2010 FIFA World Cup Quality of Service Report

Compiled by: Eric Nkopodi

August 2010

Contents

Abbreviations

CC	Cell C
DCR	Drop Call Rate
BSC	Base Station Controller
FWC	FIFA World Cup
GOS	Grade of Service
GSM	Global Systems for Mobile
ICASA	Independent Communications Authority of South Africa
RXQual	Receiver Quality
RXlev	Receiver Level
SM&C	Spectrum Monitoring and Control
QoS	Quality of Service
VC	Vodacom

Definitions

Completed Calls	These are calls that were successfully set up and received by the called party including the release failed calls.
Call Setup Rate	These are the percentage of calls that are successfully setup to a valid number, properly dialed and where called party busy tone, ringing tone or answer signal is recognized at the Network Termination Point of the calling user.
Call Drop Rate	A percentage of calls that are unintentionally disconnected in the middle of the conversation without the user's intervention.

Call Success Rate	Call success rate refers to the percentage of calls that are successfully set up and terminated as a percentage of the total call attempts. CSR exclude dropped calls or that experience no network condition, low speech quality calls and calls with long set up time.
Call Block Rate	These are calls that are unsuccessful because of lack of resources for connection due to congestion expressed as a percentage of total call attempts.
Speech Quality	Refers to the clarity of the conversational speech without noise or echo interference.
Congestion	Probability of not accessing the services (a traffic channel).
Call setup time	The call setup time is the time from a send button is pressed or when the address information required for setting up a call is received by the network to when the called party busy tone or ringing tone or answer signal is received by the calling party.

1. Introduction

1.1 Background

The SM&C Department of ICASA performed QoS monitoring in all the ten stadia for the FWC. The measurement tests were performed during match days. This report will give an analysis of all stadium measurements.

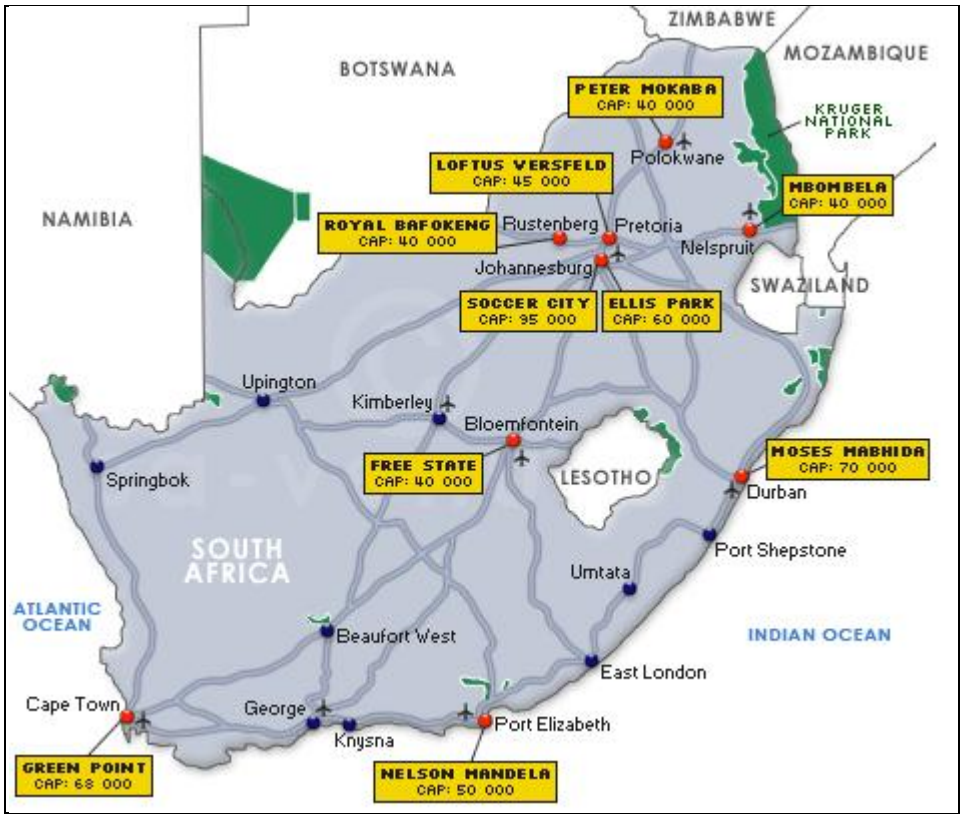


Fig 1: Map showing the stadiums where the measurements were conducted

1.2 Objectives

The objectives of QoS Monitoring were:

(i) To measure the GSM service to the telecommunications user;

(ii) To measure coverage during the match days.

