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Presentation of Specification to TSG SA Plenary

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Document for presentation: TS 26.406 "General audio codec audio processing functions; Enhanced aacPlus general audio codec; Conformance testing", Version 2.0.0 (Release 6).

Presented for: Approval

Abstract of document:

The present document specifies the digital test sequences and conformance criteria for the Enhanced aacPlus audio codec.

An electronic copy of the ANSI-C code for the Fixed-point Enhanced aacPlus codec is included in TS 26.411. Alternatively, a floating-point ANSI-C code is specified in 3GPP TS 26.410. The fixed-point codec/encoder/decoder or the fixed-point codec/encoder/decoder may be used depending on if the implementation platform is better suited for a floating-point or a fixed-point implementation. It has been verified that the fixed-point and floating-point codecs interoperate with each other without any artifacts.

Standard conformance of the Enhanced aacPlus codec is enforced by meeting the conformance criteria defined in this document.

The present document includes information applicable to network operators, service providers and manufacturers.

Changes since last presentation:

This specification is presented to TSG SA Plenary for approval.

Outstanding Issues:

None.

Contentious Issues:

None.

Comment(s):

None.

3GPP TS 26.406 V2.0.0 (2005-06)

Technical Specification

**3rd Generation Partnership Project;
Technical Specification Group Services and System Aspects;
General audio codec audio processing functions;
Enhanced aacPlus general audio codec; Conformance testing
(Release 6)**



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Foreword

This Technical Specification (TS) 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.

1 Scope

The present document specifies the digital test sequences and conformance criteria for the Enhanced aacPlus audio codec.

2 Normative 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 TS 26.401: "General audio codec audio processing functions; Enhanced aacPlus general audio codec; General description".
- [2] 3GPP TS 26.403: "General audio codec audio processing functions; Enhanced aacPlus general audio codec; Encoder specification; Advanced Audio Coding (AAC) part".
- [3] 3GPP TS 26.404: "General audio codec audio processing functions; Enhanced aacPlus general audio codec; Encoder specification; Spectral Band Replication (SBR) part".
- [4] 3GPP TS 26.405: "General audio codec audio processing functions; Enhanced aacPlus general audio codec; Encoder specification; Parametric stereo part".
- [5] 3GPP TS 26.410: "General audio codec audio processing functions; Enhanced aacPlus general audio codec; Floating-point ANSI-C code".
- [6] 3GPP TS 26.411: "General audio codec audio processing functions; Enhanced aacPlus general audio codec; Fixed-point ANSI-C code".
- [7] ISO/IEC 14496-4:2004: "Information technology - Coding of audio-visual objects - Part 4: Conformance testing".
- [8] ISO/IEC 14496-4:2004/FDAM 8:2004: "Information technology - Coding of audio-visual objects - Part 4: Conformance testing – Amendment 8".
- [9] ITU-R Recommendation BS.1387-1: "Method for objective measurements of PErceived Audio Quality (PEAQ)".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TS 26.401 [1], 3GPP TS 26.403 [2], 3GPP TS 26.404 [3], 3GPP TS 26.405 [4], 3GPP TS 26.410 [5] and 3GPP TS 26.411 [6] apply.

3.2 Abbreviations

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

AAC-LC	Advanced Audio Coding-Low Complexity audio object type
ODG	Objective Difference Grade
PEAQ	Perceptual Evaluation of Audio Quality
SBR	Spectral Band Replication

4 General

Conformance testing is an important tool to verify that implementations of Enhanced aacPlus match the relevant specifications. It is also helpful in verifying the proper use of the source code provided in 3GPP TS 26.410 [5] and 3GPP TS 26.411 [6]. Conformance testing focuses on the core algorithm, therefore no criteria are defined for error concealment, downsampling and file I/O.

Clause 5 describes the proposed method of conformance testing for the decoder. Clause 6 discusses encoder conformance.

5 Decoder conformance testing

Decoder conformance for both fixed-point and floating-point implementations shall be tested in accordance with clauses 5.1 and 5.2. Conformance shall be verified by either bit-exact behaviour to the reference output or by meeting the objective criteria defined below. Bit-exact behaviour should be preferred for fixed-point implementations where it can be achieved without undue penalty on computational complexity.

5.1 AAC-LC and SBR conformance testing

Conformance testing for AAC-LC and SBR shall be performed according to the relevant clauses in ISO/IEC 14496-4 [7] and ISO/IEC 14496-4 [8]. The reference output shall be the output created by the respective 3GPP reference code (floating- or fixed-point).

5.2 Parametric Stereo conformance testing

The 3GPP floating-point reference code implementation shall be used as the reference implementation. Conformance of an implementation shall be tested via objective quality assessments, using ITU-R Recommendation BS.1387-1 [9]. An Objective Difference Grade comparison between the output of the reference decoder and the output of the decoder implementation under test shall result in a maximum ODG deviation of 0,25 for each single test vector.. The tests shall be run over bitrate configurations of 16 kbit/s, 21 kbit/s and 28 kbit/s, stereo.

