

ETSI TS 126 252 V19.1.0 (2026-02)



TECHNICAL SPECIFICATION

**LTE;
5G;
Codec for Immersive Voice and Audio Services (IVAS);
Test sequences
(3GPP TS 26.252 version 19.1.0 Release 19)**



Reference

RTS/TSGS-0426252vj10

Keywords

5G,LTE

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° w061004871

Important notice

The present document can be downloaded from the
[ETSI Search & Browse Standards](#) application.

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format on [ETSI deliver](#) repository.

Users should be aware that the present document may be revised or have its status changed,
this information is available in the [Milestones listing](#).

If you find errors in the present document, please send your comments to
the relevant service listed under [Committee Support Staff](#).

If you find a security vulnerability in the present document, please report it through our
[Coordinated Vulnerability Disclosure \(CVD\)](#) program.

Notice of disclaimer & limitation of liability

The information provided in the present deliverable is directed solely to professionals who have the appropriate degree of experience to understand and interpret its content in accordance with generally accepted engineering or other professional standard and applicable regulations.

No recommendation as to products and services or vendors is made or should be implied.

No representation or warranty is made that this deliverable is technically accurate or sufficient or conforms to any law and/or governmental rule and/or regulation and further, no representation or warranty is made of merchantability or fitness for any particular purpose or against infringement of intellectual property rights.

In no event shall ETSI be held liable for loss of profits or any other incidental or consequential damages.

Any software contained in this deliverable is provided "AS IS" with no warranties, express or implied, including but not limited to, the warranties of merchantability, fitness for a particular purpose and non-infringement of intellectual property rights and ETSI shall not be held liable in any event for any damages whatsoever (including, without limitation, damages for loss of profits, business interruption, loss of information, or any other pecuniary loss) arising out of or related to the use of or inability to use the software.

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2026.
All rights reserved.

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The declarations pertaining to these essential IPRs, if any, are publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the [ETSI IPR online database](#).

Pursuant to the ETSI Directives including the ETSI IPR Policy, no investigation regarding the essentiality of IPRs, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members. **3GPP™**, **LTE™** and **5G™** logo are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners. **oneM2M™** logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners. **GSM®** and the GSM logo are trademarks registered and owned by the GSM Association.

Legal Notice

This Technical Specification (TS) has been produced by ETSI 3rd Generation Partnership Project (3GPP).

The present document may refer to technical specifications or reports using their 3GPP identities. These shall be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between 3GPP and ETSI identities can be found at [3GPP to ETSI numbering cross-referencing](#).

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.

Contents

Intellectual Property Rights	2
Legal Notice	2
Modal verbs terminology.....	2
Foreword.....	4
1 Scope	6
2 References	6
3 Definitions of terms, symbols and abbreviations	6
3.1 Terms.....	6
3.2 Symbols.....	7
3.3 Abbreviations	7
4 General	7
4.1 Introduction	7
5 Test sequence format.....	7
5.1 Introduction to test sequence format	7
5.2 File format	7
6 IVAS codec test sequences including error concealment of lost packets.....	8
6.1 Introduction to test sequences	8
6.2 Codec configuration	8
6.3 IVAS codec test sequences.....	8
6.3.1 Mono operation test sequences	8
6.3.2 Encoder test sequences	8
6.3.3 Decoder test sequences	8
6.3.4 Renderer test sequences	8
6.3.5 Jitter buffer management test sequences.....	9
6.3.6 Split rendering post renderer test sequences	9
7 Conformance Testing	9
7.1 Bit-exact Conformance.....	9
7.2 Non-Bit-exact Conformance	9
7.2.1 Non-Bit-exact Conformance for IVAS floating-point operations.....	9
7.2.1.1 IVAS floating-point mono operation	9
7.2.1.2 IVAS floating-point conformance in stereo and immersive operation	9
7.2.3 Running the Tests	11
7.3 LC3plus Conformance	12
Annex A: Tools Description (normative)	13
A.1 Decoder Test	13
A.1.1 General Considerations	13
A.1.2 Metrics.....	13
A.2 Encoder Test.....	14
A.2.1 General Consideration	14
A.2.2 Metrics.....	14
A.3 Thresholds and Criteria	14
A.3.1 Thresholds and Criteria for IVAS floating-point operations	14
A.3.1.1 MLD Thresholds for WAV comparisons.....	14
A.3.1.2 Thresholds for Metadata comparisons	15
A.4 Reference Implementations	15
Annex B (informative): Change history	16
History	17

