**3GPP TSG-SA4 Meeting #128 *S4-241052***

**Jeju, Korea (Republic Of), 20th May 2024 - 24th May 2024**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **26.252** | **CR** | **0001** | **rev** | **-** | **Current version:** | **18.0.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **x** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Updated IVAS test sequences | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Dolby Sweden AB, Ericsson LM, Fraunhofer IIS, Huawei Technologies Co Ltd., Nokia Corporation, NTT, Orange, Panasonic Holdings Corporation, Philips International B.V., Qualcomm Incorporated, VoiceAge Corporation | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | IVAS\_Codec, ISAR | | | | |  | ***Date:*** | | | 2024-05-14 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. After the submission of the initial IVAS C-Code to SA4#125, continued and extended testing has revealed a number of issues that have to be corrected. These issues include crashes, address/memory sanitizer errors, undefined-behavior sanitizer errors, quality issues. 2. The split rendering feature selected by SA4 according to the ISAR selection procedure has been added to IVAS codec specifications. 3. Test sequences for implementations based on fixed-point code are currently missing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Amended test sequence specification to cover updated IVAS reference code TS 26.258, split rendering for IVAS, and fixed-point implementations. 2. Updated electronic attachements    1. Readme.txt    2. Test sequences | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Incompatible test sequences for TS 26.258, lacking split rendering conformance and missing test sequences for fixed-point implemenations. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 1, 2, 3.3, 4.1, 5.1, 5.2, 6.2, 6.3.3, 6.3.6 (new), 7.1, 7.3 (new), Electronic attachments | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 26.258 CR 0002 | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | The electronic attachment of updates test sequences comprises a significant amount of data, and cannot be directly attached. It will be shared upon request, and for implementation of approved CR. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\* \* \* First Change \* \* \* \*

# 1 Scope

The present document specifies the digital test sequences for the Immersive Voice and Audio Services (IVAS) codec. These sequences shall be used in conformance testing for implementations of the IVAS codec (3GPP TS 26.253), Rendering (3GPP TS 26.254), Error Concealment of Lost Packets (3GPP TS 26.255) and Jitter Buffer Management (JBM) (3GPP TS 26.256), and its reference C code specifications 3GPP TS 26.251 (fixed-point) and 3GPP TS 26.258 (floating-point). In addition, the present document specifies procedures for conformance testing.

\* \* \* Next 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 - General overview".

[3] 3GPP TS 26.251: "Codec for Immersive Voice and Audio Services - C code (fixed-point)".

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

[5] 3GPP TS 26.254: "Codec for Immersive Voice and Audio Services - Rendering".

[6] 3GPP TS 26.255: "Codec for Immersive Voice and Audio Services - Error concealment of lost packets".

[7] 3GPP TS 26.256: "Codec for Immersive Voice and Audio Services - Jitter Buffer Management".

[8] 3GPP TS 26.258: "Codec for Immersive Voice and Audio Services - C code (floating point)".

[9] 3GPP TS 26.444: "Codec for Enhanced Voice Services - Test Sequences".

[10] ETSI TS 103 634 V1.4.1 (2023-03), "Digital Enhanced Cordless Telecommunications (DECT); Low Complexity Communication Codec plus (LC3plus)"

\* \* \* Next Change \* \* \* \*

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

AMR-WB Adaptive Multi Rate Wideband (codec)

EVS Enhanced Voice Services (codec)

IVAS Immersive Voice and Audio Services (codec)

ISAR Immersive Audio for Split Rendering Scenarios

JBM Jitter Buffer Management

\* \* \* Next Change \* \* \* \*

# 4 General

## 4.1 Introduction

This specification provides digital test sequences that shall be used to test conformance for an implementation of the IVAS codec (TS 26.253 [4]), Rendering (TS 26.254 [5]), Error Concealment of Lost Packets (TS 26.255 [6]) and Jitter Buffer Management (JBM) (TS 26.256 [7]), and its reference C code specifications in TS 26.251 [3] (fixed-point) and TS 26.258 [8] (floating-point). An overview of the IVAS Codec specifications is found in TS 25.250 [2].

NOTE: Test sequences for TS 26.251 [3] (fixed-point), being an integral part of the IVAS codec specification set, are for the moment identical to the test sequences defined for TS 26.258 [8] (floating-point), but may be differentiatied based on updates to TS 26.251.

A standard compliant implementation of the above specifications shall pass the conformance tests according to clause 7. The necessary test sequences can be found in the corresponding ZIP files according to the attached Readme.txt file.

