INFORMATION COMMUNICATIONS TECHNOLOGIES QUALITY OF SERVICE AND QUALITY OF EXPERIENCE GUIDELINES

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PART I

PRELIMINARY PROVISIONS

The Authority means Botswana Communications Regulatory Authority (BOCRA).

In these Guidelines, unless the context requires otherwise, the Act means the Communications Regulatory Authority Act (CRA Act) of 2012.

These Guidelines maybe referred to as the current Information and Communications Technologies Quality of Service (ICT QoS) and Quality of Experience (QoE) Guidelines of 2019.

These Guidelines shall apply to all Licensees offering Internet, and Telecommunications services in Botswana.

OBJECTIVES

The objectives of these Guidelines are to:

(a) Protect the interest of consumers of Internet and Telecommunications services;
(b) Provide measurement options for quality of service; and
(c) Monitor quality of experience.

PART II

ABBREVIATIONS

CCFR	-	Call Connection Failure Rate
CST	-	Call Setup Time
DCR	-	Drop Call Ratio
NA	-	Network Availability
MOS	-	Mean Opinion Score
CSSR	-	Call Set Up Success Rate
DCR	-	Drop Call Ratio
HSR	-	Handover Success Rate
MCS	-	Mobile Coverage Strength
SMS	-	Subscriber Mobile Service
DSR	-	Delivery Success Rate
DNS	-	Domain Name System
RSR	-	Resolution Success Rate
FTP	-	File Transfer Protocol
HTTP	-	Hypertext Transfer Protocol
WWW	-	World Wide Web
CSR	-	Call Success Rate
NER	-	Network Efficiency Ratio
PDD	-	Post Dialing Delay
RSR	-	Registration Success Rate
MTTR	-	Mean Time To Repair
POI	-	Point Of Interconnection

DEFINITIONS

Quality of Service (QoS) - refers to the statement of the level of quality of the service as offered to the consumer by a service provider. *[Recommendation ITU-T G.100].*

Quality of Experience (QoE) - refers to the consumer perception, or experience of the quality of the service offered.

Quality of Service Guidelines - refers to a set of standards and measures that define applicable quality measures.

Both the level of quality of service offered to the consumer and the perceptions and/ or experience of the quality of service offered are critical factors in monitoring quality of service.

Call Connection Failure (CCF) - is defined as the percentage of unsuccessful calls.

Call Setup Time (CST - for Fixed) - is defined as **t**he duration from when a call is made to the time of receiving a ring back tone.

Drop Call Ratio (DCR - for Fixed) - is defined as the percentage of calls connected to intended recipients that ended without the intervention of any of the users.

Network Availability (NA - for Fixed) - is defined as the degree to which the network is operable and not in a state of failure or outage at any point in time.

Mean Opinion Score (MOS) - is a numerical value that measures user experience and the factors that influence voice quality. *[Recommendation ITU-T P.863].*

Call Setup Time (CST - for Mobile) - is defined as time interval from the instant when the calling party initiates a connection request to the time when the calling party receives a ring back tone (called party busy tone/ringing tone/answer signal).

Call Set-up Success Rate (CSSR) - is the ratio of total number of successful calls to the total number of all call attempts made on the network during a specified period.

Drop Call Ratio (DCR - for Mobile) - is defined as the percentage of calls connected to intended recipients that ended without the intervention of any of the users.

Handover Success Rate (HSR) - refers to the ratio of successful handover calls to the total number of handover call attempts made. Handover is the

process by which a mobile telephone call is transferred from one base station to another as the subscriber passes the boundary of a cell. *[Recommendation ITU-T Q.1005]**.***

Mobile Coverage Strength - is defined as the transmitter power output as received by a reference antenna at a distance from the transmitting antenna.

Network Availability (**NA - for Mobile)** - is the degree to which a network is operable and not in a state of failure or outage at any point in time.

SMS Delivery Success Rate - is the percentage of sent messages that are received by the intended recipient(s).

SMS End to End Delivery Time - refers to the duration from when an SMS is sent to the time of receiving the SMS by the intended recipient(s).

SMS Service Accessibility - refers to the probability that a user can access the SMS centre for sending SMS.

DNS Resolver - also known as a resolver, is a server on the internet that is responsible to convert domain names to IP addresses.

DNS Resolution Success Rate - defines the likelihood for a domain name to be converted into an IP address successfully by DNS resolver.

DNS Resolution Time - defines time taken for a DNS domain name to translate website names into IP addresses.

