INTERNATIONAL STANDARD

ISO/IEC 23003-2

Information technology — MPEG audio technologies —

Part 2:
Spatial Audio Object Coding (SAOC)

AMENDMENT 4: SAOC Conformance

Technologies de l'information — Technologies audio MPEG —

Partie 2: Codage d'objet audio spatial (SAOC)

AMENDEMENT 4: Conformité SAOC

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The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

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Information technology — MPEG audio technologies —

Part 2:
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AMENDMENT 4: SAOC Conformance

Add Clause 10, Conformance testing:

10 Conformance testing

10.1 Introduction

This clause specifies conformance criteria for both bitstreams and decoders compliant with the SAOC standard as defined in Clauses 1 to 9 and Annexes A to G. This is done to assist implementers and to ensure interoperability.

10.2 Terms and definitions

The terms and definitions as stated in Clause 3 apply. Furthermore, the following terms and definitions will be used throughout this clause.

bitstream data encoded according to the SAOC standard

conformance test bitstream bitstream used for testing the conformance of an SAOC decoder.

10.3 SAOC conformance testing

5.5 defines the SAOC profiles and levels. Some conformance criteria apply to SAOC in general, while others are specific to the specific SAOC profile and its levels. Conformance shall be tested for the level of the profile with which a given bitstream or decoder/transcoder claims to comply.

10.4 Bitstreams

10.4.1 Characteristics

The SAOC audio object type (AOT) can be used in combination with various AOTs.

10.4.2 Test procedure

10.4.2.1 Introduction

An SAOC bitstream shall have the syntax and semantics as specified in Clauses 1 to 9 and Annexes A to G. The present subclause defines the conformance criteria that shall be fulfilled by a compliant bitstream. These criteria are specified for the syntactic elements of the bitstream and for some parameters decoded from the SAOC bitstream payload.

10.4.2.2 Configuration header

10.4.2.2.1 SAOCSpecificConfig()/SAOCDESpecificConfig()

bsVersion	For restrictions, see 10.4.2.5.
bsSamplingFrequencyIndex	Shall be in the range 0x0..0xc or 0xf. For further restrictions, see 10.4.2.5.
bsSamplingFrequency	For restrictions, see 10.4.2.5.
bsLowDelayMode	For restrictions, see 10.4.2.5.
bsFreqRes	Shall not be encoded with a value of 0.
bsFrameLength	For restrictions, see 10.4.2.5.
bsNumObjects	For restrictions, see 10.4.2.5.
bsNumFGOs	For restrictions, see 10.4.2.5.
bsRelatedTo[i][j]	No restrictions apply.
bsTransmitAbsNrg	No restrictions apply.
bsNumDmxChannels	For restrictions, see 10.4.2.5.
bsTttDualMode	No restrictions apply.
bsTttBandsLow	Shall not be encoded with a value larger than the value of numBands as given by Table 33.
bsPdgFlag	No restrictions apply.
bsOneIOC	No restrictions apply.
bsDcuFlag	For restrictions, see 10.4.2.5.
bsDcuMandatory	No restrictions apply.
bsDcuDynamic	No restrictions apply.
bsDcuMode	No restrictions apply.
bsDcuParam	No restrictions apply.
bsDeLimitFlag	For restrictions, see 10.4.2.5
bsDeLimitFgo	No restrictions apply.
bsDeLimitBgo	No restrictions apply.

10.4.2.2.2 SAOCExtensionConfigData()

bsSaocExtType No restrictions apply. Note that in case of values indicated as "N/A" in Table 43, the parsing function SAOCExtensionConfigData(**bsSaocExtType**) shall return the value 0, such that possibly present data is read as **bsFillBits** (i.e. skipped) and correct parsing of the bitstream can continue.

bsSaocExtLen No restrictions apply.

bsSaocExtLenAdd No restrictions apply.

bsSaocExtLenAddAdd No restrictions apply.

bsFillBits No restrictions apply.

