



Quality of Service Business Rules

(Issued Pursuant to the Quality of Service Regulations)

August, 2026

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PART I: GENERAL

1. Introduction

In furtherance to the Nigerian Communications Commission's (NCC) objectives of development and monitoring of performance standards and indices relating to the quality of telephone and other communications services in Nigeria having regard to the best international practice and in line with the Nigerian Communication Act (NCA) 2003 or as may be amended from time to time which vests the NCC with the exclusive right to regulate Communications services, the need to review the existing Quality of Service (QOS) Regulations is necessary taking into consideration of new and emerging technologies and some prevailing operational challenges.

This document sets out the Business Rules for implementation, monitoring and effective Management of Telecommunications Quality of Service by the NCC in Nigeria.

Any changes to these Business Rules shall be subject to the change control procedure as presented in the 'Change Control' Section of this document.

2. Definitions

All terms used in the Business Rules have the same meanings as defined in the Nigerian Communications Act, 2003 (the "Act") and the Quality of Service Regulations.

3. Scope of the Business Rules

The Business Rules stipulate the minimum quality and standards of service, associated measurements, and key performance indicators for measuring quality of service.

PART II: THRESHOLD TARGETS AND KPIS

1.0. WIRELINE SERVICES KPIS.

Table 1: Fixed Wireline Telephony Services for End Users

Parameter Name	KPI	Comment
Disconnection complaint rate	<0.002% of customers in the Reporting Period	For compliance
Disconnection complaint resolution time	<1 working day for the mean	For compliance
Fault report rate	<0.002% of customers in the Reporting Period	For compliance
Fault repair time	<2 working days for the mean in the Reporting Period	For compliance
Service supply time	<5 working days for the mean in the reporting period	For compliance
Other related KPIS which are not stated in this table	Same as that stated in section 2.0 of this schedule	For compliance

2.0 COMPLAINT CATEGORIES/SERVICE LEVEL AGREEMENT

COMPLAINT CODE	COMPLAINT CATEGORIES	ISSUE CODE	COMPLAINT SUBCATEGORY	COMPLAINT DESCRIPTION	QoS 2013 TIMELINE	COMPLAINT RESOLUTION TIME -1 st LEVEL (SP)	COMPLAINT RESOLUTION TIME – 2 ND LEVEL (NCC)	ACTION	PENALTY/COMPENSATION
A	Billing	A1	Dropped Balance (Unexplained change in account balance)	Overcharging Consumer's account for calls/SMS/MMS.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback to consumer Refund where applicable	Refer to note 13
				Inexplicable deduction of credit from consumer's account.	1hr	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs		
				When a consumer's recharge does not reflect in their account (recharge cards and vouchers).	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback to consumer Credit customer's account.	
				When a consumer is charged for silent call consistently over a period.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback to consumer/ Reversal/refund	Refer to note 13
				When a consumer is charged for	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs		

				SMS that is not delivered					
				When a consumer is charged more than the required amount for changing from one tariff plan to another.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs		

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		A2	Inability to change tariff plan	When a consumer is unable to migrate from one tariff plan to another.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback and Resolution to consumer	
		A3	Suspension of Postpaid line	When a consumer's line is suspended due to disputed bill	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback and resolution to consumer	
		A4	Renewal of Data Subscription	When a consumer is unable to renew his data subscription	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback and resolution to consumer	
		A5	Reduction in validity period	When a consumers data validity period is reduced arbitrarily	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback and resolution to consumer	

		A6	Data Subscription not rolled over	When a consumer is unable to roll over unused data	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback and resolution to consumer	
		A7	Data Depletion	When a consumer's data gets used up/exhausted	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback and resolution to consumer	

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				faster than expected.					
		A50	Others (please specify)	Any other Billing related issues not captured above.	48hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: Actions to be taken as is applicable	Feedback to consumer Reversal/refund as applicable	
B	Call Center/ Customer Care	B1	Inability to connect to Call Center Help line	When a consumer is unable to connect to Service Provider's Customer Care helpline.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 6hrs	Feedback to consumer and the Commission	Refer to note 13
		B2	Downtime of Service Provider's Call Centre	When the Service Provider's call center is not operational.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 48hrs	Feedback to consumer and the Commission	

		B3	Poor customer service (rudeness, nonchalant, delay)	When a consumer is poorly attended to by Customer Representative/call center agent.	24hr	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback to consumer/Apology-SMS to consumer if established to be operator related.	
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		B4	Incorrect Responses/ information from agents	When a consumer is given wrong /misleading information by customer care representatives.	24hr	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback/ provision of correct information to consumer (Refund + 100% of the value of establish loss)	
		B5	Inability to connect to live agent	When a consumer is unable to connect to a live agent within timeframe of 5 minutes (under normal circumstance).	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback to the Consumer and the Commission	
		B50	Others (please specify)	Any other Customer Care related issues not captured above.	24hrs	Feedback: 4hrs Resolution:48hrs	Feedback: 2hrs Resolution: Actions to be taken as is applicable	Feedback and resolution to consumer	

C	Quality of Service (Voice)	C1	Call Interference Voice Clarity/Background Noise	When a consumer is unable to clearly hear the receiver during the call duration or vice versa.	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Resolution	Refer to note 13
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		C2	Inability to receive Calls.	When a consumer cannot receive calls from other networks.	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be operator's fault	
				When a consumer cannot receive call from outside the Country	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be operator's fault.	
				When a consumer cannot receive calls within the	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer	

			same network					
	C3	Inability to make Call	When a consumer cannot make a successful call to other networks	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be network related.	
			When a consumer is unable to call	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer	

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				numbers outside the country				/Apology to consumer if established to be network related	
				When a consumer cannot make a successful call within the same network	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be network related.	
				When a consumer with sufficient airtime is unable to make calls)	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be	

								network related.	
				When a mobile network consumer cannot make or receive call from fixed lines or vice versa	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be network related.	
		C4	Call divert issues	When a consumer is unable to activate call divert.	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if	

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								established to be network related.	
		C5		When call divert is activated on consumer's line without request		Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be network related.	
		C6	Call barring	When a consumer is prohibited from making and receiving calls for a particular period (if established to be network related)	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Feedback to consumer /Apology to consumer if established to be network related.	

	C7	Poor Signal	When a consumer has poor reception at a particular location	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be network related.
	C8	No Network	When a consumer does not have network reception.	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to

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								be network related.	
		C9	Dropped call	When a Consumer's call is abruptly disconnected and cannot successfully complete a call (if established to be network related).	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be network related.	
		C10	Call crossing	When a call is routed to a wrong person/line	24hrs	Feedback: 2hrs Resolution: On net 24hrs, Off net 48hrs	Feedback; 1hr Resolution: On net 24hrs, Off net 48hrs	Refund of charged value	
		C50	Others (please specify)	Any other Call Setup related issues not captured above	48hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution: Address as may be applicable	Feedback to consumer /Apology to consumer if established	

								to be netwo rk related.	
	Quality of Service (Data)	D1	Poor Internet Service	When a consumer experiences poor internet service	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be netwo rk related.	Refer to note 13

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		D2	No Network	When consumer does not have internet service	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be network related.	
		D3	Internet Speed	When consumer has low/poor internet speed	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be network related.	
		D4	Others (please specify)	Any other data related issues not captured above	48hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution: Address as may be applicable	Feedback to consumer /Apology to consumer if established to be network related.	

	Quality of Experience	E1	Call Masking and Refiling	When a consumer receives an international call showing a local number	24hrs	Feedback: 2hrs, 4hrs to report to NCC	Feedback: 1hr, 2hrs to report to NCC.	Service Providers to investigate and report to the Commission.	Refer to note 13
		E2	Disconnection of internet Services	When a consumer's internet service is disconnected.	48hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to	

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								be network related.	
		E3	Installation of Internet Services Equipment	When a consumer's internet service is not installed at the agreed time	48hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be network related.	
		E4	Others (please specify)	Any other quality of experience related issues not captured above	48hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution: Address as may be applicable	Feedback to consumer /Apology to consumer if established to be network related.	

D	Faulty Terminals	F1	Faulty Terminals (Mobile phones, routers, modems, etc.)	When a consumer has problems with a device (phones, modems, routers etc.)	24hrs	Feedback: 48hrs Resolution:72hrs	Feedback: 24hrs Resolution: 48hrs	To be resolved based on Terms and Conditions Feedback to consumer/Commission	Refer to note 13
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		F50	Others (please specify)	Any other Faulty Terminal related issues not captured above.	24hrs	Feedback: 48hrs Resolution: 72hrs	Feedback: 2hrs Resolution: Actions to be taken as is applicable	To be resolved based on Terms and Conditions Feedback to consumer/Commission	
E	BTS Issues	G1	Base station issues	Problems arising from installation and location of Base Station/Mast/Towers.	24hrs	Feedback: 72hrs Resolution: 30 days (or as may be practicable depending on the type of site)	Escalate to the Commission (Technical Standards & Networks Integrity)	Immediate acknowledgement/Feedback to consumer within 72 hrs	Refer to note 13
		G2	Pollution emanating from the BTS site (generator)	When a consumer complaint of environmental pollution from the Gen Set.	24hrs	Feedback: 72hrs Resolution: 30 days	Escalate to the Commission (Compliance Monitoring & Enforcement)	Immediate acknowledgement/Feedback to consumer within 72hrs	

		G50	Others (please specify)	Any other BTS related issues not captured above	24hrs	Feedback: 72hrs Resolution: 30 days	Escalate to the Commission (Compliance Monitoring & Enforcement)	Immediate acknowledgement/Feedback to consumer within 48hrs	
G	Sales Promotions & Advertisement	H1	Bonus/Promotions Issues	When a consumer does not receive bonus/incentives subscribed/won during	24hrs	Feedback: 2hrs Resolution: 24hrs	Feedback: 6hrs Resolution: 12hrs	Feedback/Resolution to consumer	Refer to note 13

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				promotions, within stated timelines					
				Misleading/Incomplete Information on product offers	24hrs	Feedback: 2hrs Resolution:24hrs	Feedback: 6hrs Resolution:12hrs	Feedback/ to Resolution consumer	
		H50	Others (please specify)	Any other Promotion related issues not captured above	24hrs	Feedback: 4hrs Resolution:48hrs	Feedback: 2hrs Resolution: Address as may be applicable	Feedback/ to Resolution consumer	
H	Recharge/TopUp Issues	I1	Mutilated vouchers	When a consumer is unable to identify the numbers on the voucher.	24hrs	Feedback: 4hrs Resolution:12hrs	Feedback: 2hrs Resolution:6hrs	Feedback/ to Resolution consumer	Refer to note 13
		I2	Recharge Barring	When a consumer is barred from recharging after several wrong attempts.	24hrs	Feedback: 1hr Resolution: 1hr	Feedback: 1hr Resolution: 1hr	Feedback/ to Resolution consumer	

		I3	Inability to check airtime/data balance	When a Consumer is unable to check data/airtime balance via USSD or IVR	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback/ to Resolution consumer	
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		I4	Inability to Recharge	When a consumer is unable to e purchase airtime/data via the interactive Voice Response (IVR) and Unstructured Supplementary Services Data medium (USSD)	24hrs	Feedback: 2hrs Resolution:12hrs	Feedback: 1hr Resolution: 6hrs	Automatic response on platform downtime (via pop-up text/audio message)	
			Failed Airtime/Data Sharing Transactions	When a consumer is debited for an undelivered person-to-person (p2p) transfer of data/airtime	24hrs	Feedback: 2hrs Resolution:12hrs	Feedback: 1hr Resolution: 6hrs	Feedback/Resolution to consumer	
			Mobile Applications/ Virtual Top-up	When a consumer is charged for a failed airtime purchase via bank mobile application/USSD. and other 3 rd party channels	24hrs	Feedback: 2hrs Resolution:24hrs when transaction is done through the Service Provider's channel)	Feedback: 1hr Resolution: 12hrs	Forward to the appropriate Authority (Banks)	

		15	Invalid Voucher	When a consumer purchases an invalid voucher	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback/ Resolution to consumer

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				from a recognized MNO outlet					
				When a consumer experiences an "Invalid prompt" after an attempt to load a voucher. (As a result of card being blacklisted by the Network)	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Feedback/ Resolution to consumer	
		I6	Over recharge	When a consumer recharges over the value intended (For scenarios that not dependent on third parties to resolve).	24hrs	Feedback: 2hrs Resolution:72hrs	Feedback: 1hr Resolution:48hrs	Refund of the requested amount	

		I50	Others (please specify)	Any other Recharge /Top-up related issues not captured above	24hrs	Feedback: 4hrs Resolution:48hrs	Feedback: 2hrs Resolution: Address as may be applicable	Feedback/ to Resolution consumer	
I	SMS/MMS	J1	Inability to send SMS	When a consumer is charged for SMS that is not delivered (on-net SMS).	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Feedback/ to Resolution consumer	Refer to note 13
				When consumer is unable to send	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Apology/Feed back to	

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				SMS within its network				consumer / Resolution	
				When consumer cannot send SMS to other networks	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be network related.	
				When a consumer is unable to send SMS to an international number	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer /Apology to consumer if established to be network related	

		J2	Inability to receive SMS						
				When a consumer is unable to receive SMS	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Feedback/ Resolution to consumer	
				When a consumer is unable to receive SMS from	24hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback to consumer / Apology to consumer if	

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				outside the Country.				established to be operator's fault.	
		J3	MMS charges	When a consumer is charged for undelivered MMS.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Refund/Feedback to consumer	
		J50	Others (please specify)	Any other SMS/MMS related issues not captured above	24hrs	Feedback: 4hrs Resolution:48hrs	Feedback: 2hrs Resolution: Address as may be applicable	Feedback/Resolution to consumer	
J	Other Sim-Related Issues	K1	Request for SIM Block	When a consumer requests for SIM to be blocked	24hrs	30mins to of (subject of successful completion required validation)	15mins to of (subject of successful completion required validation)	Feedback and Apology to the consumer	Refer to note 13

		K2	SIM blocked, PUK required	when a consumer requires PUK number from the service Provider to unblock their SIM	24hrs	30mins (subject successful completion required validation) to of	15mins (subject successful completion required validation) to of	Feedback and Apology to the consumer	
		K3	Unauthorized Suspension of mobile line	when a consumer's line is wrongfully suspended by the Service Provider	24hrs	Feedback: 4hrs Resolution:12hrs	Feedback: 2hrs Resolution:6hrs	Feedback and Apology to the consumer	

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		K4	SIM Registration	Incorrect Registration details of Consumer	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Feedback and Apology to the consumer	
		K5	Incomplete Registration	When a consumer is asked to re-register his SIM	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: 12hrs	Feedback and Explanation to the consumer	
		K6	NIN- SIM Linkage	When a consumer's NIN is not successfully linked by the service provider.	24hrs	Feedback: 2hrs (subject to verification from NIMC) 4hrs for resolution subject to availability of subscriber.	2hrs For feedback 24hrs for resolution	Explanation /Apology to consumer where it is established to be operator related	
		K7	Inactive SIM	When a consumer's SIM is barred/suspended due to inactivity/ NIN-SIM linkage.		Feedback: 4hrs Resolution:24hrs (subject to availability of NIMC portal)	Feedback: 2hrs Resolution: 24hrs	Feedback and Explanation to the consumer	

				When a consumer's SIM is barred/deactivated from the network in error		Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Feedback +Reactivation if established to be operated related	
		K50	Others (please specify)	Any other SIM related issues not captured above	24hrs	Feedback: 4hrs Resolution:48hrs	Feedback: 2hrs Resolution:		

COMPLAINT CODE	COMPLAINT CATEGORIES	ISSUE CODE	COMPLAINT SUBCATEGORY	COMPLAINT DESCRIPTION	QoS 2013 TIMELINE	COMPLAINT RESOLUTION TIME -1 st LEVEL (SP)	COMPLAINT RESOLUTION TIME – 2 ND LEVEL (NCC)	ACTION	PENALTY/COMPENSATION
							Address as may be applicable		
K	SIM REPLACEMENT	L1	Fraudulent/Unauthorized SIM Swap	When a consumer's SIM is reported swapped without consent	24hrs	Feedback: 2hrs Resolution:12hrs	Feedback: 1hr Resolution:6hrs	Feedback/Reversal carried out immediately after due verification	Refer to note 13
		L2	Inactive Sim Replacement	When a SIM replacement process has been completed and the SIM remains inactive (for resolution not dependent on third party).	24hrs	Feedback: 2hrs Resolution:12hrs	Feedback: 1hr Resolution: 6hrs	Feedback and Resolution to the consumer	
		L3	Retrieval of deceased relative's SIM	When a consumer is unable to carry out SIM replacement for a deceased relative after providing all the necessary	24hrs	Feedback: 4hrs Resolution:12hrs	Feedback: 2hrs Resolution:6hrs	Feedback and Resolution to the consumer	

				requirements					
		L50	Others (please specify)	Any other Sim Swap/Replacement related issue	24hrs	Feedback: 4hrs Resolution:48hrs	Feedback: 2hrs Resolution: Address as may be applicable		

