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TECHNICAL SPECIFICATION

**5G;
Terminal audio quality performance requirements for
immersive audio services
(3GPP TS 26.261 version 19.1.0 Release 19)**



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Foreword

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In the present document, certain modal verbs have the following meanings:

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

NOTE 1: The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

NOTE 2: The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

should indicates a recommendation to do something

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may indicates permission to do something

need not indicates permission not to do something

NOTE 3: The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

can indicates that something is possible

cannot indicates that something is impossible

NOTE 4: The constructions "can" and "cannot" shall not to be used as substitutes for "may" and "need not".

will indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

NOTE 5: The constructions "is" and "is not" do not indicate requirements.

Introduction

TS 26.261 specifies minimum performance requirements for the electro-acoustic characteristics of LTE, NR and WLAN terminals when used to provide immersive services. The performance requirements are specified in the main body of the text; the test methods and test considerations are described in TS 26.260.

1 Scope

The present document specifies minimum performance requirements for the electro-acoustic characteristics of LTE, NR and WLAN terminals that support the 3GPP Immersive Voice and Audio Service (IVAS). It is applicable to any terminal capable of supporting wideband, super-wideband or fullband immersive services. If not specified otherwise, performance requirements and objectives apply to UEs that support fixed-point [8] or floating-point [10] implementations of the IVAS codec.

The set of minimum performance requirements enables a guaranteed level of speech quality while taking possible physical limits of the terminal design into account. Some performance objectives are also defined if such design limits can be overcome.

The present document covers both conversational services based on MTSI / telepresence and non-conversational services.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 26.260: "Objective test methodologies for the evaluation of immersive audio systems"
- [3] 3GPP TS 26.114: "IP Multimedia Subsystem (IMS); Multimedia Telephony; Media handling and interaction".
- [4] 3GPP TS 26.131: "Terminal Acoustic Characteristics for Telephony; Requirements".
- [5] ETSI TS 103 739 (2021-10) V1.4.1: "Transmission requirements for wideband mobile wireless terminals (handset and headset) from a QoS perspective as perceived by the user".
- [6] ETSI TS 103 740 (2021-10) V1.4.1: "Transmission requirements for wideband mobile wireless terminals (hands-free) from a QoS perspective as perceived by the user".
- [7] 3GPP TS 26 250: "Codec for Immersive Voice and Audio Services (IVAS); General overview".
- [8] 3GPP TS 26 251: "Codec for Immersive Voice and Audio Services (IVAS); C code (fixed-point)".
- [9] 3GPP TS 26 253: "Codec for Immersive Voice and Audio Services (IVAS); Detailed Algorithmic Description including RTP payload format and SDP parameter definitions".
- [10] 3GPP TS 26 258: "Codec for Immersive Voice and Audio Services (IVAS); C code (floating-point)".
- [11] ETSI TS 103 224: "A sound field reproduction method for terminal testing including a background noise database", 11/2025.[12] ETSI ES 202 396-1: "Speech quality performance in the presence of background noise; Part 1: Background noise simulation technique and background noise database", 2025-11.

3 Definitions of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

For the purposes of the present document the terms *wideband*, *super-wideband* and *fullband* refer to test signals associated with the corresponding operating codec modes in TS 26.260.

The overload point (maximum load capacity) is for the purposes of this document defined as the RMS level of a digital representation of a full-scale pure tone at the input of the IVAS encoder. The overload point is defined in TS 26.260.

For the purposes of the present document, the term *electrical interface* is defined as an analogue or digital access to a UE, which allows injecting and capturing signals electrically instead of through an acoustical interface. The interface can be either analogue (wired) or digital (wired or wireless). The purpose of this interface is to connect a separate device (typically a headset), which provides a receiver and transmitter.

Stereo panorama: The spatial image of a stereo signal, in which the sound source directions lie in a range from -100% (left) to 100% (right).