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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

- shall** indicates a mandatory requirement to do something
- shall not** indicates an interdiction (prohibition) to do something

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

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
- should not** indicates a recommendation not to do something
- may** indicates permission to do something
- need not** indicates permission not to do something

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

The constructions "can" and "cannot" are not 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

The constructions "is" and "is not" do not indicate requirements.

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 specification, which are 3GPP TS 26.258 (floating-point) and 3GPP TS 26.251 (fixed-point). The sequences shall also be used for conformance testing of implementations of Split Rendering functions addressing Immersive Audio for Split Rendering Scenarios ISAR according to 3GPP TS 26.249. In addition, the present document specifies procedures for conformance testing.

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] 3GPP TS 26.251: "Codec for Immersive Voice and Audio Services (IVAS); C code (fixed point)".
- [4] 3GPP TS 26.253: "Codec for Immersive Voice and Audio Services (IVAS); Detailed Algorithmic Description including RTP payload format and SDP parameter definitions".
- [5] 3GPP TS 26.254: "Codec for Immersive Voice and Audio Services (IVAS); Rendering".
- [6] 3GPP TS 26.255: "Codec for Immersive Voice and Audio Services (IVAS); Error concealment of lost packets".
- [7] 3GPP TS 26.256: "Codec for Immersive Voice and Audio Services (IVAS); Jitter Buffer Management".
- [8] 3GPP TS 26.258: "Codec for Immersive Voice and Audio Services (IVAS); C code (floating-point)".
- [9] 3GPP TS 26.444: "Codec for Enhanced Voice Services (EVS); Test Sequences".
- [10] ETSI TS 103 634 V1.6.1 (2025-10), "Digital Enhanced Cordless Telecommunications (DECT); Low Complexity Communication Codec plus (LC3plus)".
- [11] 3GPP TS 26.249: "Immersive Audio for Split rendering scenarios".

3 Definitions of terms, symbols and abbreviations

3.1 Terms

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

3.2 Symbols

Void

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

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 specification, which are TS 26.258 [8] (floating-point) and 3GPP TS 26.251 [3] (fixed-point). An overview of the IVAS Codec specifications is found in TS 25.250 [2]. The sequences shall also be used for conformance testing of implementations of Split Rendering functions addressing Immersive Audio for Split Rendering Scenarios ISAR according to 3GPP TS 26.249 [11].

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.

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, which are TS 26.258 [8] (floating-point) and TS 26.251 [3] (fixed-point).

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
Network simulator streams	*.netsimout
ISAR bitstreams	*.bit
ISAR bitstreams with frame errors	*.ep
IVAS bitstreams with frame errors	*.fer
Renderer configuration (text format or binary format)	*.cfg, *.dat
Renderer scene description	*.txt

6 IVAS codec test sequences including error concealment of lost packets

6.1 Introduction to test sequences

This clause provides information on the test sequences designed to exercise the IVAS codec.

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].

6.3 IVAS codec test sequences

6.3.1 Mono operation test sequences

For mono operation (utilizing the bit-exact EVS compatibility mode of IVAS, including the AMR-WB interoperable function) the encoder and decoder shall be tested using test sequences and instructions in accordance with TS 26.444 [9].

6.3.2 Encoder test sequences

To test an IVAS encoder (beyond mono operation, see clause 6.3.1), test sequences and instructions provided in `Readme_IVAS_enc.txt` shall be used.