COMPLAINT CODE	COMPLAINT CATEGORIES	ISSUE CODE	COMPLAINT SUBCATEGORY	COMPLAINT DESCRIPTION	QoS 2013 TIMELINE	COMPLAINT RESOLUTION TIME -1 ST LEVEL (SP)	COMPLAINT RESOLUTION TIME – 2 ND LEVEL (NCC)	ACTION	PENALTY/COMPENSATION
L	Value-Added Services (VAS)	M1	Inability to activate/deactivate VAS	When a consumer is unable to activate (Opt-In) any available VAS Services.	24hrs	Feedback: 2hrs Resolution:48hrs	Feedback: 1hr Resolution:24hrs	Feedback and Resolution to the consumer	Refer to note 13
				When a consumer is unable to deactivate (Opt-Out) VAS Services.	24hrs	Feedback: 2hrs Resolution:48hrs	Feedback: 1hr Resolution:24hrs	Feedback and Resolution to the consumer	
		M2	VAS Charges	When a consumer is charged for Caller tune download not rendered.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Feedback and Resolution to the consumer	

			When a consumer is given VAS e.g Caller Tune different from what he/she requested for.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Feedback and Resolution to the consumer	
	M3	Forceful activation of VAS	When a consumer is opted into VAS without consent.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Immediate deactivation + refund	
	M4	Inability to listen to Voice SMS/voicemail	when a consumer is unable to listen to Voice SMS from the Service Provider's network	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	Feedback to consumer / Apology in validated cases	

COMPLAINT CODE	COMPLAINT CATEGORIES	ISSUE CODE	COMPLAINT SUBCATEGORY	COMPLAINT DESCRIPTION	QoS 2013 TIMELINE	COMPLAINT RESOLUTION TIME -1 st LEVEL (SP)	COMPLAINT RESOLUTION TIME – 2 ND LEVEL (NCC)	ACTION	PENALTY/COMPENSATION
		M5	Inability to access/activate voice SMS	When a consumer is unable to send Voice SMS	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs		
		M6	Inability to access Voice Mail	When a consumer is unable to recover Voice mail.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs		
		M7	Failed Voice SMS	When a consumer is charged for Voice SMS that is not delivered.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs		
		M8	Inability to activate/deactivate voicemail box	When a Consumer is unable to deactivate/activate Voicemail.	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs		
		M9	Voicemail password reset/retrieval.	When a consumer is unable to change/recover their Voicemail password	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs		

		M50	Any other VAS related issue	Any other VAS related issue not covered therein	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution: Address as may be applicable		
M	Mobile Number Portability/	N1	Porting Issues	When a consumer is unable to successfully port from one Service Provider to	24hrs	Feedback: 4hrs Resolution:24hrs	Feedback: 2hrs Resolution:12hrs	To be resolved in line with the MNP Regulation	Refer to note 13

COMPLAINT CODE	COMPLAINT CATEGORIES	ISSUE CODE	COMPLAINT SUBCATEGORY	COMPLAINT DESCRIPTION	QoS 2013 TIMELINE	COMPLAINT RESOLUTION TIME -1 st LEVEL (SP)	COMPLAINT RESOLUTION TIME – 2 ND LEVEL (NCC)	ACTION	PENALTY/COMPENSATION
				another within the porting timeline				(MNP Business rule)	
		N50	Others (please specify)	Any other MNP related issues not captured above	24hrs	Feedback: 4hrs Resolution:48hrs	Feedback: 2hrs Resolution: Address as may be applicable	To be resolved in line with the MNP Regulation (MNP Business rule)	
N	Do-NotDisturb Service	O1	Inability to Opt In/Out of DND	When a consumer is unable to Opt in/out fully/partially of DND	24hrs	Feedback: 4hrs Resolution:12hrs	Feedback: 2hrs Resolution:6hrs	Feedback and Resolution to consumer	Refer to note 13
		O2	Receipt of unsolicited SMS/calls after opting into full DND	When a consumer continues to receive unsolicited SMS/Calls	24hrs	Feedback: 4hrs Resolution:12hrs	Feedback: 2hrs Resolution:6hrs	Immediate deactivation	

				after activating full DND					
		O50	Others (please specify)	Any other DND related issues not captured above	48hrs	Feedback: 4hrs Resolution:48hrs	Feedback: 2hrs Resolution: Address as may be applicable	Feedback and Resolution to consumer	
O	International Roaming	P1	Inability to send/receive SMS while roaming	When a consumer is unable to send	48hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback and Resolution to consumer	Refer to note 13

COMPLAINT CODE	COMPLAINT CATEGORIES	ISSUE CODE	COMPLAINT SUBCATEGORY	COMPLAINT DESCRIPTION	QoS 2013 TIMELINE	COMPLAINT RESOLUTION TIME -1 st LEVEL (SP)	COMPLAINT RESOLUTION TIME – 2 ND LEVEL (NCC)	ACTION	PENALTY/COMPENSATION
				SMS while outside the country					
		P2	Inability to make/receive call while roaming	When a consumer is unable to make outgoing/incoming calls while outside the country	48hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback and Resolution to consumer	
		P3	Inability to roam	When a consumer is unable to roam	48hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback and Resolution to consumer	
		P4	Internet service not working while roaming	When a consumer is unable to browse while outside the country	48hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback and Resolution to consumer	
		P5	Inability to recharge while roaming	When a consumer is unable to recharge their line while outside the country	48hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback and Resolution to consumer	
		P6	Overcharged while roaming	When a consumer is overcharged for calls/data while outside the country	48hrs	Feedback: 4hrs Resolution:72hrs	Feedback: 2hrs Resolution:48hrs	Feedback and Resolution	

								to consumer	
		P50	Others	Any other Roaming Related Issue	48hrs	Feedback: 4hrs Resolution:48hrs	Feedback: 2hrs Resolution: Address as may be applicable	Feedback and Resolution to consumer	

3.0 NOTES AND DEFINITIONS:

Where Consumers report to NCC before the MNO, this will be treated as an L1 Complaint.

1. **Complaint Resolution Time- 1st Level:** This refers to consumer complaints received directly by Service Providers via their various customer service channels.
2. **Complaint Resolution Time- 2nd Level:** This refers to unresolved escalated complaints received by the NCC through its various escalation channels.
3. **Action:** This refers to expected activity to be executed by MNOs within the specified Service Level Agreement timeline.
4. **Compensation:** This refers to the resultant redress to be applied to the consumer by the MNO where there is an established breach of the expected action.
5. **Penalty:** this refers to sanctions imposed by the NCC for breach of these SLAs and/or breach of other regulatory instruments pertaining to the subject matter. For every penalty applied, the Service Provider must have taken the remedial action.
6. **Feedback:** This means revert to the consumer on his/her reported complaint through the same channel the complaint was registered.
7. **Resolution:** This refers to total satisfactory closure of reported consumer issue - in all cases where the operator considers an issue as resolved but the customer is unsatisfied, the operator must inform the customer of their right to escalate to the NCC in accordance with the Consumer Code of Practice Regulations
8. **QoS Regulations:** This refers to the NCC Quality of Service Regulation 2013 or any other subsequent version thereof.
9. **GAP:** This refers to the NCC Guidelines on Promotional Advertisement or any other subsequent version thereof.
10. **Silent Calls:** This refers to where a caller is unable to hear the receiver and has no means of knowing whether anyone is at the other end.
11. **E-SIM:** This refers to a small chip embedded within a mobile device and does not require the conventional physical SIM card to be inserted.
12. That E-SIM complaints be captured as other SIM related issues.
13. Every breach of any of the Complaint Categories shall be treated in line with the provisions of the Quality of Service (QoS) Regulations 2024, the Enforcement Processes Regulations 2019 and or any other relevant extant Regulations/Guidelines/Directions/Directives of the Commission.

4.0 ACCOUNT COMPLAINT KPIs

TABLE 2 : Account Complaint KPIs		
Ten complaints to every one million bills/accounts		
2.1. Account complaint		KPI Target Resolution time
1.	Charging for line rental at incorrect rate	≤ 5 days
2.	Charging for calls/SMS/MMS messages at incorrect rate or more than once for the same call/SMS	≤ 1 Hour ≤ 24 Hours for Roaming
3.	Charging for services not rendered	≤ 24 Hours
4.	Charging for uncompleted/unsuccessful calls/SMS, or charging for access not rendered	≤ 1 Hour
5.	Charging for calls beyond their duration	≤ 24 Hour

	KPI	Target	Comment
6.	Failed attempts to load recharge payments.	(a) ≤ 3 Hours for network related faults (NB. Except for exceptional circumstances that have been made public, each time within 2 hours of occurrence of the failure in the affected area. Each failure in this category that has taken longer than 48 hours to resolve must formally and specifically be communicated to the commission (b) ≤ 1 Hour for software related faults	
7.	System failure at Contact Centers inhibiting bill payments	≤ 30 Minutes	
8.	Failed attempts to check/determine the account balance	≤ 2 Hours	
9.	Losing credited amounts from the account.	≤ 1 Hour	
10.	Miscellaneous complaint resolution time	≤ 48 Hours	
11.	Inability to change tariff plan for qualified subscriber	≤ 24 Hours	
12.	Credit deducted but not reflected in the receiving account in case of virtual top-up	≤ 1 Hour	
13.	Invalid system response for genuine service request	≤ 2 Hour	
14.	Unjustified call-barring/restriction (local, national or international	≤ 2 Hour	
15.	Inability to activate offered service	≤ 2 Hour	
16.	Inability to access offered service by a qualified customer on an enable device	≤ 1 Hour	

17.	Inability to load credit from an overscratched card	≤ 1 Hour	
18.	Request for blocking of reported lost/stolen SIM card should be channeled either directly to the Mobile Network Operator or escalated to the Telecoms Identity Risks Management System (TIRMS). The blocking will be carried out where subscriber ownership has been confirmed	≤ 45 minutes Blocking allowed, and further usage should not be chargeable to the consumer from the moment of filing the report.	

19.	Request for PUK code	Should be met within 3 Hours	
20.	Inability to send or receive SMS (local or international)	≤ 1 Hour	
21..	Inability to retrieve or send voice SMS	≤ 1 Hour	
.	Miscellaneous Complaints	KPI Target Resolution Time	
22.	Unsolicited messages	(i) The service provider must provide an option for the subscriber to “Opt out” of receiving such messages in case of messages originating from the service provider or its third party business partners. (ii) The service provider should make reasonable effort to identify and block or filter bulk, unsolicited and offensive messages from other sources.	

23.	Time for recharge/bill payments to reflect on the account.	≤ 10 seconds recharge from mobile $\leq$ minutes recharge from Bank Automated Teller Machine (ATM) ≤ 1 Hour over the counter ≤ 10 Minutes after receipt of payment confirmation, for internet-based transaction	
24.	Number of complaints upheld Per day related to: (i) wrongly cleared balance (ii) wrong IVS/System response message (iii) failed attempts to determine the account balance (iv) failure to provide agreed content	≤ 10	

25	Number of complaints per month related to incorrect settings by a licensee leading to inhibition of two-way communication while roaming internationally.	≤ 10	
26.	Meeting advertisement commitment	There shall be no disparity between advertised rates and that eventually received by the consumer	
27			
28	Complaints call ID	Each complaint call must be given a unique reference number that identifies its nature/category, for follow up and statistical analysis.	
29.	Number of complaints per day related to any of the following : (a) One-way/two-way loss of audio (b) Cross-talk (c) Call misdirection to un-intended number (d) Voice quality	≤ 50 per day	
30.	Number of complaints per day in respect of Network-related blocking of incoming calls for any subscriber.	≤ 5	
31	Number of complaints per day related to inability to meet SMS/MMS end-to-end delivery time threshold for any subscriber.	≤ 10	
32.	Voice-mail related complaints per day	≤ 2	
33.	Acknowledgment of delivery of all SMS/MMS/IMS messages sent	= 100% unless deactivated by subscriber	

34.	Cost information (end of call notification) for all completed calls or RGE via text to the consumer	= 100% within 5 minutes of hang-up unless deactivated by subscriber or deactivated at his/her behest.	
35.	Promotions and games	Rules of participation must be clear and widely published, and promotions shall not lead to breach of any part of these regulations	
2.3 <i>Disconnection of subscriber</i>			

36.	Disconnection resolution time I. Post-Paid	(a) There should be: (i) A text notice after reaching 75% of credit limit (ii) On reaching 100% of credit limit a constant IVR notice of credit expiry remains ON for the next 1 week, during which the Operator is at liberty to allow/disallow outgoing calls until debt is settled. (b) If there is dispute, resolution time ≤ 24 Hours • 1/30th of average monthly spending should be allowed for out-going calls to be used by the customer within the dispute resolution time.	
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	II. PRE-PAID	• A subscriber line may be deactivated if it has not been used, within six (6) months, for a Revenue Generating Event (RGE). If the situation persists for another 6 months the subscriber may lose his/her number, except for Network related fault inhibiting an RGE. • Monies left in account on deactivation can be claimed by subscribers once proof of ownership can be established at any given time within 1 year (less any fee paid by the operator for the number within the 1-year of non-RGE).	For Compliance
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		• Deduction of Line rental charge (if any) is regarded as an RGE. • A subscriber with a proof of good reason for absence is at liberty to request for line-parking.	
	III. REPORTING AND NOTIFICATION	• Service Providers shall upload churned, swapped and blocked numbers into the Telecoms Identity Risks Management System within 24 hours of completion of the process. • Service Providers shall notify subscribers through alternative means of the churning of their lines at least 14 days to the date of the churn.	

	III. INTERNET SERVICE	To be restored within 2 hours except for service lawfully disconnected	
	IV. Number of complaints received per day by the operator/NCC's consumer Affairs Bureau with respect to the Operator's inability to meet I, II, and III	$\leq 10/1$ million subscribers ≤ 10 for operators with ≤ 1 million subscribers	
37.	Credit run-out alert whilst on a call	A single short-beep to the call initiator at : (i) 2 Minutes, and at (iii) 30 seconds to termination of the ongoing call Low credit announcement to be played while the call is being originated in a situation where the call cannot last up to 30 secs.	
38.	Credit loading and balance checks	Free of charge; operators must provide options	

		such as by text and/or voice or other means that will support physically challenged persons.	
39.	Handset/Recipient Rejected Calls	IVR must be in place to state that the called number does not accept calls from the calling number.	
Table 3 : Customer Care Services KPIs			

3.1. <i>Call Centre</i>			
1.	Call Handling	• Maximum number of call-attempts before connecting to Customer Care Lines should not be more than three (3) times ; • Maximum number of rings before a call is answered by either an IVR machine or a live agent should not be more than five (5) ; and • Where a customer decides to speak to a live agent, the maximum duration allowable on the queue/IVR should be 5 minutes before answer. • In exceptional cases where live agent may be unavailable within	•
		5 minutes to answer the call, a customer should be given an option to hanging up to be called back within a maximum time of 30 minutes.	

2.	Customer care lines that can be accessible through other networks	≥ 1 free access number and if 1 number then it should accommodate multiple calls at the same time.	
3.2. Customer Care Centre			
	Waiting time to be physically attended to by relevant staff at customer care centers	≤ 30 minutes. The Licensee shall provide means of measuring the waiting time, starting from time of arrival at the premises.	
TABLE 4 : Network Performance KPIs			
4.1. Network Node Performance			
1.	BH call completion rate	$\geq 97.00\%$ of attempted calls	<u>For compliance</u>
2.	Location update success rate	$\geq 99.00\%$ of attempts	<u>For compliance</u>
3	Paging success rate	$\geq 98.00\%$ of attempts	<u>For compliance</u>
4.	BH TCH Assignment success rate	$\geq 99.00\%$	
5.	HLR/HSS/MSC/MGW , BH VLR and other core network capacity utilization	$\leq 70.00\%$	
6	BH BSC and BH RNC capacity utilization	$\leq 60.00\%$	
7.	BH processor loading BH Erlang Utilization/BSc	$\leq 60.00\%$	
8	No. of interconnect points per 3 contiguous covered states (standalone or shared)	≥ 1	
9.	Interference protection ratio	(a) Co-channel $C/1 \geq 12\text{dB}$	

			(b) Adjacent channel C/I $\geq$ - 12dB (c) A Licensee must operate within its permitted frequency band without causing harmful interference to parts of its network or network of other licensees.	
10.	Upgrade/Integration/Cutover related errors	Life-time of any : (a) CIC mismatch, (b) Global Cell Identity-error , (c) Improper neighboring-cell definition Life –time of Error in : (a) Neighboring MSC definition (b) Roaming number of New MSC (c) Exchange parameter settings, including SS-Tone sending (d) IN trigger table definition	Life-time of error in $\leq$ 1 hour or 12 hrs if it justified to the satisfaction of the commission	

11.	Resolution time of BTS faults impacting on traffic	≤ 2.5 hrs Rural ≤ 1.5 hrs Urban	
		Exceptional circumstances such as late night failures in difficult locations must be announced via electronic media covering such location, within 2hrs	
12.	Resolution time of BSC faults impacting on traffic	≤ 45 minutes	
13.	HLR/STP-in-pool implementation	=100%	
14.	Geographical location of HLRs/STPs/SDPs/SCPs	≥ 2 locations	
15.	Resolution time of MSC and other core network node faults impacting on traffic	≤ 10 Min	
	MSC/VLR (MSS) and other core network System Availability (monthly or any other duration as may be determined by the Commission)	$\geq 99.99\%$ of (720Hrs)	
		<u>0</u>	<u>0</u>
16.	Mean Time to Repair other failures that affect traffic	≤ 1.5 hours	<u>Compliance</u>
17.	Service coverage received signal level	Out-door ≥ -80 dBm In-door ≥ -85 dBm In-vehicle ≥ -85 dBm	
18.	Signaling (SS7) utilization	$\leq 40\%$ HSL ; $\leq 30\%$ NBL	
	Signaling (SS7) Link Availability	$\geq 99.99\%$	
	LinkSet Unavailability	$\leq 0.01\%$	
19.	Conversational voice quality on ON-NET calls	MOS ≥ 3.6 on the MOS scale	Compliance