3.2 Symbols

dB	Decibel
Hz	Unit of frequency (Hertz)
ϕ	Azimuth angle (phi)
θ	Elevation angle (theta)
T_R	UE delay in receiving direction
T_S	UE delay in sending direction
$\zeta(\phi)$	Estimate for a single source direction in the stereo panorama that is physically positioned in direction ϕ relative to the capturing device

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

DTX	Discontinuous Transmission
EVS	Enhanced Voice Services
HATS	Head and Torso Simulator
ILD	Interaural Level Difference
ISM	Independent Stream with Metadata
ITD	Interaural Time Difference
IVAS	Immersive Voice and Audio Services
MASA	Metadata-Assisted Spatial Audio
OMASA	Objects (ISM) with Metadata-Assisted Spatial Audio
OSBA	Objects (ISM) with Scene-Based Audio
POI	Point of Interconnection (with PSTN)
RLR	Receive Loudness Rating
SBA	Scene-Based Audio
SLR	Send Loudness Rating
WLAN	Wireless Local Area Network

4 Interfaces

4.1 General

The interfaces required to define immersive terminal electro-acoustic characteristics are shown in TS 26.260. These are the air interface and the point of interconnect (POI). The interfaces are shown for different types of immersive formats.

Measurements can be made using the system simulator (SS) described in TS 26.260. For conversational services, MTSI aspects are specified by TS 26.114 [3].

4.2 Air interfaces

The same air interfaces as in clause 4.2 of TS 26.131 [4] apply.

4.3 Acoustical interfaces

The acoustical interfaces are described in clause 5.4.2 of TS 26.260 [2].

4.4 Electrical interfaces

The electrical interface UE is considered in this specification and details on standardized analogue (wired) and digital (wired and wireless) electrical interfaces can be found in TS 26.260. For the electrical interface, the POI in sending / receiving direction is respectively defined as the input / output of the reference coder of the system simulator.

Any of the UE types mentioned in clause 4.3 providing an electrical interface can be considered as Electrical Interface UE.

4.5 UE configuration

4.5.1 Noise suppression mode configuration

UEs may support multiple noise suppression modes in UE sending direction as specified in Annex A of TS 26.253 [9]. The UE may indicate its supported noise suppression mode(s) via SDP using **ns-mode-init** or **ns-mode-init-send** parameter. The applied noise suppression mode(s) for testing shall be configured by negotiating the parameter for the session, if applicable. For testing UE with different noise suppression modes, the following SDP parameter mapping applies:

- If 'none' value is configured for the session, this corresponds to Disabled noise suppression mode, denoted as *ns-disabled* in the following.
- If 'min' value is configured for the session, this corresponds to Minimum noise suppression mode, denoted as *ns-min* in the following.
- If 'def' value is configured for the session, this corresponds to Default noise suppression mode, denoted as *ns-default* in the following.
- If 'max' value is configured for the session, this corresponds to Maximum noise suppression mode, denoted as *ns-max* in the following.

5 Performance in sending

5.1 Applicability

The performance requirements in this clause shall apply when UE is used to provide immersive audio capture.

5.2 Delay

The UE delay T_S in send direction shall be less or equal to the delay requirements in Table 5.2.

Table 5.2: Requirement on sending UE delay

Audio format	Subformat	UE type(s)	Maximum delay T_S (ms)	
			Performance Requirement	Performance Objective
Stereo	Stereo	All	TBD	TBD
	Binaural	All	TBD	TBD
ISM	ISM1-ISM4	All	TBD	TBD
SBA	FOA	All	TBD	TBD
	HOA2	All	TBD	TBD
	HOA3	All	TBD	TBD
MASA	1 TC	All	TBD	TBD
	2 TC	All	TBD	TBD
OSBA	(ISM1-ISM4) x (FOA, HOA2, HOA3)	All	TBD	TBD
OMASA	(ISM1-ISM4) x MASA	All	TBD	TBD
Multichannel	5.1	All	TBD	TBD
	7.1	All	TBD	TBD
	5.1.2	All	TBD	TBD
	5.1.4	All	TBD	TBD
	7.1.4	All	TBD	TBD

NOTE: This requirement only applies for one-way (sending only) cases where round-delay does not apply.

Compliance shall be checked by the relevant tests described in TS 26.260.

5.3 Loudness

5.3.1 Loudness for single source

The nominal values of SLR to the POI shall be:

$$SLR = 13 \pm 3 \text{ dB}$$

NOTE: The value of 13 dB is motivated by the corresponding SLR requirement for desktop hands-free and handheld hands-free in TS 26.131 [4].

Compliance shall be checked by the relevant tests described in TS 26.260.

5.3.2 Loudness for ambient sound fields

For SND-UE-types providing an acoustical interface, the ambient sound field loudness in send direction at the POI shall be according to the ranges in Table 5.3.2-1 (for headset UE), Table 5.3.2-2 (for handheld hands-free UE), Table 5.3.2-3 (for table-mounted hands-free UE).