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.

6.3.4 Renderer test sequences

To test an IVAS renderer, test sequences and instructions provided in `Readme_IVAS_rend.txt` shall be used.

6.3.5 Jitter buffer management test sequences

To test jitter buffer management (JBM) for an IVAS decoder, test sequences and instructions provided in `Readme_IVAS_JBM_dec.txt` shall be used.

6.3.6 Split rendering post renderer test sequences

To test post renderer for IVAS split rendering, test sequences and instructions provided in `Readme_IVAS_ISAR_post_rend.txt` shall be used.

7 Conformance Testing

7.1 Bit-exact Conformance

For an implementation to be declared conformant according to the bit-exact conformance test procedure, the output sequences of the corresponding feature being implemented (IVAS encoder, IVAS decoder, IVAS renderer, JBM, ISAR pre-renderer, ISAR post-renderer) shall match bit-exactly the reference test sequences provided in the corresponding ZIP files in accordance with clause 6, including clause 6.3.1 for mono operation of the IVAS encoder and IVAS decoder. 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, which are TS 26.258 (floating-point) and 3GPP TS 26.251 (fixed-point). This also applies for implementations of Split Rendering functions addressing Immersive Audio for Split Rendering Scenarios ISAR according to 3GPP TS 26.249.

If optional features are implemented, the corresponding conformance tests shall pass.

7.2 Non-Bit-exact Conformance

7.2.1 Non-Bit-exact Conformance for IVAS floating-point operations

7.2.1.1 IVAS floating-point mono operation

For IVAS mono operation (of and IVAS encoder or IVAS decoder), 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.

If optional features are implemented, the corresponding conformance tests shall pass.

7.2.1.2 IVAS floating-point conformance in stereo and immersive operation

If an implementation under test is based on the reference 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 process defined here shall be used to test the conformance.

A conformant floating-point implementation of the IVAS codec shall be compliant to the reference specification in TS 26.250 [3] by implementing all the algorithmic steps of the IVAS codec, further specified in 3GPP TS 26.253 (Detailed Algorithmic Description) [4], 3GPP TS 26.254 (IVAS rendering) [5], 3GPP TS 26.255 (Packet Loss Concealment (PLC) of Lost Packets) [6], 3GPP TS 26.256 (Jitter Buffer Management (JBM)) [7] and 3GPP TS 26.249 Immersive Audio for split rendering scenarios (ISAR) [11].

If a floating-point implementation uses the Jitter Buffer Management (JBM) according to TS 26.256 [7], the implementation shall be compliant to the reference specification in TS 26.253 [4] by implementing all the algorithmic steps of 3GPP TS 26.256 (Jitter Buffer Management (JBM)).

If a floating-point implementation uses the renderer according to TS 26.254 [5], the implementation shall be compliant to the reference specification in TS 26.253 [4] by implementing all the algorithmic steps of 3GPP TS 26.254 (IVAS rendering).

If a floating-point implementation uses the Immersive Audio for Split rendering (ISAR) according to TS 26.249 [11], the implementation shall be compliant to the reference specification in TS 26.253 [4] by implementing all the algorithmic steps of 3GPP TS 26.249 (Immersive Audio for Split rendering (ISAR)).

An implementation shall be tested for non-bit-exact conformance using two specific tests:

- Decoder test comparing the implementation decoder with TS 26.258 [8] decoder.
- Encoder test comparing the implementation encoder with TS 26.258 [8] encoder.

Both encoder and decoder tests shall pass for the implementation to be declared conformant. Figure 7.1 shows the flow chart of the non-bit-exact conformance process.

In addition to the encoder and decoder conformance tests, if an implementation uses the Jitter Buffer Management (JBM) according to TS 26.256 [7], then it shall be tested for non-bit-exact conformance using:

- Jitter Buffer Management (JBM) test comparing the implementation JBM with TS 26.258 [8] decoder.