20.	Speech encoding	Use full-rate (FR), enhanced FR, but, specific authorization must be obtained from the commission to use of half-rate whether manually set or automatic through adaptive multirate (AMR), for the specific period of use.	
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21.	BH SMS delivery success rate for enabled-handsets that are in working order, fit for purpose, ON, and in the service area, assuming sufficient account balance.	$\geq 99.00\%$ of attempts	
22.	SMS end-to-end delivery time for enabled-handsets that are in working order, fit for purpose, ON, and in the service area, assuming sufficient account balance.	≤ 8 seconds for MO and MT switched ON and within the service area (ON-NET) ≤ 10 seconds for OFF-NET	
23.	Minimum time for storage of SMS/MMS before deletion by the operator i.e for SMS/MMS that are sent to mobile stations that cannot be reached	30 hours	
24.	Maximum time allowed for Bnumber/routing table to be out-ofdate, or problem-resolution and inclusion of omitted numbers	≤ 24 hrs	
4.3	Microwave Transmission Path		
1.	Maximum time for transmission/physical link outage	≤ 2 Hours	
2	Percentage of microwave links with space as well as frequency diversity	$\geq 60.00\%$	
3.	BH congestion on trunks	$\leq 0.2\%$	

4.	Redundancy on transmission links	Must conveniently handle 100% of the primary link BH traffic. There should not be redundancy on all critical links	
5	Compression ratio on transmission system	$\leq 1:1$, but for any other compression ratio a specific authorization must be obtained from the commission for the specific transmission route and for a particular period of use.	
6.	Error second ratio (ESR)	≤ 0.01 ($\leq 1 \times 10^{-4}$ for IP Traffic)	
7.	Background block error ratio (BBER)	≤ 0.00005 ($\leq 1 \times 10^{-6}$ for IP traffic)	
8.	Severely error seconds (SESR)	≤ 0.02 ($\leq 1 \times 10^{-5}$ for IP traffic)	
9.	Availability	$\geq 99.99\%$	
10.	Delay	$\leq 50\text{ms}$	
11.	Average delay	$\geq 29\text{ms}$	
12.	Delay variation	$\leq 5\text{ms}$	
13.	Packet loss	$\leq 1\%$	
14.	Slip	$\leq 5\%$	
4.3.	Synchronization Network (Node Output)		
1.	Primary reference clock (PRC)	MTIE = $25 + 0.275T$ ns {T = 900s} TDEV ≤ 3 ns	
2.	Synchronization supply unit (SSU)	MTIE = 2000 ns TDEV ≤ 3 ns	
3.	SDH equipment clock (SEC)	MTIE = 250 ns	
4.	PDH synchronization interface	MTIE = 2000 ns TDEV ≤ 34 ns	

S/N	KPI	TARGET	COMMENT
	The General KPIs		

1	Percentage of cells reporting QoS data for each KPI	$\geq 97.00\%$ of cells reporting for 98% of the days of the month or any other duration as may be determined by the Commission	
2	Percentage NCC QoE applets registered in QoS Infrastructure Tool Server	$\geq 98.00\%$	Percentage of Applets allocated per MNO
	Threshold for 2G Network		
3	BH Traffic Channel (TCH) Congestion	$\leq 1.50\%$ measured at BSC level $\leq 1.00\%$ measured at Cell level	Issues outside the control of operators and escalated to the Commission will be taken into consideration by the Commission
4	BH SDCCH Congestion (measured at BSC)	$\leq 0.40\%$	
5	BH SDCCH Congestion (measured at Cell levels)	$\leq 0.20\%$	Issues outside the control of operators and escalated to the Commission will be taken into

			consideration by the Commission
6	BH CSSR (measured Cell levels)	$\geq 98.50\%$	Issues outside the control of operators and escalated to the Commission will be taken into consideration by the Commission
7	BH CSSR (measured BSC level)	$\geq 98.00\%$	For compliance
8	BH Drop Call Rate (measured cell level)	$\leq 1.00\%$	Issues outside the control of operators and escalated to the Commission will be taken into consideration by the Commission
9	BH Drop Call Rate (measured BSC level)	$\leq 1.50\%$	
10	BH Handover Success Rate	$\geq 98.00\%$	
11	BH Paging Success Rate	$\geq 97.00\%$	
12	MOS	90.00% of Samples ≥ 3	To be measured using Drive Test (POLQA)

13	Call Setup time	≤ 6 sec	To be measured using Drive Test
14	Cell Availability	$\geq 98.50\%$	Measured for all hours
	Threshold for 3G Network		
1	Call Setup Success Rate (PS)	$\geq 98.00\%$	
2	Call Setup Success Rate (CS)	$\geq 98.00\%$	
3	RRC connection establishment success rate (PS)	$\geq 98.00\%$	
4	RRC connection establishment success rate (CS)	$\geq 98.00\%$	
5	RAB Establishment Success Rate	$\geq 98.00\%$	
6	HSUPA Setup Success Ratio [%] for Streaming(S), Interactive(I) and Background(B) Services	$\geq 98.00\%$	
7	HSDPA Setup Success Ratio [%] for Streaming(S), Interactive(I) and Background(B)	$\geq 98.00\%$	
8	Iub Congestion	$\leq 1\%$	
9	RRC Congestion	$\leq 0.5\%$	
10	Circuit Switched RAB Congestion	$\leq 1\%$	
11	Paging Success Rate	$\geq 97.00\%$	
12	CS RAB Abnormal Release Rate	$\leq 1.5\%$	
13	PS RAB Abnormal Release Rate	$\leq 1.5\%$	
14	Soft Handover Success Rate	$\geq 98.00\%$	
15	Inter RAT Handover Success Rate for CS Domain	$\geq 97.00\%$	
16	Cell Availability (or Node-B Accumulated downtime (not available for service))	$\geq 98.50\%$ ($\leq 1.50\%$)	
17	Average Downlink Throughput per User	≥ 1.50 Mbps	To be measured using Drive Test and FTP service
18	CS Call setup time (CST) for on-net calls	≤ 6 sec	To be measured using Drive Test
19	MOS	90.00% of Samples ≥ 3.5	To be measured using Drive Test (POLQA)

	Threshold for 4G Network		
1	Cell Availability	$\geq 98.50\%$	
2	Call Setup Time	$\leq 5\text{sec}$	To be measured using Drive Test
3	CSFB CST	$\leq 8\text{sec}$	
4	CSFB Preparation Success Rate	$\geq 98.00\%$	
5	ERAB Set up Success Rate	$\geq 98.00\%$	
6	RRC Set up Success Rate	$\geq 99.00\%$	
7	ERAB Drop Rate	$\leq 1.00\%$	
8	E – UTRAN Downlink User Throughput (Mbps) per user	$\geq 20\text{ Mbps}$	To be measured using Drive Test and FTP service
9	E – UTRAN Uplink Throughput (Mbps) per user	$\geq 5\text{ Mbps}$	Monitoring. To be measured using Drive Test and FTP service
10	Latency	50msec	
11	LTE HOSR (Inter Cell/Inter Frequency)	$\geq 98.00\%$	
12	Mean Session Utilization	$\leq 70.00\%$	Monitoring
13	MOS	90.00% of Samples ≥ 3.6	To be measured using Drive Test (POLQA)
14	SRVCC		Monitoring
	5G KPIs		
1	Latency	$\leq 1\text{ ms}$	Monitoring
2	Download throughput	$\geq 100\text{ Mbps}$	Monitoring
3	Upload Throughput	$\geq 25\text{ Mbps}$	Monitoring

Table 5 Internet Service Provider's (ISP) KPIs

Terrestrial ISP KPIs

KPI	Target
Latency (Metro)	$\leq 10\text{ms}$
Latency (Long Distance)	$\leq 40\text{ms}$
Latency (International)	$\leq 120\text{ms}$
Availability	$\geq 98.50\%$
Packet Loss	$\leq 0.50\%$
Jitter (Metro)	$\leq \pm 2\text{ms}$

Jitter (Long Distance)	$\leq \pm 4\text{ms}$
Jitter (International)	$\leq \pm 12\text{ms}$
Link Utilization	$\leq 80.00\%$
Download Throughput	$\geq 25 \text{ Mbps}$ (for compliance purposes, advertised speed or SLA is going to be used). Advertised speed or SLA shall not be less
Upload Throughput	$\geq 5 \text{ Mbps}$ (for compliance purposes, advertised speed or SLA is going to be used).
Mean Time to Repair (MTTR)	$\leq 2.5 \text{ hours}$ (Any outage outside the control of the service provider that will result in higher MTTR shall be reported to the Commission in line with the reporting requirements of the Directive on major outages).
Data Integrity	All KPIs shall be reported in at least 97.00% of all Access Points and in 98% of reporting period as may be defined by the Commission from time-to-time.
Reporting period	Average daily performance measured shall be submitted on a weekly basis and Busy Hour daily performance submitted on a monthly basis or as may be determined by the Commission from time-to-time.

2. KPI TARGETS FOR SATELLITE SERVICES

Satellite ISP KPIs

KPIs are categorized by satellite orbit type: GEO (Geostationary), MEO (Medium Earth Orbit), and LEO (Low Earth Orbit).

a. GEO Satellite KPIs

KPI	Target
Latency	$\leq 500\text{ms}$
Availability	$\geq 99.00\%$
Packet Loss	$\leq 1.00\%$
Jitter	$\leq \pm 50\text{ms}$
Download Throughput	$\geq 25 \text{ Mbps}$ (for compliance purposes, advertised speed or SLA is going to be used). Advertised speed or SLA shall not be less than 25 Mbps)
Upload Throughput	$\geq 3 \text{ Mbps}$

MTTR	≤ 6 hours
	(Any outage outside the control of the service provider that will result in higher MTTR shall be reported to the Commission in line with the reporting requirements of the Directive on major outages).
Data Integrity	All KPIs shall be reported in all reporting areas or clusters as may be defined by the Commission from time-to-time for 98% of days/month.
Reporting period	Average daily performance measured at Busy Hour shall be submitted on a monthly basis and as may be determined by the Commission from time-to-time.

b. MEO Satellite KPIs

KPI	Target
Latency	≤ 150 ms
Availability	$\geq 99.00\%$
Packet Loss	$\leq 1.00\%$
Jitter	$\leq \pm 15$ ms
Download Throughput	≥ 40 Mbps (for compliance purposes, advertised speed or SLA is going to be used). Advertised speed or SLA shall not be less than 40 Mbps)
Upload Throughput	≥ 5 Mbps
MTTR	≤ 6 hours (Any outage outside the control of the service provider that will result in higher MTTR shall be reported to the Commission in line with the reporting requirements of the Directive on major outages).
Data Integrity	All KPIs shall be reported in all reporting areas or clusters as may be defined by the Commission from time-to-time for 98% of days/month.
Reporting period	Average daily performance measured at Busy Hour shall be submitted on a weekly basis and as may be determined by the Commission from time-to-time.

c. LEO Satellite KPIs

KPI	Target
Latency	≤ 50 ms
Availability	$\geq 99.00\%$

Packet Loss	$\leq 1.00\%$
Jitter	$\leq \pm 5\text{ms}$
Download Throughput	$\geq 80 \text{ Mbps}$ (for compliance purposes, advertised speed or SLA is going to be used). Advertised speed or SLA shall not be less than 80 Mbps)
Upload Throughput	$\geq 15 \text{ Mbps}$
MTTR	$\leq 6 \text{ hours}$ (Any outage outside the control of the service provider that will result in higher MTTR shall be reported to the Commission in line with the reporting requirements of the Directive on major outages).
Data Integrity	All KPIs shall be reported in all reporting areas or clusters/cells as may be defined by the Commission from time-to-time for 98% of days/month.
Reporting period	Average daily performance measured shall be submitted on a weekly basis and Busy Hour daily performance submitted on a monthly basis and as may be determined by the Commission from time-to-time.

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Note:

- i. Different combinations of the above will be utilized for different categories of licensees that offer data services either as service to subscribers, or wholesale bandwidth providers to other resellers.
- ii. Throughput for 5G services to be measured using Drive Test and FTP service.

In computing the KPIs, the following will apply:

1. The busy hour (BH) will be as specified by the Commission. Some examples include Network Busy Hour, Cell Bouncing Busy hour etc
2. All counter data reporting periods shall be 1 hour
3. The average values to utilize in computing the KPI performance will be as specified by the Commission. Some example of averages include Arithmetic Average, Weighted Average etc.
4. Harmonized formula across vendors will be utilized.
5. Harmonized counters across vendors will be utilized.
6. General KPIs will be used to determine the integrity of the KPI data collected or reported
7. For the power availability KPI, a multiplication factor as defined in paragraph 3.0 will be applied for hub sites availability computation.

3.0 COLOCATION PROVIDERS KEY PERFORMANCE INDICATORS (KPI)

	KPI	Target	Comment
1	Power Availability (Terminal sites)	$\geq 99.50\%$	A multiplication factor (between 1.00 to 1.0049) to be determined will be applied for hub sites
	Power Availability (Hub sites)	$\geq 99.80\%$	
2	Mean Time to Repair	≤ 2.5 hours	

Note: Weighting for over-all performance per KPI will be as determined by the Commission taking into consideration performance for hub sites and terminal sites respectively.

4.0 QUALITY OF SERVICE INDEX

In order to assess the performance of mobile operators in Nigeria, an aggregation measure called the Quality of Service (QoS) Key Performance Indicator (KPI) (QoS KPI Index) will be developed. The QoS KPI index will combine various QoS KPIs published by the Nigerian Communications Commission (NCC) to provide a comprehensive metric that can assess the quality of service across different generations of mobile networks (2G, 3G, 4G and 5G). This will provide a unified and easily interpretable performance measure that can facilitate effective Quality of Service assessment of telecommunications service providers by subscribers. The QoS KPI Index will aggregate the KPIs for voice, data, and SMS, for different technology generations (2G, 3G, 4G, 5G) and across generations and services.

5.0 POINT OF INTERCONNECT KPIs

	KPI	Target	Comment
1	ASR Incoming	$\geq 35.00\%$	35.00% for MNOs and ICHs and 40.00% for PNLs/fixed line
2	ASR Outgoing	$\geq 35.00\%$	35.00% for MNOs and 40.00% for PNLs/fixed line
3	Congestion Incoming	$\leq 0.50\%$	
4	Congestion Outgoing	$\leq 0.50\%$	
5	Utilization	$\leq 70.00\%$	
6	Route Availability	$\geq 99.99\%$	

A. 6.0 ESCALATION MATRIX FOR MAJOR OUTAGES

6.1 Escalation Matrix for Regulatory Reporting

S/N	NUMBER OF IMPACTED SITES	MEDIUM OF COMMUNICATION
1	$50 \leq \text{Sites} < 100$	Email, SMS and letters to the Regulator
2	$100 \leq \text{Sites} < 150$	Email, SMS and letters to the Regulator
3	$150 \leq \text{Sites} < 300$	Email, SMS and letters to the Regulator
4	$\text{Sites} \geq 300$	Email, SMS and letters to the Regulator

6.2 Classification and Reporting & Publication of Major Network Outages

Pursuant to Section 4 of the Nigerian Communications Act 2003 and Section 13(3) of the General Consumer Code of Practice, the Commission hereby establishes the framework for the classification, escalation, and reporting of Major Network Outages by Licensees.

A **Major Network Outage** shall include any network condition that:

- a. Impacts **five percent (5%) or more of an operator's subscriber base**, or **five (5) or more Local Government Areas**; b. Affects **one hundred (100) or more sites**, **five percent (5%) of total network sites**, or **one reporting area**, resulting in an outage of **2.5 hours or more**; or c. Results in degradation of network quality in the **top ten (10) states by traffic volume**, as may be determined by the Commission.

6.3 Escalation and Notification Requirements

Licensees shall comply with the following requirements:

a. **Immediate Reporting:** All Major Network Outages shall be reported immediately to the Commission upon occurrence; b. **Public Disclosure:** Licensees shall immediately issue public notices via conventional and alternative media platforms; c. **Consumer Notification:** Consumers shall be informed directly using electronic channels including SMS, MMS, and social media platforms.

6.4 Post-Restoration Obligations

Upon restoration of services, Licensees shall:

a. Submit a **Root Cause Analysis (RCA)** to the Commission within **forty-eight (48) hours**, detailing:

- Cause(s) of the outage;
- Affected areas;
- Actions taken to restore service;
- Measures implemented to prevent recurrence.

6.5 Compensation Framework

a. Where outages exceed **twenty-four (24) hours**, Licensees shall provide **proportional compensation** in accordance with the Consumer Code of Practice; b. Any outage exceeding **twelve (12) hours within a day** shall be deemed a **full day** for compensation purposes; c. **Force majeure events**, where properly documented and reported, may be exempt from compensation obligations.