Data Transmission Rate - refers to the speed of data travelling from user to a network and back.

Access Network Utilization - is the total traffic between access node to aggregation node.

Throughput - refers to the speed of uploading and downloading data in Megabits per second between end-user and test equipment.

Latency defines - the round-trip time taken by standard packet to travel across network from end user to the test equipment and back to the user.

Packet Loss - defines is defined as the percentage of data packets transmitted from the source but fail to arrive at their destinations.

FTP - refers to the standard network protocol used for computer file transfer between a client and a server

FTP Drop Rate - defines the percentage of incomplete data transfers that were started successfully.

FTP Mean Data Rate [Kbit/s] - defines the average data transfer rate measured through the entire connect time to the service.

FTP Set-up Time - refers to the duration to access the service successfully, from starting the dial-up connection to the point of time when the content is sent or received.

HTTP - refers to the underlying protocol used by the world wide web that defines how messages are formatted and transmitted and what actions the WEB server and browser should take in response to various commands

HTTP Drop Rate - defines the percentage of incomplete data transfers that were started successfully.

HTTP Mean Data Rate - defines the average data transfer rate measured through the entire connection time to the service.

HTTP Set-up Time - defines the duration between the instant when the request of the web page is sent to the instant when the beginning of the web page is received.

Web Radio Tune-in Success Rate - defines the percentage that a subscriber can obtain the tune-in information for a web radio streaming server successfully.

Web Radio Tune-in Success Time - defines the duration needed to obtain the tune-in information for a web radio streaming server successfully.

Web Radio Reproduction Cut-off Ratio - defines the percentage that a subscriber cannot successfully complete stream reproduction from a given web radio station for a given period.

Drop Call Rate (DCR - for VoLTE) - defines the proportion of calls that are ended prior to the user initiating a disconnect.

Network Efficiency Ratio (NER - for VoLTE) - refers to the ability of the network to deliver calls to the furthest terminal. It expresses the relationship between the number of seizures and the sum of number of seizures resulting in either an answer message, or a user busy or a no answer ring. *[Recommendation ITU-T E.425].* [the ability of the network to deliver calls]

Post Dialing Delay (PDD - for VoLTE) - is defined as the Time interval in seconds between the end of dialing by the caller and the reception of the network response. Equivalent to Call Setup Time, as defined in *[Recommendation ITU-T E.800].*

Registration Success Rate (RSR - for VoLTE) - defines the ratio of the number of successful established terminating sessions to the number of attempted established terminating sessions. *[ETSI TR 103 219]*.

Service Availability (SA - for VoLTE) - refers to the percentage of the time a system stays operational.

Interconnection Route Utilization (IRU) - refers to the percentage of provisioned interconnection route(s) that carry traffic.

Mean Time To Repair (MTTR - for Interconnection) - refers to the duration between a reported interconnection fault to service restoration.

Point of Interconnection Congestion - defines the percentage of congestion at point of interconnection. *[Recommendation ITU-T E847].*

Service Availability (SA - for Non-Technical) - is defined the percentage of time the network shall be available to the subscribers.

Provision of Service - refers to the time taken to provide service to a location where it is required.

Call Centre Operator Response (CCOR) - defines the duration between sending a request to speak to the Operator to the time that the Operator's response is heard.

Mean Time To Repair (MTTR - for Non-Technical) - defines the duration between a reported fault to service restoration.

Billing Complaint Rate (BCR) - defines the percentage of customer billing related complaints per the reporting period.

Billing Accuracy (BA) - same duration in seconds used for a call should be used for charging.

Complaint Resolution Time (CRT) - defines the time taken for a service provider to resolve a complaint.

A. TECHNICAL PARAMETERS

FIXED SERVICES

The following parameters as defined under definitions are applicable to fixed services: -

Call Connection Failure Rate (CCFR)

Call Setup Time (CST)

Drop Call Ratio (DCR)

Network Availability NA)

MOBILE SERVICES

The following parameters as defined under definitions are applicable to mobile services: -

Mean Opinion Score (MOS)

Call Setup Time (CST)

Call Set-up Success Rate (CSSR)

Drop Call Ratio (DCR)

Handover Success Rate

Mobile Coverage Strength (MCS)

Network Availability (NA)

SMS Delivery Success Rate

SMS End to End Delivery Time

SMS Service Accessibility

Network Efficiency Ratio (NER - for VoLTE)

Post Dialing Delay (PDD - for VoLTE)

Registration Success Rate (RSR - for VoLTE)