Table 5.3.2-1: Ambient sound fields used for headset UE

Ambient Sound Field	Ambient Sound Field Loudness (in LKFS)			
	<i>ns-disabled</i>	<i>ns-min</i>	<i>ns-default</i>	<i>ns-max</i>
Rock Concert	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Downtown Scene	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Kindergarden	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Nature Scene	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
NOTE 1: Ambient sound field recordings as well as analysis ranges should be provided by the manufacturer. These may be replaced by specific recordings if/when they become available in the database of ETSI TS 103 224 [11].				
NOTE 2: The table entries TBDs are placeholders and need to be confirmed.				

Table 5.3.2-2: Ambient sound fields used for handheld hands-free UE

Ambient Sound Field	Ambient Sound Field Loudness (in LKFS)			
	<i>ns-disabled</i>	<i>ns-min</i>	<i>ns-default</i>	<i>ns-max</i>
Rock Concert	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Downtown Scene	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Kindergarden	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Nature Scene	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
NOTE 1: Ambient sound field recordings as well as analysis ranges should be provided by the manufacturer. These may be replaced by specific recordings if/when they become available in the database of ETSI TS 103 224 [11].				
NOTE 2: The table entries TBDs are placeholders and need to be confirmed.				

Table 5.3.2-3: Ambient sound fields used for table-mounted hands-free UE

Ambient Sound Field	Ambient Sound Field Loudness (in LKFS)			
	<i>ns-disabled</i>	<i>ns-min</i>	<i>ns-default</i>	<i>ns-max</i>
[Round table conversation]	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Kitchen_desktop.wav	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Officerroom_desktop.wav	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Conference3_desktop.wav	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
NOTE 1: Wave filenames correspond to the database provided in clause 8.2 of ETSI TS 103 224 [11]. Ambient sound field recordings not included in ETSI TS 103 224 should be provided by the manufacturer.				
NOTE 2: The table entries TBDs are placeholders and need to be confirmed.				

For SND-UE-types providing an electrical interface with binaural input format, the ambient sound field loudness in send direction at the POI shall be according to the ranges Table 5.3.2-4.

Table 5.3.2-4: Ambient sound fields used for electrical interface UE and binaural input format

Ambient Sound Field	Ambient Sound Field Loudness (in LKFS)			
	<i>ns-disabled</i>	<i>ns-min</i>	<i>ns-default</i>	<i>ns-max</i>
RockMusic01m48k_ETSI_3m18s_1sRamp.wav	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Kindergarten_Noise1_binaural (0.00-30.00 s).wav	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Outside_Traffic_Crossroads_binaural (0.00-20.00 s).wav	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD
Nature1_Forrest_Noise_binaural (0.00-30.00 s).wav	TBD ± TBD	TBD ± TBD	TBD ± TBD	≤ TBD

NOTE 1: Wave filenames correspond to the database provided in clause 8.1 of ETSI ES 202 396-1 [12].
NOTE 2: The table entries TBDs are placeholders and need to be confirmed.

Compliance shall be checked by the relevant tests described in TS 26.260.

5.4 Frequency response

5.4.1 Frequency response for single source

5.4.1.1 General

The sensitivity/frequency characteristics shall be as follows.

The sending sensitivity frequency response, measured from the source direction under test to the SS audio output (digital output of the reference speech decoder of the SS), shall be within a mask, which can be drawn between the points given in the respective requirements table. The mask is drawn with straight lines between the breaking points in the requirements table on a logarithmic (frequency) - linear (dB sensitivity) scale.

5.4.1.2 Acoustical interface

The requirements for acoustical interface testing are given in Table 5.4.1.2-1.

Table 5.4.1.2-1: Sending sensitivity/frequency requirements table for acoustical interface

Frequency (Hz)	Upper limit (dB)	Lower limit (dB)
100	TBD	
200	TBD	TBD
300	TBD	TBD
4000	TBD	TBD
8000	TBD	TBD
12000	TBD	

Compliance shall be checked by the relevant tests described in TS 26.260.

5.4.1.3 Electrical interface

The requirements for electrical interface testing are given in Table 5.4.1.3-1.