6.6 Planned Outages

Licensees shall:

a. Provide **at least one (1) week prior notice** for planned outages through traditional media (radio, television, newspapers); b. Ensure such notices include:

- Nature and cause of the planned outage;
- Affected locations;
- Expected duration; • Mitigation measures.

6.7 Public Communication Requirements

All outage-related communications shall include:

- Cause(s) of the outage;
- Affected areas;
- Steps being taken to restore service;

- Estimated restoration timeline;
- Updates where restoration timelines change;
- Confirmation of service restoration.

7.0 EXTERNAL ENVIRONMENTAL INTERFERENCE

External environmental interference is outside the control of licensees and requires NCC's intervention to resolve. However, internal interference is within the control of licensees and 4 hours resolution time shall apply.

PART III: REPORTING PRIORITISATION LIST

To ensure compliance with the QoS Regulations, 2024 and for proper monitoring on a reporting area basis, the Commission shall communicate the Reporting Areas priorities to Licensees as may be required.

- a. That, Mobile Service Providers shall submit QoS data on a Reporting Area basis at the cell level to enable the Commission review its threshold. The mechanism of reporting the QoS data shall be as determined by the Commission
- b. That, Mobile Service Providers shall comply with the prioritization of Reporting Areas and KPI set for the Reporting Areas.

PART IV: DEFINITION OF TERMS AND PARAMETERS

The following terms shall convey the meanings ascribed to them hereunder in the context of these regulations. Formula-based definitions can be implemented using the formula specified hereunder or formula with similar effect (should the counters specified not be directly available). All KPIs must be achieved by pre-and post-paid services.

1. Call: A generic term related to the establishment, utilization and release of connection.
2. Call attempt: an attempt to achieve to a connection to one or more devices attached to a telecommunication network.
3. Successful call: A call that has reached the desired number and allows conversation to proceed.
4. Busy Hour (BH): The continuous 1 – hour period lying wholly in the time interval concerned (usually 24hrs) for which the traffic or number of call attempts is greatest.
5. Call completion rate = $CSSR * (1 - TCHDropRate)$

6. Location Update Success Rate (Registered and non-registered subscribers)
7.
$$\text{Paging Success Rate} = \frac{(\text{NPAGIRESUC} + \text{NPAG2RESUC})}{(\text{NPAGILATOT} + \text{NPAGIGLTOT})} \times 100 \text{ [\%]}$$
8. Call Setup Time (Post Dialing Delay): Time interval between the end of dialing by the user and the reception by him of the appropriate ring-back tone or recorded announcement, or the abandonment of the call without a tone.
9. Interconnect Circuit (Pol) Congestion: This is the percentage congestion of the Interconnect Circuits measured at busy hour.

$$\frac{\text{Total Number of unavailable Pol circuit requests}}{\text{Total Number of available Pol circuits}} \times 100$$

10. Processor Load: This is the percentage of MSC Processor Workload measured at busy hour.
- I. BHHIR, MSC Utilization: % Capacity Utilization VLR and MSC at busy hour.
- II. Transceiver Unit (TRX) Utilization: % Capacity Utilization of TRX at busy hour.
11. No. of Interconnect points per zone: Is the existence of at least one interconnection point per zone.
12. Interference Protection Ratio: Is the interference protection due to CoChannel and Adjacent Channels.
13. Resolution Time of CIC mismatch: Is the time taken to resolve a CIC mismatch.
14. Resolution time of BTS faults impacting on traffic: This is the time taken to resolve faults that hinder traffic flow in the BTS.
15. Resolution time of BSC faults impacting on traffic: This is the time taken to resolve faults that hinder traffic flow in the BSC.
16. Resolution time of MSC faults impacting on traffic: This is the time taken to resolve faults that hinder traffic flow in the MSC.
17. Time to repair other failures that affect traffic: Time taken to repair other failures (not specifically captured in other parts of this document) that affect traffic.

18. Maximum time for Transmission/Physical link outages: Is the Maximum time allowed for transmission/Physical link to remain in a failed state or state of operation that negatively affects services to consumers.
19. Service Coverage in cities/towns: Is the measured Radio Signal Level in urban and sub-urban areas, in-door and out-door and in moving vehicles in
20. Percentage of Radio Links with Space and Frequency Diversity: Is the percentage of Microwave Transmission Links employing Space and Frequency diversity in the entire transmission network.
21. Conversational Voice Quality: Is the Mean Opinion Score (MOS) of the speech quality perceived by Caller or Called party in accordance with ITU-T P.862.
22. Compression Ratio: Is the compression ratio on the transmission network.
23. Voice Encoding: Is the type of voice encoding that is used on the radio network.
24. SMS Delivery Success Rate: Is the ratio of the failed SMS to the total number of delivered SMS at busy hour if the recipient is active and in coverage area.

$$\frac{\text{Number of SMS received by recipient}}{\text{Total Number of SMS sent to the recipient}} \times 100$$

25. SMS End-to-End Delivery time: Is the maximum End-to-End delivery time of SMS if the recipient is active and the area.
26. Number of Complaints per day related to:
 - (i) One way or both way loss of audio: A situation whereby either caller or called party cannot hear the audio message or both could not hear each other.
 - (ii) Cross-Talk: A situation whereby unintended conversation interferes with that of caller or called party or both.
 - (iii) Call Misdirection to unintended number: A situation whereby a call is terminated at unintended destination.
 - (iv) Voice Quantity: Conversation with bad speech quality.
27. Number of complaints per day in respect of Network blocking of incoming calls: Number of complaints received per day in respect of blocking of incoming calls in the network.

28. Number of complaints per day related to inability to meet SMS/MMS End-to-End Delivery Time Threshold: Complaints per day received on the network related to inability to meet SMS/MMS delivery time.

29. SMS Delivery Failure Rate: This is the ratio of SMS undelivered to recipient to the total number of SMS received at the Service Center for the recipient.

$$\frac{\text{Number of SMS to recipient undelivered}}{\text{Total Number of SMS received at Service Center}} \times 100$$

30. Voice Mail related complaints per day: The complaints related to voice-mail received per day.

31. Acknowledgement of delivery of SMS/MMS/IMS messages sent: Successful delivery acknowledgement of SMS/MMS/IMS messages sent must be received by the sender for all messages delivered.

32. Cost information for all completed calls or Revenue Generative Events (RGE) via text to consumer: Charging information must be communicated to the consumer for all calls and RGEs on the network.

33. Circuit Switched Data Services (CDS): Upstream/Downstream throughput of Circuit Switched Data Services. Greater or equal to 95% of the agreed data rate must be delivered to customer at busy hour.

34. Packet Switched Data Services (PDS): Upstream/Downstream throughput of Packet Switched Data Services. Greater or equal to 95% of the agreed data rate must be delivered to customer at busy hour.

35. CIC: Circuit Identification Code.

36. RGE: Revenue Generating Event (RGE) is any action by one or more subscribers that leads to Revenue being derived directly or indirectly by one or more operators. **RGE are the following actions:**

I. Outgoing and Incoming voice Calls;

II. Subscription to any voice plan or any plan that gives voice access to a subscriber for a specific time period;

III. Outgoing and Incoming SMS and MMS; IV. USSD transactions;

V. Value Added Service (VAS) transactions;

VI. Mobile Data Usage;

- VII. Data subscription or subscription to any plan that includes data access for a specific time period;
- VIII. Line Rental Payment or any payment incidental to a subsisting subscription for service or access to service;
- IX. Parked Numbers;
- X. Subscriber who utilizes/shares of another Subscriber's data services.

It shall be noted that RGE excludes:

- I. Recharge by any means that is not followed up by any of the defined activities above;
- II. Receipt of transferred recharge from any subscriber or the network provider without any follow up activity as listed above;
- III. Failed attempts to make calls or download/upload data that has not been charged by the network provider;
- IV. Transactions from barred Subscribers (Full Network barring) due to noncompliance to the Registration of Communication Subscribers Regulations during the reporting period;
- V. Subscribers who have ported out of MNO's network during the reporting period.

- 37. MSC/VLR, MSS System Availability/Down Time: Amount of time the MSC and MSC-S were in/out of service during a given period excluding planned outage. Obtainable from system logs.
- 38. Signaling (SS7) Link Availability: Availability for ETSI SS7 signaling network, evaluated as:

$$(\text{ASLDUR} / (\text{ASLDUR} + \text{UNAVAILDUR})) * 100$$
- 39. Signaling (SST) LinkSet Unavailability: Duration of unavailability of signaling link set in seconds, evaluated from: STUNADURAT
- 40. Answer Seizure Ratio (ASR): Answer/Seizure ratio (ASR) is the number of successfully answered calls divided by the total number of calls attempted (seizures) multiplied by 100. It is evaluated as follows:

Number of B answers in the Incoming route

$$\text{ASR IN} = (\text{ANSWERSIN} / \text{CALLSI}) * 100$$
 Number of B answers in the Outgoing route

$$\text{ASR_OUT} = (\text{NANSWERSO} / \text{NCALLSO}) * 100$$

Number of calls answered (B-answer) for both outgoing and Incoming calls
 $ASR_TOT = ((NANSWERSI + NANSWERSO) / (NCALLSI + NCALLSO)) * 100$

41. Background Block Error Ratio (BBER): The ratio of Background Block Errors (BBE) to total blocks in available time during a fixed measurement interval. The count of total blocks excludes all blocks during Severely Error Seconds (SESS). It is expressed as:

$$BBER = BBE / (T_{TOT} - UAS)$$

T_{TOT} Total Measurement Time

UAS Unavailable Second

42. Error Second Ratio (ESR): The ratio of Error Second (ES) to total seconds in available time during a fixed measurement interval. It is expressed as:

$$ESR = [ES / (T_{TOT} - UAS)]$$

43. Severely Error Seconds (SESR): SESR is a one-second period that contains over 30 percent error blocks or at least one defect. SES is a subset of ES. It is expressed as:

$$SESR = [SES / (T_{TOT} - UAS)]$$

44. RTWP – Received Total Wideband Power

45. RSCP-Received Signal Code Power

Uu Transmission Interface

E_c/I_0 -Chip Energy per Interference Spectral Density

46. CS_IRAT HHO Failure - Circuit Switch Inter Radio Access Technology Hard Handover Failure

47. PS IRAT HHO Failure-Packet Switch Inter Radio Access Hard Handover Failure

48. Cell-Emission coverage area of a cell site Technology

49. A CELL SITE is a term used to describe a site where antennas and electronic communications equipment are placed, usually on a radio mast, tower or other high place, to create a cell in a cellular network.

50. BASE TRANSCEIVER STATION (BSc) also referred to as the radio base station (RBS), node B (in 3G Networks), eNB (in LTE Standard) or, simply,

the base station (BS) is a piece of equipment that facilitates wireless communication between user equipment (UE) and a network.

51. BASE STATION CONTROLLER (BSC) is equipment that provides the intelligence behind the BTSs. It has tens or even hundreds of BTSs under its control. The BSC handles allocation of radio channels, receive measurements from the mobile phones, and controls handovers from BTS to BTS.
52. The Mobile Switching Center (MSC) is the primary service delivery node for GSM/CDMA, responsible for routing voice calls and SMS as well as other services. It has a number of BSCs under its control. The MSC sets up and releases the end-to-end connection, handles mobility and hand-over requirements during the call and takes care of charging and real time pre-paid account monitoring.
53. 3G refers to Third Generation
54. LTE refers to Long Term Evolution
55. General packet radio service (GPRS): is a packet oriented mobile data service on the 2G and 3G cellular communication systems.
56. Enhanced Data rates for GSM Evolution (EDGE) (also known as Enhanced GPRS (EGPRS): is a digital mobile phone technology that allows improved data transmission rates as a backward-compatible extension of (Global System for Mobile Communications (GSM).
56. Network Segment: is an identifiable part of a Telecommunications Network such as BTS, BSC, MSC, Interfaces, etc.
57. Core Network : the component of a Telecommunications Network involve in call processing functions apart from base stations and Business support subsystems.
58. High Speed Packet Access (HSPA) is an amalgamation of two mobile telephony protocols, High Speed Downlink Packet Access (HSDPA) and High Speed Uplink Packet Access (HSUPA) that extends and improves the performance of existing Wideband CDMA (WCDMA) protocols.
59. Latency: Network latency is the amount of time it takes for a data packet to go from origin to destination
60. Jitter: is the time delay between when a signal is transmitted and when it is received
61. Additional Terms and Parameters (See Appendix 1,2,3 and 4)

PART V: CHANGE PROCESS

- i. Proposed amendment to this Business Rules should be an outcome of the Technical Sub-committee of the Quality of Service Industry Working Group.
- ii. Proposed amendments to the current document should be submitted to the Steering Group (SG) in advance of the next planned meeting. It is recommended that proposed amendments include the following information: Originator, date originated, proposed change (including textual amendments to the document), benefits of change, objectives of change, risk if the change is not implemented, assessment of scope of work and proposed implementation date.
- iii. Proposed amendment requests will only be considered by the SG if the originator is a service provider in Nigeria or the NCC. Any proposed amendment requests originated by other third parties should be referred to the NCC for consideration and if the NCC views the requests as appropriate, the NCC will refer the request to the SG in accordance with the terms of the change control provisions.
- iv. It is desirable that amendment requests be circulated to the SG members for consideration at least ten (10) working days prior to the next planned meeting of the SG. If no meeting is planned within a month of receipt of the request an ad hoc meeting should be called to discuss the proposed amendment.
- v. Attendance at the SG to discuss proposed agreement amendments is open to all service providers or their representatives.
- vi. Amendment requests will be debated in the relevant SG meeting and accepted or rejected by consensus or majority voting in accordance with the following rules: (a) A voting quorum will be achieved, provided each of the service providers has received a minimum of ten (10) working days advance notice of the meeting and a majority of the service providers are present. The quorum should be deemed formed, only when there are at least six (6) mobile and collocation service providers, (b) One vote for each of the Nigeria mobile service provider present at SG meetings will apply. (c) In the absence of a consensus view, majority voting will apply. (d) For the avoidance of doubt, voting rights shall only be exercisable by mobile service providers and other members of the SG with at least 10% market share in their respective segments. At the NCC's sole discretion, voting rights may be extended to other appropriate stakeholders, including Fixed Service Providers, Internet Service Providers, International Gateway Operators, Collocation Service Providers, Aggregators, Interconnect Clearing Houses, and Value-Added Service Providers.
- vii. All recommendations and decisions agreed by the SG will be referred to the NCC for final review and approval. For avoidance of doubt, SG recommendations and decisions can only be actioned and implemented once formal written approval from the NCC has been granted. The NCC will communicate its decision within two (2) weeks of receipt of the outcome of the SG deliberations.

- viii. When amendments are approved by the NCC this document will be reissued as appropriate.
- ix. It is the responsibility of the SG Chairperson, at the meeting where the change is agreed, to ensure that accepted changes are incorporated into the Business Rules and the updated document is re-issued in a timely manner to the members of the SG.
- x. The QoS Steering Group members shall be drawn from the Commission, Senior Management or representatives of the Mobile Network Operators, Fixed Service

Providers, Internet Service Providers, International Gateway Operators,

S/N	KPIs	Meaning
38	HTTP	Hyper Text Transfer Protocol
39	CSSR	Call Set Up Success Rate

Interconnect Clearing Houses, Aggregators, Collocation Service Providers and one representative of Value-Added Service Providers

APPENDIX 1

Ericsson KPI counters

Technology	KPI	Formula	KPI Counter
2G	CSSR	CSSR=Immediate Assignment Success Rate * Success Rate of TCH Assignment * (1-SDCCH Call Drop Rate) * 100%	$(1 - (CNDROP - CNRELCONG - CLUNDROP) / (CMSESTAB - CLUMSESTAB)) * (TCASSALL) / (TASSALL)$
	SDCCH Cong	$(\text{Nr of SDCCH Allocation Failures (Due to Congestion)}) / \text{Nr of SDCCH Allocation Attempts} * 100$	$100 * (CCONGSSUB / CCALLS)$

	Drop Call Rate	$(\text{Nr of TCH HR Drops} / \text{Nr of TCH HR Assignment Successes (Excluding Handover)}) * 100$	$((CNDROP - CNRELCONG) / CMSESTAB) * 100$
	TCH Congestion	Congestion Rate (TCH) = $(\text{Number of Failed TCH Assignments and handovers due to Congestion} / \text{Number of TCH Seizure Requests}) * 100\%$ $= \frac{\sum(E///_CONG_TCH_NUM)}{\sum(E///_CONG_TCH_DENOM)} * 100\%$ 1. $E///_CONG_TCH_NUM = (TFTCONGS + TFTCONSUB + THTCONGS + THTCONSUB)$ 2. $E///_CONG_TCH_DENOM = (TFMSESTB + THMSESTB)$	$(\text{NG} + \text{TFNRELCONG} + \text{CONGSUB} + \text{THNREL} + \text{THTNRELCONG}) / \text{TASSALL}$
	Handover Success Rate	$(HOVERSUCC / HOVERCNT) * 100$	$100 * (\text{SUMOHSUCC} + \text{SUMEOHSUCC}) / (\text{SUMOHOAT} + \text{T} + \text{SUMEOHAT} + \text{T})$