Service Availability (SA - for VoLTE)

FIXED INTERNET SERVICES

The following parameters as defined under definitions are applicable to fixed internet services: -

DNS Resolution Success Rate

DNS Resolution Time

Data Transmission Rate

Access Network Utilization

Throughput

Latency

Packet Loss

MOBILE INTERNET SERVICES

The following parameters as defined under definitions are applicable to mobile internet services: -

FTP Drop Rate

FTP Mean Data Rate [Kbit/*s]*

FTP Set-up Time

HTTP Drop Rate

HTTP Mean Data Rate

HTTP Set-up Time

WEB RADIO STREAMING SERVICE

The following parameters as defined under definitions are applicable to web radio streaming services: -

Web Radio Tune-in Success Rate

Web Radio Tune-in Success Time

Web Radio Reproduction Cut-off Ratio

INTERCONNECTION

The following parameters as defined under definitions are applicable to interconnection:

Interconnection Route Utilization

Mean Time To Repair (MTTR)

Point of Interconnection Congestion

B. NON-TECHNICAL PARAMETERS

The following parameters as defined under definitions are applicable to non-Technical Services

Service Availability

Provision of Service

Call Centre Operator Response

Mean Time To Repair (MTTR)

Billing Complaint Rate

Billing Accuracy

Complaint Resolution Time

PART III

COMMUNICATION SERVICE LICENSEE OBLIGATIONS

The ICT service providers shall: -

(a) provide communication services that meet quality of service parameters as set forth by these Guidelines;

(b) continuously measure network performance and keep records of the results of the measurements as per Part V; and

(c) report the same as per Part V of these guidelines.

PART IV

COMPLIANCE

Section 6 (2) (a and c) of the CRA Act, mandates the Authority to: -

“(a) protect and promote the interests of consumers, purchasers and other users of the services in the regulated sectors, particularly in respect of the prices charged for, and the availability, quality and variety of services and products, and where appropriate, the variety of services and products offered throughout Botswana, such as will satisfy all reasonable demands for those services and products;

and

(b) monitor the performance of the regulated sectors in relation to levels of investment, availability, quantity, quality and standards of services, competition, pricing, the costs of services, the efficiency of production and distribution of services and any other matters decided upon by the Authority;”.

Service Level Agreements

The Service Providers shall establish well-defined Service Level Agreements (SLAs) with consumers to ensure end to end QoS.

In general, the SLA shall state, among others, the following: -

- Level of performance: The minimum level of service performance offered to the customer, not the average level to be achieved for all customers;

- The compensation: if the minimum service level is not achieved, the compensation should at least be commensurate to the degree of failure; and
- The mechanism for claiming compensation: this should be done automatically without requiring the customer to file for a claim.

Monitoring

The Authority shall: -

(a) monitor the adherence to Quality of Service measurements procedures; and

(b) direct its officers or agents (third party) to carry out investigations on Quality of Service measurements.

Inspection

The Authority or any person authorized in writing by the Authority may, upon furnishing reasonable notice, enter upon the premises of the licensee for purposes of ascertaining compliance with these Guidelines.

Enforcement

The Authority shall take appropriate measures to enforce these Guidelines in conjunction with penalties.

PART V

REPORTING

Reporting

The Licensee shall, submit Quality of Service reports as may be required by the Authority from time to time.

Record Keeping

All Licensed Service Providers shall:

(a) maintain documented processes of data collection for each parameter contained in these Guidelines and submit the same to the Authority as required from time to time;

(b) complete and maintain accurate records of its compliance for each QoS parameter specified in such a manner and in such a format, as may be prescribed by the Authority from time to time;

(c) The Authority may, from time to time, either by order or by direction, specify uniform record keeping procedures and formats including guidelines on measurement methodology for various QoS parameters; and

(d) The Authority may, if it considers it expedient to do so, at any time, direct any of its officers or employees or an agency appointed by the Authority to inspect the records or to get such records audited.

Auditing

The Authority shall:

(a) audit some or all the Quality of Service data;
(b) opt to use a third party to perform audits on behalf of the Authority;
(c) audit Quality of Experience based on Customer Satisfaction Surveys undertaken by the Authority; and
(d) vary the frequency of the audits, reporting areas and reporting periods that require auditing.