10.4.2.2.3 SAOCExtensionConfigData(0)

The syntactic element SAOCExtensionConfigData(0) shall not be present in case of Low Delay profile. This syntactic element shall not be present in case of Baseline and Dialogue Enhancement profiles of Level 1. Furthermore, this syntactic element shall not be present if the helper variable numSlots has a value that is not listed in ISO/IEC 23003-1:2007, Table 55. Furthermore, if this syntactic element is present, the bitstream shall fulfil the requirements outlined in ISO/IEC 23003-1:2007, 6.1.13. For further restrictions, see 10.4.2.5.

bsDeLimitFgoEAO No restrictions apply.

bsDeLimitBgoEAO No restrictions apply.

bsDcuFlag2 No restrictions apply.

bsDcuMode2 No restrictions apply.

bsDcuParam2 No restrictions apply.

10.4.2.2.3.1 ResidualConfig()

bsResidualSamplingFrequencyIndex Shall fulfil the requirements outlined in ISO/IEC 23003-1:2007, 6.1.13 and Table 88.

bsResidualFramesPerSAOCFrame Shall fulfil the requirements outlined in ISO/IEC 23003-1:2007, 6.1.13 and Table 87

bsNumGroupsFGO For restrictions, see 10.4.2.5.

bsResidualPresent[i] No restrictions apply.

bsResidualBands[i] Shall not be encoded with a value larger than the value of **bsTtnBandsLow**[i].

bsTtnDualMode[i] No restrictions apply.

bsTtnBandsLow[i] Shall not be encoded with a value larger than the value of numBands as given by Table 33.

10.4.2.2.4 SAOCExtensionConfigData(1)

No restrictions apply.

10.4.2.2.5 SAOCExtensionConfigData(2)

The syntactic element SAOCExtensionConfigData(2) shall not be present in case of SAOC-DE profile. Shall fulfil the requirements outlined in Table 51.

10.4.2.2.6 SAOCExtensionConfigData(3)

No restrictions apply.

10.4.2.2.7 SAOCExtensionConfigData(8)

10.4.2.2.7.1 ObjectMetaData()

bsNumByteMetaData[i]   No restrictions apply.

bsMetaData[i][j]   Shall be encoded in UTF-8 encoding format.

10.4.2.2.8 SAOCExtensionConfigData(9)

10.4.2.2.8.1 PresetConfig()

bsNumPresets   No restrictions apply.

bsNumBytePresetLabel[i]   No restrictions apply.

bsPresetLabel[i][j]   Shall be encoded in UTF-8 encoding format.

bsPresetMatrix   No restrictions apply.

10.4.2.2.8.2 PresetMatrixData()

bsPresetMatrixType   Shall not be encoded with a value of 3.

bsPresetMatrixElements[i][j]   No restrictions apply.

10.4.2.2.8.3 PresetMatrixData()

bsPresetUserDataIdentifier[i]   Shall be encoded in UTF-8 encoding format.

bsPresetUserDataLen   No restrictions apply.

10.4.2.2.9 SAOCExtensionConfigData(10)

The syntactic element SAOCExtensionConfigData(10) shall not be present in case of SAOC-DE profile.

10.4.2.2.9.1 SeparationMetaData()

bsNumSeparationPairs   No restrictions apply.

bsSeparationMainObjectID[i]   No restrictions apply.

bsSeparationSubObjectID[i]   No restrictions apply.

10.4.2.3 Bitstream payload

10.4.2.3.1 SAOCFrame()/SAOCDEFrame()

bsIndependencyFlag   No restrictions apply.

10.4.2.3.1.1 SAOCFramingInfo()

bsFramingType   No restrictions apply.

bsNumParamSets   For restrictions, see 10.4.2.5.

bsParamSlot[i]   Shall be in the range 0…**bsFrameLength**.

