



Ultra HD Breakfast, London May 2017
Connected TV Summit

Agenda

- **Thierry Fautier**
 - State of the UHD union including update on the Forum
 - Update on phase B and exciting things coming soon ...
- **Ian Nock**
 - Mini HDR primer
 - Lessons learnt from our NAB demos
 - Update on our Interoperability work
- **Arian Koster**
 - Real world HDR issues from an operator perspective
- Q/A

Global Advocacy for Next-Gen A/V Delivery

CHARTER (17)



CONTRIBUTOR (18)



ASSOCIATE (25)



60 members

Ultra HD Forum Progress

By NAB'17

Members

60

Guideline (Phase A)

V1.3 incl Watermarking

Interop

Public Interop Fest with 11+3 demos

Liaison

Engagement with DVB/ATSC/SMPTE/CTA

Communication

Master Class on HDR

What is coming Next ?

Interop

Guideline

ATSC 3.0

China

Liaison

Communication

June'17 plug fest
DTG/German TV platform

Phase B

Meeting in Korea (Winter Olympic'18)

Meeting in Q4'17 (Huawei Invitation)

Work closer with UHD Alliance on
Broadcast

Considering booth at IBC

Phase B

Topic	Details
NGA	Object based
HDR Dynamic Metadata	Dolby, Technicolor, HDR10+
HDR Dual Layer Technology	Backward compatibility
HFR	P100 & 120
HDR Conversion Tools	PQ10 <> HLG
HDR “Brightness” Control	Could become a regulated topic
Applications : OTT	Live
Applications : OTA	ATSC 3.0 / DVB-T2 / ISDB-T
Applications : MVPD	Broadcast / IP Unicast & Multicast

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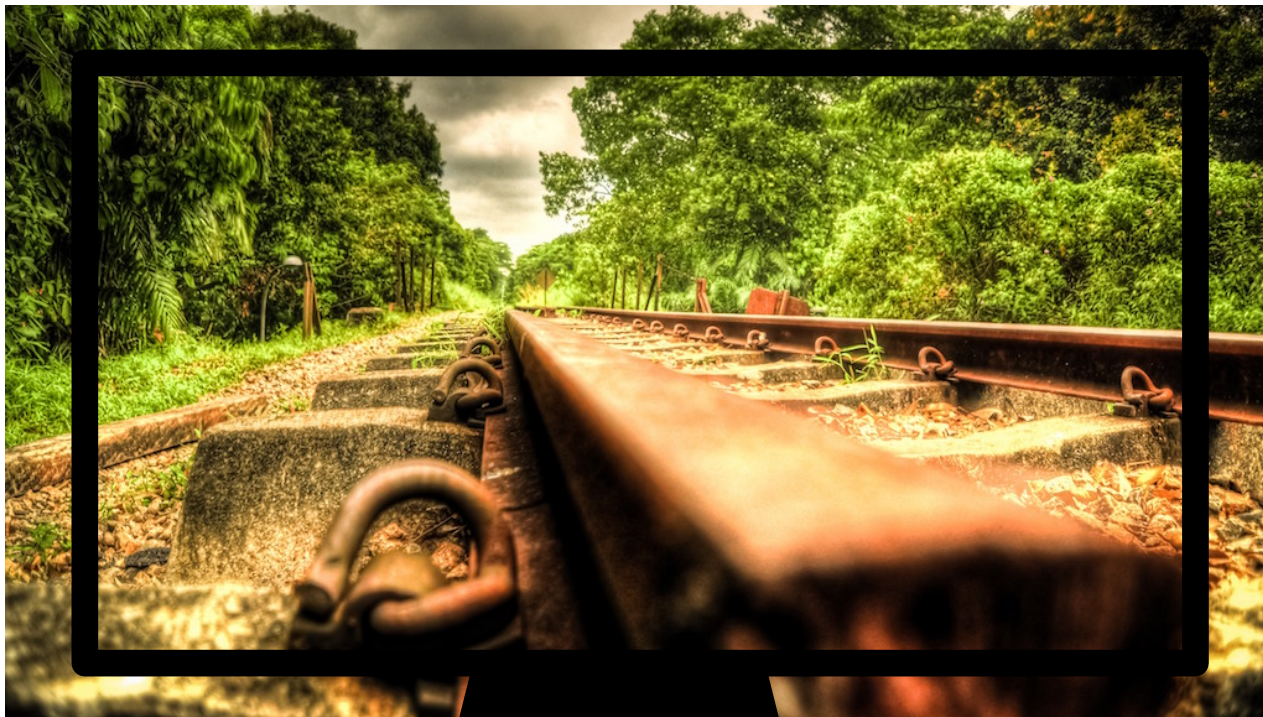
Ultra HD is ...



