Report on Quality of Services (QOS) Drive test

(First Quarter Report)

Contents

1 Introduction

We are pleased to present First Quarter 079-80 report obliged by QoS Bylaw 2074, which are the Key Indicators of telecom Sector in Nepal. The report provides a brief update on the status of major telecom services. The quality of mobile telecommunication services are critical elements for daily economical activities. They are heavily used by consumers in their personal life or businesses, located either inside or outside the country.
In this study NTA aimed at evaluating quality levels offered by Mobile Network Operators in the country from an end-user perspective. This report covers test result of:
- Voice Services
- SMS Services
- Data Services

2 Methodology Adapted

Drive testing is a method of measuring and assessing the coverage, capacity and Quality of Service (QoS) of mobile radio network. It is performance oriented and technology neutral technique. In the Drive test process, testing tool collects key performance indicator (KPI) of cellular network by repeatedly making voice or data calls or keeping at idle mode.
In Drive Test process, a vehicle is drive at a steady speed (Not More than 35Km/Hr) over the selected route. GPS, Mobile and drive test software are tools, which collects information.

3 Drive Test tool and selection of Mobile station

Any devices computable with voice, SMS and data services are recommended. Further operator is requested to inform NTA about drive test tool, mobile phone and other accessories used in the test. Based on the mobile operator's technology, selection of devices

shall vary.
Name of Drive test Tool: GENEX Probe 5.3,PHU
Technology Supported: GSM, UMTS, LTE

4 Test Types

4.1 Coverage test

To test coverage, mobile station is connected with drive test tool in below configuration
- One mobile for 2G only at idle mode
- One mobile for 3G only at idle mode
- One mobile for 4G only at idle mode

4.2 Voice and SMS test

A free mode (2G, 3G and 4G mode) mobile station is used to attempt a call followed by 2 minutes conversation. After that, task of waiting for 3 Firsts is performed and in the next step four SMS is sent in same network. This combined test is executed in loop for whole drive test route.
For voice and SMS test:
- One mobile at free mode
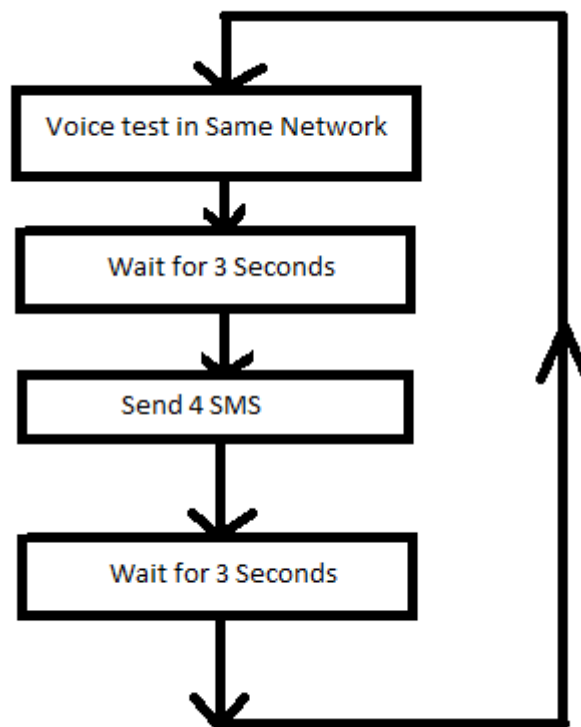
Fig: Flow Chart of voice and SMS test

4.3 Data test

In the Data testing process, Firstly, Mobile station is De-attached followed by waiting for 2 Firsts and in the next step attach process is done. Then dialup process is started. After successful dialup process the ping(4nos) test is perfumed followed by http browsing test, http downloads and upload.

For data test

- One mobile at free data mode (2G, 3G and 4G)

