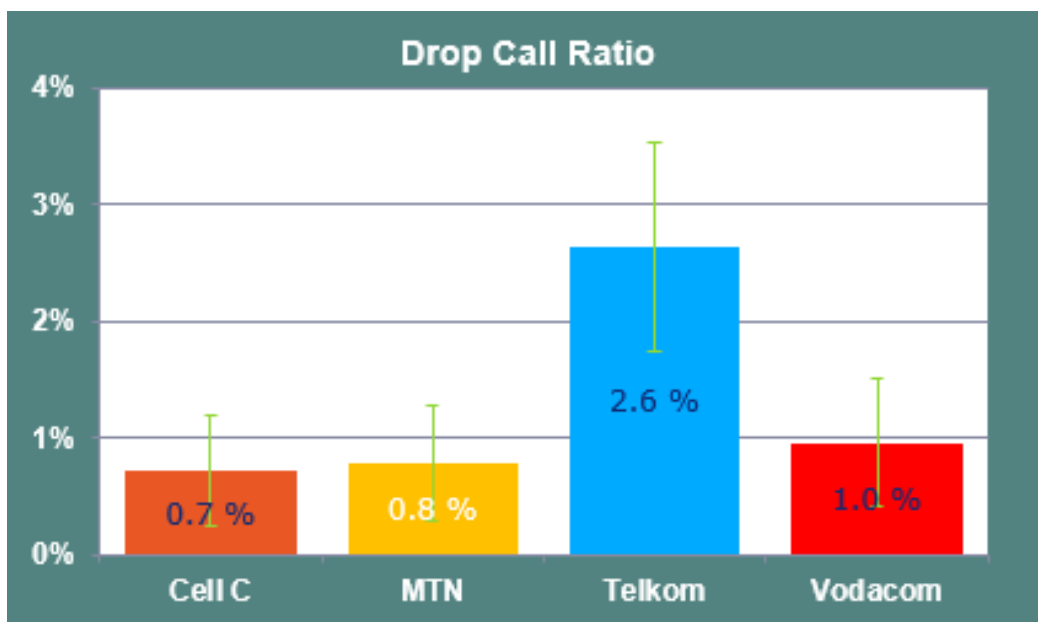


Figure 6. DCR KPI Overall Results

Figure 6 Overall results show that all operators met the DCR KPI target of less than 3%. Cell C's Overall DCR is the lowest followed by MTN, Vodacom and Telkom in an ascending order. There is no statistically significant difference recorded between MTN, Vodacom and Cell C. There is statistical significance difference between Telkom and the other three operators: MTN, Cell C and Vodacom.



#### 4.1.4. Call Setup Time (Short call)

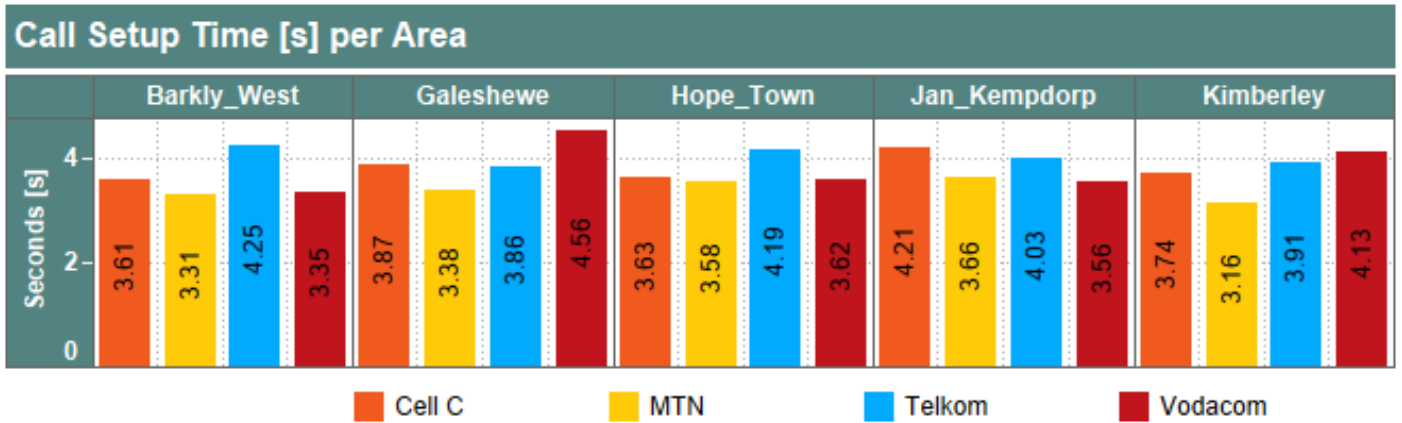


Figure 7. Call Setup Time[s] KPI per Area

Figure 7 shows all operators met the Call Setup Time target of less than 20 seconds in all the tested area of Northern Cape as per the End-User and Subscribers Service Charter Regulations of 2016.