Publication

The Authority shall publish, on print media or on the Authority's website, the Quality of Service/ Quality of Experience Report as may be decided by the Authority as follows:

(a) the compliance reports of each Quality of Service and Quality of Experience parameter reported to it by the service providers under these Guidelines;
(b) the results of the audit and assessment of the Quality of Service and Quality of Experience undertaken by the Authority or its authorized agent;
(c) the Authority may request licensees to publish Quality of Service and Quality of Experience parameter information on their websites; and
(d) If so requested in terms of (c) above, Operators shall publish on their websites a Coverage Map showing their network coverage and services availability.

PART VI

SERVICE INTERRUPTIONS

Planned Service Interruptions

Licensees shall:

(a) issue public notices in advance of any planned interruption of services by publishing such notice in a widely read electronic media or print media at least 48 hours before the planned interruption of services;
(b) send the notice through the Short Messaging System (SMS);
(c) issue public notices stating the number and type of subscribers that will be affected by the planned interruptions; and
(d) provide the information for such service interruptions to the Authority at least 48 hours before the planned interruption of service.

Unplanned Service Interruptions

In the event of any unplanned service interruption a licensee shall:

(a) within an hour of the event, notify the Authority via email of the occurrence of the event, including details on areas affected and numbers of end users affected where possible;
(b) continue to provide updates to the Authority via email every one-hour detailing progress in resolving the issue; and
(c) within 24 hours of resolution of the issue, provide the Authority with a formal report detailing the circumstances attributing to the interruptions of the service, and the action taken to remedy the situation.

PART VII

REVIEW

The Authority may review the Quality of Service and Quality of Experience targets and parameters under these guidelines as and when required.

PART VIII

IMPLEMENTATION

These Guidelines shall come into effect on the 1st of January 2020.

Licensees are expected to have met the requirements of the Guidelines within six (6) months after coming into effect.

SCHEDULES

The licensee providing services above shall be required to meet targets on Quality of Service parameters as specified in **Schedule 1** to **7** of these Guidelines.

SCHEDULE 1

QUALITY OF SERVICE PUBLIC SWITCHED TELEPHONE SERVICES

TABLE 1: QUALITY OF SERVICE PUBLIC SWITCHED TELEPHONE SERVICES

Parameter Name	Formula	Measurement Mechanism (standards)	Measurement Tool	Target
Network Availability	*Network Availability* = [(Total Operational minutes - Total minutes of service downtime) / Total operational minutes]) x 100	Test traffic. [ETSI EG 202 057-3]	Test Stations or Drive Test System	>99%
Call Set-up Time	*Call Set-up Time* = Time of Call Alerting - Time of receiving Dial tone	Test traffic	Test Stations or Drive Test System	<3sec (local call) <5sec (Toll)
Call Connection Failure Rate	*Call Connection Failure Rate* = Probability of end-to-end blocking [Rec. ITU-T E.721];	Test Traffic [ETSI EG 201 769-1]	Test Stations or Drive Test System	<2%
Drop Call Ratio	*Drop Call Ratio* = *(*Number of Calls disconnected without intervention by any user / Number of Calls connected to intended recipient) *100%	Real Traffic from OSS and or Test traffic. [ETSI ES 202 765-2, clause 7.4].	Performance Monitoring System/ Test Stations or Drive Test System	≤ 2%

SCHEDULE 2

QUALITY OF SERVICE PARAMETR FOR MOBILE SERVICES

TABLE 2: QUALITY OF SERVICE PARAMETR FOR MOBILE SERVICES

Parameter Name	Formula	Measurement Mechanism	Measurement Tool	Target
Network Availability	*Network Availability* = [(Total Operational minutes - Total minutes of service downtime) / Total operational minutes]) x 100	Test traffic.	Test Stations or Drive Test System	>99%
Call Set-up Time	*Call Set-up Time* = Time of Call Alerting - Time of receiving Dial tone	Test traffic	Test Stations or Drive Test System	<5Sec (intra network normal traffic) <8Sec (fixed to mobile normal traffic)
Drop Call Rate	*Drop Call Ratio* = *(*Number of Calls disconnected without intervention by any user / Number of Calls connected to intended recipient) *100%	Real Traffic from OSS and or Test traffic.	Test Stations or Drive Test System	≤ 2%
Call Set-up Success Rate	*Call Set-up Success Rate* = (Total number of successfully connected calls / Total number of attempts) *100	Real Traffic from OSS and or Test traffic.	Test Stations or Drive Test System	≥98% for all calls
Handover Successful Rate	Handover Successful Rate = (Total number of Successful handovers / Total number of handover requests) *100	from OSS and or Test traffic	Test Stations or Drive Test System	≥96%
Mobile Service Coverage	Mobile Service Coverage signal strength = Field	Field strength measurements	Test Stations or Drive Test System	≥ -85dBm ((in-vehicles) ≥ -95dBm (outdoors)