TCH Availability	((Available Basic Physical Channels (BPCs) for traffic channels accumulator / Number of accumulations of available BPCs for traffic channels counter)/ (Average Number of defined TCH))*100%	100*((TAVAACC/TAVASCAN)/TNUCHCNT (avg))
Cell Availability		1-(Sum((TDWNACC) ForEach (Cell Name)) /Sum((TDWNSCAN) ForEach (Cell Name)))
Location Update Success Rate	(NLOCNRGSUCC + NLOCOLDSUCC + NLOCNRG2SUCC + NLOCNRG2SUCC) / (NLOCNRGTOT + NLOCOLDTOT + NLOCNRG2TOT + NLOCOLD2TOT) * 100 [%]	
Paging Success Rate	(NPAGIRESUC + NPAG2RESUC) / (NPAGILATOT +	

		NPAGIGLTOT) *100 [%]	
3G	CSSR CS	(Nr of RRC Connection Successes (CS) / Nr of RRC Connection Requests (CS))*(Nr of RAB Establishment Successes (CS) / Nr of RAB Establishment Attempts (CS)) * 100%	100*(pmTotNoRrcConnectReqCsSucc/pmTotNoRrcConnectReqCs)*(pmNoRabEstablishSuccessSpeech/(pmNoRabEstablishAttemptSpeech - pmNoDirRetryAtt))

CSSR PS	$\frac{(\text{Nr of RRC Connection Successes (PS) / Nr of RRC Connection Requests (PS)}) * (\text{Nr of RAB Establishment Successes (PS) / Nr of RAB Establishment Attempts (PS)})}{100\%}$	$\frac{((\text{pmTotNoRrcConnectReqPsSucc}) * (\text{pmNoRabEstSuccPktInteractiveHs})) / ((\text{pmTotNoRrcConnectReqPsSucc} - \text{pmNoLoadSharingRrcConn}) * (\text{pmNoRabEstAttemptPktInteractiveHs} - \text{pmNoRabEstAtptPktInteractiveHs} + \text{pmNoOfN onHoReqDeniedHs} + \text{pmNoRabEstBlockTnPsnthHsBest}))}{100}$
DCR CS	$\frac{(\sum(\text{Number of Speech RAB Abnormal Releases}) / \sum(\text{Total Number of Speech RAB Releases}))}{100\%}$	$\frac{(\text{pmNoSystemRabReleaseSpeech} + \text{pmNoSystemRabReleaseCs64})}{((\text{pmNoNormalRabReleaseSpeech} + \text{pmNoSystemRabReleaseSpeech} + \text{pmNoSystemRabReleaseCs64} + \text{pmNoNormalRabReleaseCs64}))} * 100$
DCR PS	$\frac{(\sum(\text{Number of PS RAB Abnormal Releases}) / \sum(\text{Total Number of PS RAB Releases}))}{100\%}$	$100 * ((\text{pmNoSystemRabReleasePacket}) / ((\text{pmNoRabEstSuccPktInteractiveHs} + \text{pmUpswitchFachHsSuccess} + (\text{pmNoNormalRabReleasePacket} - \text{pmNoNormalRbReleaseHs}) + (\text{pmNoSystemRabReleasePacket} - \text{pmNoSystemRbReleaseHs})))$
RAB SSR	$\frac{(\text{Nr of RAB Establishment Successes (CS) / Nr of RAB Establishment Attempts (CS)})}{100\%}$	$100 * ((\text{pmNoRabEstablishSuccessSpeech} + \text{pmNoRabEstablishSuccessCs64}) / ((\text{pmNoRabEstablishAttemptSpeech} + \text{pmNoRabEstablishAttemptCs64} - \text{pmNoDirRetryAtt}))$
RRC Congestion	This KPI is used to check the RRC Congestion Ratio in a cluster.	NA
CS RAB Congestion	This KPI is used to check the CS RAB Congestion Ratio in a cluster.	NA

Soft Handover Success Rate	$\text{SHO Success Rate (\%)} = \frac{100 * (\text{SHO Success Rate Num} / \text{SHO Success Rate Denum})}{100}$	$\text{SHO Success Rate (\%)} = \frac{100 * (\text{pmNoTimesRlAddToActSet})}{(\text{pmNoTimesRlAddToActSet} + \text{pmNoTimesCellFailAddToActSet})}$
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	Cell Availability	$100 * \frac{[\text{Measurement time duration in seconds}(\text{pmCellDowntimeAuto})]}{[\text{Measurement time duration in seconds}]}$	$(\text{Cell available Time}) / \text{measurement Time Duration} * 100\%$
4G	RRC Connection Setup Success Rate	$100 * \frac{(\text{Number of RRC Connection Successes})}{(\text{Number of RRC Connection Attempts})}$	$100 * (\text{pmRrcConnEstabSucc} / (\text{pmRrcConnEstabAtt} + \text{pmRrcConnEstabAttReatt}))$
	E-RAB Setup Success Rate	$100 * \frac{(\text{Nr of E-RAB Setup Successes})}{(\text{Nr of E-RAB Setup Attempts})}$	$100 * (\text{pmS1SigConnEstabSucc} / \text{pmRrcConnEstabSucc}) * (\text{pmErabEstabSuccInit} / \text{pmErabEstabAttInit})$
	Accessibility (SSSR %)	$100 * \frac{(\text{Nr of E-RAB Setup Successes})}{(\text{Nr of E-RAB Setup Attempts})}$	$100 * (\text{pmRrcConnEstabSucc} / (\text{pmRrcConnEstabAtt} + \text{pmRrcConnEstabAttReatt})) * (\text{pmS1SigConnEstabSucc} / \text{pmRrcConnEstabSucc}) * (\text{pmErabEstabSuccInit} / \text{pmErabEstabAttInit})$
	Intra-Frequency Handover Out Success Rate	$100 * \frac{(\text{Number of Outgoing Intra-Frequency Handover Execution Successes})}{(\text{Number of Outgoing Intra-Frequency Handover Preparation Attempts})}$	$\frac{(\text{pmHoPrepSuccLteIntraF} / \text{pmHoPrepAttLteIntraF}) * (\text{pmHoExeSuccLteIntraF} / \text{pmHoExeAttLteIntraF})}{100}$
	Inter-Frequency Handover Out Success Rate	$100 * \frac{(\text{Number of Outgoing Inter-Frequency Handover Execution Successes})}{(\text{Number of Outgoing Inter-Frequency Handover Preparation Attempts})}$	$\frac{(((\text{pmHoPrepSuccLteIntraF} + \text{pmHoPrepSuccLteInterF}) / (\text{pmHoPrepAttLteIntraF} + \text{pmHoPrepAttLteInterF})) * ((\text{pmHoExeSuccLteIntraF} + \text{pmHoExeSuccLteInterF}) / (\text{pmHoPrepExeAttLteIntraF} + \text{pmHoExeAttLteInterF})))}{100}$
	CSFB Preparation Success Rate (%)	$100 * \frac{(\text{Nr of RRC Release with Redirects for CSFB (L2G)} + \text{Nr of RRC Release with Redirects for CSFB (L2U)})}{(\text{Nr of CSFB Indicators Received})}$	$100 * \frac{(\text{UtranCellRelation.pmHoPrepSuccCsfb})}{(\text{UtranCellRelation.pmHoPrepAttCsfb})} * \frac{(\text{UtranCellRelation.pmHoExeSuccCsfb})}{(\text{UtranCellRelation.pmHoExeAttCsfb})}$
	Service Call drop rate	$100 * \frac{(\text{Number of Abnormal eNB E-RAB Releases} + \text{Number of Abnormal MME E-RAB Releases})}{(\text{Number of ERAB Releases})}$	$100 * \frac{(\text{pmErabRelAbnormalEnbAct} + \text{pmErabRelAbnormalMmeAct})}{(\text{pmErabRelAbnormalEnb} + \text{pmErabRelMme} + \text{pmErabRelNormalEnb})}$

E-Utran UE DL Throughput (kbps)	$1000 * (\text{PDCP DRB Volume DL (kbps)}) / (\text{Cell Throughput Time DL (ms)})$	$(\text{pmPdcPVolDlDrb} - \text{pmPdcPVolDlDrbLastTTI}) / (\text{pmUeThpTimeDl} / 1000)$
E-Utran UE UL Throughput (kbps)	$1000 * (\text{PDCP DRB Volume UL (kbps)}) / (\text{Cell Throughput Time UL (ms)})$	$([\text{pmPdcPVolUlDrb}] + [\text{pmZtempora ry4}] + [\text{pmUeThpVolUl}]) / ([\text{pmUeThpTimeUl}] / 1000)$
Cell Availability	$100 * (4\text{G CELL ROP Time} - \text{Cell Downtime System (s)} - \text{Cell Downtime Manual (s)}) / (4\text{G CELL ROP Time})$	$100 * (([\text{period_duration}] * 60) - ([\text{pmCellDowntimeAuto}] + [\text{pmCellDowntimeMan}])) / ([\text{period_duration}] * 60)$

APPENDIX 3 HUAWEI KPI counters

Technology	KPI	Formula	KPI Counter
2G	CSSR	$(\{1\} - [\text{K3001:Failed SDCCH Seizures due to Busy SDCCH}] / [\text{K3000:SDCCH Seizure Requests}] * (\{1\} [\text{CM30:Call Drops on SDCCH}] / [\text{K3003:Successful SDCCH Seizures}])) * [\text{K3013A:Successful TCH Seizures (Traffic Channel)}] / [\text{K3010A:TCH Seizure Requests (Traffic Channel)}] * \{100\}$	$(1 - 1278087420) / (1278087419 * (1 - (1278072520 / 1278087421))) * (1278087432 / 1278087430) * 100$
	SDCCH Cong	$[\text{K3001:Failed SDCCH Seizures due to Busy SDCCH}] / [\text{K3000:SDCCH Seizure Requests}] * 100$	$(1278087420 / 1278087419) * 100$
	Drop Rate Call	$[\text{CM33:Call Drops on Traffic Channel}] / ([\text{K3013A:Successful TCH Seizures (Traffic Channel)}] + [\text{K3013B:Successful TCH Seizures in TCH handovers (Traffic Channel)}] + [\text{K3023:Successful TCH Seizures (Signaling Channel)}]) * \{100\}$	$(1278072498 / (1278087432 + 1278087436 + 1278087427)) * 100$

TCH Congestion	[K3011A:Failed TCH Seizures due to Busy TCH (Traffic Channel)/[K3010A:TCH Seizure Requests (Traffic Channel)]*{100}	(1278087431/1278087430)*100
Handover Success Rate	(CH313+CH333)/(CH311+CH331)*100	(1278079528+1278081557)/(1278079531+1278081558)*100

	TCH Availability	[K3015:Available TCHs]/[K3016:Configured TCHs]*{100}	(1278087439/1278087440)*100
	Cell Availability	[CR373:Cell In-Service Duration]/([CR373:Cell InService Duration]+[R373:Cell Out-of-Service Duration])*{100}	(1276071425/(1276071425+1276071423))*100
3G	CSSR CS	((([RRC.SuccConnEstab.OrgConvCall]+[RRC.SuccConnEstab.EmgCall]+[RRC.SuccConnEstab.CallReEst]+[RRC.SuccConnEstab.TmConvCall])/([RRC.AttConnEstab.OrgConvCall]+[RRC.AttConnEstab.TmConvCall]+[RRC.AttConnEstab.EmgCall]+[RRC.AttConnEstab.CallReEst]))*([VS.RAB.SuccEstabCS.Conv]+[VS.RAB.SuccEstabCS.Str])/([VS.RAB.AttEstabCS.Conv]+[VS.RAB.AttEstabCS.Str])*{100}	(([67179457] + [67179466] + [67179473] + [67179462]) / ([67179329] + [67179334] + [67179338] + [67179345]))*([67179827] + [67179828]) / ([67179825] + [67179826])*{100}
	CSSR PS	([RRC.SuccConnEstab.OrgBkgCall]+[RRC.SuccConnEstab.OrgInterCall]+[RRC.SuccConnEstab.TmBkgCall]+[RRC.SuccConnEstab.TmItrCall])/([RRC.AttConnEstab.TmBkgCall]+[RRC.AttConnEstab.TmInterCall]+[RRC.AttConnEstab.OrgBkgCall]+[RRC.AttConnEstab.OrgInterCall])*([VS.RAB.SuccEstabPS.Conv]+[VS.RAB.SuccEstabPS.Str]+[VS.RAB.SuccEstabPS.Int]+[VS.RAB.SuccEstabPS.Bkg])/([VS.RAB.AttEstabPS.Conv]+[VS.RAB.AttEstabPS.Str]+[VS.RAB.AttEstabPS.Int]+[VS.RAB.AttEstabPS.Bkg])*{100}	([67179460] + [671794590] + [67179465] + [67179464]) / ([67179337] + [67179336] + [67179332] + [67179331]) * ([67179925] + [67179926] + [67179927] + [67179928]) / ([67179921] + [67179922] + [67179923] + [67179924])*{100}
	DCR CS	[VS.RAB.AbnormRel.AMR]/([VS.RAB.AbnormRel.AMR]+[VS.RAB.NormRel.AMR])*{100}	[67180082] / ([67180082] + [67190518])*{100}

DCR PS	$\frac{([VS.RAB.AbnormRel.PS][VS.RAB.AbnormRel.PS.PCH]-[VS.RAB.AbnormRel.PS.D2P][VS.RAB.AbnormRel.PS.F2P])/([VS.RAB.AbnormRel.PS]+[VS.RAB.NormRel.PS]-[VS.RAB.AbnormRel.PS.PCH]-[VS.RAB.NormRel.PS.PCH]+[VS.DCCC.D2P.Succ]+[VS.DCCC.Succ.F2P]+[VS.DCCC.Succ.D2U]+[VS.DCCC.Succ.F2U])}{\{100\}}$	$\frac{([67179781] - [73421883] - [73422166] - [73421886]) / ([67179782] - [73421883] - [73421882] + [73421766] + [67192584] + [73424899] + [73424897])}{\{100\}}$
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RAB SSR CS	$\frac{([VS.RAB.SuccEstabCS.Conv]+[VS.RAB.SuccEstabCS.Str])/([VS.RAB.AttEstabCS.Conv]+[VS.RAB.AttEstabCS.Str])}{\{100\}}$	$\frac{([67179827] + [67179828])}{([67179825] + [67179826])} * \{100\}$
RAB SSR PS	$\frac{([VS.RAB.SuccEstabPS.Conv]+[VS.RAB.SuccEstabPS.Str]+[VS.RAB.SuccEstabPS.Int]+[VS.RAB.SuccEstabPS.Bkg])/([VS.RAB.AttEstabPS.Conv]+[VS.RAB.AttEstabPS.Str]+[VS.RAB.AttEstabPS.Int]+[VS.RAB.AttEstabPS.Bkg])}{\{100\}}$	$\frac{([67179925] + [67179926] + [67179927] + [67179928])}{([67179921] + [67179922] + [67179923] + [67179924])} * \{100\}$
RRC Congestion	$[VS.RRC.Rej.DLPower.Cong]+[VS.RRC.Rej.Code.Cong]+[VS.RRC.Rej.DLCE.Cong]+[VS.RRC.Rej.DLIUBBand.Cong]+[VS.RRC.Rej.ULCE.Cong]+[VS.RRC.Rej.ULPower.Cong]$	$[67193610] + [67179524] + [67190405] + [67192609] + [67190404] + [67193609]$
CS RAB Congestion	$([VS.RAB.FailEstabCS.DLIUBBand.Cong]+[VS.RAB.FailEstabCS.ULIUBBand.Cong]+[VS.RAB.FailEstabCS.ULCE.Cong]+[VS.RAB.FailEstabCS.DLCE.Cong]+[VS.RAB.FailEstabCS.Code.Cong]+[VS.RAB.FailEstabCS.ULPower.Cong]+[VS.RAB.FailEstabCS.DLPower.Cong])$	$([67192610] + [67192611] + [67190406] + [67190407] + [67179864] + [67193611] + [67193612])$
Soft Handover Success Rate	$\frac{([VS.SHO.SuccRLAdd]+[VS.SHO.SuccRLDel])/([VS.SHO.AttRLAdd]+[VS.SHO.AttRLDel])}{\{100\}}$	$\frac{([67180499] + [67180509])}{([67180498] + [67180508])} * \{100\}$
Cell Availability	$\frac{([VS.Cell.UnavailTime.Sys]/\{60\})}{\{GP\}} * \{100\}$	$\{100\} - ([67204837]/\{60\}) / \{GP\} * \{100\}$

4G	RRC Connection Setup Success Rate	$[L.RRC.ConnReq.Succ]/[L.RRC.ConnReq.Att]*\{100\}$	$[1526726659]/[1526726658]*\{100\}$
	E-RAB Setup Success Rate	$ERAB.NbrSuccEstab/ERAB.NbrAttEstab*100\%$	$L.E-RAB.SuccEst[1526727544]/L.E-RAB.AttEst[1526727545]$
	Accessibility (SSSR %)	$RRC\ Connection\ Setup\ Success\ Rate * E-RAB\ Setup\ Success\ Rate * 100\%$	$L.RRC.ConnReq.Succ[1526726659]/L.RRC.ConnReq.Att[1526726658]*L.E-RAB.SuccEst[1526727544]/L.E-RAB.AttEst[1526727545]$