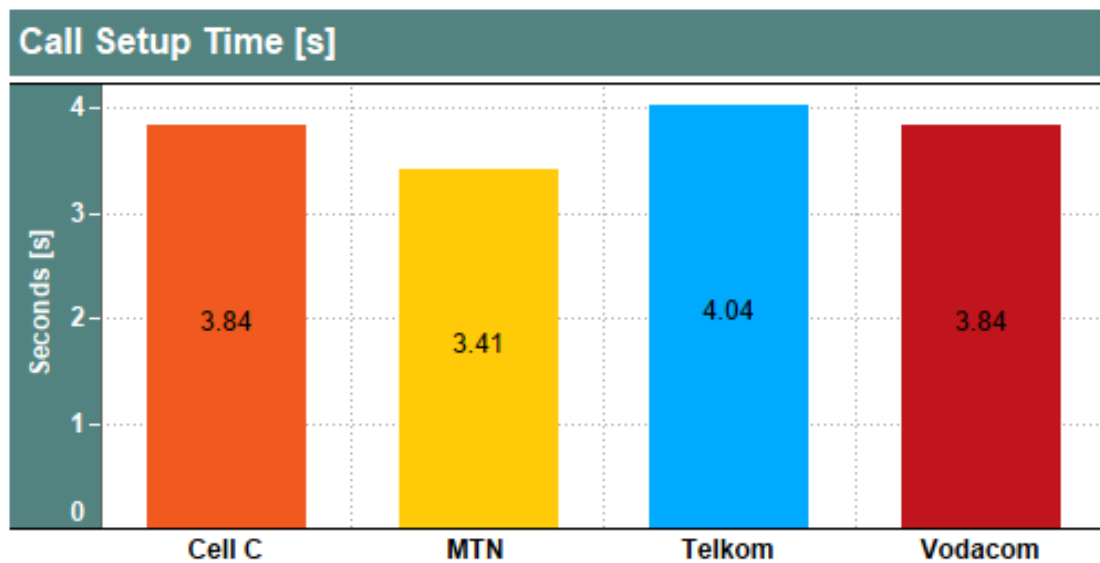


Figure 8. Call Setup Time[s] KPI Overall Results

Figure 8 shows the overall Call setup time results for the Northern Cape Province. MTN had the lowest overall Call Setup Time followed by Vodacom, Cell C, and Telkom.

#### 4.1.5. POLQA MOS (Long call)

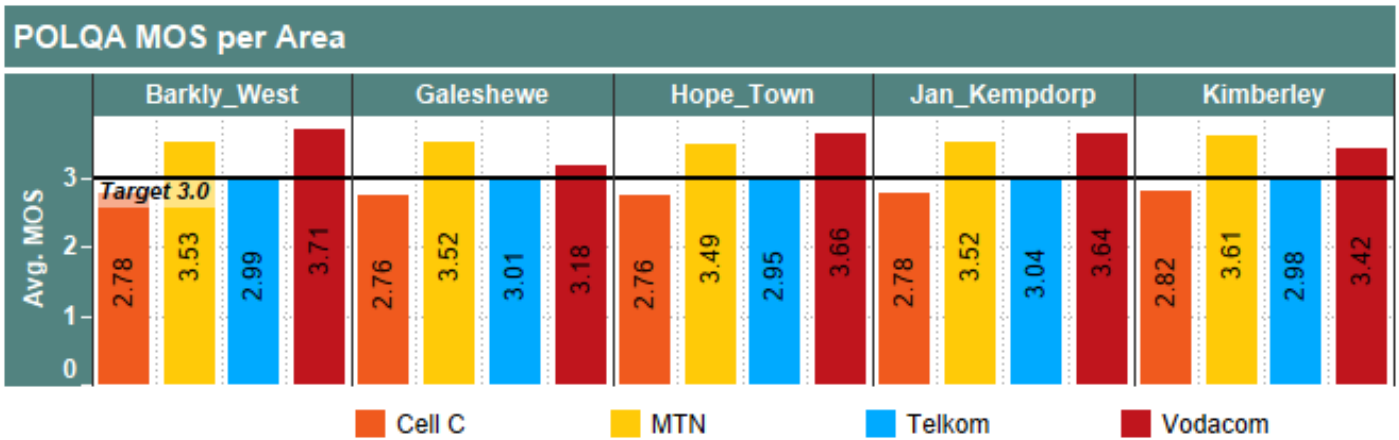


Figure 9. Speech Quality per Area

Figure 9 depicts speech quality results per tested area. MTN and Vodacom are the only two Operators that achieved an average POLQA MOS of at least 3 in all the tested areas thus meeting the required speech quality target. Cell C failed to meet the target for speech quality in all tested areas of Northern Cape province while Telkom didn't meet the target in Barkly West, Hopetown, and Kimberley.

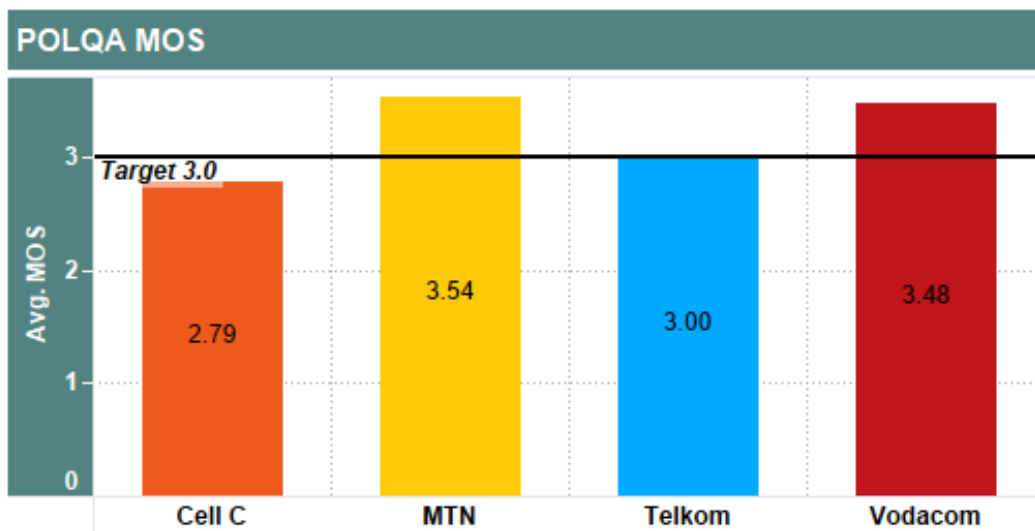


Figure 10. Speech Quality Results

Figure 10 shows the overall Voice Quality scores for each Operator for the Northern Cape Province. MTN achieved the best Speech Quality followed by Vodacom, Telkom, and Cell C in descending order. Cell C failed to meet the required speech quality target of a score of 3.