10.4.2.3.1.2 EcDataSaoc()

bsXXXdataMode[i][j]   Shall fulfil the requirements outlined in ISO/IEC 23003-1:2007, 6.1.13. Shall not be encoded with the value 2 if EAO mode (residual coding) is applied.

bsDataPairXXX[i][j]   Shall have the value 0 if setIdx == dataSets-1. No further restrictions apply.

bsQuantCoarseXXX[i][j]   No restrictions apply.

bsFreqResStrideXXX[i][j] No restrictions apply.

10.4.2.3.1.3 SAOCEcDataPair()

bsPcmCodingXXX[i][j]   No restrictions apply.

10.4.2.3.1.4 SAOCDiffHuffData()

bsDiffType   No restrictions apply.

bsCodingScheme   No restrictions apply.

10.4.2.3.1.5 SAOCHuffData1D()

hcodFirstBand_XXX   **bsCodeW** shall have a value out of a set of values as defined by column "code-word" of Tables A.2 and A.3, respectively, and shall have a length as defined by the corresponding entry in column "length".

hcod1D_XXX_YY   **bsCodeW** shall have a value out of a set of values as defined by column "code-word" of Tables A.4 and A.5, respectively, and shall have a length as defined by the corresponding entry in column 'length'.

bsSign   No restrictions apply.

10.4.2.3.1.6 SAOCHuffData2DFreqPair()

hcodLavIdx — **bsCodeW** shall have a value out of a set of values as defined by column "code-word" of Table A.24, and shall have a length as defined by the corresponding entry in column "length".

hcodFirstBand_XXX — **bsCodeW** shall have a value out of a set of values as defined by column "code-word" of Tables A.2 and A.3, respectively, and shall have a length as defined by the corresponding entry in column "length".

hcod2D_XXX_YY_FP_LL — **bsCodeW** shall have a value out of a set of values as defined by column "code-word" of the applicable table out of Tables A.11 to A.22, and shall have a length as defined by the corresponding entry in column "length".

hcod1D_XXX_YY — **bsCodeW** shall have a value out of a set of values as defined by column "code-word" of Tables A.4 and A.5, respectively, and shall have a length as defined by the corresponding entry in column "length".

bsSign — No restrictions apply.

10.4.2.3.2 SAOCExtensionFrame()

No restrictions apply. Note that in case of **bsSaocExtType** having values indicated as "N/A" in Table 43, the parsing function SAOCExtensionFrameData(**bsSaocExtType**) shall return the value 0, such that possibly present data is read as **bsFillBits** (i.e. skipped) and correct parsing of the bitstream can continue.

bsSaocExtLen — No restrictions apply.

bsSaocExtLenAdd — No restrictions apply.

bsFillBits — No restrictions apply.

10.4.2.3.3 SAOCExtensionFrameData(0)

bsDeLimitEaoUpdate — No restrictions apply.

bsDeLimitFgoEAO — No restrictions apply.

bsDeLimitBgoEAO — No restrictions apply.

bsDcuDynamicUpdate2 — No restrictions apply.

bsDcuMode2 — No restrictions apply.

bsDcuParam2 — No restrictions apply.

10.4.2.4 Transport of SAOC data

10.4.2.4.1 Transport in an MPEG environment

10.4.2.4.1.1 Introduction

In case of transport of SAOC data in an MPEG-4 environment, the following restrictions apply. In case of SAOCSpecificConfig() (or SAOCDESpecificConfig() for SAOC-DE profile) is conveyed out-of-band, any in-band SAOCSpecificConfig() (or SAOCDESpecificConfig() for SAOC-DE profile) shall be identical to the out-of-band one.

In case of embedding of MPEG SAOC data in MPEG-2/4 AAC payloads, the following restrictions apply. There must be at least one extension_payload() element with extension_type==EXT_SAOC_DATA (or extension_type==EXT_SAOC_DE_DATA for SAOC-DE profile) in each AAC frame in order to enable immediate implicit signalling.