(iii) To measure Radio Congestion during match days.

1.3 Consumer issues during the tournament

One of ICASA's mandates is to ensure that the consumers are protected and given acceptable Quality of Service level. Some of the challenges that were experienced during FWC were:

- Some service providers were limiting the number of subscribers that they accept concurrently in the network.
- Instances when the network was inaccessible making it impossible for one to make or receive phone calls.

2. Drive Test Methodology

Drive testing is the most common and possibly the best way to analyse Network performance by means of coverage evaluation, system availability, network capacity, network retainability and call quality. Although these tests only provide data on the downlink side of the process, it provides a perspective to the service provider about what's happening from a subscriber point of view. The drive testing is basically collecting measurement data with drive test equipment.

- The Drive Test equipment consists of:
  - TEMS Investigation Software
  - Maps of South Africa
  - TEMS phones
  - GPS
  - Laptop

- In each area where the tests were conducted, the distance covered was at least 400m around the stadium.
- Voice Quality enabled Mobile to Mobile test methodology was adopted. Mobile 1 (Vodacom) was used to call Mobile 2 (MTN) and Mobile 3 (Cell-C).
- The minimum samples of calls were 100 calls per test.
- Long Calls and Short Calls were initiated to provide a true reflection of the actual GSM network coverage and performance.

3. Computational Methodology

Call Success Rate

Call Success Rate refers to the percentage of calls that are successfully set up and terminated as a percentage of the total call attempts. CSR exclude dropped calls or calls that experience no network condition, low speech quality calls and calls with long set up time. The number of successful call setups should be divided by the number of call setups. The result, and the number of call setups, is taken as Measurement's results. CSR can be calculated as shown below:

Call Success Rate	
Call Attempts	X
Call Failures	Y
CSR =	(X/Y) * 100

Drop Call Rate

Dropped Call Rate means the rate at which a call, in which connection succeeds, (i.e. the network is accessed and set up is successful, whether or not the communication channel is assigned) but is disconnected due to abnormal call release. The measurement of dropped call rate is described by the ratio of successful originated calls that were found to drop to the total num of successful originated calls that were correctly released. DCR can be calculated as shown below:

Drop Call Rate	
Successful Call Attempts	S
Drop Calls	D
DCR =	(S/D) * 100

Signal Strength Indicator

Signal Strength Indicator – The definition of service coverage in this case is based on signal strength. The availability of service coverage is therefore the ability of a network in achieving minimum signal strength of -100dBm.

TEMS can be used to plot the actual coverage in the network; it uses the color representation as given below to show the signal strength vs the RXlevels.

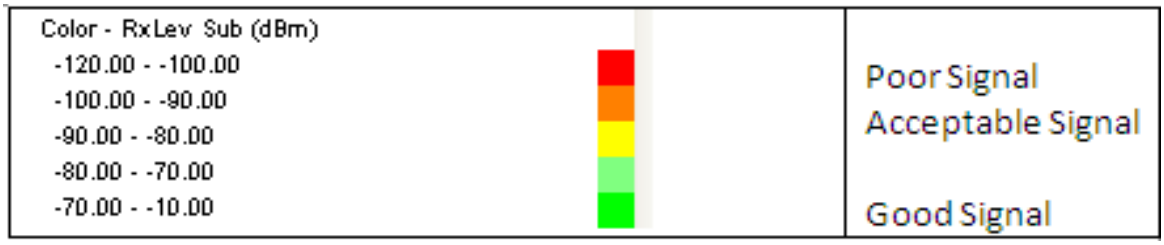


Fig 2: Signal Strength Indicator showing the colors vs. Rxlevels.