Signal Strength	strength measurements			
SMS Delivery Success Rate	SMS Delivery Success Rate = (Number of SMS received by intended recipients/ number of SMS sent) *100	Real Traffic from OSS and or Test Traffic	Performance Monitoring System/ Test Stations or Drive Test System	All SMS 99%
SMS End to End Delivery Time	SMS End to End Delivery Time = Time SMS received – time SMS sent	Test traffic	Test Stations or Drive Test System	All SMS should be delivered in less than <5 seconds
SMS Service Accessibility	SMS Service Accessibility = (Success access to SMS centre /over total Number of SMS attempts) * 100.	Test traffic	Test Stations or Drive Test System	≥ 98%
Mean Opinion Score (MOS)	Mean Opinion Score is expressed in one number from 1-5, 1 being the worst and 5 being the best.	Test traffic	Test Stations or Drive Test System	≥3.5

SCHEDULE 3

QUALITY OF SERVICE PARAMETERS FOR FIXED INTERNET SERVICES

TABLE 3: QUALITY OF SERVICE PARAMETERS FOR FIXED INTERNET SERVICES

Parameter Name	Formula	Measurement Mechanism	Measurement Tool	Target
DNS Host Name Resolution Time	*DNS Host Name Resolution Time* = Time for standard query response received – time standard query sent. [ETSI TS 102 250-2 & Rec. ITU-T Y.1540]	Real Traffic from OSS and or Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	< 10 ms
DNS Host Name Resolution Success Rate	*DNS Host Name Resolution Success Rate* = (Successful DNS host Name resolution requests/ Total DNS Host name resolution requests) *100 [ETSI TS 102 250-2]	Real Traffic from OSS and or Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	< 99%
Data transmission Rate	Data transmission rate = Size of test file/ The transmission time required for a complete and error free transmission	Test Traffic	Test station	At least 75% of the advertised speed during peak time
Access Network Utilization	*Access Network Utilization* = Total traffic between access node / aggregation of traffic at the node	Test Traffic	Test Stations	uplink utilization must not be more than 75% of uplink bandwidth provided
Throughput	Throughput = Number of test samples greater	Test Traffic	Test Stations	Throughput must not be less than:

	than or equals QoS throughput) /Total number of test samples)) *100			a) 75% of subscribed level of bandwidth for 90% of the time for ADSL b) 95% of the subscribed bandwidth for 100 % of the time for dedicated services
Latency	Latency = (Number of test samples less than or equal to 85 ms /Total number of test samples) *100	Test Traffic	Test Stations	≤ 85 ms 95% of the time
Packet Loss	*Packet Loss = (Total no of packet lost / Total no of packets sent) *100*	Test Traffic	Test Stations	≤ 1%

SCHEDULE 4

QUALITY OF SERVICE PARAMETERS FOR MOBILE INTERNET SERVICES

TABLE 4: QUALITY OF SERVICE PARAMETERS FOR MOBILE INTERNET SERVICES

Parameter Name	Formula	Measurement Mechanism	Measurement Tool	Target
HTTP Set-up Time	*HTTP Set-up Time* = Time Content Received-Time Content requested	Real Traffic from OSS and or Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	95% within 5 seconds
HTTP Drop Rate	*HTTP Drop Rate* = (Number of incomplete data transfers/ Number of transfers started successfully) *100%	Real Traffic from OSS and or Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	< 1%
HTTP Mean data Rate	*HTTP Mean data Rate* = User data transferred (Kbit) /(Time Data transfer Complete-Time Data Transfer Start)	Real Traffic from OSS and or Test traffic= user data transferred [Kbits]/ Time data transfer is completed-time data transfer start	Performance Monitoring System/ Test Stations or Drive Test System	1Mbps
FTP {download |upload} Set-up Time	*FTP {download |upload} Set-up Time* = Time Service Access Successful -Time Service Access Start	Real Traffic from OSS and or Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	< 2 seconds
FTP Drop Rate	*FTP Drop Rate* = (Number of incomplete data transfers/ Number of transfers started successfully) *100%	Real Traffic from OSS and or Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	< 1%
FTP {download| upload} Mean	*FTP {download| upload} Mean Data Rate [Kbit/s]* = User data transferred (Kbits)	Real Traffic from OSS and or Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	2Mbps

