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Speech and multimedia Transmission Quality (STQ);
Reference benchmarking,
background traffic profiles and KPIs;
Part 3: Reference benchmarking, background traffic profiles and KPIs for UMTS, VoLTE and VoNR

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Speech and multimedia Transmission Quality (STQ).

The present document is part 3 of a multi-part deliverable covering the Reference benchmarking, background traffic profiles and KPIs, as identified below:

Part 1: "Reference benchmarking, background traffic profiles and KPIs for VoIP and FoIP in fixed networks";

Part 2: "Reference benchmarking and KPIs for High speed internet";

Part 3: "Reference benchmarking, background traffic profiles and KPIs for UMTS, VoLTE and VoNR";

Part 4: "Reference benchmarking for IPTV, Web TV and RCS-e Video Share".

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Introduction

The present document describes the reference benchmarking, background traffic profiles and key performance Indicators for UMTS, VoLTE and VoNR.

1 Scope

The present document contains KPIs that may be used for UMTS, VoLTE and VoNR as well as framework requirements for reference benchmarking particularly with regard to background traffic profiles.

The offer of new NGN services requires new:

- KPIs;
- QoS measurement; and
- benchmarking methods;

which are needed to ensure the quality of new services. To ensure the comparability of test results, reference benchmarking methods and background traffic load profiles are needed.

The present document:

- identifies and defines possible key performance indicators for voice and fax telephony services;
- defines benchmarking methods for the spectrum of potential applications.

The scope of the defined testing procedures is the evaluation of the network access by VoIP and FoIP for mobile - network services. The measurements are conducted between a mobile device to a measurement point which can be a mobile device or a device emulating an idealized termination point in the core network. All access technologies offered by the operator under test are considered. In this context the measurements and key performance indicators determinations are performed by analysing signals accessible on the network.

The present document is not intended to overlap with the scope of the series ETSI TS 102 250 [i.3]. Measurements described in that series are not affected by the provisions of the present document.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found in the ETSI docbox.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1] Void.

[2] ETSI TS 102 250-2 (V2.3.1): "Speech and multimedia Transmission Quality (STQ); QoS aspects for popular services in mobile networks; Part 2: Definition of Quality of Service parameters and their computation".

[3] ETSI TS 101 563 (V1.2.1): "Speech and multimedia Transmission Quality (STQ); IMS/PES exchange performance requirements".

[4] Recommendation ITU-T Q.543 (1993): "Digital exchange performance design objectives".

[5] ETSI TS 103 222-1: "Speech and multimedia Transmission Quality (STQ); Reference benchmarking, background traffic profiles and KPIs; Part 1: Reference benchmarking, background traffic profiles and KPIs for VoIP and FoIP in fixed networks".

[6] ETSI TBR 003 ed.1 (11-1995):"Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN basic access".

[7] ETSI TBR 004 ed.1 (11-1995):"Integrated Services Digital Network (ISDN); Attachment requirements for terminal equipment to connect to an ISDN using ISDN primary rate access".

[8] Recommendation ITU-T P.863 (03/2018): "Perceptual objective listening quality prediction".

[9] Recommendation ITU-T P.863.1 (06/2019): "Application guide for Recommendation ITU-T P.863".

[10] ETSI TS 102 425 (V1.1.1): "Speech and multimedia Transmission Quality (STQ); Digital reference point for speech communication in packet based networks".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] Void.

[i.1] ETSI EG 202 057-2: "Speech and multimedia Transmission Quality (STQ); User related QoS parameter definitions and measurements; Part 2: Voice telephony, Group 3 fax, modem data services and SMS".

[i.2] ETSI TS 102 250 (all parts): "Speech and multimedia Transmission Quality (STQ); QoS aspects for popular services in mobile networks".

[i.3] ITU-T Circular Letter 141 (2023): "Proposed deletion of Recommendations ITU-T P.862, P.862.1, P.862.2 and P.862.3 agreed to by ITU-T SG12 at its meeting in Mexico City, 19-28 September 2023".

[i.4] ITU-T Circular Letter 169 (2024): "Deletion of Recommendations ITU-T P.862, P.862.1, P.862.2 and P.862.3".

[i.5] Recommendation ITU-T E.800 (2008): "Definitions of terms related to quality of service".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the following term given in Recommendation ITU-T E.800 [i.5] applies:

benchmark: evaluation of performance value/s of a parameter or set of parameters for the purpose of establishing value/s as the norm against which future performance achievements may be compared or assessed

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AGCF	Access Gateway Control Function
AMF	Access and Mobility management Function
BRI	Basic Rate Interface
BST	Broadband Speed Test
CCCH	Common Control CHannel
CFNR	Call Forwarding No Reply
CFNRc	Call Forwarding Not Reachable
CS	Circuit Switched
CSFB	Circuit Switched Fall Back
CST	Call Setup Time
DTMF	Dual-Tone Multi-Frequency signalling
EPC	Evolved Packet Core
EPS	Evolved Packet System
ESM	EPS Session Management
E-UTRA	Evolved UMTS Terrestrial Radio Access
FB	Fullband
FoIP	Fax over IP
gNB	gNodeB
gNodeB	Next-Generation Node B
GSM	Global System for Mobile communications
GSMA	GSM Association
HGW	Home Gateway
IAD	Integrated Access Device
IMS	Internet Multimedia Subsystem
IMS-VoPS-N3GPP	IMS Voice over PS session over Non-3GPP access
IP	Internet Protocol
IPTV	IP Television
ISDN	Integrated Services Digital Network
ITU-T	Telecommunication standardization sector of the International Telecommunications Union
KPI	Key Performance Indicator
LTE	Long Term Evolution
MME	Mobility Management Entity
MMTel	MultiMedia Telephony service
MO	Mobile Originated
MOS	Mean Opinion Score
MOS-LQxF	MOS Listening Quality Fullband (either from Objective, Subjective or Estimation assessment)
MT	Mobile Terminated
NGN	New Generation Network
NNI	Network Network Interface
NR	New Radio
PES	PSTN/ISDN Emulation Subsystem
PRI	Primary Rate Interface
PS	Packet Service
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RACH	Random Access CHannel
RAT	Radio Access Technology
RCS	Rich Communication Services
RRC	Radio Resource Control
SBC	Session Border Controller
SIP	Session Initiation Protocol
TV	Television
UMTS	Universal Mobile Telecommunications System
UNI	User Network Interface
VGW	Voice GateWay
Vo5G	Voice over 5G
VoIP	Voice over IP

VoLTE	Voice over LTE
VoNR	Voice over LTE New Radio
VoPS	Voice over Packet Switched

4 Management Summary

4.1 Introduction

The spectrum of potential applications of a benchmarking platform requires measurements including but not limited to the following: analogue (a/b), ISDN, VoIP (including SIP trunking), high-speed internet, UMTS, VoLTE and VoNR.

The performance data which are collected will be relevant for a real-world environment encompassing a mix of technologies. This approach ensures that service quality is evaluated from a customers' point of view, since all system components involved in an end-to-end connection are incorporated into the test.