4. Measurements Results

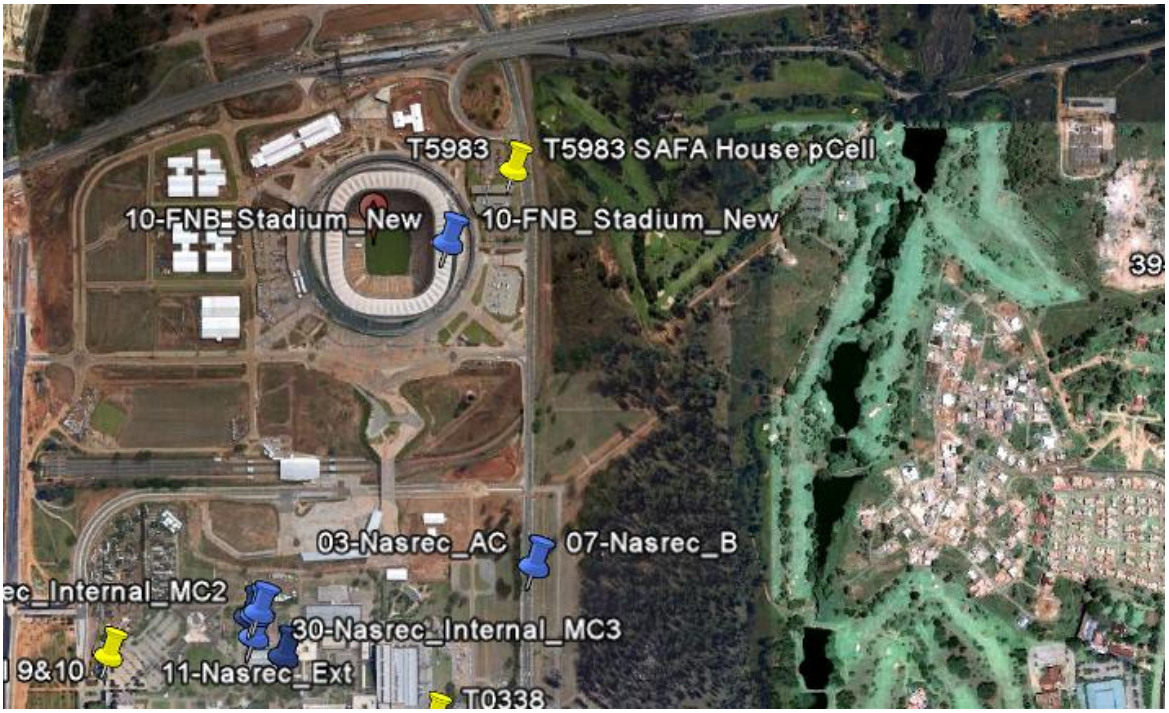
The Quality of Service monitoring measurements were performed on the following dates:

Game	Day	Venue
01	10-Jun-10	SC-JHB
03 & 08	12-Jun-10	LV-PTA & EP-JHB
16	13-Jun-10	FS-BLM
22	16-Jun-10	MM-DBN
36	21-Jun-10	PM-PLK
33	22-Jun-10	RB-RUS
37	23-Jun-10	NMB-PE
46	25-Jun-10	MB-NEL
54	29-Jun-10	GP-CPT

Measurements Details

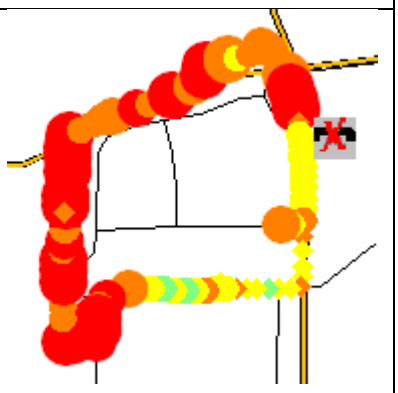
Collection Type	Only GSM technology measurements were conducted on Cell-C, MTN and Vodacom's networks. The objective was to conduct an unbiased comparison of the quality performance of three mobile networks. The targets of the parameters are based on ITU recommendations.
Collection Date	This report is based on measurements done before the match dates above.