LTE HOSR (Intra Freq + Inter Freq)		$\text{Inter-Frequency Handover Out Success Rate} = \frac{[L.HHO.IntraeNB.InterFreq.ExecSuccOut + L.HHO.IntereNB.InterFreq.ExecSuccOut]}{[L.HHO.IntraeNB.InterFreq.ExecAttOut + L.HHO.IntereNB.InterFreq.ExecAttOut]} \times 100\%$
CSFB Preparation Success Rate (%)	$100 * \left(\frac{L.RRCRedirection.E2G.CSFB + L.RRCRedirection.E2W.CSFB}{L.CSFB.PrepAtt} \right)$	$100 * \left(\frac{L.RRCRedirection.E2G.CSFB + L.RRCRedirection.E2W.CSFB}{L.CSFB.PrepAtt} \right)$

Service Call drop rate	$\frac{(\text{CONTEXT.AttRelEnb} - \text{CONTEXT.AttRelEnb.Normal})}{(\text{CONTEXT.SuccInitialSetup} + \text{CONTEXT.NbrLeft})} * 100\%$	$\frac{(\text{L.UECNTX.Rel.S1Reset.eNodeB}[1526728838] - \text{L.UECNTX.Rel.S1Reset.eNodeB}[1526728838].\text{Normal})}{(\text{L.UECNTX.Rel.S1Reset.eNodeB}[1526728838].\text{SuccInitialSetup} + \text{L.UECNTX.Rel.S1Reset.eNodeB}[1526728838].\text{NbrLeft})} * 100\%$
E-Utran UE DL Throughput (kbps)	$\text{PDCP.UpOctDL} * 8 / \text{PDCP.ThrpTimeDL}$	$\text{L.Thrp.bits.DL}[1526728261] / 1000000 / \text{L.Thrp.Time.DL}[1526728261]$
E-Utran UE UL Throughput (kbps)	$\text{PDCP.UpOctUL} * 8 / \text{PDCP.ThrpTimeUL}$	$\text{L.Thrp.bits.UL}[1526728259] / 1000000 / \text{L.Thrp.Time.UL}[1526728259]$
Availability	$\frac{((\text{L.Cell.Avail.Dur}) / ((\text{L.Cell.Avail.Dur} + [\text{L.Cell.Unavail.Dur.Sys}] + [\text{L.Cell.Unavail.Dur.Manual}] + [\text{L.Cell.Unavail.Dur.EnergySaving}])) * \{100\})}{100}$	$\frac{((\text{L.Cell.Avail.Dur}[1526728320]) / ((\text{L.Cell.Avail.Dur}[1526728320] + [\text{L.Cell.Unavail.Dur.Sys}[1526727209] + [\text{L.Cell.Unavail.Dur.Manual}[1526727210] + [\text{L.Cell.Unavail.Dur.EnergySaving}[1526728493]]) * \{100\})}{100}$

APPENDIX 4

ZTE KPI counters

Technology	KPI	Formula	Counter
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2G	CSSR	$\frac{((1 - [\text{Number of SDCCH drops}] / ([\text{Number of SDCCH assignment success}] + [\text{Number of BSC-controlled inter-cell incoming handover success (on SDCCH)}] + [\text{Number of MSC-controlled incoming handover success (on SDCCH)}])) * ([\text{Number of voice TCH/F assignment success}] + [\text{Number of voice TCH/H assignment success}] / ([\text{Number of voice TCH/F seizure attempts for assignment}] + [\text{Number of voice TCH/H seizure attempts for assignment}]))) * (1 - ([\text{Number of SDCCH seizure failure for assignment}] + [\text{Number of SDCCH seizure failure for handover}] / ([\text{Number of SDCCH seizure attempts for assignment}] + [\text{Number of SDCCH seizure})))}{C901070050 / (C901250014 + C902120018 + C902120033)) * ((C901260063 + C901270063) / (C901260020 + C901270020)) * (1 + C901250003 + C901250001 + C901250004))}$	
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		attempts for handover]]))	
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	SDCC H Cong	$\frac{((1 - [\text{Number of SDCCH drops}] / ([\text{Number of SDCCH assignment success}] + [\text{Number of BSC-controlled inter-cell incoming handover success (on SDCCH)}] + [\text{Number of MSC-controlled incoming handover success (on SDCCH)}])) * ([\text{Number of voice TCH/F assignment success}] + [\text{Number of voice TCH/H assignment success}]) / ([\text{Number of voice TCH/F seizure attempts for assignment}] + [\text{Number of voice TCH/H seizure attempts for assignment}])) * (1 - ([\text{Number of SDCCH seizure failure for assignment}] + [\text{Number of SDCCH seizure failure for handover}]) / ([\text{Number of SDCCH seizure attempts for assignment}] + [\text{Number of SDCCH seizure attempts for handover}])))}{(C901250003 + C901250006) / (C901250001 + C901250004)}$
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	Drop Call Rate	$\frac{([\text{Number of TCH/F drops}] + [\text{Number of TCH/H drops}]) / ([\text{Number of voice TCH/F assignment success}] + [\text{Number of voice TCH/H assignment success}])}{((C901070051 + C901070052) / (C901260063 + C901270063))}$
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TCH Congestion	$\frac{([\text{Number of voice TCH/F seizure failure for assignment}] + [\text{Number of voice TCH/H seizure failure for assignment}])}{([\text{Number of voice TCH/F seizure attempts for assignment}] + [\text{Number of voice TCH/H seizure attempts for assignment}])}$	$\frac{(C901260022 + C901270022)}{(C901260020 + C901270020)}$
Handover Success Rate	$\frac{(([\text{Number of BSC-controlled inter-cell outgoing handover success}] + [\text{Number of MSC-controlled outgoing handover success}])}{([\text{Number of BSC-controlled inter-cell outgoing handover}] + [\text{Number of MSC-controlled outgoing handover}])))}$	$\frac{(C901090003 + C901090010)}{(C901090002 + C901090009)}$
TCH Availability	$\frac{([\text{Average number of available dynamic radio channel}] + [\text{Number of available static TCH/Fs}] + [\text{Number of available static TCH/Hs}])}{([\text{Average number of available dynamic radio channel}] + [\text{Number of available static TCH/Fs}] + [\text{Number of available static TCH/Hs}] + [\text{Average number of unavailable dynamic radio channel}] + [\text{Number of unavailable defined TCH/Hs}] + [\text{Number of unavailable defined TCH/Fs}])}$	$\frac{(C901080009 + C901080028 + C901080019)}{(C901080009 + C901080028 + C901080019 + C901080010 + C901080020 + C901080029)}$

		of unavailable defined TCH/Fs]))*100	
	Cell Availability	1-([Cell down time due to link break(s)]+[Cell down time due to site fault(s)]+[Cell down time due to manual block(s)])/Gr	1-(C901080083+C901080084+C901080034)/Gr