### 4.1.6. Radio Technology

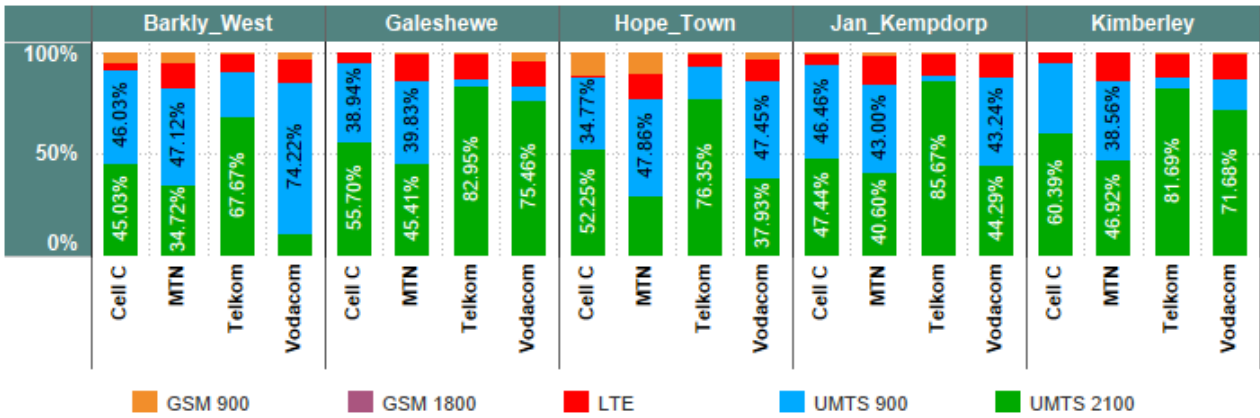


Figure 11. Serving Radio Technology per Area

Figure 11 shows the distribution of the serving radio technology per area. Barkly West, Galeshewe, Hopetown and Jan Kempdorp showed significant presence of UMTS 900 for Vodacom, MTN and Cell C.

Figure 12 shows the distribution of the overall serving technology during the drive test. All operators' serving technology was mainly on UMTS technology, Telkom showed presence of most samples on UMTS 2100. MTN has the highest LTE presence followed by Vodacom, Telkom, and Cell C in a descending order.