Table 5.4.1.3-1: Sending sensitivity/frequency requirements table for electrical interface

Frequency (Hz)	Upper limit (dB)	Lower limit (dB)
100	TBD	
200	TBD	TBD
300	TBD	TBD
6000	TBD	TBD
8000	TBD	TBD
12000	TBD	

Compliance shall be checked by the relevant tests described in TS 26.260.

5.4.2 Frequency response for ambient sound fields

5.4.2.1 Acoustical interface

The requirements for acoustical interface testing noise suppression modes *ns-disabled* and *ns-min* are given in Table 5.4.2.1-1.

Table 5.4.2.1-1: Sending sensitivity/frequency requirements for acoustical interface & noise suppression modes *ns-disabled* and *ns-min*

Frequency (Hz)	Upper limit (dB)	Lower limit (dB)
100	TBD	
200	TBD	TBD
300	TBD	TBD
4000	TBD	TBD
8000	TBD	TBD
12000	TBD	

The requirements for acoustical interface testing with noise suppression mode *ns-default* are given in Table 5.4.2.1-2.

Table 5.4.2.1-2: Sending sensitivity/frequency requirements for acoustical interfaces & noise suppression mode *ns-default*

Frequency (Hz)	Upper limit (dB)	Lower limit (dB)
100	TBD	
200	TBD	TBD
300	TBD	TBD
4000	TBD	TBD
8000	TBD	TBD
12000	TBD	

Compliance shall be checked by the relevant tests described in TS 26.260.

5.4.2.2 Electrical interface

The requirements for acoustical interface testing with noise suppression mode *ns-min* are given in Table 5.4.2.2-1.

Table 5.4.2.2-1: Sending sensitivity/frequency requirements for electrical interface UE & noise suppression modes *ns-min* and *ns-disabled*

Frequency (Hz)	Upper limit (dB)	Lower limit (dB)
100	TBD	
200	TBD	TBD
300	TBD	TBD
4000	TBD	TBD
8000	TBD	TBD
12000	TBD	

The requirements for acoustical interface testing with noise suppression mode *ns-default* are given in Table 5.4.2.2-2.

Table 5.4.2.2-2: Sending sensitivity/frequency requirements for electrical interface UE & noise suppression mode *ns-default*

Frequency (Hz)	Upper limit (dB)	Lower limit (dB)
100	TBD	
200	TBD	TBD
300	TBD	TBD
4000	TBD	TBD
8000	TBD	TBD
12000	TBD	

Compliance shall be checked by the relevant tests described in TS 26.260.

5.5 Directional information

5.5.1 Stereo

The estimated source directions in the stereo panorama $\zeta(\phi_i)$ shall be monotonically increasing between -60° and $+60^\circ$, i.e., $\zeta(\phi_i) - \zeta(\phi_{i-1}) \geq 10\%$ for $i = 3, \dots, 6$, where i is the source direction index according to Table 5 in TS 26.260. This requirement verifies that the estimated stereo panorama is consistent for the relevant source directions ϕ_i .

The estimated source directions in the stereo panorama shall provide a minimum and symmetric width between ϕ_2 and ϕ_6 , i.e., $|\zeta(\phi_2)|$ and $\zeta(\phi_6)$ shall be larger than or equal to 60%.

The estimated source directions in the stereo panorama shall be consistent at the edges, i.e., $\zeta(\phi_1) \leq \zeta(\phi_2)$ and $\zeta(\phi_7) \geq \zeta(\phi_6)$.

For frontal incidence position ($\phi_4 = 0^\circ$), the estimated sound source direction shall be in the center of the stereo panorama, i.e., $|\zeta(\phi_4)| < 3\%$.

For the first $L = 7$ source directions of Table 5 in TS 26.260, the absolute value of ICTD shall be less than 1.5 ms.

Compliance shall be checked by the relevant tests described in TS 26.260.

5.5.2 SBA

5.5.2.1 Applicability

Based on the specification of the physical test arrangement used for UE testing in sending according to clause 5.4.2 of TS 26.260, a UE may support half-circular planar, full-circular planar or 3D spherical SBA capture. Depending on this capability, either the requirements according to clauses 5.5.2.2, 5.5.2.3 or 5.5.2.4 apply.

If the type of SBA capture capability is not specified by the manufacturer, at least the requirements for half-circular planar capture shall be met. In this case, it is recommended to additionally evaluate requirements for full-circular planar and 3D spherical capture capabilities. This allows to determine and report the UE's supported capture capability.