4.1 Soccer City Stadium



4.1.1 Measurement Results

(i) Coverage map

MTN	Vodacom	Cell-C
		

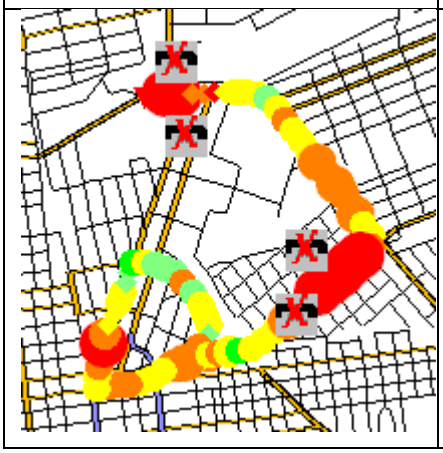
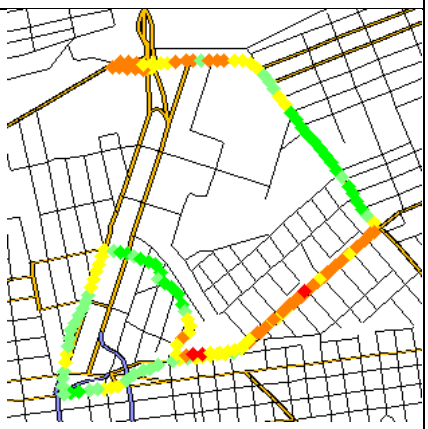
(ii) Parameters

Metric	Target	MTN	VC	CC	Comments
Overall Call Setup Success Rate	*98%*	*78 %*	*80%*	*83%*	*All operators below the target*
Good RxQual - Good RxLev	*95%*	*85%*	*81%*	*90%*	*All operators below the target*
Dropped Calls Rate	*2%*	*4%*	*6%*	*0.01%*	*MTN and Vodacom below the target*

4.2 Ellis Park Stadium

4.2.1 Measurement Results

(i) Coverage map

MTN	Vodacom	Cell-C
		

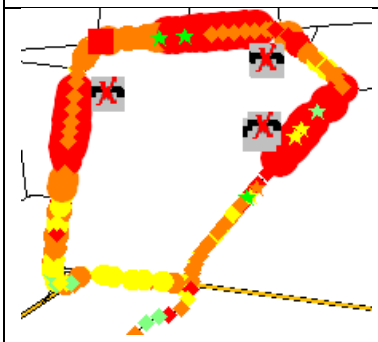
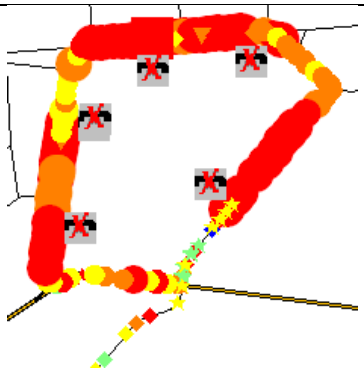
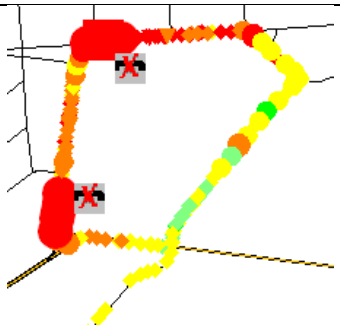
(ii) Parameters

Metric	Target	MTN	VC	CC	Comments
Overall Call Setup Success Rate	*98%*	*95.%*	*91%*	*92%*	*All operators below the target*
Good RxQual - Good RxLev	*95%*	*93%*	*92%*	*95%*	*MTN and Vodacom are below the target*
Dropped Calls Rate	*2%*	*9%*	*12%*	*0%*	*MTN and Vodacom below the target*

4.3 Loftus Versfeld Stadium

4.3.1 Measurement Results

(i) Coverage map

MTN	Vodacom	Cell-C
		

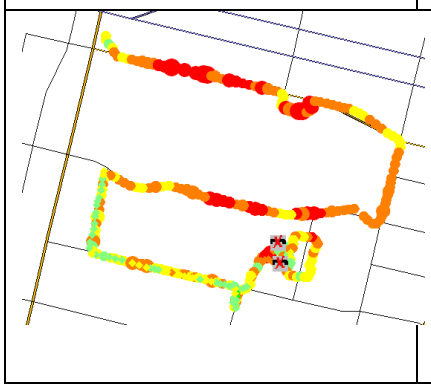
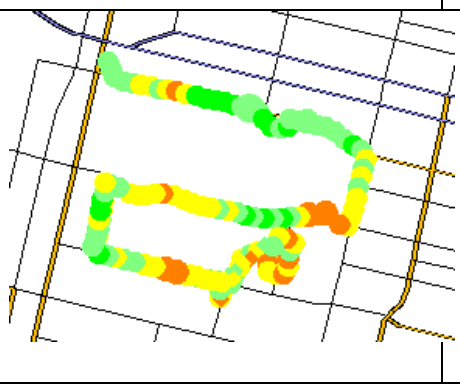
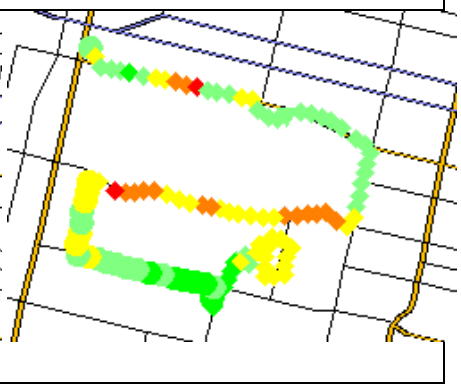
(ii) Parameters