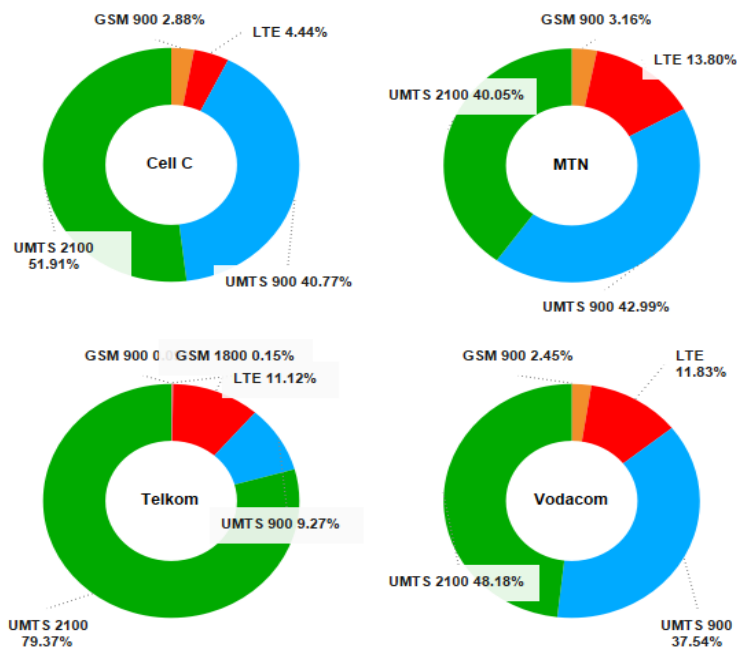


Figure 12. Serving Radio Technology Overall Results

#### 4.1.7. CSFB

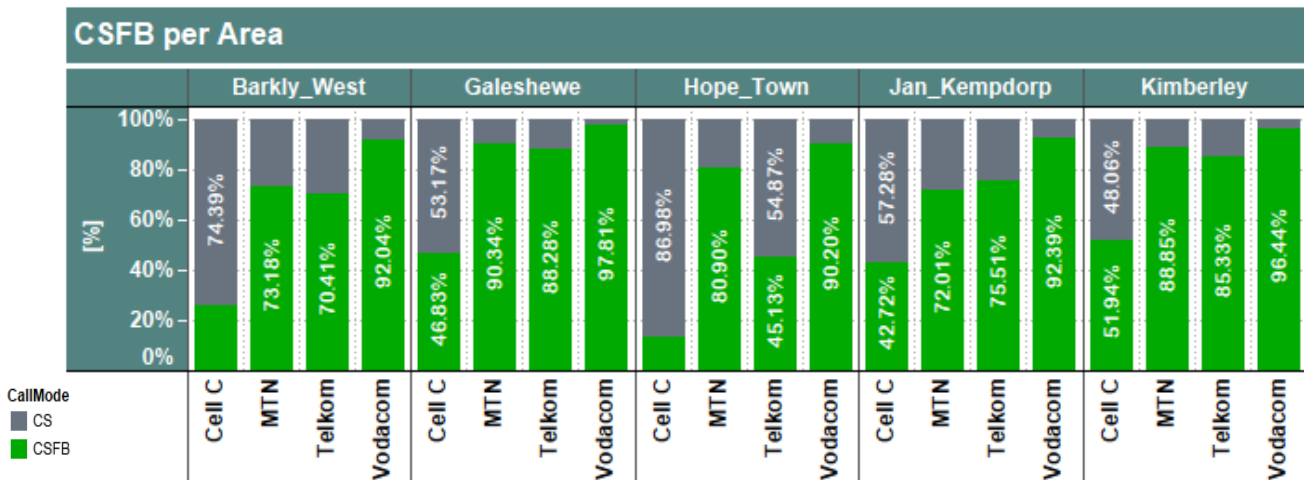


Figure 13. CSFB per Area

Figure 13 shows the breakdown of CS/CSFB calls per Route. Vodacom is seen with most CSFB samples in all the areas. This is also an indication that the operator has significant LTE coverage in all the areas of Northern Cape Province.

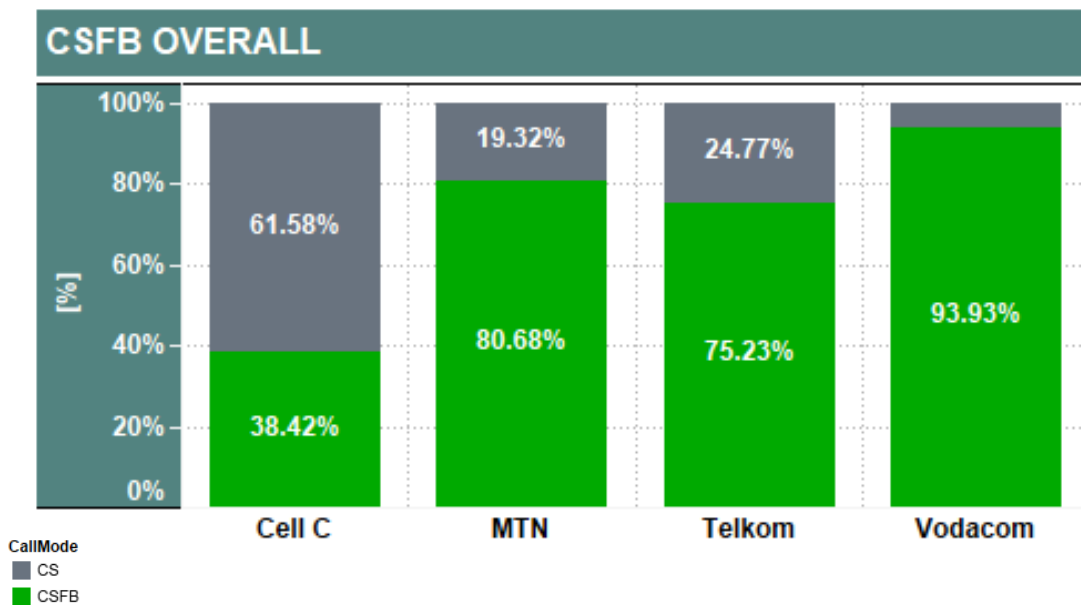


Figure 14. CSFB Overall Results

Figure 14 shows percentage of calls that were attempted on traditional networks as well as the ones initiated on LTE network and made CS fall back to UMTS/ GSM. Vodacom is seen with the most CSFB samples in Overall results.

## 4.2. Comparison of current results to previous results

Jan Kempdorp and Kimberley were previously monitored in the financial year 2014/2015. The aim of conducting the recent QoS measurements in these areas was to assess the level of improvement that the operators promised in the previous financial years. The results show that there is still no improvement in terms of Call Accessibility, however there is still good performance in terms of Call Retainability from all operators in Jan Kempdorp and Kimberley.

In Jan Kempdorp, Vodacom is the only operator that shows slight improvement in terms of Accessibility. In terms of Retainability, all operators maintained good performance.

In Kimberley, MTN is the only operator that maintained good performance in terms of Accessibility; all operators met the then target of 95% during 2014/15. In terms of Retainability, all operators maintained good performance.

It must be noted that the target for Accessibility was 95% in 2014/2015, this is before the revision of *End-User and Subscriber Service Charter Regulations of 2016* which became effective on 1 April 2016. Table 4 below summarises the previous and current results. Telkom was not yet included in the measurements during the financial year 2014/15.

*Table 1. Comparison of previous results*

Route	Financial Year	Accessibility (%)				Retainability (%)			
		Cell C	MTN	Telkom	Vodacom	Cell C	MTN	Telkom	Vodacom
Jan Kempdorp	2014/15	96,11%	96,37%	-	96,68%	0,00%	0,00%	-	0,00%
	2021/22	84,98%	88,96%	96,54%	97,53%	0,36%	0,35%	0,99%	0,33%
Kimberley	2014/15	98,48%	99,31%	-	99,30%	1,81%	1,06%	-	0,00%
	2021/22	97,64%	98,16%	92,12%	97,95%	0,00%	0,00%	2,31%	0,41%

---

## 5. Conclusion

This section provides the summary and key findings of all measurements. The results illustrate a snapshot of the mobile network performance and customer experience within the measured time and location context.