4.2 Scope of functionality

A benchmarking platform can be distributed across a larger region or an entire country. In this case several server systems should be also part of the setup, including: a business intelligence platform; a data warehouse, a management system and a system for evaluating of media (e.g. video, audio and voice) quality.

The measurement systems at the **user premises** are connected electrically to VoLTE and UMTS.

The test system (QoS control and data server) is connected through UMTS, LTE, 5G or ISDN connections (via IMS PES with AGCF (or PSTN or ISDN Access) or IMS PES with VGW) or MMTel (IMS) fixed access lines for voice quality measurements.

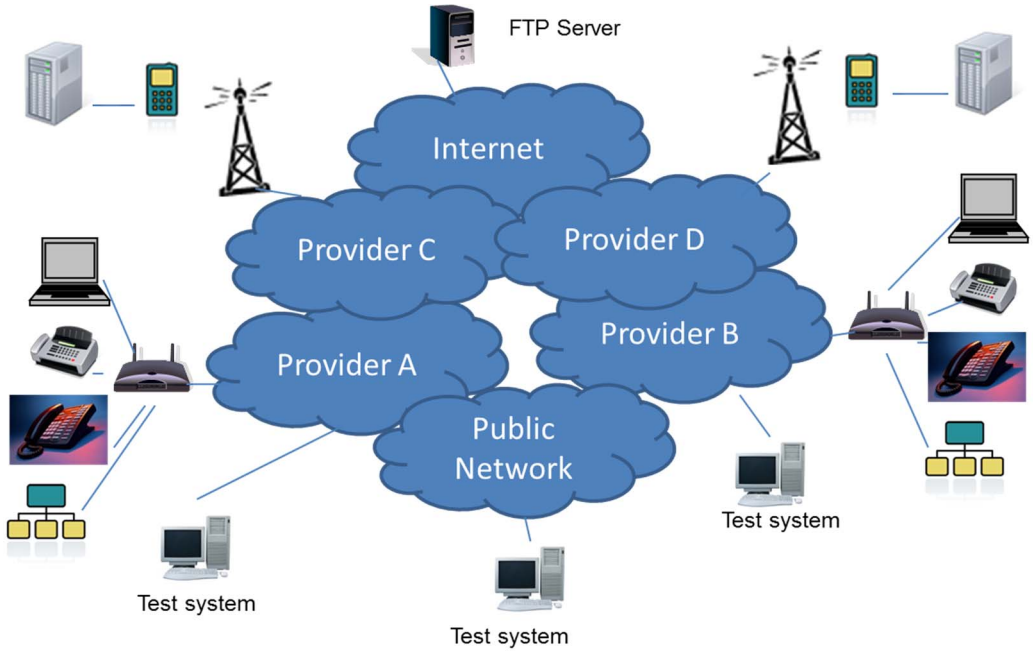

Figure 1: Setup of the benchmarking platform

5 Technical concept

5.1 Introduction

The conduction of voice quality measurements is following the guidelines given in ETSI EG 202 057-2 [i.1], Recommendation ITU-T Q.543 [4], ETSI TS 101 563 [3] and ETSI TS 102 250-2 [2].

5.2 Network side measurements in mobile networks

The conduction of voice quality measurements is following the descriptions that can be found in ETSI EG 202 057-2 [i.1], Recommendation ITU-T Q.543 [4], ETSI TS 101 563 [3] and ETSI TS 102 250-2 [2], clauses 6.6.3.1 and 6.6.3.2. In contrast to clause 6.6.32 of [2] there is no longer a choice between the use of methods according to Recommendations ITU-T P.862 / P.862.1 and Recommendation ITU-T P.863 since Recommendations ITU-T P.862.x have been withdrawn, see ITU-T [i.3], [i.4]. Therefore, the use of methods complying with Recommendation P.863 [8] is mandatory in the present context.

The access points of the test equipment which are used for inserting or retrieving the signals needed for determining the speech quality parameters shall conform to the reference characteristics as laid down in the following relevant standards:

- ETSI TS 102 425 [10] for VoIP access;
- ETSI TBR 003 [6] for analogue access and ISDN BRI access;
- ETSI TBR 004 [7] for ISDN PRI access.

The following KPI values are recorded as part of the voice quality measurements.

Table 1: Overview of Quality characteristics for voice quality measurements

Overview of quality benchmarking for voice quality measurements	
1.	Call setup delay [4] and session initiation call setup delay [3], see clause 5.3
2.	Call setup time (Post Dialling Delay) [5], see clause 5.4
3.	Premature release probability (Call Failure Rate), see clause 5.4 in ETSI TS 103 222-1 [5]
4.	Telephony Cut-off Call Ratio [%] (Call drop rate), see clause 5.5 in ETSI TS 103 222-1 [5]
5.	Media establishment delay, see clause 5.6 in ETSI TS 103 222-1 [5]
6.	Level of active speech signal, see clause 5.7 in ETSI TS 103 222-1 [5]
7.	Noise level, see clause 5.8 in ETSI TS 103 222-1 [5]
8.	Signal to Noise ratio, see clause 5.9 in ETSI TS 103 222-1 [5]
9.	Speech signal attenuation, see clause 5.10 in ETSI TS 103 222-1 [5]
10.	Talker echo delay, see clause 5.11 in ETSI TS 103 222-1 [5]
11.	Double talk, see clause 5.12 in ETSI TS 103 222-1 [5]
12.	Interrupted voice transmission, see clause 5.13 in ETSI TS 103 222-1 [5]
13.	Listening speech quality, see clause 5.5
14.	Listening speech quality stability, see clause 5.15 in ETSI TS 103 222-1 [5]
15.	End-to-end audio delay, see clause 5.16 in ETSI TS 103 222-1 [5]
16.	End-to-end audio delay variation, see clause 5.17 in ETSI TS 103 222-1 [5]
17.	Frequency response, see clause 5.18 in ETSI TS 103 222-1 [5]
18.	Fax transmission T.30 (Fax, bit rate ≤ 14,4 kbit/s and Fax, bit rate ≥ 14,4 kbit/s), see clause 5.19 in ETSI TS 103 222-1 [5]
19.	Early media, see clause 5.20 in ETSI TS 103 222-1 [5]
20.	Jitter Buffer and IP periodization response time, see clause 5.21 in ETSI TS 103 222-1 [5]

5.3 Call setup delay

The testing methodology is described in ETSI TS 101 563 [3], the trigger points for mobile devices are described in clause 6.6.2 of [2].

Call setup delay is defined as the interval from the instant when the signalling information required for outgoing circuit selection is received from the incoming signalling system until the instant when the corresponding signalling information is passed to the outgoing signalling system.

For ISDN Implementations the call setup delay starts when the SETUP message has been received from the user signalling system. For UMTS implementation the call setup delay starts with the first "RRC CONNECTION REQUEST" with Establishment Cause "Originating Conversational Call" message carried on the CCCH logical channel and mapped to the RACH transport channel is sent.

For VoLTE/VoNR call setup delay is defined as the time in seconds from the sending of the RRCConnectionRequest (if no signalling connection is established) or the ESM Activate dedicated EPS Bearer context request (if occurring before the SIP:INVITE) until the instant when the corresponding INVITE signalling information is passed on the terminating U-u interface to the called user.