In addition to the encoder and decoder conformance tests, if an implementation uses the IVAS rendering according to TS 26.254 [5], then it shall be tested for non-bit-exact conformance using:

- Renderer test comparing the implementation encoder with TS 26.258 [8] renderer.

In addition to the encoder and decoder conformance tests, if an implementation uses the IVAS split rendering according to TS 26.254 [5], then it shall be tested for non-bit-exact conformance using two specific tests:

- Split rendering pre-renderer test comparing the implementation split renderer with TS 26.258 [8] decoder and renderer
- Split rendering post-renderer test comparing the implementation split renderer with TS 26.258 [8] split renderer post-renderer.

Non-bit-exact conformance is defined based on comparisons with WAV output files and metadata output files. Metadata output files are ISM metadata (with .csv file extension) and MASA metadata (with .met file extension) output files.

The tests with WAV output files described in more details in Annex A.

The tests with Metadata output files shall yield a maximum deviation from the reference that is not larger than the threshold specified in Annex A.3.1.2, where the maximum deviation is measured separately per metadata parameter for each metadata format.

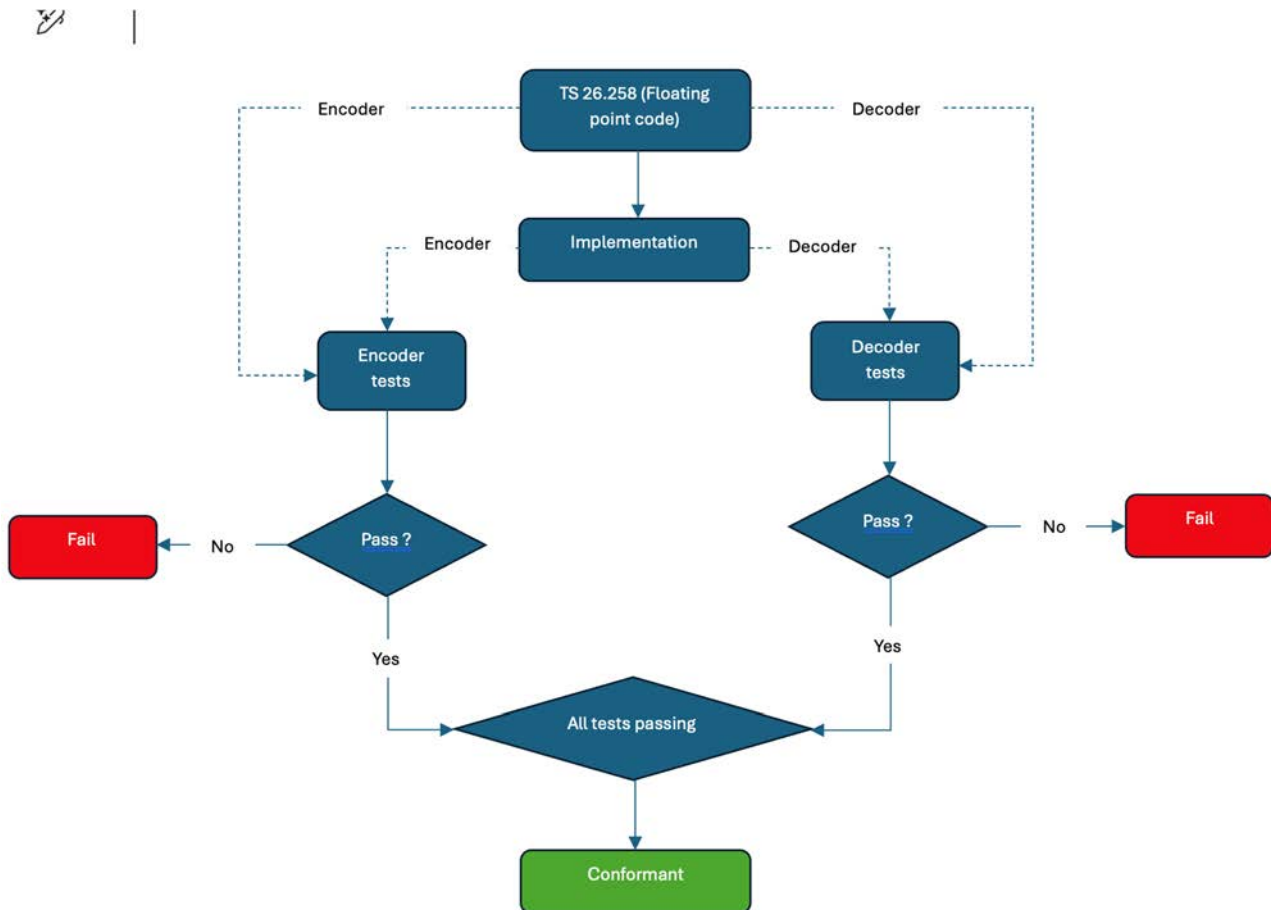


Figure 7.1: Non-bit-exact conformance process

7.2.3 Running the Tests

The executables and scripts illustrating how to run the tests are included in the ZIP of the floating-point test sequences. Annex A provides more details on the tests. In the case of discrepancy between the procedure described in Annex A and the scripts provided in the ZIP file, the procedure of the scripts provided prevail.

For all IVAS tests, including encoder, decoder, JBM, renderer and split renderer, instructions on how to operate the implementation under test to run the tests are contained in the text file Readme.md. The scripts require certain Python® packages (instructions on Python® packages are contained in the Readme file) and an additional tool, wav-diff.exe (instructions on how to download it are contained in the Readme file). The IVAS test scripts are run by executing a Python® script:

- runConformance.py (instruction on how to use the script are provided in the Readme.md)

The reference files for MLD encoder and decoder tests are also included in the zip file.

The implementation will be declared conformant if all encoder and decoder tests are passed.

The reference files for MLD JBM, Rendering and Split rendering tests are also included in the zip file.

The implementation of JBM will be declared conformant if all JBM tests are passed.

The implementation of IVAS rendering will be declared conformant if all IVAS rendering tests are passed.

The implementation of IVAS split rendering will be declared conformant if all IVAS split rendering (ISAR) tests are passed.

7.3 LC3plus Conformance

For IVAS/ISAR split rendering operation utilizing LC3plus, the LC3plus encoder and decoder implementation shall pass the conformance test according to ETSI TS 103 634 clause 7. The conformance tests configuration is defined in Table 2.

Table 2: Conformance tests for LC3plus in IVAS split rendering

LC3plus for IVAS split rendering	Codec configuration				Conformance tests group (see clause 7.3.1) (see note 1)		
	HR mode	Sampling rate [Hz]	Frame size [ms]	Bit rate [bytes per frame] (see note 2)	Core coder	Concealment	Channel Coder
	Disabled	48 000	5	80, 120, 160	Enc, Dec, EncDec	Dec	N/A
			10	155 ³ , 240, 320, 400			
	Enabled		5	80, 120, 160	Enc, Dec, EncDec	Dec	N/A
			10	155 ³ , 240, 320, 400			

NOTE 1: Some conformance tests are conducted for the modules encoder (enc), decoder (dec) and codec (EncDec) separately.

NOTE 2: As LC3plus operates in dual-mono for stereo signals, the conformance tests are applied on mono signals only.

NOTE 3: Rates correspond to Basic Audio Profile for Bluetooth Low Energy audio using the configurations 48_6

Annex A: Tools Description (normative)

A.1 Decoder Test

A.1.1 General Considerations

The WAV signals under test are obtained by running the bit-stream included in this specification through the Decoder under Test (Figure A.1). The reference decoder is built from the floating-point code of TS 26.258 [8] if conformance is tested according to clause 7.2.1.2.

NOTE: The reference decoders must be built following the procedures and for the platforms as specified in [8] or [3], respectively.