The results indicate that the end-user's Quality of Service and operators' network performance varies significantly per area tested. Below are the highlights: -

- **Worst Performing Area:** All four operators failed to meet CSSR target in **Hopetown**.
- **Best Performing Area:** Kimberley is the area where Operators achieved most of the targets with Cell C and Telkom only failing to achieve the MOS target. MTN is the only operator that achieved the CSSR target for the town and the other three operators failed to achieve 98 % CSSR.
- **Call Setup Success Ratio (CSSR):** Overall results show that all the operators failed to achieve 98% CSSR target. Hopetown was the worst performing area.
- **Drop Call Ratio (DCR):** All operators successfully met the overall Drop Call Ratio target. Cell C was a best performer with 0.72 DCR and Telkom was worst performer with 2.63 DCR. In Kimberley, Galeshewe and Jan Kempdorp; All Operators achieved less than 3% DCR values and met the target.
- **Speech Quality (MOS):** MTN, Vodacom and Telkom achieved speech quality target and while Cell C is the only operator that failed to meet the target for Speech Quality i.e. (score of 3). In Galeshewe and Jan Kempdorp; All Operators except Cell C achieved more than a score of 3 in POLQA MOS values and met the target.
- **Call Setup Time (CST):** All operators achieved the target according to the End-User and Subscribers Service Charter Regulation of 2016. MTN has the fastest overall call set up time with an average of 3.41s, followed by Vodacom and Cell C at 3.84s and Telkom at 4.04s.

## 6. Appendices

### 6.1. Appendix 1: Mobile operators' feedback on the report

#### 6.1.1. Vodacom

Vodacom provided feedback and network improvement plans that are in place for all areas.

- Barkley West – Call setup failures were experienced in the area are due to poor coverage following vandalism of the serving site Windsorton Town. Work around solution to improve coverage in the area has been implemented, cell range parameters have been optimized on all 4 sites serving the area. Re-Building of Vandalized site Windsorton Town commenced on the 15<sup>th</sup> of Nov 2021.
- Galeshewe - ICASA measurements coincided with the dates of RAN Modernization where serving sites were barred to take calls for few hours while RAN modernization was in progress. After RAN modernization and Fine-tuning area was tested and no problems were found. There are 3 new sites that are planned in this area to continuously improve customer experience and in preparation for future traffic growth.
- Jan Kempdorp – Call Failures were due to a site being out of service. The site was retested after RF Optimization and number of failures were reduced. Two new sites will be brought up in the area by February 2022.
- Kimberley – ICASA measurements also coincided with the dates of RAN Modernization where serving sites were barred to take calls for few hours while RAN modernization was in progress. RF optimization was performed after modernization and LTE activated on 900 MHz Band to extend LTE coverage and improve capacity and experience. Two new sites are planned in the area to continually improve network performance, the sites are planned to be commissioned in February 2022.
- Hopetown – The area is mountainous and poses challenges with line of sight due to few numbers of base stations serving the area. A new site is planned for the area.

#### 6.1.2. MTN

MTN has indicated that it will remain committed to the improvement of the network quality even in areas where performance was good, thereby improving the end user mobile voice service experience.

- Barkley West – The call failures in the area were due to poor coverage. MTN will implement antenna optimisation in the identified sites to improve the coverage footprint.

- Galeshewe – The operator experienced site availability problems, and these were rectified. MTN has planned a new site to improve the coverage in the identified areas.
- Jan Kempdorp – Call setup failures experienced during the test were due to equipment failure in one site. MTN has resolved the issues on the site. Other call failures are due to poor coverage in the area. MTN will also implement technology upgrades on some sites, from 2G and 3G to 4G to improve call setup in the area.
- Kimberley – The operator met all the Authority's KPI's Performance Targets, and maintained good performance compared to previous measurements conducted in 2014/2015 financial year.
- Hopetown – The high dropped call rate and call setup failures in Hopetown are due to poor network coverage. On two cases, dropped calls were due to site availability issues and the two cases have been resolved.

### 6.1.3. Cell C

Cell C in its response indicated that it notes the findings of the Authority and will continue to provide improved 3G and 4G coverage to its subscribers by working with its roaming services provider in the tested areas. In some cases, the experienced challenges would have improved as Cell C transition to its national roaming service providers network would have taken place after the ICASA drive tests were conducted. Cell C will engage with its roaming service provider to resolve the low MOS findings as this is of great concern to Cell C.

### 6.1.4. Telkom

Telkom's response to the report indicated that it views the Authority test results as very significant and use them as additional input to further improve the quality of the mobile network. Furthermore, Telkom indicated that they will be engaging with its roaming partners to resolve issues and improve customer experience.

- Galeshewe – Telkom has limited coverage in Galeshewe where most of the failures occurred on the outskirts of Telkom's network coverage. Out of the twelve (12) sites in this area, one (1) site was off-air due to vandalism during the drive test period.
- In the rest of the tested areas, most of the failures occurred on the operator's roaming partner's network and were due to poor coverage. Telkom has two (2) on-air sites and an additional two



---

(2) sites planned for completion within 8 months in Barkly West, which will improve Telkom's network coverage and overall quality. The number of sites planned for each area; One site is planned for Hope Town, eight sites for Jan Kempdorp and three sites in Kimberley. This will address Telkom's lack of coverage in the areas.