For VoIP call setup delay is defined as the interval from the instant when the INVITE signalling information is received from the calling user on the originating Gm interface until the instant when the corresponding INVITE signalling information is passed on the terminating Gm interface to the called user.

Table 2 gives an overview about the call setup delay configurations options for UMTS and VoLTE, Table 3 the call setup time configurations options for VoNR.

5.4 Call setup time

The testing methodology is described in ETSI TS 101 563 [3].

Call Setup Time (CST) is the duration from when a call (INVITE) is made to the time of receiving a 180 ringing (ringing tone). Two measurements methods are used:

- Call setup time measured at MO SBC NNI and MT SBC NNI
- Call setup time measured at MO UNI and MT UNI

Table 2 gives an overview about the call setup time configurations options for UMTS and VoLTE, Table 3 the call setup time configurations options for VoNR.

Table 2: Call setup delay configurations and call setup time configurations for UMTS and VoLTE

	From	To
Call setup Delay and call setup Time configurations	VoLTE	MMTel (IMS) fixed access
	MMTel (IMS) fixed access	VoLTE
	VoLTE	VoLTE
	UMTS	IMS PES with AGCF with AGCF (or PSTN or ISDN Access)
	IMS PES with AGCF with AGCF (or PSTN or ISDN Access)	UMTS
	IMS PES with AGCF with AGCF (or PSTN or ISDN Access)	LTE with CS fallback
	UMTS	IMS PES with VGW
	IMS PES with VGW	UMTS
	IMS PES with VGW	LTE with CS fallback
	UMTS	UMTS
	UMTS	LTE with CS fallback

Table 3: Call setup delay, call setup time and Connections with parallel data transfer configurations for VoNR