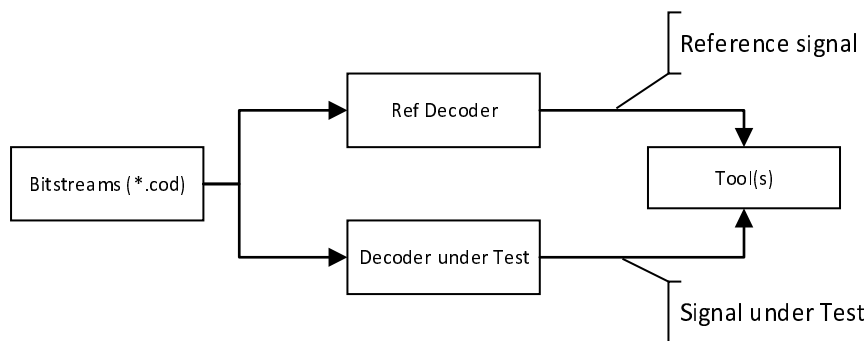


Figure A.1: Flow diagram for the decoder test using signal-based metrics

The MLD metric, as defined in clause A.1.2, is used to test the non-bit-exact floating-point implementation. This metric is calculated on the reference WAV signal $x_{REF}(t)$ and the WAV signal under test $x_{TST}(t)$ based on 20ms frames. The frames of the two signals will be time aligned, this means the delay compensation in IVAS encoder and decoder remains ON (the default configuration).

The number of samples N for a 20ms frame size is defined by $N = f_s \cdot 0.02$, where f_s represents the sampling rate.

A.1.2 Metrics

The Loudness Difference (LD) is used as defined in A.2.2 of [9]. Given that the IVAS decoder output can have multiple channels, the MLD per 20 ms frame is computed as the maximum of MLD values of all the channels in that frame.

The LD should be below a threshold Th_{MLD} based on a reference value plus some headroom as defined below.

The headroom is defined as fixed value, currently set to 0.1.

$$Th_{MLD}[n] = 0.1 + LD_{ref}[n]$$

Then for each file a MLD could be defined as

$$MLD = \min(Th_{MLD}[n] - N_{diff}[n])$$

Where, N_{diff} is MLD per 20ms frame as defined in A.2.2 of [9].

The test file will be considered equivalent to the reference file if the MLD is positive or equal to 0, i.e. the Loudness Difference does not exceed the threshold for all the frames.

LD_{ref} is defined by reference implementations of the reference c-code on various reference platforms listed in clause A.4:

For each frame of each test sequence, the maximum LD value of all reference implementations defines a corridor, the ‘refline’. This then leads to a profile for each IVAS test sequence, which contains on a 20ms frame basis an allowed

LD_{ref} value relative to the reference. Allowed differences in implementations under test (IuTs) are thus limited to the tolerable differences by the different compilers used for the refile generation.

All the test sequences need to pass for the implementation to be conformant.

A.2 Encoder Test

A.2.1 General Consideration

The reference bitstreams are taken from the encoded floating-point test sequences of this specification. Figure A.3 shows the flow diagram of the encoder conformance test according to clause 7.2.1.2 for a floating-point implementation.

NOTE: The reference encoders and decoders must be built following the procedures and for the platforms as specified in [8] or [3], respectively.

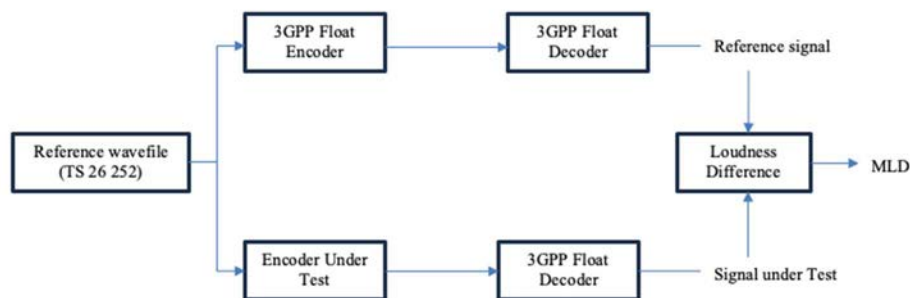


Figure A.3: Flow diagram for the encoder test using MLD Loudness Difference metric