- Telkom has fifteen (15) sites at different stages of rollout in the tested areas. It is expected that more than four (4) of these new planned sites will be in-service by first quarter of 2022/2023 financial year.

## 6.2. Appendix 2: Detailed Test results per Phase

Table 5. CSSR & Call Setup Time Phase 1 & Phase 2

		Barkly West		Galeshewe		Hopetown		Jan Kempdorp		Kimberley		Grand Total
		Phase 1	Phase 2	Phase 1	Phase 2	Phase 1	Phase 2	Phase 1	Phase 2	Phase 1	Phase 2	
Call Attempt	Cell C	488	492	446	458	335	317	635	577	509	467	4724
	MTN	491	492	450	460	336	317	637	577	510	468	4738
	Telkom	491	495	449	460	336	317	636	578	509	468	4739
	Vodacom	491	492	450	459	334	317	636	577	509	467	4732
Call Failed	Cell C	50	24	35	17	86	59	126	56	10	13	476
	MTN	30	17	36	4	95	45	92	42	18	0	379
	Telkom	46	41	7	15	64	35	22	20	44	33	327
	Vodacom	41	37	27	15	22	37	14	16	15	5	229
Call Setup Success Rate [%]	Cell C	89.75%	95.12%	92.15%	96.29%	74.33%	81.39%	80.16%	90.29%	98.04%	97.22%	89.92%
	MTN	93.89%	96.54%	92.00%	99.13%	71.73%	85.80%	85.56%	92.72%	96.47%	100.00%	92.00%
	Telkom	90.63%	91.72%	98.44%	96.74%	80.95%	88.96%	96.54%	96.54%	91.36%	92.95%	93.10%
	Vodacom	91.65%	92.48%	94.00%	96.73%	93.41%	88.33%	97.80%	97.23%	97.05%	98.93%	95.16%
Call Setup Time (s)	Cell C	3.57	3.65	3.90	3.85	3.60	3.66	4.30	4.12	3.70	3.78	3.84
	MTN	3.33	3.28	3.33	3.43	3.62	3.54	3.71	3.60	3.16	3.16	3.41
	Telkom	3.97	4.52	3.84	3.89	4.16	4.22	4.13	3.92	3.94	3.88	4.04
	Vodacom	3.34	3.36	4.78	4.36	3.60	3.65	3.56	3.56	4.09	4.17	3.84

Table 6. (DCR) & POLQA MOS Phase 1 & Phase 2

		Barkly West		Galeshewe		Hopetown		Jan Kempdorp		Kimberley		Grand Total
		Phase 1	Phase 2	Phase 1	Phase 2	Phase 1	Phase 2	Phase 1	Phase 2	Phase 1	Phase 2	
Call Completed	Cell C	115	116	107	114	57	66	138	135	131	120	1099
	MTN	117	117	106	115	66	71	139	142	132	120	1125
	Telkom	110	100	105	103	76	67	155	145	103	108	1072
	Vodacom	116	110	104	112	78	72	157	144	128	116	1137
Call Dropped	Cell C	2	1	0	0	0	4	1	0	0	0	8
	MTN	2	1	0	0	2	3	1	0	0	0	9
	Telkom	8	3	2	3	2	3	2	1	4	1	29
	Vodacom	1	2	2	1	1	2	1	0	1	0	11
Drop Call Rate [%]	Cell C	1.71%	0.85%	0.00%	0.00%	0.00%	5.71%	0.72%	0.00%	0.00%	0.00%	0.72%
	MTN	1.68%	0.85%	0.00%	0.00%	2.94%	4.05%	0.71%	0.00%	0.00%	0.00%	0.79%
	Telkom	6.78%	2.91%	1.87%	2.83%	2.56%	4.29%	1.27%	0.68%	3.74%	0.92%	2.63%
	Vodacom	0.85%	1.79%	1.89%	0.88%	1.27%	2.70%	0.63%	0.00%	0.78%	0.00%	0.96%
POLQA MOS	Cell C	2.76	2.79	2.78	2.75	2.73	2.78	2.77	2.78	2.83	2.82	2.79
	MTN	3.50	3.57	3.52	3.52	3.47	3.51	3.53	3.51	3.62	3.60	3.54
	Telkom	3.00	2.98	3.01	3.01	2.95	2.95	3.03	3.05	2.96	3.00	3.00
	Vodacom	3.67	3.74	3.22	3.15	3.64	3.68	3.64	3.64	3.35	3.50	3.48