Compliance shall be checked by the relevant tests described in TS 26.260.

5.5.2.2 Half-circular planar capture

For UEs supporting half-circular planar capture, the following set of requirements apply:

Azimuth

For half-circular planar capture, the estimated azimuths $\hat{\phi}_i$ for source directions $i=1 \dots L-1$, where $L=7$, as listed in Table 5 of TS 26.260, shall be monotonically increasing such that $\hat{\phi}_{i+1} > \hat{\phi}_i$.

The estimated azimuth for source direction 4, the 0° source direction, shall be well within the front half of the listening plane, such that $-60^\circ < \hat{\phi}_4 < 60^\circ$

The estimated azimuths of source directions 1 and 7, the $\pm 90^\circ$ source directions, shall be well within the right and left halves of the listening plane, respectively, such that $-150^\circ < \hat{\phi}_1 < -30^\circ$ and $30^\circ < \hat{\phi}_7 < 150^\circ$.

NOTE: The measured angle $\hat{\phi}_1$ shall be unwrapped to ensure continuity in the neighbourhood of its corresponding source direction ϕ_1 .

Elevation

The estimated source elevations for the source directions listed in Table 5 of TS 26.260 should have an absolute value of $|\hat{\theta}_i| \leq 30^\circ$.

5.5.2.3 Full-circular planar capture

For UEs supporting full-circular planar capture, the requirements according to clause 5.5.2.2 apply with the source directions $i=1\dots L-1$, where $L=12$, as listed in Table 5 of TS 26.260. In addition, the requirement $\hat{\phi}_1 > \hat{\phi}_{12} - 360^\circ$ applies.

Furthermore, the estimated azimuth of source direction $i = 10$ shall be well within the rear half of the listening plane, such that $120^\circ < \hat{\phi}_{10} < 240^\circ$.

NOTE: The measured angles $\hat{\phi}_1$ and $\hat{\phi}_{12}$ shall be unwrapped to ensure continuity in the neighbourhood of their corresponding source directions ϕ_1 and ϕ_{12} , respectively.

5.5.2.4 3D spherical capture

UEs supporting full SBA capture should meet the requirements for full-circular planar capture according to clause 5.5.2.3.

In addition, the following requirements apply:

Azimuth

The requirements according to clause 5.5.2.2 apply with the source directions $i=13\dots L-1$, where $L=20$, as listed in Table 5 of TS 26.260. In addition, the requirement $\hat{\phi}_{13} > \hat{\phi}_{20} - 360^\circ$ applies.

The estimated azimuths of non-zero elevation source directions $i = 13, 17$, i.e. the $\pm 90^\circ$ azimuth directions, shall be within the right and left halves of the listening plane, respectively, such that $-180^\circ < \hat{\phi}_{13} < 0^\circ$ and $0^\circ < \hat{\phi}_{17} < 180^\circ$.

The estimated azimuths of non-zero elevation source directions $i = 15, 19$, i.e. the 0° and 180° azimuth directions, shall be within the front and rear halves of the listening plane, respectively, such that $-90^\circ < \hat{\phi}_{15} < 90^\circ$ and $90^\circ < \hat{\phi}_{19} < 270^\circ$.

NOTE: The measured angles $\hat{\phi}_{13}$ and $\hat{\phi}_{20}$ shall be unwrapped to ensure continuity in the neighbourhood of their corresponding source directions ϕ_{13} and ϕ_{20} , respectively.

Elevation

Source directions with equal non-zero elevations, i.e. $i = 13 \dots 20$, should have estimated elevations within a range of $\pm 30^\circ$ from their mean estimated elevation, such that $|\bar{\theta} - \hat{\theta}_i| \leq 30^\circ$, where $\bar{\theta} = \frac{1}{N} \sum_{i=13}^{20} \hat{\theta}_i$.

The following objective pertains to source directions beyond the sets described in Table 5 in TS 26.260. It is included to test a UE capable of 3D spherical capture more fully, if additional source directions were to be included.

Sets of source directions with the same azimuth should have monotonically increasing estimated elevation with respect to their actual elevation, such that for each pair of source directions i and j with equal actual azimuth $\phi_i = \phi_j$, if $\theta_j > \theta_i$ then $\hat{\theta}_j > \hat{\theta}_i$.