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	1	5G Configuration for Voice Centric and Single-Registration Mode for originating Vo5G calls	5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	Description: • In this use case, the focus is on configuring 5G networks to facilitate Voice over 5G (Vo5G) calls in a voice-centric environment where users are in single-registration mode. Single-registration mode implies that the user's device is registered with only one network at a time. Key Components: • Vo5G Call Termination: The primary objective of this use case is to ensure the smooth termination of Vo5G calls. When a Vo5G call is made to a user in a voice-centric environment, the 5G network is expected to efficiently handle the call termination process. • Voice-Centric Configuration: The configuration of the 5G network is optimized for voice-centric communication. This involves prioritizing voice services to ensure high-quality voice transmission over the network. Single-Registration Mode: • Users are in single-registration mode, meaning their devices are registered with only one network (likely the 5G network in this case). This simplifies network management and ensures seamless handover procedures. Functionality: • When a Vo5G call is initiated towards a user who is registered in single-registration mode on the 5G network, the network identifies the user's location and forwards the call to the appropriate destination. • The network ensures that the call termination process is efficient and reliable, maintaining the quality of the voice communication throughout the call session. • Various network elements, such as base stations, controllers, and gateways, collaborate to facilitate the termination of Vo5G calls in a voice-centric environment.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	2	5G Configuration IMS voice over PS session over non-3GPP access (IMS-VoPS-N3GPP)	5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	Description: This use case focuses on configuring the 5G network to enable IP Multimedia Subsystem (IMS) voice over Packet Switched (PS) session over non-3GPP access. It involves the integration of IMS architecture to facilitate voice communication over packet-switched networks that are not part of the 3rd Generation Partnership Project (3GPP). Key Components: • IMS Integration: The 5G network is configured to integrate IMS architecture, which provides multimedia services, including voice, over IP networks. • Packet Switched Session: Voice communication takes place over packet-switched sessions, ensuring efficient utilization of network resources and supporting IP-based transmission. Functionality: • When a voice call is initiated by a user, the 5G network establishes an IMS session over the packet-switched network, ensuring end-to-end IP connectivity for voice transmission. • The IMS architecture handles session establishment, signalling, and media negotiation to facilitate voice communication between users. • Non-3GPP access networks, such as Wi-Fi® or WiMAX, are utilized for transporting voice packets, providing flexibility and extending voice services to diverse network environments.
	3	5G Configuration for Voice Centric and Single-Registration Mode for originating Vo5G calls	5G Configuration IMS voice over PS session over non-3GPP access (IMS-VoPS-N3GPP)	Description: • The setting involves the implementation of a 5G configuration tailored specifically for voice-centric operations, utilizing a single-registration mode to efficiently handle terminating Voice over 5G (Vo5G) calls. This configuration is designed to facilitate IMS (IP Multimedia Subsystem) voice services over Packet-Switched (PS) sessions, particularly over non-3GPP access networks, denoted as IMS-VoPS-N3GPP.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	4	5G Configuration for Voice Centric and Single-Registration Mode for originating Vo5G calls	VoLTE (E-UTRA-NR Dual Connectivity with E-UTRA connected to EPC (GSMA Option#3; E-UTRA-NR Dual Connectivity (EN-DC) is a technology used in 5G networks to enable simultaneous connections to both 4G LTE (Evolved Universal Terrestrial Radio Access) and 5G NR (New Radio) networks)	Calling User (5G Configuration for Voice Centric and Single-Registration Mode): • This user is configured for 5G (fifth-generation) communication. • It is optimized for voice-centric operations, indicating that its primary function is voice calls rather than data. • Single-Registration Mode suggests that the user is registered with a single network at a time, simplifying the registration process and potentially enhancing efficiency. Terminating User (VoLTE): • This user supports Voice over LTE (VoLTE), which means it can handle voice calls over a 4G Long-Term Evolution (LTE) network. • It utilizes E-UTRA-NR Dual Connectivity, which involves simultaneous connection to both LTE (E-UTRA) and 5G New Radio (NR) networks. • The LTE component of this connectivity setup is connected to the Evolved Packet Core (EPC) network, following GSMA Option#3 specifications. Global System for Mobile Communications Association (GSMA) Options define interoperability and interface standards for mobile networks.
	5	VoLTE (E-UTRA-NR Dual Connectivity with E-UTRA connected to EPC (GSMA Option#3)	5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	Terminating User (VoLTE): • This user supports Voice over LTE (VoLTE), indicating its capability to handle voice calls over a 4G Long-Term Evolution (LTE) network. • It utilizes E-UTRA-NR Dual Connectivity, which means it can simultaneously connect to both LTE (E-UTRA) and 5G New Radio (NR) networks. • The LTE component of this connectivity setup is connected to the Evolved Packet Core (EPC) network, following GSMA Option#3 specifications. GSMA Options define interoperability and interface standards for mobile networks. Origination User (5G Configuration for Voice Centric and Single-Registration Mode): • This user is configured for 5G (fifth-generation) communication. • It is optimized for voice-centric operations, indicating that its primary function is voice calls rather than data. • Single-Registration Mode suggests that the user is registered with a single network at a time, simplifying the registration process and potentially enhancing efficiency. • Specifically configured for originating Vo5G calls, meaning it is setup to initiate voice calls over a 5G network.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	6	5G Configuration for Voice Centric and Dual Registration Mode for originating Vo5G calls	5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	Description: • This use case pertains to configuring the 5G network to support originating Vo5G calls in a voice-centric environment where users operate in dual registration mode. Dual registration mode implies that the user's device is simultaneously registered with multiple networks for redundancy or load balancing purposes. Key Components: • Vo5G Call Origination: The primary objective is to enable users to initiate Vo5G calls seamlessly from their devices, ensuring efficient call setup and transmission. • Voice-Centric Configuration: The network is configured to prioritize voice services, ensuring high-quality voice transmission over the 5G infrastructure. Dual Registration Mode: • Users' devices are registered with multiple networks simultaneously, providing redundancy and load balancing capabilities. Functionality: • When a user initiates a Vo5G call from a device operating in dual registration mode, the 5G network identifies the most suitable network for call setup based on factors such as network availability, quality, and user preferences. • The network establishes the Vo5G call session, ensuring end-to-end connectivity for voice transmission while prioritizing voice traffic over other data types. • Dual registration mode allows for seamless handover between different networks during the call session, ensuring continuity and quality of service.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	7	5G Configuration for Voice Centric and Dual Registration Mode for originating Vo5G calls	VoLTE (E-UTRA-NR Dual Connectivity with E-UTRA connected to EPC (GSMA Option#3)	Origination User (5G Configuration for Voice Centric and Dual Registration Mode): This user is configured for 5G (fifth-generation) communication. It is optimized for voice-centric operations, suggesting that its primary function is voice calls rather than data. Dual Registration Mode indicates that the user is registered with two networks simultaneously, potentially for redundancy or load balancing purposes. Specifically configured for originating Vo5G calls, meaning it is setup to initiate voice calls over a 5G network. Terminating User (VoLTE): • This user supports Voice over LTE (VoLTE), indicating its capability to handle voice calls over a 4G Long-Term Evolution (LTE) network. • It utilizes E-UTRA-NR Dual Connectivity, which means it can simultaneously connect to both LTE (E-UTRA) and 5G New Radio (NR) networks. • The LTE component of this connectivity setup is connected to the Evolved Packet Core (EPC) network, following GSMA Option#3 specifications. GSMA Options define interoperability and interface standards for mobile networks.
	8	VoLTE (E-UTRA-NR Dual Connectivity with E-UTRA connected to EPC (GSMA Option#3)	5G Configuration for Voice Centric and Dual Registration Mode for terminating Vo5G calls	Originating User (VoLTE): • This user supports Voice over LTE (VoLTE), indicating its capability to handle voice calls over a 4G Long-Term Evolution (LTE) network. • It utilizes E-UTRA-NR Dual Connectivity, allowing it to simultaneously connect to both LTE (E-UTRA) and 5G New Radio (NR) networks. • The LTE component of this connectivity setup is connected to the Evolved Packet Core (EPC) network, following GSMA Option#3 specifications. GSMA Options define interoperability and interface standards for mobile networks. Terminating User (5G Configuration for Voice Centric and Dual Registration Mode): • This user is configured for 5G (fifth-generation) communication. • It is optimized for voice-centric operations, suggesting its primary function is voice calls rather than data. • Dual Registration Mode indicates that the user is registered with two networks simultaneously. • Specifically configured for terminating Vo5G calls, meaning it is setup to receive voice calls over a 5G network.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	9	5G Configuration EPS Use Cases for EPS Fallback	5G Configuration: Voice Centric and Single-Registration Mode for terminating Vo5G	When a Vo5G call is initiated within the EPS environment but encounters network degradation or the absence of 5G coverage, the EPS Fallback mechanism is triggered. This mechanism transitions the call to VoLTE, ensuring that voice communication remains uninterrupted. Terminating user is a Voice Centric and Single-Registration Mode User.
	10	5G Configuration EPS Use Cases for EPS Fallback	VoLTE (E-UTRA-NR Dual Connectivity with E-UTRA connected to EPC (GSMA Option#3)	When a Vo5G call is initiated within the EPS environment but encounters network degradation or the absence of 5G coverage, the EPS Fallback mechanism is triggered. This mechanism transitions the call to VoLTE, ensuring that voice communication remains uninterrupted. Terminating user is a VoLTE User.
	11	5G Configuration EPS Use Cases for RAT Fallback	5G Configuration: Voice Centric and Single-Registration Mode for terminating Vo5G	Description: • This use case involves configuring the 5G network to handle Radio Access Technology (RAT) fallback scenarios, specifically when the network needs to fallback to Voice over LTE (VoLTE) for voice communication. RAT fallback occurs when a device loses its 5G connection and needs to revert to LTE for continued service, ensuring uninterrupted voice communication. Key Components: • RAT Fallback Mechanism: The network is equipped with mechanisms to detect instances where devices lose their 5G connectivity and need to fallback to LTE for voice services. • VoLTE Support: VoLTE capabilities are integrated into the network infrastructure, allowing for voice communication over LTE networks with high quality and low latency. • Seamless Handover: The transition from 5G to LTE for voice services is seamless, ensuring continuity of voice calls without disruptions. Functionality: • When a device experiences a loss of 5G connectivity, the network triggers a RAT fallback mechanism to switch the device to LTE for voice communication. • VoLTE services are activated upon fallback, enabling the device to establish voice calls over LTE with the same quality and reliability as Vo5G calls. • Seamless handover procedures are implemented to ensure that ongoing voice calls remain uninterrupted during the transition from 5G to LTE. • Terminating user is a Voice Centric and Single-Registration Mode User.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	12	5G Configuration EPS Use Cases for RAT Fallback	VoLTE (E-UTRA-NR Dual Connectivity with E-UTRA connected to EPC (GSMA Option#3)	Description: This use case involves configuring the 5G network to handle Radio Access Technology (RAT) fallback scenarios, specifically when the network needs to fallback to Voice over LTE (VoLTE) for voice communication. RAT fallback occurs when a device loses its 5G connection and needs to revert to LTE for continued service, ensuring uninterrupted voice communication. Key Components: • RAT Fallback Mechanism: The network is equipped with mechanisms to detect instances where devices lose their 5G connectivity and need to fallback to LTE for voice services. • VoLTE Support: VoLTE capabilities are integrated into the network infrastructure, allowing for voice communication over LTE networks with high quality and low latency. • Seamless Handover: The transition from 5G to LTE for voice services is seamless, ensuring continuity of voice calls without disruptions. Functionality: • When a device experiences a loss of 5G connectivity, the network triggers a RAT fallback mechanism to switch the device to LTE for voice communication. • VoLTE services are activated upon fallback, enabling the device to establish voice calls over LTE with the same quality and reliability as Vo5G calls. • Seamless handover procedures are implemented to ensure that ongoing voice calls remain uninterrupted during the transition from 5G to LTE. • Terminating user is a VoLTE User.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	13	5G Handover (Xn and B2 based)	5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	Description: • This use case involves configuring the 5G network to facilitate handovers between different base stations or gNBs (gNodeBs) using Xn and B2 interfaces. Handover is the process where a mobile device transitions its connection from one base station to another while maintaining an ongoing call or data session. Key Components: • Xn Interface: The Xn interface is used for communication between adjacent gNBs within the same Mobility Management Entity (MME) or Access and Mobility Management Function (AMF) area. It enables the exchange of control and user plane information necessary for seamless handovers. • B2 Interface: The B2 interface facilitates communication between the source gNB and the target gNB during a handover. It allows for the transfer of context information and data packets between the two base stations. • Handover Policies: The network is configured with handover policies and algorithms to determine when and how handovers should occur based on factors such as signal strength, load balancing, and quality of service requirements. Functionality: • When a mobile device undergoes a handover procedure, the source gNB initiates communication with the target gNB via the Xn and B2 interfaces. • Context information, including the device's session state and radio resource requirements, is exchanged between the source and target gNBs to facilitate a smooth handover transition. • The target gNB allocates radio resources and prepares to take over the communication with the mobile device, ensuring minimal disruption to ongoing calls or data sessions.