Metric	Target	MTN	VC	CC	Comments
Overall Call Setup Success Rate	*98%*	*95%*	*92%*	*94%*	*All operators below the target*
Good RxQual - Good RxLev	*95%*	*85%*	*81%*	*90%*	*All operators below the target*
Dropped Calls Rate	*2%*	*4%*	*6%*	*2%*	*MTN and Vodacom below the target*

4.4 Free State Stadium

4.4.1 Measurement Results

(i) Coverage map

MTN	Vodacom	Cell-C
		

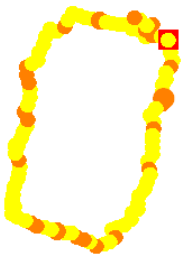
(ii) Parameters

Metric	Target	MTN	VC	CC	Comments
Overall Call Setup Success Rate	*98%*	*98%*	*100%*	*100%*	*All operators are above the target*
Good RxQual - Good RxLev	*95%*	*90%*	*98%*	*98%*	*MTN is below the target*
Dropped Calls Rate	*2%*	*0.02%*	*0%*	*0%*	*All operators are above the target*

4.5 Nelson Mandela Bay Stadium

4.5.1 Measurement Results

(i) Coverage map

MTN	Vodacom	Cell-C
		

(ii) Parameters

Metric	Target	MTN	VC	CC	Comments
Overall Call Setup Success Rate	*98%*	*100%*	*100%*	*98%*	*All operators are above the target*
Good RxQual - Good RxLev	*95%*	*95 %*	*97%*	*94%*	*All operators are above the target*
Dropped Calls Rate	*2%*	*0%*	*0%*	*0%*	*All operators are above the target*

4.6 Royal Bafokeng Stadium

4.6.1 Measurement Results

(i) Coverage map

MTN	Vodacom	Cell-C
		

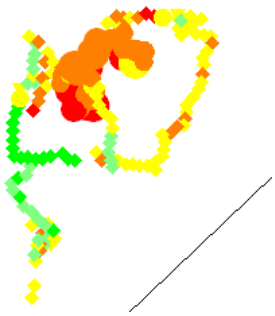
(ii) Parameters

Metric	Target	MTN	VC	CC	Comments
Overall Call Setup Success Rate	*98%*	*98%*	*97%*	*98%*	*Vodacom is below the target*
Good RxQual - Good RxLev	*95%*	*95%*	*94%*	*94%*	*Vodacom and Cell C are below the target*
Dropped Calls Rate	*2%*	*0%*	*0.01%*	*0%*	*All operators are above the target*

4.7 Peter Mokaba Stadium

4.7.1 Measurement Results

(i) Coverage map

MTN	Vodacom	Cell-C
		

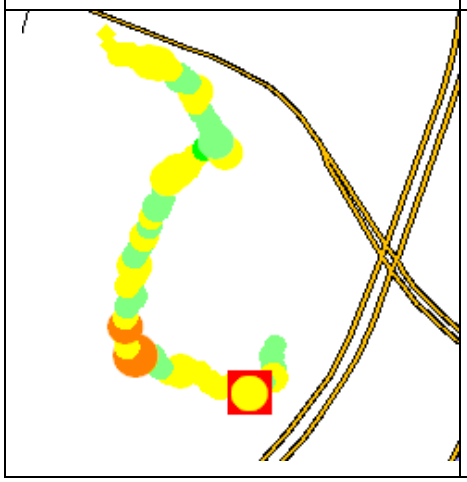
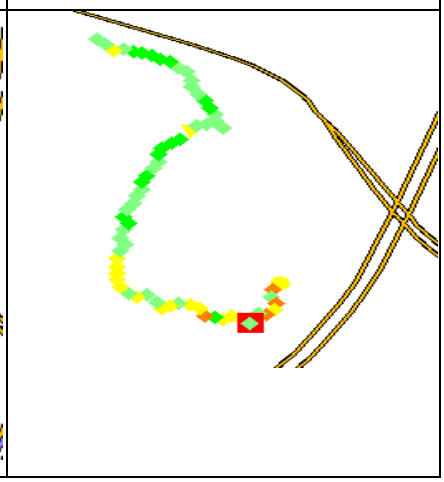
(ii) Parameters