All encoder test sequences from this specification will be encoded using the encoder implementation under test. The bit-stream obtained will be then decoded using the 3GPP reference float decoder from TS 26.258 [8] to obtain the test signals. The test signals will then be compared with the reference signal from this specification. Since the loudness tool (presented in clause A.2.2) operates on 48 kHz sample rate only, additional resampling is applied before processing.

A.2.2 Metrics

As defined in A.1.2.

All the test sequences need to pass for the implementation to be conformant.

A.3 Thresholds and Criteria

A.3.1 Thresholds and Criteria for IVAS floating-point operations

A.3.1.1 MLD Thresholds for WAV comparisons

MLD thresholds are defined using MLD corridor defined in clause A.1.2.

A.3.1.2 Thresholds for Metadata comparisons

For Metadata output files of IVAS floating-point operations a deviation threshold is defined for each metadata format separately.

For ISM metadata format, each metadata parameter is defined to have a separate threshold. The threshold of 0 applies to each metadata parameter.

For MASA metadata format, each spatial metadata parameter is defined to have a separate threshold. The threshold of 0 applies to each spatial metadata parameter.

A.4 Reference Implementations

To get the MLD corridor as the threshold values for non-BE conformance tests, a set of reference implementations were used. Table A.8 lists the implementations used for references, including compiler, target platform, compiler setting. These implementations are based on mainstream compilers and platforms and used the latest version of IVAS code defined in TS 26.258 [8]. These implementations are not bit-exact between themselves or with the 3GPP reference implementation (Ubuntu 24.04, Clang 18, O0).

Table A.4: List of Reference Implementations

Name	Platform	Compiler	Optimization	OS
Xeon_gcc_v11_o0	Intel(R) Xeon(R) W-1290	GCC v11	O0	Linux
Xeon_gcc_v11_o2	Intel(R) Xeon(R) W-1290	GCC v11	O2	Linux
Xeon_gcc_v11_o3	Intel(R) Xeon(R) W-1290	GCC v11	O3	Linux
Xeon_clang_v14_o2	Intel(R) Xeon(R) W-1290	Clang v14	O2	Linux
Xeon_clang_v14_o3	Intel(R) Xeon(R) W-1290	Clang v14	O3	Linux
Windows_	Visual Studio 2017 (v141)	MSVC 2017, toolset 2015	O0	Windows 10
	Visual Studio 2017 (v141)	MSVC 2017, toolset 2015	O2	Windows 10

Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2023-11	SA4#126	S4-231880				Initial version	0.0.1
2023-11	SA4#126	S4-231994				Presented to SA4 plenary	0.1.0
2023-12	SA#102	SP-231302				Version 1.0.0 created by MCC	1.0.0
2024-02	SA4#127	S4-240343				Added initial test sequences for TS 26.258	1.1.0
2024-03	SA#103	SP-240028				Version 2.0.0 created by MCC	2.0.0
2024-03						Version 18.0.0 created by MCC	18.0.0
2024-06	SA#104	SP-240693	0001	2	B	Updated IVAS test sequences	18.1.0
2024-06						Title changed, abbreviation "IVAS" added per TSG SA decision	18.1.0
2024-06	SA#105	SP-241115	0002	1	F	Correction of references	18.2.0
2025-10	-	-	-	-	-	Update to Rel-19 version (MCC)	19.0.0
2025-12	SA#110	SP-251431	0004	2	A	Corrections for IVAS test sequences	19.1.0
2025-12	SA#110	SP-252025	0005	2	B	Updates related to IVAS conformance testing of TS 26.258 and TS 26.251	19.1.0

History

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