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	14	5G Configuration for Voice Centric and Single-Registration Mode for originating Vo5G calls	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	Description: • This use case focuses on configuring the 5G network to enable users to originate Vo5G calls in a voice-centric environment where devices are registered in single-registration mode. It involves integrating the IP Multimedia Subsystem (IMS) with Access Gateway Control Function (AGCF) or allowing access to the PSTN. Key Components: • IMS Integration: The 5G network is configured to integrate IMS architecture, enabling multimedia services, including Vo5G calls, over IP networks. • AGCF or PSTN/ISDN Access: The network allows access to AGCF for interoperability with the PSTN. AGCF serves as a gateway between IMS and the PSTN. • Single-Registration Mode: Devices are registered in single-registration mode, simplifying network management and allowing seamless connectivity for Vo5G calls. Functionality: • When a user initiates a Vo5G call, the 5G network establishes an IMS session, allowing the user's device to access IMS services for voice communication. • If the call requires connectivity to the PSTN, the network routes the call through AGCF, ensuring interoperability between IMS and the PSTN. • Single-registration mode simplifies the authentication and authorization process, allowing users to seamlessly access voice services over 5G without the need for multiple network registrations.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	15	5G Configuration IMS voice over PS session over non-3GPP access (IMS-VoPS-N3GPP)	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	Description: • This use case involves configuring the 5G network to enable IP Multimedia Subsystem (IMS) voice communication over PS (Packet Switched) sessions, particularly over non-3GPP access networks. • Additionally, it integrates the IMS PES (PSTN/ISDN Emulation Sub-system (PES)) with Access Gateway Control Function (AGCF) to provide access to the PSTN. Key Components: • IMS Integration: The 5G network is configured to integrate IMS architecture, facilitating multimedia services, including voice, over IP networks. • PS Session Establishment: Voice communication is established over PS sessions, utilizing the IP connectivity provided by non-3GPP access networks. • IMS PES with AGCF: IMS PES serves as a gateway between the IMS network and the PSTN. AGCF functionality within IMS PES enables access to the PSTN. Functionality: • When a user initiates a voice call, the 5G network establishes an IMS session over the non-3GPP access network, providing end-to-end IP connectivity for voice transmission. • IMS architecture handles session establishment, signalling, and media negotiation, ensuring efficient exchange of voice data between users. • IMS PES with AGCF functionality allows seamless connectivity between IMS-based VoPS calls and the PSTN, ensuring interoperability and extending voice services to users connected to the PSTN.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	16	5G Configuration for Voice Centric and Dual Registration Mode for originating Vo5G calls	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	Description: • This use case involves configuring the 5G network to support originating Vo5G calls in a voice-centric environment where devices are registered in dual registration mode. Additionally, it integrates the IMS PES with Access Gateway Control Function (AGCF) to provide access to the PSTN. Key Components: • Voice Centric Configuration: The 5G network is configured to prioritize voice services, ensuring high-quality voice communication over the network. • Dual Registration Mode: Devices are registered in dual registration mode, allowing them to be simultaneously connected to multiple networks for redundancy or load balancing purposes. • IMS PES with AGCF: IMS PES serves as a gateway between the IMS network and the PSTN. AGCF functionality within IMS PES enables access to the PSTN. Functionality: • When a user initiates a Vo5G call, the 5G network establishes an IMS session, allowing the user's device to access IMS services for voice communication. • IMS PES with AGCF functionality allows seamless connectivity between IMS-based Vo5G calls and the PSTN, ensuring interoperability and extending voice services to users connected to the PSTN. • Dual registration mode enables devices to maintain connections to multiple networks simultaneously, providing redundancy and load balancing capabilities.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	17	5G Configuration EPS Use Cases for EPS Fallback	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	Description: • This use case involves configuring the 5G network to handle Evolved Packet System (EPS) fallback scenarios, specifically when the network needs to fallback to IMS PES (IP Multimedia Subsystem PSTN/ISDN Emulation Sub-system (PES)) with access to the PSTN through Access Gateway Control Function (AGCF). Key Components: • EPS Fallback Mechanism: The network is equipped with mechanisms to detect instances where devices lose their 5G connection and need to fallback to IMS services. • IMS PES Integration: IMS PES is integrated into the network infrastructure, serving as a gateway between IMS-based services and the PSTN. • AGCF Functionality: AGCF within IMS PES enables access to the PSTN, ensuring interoperability between modern and legacy communication systems. Functionality: • When a device loses its 5G connection, the network triggers an EPS fallback mechanism to switch the device to IMS-based services. • IMS PES facilitates the transition to IMS-based services, ensuring continuity of communication for voice calls and other multimedia services. • AGCF functionality within IMS PES allows seamless connectivity between IMS-based services and the PSTN, ensuring interoperability and extending service reach to users connected to the PSTN.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	18	5G Configuration EPS Use Cases for RAT Fallback	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	Description: • This use case involves configuring the 5G network to manage Radio Access Technology (RAT) fallback scenarios, specifically when the network needs to fallback to IP Multimedia Subsystem (IMS) services via IMS PES (PSTN/ISDN Emulation Sub-system (PES)) or Integrated Services Digital Network (ISDN) through Access Gateway Control Function (AGCF). Key Components: • RAT Fallback Mechanism: The network is equipped with mechanisms to detect instances where devices lose their 5G connection and need to fallback to IMS services. • IMS PES Integration: IMS PES is integrated into the network infrastructure, serving as a gateway between IMS-based services and the PSTN. • AGCF Functionality: AGCF within IMS PES enables access to the PSTN, ensuring interoperability between modern and legacy communication systems. Functionality: • When a device loses its 5G connection or the quality of the connection degrades below a certain threshold, the network triggers a Radio Access Technology (RAT) fallback mechanism to switch the device to IMS-based services. • IMS PES facilitates the transition to IMS-based services, ensuring continuity of communication for voice calls and other multimedia services. • AGCF functionality within IMS PES allows seamless connectivity between IMS-based services and the PSTN, ensuring interoperability and extending service reach to users connected to the PSTN.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	19	5G Configuration for Voice Centric Roaming Vo5G calls	IMS PES with AGCF (or PSTN or ISDN Access) or HGW (IAD)	Description: • This use case focuses on configuring the 5G network to support voice-centric roaming Vo5G calls, allowing users to make and receive Vo5G calls while roaming in different geographical locations. Additionally, it integrates IMS PES (PSTN/ISDN Emulation Sub-system) with Access Gateway Control Function (AGCF) to provide access to the PSTN. Key Components: • Voice Centric Roaming Configuration: The 5G network is configured to prioritize voice services during roaming scenarios, ensuring high-quality Vo5G calls for roaming users. • IMS PES Integration: IMS PES is integrated into the network infrastructure, serving as a gateway between IMS-based services and the PSTN. • AGCF Functionality: AGCF within IMS PES enables access to the PSTN, ensuring interoperability between modern and legacy communication systems. Functionality: • When a user roams into a visited network's coverage area, the 5G network identifies the user's location and establishes connectivity to enable Vo5G calls. • IMS PES facilitates the routing of Vo5G calls, ensuring seamless connectivity and interoperability with IMS-based services and the PSTN. • AGCF functionality within IMS PES allows roaming users to access IMS-based services and seamlessly connect to the PSTN, ensuring service continuity and reachability.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	20	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	Description: Originating IMS PES: with AGCF (or PSTN or ISDN Access): • AGCF within IMS PES acts as a gateway facilitating connectivity between IMS-based services and the PSTN. • The 5G network is configured to support terminating Vo5G calls, prioritizing voice-centric environments with single-registration mode. • This configuration ensures that Vo5G calls initiated from IMS PES or the PSTN are seamlessly integrated into the 5G network for further processing and transmission. Functionality: • IMS PES, with AGCF functionality or direct access to the PSTN, initiates voice calls or multimedia sessions. • The 5G network, configured for Terminating Vo5G calls in a voice-centric environment with single-registration mode, receives the initiated calls from IMS PES or the PSTN. • Upon receiving the calls, the 5G network handles the session establishment and facilitates the transmission of Vo5G calls within its voice-centric environment.
	21	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	5G Configuration IMS voice over PS session over non-3GPP access (IMS-VoPS-N3GPP)	Description: • This configuration involves initiating a voice call from an IMS PES (IP Multimedia Subsystem PSTN/ISDN Emulation Sub-system) with Access Gateway Control Function (AGCF) or access to the PSTN and routing it to a 5G network configured for IMS voice over Packet Switched (PS) session over non-3GPP access (IMS-VoPS-N3GPP). Key Components: • Originating IMS PES: The IMS PES serves as the originating point for the voice call, facilitating multimedia service exchanges over IP networks. • AGCF Functionality: AGCF within IMS PES acts as a gateway between the IMS network and legacy telephony networks, enabling connectivity to the PSTN. • PSTN or ISDN Access: Alternatively, direct access to the PSTN is provided through IMS PES, allowing connectivity to the PSTN. Functionality: • A voice call initiated from the originating IMS PES is routed either through AGCF or directly to the PSTN. • The call is then routed to the destination, which is a 5G network configured for IMS voice over PS session over non-3GPP access (IMS-VoPS-N3GPP). • In the destination 5G network, the call is processed as an IMS voice call over a PS session, ensuring efficient transmission of voice data over non-3GPP access networks.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	22	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	5G Configuration for Voice Centric and Dual Registration Mode for originating Vo5G calls	Description: • This configuration involves initiating a voice call from an IMS PES (IP Multimedia Subsystem PSTN/ISDN Emulation Sub-system (PES) with Access Gateway Control Function (AGCF) or access to the PSTN and routing it to a 5G network configured for voice-centric communication with dual registration mode for originating Vo5G calls. Key Components: • Originating AGCF Functionality: AGCF within IMS PES acts as a gateway between the IMS network and the PSTN, enabling connectivity to the PSTN. Functionality: • A voice call initiated from the originating IMS PES is routed either through AGCF or directly to the PSTN. • The call is then routed to the destination, which is a 5G network configured for voice-centric communication with dual registration mode for originating Vo5G calls. • In the destination 5G network, the call is processed as an originating Vo5G call in a voice-centric environment with dual registration mode, allowing users to maintain simultaneous connections to multiple networks.
	23	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	5G Configuration EPS Use Cases for EPS Fallback	Description: • This configuration involves establishing connectivity from an IP Multimedia Subsystem (IMS) PSTN/ISDN Emulation Subsystem (PES) with Access Gateway Control Function (AGCF) or access to the PSTN to a 5G network configured for Evolved Packet System (EPS) with EPS fallback capability. Key Components: • AGCF Functionality: AGCF within IMS PES acts as a gateway between the IMS network and the PSTN, enabling connectivity to the PSTN. Functionality: • Voice calls initiated from IMS PES are routed through AGCF or directly to the PSTN. • The call is then directed to the destination, which is a 5G network configured for EPS with EPS fallback capability. • In the event of a network degradation or unavailability of the primary communication path, EPS fallback is triggered, allowing seamless transition to alternative communication paths within the 5G network.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	24	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	5G Configuration EPS Use Cases for RAT Fallback	Description: • This configuration involves establishing connectivity from an IP Multimedia Subsystem (IMS) PES (IP Multimedia Subsystem PSTN/ISDN Emulation Subsystem (PES)) with Access Gateway Control Function (AGCF) or access to the PSTN to a 5G network configured for Evolved Packet System (EPS) with Radio Access Technology (RAT) fallback capability. Key Components: • AGCF Functionality: AGCF within IMS PES acts as a gateway between the IMS network and the PSTN, enabling connectivity to the PSTN. Functionality: • Voice calls initiated from IMS PES are routed through AGCF or directly to the PSTN. • The call is then directed to the destination, which is a 5G network configured for EPS with RAT fallback capability. • In the event of a deterioration in the quality of the 5G network connection or its unavailability, RAT fallback is triggered, allowing seamless transition to alternative radio access technologies within the 5G network.
	25	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	5G Configuration for Voice Centric Roaming Vo5G calls	Configuration: • IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines to a 5G Configuration for Voice Centric Roaming Vo5G calls. Description: • This configuration entails establishing connectivity from an IP Multimedia Subsystem (IMS) PES IP Multimedia Subsystem PSTN/ISDN Emulation Sub-system (PES)) with Access Gateway Control Function (AGCF) or access to the PSTN to a 5G network configured for voice-centric roaming Vo5G calls. Key Components: • AGCF Functionality: AGCF within IMS PES acts as a gateway between the IMS network and the PSTN, enabling connectivity to the PSTN. Functionality: • Voice calls initiated from IMS PES are routed through AGCF or directly to the PSTN. • The call is then directed to the destination, which is a 5G network configured for voice-centric roaming Vo5G calls. • In the 5G network, specialized configurations for voice-centric roaming Vo5G calls ensure seamless communication for users roaming across different geographical locations.

