**** **ISO/IEC JTC 1/SC 29/WG 03 N0494**

**ISO/IEC JTC 1/SC 29/WG 03**

**MPEG Systems   
Convenorship: KATS (Korea, Republic of)**

**Document type:** Output Document

**Title: WD of ISO/IEC 23000-19:2020 AMD 1   
LCEVC and Other Technologies**

**Status:** Approved

**Date of document:** 2022-01-21

**Source:** ISO/IEC JTC 1/SC 29/WG 03

**Expected action:** ACT

**Action due date:**

**No. of pages:** 11 (with cover page)

**Email of Convenor:** young.L@samsung.com

**Committee URL:** <https://isotc.iso.org/livelink/livelink/open/jtc1sc29wg3>

**INTERNATIONAL ORGANIZATION FOR STANDARDIZATION**

**ORGANISATION INTERNATIONALE DE NORMALISATION**

**ISO/IEC JTC 1/SC 29/WG 03 MPEG SYSTEMS**

**ISO/IEC JTC 1/SC 29/WG 03 N0494**

**January 2022, Virtual**

|  |  |
| --- | --- |
| **Title** | **WD of ISO/IEC 23000-19:2020 AMD 1  LCEVC and Other Technologies** |
| **Source** | **WG 03, MPEG Systems** |
| **Status** | **Approved** |
| **Serial Number** | **21215** |

**ISO 23000-19:2020(X)**

ISO/IEC JTC1 /SC 29 /WG 03 /N0494

Secretariat: XXXX

Information technology — Multimedia application format (MPEG-A) — Part 19: Common media application format (CMAF) for segmented media, AMENDMENT 4: Media Profile for LCEVC

WD stage

**Warning for WDs and CDs**

This document is not an ISO International Standard. It is distributed for review and comment. It is subject to change without notice and may not be referred to as an International Standard.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

© ISO 2020

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office

Case postale 56 • CH-1211 Geneva 20

Tel.  + 41 22 749 01 11

Fax  + 41 22 749 09 47

E-mail  copyright@iso.org

Web  www.iso.org

Published in Switzerland.

# Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. [www.iso.org/directives](http://www.iso.org/directives)

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. [www.iso.org/patents](http://www.iso.org/patents)

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](http://www.iso.org/iso/home/standards_development/resources-for-technical-work/foreword.htm)

The committee responsible for this document is ISO/IEC JTC1 SC29.

# Introduction to Amendment 1

This amendment adds support for

* Low Complexity Enhancement Video Coding (LCEVC).

The notation "Annex Z" is used, where Z will be replaced as appropriate.

Information technology — Multimedia application format (MPEG-A) — Part 19: Common media application format (CMAF) for segmented media, AMENDMENT 1: LCEVC and Other Technologies

# Change 1: Add additional LCEVC profile

Annex Z  
(normative)  
  
LCEVC media profile and track format

Z.1 Dependent CMAF tracks

The LCEVC media profile makes use of Dependent CMAF Tracks, as defined in Clause H.1.

Z.2 LCEVC CMAF tracks

LCEVC CMAF tracks shall conform to clauses ‎7, ‎8, ‎9, and ‎12, and shall additionally conform to the constraints specified in this Annex.

Each LCEVC CMAF track that does not contain the Base Codec VCL NAL units is a dependent CMAF track, and the constraints specified for dependent CMAF tracks in clause H.1 shall apply. It is expected that the manifest provides signalling to express the dependency of a dependent LCEVC CMAF track on a Base CMAF track, for example, using the @dependencyID in a DASH MPD.

**Z.3 CMAF switching set constraints for LCEVC CMAF tracks and media profiles**

**Z.3.1 General**

Subclause ‎9.2.3 applies, and additionally the following constraints apply:

— Each CMAF track with sample entry 'lvc1' shall conform to the LCEVC media profile and track format as specified in this ‎Annex.