Fig: Flow Chat of Data test

5 Test result

5.1 Drive Test Route
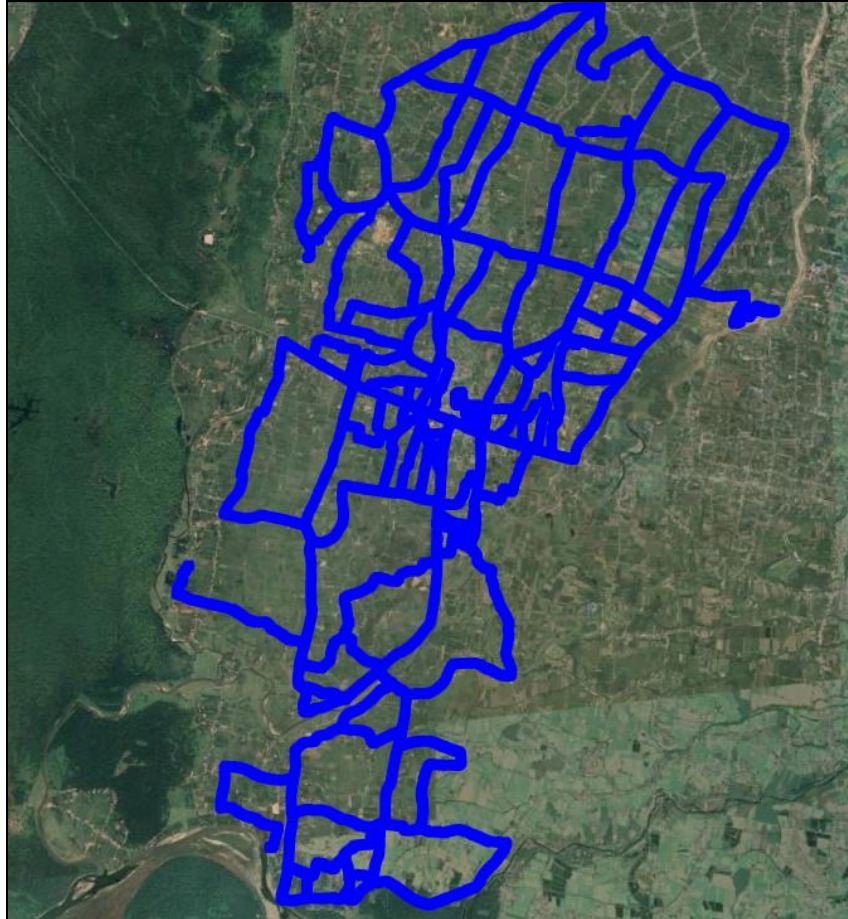
Fig: Drive test route (Google Earth Route)

5.2 Call and SMS Test

5.2.1 Call Setup Success Rate:

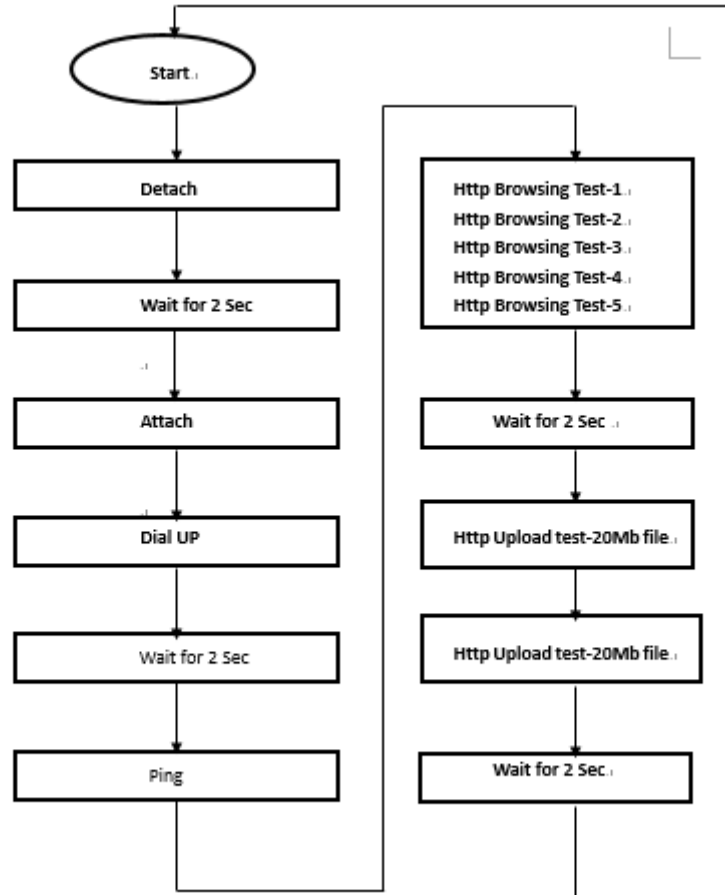| SN	Drive test KPI Item	result	Unit	Call Attempts	call Setup failure	Formula
1	Call Setup Success Rate	99.08	%	109	1	(Successful Call Attempts/Call Request) *100
	Remarks: Call Setup Success rate and Call setup failure includes GSM and WCDMA					

5.2.2 Call Drop Rate:

SN	Drive test KPI Item	result	Unit	Successful calls	Call Dropped	Formula
1	Call Drop Rate	0	%	104	0	[total Number of drop calls/total number of successful calls] *100
	Remarks: Call Drop Rate includes GSM and WCDMA Call Drops					

5.2.3 Handover Success rate:

SN	Drive test KPI Item	result	Unit	Number of Successful handovers	Handover failure	Formula
1	Handover Success Rate	100	%	873	0	(Number of Successful handovers/Number of attempt handovers) *100
Remarks: Handover Success Rate Includes GSM and WCDMA.						