Metric	Target	MTN	VC	CC	Comments
Overall Call Setup Success Rate	*98%*	*99%*	*100%*	*100%*	*All operators are above the target*
Good RxQual - Good RxLev	*95%*	*95%*	*97%*	*95%*	*All operators are within or above the target*
Dropped Calls Rate	*2%*	*0.01%*	*0%*	*0%*	*All operators are above the target*

4.8 Moses Mabida Stadium

4.8.1 Measurement Results

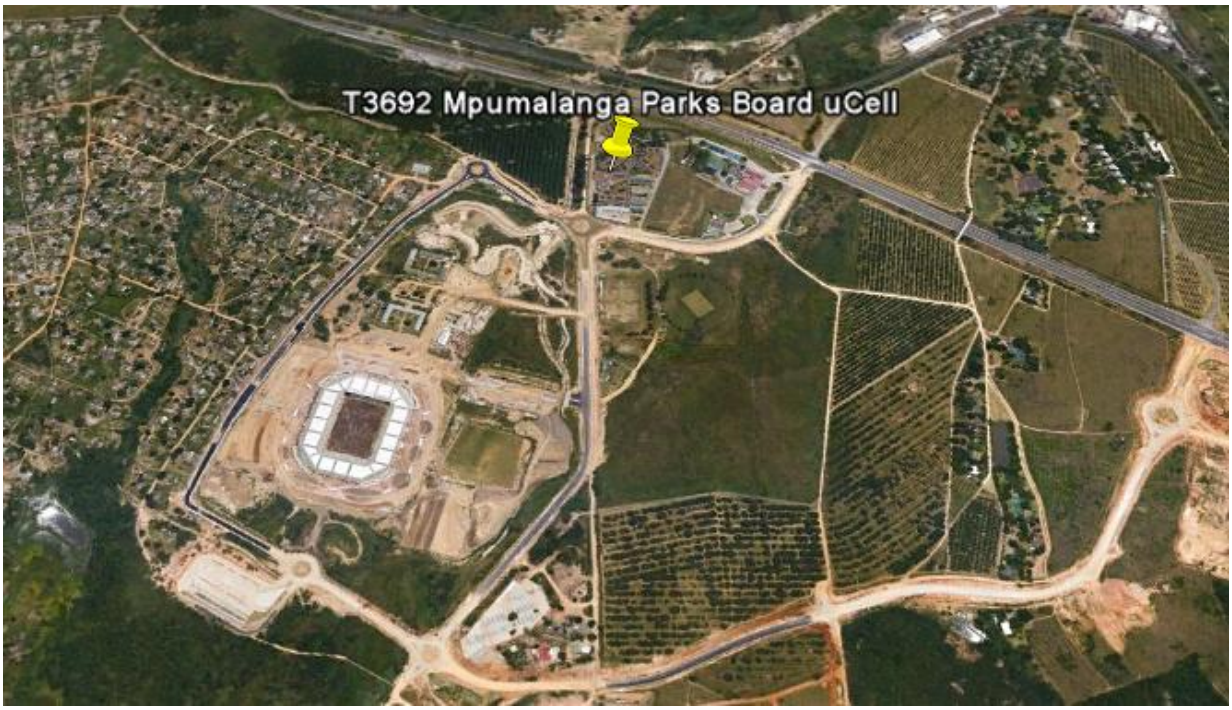
(i) Coverage map

MTN	Vodacom	Cell-C
		

(ii) Parameters

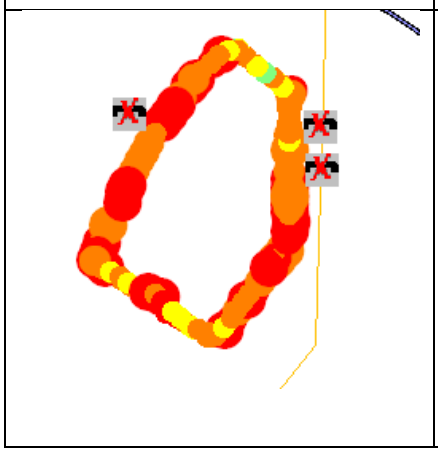
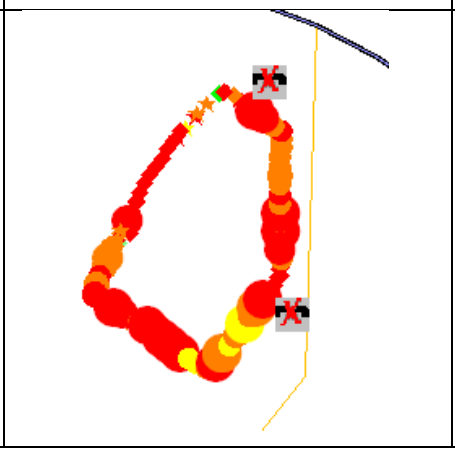
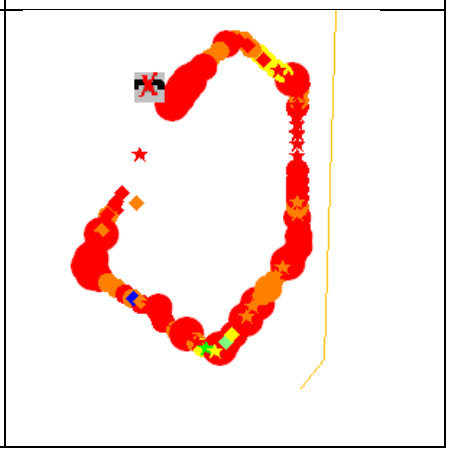
Metric	Target	MTN	VC	CC	Comments
Overall Call Setup Success Rate	*98%*	*99 %*	*99%*	*100%*	*All operators are above the target*
Good RxQual - Good RxLev	*95%*	*97%*	*95%*	*95%*	*All operators are within or above the target*
Dropped Calls Rate	*2%*	*0%*	*0%*	*0%*	*All operators are above the target*

