**3GPP TSG- Meeting #**

**, , - *Revision of S4-252002***

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| *CR-Form-v12.4* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** | **2** | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*https://www.3gpp.org/Change-Requests*](https://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:*** |  | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
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| ***Reason for change:*** | | IVAS rendering supports features that are currently missing in the specification. TS 26.251 is not available in Rel-18 and should therefore be removed. | | | | | | | | |
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| ***Summary of change:*** | | Adds description of rendering features: object editing. Removes redundant references to the fixed-point IVAS specification. | | | | | | | | |
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| ***Consequences if not approved:*** | | Implementers can be confused and miss essential IVAS rendering features | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 3.3, 4.2, 7.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

==============First change==============

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 26.250: "Codec for Immersive Voice and Audio Services (IVAS); General overview".

[3] (void)

[4] 3GPP TS 26.253: "Codec for Immersive Voice and Audio Services (IVAS); Detailed Algorithmic Description incl. RTP payload format and SDP parameter definitions".

[5] 3GPP TS 26.258: "Codec for Immersive Voice and Audio Services (IVAS); C code (floating point)".

[6] 3GPP TS 26.249: " Immersive Audio for Split Rendering Scenarios; Detailed Algorithmic Description of Split Rendering Functions".

==============Next change==============

3.3 Abbreviations

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

BRIR Binaural Room Impulse Response

CPE Channel Pair Element

EVS Enhanced Voice Services

HRIR Head-Related Impulse Response

HRTF Head-Related Transfer Function

ISM Independent Stream with Metadata

IVAS Immersive Voice and Audio Services

MASA Metadata Assisted Spatial Audio

MCT Multi-channel Coding Tool

OMASA Objects with MASA

OSBA Objects with SBA

RTP Real-Time Protocol

SBA Scene-Based Audio

SCE Single Channel Element

UE User Equipment

==============Next change==============

4.2 IVAS rendering

Rendering is the process of generating digital audio output from the decoded digital audio signal. Rendering is used when output format is different than input format. In case output format is the same as input format, the decoded audio channels are simply passed through to the output channels. Binaural rendering is a special case, where binaural output channels are prepared for headphone reproduction. This process includes head-tracking and scene orientation control, head-related transfer function processing, and room acoustic synthesis. Rendering for loudspeaker reproduction is also supported for preset or custom loudspeaker configurations.

IVAS rendering is available as an integral component of the IVAS decoder (internal renderer) or can be operated standalone as external rendering. The external renderer can be applied, e.g., in the case of rendering outputs originating from multiple sources, such as decoders or audio streams.

IVAS rendering include:

* support for provisioning of HRIR/BRIR filter sets as control data for binaural rendering. The format of HRIR/BRIR data is provided in clause 5.10 of [5],
* support for default HRIR/BRIR sets for binaural rendering,
* support for rendering control features:
  + head-tracking data as control data and external orientation data for binaural audio rendering in quaternions (and for head-tracking also in Euler notation). The format of orientation data is provided in clause 5.11 of [5],
  + binaural reverb and early reflections controlled by reverb parameters, the format of reverb parameters is provided in clause 5.14.1, and in Annex B of [5],
  + object editing of decoded ISM, OMASA, and OSBA bitstreams in internal IVAS renderer (clause 5) according to interface provided in clause 5.18 of [5].

A special feature of the renderer is that it supports split operation with pre-rendering and transcoding to a head-trackable intermediate representation that can be transmitted to a post-rendering end-device. This enables moving a large part of the processing load and memory requirements for IVAS decoding and rendering to a (more) capable node/UE while offloading the final rendering end-device. The IVAS specific split rendering functionality is mostly described in TS 26.253 [4] whereas more generic split rendering functionality is specified in TS 26.249 [6].

This document provides a high-level specification of the internal (clause 5) and external renderer (clause 6). Furthermore, the rendering library interface is provided (clause 7). Split rendering is described on high level in clause 8. Specific rendering algorithms and processing paths are out of scope of this specification and are provided in TS 26.253 [4].

==============Next change==============

7.1 High-level rendering interface description

IVAS renderer and its interface provide support to IVAS codec design constraints. The rendering modes and rendering control mechanisms are discussed in clause of TS 26.253 [4].

The details of the rendering library API are provided in TS 26.258 [5] for the floating-point code. The API functions of the IVAS rendering library provide access to the following groups of functionalities:

* Initialization,
* Configuration (input/output),
* Metadata (input/output),
* Audio (input/output),
* Head tracking and orientation tracking (input/output),
* Object editing

==============End of change==============