5.2.4 Call Connection Time:

	Call Connection time				
SN	Drive test KPI Item	result	Unit	Remarks	Formula
1	Call Connection time	5.89	Sec	GSM, WCDMA and LTE	Average call connection time of total successful calls

5.2.5 Grade of Service:

SN	Drive test KPI Item	result	Unit	Total Number of call attempts	fail or lost calls due to Radio + other reasons	Formula
1	Grade of Service (call Block rate)	0.917	%	109	1	(Number of fail or lost calls due to radio or other reasons/Number of call Attempts) *100
Remarks: Grade of Service contains call Block occurred in GSM and WCDMA.						

5.2.6 SMS Test:

SN	Drive test KPI Item	result	Unit	Number of Successfully delivered SMS	Number of SMS Delivered	Formula
1	SMS Success Rate	83.99	%	404	481	([total Number of Successfully delivered SMSs]/ [Total number of SMS delivered]) *100
Remarks: SMS Success rate is for all GSM, WCDMA and LTE						

Event Layer
- ☑ WCDMASMSSentAttempt-call and sms(86)
- ☑ LTESMSSendAttempt-call and sms(231)
- ☑ GSMSMSSentAttempt-call and sms(164)

Event Layer
- ☑ WCDMASMSSent-call and sms(48)
- ☑ LTESMSSendSuc-call and sms(232)
- ☑ GSMSMSSent-call and sms(124)

5.3   HTTP Browsing and UL DL test

5.3.1 PDP Context Activation Success Ratio:

SN	Drive test KPI Item	result	Unit	PDP Activation Request	Number of successful PDP Activations	Formula
1	PDP Context Activation Success Ratio	100	%	11	11	(Number of Successful PDP Activations/PDP Activation Requests) *100
Remarks: LTE, WCDMA AND GSM						

5.3.2 Ping 32 Bytes RTT on http:// www.washingtonpost.com/

SN	Drive test KPI Item	result	Unit	Remarks	Formula
1	Ping 32bytes RTT	184.98	ms		Average time of total successful ping requests

5.3.3 HTTP browsing Display Success Rate:

SN	Drive test KPI Item	result	Unit	HTTP Browsing Display requests	Successful HTTP Browsing Display	Formula
1	HTTP Browsing Display Success Rate	97.17	%	424	412	([Total Number of Successful HTTP Browsing Display]/ [Total number of HTTP Browsing Display Requests]) *100
Remarks: LTE, WCDMA and GSM						

5.3.4 HTTP Browsing Display Delay Average:

SN	Drive test KPI Item	result	Unit	Remarks	Formula
1	HTTP Browsing display Delay Average	16,664.77	ms	LTE, WCDMA and GSM	Average time of total successful HTTP Browsing Display

5.3.5 Throughputs:

SN	Drive test KPI Item	result	Unit	Attempts	Remarks
1	Download Average Throughput-FTP	4.72	Mbps	22	Average of all download Attempts
2	Upload Average Throughput-FTP	1.02	Mbps	11	Average of all Upload Attempts
3	FTP download Throughput-Peak value	86.38	Mbps	22	peak download value
4	FTP Upload Throughput-peak Value	45.22	Mbps	11	Peak Upload value
Remarks: GSM, WCDMA and LTE Throughput					

5.3.6 Data download Success Rate:

SN	Drive test KPI Item	result	Unit	Total Number of download requests	Successful download Attempts	Formula
1	Download success Rate-FTP	90.91	%	22	20	(Successful download attempts/total number of download attempts) *100
Remarks: LTE, WCDMA and GSM						

5.3.7 Data Upload Success Rate:

SN	Drive test KPI Item	result	Unit	Total Number of Upload Requests	Successful Upload Attempts	Formula
1	Upload success Rate-FTP	100	%	11	11	(Successful upload attempts/total number of