	Nr.	From	To	Description
Call setup delay, call setup time and Connections with parallel data transfer configurations	26	5G Configuration for Voice Centric and Single-Registration Mode for originating Vo5G calls .	Forwarding user with CFNRc: 5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls Forwarded to User: 5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	In simpler terms, if User A initiates a Vo5G call within the 5G network, the call is forwarded to User B who is also configured within the same network setup for receiving such calls. Both users are operating under the same configuration optimized for voice communication in the 5G network and are capable of initiating and receiving Vo5G calls.
	27	5G Configuration for Voice Centric and Single-Registration Mode for originating Vo5G calls .	Forwarding user with CFNR: IMS PES with AGCF (or PSTN or ISDN Access) or HGW (IAD) Forwarded to User: 5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	In this forwarding scenario, the call is routed through the IMS PES with AGCF. The IMS PES with AGCF acts as an intermediary, facilitating the call forwarding process. It evaluates the call routing rules and forwards the call to the appropriate destination, ensuring that the call reaches its intended recipient within the same configured environment optimized for voice-centric communication and single-registration mode.
	28	5G Configuration for Voice Centric and Single-Registration Mode for originating Vo5G calls .	Forwarding user with CFNRc: 5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls Forwarded to User: IMS PES with AGCF (or PSTN or ISDN Access) or HGW (IAD)	In this forwarding scenario, the call is redirected to the IP Multimedia Subsystem PSTN/ISDN Emulation Subsystem (IMS PES) with Access Gateway Control Function (AGCF). The IMS PES with AGCF serves as a critical component within the IMS architecture, responsible for controlling access to IMS networks from non-IMS networks (such as the PSTN).