5.5.3 MASA

Based on the specification of the physical test arrangement used for UE testing in sending according to clause 5.4.2 of TS 26.260, a UE may support half-circular planar, full-circular planar or 3D spherical MASA capture. Depending on this capability, either the requirements according to clauses 5.5.2.2, 5.5.2.3 or 5.5.2.4 apply.

If the type of MASA capture capability is not specified by the manufacturer, at least the requirements for half-circular planar capture shall be met. In this case, it is recommended to additionally evaluate requirements for full-circular planar and 3D spherical capture capabilities. This allows to determine and report the UE's supported capture capability.

Compliance shall be checked by the relevant tests described in TS 26.260.

5.6 Acoustic echo control

Requirements and performance objectives for TCL only apply for UEs for certain combinations of SND-UE-type and RCV-UE-type as specified according to clause 5.4.2 of TS 26.260. For nominal setting of the volume control, requirements for TCL are provided in Table 5.6-1 for each SND-/RCV-UE-type combination.

For any SND-/RCV-UE-type combination and any setting of the volume control, TCL shall be \geq [40 dB].

Table 5.6-1: Requirements on TCL (in dB) for nominal volume control setting

UE-Type SND	UE-Type RCV			
	Headset UE	Handheld hands-free UE	Table-mounted hands-free UE	Loudspeaker UE
Headset UE	[46]	[46]	[46]	[46]
Handheld Hands-free UE	[46]	[46]	[46]	[46]
Table-mounted UE	[46]	[46]	[46]	[46]

NOTE: Values in brackets are provisional.

Compliance with this requirement shall be checked by the relevant test described in TS 26.260.

5.7 Temporal characteristics

5.7.1 Temporal characteristics for ambient sound fields

For Noise suppression modes *ns-disabled* and *ns-min*, the absolute differences (maximum to minimum) in level versus time shall be less than TBD dB for all evaluated ambient sound fields.

For Noise suppression mode *ns-default*, the absolute differences (maximum to minimum) in level versus time should be less than TBD dB for all evaluated ambient sound fields.

Compliance shall be checked by the relevant tests described in TS 26.260.

6 Performance in receiving

6.1 Applicability

The performance requirements in this clause shall apply when UE is used to provide immersive audio rendering.

6.2 Delay

The UE delay T_R in receiving direction shall be less or equal to TBD.

NOTE: This requirement only applies for one-way (receiving only) cases where round-delay does not apply.

Compliance shall be checked by the relevant tests described in TS 26.260.

6.3 Loudness

The nominal value of Loudness Level in Receive (LLR) shall be:

- 75 ± 4 phon for headset UE,
- 75 ± 4 phon for electrical interface UE (including binaural rendering and calibration),
- $67 -4/+8$ phon for handheld hands-free UE,
- 71 ± 4 phon for table-mounted hands-free UE,
- 75 ± 4 phon for loudspeaker UE.

In case a user controlled receive volume control is provided, for at least one setting of the control the LLR shall meet the nominal value.

When the control is set to maximum, the LLR shall not be louder than 89 phon for all UE types. With the volume control set to the minimum position the LLR shall not be quieter than 52 phon and should not be quieter than 58 phon for all UE types.

NOTE: The loudness level requirements are motivated by corresponding requirements in ETSI TS 103 739 [5] for desktop hands-free and handheld hands-free and in ETSI TS 103 740 [6] for headset, respectively.

Performance requirements and objectives apply for source position of azimuth 0° and elevation 0° in the test signal. They should also be evaluated for the source positions listed in Table 6.3, and results should be included in the test report.

Table 6.3: Additional source positions for loudness

Azimuth [°]	Elevation [°]
+90	0
-90	0
180	0
0	+90

Compliance shall be checked by the relevant tests described in TS 26.260.

6.4 Frequency response

6.4.1 Frequency response for single source

6.4.1.1 General

The sensitivity/frequency characteristics shall be as follows.

The receiving sensitivity frequency response, measured either from the digital interface to the DRP with diffuse-field correction or from the SS audio input (analogue or digital input of the reference speech encoder of the SS) to the DRP with diffuse-field correction shall be within a mask, which can be drawn with straight lines between the breaking points in table 2 on a logarithmic (frequency) - linear (dB sensitivity) scale.

6.4.1.2 Acoustical interface

The requirements for acoustical interface testing are given in Table 6.4.1.2-1.