Remarks: GSM, WCDMA and LTE	upload attempts) *100

5.4 QOS Summary:
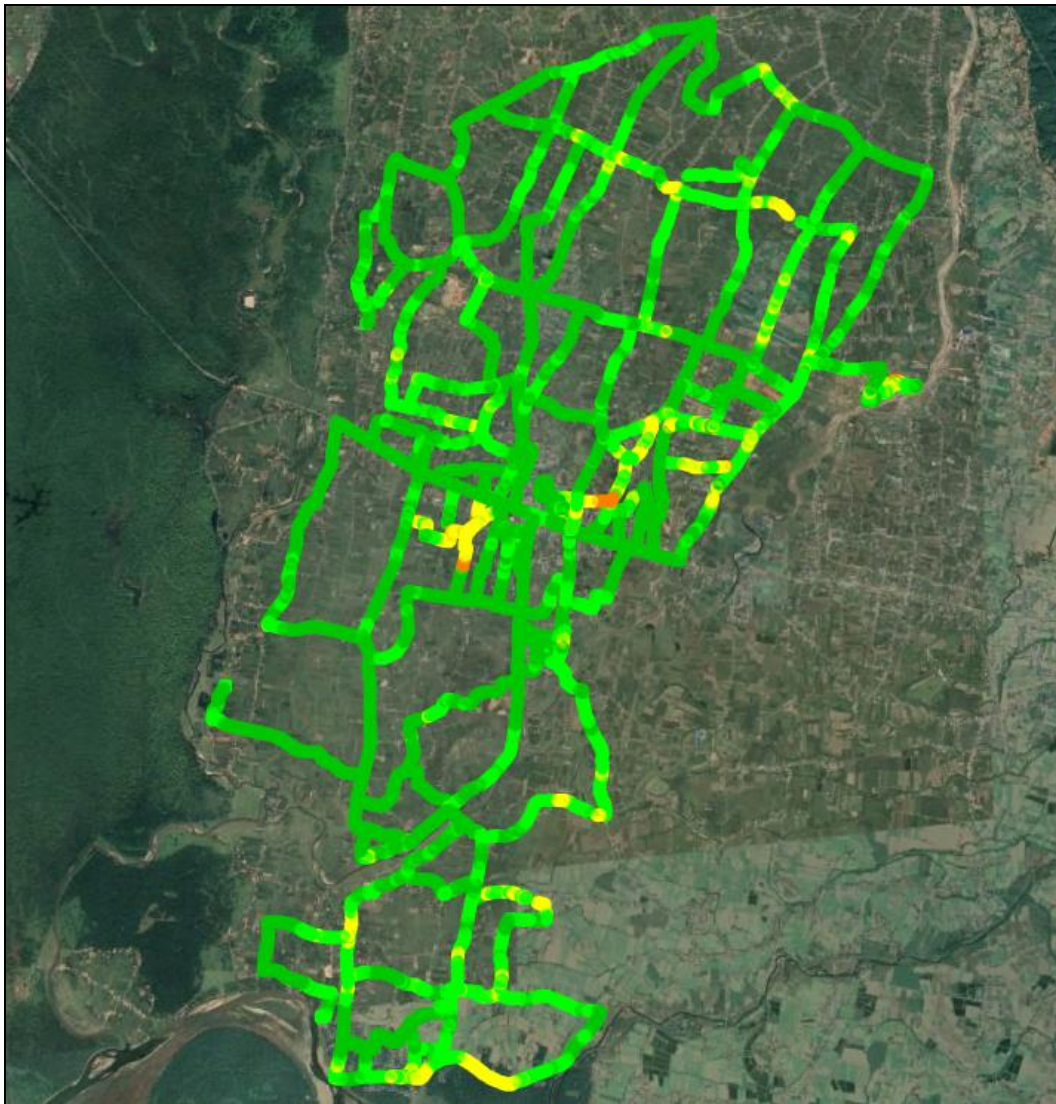
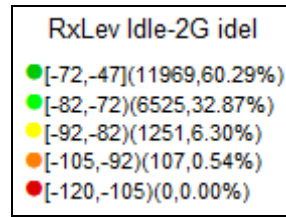### 5.4.1 2G Coverage (Rx Level Idle):