— Each CMAF track containing a Base bitstream or an LCEVC bitstream or part thereof shall contain exactly one ISO BMFF track with a Base bitstream or an LCEVC bitstream, respectively.

— When two CMAF tracks are present for carrying Base and LCEVC bitstreams, the corresponding ISO BMFF tracks shall use distinct track IDs.

— CMAF switching sets containing a media profile listed in clause Z.6 with sample entry 'lvc1' shall conform to single initialization CMAF switching set constraints.

Each coded video sequence in an LCEVC bitstream shall contain the necessary parameter sets (Sequence Configuration, Global Configuration) to signal decoding parameters changes allowed between CMAF tracks in the same switching set.

**Z.3.2 Sample Description Box ('stsd')**

Subclauses ‎9.2.4 and ‎9.3.2.2 shall apply with the following additional restrictions:

A decoder configuration record:

— Shall signal other parameter sets (Sequence Configuration, Global Configuration ) fields used by the video track as specified in ISO/IEC 14496-15:2017, subclause 13.7.4,

— For a visual sample entry with codingname 'lvc1', shall contain one or more decoding parameter sets (containing Sequence Configuration, Global Configuration NAL units for LCEVC video). Each video sample in the CMAF track shall reference a parameter set in the sample entry.

— May contain additional SEI NAL units to signal colour encoding and rendering, such as:

mastering\_display\_colour\_volume, SEI payloadType=1 (ISO/IEC 23094-2, Annex D), or

content\_light\_level\_inifo, SEI payloadType=2 (ISO/IEC 23094-2, Annex D).

**Z.3.3 Track Header Box ('tkhd')**

The requirements of ‎7.5.4 apply.

NOTE Normalized width and height can be derived from a Global Configuration NAL unit in each segment and coded video sequence for 'lvc1' video samples. See ‎9.3.3 and ‎9.3.4 for the storage and semantics of video sequence parameter sets.

**Z.3.4 Access units**

Clause ‎9.2.6 applies.

Access units shall conform to the requirements of a sample of the indicated description ('lvc1') as specified in ISO/IEC 14496-15.

CMAF fragments containing samples identified by the 'lvc1' type shall contain all Sequence Configuration, Global Configuration NAL units referenced by a coded video sequence in the first access unit of that sequence, immediately following its first access unit delimiter NAL (if any).

NOTE Access units of type 'lvc1' can retain filler data (NAL units or SEI messages) and SEI messages that would change hypothetical reference decoder bitstream conformance if such conformance is necessary, such as the case where bitstreams are to be repackaged and conformance tested in MPEG-2 transport streams.

**Z.3.5 Decoding of adaptively switched LCEVC CMAF tracks**

Subclause ‎6.6.6 applies to switching between single-layer bitstreams, wherein a “conceptual” track is generated by concatenating segments from the Base track (e.g. AVC, HEVC, EVC, VVC) and the Enhancement LCEVC track among which the switching occurs. Once the multiple “conceptual” tracks are generated, the process specified in ISO/IEC 14496-15:2017, clause 13 is applied to construct the bitstream to be decoded by the video decoder.

**Z.4 Sample and CMAF fragment constraints**

**Z.4.1 Storage of LCEVC elementary streams**

***Z.4.1.1 Conformance***

Low Complexity Enhancement Video Coding (LCEVC) video tracks shall comply with ISO/IEC 14496-15:2017, clause 13, with the following constraints:

— Each track shall carry either the Base Layer and the Enhancement Layer, or only one layer (either Base or Enhancement).

— Aggregators (as defined in ISO/IEC 14496-15:2017, Annex A) shall not be included in any track.

The Base Layer (coded according to any specification, e.g. AVC, HEVC, EVC, VVC) shall be stored as described in the respective clause of the CMAF specification, where applicable, e.g. for AVC subcluse 9.4.1, for HEVC subclause ‎B.3.1.

***Z.4.1.2 Visual sample entry***

The Base track’s syntax and values for a visual sample entry shall conform to any regular (independent) sample entry, e.g. 'avc1', 'hev1', 'evc1', 'vvc1', as defined in ISO/IEC 14496-15.

