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TECHNICAL REPORT

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Information technology — High efficiency coding and media delivery in heterogeneous environments —

Part 14: Conversion and coding practices for HDR/WCG Y′CbCr 4:2:0 video with PQ transfer characteristics

Technologies de l'information — Codage à haut rendement et fourniture de supports dans les environnements hétérogènes —

Partie 14: Conversion et pratiques de codage pour la vidéo HDR/WCG Y′CbCr 4:2:0 avec caractéristiques de transfert PQ

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Foreword

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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 document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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A list of all parts in the ISO/IEC 23008 series can be found on the ISO website.

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Introduction

High dynamic range (HDR) video is a type of video content in which the sample values span a larger luminance range than conventional standard dynamic range (SDR) video. HDR video can provide an enhanced viewer experience and can more accurately reproduce scenes that include, within the same image, dark areas and bright highlights, such as emissive light sources and reflections. On the other hand, wide colour gamut (WCG) video is video characterized by a wider spectrum of colours compared to what has been commonly available in conventional video. Recent advances in capture and display technology have enabled consumer distribution of HDR and WCG content. However, given the characteristics of such content, special considerations may need to be made, in terms of both processing and compression, compared to conventional content.

This document provides a set of recommended guidelines on processing of consumer distribution HDR/WCG video. This includes recommendations for converting a video signal, in a linear light RGB representation with Rec. ITU-R BT.2020 colour primaries, to a 10-bit, narrow range, PQ encoded (as defined in SMPTE ST 2084 and Rec. ITU-R BT.2100), 4:2:0, non-constant luminance Y′CbCr representation. These guidelines may also apply to other representations with higher bit depth or other colour formats, such as 4:4:4 Y′CbCr 12 bit video. The scope of this document is illustrated in Figure 1.

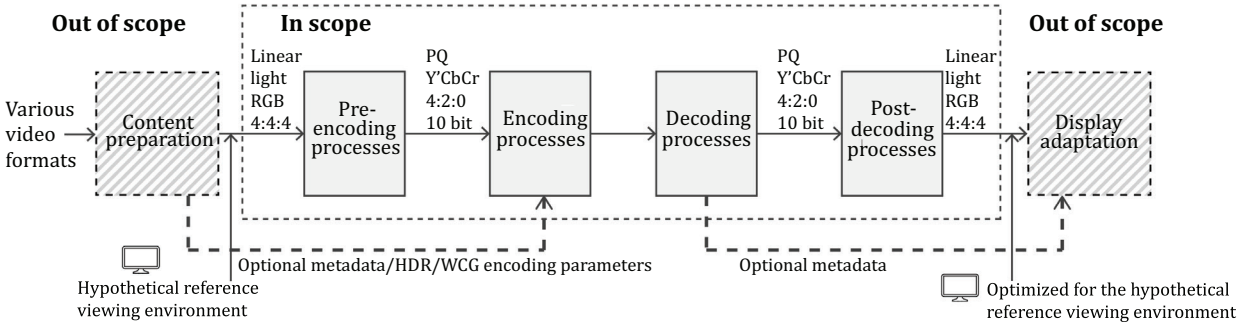

Figure 1 — Illustration of the scope of this document

The content preparation step, as well as the display adaptation step, are considered to be out of the scope of this document. However, metadata generated during the content preparation step may be passed through the encoder-decoder chain and can significantly affect the display adaptation step. The content preparation step may include filtering and image enhancement processing such as de-noising, colour correction, and sharpening, as well as other processes. Such methods are deliberately not described in this document. The processing steps described in this document are made available for reference only and the document does not contain any elements of normative nature. It is possible to replace one or more of the processing steps described in this document; for example, in order to reduce computational complexity or to improve fidelity. This document's intention is to provide some guidelines for operating an HDR/WCG video system that is constrained to code a 10-bit, PQ (as defined in SMPTE ST 2084 and Rec. ITU-R BT.2100), 4:2:0, non-constant luminance Y′CbCr signal representation. This configuration is also aligned with the HDR10 media profile defined in DECE v2.1, the interface defined in CTA 861G and the restrictions in the BD-ROM specifications. The processing steps in this document are designed for the case when the same hypothetical reference viewing environment (HRVE) is used before and after the HDR/WCG system. This document does not account for when the viewing environment used after the HDR/WCG system is different from the viewing environment used as the HRVE. In particular, display adaptation, such as the techniques described in the SMPTE ST 2094 standards, are not considered in this document. Report ITU-R BT.2390 contains additional information on viewing environments and examples of parameters that may be appropriate to apply for practical HDR/WCG systems. This document does not provide a description of any preferred HRVE, but acknowledges the fact that in many applications of HDR/WCG video, it may be desirable to have a well-defined HRVE description in order to ensure alignment between content preparation and content consumption.

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Part 14:
Conversion and coding practices for HDR/WCG Y′CbCr 4:2:0 video with PQ transfer characteristics

1 Scope

This document provides guidance on the processing of high dynamic range (HDR) and wide colour gamut (WCG) video content. The purpose of this document is to provide a set of publicly referenceable recommended guidelines for the operation of AVC or HEVC video coding systems adapted for compressing HDR/WCG video for consumer distribution applications. This document includes a description of processing steps for converting from 4:4:4 RGB linear light representation video signals into non-constant luminance (NCL) Y′CbCr video signals that use the perceptual quantizer (PQ) transfer function defined in SMPTE ST 2084 and Rec. ITU-R BT.2100. Although the focus of this document is primarily on 4:2:0 Y′CbCr 10 bit representations, these guidelines are also applicable to other representations with higher bit depth or other colour formats, such as 4:4:4 Y′CbCr 12 bit video. In addition, this document provides some high-level recommendations for compressing these signals using either the AVC or HEVC video coding standards. A description of post-decoding processing steps is also included for converting these NCL Y′CbCr signals back to a linear light, 4:4:4 RGB representation.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Rec. ITU-T H.264 | ISO/IEC 14496-10, *Information technology — Coding of audio-visual objects — Part 10: Advanced Video Coding*

Rec. ITU-T H.265 | ISO/IEC 23008-2, *Information technology — High efficiency coding and media delivery in heterogeneous environments — Part 2: High efficiency video coding*

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