Fig: Map: Rx level Idle Google Earth View
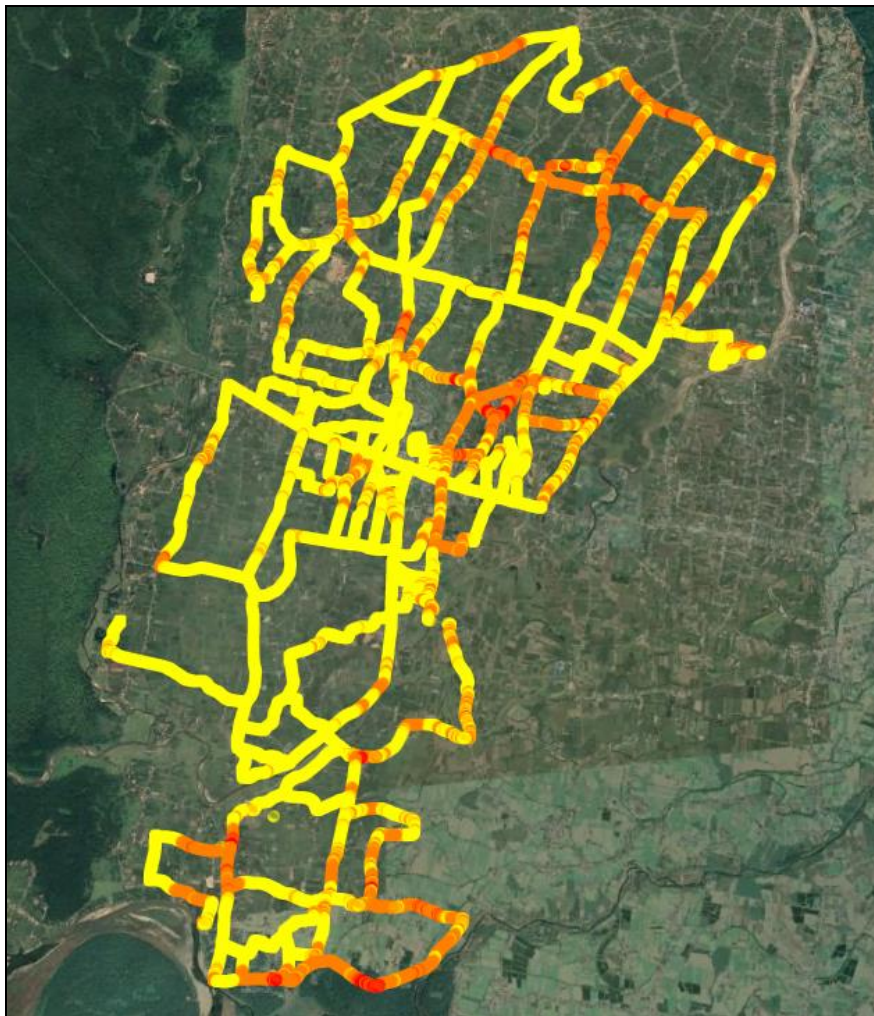
Fig: Legend: Rx level Idle

