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# Abstract

This document aims at re-emphasizing the importance of SDR backward compatibility for the incoming HDR video content distribution systems.

# Introduction

The exploration work for a possible HEVC extension for HDR and WCG video is in progress. An exploratory Test Model and different Core Experiments have been set up in October 2015. In these exploratory works, two main tracks are under investigation: HDR-only systems, where the main target is improved compression performance compared to the draft HEVC specification; SDR backward compatible systems, where the target is to deliver an SDR backward compatible content adapted to legacy SDR devices, while offering good compression performance.

This document aims at re-emphasizing the importance of this second track for the actual HDR video deployment in the coming years. It reminds the main features of the SDR backward compatibility requirement, and the overall architecture of such an SDR backward compatible system.

# Description of SDR backward compatibility requirements

MPEG document M37244 [1], co-signed by 17 companies, identifies the following major requirements related to the support of SDR backward compatibility in HDR distribution systems:

* Compatibility with SDR rendering devices. The video should be decodable by a non-HDR aware decoder without modifications to the SDR device. The resulting decoded video should deliver a high quality image on SDR displays without further processing. This is vital for a phased HDR deployment as we do not expect all devices to be HDR aware and it is not economical to run concurrent HDR and SDR broadcasts (simulcast). Legacy SDR devices should not require any modifications. This will also simplify storage and distribution management without the need to store multiple copies of files in both SDR and HDR formats.
* Single layer design with 10 bit support. This will enable re-use of existing HEVC Main 10 implementations and efficient single decoder deployments on devices.
* If metadata is needed to support HDR, it should be integrated into an automated broadcast workflow and support typical television operations such as mixes, wipes and graphics overlays.
* Any changes of the HEVC coding specifications to support HDR should not impact the HEVC core decoder on devices and should be available in a timely fashion to match the DVB, ATSC and ARIB HDR standardization timescales.
* As there is still considerable debate and discussion going on within the industry regarding OETFs for HDR video production and programme exchange, and more than one OETF for HDR video is considered likely, any MPEG solution should support the common HDR productions formats, such as EOTFs, through transcoding where necessary, with minimal loss of quality.

# Synoptic of a single-layer SDR backward compatible distribution system

Figure 1 illustrates the global synoptic of an SDR backward compatible distribution system. This type of solutions has been proposed in various MPEG-JCTVC contributions, such as [2,3,4,5].



Figure 1. SDR backward compatible system diagram.

The SDR backward compatible system is made of four basic components:

Encoder side

1. The **HDR pre-processing** block produces from the input HDR content an SDR backward compatible content, plus HDR-related metadata that will be used to regenerate the HDR content from the SDR content at decoder side.
2. The **Encoder** block that should typically be based on HEVC Main 10 profile; the generated bitstream embeds the SDR binary stream, plus HDR-related metadata embedded for example in an SEI container. It is highly desirable that the size of the HDR-related metadata is negligible compared to the SDR video stream, even at low video bit rates, to ensure that e.g. existing SDR broadcast channels can be used.

Decoder side

1. The **Decoder** block that should typically be compliant to HEVC Main 10 profile; the output of the decoder is an SDR backward compatible video and HDR-related metadata. The SDR backward compatible video can be directly sent to legacy SDR rendering devices.
2. The **HDR reconstruction** block generates from the decoded SDR video and HDR-related metadata the HDR signal that can then be rendered on new HDR rendering devices.

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