Data Rate [Kbit/s]	/(Time Data transfer Complete-Time Data Transfer Start)			
FTP {download| upload} data transfer success ratio [%]	*FTP {download| upload} data transfer success ratio [%] = (completed data transfers /successfully started data transfers) *100*	Real Traffic from OSS and or Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	80%
Web Radio Tune-in Success Rate	*Web Radio Tune-in Success Rate* = (Number of Successful tune-in/ Total attempts) * 100%	Test traffic	Test Stations or Drive Test System	>98%
Web Radio Tune-in Success Time	*Web Radio Tune-in Success Time* = Time attempt Tune-in - Time Successful Tune-in	Test Traffic	Test Stations or Drive Test System	< 2 seconds
Web Radio Reproduction Cut-off Ratio	*Web Radio Reproduction Cut-off Ratio* = (Number of Unsuccessful listening attempts/ Total attempts) * 100%	Test Traffic	Test Stations or Drive Test System	< 2%

SCHEDULE 5

QUALITY OF SERVICE FOR VoLTE SERVICES

TABLE 5: QUALITY OF SERVICE FOR VoLTE SERVICES

Parameter Name	Formula	Measurement Mechanism	Measurement Tool	Target
Registration Success Rate	*Registration success rate* = (Successful Registration attempts/ Total number of Registration attempts) *100 [ETSI TR 103 219]	Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	≤ 98%
Service Availability	Service Availability = [(Total Operational minutes - Total minutes of service downtime) / Total operational minutes] x 100	Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	≥ 98%
Post Dialing Delay (PDD)	*Post Dialing Delay (PDD)* = Time of ringing tone - time of dialing.	Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	≤4s
Drop Call Rate	Drop Call Rate = (Total number of calls terminated unwillingly/ total number of successfully established calls) *100 [Rec. ITU-T E.804 Section 7.3.6.5]	Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	≤2%
Network Efficiency Ratio	Network Efficiency Ratio = Number of seizures resulting in answer message, user busy, no answer / Total number of seizures attempt) *100	Test traffic	Performance Monitoring System/ Test Stations or Drive Test System	≥ 95%

SCHEDULE 6

QUALITY OF SERVICE FOR INTERCONNECTION

TABLE 6: QUALITY OF SERVICE FOR INTERCONNECTION

Parameter Name	Formula	Measurement Mechanism	Measurement Tool	Target
Interconnection Route Utilization	*Interconnection Route Utilization* = Capacity in use / Capacity Provisioned) *100%	Real Traffic	Performance Management system	< 80%
Mean Time To Repair (MTTR) Interconnection Route	*Mean Time To Repair (MTTR) Interconnection Route* = Time Service Restored-Time Reported	Real Traffic	Performance Management system	< 2 hours
Point of interconnection Congestion	*Point of interconnection Congestion = (Number of blocked call attempts /total number of call attempts) * 100*	Real traffic from OSS and or test Traffic [Rec. ITU-T E.847-201703]	Performance Monitoring system test stations or Drive test	<0.5%

SCHEDULE 7

QUALITY OF EXPERIENCE (NON-TECHNICAL PARAMETERS)

TABLE 7: **QUALITY OF EXPERIENCE (NON-TECHNICAL PARAMETERS)**

Parameter Name	Formula	Measurement Mechanism	Measurement Tool	Target
Service Availability	*Service Availability* = percentage of the time the service was available to the percentage the service was available + the down time	Report from systems	Test tools	>99%
Provision of Service	Provision of Service = the time the customer pays for service to the time the customer is provided with service	Complaints	Trouble ticket system	5 Calendar Days
Call Centre Operator Response	*Call Centre Operator Response* = Time Operator Assistance Pick up - Time Making Operator request.	Test traffic	Test Stations	< 30 seconds
Mean Time To Repair (MTTR)	Mean Time To Repair (MTTR) = Time Service Restored - Time Reported	Complaints	Trouble ticket system	< 8 hours
Billing Accuracy	Billing Accuracy = (Time Service used - Time Service charged) *100	Test traffic	Billing Assurance Systems	Not more than 0.1% issued should be disputed
Complaint Resolution Time	Complaint Resolution Time = (number of valid complaint resolved/total number of complaints received) *100%	Test Traffic	Trouble ticket system	99% of complaints resolved within 1 week
Billing Complaint Rate	Billing Complaint Rate = (Total number of billing complaint received at the end of the reporting period / Total number of active customer base at the end of the period) *100	Complaints	Trouble Tickets	≥1%