NOTE: The test sequences apply to specific version(s) of the IVAS codec as indicated by the name of the ZIP file, e.g., IVAS-FL-1.0. The codec version number is used to have consistent numbering across reference C code specifications.

Clause 5 describes the format of the files, which contain the digital test sequences. Clause 6 describes the test sequences for the IVAS codec, including rendering, error concealment of lost packets, and jitter buffer management. Clause 7 describes the conformance testing procedure for implementations of the IVAS codec.

\* \* \* Next Change \* \* \* \*

# 5 Test sequence format

## 5.1 Introduction to test sequence format

This clause provides information on the format of the digital test sequences for the IVAS codec (TS 26.253 [4]), Rendering (TS 26.254 [5]), Error Concealment of Lost Packets (TS 26.255 [6]) and Jitter Buffer Management (JBM) (TS 26.256 [7]), and its reference C code specifications in TS 26.251 [3] (fixed-point) and TS 26.258 [8] (floating-point).

\* \* \* Next Change \* \* \* \*

## 5.2 File format

The test sequence data is provided in PC (little-endian byte order) files, according to table 1.

Table 1: Overview of test sequence files

|  |  |
| --- | --- |
| File type | File extensions |
| Audio input to the encoder and output from the decoder and renderer | \*.wav |
| ISM metadata, Head rotation trajectories | \*.csv |
| MASA metadata | \*.met |
| Rate switching | \*.bin |
| IVAS bitstreams | \*.192 |
| ISAR bitstreams | \*.bit |
| IVAS bitstreams with frame errors | \*.fer |
| Renderer configuration (text format or binary format) | \*.cfg, \*.dat |
| Renderer scene description | \*.txt |

\* \* \* Next Change \* \* \* \*

## 6.2 Codec configuration

The codec shall be configured according to the instructions in Readme\_IVAS\_{enc, dec, rend, JBM\_dec, ISAR\_dec, ISAR\_post\_rend}.txt for each test case respectively in accordance with clause 6.3. For the bit-exact EVS compatibility mode of IVAS, including the AMR-WB interoperable function, the codec shall be configured in accordance with TS 26.444 [9].

\* \* \* Next Change \* \* \* \*

### 6.3.3 Decoder test sequences

To test an IVAS decoder (beyond mono operation, see clause 6.3.1), test sequences and instructions provided in Readme\_IVAS\_dec.txt shall be used. To test the IVAS decoder for split rendering (ISAR pre-renderer), test sequences and instructions provided in Readme\_IVAS\_ISAR\_dec.txt shall be used.

\* \* \* Next Change \* \* \* \*

### 6.3.6 ISAR post-renderer (split rendering) test sequences

To test an ISAR post-renderer, test sequences and instructions provided in Readme\_IVAS\_ISAR\_post\_rend.txt shall be used.

\* \* \* Next Change \* \* \* \*

# 7 Conformance Testing

## 7.1 Bit-exact Conformance

For an implementation to be declared conformant according to the bit-exact conformance test procedure, the encoder, decoder and renderer output sequences of the implementation shall match bit-exactly the reference test sequences provided in the corresponding ZIP files in accordance with clause 6. This applies for all implementations of the IVAS codec (TS 26.253 [4]), Rendering (TS 26.254 [5]), Error Concealment of Lost Packets (TS 26.255 [6]) and Jitter Buffer Management (JBM) (TS 26.256 [7]), and its reference C code specifications in TS 26.251 [3] (fixed-point) and TS 26.258 [8] (floating-point).

Note: Optional features if implemented, corresponding conformance tests shall pass.

## 7.2 Non-Bit-exact Conformance

For IVAS mono operation, if an implementation under test is based on floating–point code (TS 26.258 [8]) and the output sequences are not bit-exact to the test sequences according to clause 6, the non-bit-exact conformance testing procedure defined in TS 26.444 [9] shall be used to test the conformance.

Note: Optional features if implemented, corresponding conformance tests shall pass.

\* \* \* Next Change \* \* \* \*

## 7.3 LC3plus Conformance

For IVAS/ISAR split rendering operation utilizing LC3plus, the LC3plus encoder and decoder implementation shall pass all required conformance tests in accordance with the conformance procedure specified in [10] for the corresponding LC3plus codec version [10].

NOTE: Further details on the conformance configuration is TBD.

\* \* \* End of Changes \* \* \* \*