5.5 End-to-End Listening Quality MOS-LQxF

For the End-to-End Listening Quality MOS-LQxF, the requirements specified in ETSI TS 101 563 [3], clause 4.8 shall apply.

5.6 General aspects of voice channel test calls

The general aspects of voice channel test calls are described in clause 5.14.2 of [5]. The test shall be conducted in compliance with Recommendation ITU-T P.863 [8] and follow the instructions given in Recommendation ITU-T P.863.1 [9].

5.7 Connections without parallel data transfer

5.7.1 Connections with one voice channel

For the **single voice channel Test,** a test call consisting of the three following parts should be used:

- Channel Convergence Quality test;
- Listening Speech Quality test;
- DTMF test.

Table 4 gives an overview of the connection options without parallel data transfer for UMTS and VoLTE, Table 3 the connection options for VoNR.

Table 4: Configurations options for connections without parallel data transfer for UMTS and VoLTE

	Voice from	Voice to
Listening speech quality configurations without parallel data transfer	VoLTE	MMTel (IMS) fixed access
	VoLTE	VoLTE
	LTE Mobile network with CSFB	IMS PES with AGCF with AGCF (or PSTN or ISDN Access)
	UMTS	IMS PES with AGCF with AGCF (or PSTN or ISDN Access)
	LTE Mobile network with CSFB	IMS PES with VGW
	UMTS	IMS PES with VGW
	UMTS	UMTS

If the duration of the interruption of the voice transmission time is > 1 s and the call connection maintained the call is considered as interrupted (see clause 6.13 of ETSI TS 103 222-1 [5]).

Figures 2 and 3 depict the scenarios VoLTE to VoLTE and VoLTE to MMTel, whereas Figures 4 and 5 depict the scenarios UMTS to UMTS and UMTS to ISDN for the measurement of voice quality.

Figure 13 in clause 5.14.3.1 of ETSI TS 103 222-1 [5] depicts the detailed description of the single **voice channel test**.

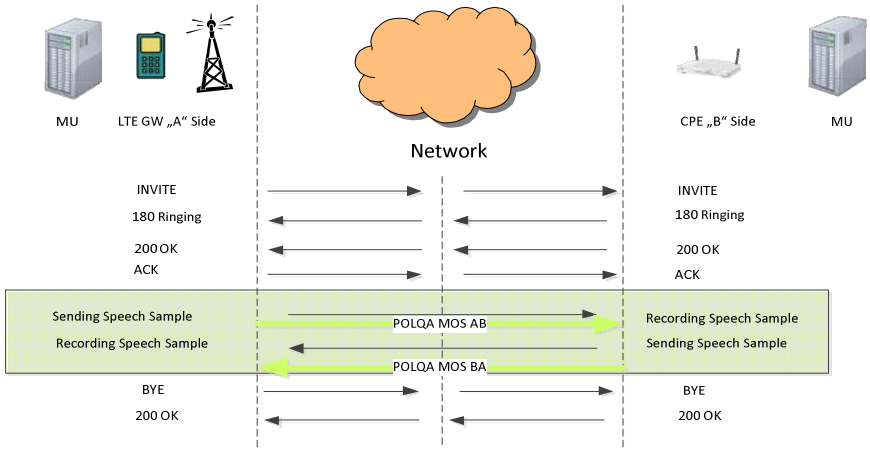

Figure 2: VoLTE voice quality measurement for a Mobile - Fixed network connection