***Z.4.1.3 Base DecoderConfigurationRecord and LCEVCDecoderConfigurationRecord***

The Base DecoderConfigurationRecord and the Base Layer shall conform to the respective clause of the CMAF specification, where applicable, for usage of SEI messages, e.g. for HEVC subclause B.2.4.

The LCEVCDecoderConfigurationRecord and the Enhancement Layer shall conform to subclause Z.3.2, for the usage of SEI messages.

**Z.4.2 Constraints on LCEVC elementary streams**

***Z.4.2.1 General***

The following constraints apply to all CMAF LCEVC elementary streams. See clause Z.6 for media profile constraints on profile, level, and frame rates.

***Z.4.2.2 General constraints***

— The bitstream shall contain at most two layers, a Base Layer and an LCEVC Enhancement Layer.

— The Base Layer shall conform to any of the specifications for Video supported by CMAF, e.g. AVC, HEVC, EVC, VVC.

— The LCEVC Enhancement Layer shall conform to LCEVC Main profile (23094-2, A.3.2) or LCEVC Main 4:4:4 profile (23094-2, A.3.3).

— The spatial resolution of the LCEVC Enhancement Layer shall be equal to X times that of the base layer both horizontally and vertically. The value of X shall be 1, 2, or 4.

— The LCEVC Enhancement Layer shall conform to the LCEVC specification (23094-2).

***Z.4.2.3 Picture rate related constraints***

— The LCEVC Enhancement Layer shall have the same picture rate as the Base Layer.

***Z.4.2.4 Picture type***

All pictures shall be encoded as coded frames, and shall not be encoded as coded fields.

***Z.4.2.5 Parameter sets (Sequence Configuration, Global Configuration)***

***Z.4.2.5.1 Sequence Configuration and Global Configuration fields***

Each LCEVC video sample in the CMAF track shall reference the parameter sets (SC, GC) in the CMAF header sample entry according to ISO/IEC 14496-15. Parameter sets shall not change within CMAF tracks or between CMAF tracks in a switching set. A CMAF LCEVC track shall conform to ISO/IEC 23094-2.

***Z.4.2.5.2 Visual Usability Information (VUI) fields***

VPS VUI parameters that occur within a CMAF LCEVC track shall conform to ISO/IEC 23094-2, Annex E.

***Z.4.2.6 Maximum bitrate***

The maximum bitrate of LCEVC elementary streams shall be calculated by implementation of the buffer and timing model defined in ISO/IEC 23094-2, Annex C.

***Z.4.2.7 Frame rate in the elementary stream***

Sample durations stored in the ISO Media TrackRunBox shall determine the frame rate of a track.

**Z.5 Video codec parameters**

**Z.5.1 LCEVC signalling of “codecs” parameters**

Presentation applications should signal video codec profile and levels of each Base Layer and LCEVC Enhancement Layer track and switching set using parameters conforming to IETF RFC 6381 and ISO/IEC 14496-15:2017, clause E.4.

**Z.5.2 Cropping**

If picture cropping is used, it shall be set by SC (Sequence Configuration) cropping parameters conf\_win\_right\_offset, conf\_win\_top\_offset, conf\_win\_left\_offset and conf\_win\_bottom\_offset.

SC cropping parameters conf\_win\_top\_offset and conf\_win\_left\_offset shall be set to 0.

**Z.6 LCEVC media profile and track brands**

LCEVC media profiles and track brands shall conform to Table Z.1.

CMAF file with brand 'clv1' shall contain only LCEVC samples with sample entry 'lvc1'.

**Table Z.1 — LCEVC video media profiles**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Media profile** | **Codec** | **Profile** | **Level** | **Max frame height** | **Max frame width** | **Max frame rate** | **CMAF file brand** |
| **LVC**  **Main** | LCEVC | Main | 4.1 | 4 320 | 7 680 | 120 | 'clv1' |