4.9 Mbombela Stadium



4.9.1 Measurement Results

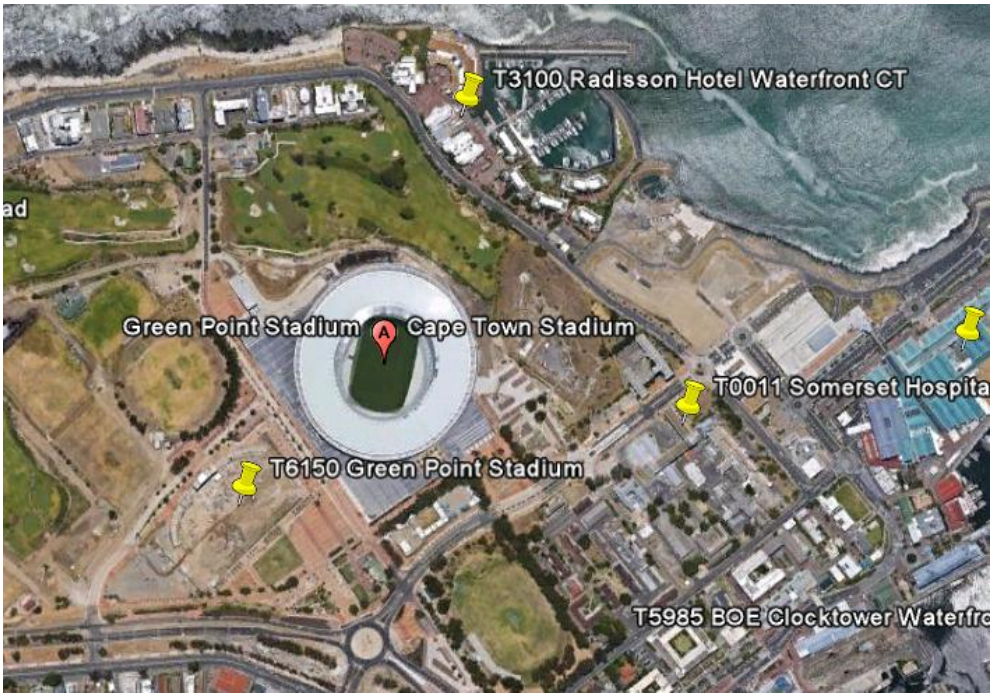
(i) Coverage map

MTN	Vodacom	Cell-C
		

(ii) Parameters

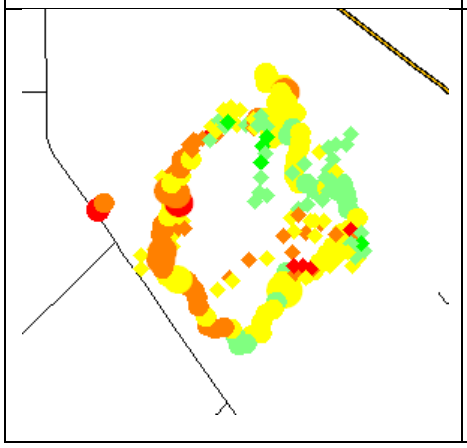
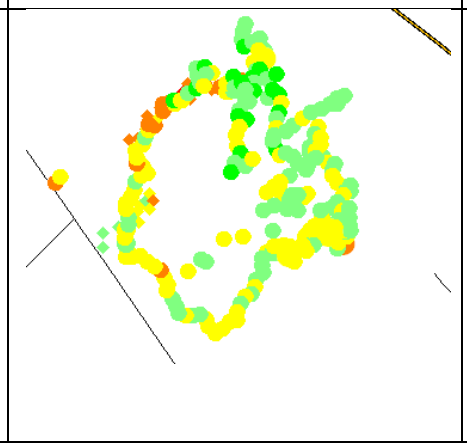
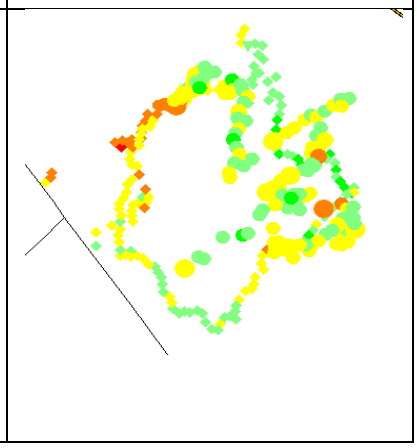
Metric	Target	MTN	VC	CC	Comments
Overall Call Setup Success Rate	*98%*	*82%*	*80%*	*80%*	*All operators below the target*
Good RxQual - Good RxLev	*95%*	*85%*	*81%*	*78%*	*All operators below the target*
Dropped Calls Rate	*2%*	*3%*	*3%*	*3%*	*All operators below the target*

4.10 Green point Stadium



4.10.1 Measurement Results

(i) Coverage map

MTN	Vodacom	Cell-C
		

(ii) Parameters

Metric	Target	MTN	VC	CC	Comments
Overall Call Setup Success Rate	*98%*	*99 %*	*100%*	*100%*	*All operators are above the target*
Good RxQual - Good RxLev	*95%*	*96%*	*96%*	*95%*	*All operators are within or above the target*
Dropped Calls Rate	*2%*	*0%*	*0%*	*0%*	*All operators are above the target*

5. Average Results

(i) Parameters

Metric	Target	MTN	VC	CC	Comments
Average Overall Call Setup Success Rate	*98%*	*93.90%*	*93.59 %*	*94.50 %*	*All operators below the target*
Average Good RxQual - Good RxLev	*95%*	*91.50%*	*91.20 %*	*92.64 %*	*All operators below the target*
Average Dropped Calls Rate	*2%*	*2 %*	*2.6 %*	*0.30%*	*VC is below the target*

6. Conclusion and Recommendations

- The drive test results represent a snapshot of the mobile service provider's network performance based on the specified routes during the time of day when the measurements were carried out and using a particular type of handset. The reported level of service quality may therefore not be exactly comparable with the consumer's own experience;
- The operators should be mandated to improve coverage in and around the stadiums so that the consumers can enjoy Voice and Data services in future events.
- ICASA should get three independent test numbers for independent results.
- Most of the stadiums are built out of town, so more sites need to be brought up for capacity improvements.
- More licenses are needed in order to reduce the travelling costs, since South Africa is too big to be monitored by SM&C only. Regional staff should be trained on the software to assist SM&C with monitoring.

- All the measurements of engineering standards such as Grade of Service (GOS) are to be carried out in accordance with ITU-T's recommendations.
- Network performance parameters like Coverage, Drop calls Rate (DCR) and Call Completion Rate (CCR) should be measured on a sample basis by the Authority from time to time, directly or if it so chooses, through a Consultant.