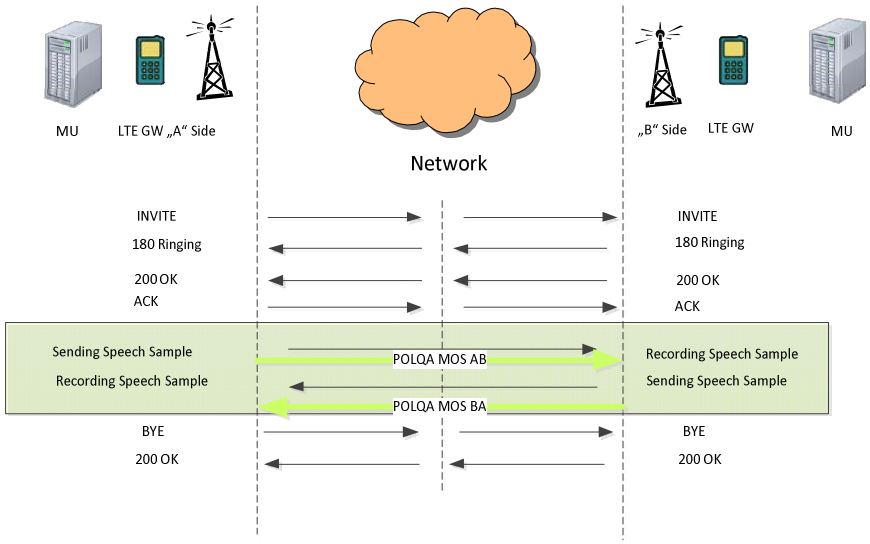

Figure 3: VoLTE voice quality measurement for a Mobile - Mobile connection

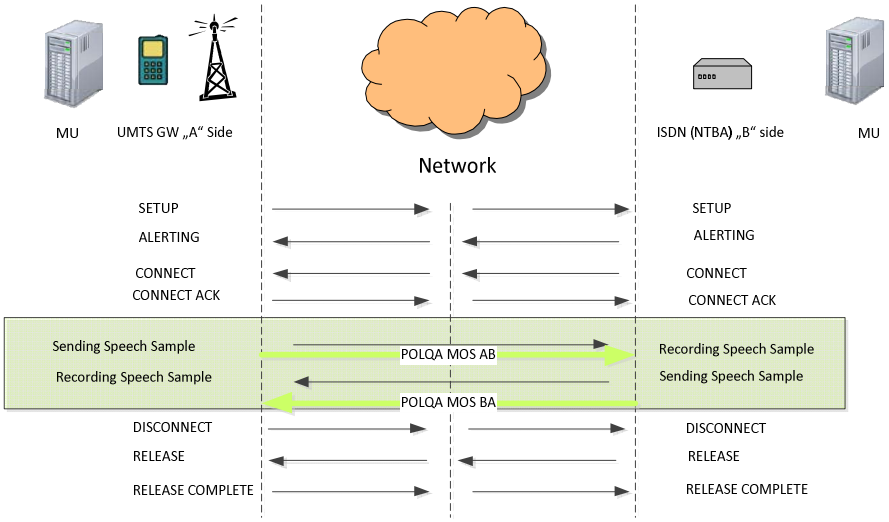

Figure 4: UMTS voice quality measurement for Mobile - Fixed network connection

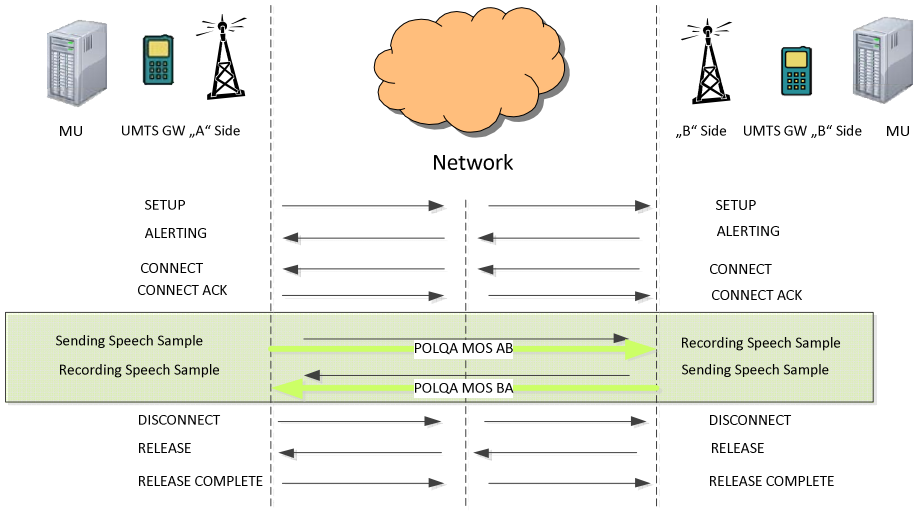

Figure 5: UMTS voice quality measurement for Mobile - Mobile network connection

5.7.2 Multiple voice channel access

In case the LTE Access is used for SIP trunking or multiple voice channel transmission, the testing procedure described in clause 5.14.3.2 of [5] applies.

5.8 Connections with parallel data transfer

5.8.1 Connections with one voice channel and parallel data transfer

In the case when the access link is used for voice and data applications the voice quality measurement sequence with parallel upload/download shall be used. Table 5 gives an overview of the connection options with parallel data transfer. The testing procedure for connections with one voice channel and parallel data transfer are described in clause 5.14.4.1 of ETSI TS 103 222-1 [5].

Table 5: Connection options with parallel data transfer

	From		To	
	Voice	**Data**	**Voice**	**Data**
Connections with parallel data transfer	VoLTE	User data server or user data application	VoLTE	User data server or user data application
	VoLTE	User data server or user data application	MMTel (IMS) fixed access	Webserver
	VoLTE	User data server or user data application	IMS PES with AGCF with AGCF (or PSTN or ISDN Access)	Webserver
	VoLTE	User data server or user data application	IMS PES with VGW	Webserver
	UMTS	User data server or user data application	UMTS	User data server or user data application
	UMTS	User data server or user data application	MMTel (IMS) fixed access	Webserver
	UMTS	User data server or user data application	IMS PES with AGCF with AGCF (or PSTN or ISDN Access)	Webserver
	UMTS	User data server or user data application	IMS PES with VGW	Webserver
	MMTel (IMS) fixed access	User data server or user data application	VoLTE	User data server or user data application
	MMTel (IMS) fixed access	User data server or user data application	LTE Mobile network with CSFB	User data server or user data application
	MMTel (IMS) fixed access	User data server or user data application	UMTS	User data server or user data application

	From		To	
Connections with parallel data transfer	IMS PES with AGCF with AGCF (or PSTN or ISDN Access)	User data server or user data application	VoLTE	User data server or user data application
	IMS PES with AGCF with AGCF (or PSTN or ISDN Access)	User data server or user data application	LTE Mobile network with CSFB	User data server or user data application
	IMS PES with AGCF with AGCF (or PSTN or ISDN Access	User data server or user data application	UMTS	User data server or user data application
	IMS PES with VGW	User data server or user data application	VoLTE	User data server or user data application
	IMS PES with VGW	User data server or user data application	LTE Mobile network with CSFB	User data server or user data application
	IMS PES with VGW	User data server or user data application	UMTS	User data server or user data application
	LTE Mobile network with CSFB	User data server or user data application	IMS PES with AGCF with AGCF (or PSTN or ISDN Access)	Webserver
	5G Configuration for Voice Centric and Single-Registration Mode for originating Vo5G calls	User data server or user data application	5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	User data server or user data application
	5G Configuration IMS voice over PS session over non-3GPP access (IMS-VoPS-N3GPP)	User data server or user data application	5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	User data server or user data application
	5G Configuration for Voice Centric and Single-Registration Mode for originating Vo5G calls	User data server or user data application	VoLTE (E-UTRA-NR Dual Connectivity with E-UTRA connected to EPC (GSMA Option#3)	User data server or user data application
	VoLTE (E-UTRA-NR Dual Connectivity with E-UTRA connected to EPC (GSMA Option#3)	User data server or user data application	5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	User data server or user data application
	5G Configuration for Voice Centric and Single-Registration Mode for originating Vo5G calls	User data server or user data application	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	Webserver
	5G Configuration IMS voice over PS session over non-3GPP access (IMS-VoPS-N3GPP)	User data server or user data application	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	Webserver
	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	Webserver	5G Configuration for Voice Centric and Single-Registration Mode for terminating Vo5G calls	User data server or user data application
	IMS PES with AGCF / IMS PES with VGW / MMTel (IMS) fixed access lines	Webserver	5G Configuration IMS voice over PS session over non-3GPP access (IMS-VoPS-N3GPP)	User data server or user data application

5.8.2 Parallel quality measurement of one voice channel and data transmission speed

In case the LTE/5G Access is used for SIP trunking or multiple voice channel transmission, the testing procedure for Parallel quality measurement of one voice channel and data transmission speed is described in clause 5.15.4.2 of ETSI TS 103 222-1 [5].

5.8.3 Quality measurement of multiple voice channels and data transfer

In case the LTE/5G Access is used for SIP trunking or multiple voice channel transmission, the testing procedure for Quality measurement of multiple voice channels and data transfer is described in clause 5.15.4.3 of ETSI TS 103 222-1 [5].

5.8.4 Parallel quality measurement of multiple voice channels and data transmission speed

In case the LTE Access is used for SIP trunking or multiple voice channel transmission, the testing procedure for Quality measurement of multiple voice channels and data transmission speed is described in clause 5.15.4.4 of ETSI TS 103 222-1 [5].

6 Broadband Speed Test (BST) - Measurement method of data transmission speed and transit time

6.1 Introduction

The measurement method of data transmission speed and transit time (Broadband Speed Test (BST)) is described in clause 6 of ETSI TS 103 222-1 [5].

History

Document history		
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