3G	CSSR CS	((([Number of successful RRC connection access for originating conversational calls]+[Number of successful RRC connection access for terminating conversational calls]+[Number of successful RRC connection access for emergency calls])/([Number of RRC connection attempts due to originating conversational calls]+[Number of RRC connection attempts due to terminating conversational calls]+[Number of RRC connection attempts due to emergency calls])[Number of repeated RRC connection attempts due to originating conversational calls])[Number of repeated RRC connection attempts due to terminating conversational calls])[Number of repeated	((C310080170+C310080177+C310080185)/(C310080001+C310080008+C310080016-C310080023-C310080030-C310080038))*((C310100711+C310100733+C310100734+C310100735)/(C310090252+C310090274+C310090275+C310090276))
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		RRC connection attempts due to emergency calls))*([Number of successful RAB establishment in the CS domain for conversational services]+[Number of successful RAB establishment in the CS domain for streaming services]+[Number of successful RAB establishment in the CS domain for interactive services]+[Number of successful RAB establishment in the CS domain for background services])/([Number of RAB establishment attempts in the CS domain for conversational services]+[Number of RAB establishment attempts in the CS domain for streaming services]+[Number of RAB establishment attempts in the CS domain for interactive services]+[Number of RAB establishment attempts in the CS domain for background services]))	
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CSSR PS	(([Number of successful RRC connection access for originating streaming calls]+[Number of successful RRC connection access for originating interactive calls]+[Number of successful RRC connection access for originating background calls]+[Number of successful RRC connection access due to originating high-priority signaling]+[Number of successful RRC connection access due to originating low-priority signaling]+[Number of successful RRC connection access for terminating streaming calls]+[Number of successful RRC connection access for terminating interactive calls]+[Number of successful RRC connection access for terminating background calls]+[Number of successful RRC connection access due to terminating high-priority signaling]+[Number of successful RRC	((C310080171+C310080172+C310080173+C310080175+C310080176+C310080178+C310080179+C310080180+C310080181+C310080182)/((C310080002+C310080003+C310080004+C310080006+C310080007+C310080009+C310080010+C310080011+C310080012+C310080013)(C310080024+C310080025+C310080026+C310080028+C310080029+C310080031+C310080032+C310080033+C310080034+C310080035))))*((C310100736+C310100739+C310100752+C310100768)/(C310090277+C310090280+C310090293+C310090309))
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		connection access due to terminating low- priority signaling)/([Number of RRC connection attempts due to originating streaming calls]+[Number of RRC connection attempts due to originating interactive	
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		calls]+[Number of RRC connection attempts due to originating background calls]+[Number of RRC connection attempts due to originating high-priority signaling]+[Number of RRC connection attempts due to originating low-priority signaling]+[Number of RRC connection attempts due to terminating streaming calls]+[Number of RRC connection attempts due to terminating interactive calls]+[Number of RRC connection attempts due to terminating background calls]+[Number of RRC connection attempts due to terminating high-priority signaling]+[Number of RRC connection attempts due to terminating lowpriority signaling])([Number of repeated RRC connection attempts due to originating streaming calls]+[Number of repeated RRC connection attempts due to originating interactive calls]+[Number of repeated RRC connection attempts due to	
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		originating background calls]+[Number of repeated RRC	
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		connection attempts due to originating high-priority signaling]+[Number of repeated RRC connection attempts due to originating lowpriority signaling]+[Number of repeated RRC connection attempts due to terminating streaming calls]+[Number of repeated RRC connection attempts due to terminating interactive calls]+[Number of repeated RRC connection attempts due to terminating background calls]+[Number of repeated RRC connection attempts due to terminating high-priority signaling]+[Number of repeated RRC connection attempts due to terminating low-priority signaling]])*((Number of successful RAB establishment in the PS domain for conversational services)+[Number of successful RAB establishment in the PS domain for streaming services]+[Number of successful RAB establishment in the PS domain for interactive services]+[Number of successful RAB establishment in the PS domain for	
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		background services])/([Number	
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		of RAB establishment attempts in the PS domain for conversational services]+[Number of RAB establishment attempts in the PS domain for streaming services]+[Number of RAB establishment attempts in the PS domain for interactive services]+[Number of RAB establishment attempts in the PS domain for background services]))	
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	DCR CS	([Number of abnormally released RABs of CS-domain conversational services (AMR12.2K)]+[Number of abnormally released RABs of CSdomain conversational services (AMR10.2K)]+[Number of abnormally released RABs of CSdomain conversational services (AMR7.95K)]+[Number of abnormally released RABs of CSdomain conversational services (AMR7.4K)]+[Number of abnormally released RABs of CSdomain conversational services (AMR6.7K)]+[Number of abnormally released RABs of CSdomain conversational services (AMR5.9K)]+[Number of abnormally released RABs of CSdomain conversational services (AMR5.15K)]+[Number of abnormally released RABs of CSdomain conversational services (AMR4.75K)]+[Number of abnormally released RABs of CSdomain conversational services (WB-AMR23.85K)]+[Number of abnormally released RABs of CSdomain conversational	(C310231162+C310231163+C310231164+C310231165+C310231166+C310231167+C310231168+C310231169+C310231170+C310231171+C310231172+C310231173+C310231174+C310231175+C310231176+C310231177+C310231178+C310231179+C310231180+C310231181+C310231182+C310231183+C310231184)/(C310231185+C310231186+C310231187+C310231188+C310231189+C310231190+C310231191+C310231192+C310231193+C310231194+C310231195+C310231196+C310231197+C310231198+C310231199+C310231200+C310231201+C310231202+C310231203+C310231204+C310231205+C310231206+C310231207)
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		services (WB-AMR23.05K)]+[Number of abnormally released RABs of CSdomain conversational services (WB-	
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		AMR19.85K)]+[Number of abnormally released RABs of CSdomain conversational services (WB-AMR18.25K)]+[Number of abnormally released RABs of CSdomain conversational services (WB-AMR15.85K)]+[Number of abnormally released RABs of CSdomain conversational services (WB-AMR14.25K)]+[Number of abnormally released RABs of CSdomain conversational services (WB-AMR12.65K)]+[Number of abnormally released RABs of CSdomain conversational services (WB-AMR8.85K)]+[Number of abnormally released RABs of CSdomain conversational services (WB-AMR6.60K)]+[Number of abnormally released RABs of CSdomain conversational services (32K/32K)]+[Number of abnormally released RABs of CSdomain conversational services (64K/64K, Videotelephone)]+[Number of abnormally released RABs of CSdomain conversational other	
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		services]+[Number of abnormally released RABs of CS-domain streaming services]+[Number of abnormally released RABs of CS-domain interactive services]+[Number of	
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		abnormally released RABs of CS-domain background services)/([Total number of released RABs of CS-domain conversational services (AMR12.2K)]+[Total number of released RABs of CS-domain conversational services (AMR10.2K)]+[Total number of released RABs of CS-domain conversational services (AMR7.95K)]+[Total number of released RABs of CS-domain conversational services (AMR7.4K)]+[Total number of released RABs of CS-domain conversational services (AMR6.7K)]+[Total number of released RABs of CS-domain conversational services (AMR5.9K)]+[Total number of released RABs of CS-domain conversational services (AMR5.15K)]+[Total number of released RABs of CS-domain conversational services (AMR4.75K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR23.85K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR23.05K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR19.85K)]+[Total number of released RABs of CS-domain conversational services	
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		(WB-AMR18.25K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR15.85K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR14.25K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR12.65K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR8.85K)]+[Total number of released RABs of CS-domain conversational services (WB-AMR6.60K)]+[Total number of released RABs of CS-domain conversational services (32K/32K)]+[Total number of released RABs of CS-domain conversational services (64K/64K, Videotelephone)]+[Total number of released RABs of CS-domain conversational other services]+[Total number of released RABs of CS-domain streaming services]+[Total number of released RABs of CS-domain interactive services]+[Total number of released RABs of CS-domain background services])	
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	DCR PS	([Number of abnormally released RABs of PS-domain conversational VOIP services])+[Number of abnormally released RABs of PS-domain conversational other services])+[Number of abnormally released RABs of PS-domain streaming services (8K/8K)]+[Number of abnormally released RABs of PS-domain streaming services (32K/32K)]+[Number of abnormally released RABs of PSdomain streaming services (16K/64K)]+[Number of abnormally released RABs of PSdomain streaming services (64K/64K)]+[Number of abnormally released RABs of PSdomain streaming services (64K/128K)]+[Number of abnormally released RABs of PSdomain streaming services (64K/144K)]+[Number of abnormally released RABs of PSdomain streaming services (64K/256K)]+[Number of abnormally released RABs of PSdomain streaming services (64K/384K)]+[Number of abnormally released RABs of PSdomain streaming services	(C310241254+C310241255+C310241256+C310241257+C310241258+C310241259+C310241260+C310241261+C310241262+C310241263+C310241264+C310241265+C310241266+C310241267+C310241268+C310241269+C310241270+C310241271+C310241272+C310241273+C310241274+C310241275+C310241276+C310241277+C310241278+C310241279+C310241280+C310241281+C310241282+C310241283+C310241284+C310241285+C310241286+C310241287+C310241288+C310241289+C310241290+C310241291+C310241292-C310282103-C310282104-C310282105-C310282106-C310282107-C310282108-C310282109-C310282110-C310282111-C310282112-C310282113-C310282114-C310282119)/(C311866866+C311866868+C311866869+C311866870+C311866871+C311866872+C311866873+C311866874+C311866875+C311866876+C311866878+C311866879+C311866880+C311866881+C311866882+C311866883+C311866884+C311866885+C311866886+C311866887+C311866888+C311866890+C311866891+C311866892+C311866893+C311866894+C311866895+C311866896+C311866897+C311866898+C311866899+C311866900)
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		(384K/384K)]+[Number of abnormally released RABs of PS-	
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		domain streaming services (above 384K/384K)]+[Number of abnormally released RABs of PSdomain streaming other services]+[Number of abnormally released RABs of PS-domain interactive services (8K/8K)]+[Number of abnormally released RABs of PS-domain interactive services (32K/32K)]+[Number of abnormally released RABs of PSdomain interactive services (16K/64K)]+[Number of abnormally released RABs of PSdomain interactive services (64K/64K)]+[Number of abnormally released RABs of PSdomain interactive services (64K/128K)]+[Number of abnormally released RABs of PSdomain interactive services (64K/144K)]+[Number of abnormally released RABs of PSdomain interactive services (64K/256K)]+[Number of abnormally released RABs of PSdomain interactive services (64K/384K)]+[Number of abnormally released RABs of PSdomain interactive services	
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		(128K/128K)]+[Number of abnormally released RABs of PSdomain interactive	
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		services (128K/144K)]+[Number of abnormally released RABs of PSdomain interactive services (128K/384K)]+[Number of abnormally released RABs of PSdomain interactive services (384K/384K)]+[Number of abnormally released RABs of PSdomain interactive other services]+[Number of abnormally released RABs of PS-domain background services (8K/8K)]+[Number of abnormally released RABs of PS-domain background services (32K/32K)]+[Number of abnormally released RABs of PSdomain background services (16K/64K)]+[Number of abnormally released RABs of PSdomain background services (64K/64K)]+[Number of abnormally released RABs of PSdomain background services (64K/128K)]+[Number of abnormally released RABs of PSdomain background services (64K/144K)]+[Number of abnormally released RABs of PSdomain background services (64K/256K)]+[Number of abnormally	
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		released RABs of PSdomain background services	
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		(64K/384K)]+[Number of abnormally released RABs of PSdomain background services (128K/128K)]+[Number of abnormally released RABs of PSdomain background services (128K/144K)]+[Number of abnormally released RABs of PSdomain background services (128K/384K)]+[Number of abnormally released RABs of PSdomain background services (384K/384K)]+[Number of abnormally released RABs of PSdomain background other services][Number of RABs of PS-domain services requested to be released by the RNC due to RB setup expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to RB release expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to soft handover expiration][Number of RABs of PS-domain services requested to be released by the RNC due to softer handover expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to UE not involved relocation	
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		UMI expiration][Number of RABs of	
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		PS-domain services requested to be released by the RNC due to hard handover expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to DRBC expiration (channel switchover)]-[Number of RABs of PS-domain services requested to be released by the RNC due to DRBC expiration (rate adjustment)]-[Number of RABs of PS-domain services requested to be released by the RNC due to serving cell change expiration]-[Number of RABs of PS-domain services requested to be released by the RNC due to Uu reconfiguration failure]-[Number of RABs of PS-domain services requested to be released by the RNC due to security mode expiration][Number of RABs of PS-domain services requested to be released by the RNC due to signaling reconfiguration failure]-[Number of RABs of PS-domain services requested to be released by the RNC due to relocation expiration])/([Number of released RBs for PSdomain conversational services]+[Number of released RBs for PSdomain streaming services (8K/8K)]+[Number	
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		of released RBs for PS-	
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		domain streaming services (32K/32K)]+[Number of released RBs for PS-domain streaming services (16K/64K)]+[Number of released RBs for PS-domain streaming services (64K/64K)]+[Number of released RBs for PS-domain streaming services (64K/128K)]+[Number of released RBs for PS-domain streaming services (64K/256K)]+[Number of released RBs for PS-domain streaming services (64K/384K)]+[Number of released RBs for PS-domain streaming services (384K/384K)]+[Number of released RBs for PS-domain streaming other services]+[Number of released RBs for PSdomain interactive services (8K/8K)]+[Number of released RBs for PSdomain interactive services (32K/32K)]+[Number of released RBs for PS-domain interactive services (16K/64K)]+[Number of released RBs for PS-domain interactive services (64K/64K)]+[Number of released RBs for PS-domain interactive services (64K/128K)]+[Numb	
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		er of released RBs for PS-domain interactive services	
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		$(64K/256K)] + [\text{Number of released RBs for PS-domain interactive services}$ $(64K/384K)] + [\text{Number of released RBs for PS-domain interactive services}$ $(128K/128K)] + [\text{Number of released RBs for PS-domain interactive services}$ $(128K/384K)] + [\text{Number of released RBs for PS-domain interactive services}$ $(384K/384K)] + [\text{Number of released RBs for PS-domain interactive other services}] + [\text{Total number of RB release for PS domain, background } 8K/8K] + [\text{Total number of RB release for PS domain, background } 32K/32K] + [\text{Total number of RB release for PS domain, background } 16K/64K] + [\text{Total number of RB release for PS domain, background } 64K/64K] + [\text{Total number of RB release for PS domain, background } 64K/128K] + [\text{Total number of RB release for PS domain, background } 64K/256K] + [\text{Total number of RB release for PS domain, background } 64K/384K] + [\text{Total number of RB release for PS domain, background } 128K/128K] + [\text{Total number of RB release for PS domain, background } 128K/128K] + [\text{Total number of RB release for PS domain, background } 128K/128K]$	
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		domain,background128K/384K]+[Total number of RB release for PS domain,background384K/384K]+[Total number of RB release for PS domain,backgroundother])	
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	RAB SSR	([Number of successful RAB establishment in the CS domain for conversational services]+[Number of successful RAB establishment in the CS domain for streaming services]+[Number of successful RAB establishment in the CS domain for interactive services]+[Number of successful RAB establishment in the CS domain for background services]+[Number of successful RAB establishment in the PS domain for conversational services]+[Number of successful RAB establishment in the PS domain for streaming services]+[Number of successful RAB establishment in the PS domain for interactive services]+[Number of successful RAB establishment in the PS domain for background services])/([Number of RAB establishment attempts in the CS domain for conversational services]+[Number of RAB establishment attempts in the CS domain for streaming services]+[Number of RAB establishment attempts in the CS	(C310100711+C310100733+C310100734+C310100735+C310100736+C310100739+C310100752+C310100768)/(C310090252+C310090274+C310090275+C310090276+C310090277+C310090280+C310090293+C310090309)
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		domain for interactive services]+[Number of	
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		RAB establishment attempts in the CS domain for background services]+[Number of RAB establishment attempts in the PS domain for conversational services]+[Number of RAB establishment attempts in the PS domain for streaming services]+[Number of RAB establishment attempts in the PS domain for interactive services]+[Number of RAB establishment attempts in the PS domain for background services])	
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RRC Congestion	[Number of RRC connection rejections due to congestion]/([Number of RRC connection attempts due to originating conversational calls]+[Number of RRC connection attempts due to originating streaming calls]+[Number of RRC connection attempts due to originating interactive calls]+[Number of RRC connection attempts due to originating background calls]+[Number of RRC connection attempts due to originating customized calls]+[Number of RRC connection attempts due to originating high-priority signaling]+[Number of RRC connection attempts due to originating low-priority signaling]+[Number of RRC connection attempts due to terminating conversational calls]+[Number of RRC connection attempts due to terminating streaming calls]+[Number of RRC connection attempts due to terminating interactive	C310555130/((C310080001+C310080002+C310080003+C310080004+C310080005+C310080006+C310080007+C310080008+C310080009+C310080010+C310080011+C310080012+C310080013+C310080014+C310080015+C310080016+C310080017+C310080018+C310080019+C310080020+C310080021+C310080022)(C310080023+C310080024+C310080025+C310080026+C310080027+C310080028+C310080029+C310080030+C310080031+C310080032+C310080033+C310080034+C310080035+C310080036+C310080037+C310080038+C310080039+C310080040+C310080041+C310080042+C310080043+C310080044))
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		calls]+[Number of RRC connection attempts due to terminating background calls]+[Number of	
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		RRC connection attempts due to terminating high-priority signaling]+[Number of RRC connection attempts due to terminating low-priority signaling]+[Number of RRC connection attempts due to terminating calls with unknown causes]+[Number of RRC connection attempts due to registration]+[Number of RRC connection attempts due to emergency calls]+[Number of RRC connection attempts due to inter-RAT cell reselection]+[Number of RRC connection attempts due to inter-RAT cell change order]+[Number of RRC connection attempts due to detachment]+[Number of RRC connection attempts due to call reestablishment]+[Number of RRC connection attempts due to MBMS reception]+[Number of RRC connection attempts due to MBMS PTP RB requests)]-(Number of repeated RRC connection attempts due to originating conversational calls)+[Number of repeated RRC connection attempts due to originating streaming calls]+[Number of	
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		repeated RRC connection attempts due to originating interactive calls]+[Number of repeated RRC connection attempts due to originating background calls]+[Number of repeated RRC connection attempts due to originating customized calls]+[Number of repeated RRC connection attempts due to originating high-priority signaling]+[Number of repeated RRC connection attempts due to originating lowpriority signaling]+[Number of repeated RRC connection attempts due to terminating conversational calls]+[Number of repeated RRC connection attempts due to terminating streaming calls]+[Number of repeated RRC connection	
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		attempts due to terminating interactive calls]+[Number of repeated RRC connection attempts due to terminating background calls]+[Number of repeated RRC connection attempts due to terminating high-priority signaling]+[Number of repeated RRC connection attempts due to terminating low-priority	
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		signaling]+[Number of repeated RRC connection attempts due to terminating calls with unknown causes]+[Number of repeated RRC connection attempts due to registration]+[Number of repeated RRC connection attempts due to emergency calls]+[Number of repeated RRC connection attempts due to inter-RAT cell reselection]+[Number of repeated RRC connection attempts due to inter-RAT cell change order]+[Number of repeated RRC connection attempts due to detachment]+[Number of repeated RRC connection attempts due to call re-establishment]+[Number of repeated RRC connection attempts due to MBMS reception]+[Number of repeated RRC connection attempts due to MBMS PTP RB requests]))	
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	CS RAB Congestion	([Number of failed RAB assignment setup for the CS domain due to code resource congestion]+[Number of failed RAB assignment setup for the CS domain due to downlink CE congestion]+[Number of failed RAB assignment setup for the CS domain due to uplink CE congestion]+[Number of failed RAB assignment setup for the CS domain due to downlink power resource congestion]+[Number of failed RAB assignment setup for the CS domain due to uplink power resource congestion]+[Number of failed RAB assignment setup for the CS domain due to uplink Iub congestion]+[Number of failed RAB assignment setup for the CS domain due to downlink Iub congestion])/([Number of RAB establishment attempts in the CS domain for conversational services]+[Number of RAB establishment attempts in the CS domain for streaming services]+[Number of RAB establishment attempts in the CS domain for interactive services]+[Number of RAB establishment attempts in the CS domain for background services])	(C310110336+C310110337+C310110340+C310110338+C310110341+C310110360+C310110361)/(C310090252+C310090274+C310090275+C310090276)
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	Soft Handover Success Rate	$\frac{([Number\ of\ attempts\ of\ active-set\ update\ for\ cell\ addition\ in\ the\ case\ of\ softer\ handover] + [Number\ of\ attempts\ of\ activeset\ update\ for\ cell\ addition\ in\ the\ case\ of\ soft\ handover] + [Number\ of\ attempts\ of\ activeset\ update\ for\ cell\ deletion\ in\ the\ case\ of\ softer\ handover] + [Number\ of\ attempts\ of\ activeset\ update\ for\ cell\ deletion\ in\ the\ case\ of\ soft\ handover] + [Number\ of\ attempts\ of\ activeset\ update\ for\ cell\ deletion\ in\ the\ case\ of\ soft\ handover\ over\ the\ Iur\ interface] + [Number\ of\ attempts\ of\ activeset\ update\ for\ cell\ deletion\ in\ the\ case\ of\ soft\ handover\ over\ the\ Iur\ interface]) \times 100}{([Number\ of\ failed\ active-set\ updates\ for\ cell\ addition\ due\ to\ unsupported\ configuration] + [Number\ of\ failed\ active-set\ updates\ for\ cell\ addition\ due\ to\ physical\ channel\ failures] + [Number\ of\ failed\ active-set\ updates\ for\ cell\ addition\ due\ to\ incompatible\ simultaneous\ reconfiguration] + [Number\ of\ failed\ activeset\ updates\ for\ cell\ addition\ due\ to\ compression\ mode]) + ([Number\ of\ active-set\ update\ for\ cell\ addition\ in\ the\ case\ of\ softer\ handover] + [Number\ of\ attempts\ of\ activeset\ update\ for\ cell\ addition\ in\ the\ case\ of\ soft\ handover] + [Number\ of\ attempts\ of\ activeset\ update\ for\ cell\ deletion\ in\ the\ case\ of\ softer\ handover] + [Number\ of\ attempts\ of\ activeset\ update\ for\ cell\ deletion\ in\ the\ case\ of\ soft\ handover] + [Number\ of\ attempts\ of\ activeset\ update\ for\ cell\ deletion\ in\ the\ case\ of\ soft\ handover\ over\ the\ Iur\ interface] + [Number\ of\ attempts\ of\ activeset\ update\ for\ cell\ deletion\ in\ the\ case\ of\ soft\ handover\ over\ the\ Iur\ interface])}$	$\frac{((C310322216 + C310322217 + C310322218 + C310322232 + C310322233 + C310322234) + (C310322222 + C310322223 + C310322224 + C310322225 + C310322226 + C310322227 + C310322230 + C310322231 + C310322235 + C310322236 + C310322237 + C310322238 + C310322239 + C310322240 + C310322243 + C310322244)) \times 100}{(C310322216 + C310322217 + C310322218 + C310322232 + C310322233 + C310322234)}$
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		errors]+[Number of failed active-set updates for cell	
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		addition due to protocol errors]+[Number of failed active-set updates for cell addition due to cell update]+[Number of failed active-set updates for cell addition due to no reply]+[Number of failed active-set updates for cell addition due to other causes]+[Number of failed active-set updates for cell deletion due to unsupported configuration]+[Number of failed active-set updates for cell deletion due to physical channel failures]+[Number of failed active-set updates for cell deletion due to incompatible simultaneous reconfiguration]+[Number of failed active-set updates for cell deletion due to compression mode errors]+[Number of failed active-set updates for cell deletion due to protocol errors]+[Number of failed active-set updates for cell deletion due to cell update]+[Number of failed active-set updates for cell deletion due to no reply]+[Number of failed active-set updates for cell deletion due to other	
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		causes]))/([Number of attempts of active-set	
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		update for cell addition in the case of softer handover]+[Number of attempts of activeset update for cell addition in the case of soft handover]+[Number of attempts of activeset update for cell addition in the case of soft handover over the Iur interface]+[Number of attempts of activeset update for cell deletion in the case of softer handover]+[Number of attempts of activeset update for cell deletion in the case of soft handover]+[Number of attempts of activeset update for cell deletion in the case of soft handover over the Iur interface])	
	Cell Availability	[Service time of the cell(s)]/(NO*Gr)	C310464560/(NO*Gr)
4G	RRC Connection Setup Success Rate		P311130/(C373200000+C373200004+C373200008+C373200012+C373200016+C373200120+C373200001+C373200002+C373200003+C373200005+C373200006+C373200007+C373200009+C373200010+C373200011+C373200013+C373200014+C373200015+C373200017+C373200018+C373200019+C373200121+C373200122+C373200123+C373200152+C373200153+C373200154+C373200155)

	E-RAB Setup Success Rate		$\frac{P311149}{(C373505473+C373505474+C373505475+C373505476+C373505477+C373505478+C373505479+C373210589+C373505481+C373505482+C373505483+C373505484+C373505485+C373505486+C373505487+C373210599)}$
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	Accessibility (SSSR %)		$\frac{(P311130/(C373200000+C373200004+C373200008+C373200012+C373200016+C373200120+C373200001+C373200002+C373200003+C373200005+C373200006+C373200007+C373200009+C373200010+C373200011+C373200013+C373200014+C373200015+C373200017+C373200018+C373200019+C373200121+C373200122+C373200123+C373200152+C373200153+C373200154+C373200155)) \times (P311149/(C373505473+C373505474+C373505475+C373505476+C373505477+C373505478+C373505479+C373210589+C373505481+C373505482+C373505483+C373505484+C373505485+C373505486+C373505487+C373210599))}{1}$
	Intra-Frequency Handover Out Success Rate		$\frac{(C373250980+C373261280+C373271580)/(C373250980+C373250981+C373250982+C373250983+C373250989+C373250901+C373250902+C373250903+C373250988+C373261280+C373261281+C373261282+C373261283+C373261201+C373261202+C373261203+C373261204+C373261289+C373261294+C373271580+C373271581+C373271582+C373271583+C373271501+C373271502+C373271503+C373271504+C373271588+C373271593)}$

	LTE HOSR (Intra Freq + Inter Freq)		$[(C373281880+C373292180+C373302480)/(C373281800+C373281801+C373281802+C373281803+C373281888+C373292192+C373302491)]*100$
	CSFB Prepara tion Success		$(C373576600+C373576607+C373576614)/(C373220644+C373220647+C373220650+C373220653)$
	Rate (%)		
	Service Call drop rate		$((C373200022+C373200023+C373200024+C373200049+C373200051+C373200052+C373200053)/(C373200000+C373200004+C373200008+C373200012+C373200016+C373200031+C373200060+C373200066+C373200072+C373200120+C373250984+C373261284+C373271584+C373281884+C373292184+C373302484+C373312704+C373333304+C373200152))*((C373210381+C373210391+C373210421+C373210441+C373210451+C373210511+C373210521+C373505354)/(C373210461+C373240828+C373505473+C373505481+C373546257))$
	E-Utran UE DL Throug hput (kbps)		$(1000*((C374107514*1024)+C374107515)/(C374107516))/1024$

E-Utran UE UL Throug hput (kbps)		$\frac{(1000*((C374107517*1024)+C374107518))}{(C374107519))/1024}$
Cell Availabi lity		$100*((C373230700+C373230706)/(Gr*N O))$