Table 6.4.1.2-1: Sending sensitivity/frequency requirements table for acoustical interface

Frequency (Hz)	Upper limit (dB)	Lower limit (dB)
100	TBD	
200	TBD	TBD
300	TBD	TBD
4000	TBD	TBD
8000	TBD	TBD
12000	TBD	

Compliance shall be checked by the relevant tests described in TS 26.260.

6.4.1.3 Electrical interface

The requirements for electrical interface testing are given in Table 6.4.1.3-1.

Table 6.4.1.3-1: Sending sensitivity/frequency requirements table for electrical interface

Frequency (Hz)	Upper limit (dB)	Lower limit (dB)
100	TBD	
200	TBD	TBD
300	TBD	TBD
6000	TBD	TBD
8000	TBD	TBD
12000	TBD	

Compliance shall be checked by the relevant tests described in TS 26.260.

6.5 Binaural rendering

6.5.1 ILD

For headset UE or electrical interface UE (if intended for headset usage), the UE shall pass ILD requirements defined in Table 6.5.1-1.

If the UE supports headtracking, the same requirements in Table 6.5.1 shall be met for each HATS orientation $\tilde{\varphi}_j \in \{0^\circ, -30^\circ, +30^\circ\}$.

NOTE: If the UE supports headtracking and the requirements are not met, the test operator should verify if the failure might be caused by an automatic reset of the reference orientation.

Table 6.5.1-1: ILD requirements

i	Source azimuth (°)	Source elevation (°)	500 Hz		1000 Hz		2000 Hz		4000 Hz		8000 Hz	
			Lower limit (dB)	Upper limit (dB)	Lower limit (dB)	Upper limit (dB)	Lower limit (dB)	Upper limit (dB)	Lower limit (dB)	Upper limit (dB)	Lower limit (dB)	Upper limit (dB)
1	0	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
2	180	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
3	0	90	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
4	90	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
5	-90 (270)	0	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD

Compliance shall be checked by the relevant tests described in TS 26.260.

6.5.2 ITD

For headset UE or electrical interface UE (if intended for headset usage), the UE shall pass ITD requirements defined in Table 6.5.2.

If the UE supports headtracking, the same requirements in Table 6.5.2-1 shall be met for each HATS orientation.

NOTE: If the UE supports headtracking and the requirements are not met, the test operator should verify if the failure might be caused by an automatic reset of the reference orientation.

Table 6.5.2-1: ITD requirements

i	Source azimuth (°)	Source elevation (°)	Lower limit (ms)	Upper limit (ms)
1	0	0	TBD	TBD
2	180	0	TBD	TBD
3	0	90	TBD	TBD
4	90	0	TBD	TBD
5	-90 (270)	0	TBD	TBD

Compliance shall be checked by the relevant tests described in TS 26.260.

6.5.3 Motion-to-Sound Latency

The M2S latency measured with the test method from clause 5.7.5 from TS 26.260 should not exceed [80 ms] and shall not exceed [100 ms].

The absolute difference between the initial ILD calibration (ILD_{0°) and the verification ILD ($ILD_{0^\circ, v}$) shall not exceed 0.5 dB.

NOTE: Values in brackets are provisional.

Compliance shall be checked by the relevant tests described in TS 26.260.

7 Performance in sending+receiving

7.1 Applicability

The performance requirements in this clause shall apply when UE is used to provide end to end immersive audio, including both capture and rendering.

7.2 Delay

The UE roundtrip delay ($T_S + T_R$) in send and receive direction shall be less or equal to TBD.

NOTE: This requirement does not apply for one-way scenarios, delay corresponds here to complete terminal delay.

Annex A (informative):

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-04	SA4#103	S4-190426				Initial version	0.0.1
2024-05	SA4#128	S4-241235				Definition of initial clauses and revision of structure	0.1.0
2024-05	SA4#128	S4-241333				Inclusion of preliminary requirements	0.2.0
2024-06	SA4-e (AH) Audio SWG post 128	SA4aA24003 2				Additional requirements, improvements and editorial changes	0.3.0
2024-06						Version 1.0.0 created by MCC	1.0.0
2024-06						Version 18.0.0 created by MCC upon TSG approval	18.0.0
2025-10						Update to Rel-19 version (MCC)	19.0.0
2026-01	SA#110		000 2	-	B	New performance requirements for immersive UEs	19.1.0

History

Version	Date	Status
V19.0.0	November 2025	Publication
V19.1.0	February 2026	Publication