5.4.2 3G Coverage (RSCP):
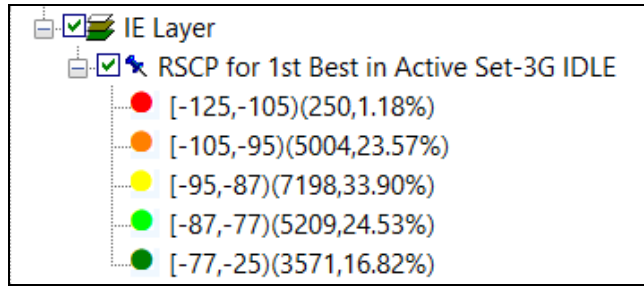

Fig: Map: Active Set RSCP Google Earth View

Fig: Legend: RSCP for 1st Best in Active Set

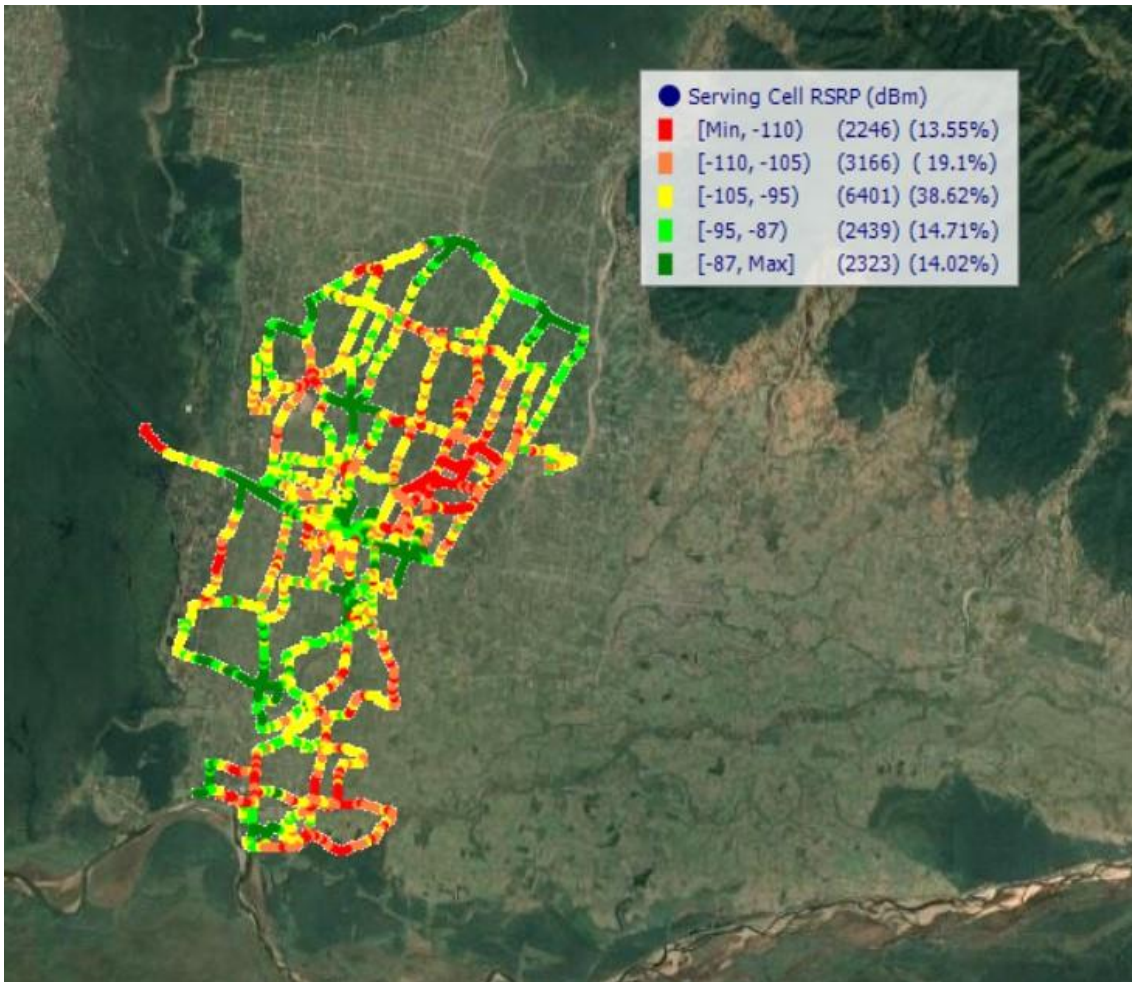## 5.4.3 4G Coverage(RSRP):

Fig: Map: RSRP Google earth View

Fig: Map: RSRP Google earth View

6 QoS Parameter Summary

SN	Drive Test KPI Summary	Result	Unit	Criteria in QoS Bylaw
1	Call setup Success Rate-Mobile network Accessibility	99.08	%	>=99
2	Call Drop Rate	0	%	<=2
3	Ho success rate	100	%	
4	Voice call Setup Time (MO/MT)-call Connection Time	5.89	s	<=5
5	Grade of Service (call Block Rate)	0.917	%	
6	SMS Delivery Success Rate (Within 2 Minutes)	83.99	%	
7	PDP Context Activation Success Ratio	100	%	
8	Ping 32 Bytes RTT	184.98	ms	<=250
9	HTTP Browsing display Success Rate	97.17	%	
10	HTTP Browsing Display delay Avg	16,664.77	ms	
11	Download Average Throughput (FTP)	4.72	Mbps	
12	Upload Average Throughput (FTP)	1.02	Mbps	
13	Peak Download Throughput (FTP)	86.38	Mbps	
14	Peak Upload Throughput (FTP)	45.22	Mbps	
15	Download Success rate-(FTP)	90.91	%	>=80
16	Upload Success rate-(FTP)	100	%	>=75
17	Rx Level(2G) -(Level>-82dBm)	93.16	%	
18	RSCP (3G) -(Level>-87dBm)	41.35	%	
19	RSCP (3G) -(Level>-95dBm)	75.25	%	
20	RSRP (4G) -(Level>-87dBm)	14.02	%	
21	RSRP (4G) -(Level>-95dBm)	28.73	%	
22	RSRP (4G) -(Level>-110dBm)	86.45	%	
23	MOS	3.385		>=3