SDR reproducing the view



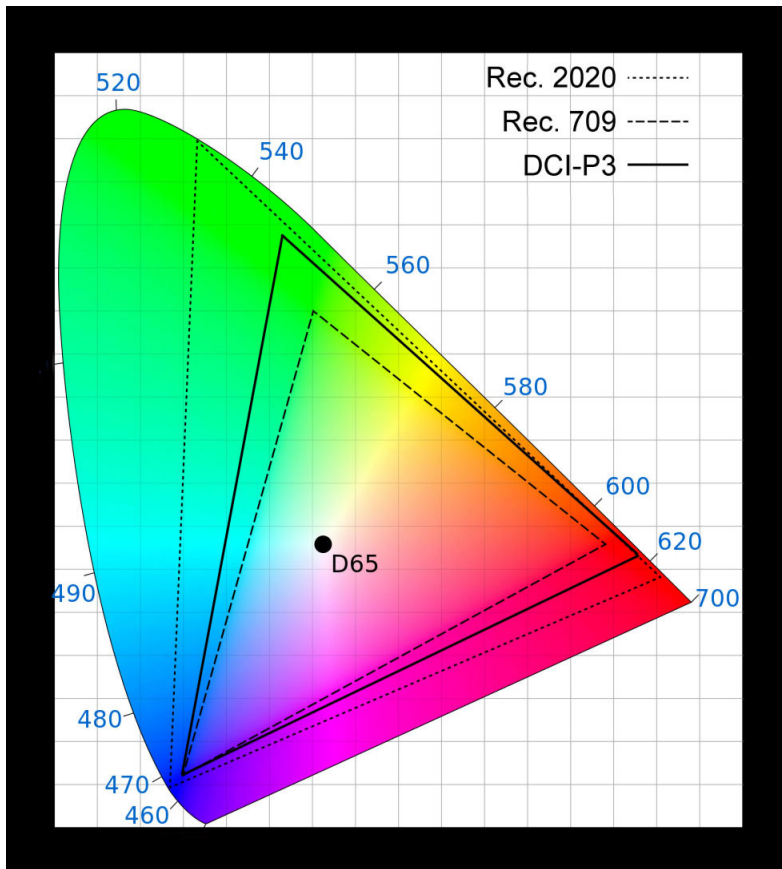
HDR with WCG a more realistic view



High Dynamic Range

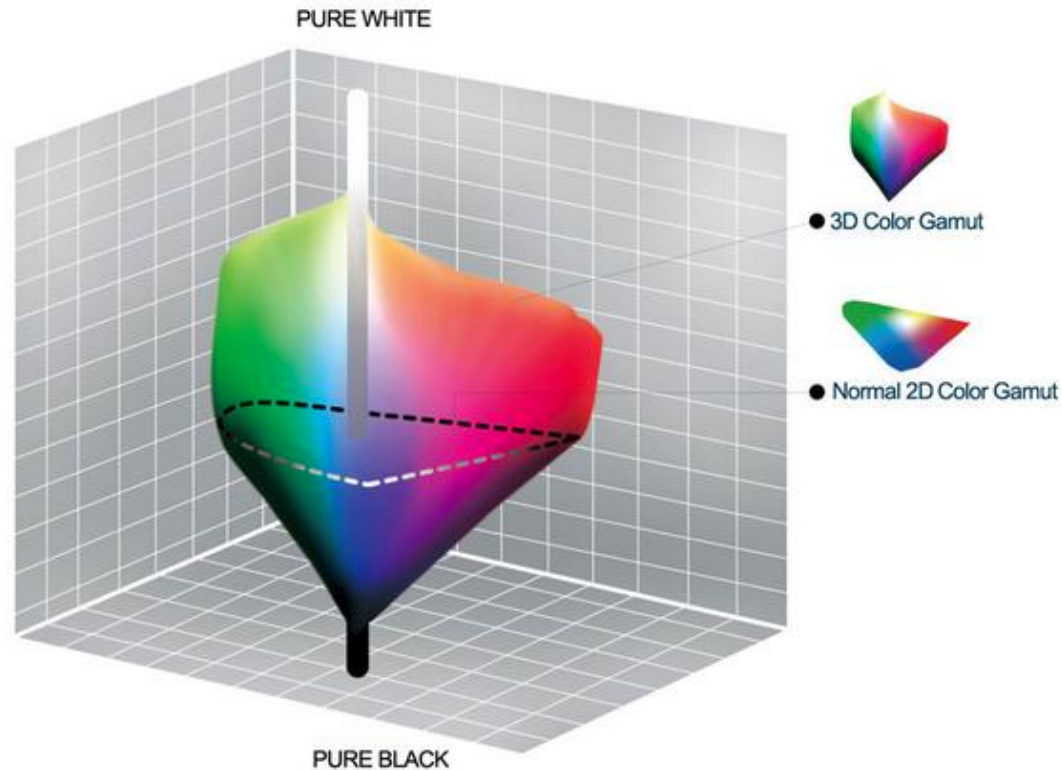


Wide Color Gamut



HDR & WCG - Color Volume

Combination of Color and Luminance



HDR Phase A Formats

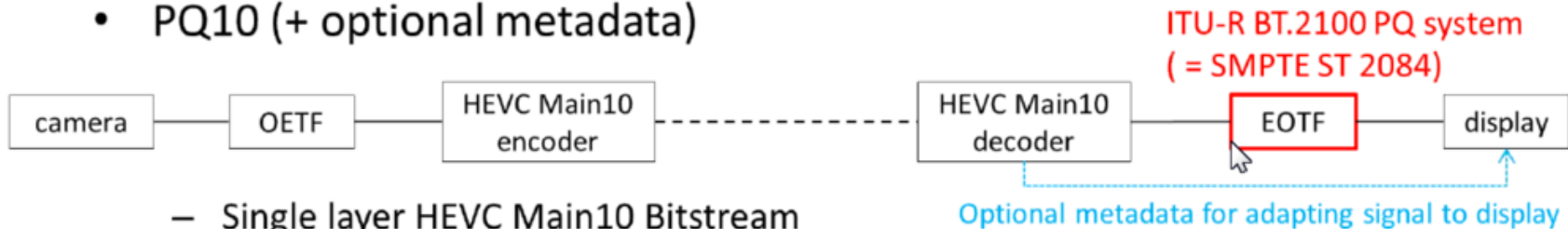
As defined in ITU BT.2100

- PQ - Perceptual Quantization - EOTF
 - Screen Referenced Reproduction
 - With or Without Metadata