In case of embedding of MPEG SAOC data in MPEG-1/2 Layer I/II/III bistreams, the following restrictions apply. The first bit of the ancSyncword must be byte-aligned with respect to the first bit of the 0xFFF syncword of the MPEG-1/2 frame header. The AncDataElement() must be completely included in the ancillary data of a single MPEG-1/2 frame. There must be at least one AncDataElement() in the ancillary data of each MPEG-1/2 frame in order to enable immediate implicit signalling.

10.4.2.4.1.2 AncDataElement()

ancSyncword	Shall be 0x473.
ancType	No restrictions apply.
ancStart	No restrictions apply.
ancStop	No restrictions apply.
ancLenBytes	No restrictions apply.
ancLenBytesAdd	No restrictions apply.
ancCrcWord	Shall have the value as determined by the procedure specified in 8.2.4.
ancDataSegmentByte	A data block formed by concatenation of ancDataSegmentByte as specified in 8.2.4 shall, if ancType==0x0 or ancType==0x1, constitute one SaocDataFrame() syntax element, padded at the end to obtain an integer number of bytes.

10.4.2.4.1.3 SaocDataFrame(saocHeaderFlag)

saocHeaderFlag	No restrictions apply.
saocHeaderLen	No restrictions apply.
saocHeaderLenAdd	No restrictions apply.
bsFillBits	No restrictions apply.
saocTimeAlignFlag	No restrictions apply.
saocTimeAlign	Shall have an absolute value no larger than two times the number of samples in the MPEG SAOC PCM frame as defined by **bsFrameLength** and **bsSamplingFrequencyIndex** or **bsSamplingFrequency**.

10.4.2.4.2 Transport over PCM channels

10.4.2.4.2.1 Introduction

In case of transport of SAOC data over PCM channels, the following restrictions apply. The BuriedData() data shall be embedded in the LSBs of the PCM channels. Typically, 16 bit PCM samples are used. However, also other sample precisions shall be supported, e.g. 20 and 24 bits.

10.4.2.4.2.2 BuriedDataHeader()

bsBDSyncword	Shall be 0xAA95.
bsBDChannels	Shall have the value of the number of PCM channels in which the MPEG SAOC data is embedded.
bsBDFramelength	Shall define a PCM buried data frame size which is exactly the same as the MPEG SAOC PCM frame size defined by **bsFrameLength** and **bsSamplingFrequencyIndex** or **bsSamplingFrequency**.
bdBDSubframes	Shall fulfil the restrictions outlined for this syntactic element in 8.3.3.
bsBDReserved	Shall be 0.
bsBDAlloc[channel][subframe]	Shall not exceed the value of n for n bit PCM samples.
bsBDHeaderCrc	Shall fulfil the restrictions outlined for this syntactic element in 8.3.3.
bsBDHeaderPadding	Shall be 0.

10.4.2.4.2.3 BuriedDataFrame()

bsBDFramePadding   Shall be 0.

10.4.2.4.2.4 BuriedDataElement()

bsBDType	Each BuriedDataFrame() shall at least contain one BuriedDataElement() with **bsBDType** set to the value of 4 or 5. In the case of file based applications, the first frame shall contain a BuriedDataElement() with **bsBDType** set to the value of 5.
bsBDID	Shall be set to a value in the range of 0..7, each value shall be used only once in a BuriedDataFrame().
bsBDLengthIdx	No restrictions apply.
bsBDLength	Shall fulfil the restriction outlined for this syntactic element in 8.3.3.
bsBDBytes	Shall contain exactly one SaocDataFrame().
bsBDDataCrc	Shall fulfil the restrictions outlined for this syntactic element in 8.3.3.

10.4.2.5 Restrictions depending on profiles and levels

10.4.2.5.1 Introduction

Depending on the profile and level associated with the present SAOC bitstream, further restrictions may apply.

10.4.2.5.2   Baseline SAOC profile

For the Baseline SAOC profile, the following further restrictions apply.

bsSamplingFrequencyIndex	Shall be encoded with a value listed in Table AMD1.1.
bsSamplingFrequency	Shall be encoded with a value listed in Table AMD1.1.
bsFrameLength	Shall be in the range 3..71.