### 6.3. Appendix 3 Technology Maps

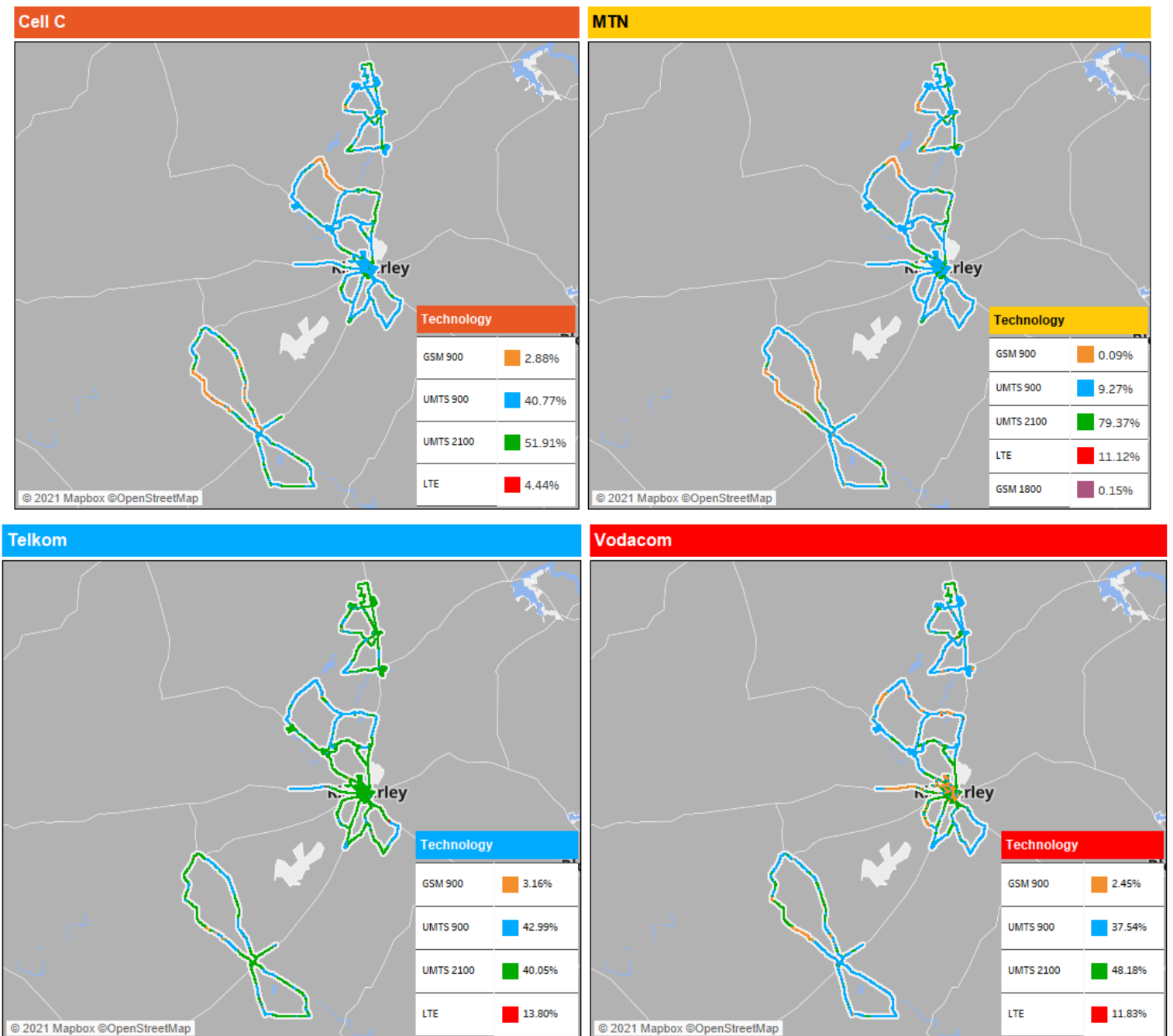


Figure 15. Radio Technology Maps

## 6.4. Appendix 4 UMTS Coverage Maps