The set of test vectors shall be the same as used for characterization testing. The attached zip file “ps_bitstream_testvec.zip” contains the bitstream test vectors, a filename list given in Annex A. The attached zip file “ps_testvec_creation.zip” shall be used to derive the output test vectors. The zip file contains:

- A Win32 precompiled version of the 3GPP floating-point decoder.

- A batch file which calls the reference decoder to produce reference decoded output test vectors for each bitstream test vector.

6 Encoder conformance

6.1 Floating point encoder

No specific routines for floating-point encoder conformance testing are defined. It is recommended to use the floating-point code from 3GPP TS 26.410 [5]. In addition, it is recommended to verify that the implementation meets the criteria defined in clause 6.2 (Fixed-point encoder). If the floating-point code is used for an implementation in mobile equipment, the criteria defined in 6.2 shall be met.

6.2 Fixed point encoder

Conformance of fixed-point encoder implementations for use in mobile equipment shall be verified by bit-exact behaviour to the fixed-point reference code [6], or by meeting the objective criteria defined below, or by performing subjective tests as described below. Fixed-point encoder implementations which are not used in mobile equipment, should meet the conformance criteria defined in this clause.

Bit-exact behaviour should be preferred for fixed-point implementations where it can be achieved without undue penalty on computational complexity.

If an implementer chooses to implement only a mono-encoder functionality (or other functionality FFS), then conformance of only this functionality shall be tested. This shall apply irrespective of the conformance testing method chosen.

Objective criteria FFS.

Subjective tests shall cover the encoder configurations tested during the characterization phase. The requirement for passing the subjective tests is that the encoder under test does not perform worse in a statistically significant sense in any test case when compared to the fixed-point reference encoder. (Further details: FFS).

Annex A (normative): Bitstream test vectors for testing Parametric Stereo decoding

#	Bitstream test vector file name	Bitrate configuration
1	m_cl_x_2_16s.wav	16 kbit/s, stereo
2	m_ot_x_1_16s.wav	16 kbit/s, stereo
3	m_p_x_1_16s.wav	16 kbit/s, stereo
4	m_si_x_1_16s.wav	16 kbit/s, stereo
5	s_cl_2t_1_16s.wav	16 kbit/s, stereo
6	s_cl_2t_2_16s.wav	16 kbit/s, stereo
7	s_cl_mt_1_16s.wav	16 kbit/s, stereo
8	s_no_ft_2_16s.wav	16 kbit/s, stereo
9	sbm_sm_x_1_16s.wav	16 kbit/s, stereo
10	sbm_sm_x_2_16s.wav	16 kbit/s, stereo
11	som_fi_x_2_16s.wav	16 kbit/s, stereo
12	som_ot_x_1_16s.wav	16 kbit/s, stereo
13	m_cl_x_2_21s.wav	21 kbit/s, stereo
14	m_ot_x_1_21s.wav	21 kbit/s, stereo
15	m_p_x_1_21s.wav	21 kbit/s, stereo
16	m_si_x_1_21s.wav	21 kbit/s, stereo
17	s_cl_2t_1_21s.wav	21 kbit/s, stereo
18	s_cl_2t_2_21s.wav	21 kbit/s, stereo
19	s_cl_mt_1_21s.wav	21 kbit/s, stereo
20	s_no_ft_2_21s.wav	21 kbit/s, stereo
21	sbm_sm_x_1_21s.wav	21 kbit/s, stereo
22	sbm_sm_x_2_21s.wav	21 kbit/s, stereo
23	som_fi_x_2_21s.wav	21 kbit/s, stereo
24	som_ot_x_1_21s.wav	21 kbit/s, stereo
25	m_cl_x_2_28s.wav	28 kbit/s, stereo
26	m_ot_x_1_28s.wav	28 kbit/s, stereo
27	m_p_x_1_28s.wav	28 kbit/s, stereo
28	m_si_x_1_28s.wav	28 kbit/s, stereo
29	s_cl_2t_1_28s.wav	28 kbit/s, stereo
30	s_cl_2t_2_28s.wav	28 kbit/s, stereo
31	s_cl_mt_1_28s.wav	28 kbit/s, stereo
32	s_no_ft_2_28s.wav	28 kbit/s, stereo
33	sbm_sm_x_1_28s.wav	28 kbit/s, stereo
34	sbm_sm_x_2_28s.wav	28 kbit/s, stereo
35	som_fi_x_2_28s.wav	28 kbit/s, stereo
36	som_ot_x_1_28s.wav	28 kbit/s, stereo

Annex B (informative): Change history

Change history							
Date	TSG SA#	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2005-06	28	SP-050242			Presented to TSG SA#28 for approval	1.0.0	2.0.0