APPENDIX 5

Nokia Siemens KPI counters

2G	CSSR	$100*(((SDCCH_RADIO_FAIL)+(SDCCH_RF_OLD_HO)+(SDCCH_U SER_ACT)+(SDCCH_BCSU_RESET)+(SDCCH_NETW_ACT)+(SDCC H_BTS_FAIL)+(SDCCH_LAPD_FAIL))/((SDCCH_ASSIGN)+((SDCC H_HO_SEIZ)-(SDCCH_ABIS_FAIL_CALL)-(SDCCH_ABIS_FAIL_OLD)-(SDCCH_A_IF_FAIL_CALL)-(SDCCH_A_IF_FAIL_OLD))))*((SDCCH_BUSY_ATT)-(TCH_SEIZ_DUE_SDCCH_CON))/(SDCCH_SEIZ_ATT))*(((MS_TCH _SUCC_SEIZ_ASSIGN_CMPLT)+(MSC_I_SDCCH_TCH)+(BSC_I_SD CCH_TCH))/((TCH_NORM_SEIZ)+(MSC_I_SDCCH_TCH_AT)+(BSC _I_SDCCH_TCH_AT)))$
	SDCC H Cong	$100*(((SDCCH_BUSY_ATT)-(TCH_SEIZ_DUE_SDCCH_CON))/(SDCCH_SEIZ_ATT))$

	Drop Call Rate TCH	$100*(((DROP_AFTER_TCH_ASSIGN)-(TCH_RE_EST_RELEASE))/((TCH_NEW_CALL_ASSIGN)+(MSC_I_ TCH_TCH)+(BSC_I_TCH_TCH)-(MSC_O_TCH_TCH)(BSC_O_TCH_TCH)+(MSC_HO_WCDMA_RAN_SUCC)))$
	TCH Conge stion	$100*(((TCH_CALL_REQ-TCH_NORM_SEIZ)-(MSC_O_SDCCH_TCH+HO.BSC_O_SDCCH_TCH+CELL_SDCCH_T CH)+(TCH_SUCC_SEIZ_FOR_DIR_ACC)(TCH_REJ_DUE_REQ_CH_A_IF_CRC-(BSC_I_UNSUCC_A_INT_CIRC_TYPE+MSC_CONTROLLED_IN_H O+HO_UNSUCC_A_INT_CIRC_TYPE))))/(TCH_CALL_REQ-(TCH_REJ_DUE_REQ_CH_A_IF_CRC-(BSC_I_UNSUCC_A_INT_CIRC_TYPE+MSC_CONTROLLED_IN_H O+HO_UNSUCC_A_INT_CIRC_TYPE))))$
	Hando ver Succes s Rate	$100*(MSC_O_SUCC_HO+BSC_O_SUCC_HO+HO.CELL_SUCC_HO) / (MSC_O_HO_CMD+BSC_O_HO_CMD_ASSGN+BTS_HO_ASSGN)$

	TCH Availability	$100 * (((\text{AVE_AVAIL_TCH_SUM} / \text{AVE_AVAIL_TCH_DEN}) + (\text{AVE_GPRS_CHANNELS_SUM} / \text{AVE_GPRS_CHANNELS_DEN}) + (\text{AVE_AVAIL_TCH_SUM} / \text{AVE_AVAIL_TCH_DEN}) + (\text{AVE_GPRS_CHANNELS_SUM} / \text{AVE_GPRS_CHANNELS_DEN})) / ((\text{AVE_AVAIL_TCH_SUM} / \text{AVE_AVAIL_TCH_DEN}) + (\text{AVE_GPRS_CHANNELS_SUM} / \text{AVE_GPRS_CHANNELS_DEN}) + (\text{AVE_NON_AVAIL_TCH_TIMESLOT} / \text{NON_AVAIL_TCH_DENOM})))$
	Cell Availability	$100 * ((60 - (\text{RESAVAIL_BCCH_DOWNTIME} / 60)) / 60)$
3G	CSSR CS	$100 * [((\text{moc_conv_call_atts}) - (\text{moc_conv_call_fails}) + (\text{mtc_conv_call_atts}) (\text{mtc_conv_call_fails}) + (\text{emergency_call_atts}) - (\text{emergency_call_fails}) - (\text{RRC_ACC_REL_MO_CONV}) - (\text{RRC_ACC_REL_MT_CONV}) - (\text{RRC_ACC_REL_EMERGENCY})) / ((\text{moc_conv_call_atts}) + (\text{mtc_conv_call_atts}) + (\text{emergency_call_atts}) - (\text{RRC_ATT_REP_MO_CONV}) - (\text{RRC_ATT_REP_MT_CONV}) - (\text{RRC_ATT_REP_EMERGENCY}) - (\text{RRC_ACC_REL_MO_CONV}) - (\text{RRC_ACC_REL_MT_CONV}) - (\text{RRC_ACC_REL_EMERGENCY})))] * [((\text{rab_acc_comp_cs_voice}) / (\text{rab_stp_att_cs_voice}))]$

	CSSR PS	$100 * [(\text{moc_strea_call_atts} - \text{moc_strea_call_fails} + \text{mtc_strea_call_atts} \text{mtc_strea_call_fails} + \text{moc_high_prior_sign_atts} \text{moc_high_prior_sign_fails} + \text{moc_inter_call_atts} + \text{moc_backg_call_atts} \text{moc_inter_call_fails} - \text{moc_backg_call_fails} + \text{mtc_inter_call_atts} + \text{mtc_backg_call_atts} \text{mtc_inter_call_fails} - \text{mtc_backg_call_fails} - \text{RRC_ACC_REL_INTERACTIVE} - \text{RRC_ACC_REL_MO_BACKGROUND} \text{RRC_ACC_REL_MO_HIGH_PR_SIGN} - \text{RRC_ACC_REL_MO_INTERACTIVE} \text{RRC_ACC_REL_MT_BACKGROUND} \text{RRC_ACC_REL_MT_STREAMING} + \text{RRC.DENOM_ST_TRANS_TIME_PCH_FACH}) / (\text{RRC.ATT_PCH_TO_FACH} + \text{moc_inter_call_atts} + \text{moc_backg_call_atts} + \text{moc_strea_call_atts} + \text{moc_high_prior_sign_atts} + \text{mtc_inter_call_atts} + \text{mtc_backg_call_atts} + \text{mtc_strea_call_atts} + \text{mtc_high_prior_sign_atts} - \text{RRC_ACC_REL_INTERACTIVE} \text{RRC_ACC_REL_MO_BACKGROUND} \text{RRC_ACC_REL_MO_INTERACTIVE} - \text{RRC_ACC_REL_MO_STREAMING} \text{RRC_ACC_REL_MT_BACKGROUND} \text{RRC_ACC_REL_MT_HIGH_PR_SIGN})] * [((\text{rab_acc_comp_ps_inter}) + (\text{RRC.DENOM_ST_TRANS_TIME_PCH_FACH})) / ((\text{rab_stp_att_ps_inter}) + (\text{RRC.ATT_PCH_TO_FACH})) + (\text{SERVLEV.RAB_STP_ATT_PS_BACKG})]$
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DCR CS	$100 * [((\text{rab_act_rel_cs_voice_p_emp}) + (\text{rab_act_fail_cs_voice_iu}) + (\text{rab_act_fail_cs_voice_radio}) + (\text{rab_act_fail_cs_voice_rnc}) + (\text{RAB_ACT_FAIL_CS_VOICE_UE}) + (\text{RAB_ACT_FAIL_CS_VOICE_REL_CS_VOICE_srnc}) + (\text{rab_act_rel_cs_voice_p_emp}) + (\text{RAB_ACT_REL_CS_VOICE_HHO}) + (\text{RAB_ACT_REL_CS_VOICE_GANHO}) + (\text{rab_act_fail_cs_voice_iu}) + (\text{rab_act_fail_cs_voice_radio}) + (\text{rab_act_fail_cs_voice_bts}) + (\text{rab_act_fail_cs_voice_iur}) + (\text{rab_act_fail_cs_voice_rnc}) + (\text{RAB_ACT_FAIL_CS_VOICE_UE}) + (\text{RAB_ACT_FAIL_CS_VOICE_REL_CS_VOICE_srnc}) + (\text{RAB_ACT_REL_CS_VOICE_HHO}) + (\text{RAB_ACT_REL_CS_VOICE_GANHO}))]$
DCR PS	$100 * [((\text{RAB_ACT_FAIL_PS_BACKG_TRANS}) + (\text{RAB_ACT_FAIL_PS_INTER_TRANS}) + (\text{rab_act_fail_ps_inter_iu}) + (\text{rab_act_fail_ps_inter_radio}) + (\text{rab_act_fail_ps_inter_rnc}) + (\text{rab_act_fail_ps_backg_iu}) + (\text{rab_act_fail_ps_backg_radio}) + (\text{rab_act_fail_ps_backg_bts}) + (\text{RAB_ACT_FAIL_PS_BACKG_UE}) + (\text{RAB_ACT_FAIL_PS_INTER_UE}) - (\text{RAB_ACT_FAIL_PS_BACKG_PCH}) - (\text{RAB_ACT_FAIL_PS_INT_PCH})) / ((\text{rab_act_comp_ps_inter}) + (\text{rab_act_comp_ps_backg}) + (\text{rab_act_comp_ps_inter_rnc}) + (\text{RAB_ACT_REL_PS_INTER_ISHO}) + (\text{rab_act_rel_ps_backg_srnc}) + (\text{RAB_ACT_REL_PS_INTER_ISHO}) + (\text{rab_act_fail_ps_inter_iu}) + (\text{rab_act_fail_ps_inter_radio}) + (\text{rab_act_fail_ps_inter_bts}) + (\text{rab_act_fail_ps_inter_iur}) + (\text{rab_act_fail_ps_inter_rnc}) + (\text{rab_act_fail_ps_backg_iu}) + (\text{rab_act_fail_ps_backg_radio}) + (\text{rab_act_fail_ps_backg_bts}) + (\text{rab_act_fail_ps_backg_iur}) + (\text{rab_act_fail_ps_backg_rnc}))]$

	$(\text{rnc}) + (\text{RAB_ACT_FAIL_PS_BACKG_UE}) + (\text{RAB_ACT_FAIL_PS_INTER_UE}) + (\text{RAB_ACT_FAIL_PS_INTER_TRANS}) + (\text{RAB_ACT_FAIL_PS_BACKG_TRANS}) - (\text{RAB_ACT_FAIL_PS_BACKG_PCH}) - (\text{RAB_ACT_FAIL_PS_INT_PCH})]$
RAB SSR CS	$100 * [((\text{rab_acc_comp_cs_voice}) / (\text{rab_stp_att_cs_voice}))]$
RAB SSR PS	$100 * [((\text{rab_acc_comp_ps_inter}) + (\text{RRC.DENOM_ST_TRANS_TIME_PC_H_FACH}) + (\text{SERVLEV.rab_acc_comp_ps_backg})) / ((\text{rab_stp_att_ps_inter}) + (\text{RRC.ATT_PCH_TO_FACH}) + (\text{SERVLEV.RAB_STP_ATT_PS_BACKG}))]$
RRC Congestion	$\text{RRC_CONN_STP_FAIL_AC_UL} + \text{RRC_CONN_STP_FAIL_AC_DL} + \text{RRC_CONN_STP_FAIL_AC_COD} + \text{PS_SETUP_FAIL_AC_DL_NRT} + \text{PS_SETUP_FAIL_AC_UL_NRT} + \text{PS_SETUP_FAIL_AC_COD_NRT}$

	CS RAB Conge stion	RAB_STP_FAIL_CS_VOICE_AC_UL+RAB_STP_FAIL_CS_VOICE_A C_DL+RAB_STP_FAIL_CS_VOICE_AC_COD
	Soft Hando ver Succes s Rate	$100 * [(succ_updates_on_sho_for_rt + succ_updates_on_sho_for_nrt) / (cell_add_req_on_sho_for_rt + cell_del_req_on_sho_for_rt + cell_repl_req_on_sho_for_rt + cell_add_req_on_sho_for_nrt + cell_del_req_on_sho_for_nrt + cell_repl_req_on_sho_for_nrt)]$
	Cell Availa bility	$100 * [(avail_wcell_in_wo_state) / (avail_wcell_exists_in_rnw_dbavail_wcell_blocked_by_user)]$
4G	RRC Conne ction Setup Succes s Rate	$RCC\ Con\ SSR = (RRC\ connection\ setup\ completions / RRC\ connection\ requests) * 100\%$ $100 * sum([M8013C5]) / sum([M8013C17] + [M8013C18] + [M8013C19] + [M8013C21] + [M8013C31] + [M8013C34] + [M8013C93] + [M8013C91])$
	ERAB Setup Succes s Rate	$(100 * sum([EPS_BEARER_SETUP_COMPLETIONS]) / sum([EPS_BEARER_SETUP_ATTEMPTS]))$
	Access ibility (SSSR %)	Accessibility (SSSR %): RRC Connection Setup Success Rate * E-RAB Setup Success Rate $Accessibility\ (SSSR\ \%) = [(RRC\ connection\ setup\ completions / RRC\ connection\ requests) * 100\%$ $100 * sum([M8013C5]) / sum([M8013C17] + [M8013C18] + [M8013C19] + [M8013C21] + [M8013C31] + [M8013C34] + [M8013C93] + [M8013C91])$ $* [(100 * sum([EPS_BEARER_SETUP_COMPLETIONS]) / sum([EPS_BEARER_SETUP_ATTEMPTS]))]$

LTE HOSR (Intra Freq + Inter Freq)		$100 * decode((nvl(LIANBHO.ATT_INTRA_ENB_HO,0) + nvl(LIENBHO.ATT_INTER_ENB_HO,0) + nvl(LIENBHO.INTER_ENB_S1_HO_ATT,0)),$ $0, (nvl(LIANBHO.ATT_INTRA_ENB_HO,0) + nvl(LIENBHO.ATT_INTER_ENB_HO,0) + nvl(LIENBHO.INTER_ENB_S1_HO_ATT,0)) / (nvl(LIANBHO.ENB_INTRA_HO_B_HO_FAIL,0) + nvl(LIENBHO.INTER_ENB_S1_HO_FAIL,0)) / (nvl(LIANBHO.ATT_INTRA_ENB_HO,0) + nvl(LIENBHO.ATT_INTER_ENB_HO,0) + nvl(LIENBHO.INTER_ENB_S1_HO_ATT,0)))$

CSFB Preparation Success Rate (%)	$100 * ((UE_CTX_SETUP_SUCC_CSFB + UE_CTX_MOD_SUCC_CSFB) / (UE_CTX_SETUP_ATT_CSFB + UE_CTX_MOD_ATT_CSFB))$
Service Call drop rate	$\frac{(100 * \text{sum}([ERAB_REL_HO_PART] + [ERAB_REL_ENB_RNL_INA] - [ERAB_REL_ENB_RNL_RED] - [ERAB_REL_ENB_RNL_PREEM] - [ERAB_REL_TEMP_QCI1] + [ERAB_REL_ENB_INI_S1_GLOB_RESET] + [ERAB_REL_ENB_INI_S1_PART_RESET] + [ERAB_REL_S1_OUTAGE]) / \text{sum}([ERAB_REL_ENB] + [ERAB_REL_HO_PART] + [EPC_EPS_BEARER_REL_REQ_NORM] + [EPC_EPS_BEARER_REL_REQ_DETACH] + [EPC_EPS_BEARER_REL_REQ_RNL] + [EPC_EPS_BEARER_REL_REQ_OTH] + [ERAB_REL_EPC_PATH_SWITCH] - [ERAB_REL_TEMP_QCI1] + [ERAB_REL_SUCC_HO_UTRAN] + [ERAB_REL_SUCC_HO_GERAN] + [ERAB_REL_ENB_INI_S1_GLOB_RESET] + [ERAB_REL_MME_INI_S1_GLOB_RESET] + [ERAB_REL_ENB_INI_S1_PART_RESET] + [ERAB_REL_MME_INI_S1_PART_RESET] + [ERAB_REL_S1_OUTAGE]))}{100}$
E-Utran UE DL Throug hput (kbps)	$\frac{\text{sum}([IP_TPUT_VOL_DL_QCI_5] + [IP_TPUT_VOL_DL_QCI_6] + [IP_TPUT_VOL_DL_QCI_7] + [IP_TPUT_VOL_DL_QCI_8] + [IP_TPUT_VOL_DL_QCI_9])}{\text{sum}([IP_TPUT_TIME_DL_QCI_5] + [IP_TPUT_TIME_DL_QCI_6] + [IP_TPUT_TIME_DL_QCI_7] + [IP_TPUT_TIME_DL_QCI_8] + [IP_TPUT_TIME_DL_QCI_9])} * 100$
E-Utran UE UL Throug hput (kbps)	$\frac{((IP_TPUT_VOL_UL_QCI_5 + IP_TPUT_VOL_UL_QCI_6 + IP_TPUT_VOL_UL_QCI_7 + IP_TPUT_VOL_UL_QCI_8 + IP_TPUT_VOL_UL_QCI_9) / ((IP_TPUT_TIME_UL_QCI_5 + IP_TPUT_TIME_UL_QCI_6 + IP_TPUT_TIME_UL_QCI_7 + IP_TPUT_TIME_UL_QCI_8 + IP_TPUT_TIME_UL_QCI_9))) * 100}$
Cell Availa bility	$(100 * \text{sum}([SAMPLES_CELL_AVAIL]) / \text{sum}([DENOM_CELL_AVAIL]))$