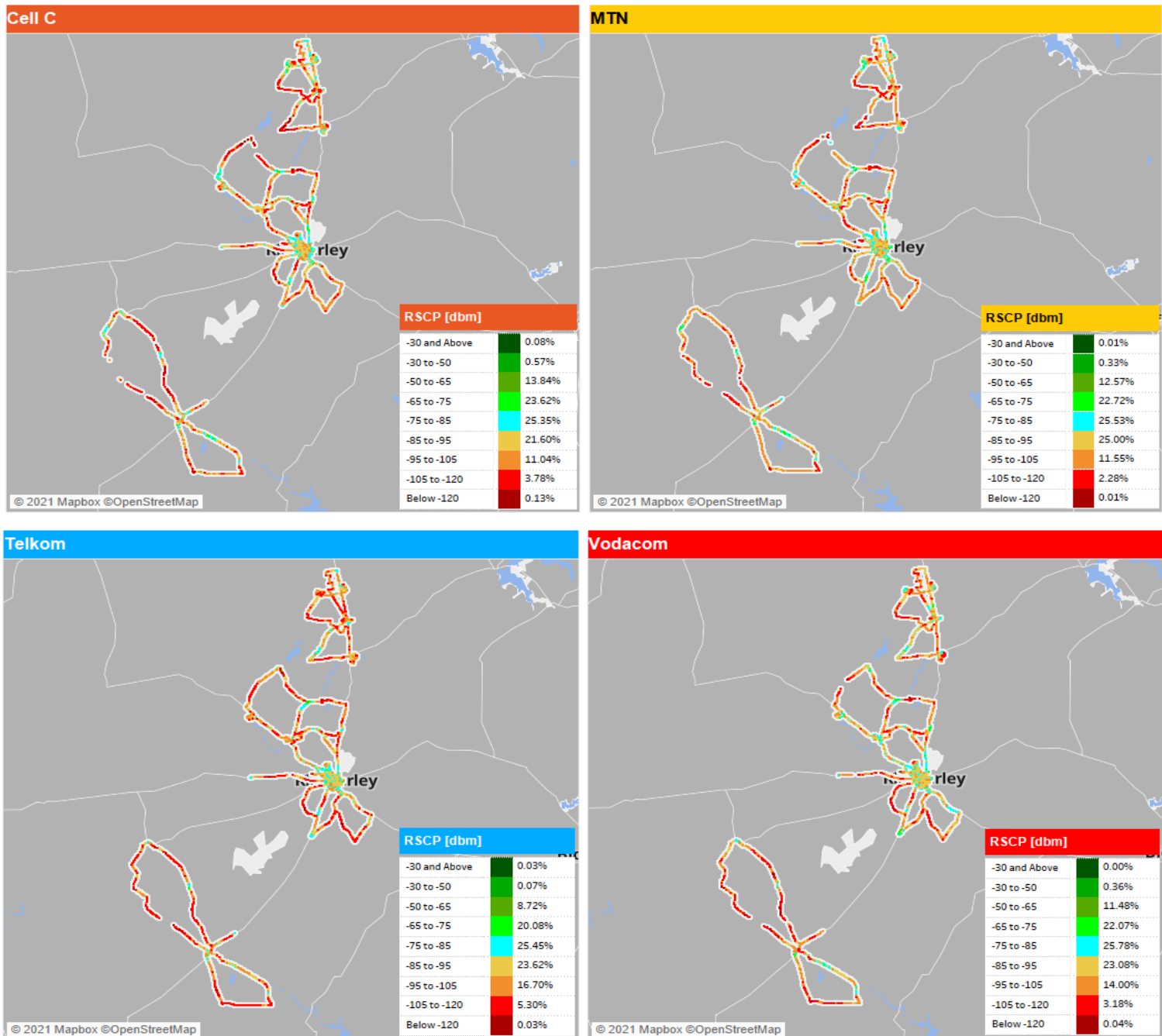


Figure 16. UMTS Coverage Maps

## 6.5. Appendix 4 UMTS Quality Map

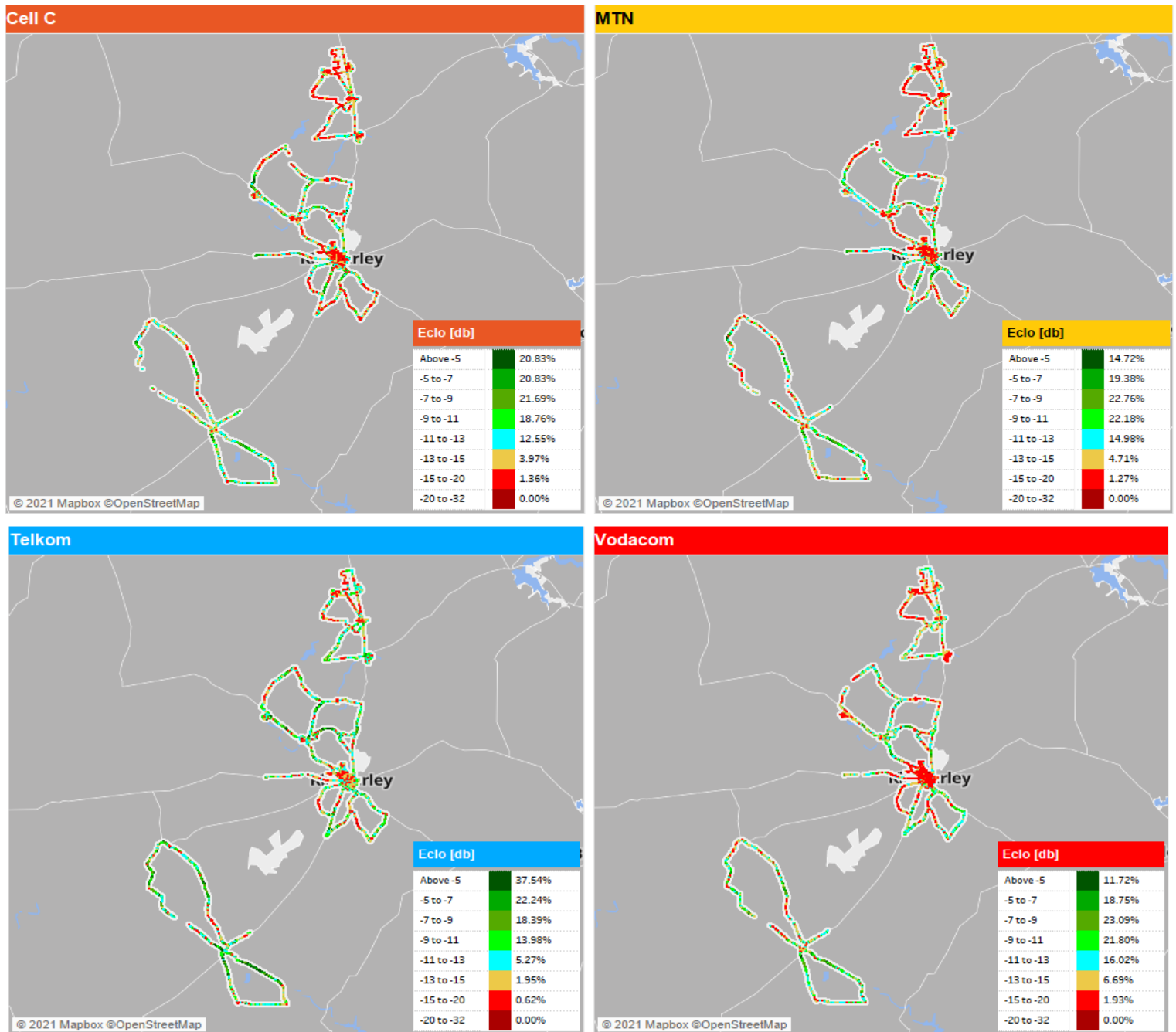


Figure 17. UMTS Quality Maps