 - HDR10 is a media profile of PQ
 - No backwards compatibility
- HLG – Hybrid Log Gamma - OETF
 - Scene Referenced Reproduction
 - No Metadata
 - Has a very specific form of backwards compatibility

NOT A FORMAT WAR – EACH HAS PROs and CONs with specific use cases

HDR Phase A Formats

- PQ10 (+ optional metadata)



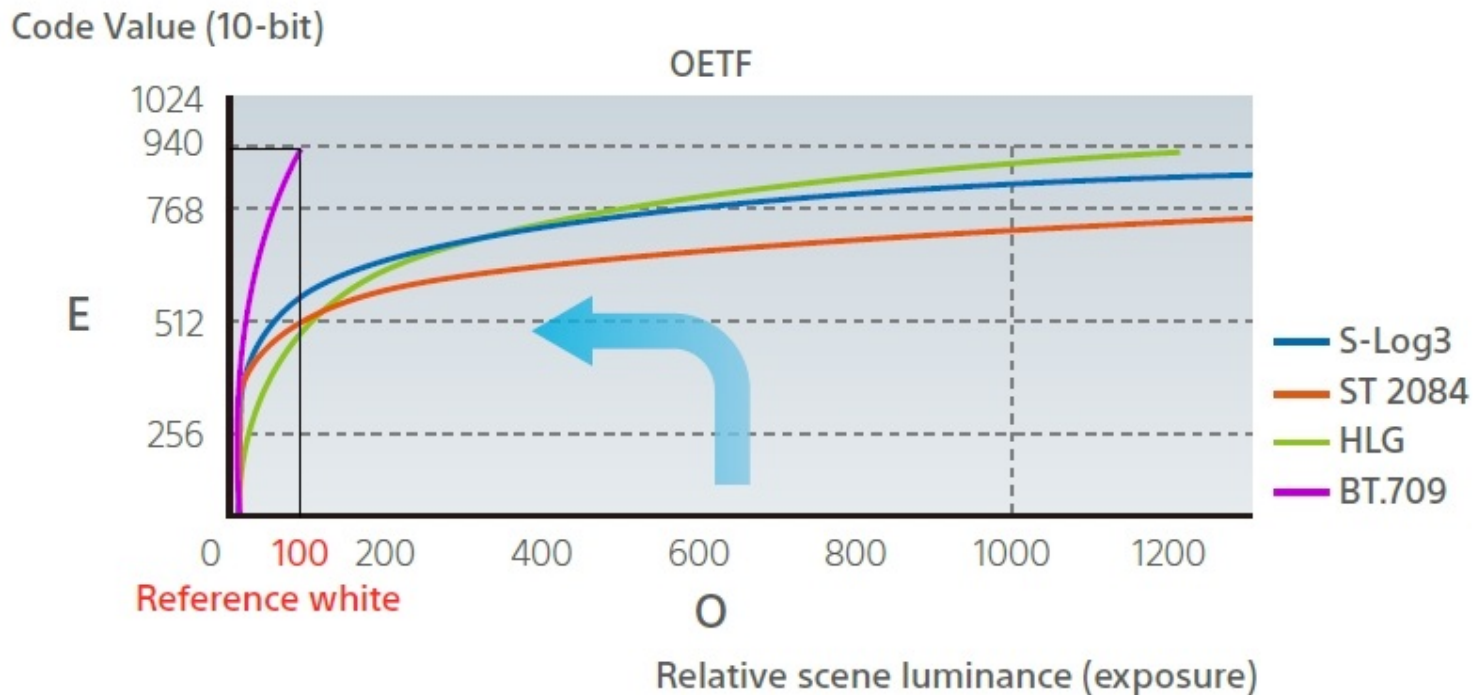
- Single layer HEVC Main10 Bitstream
- Bitstream is not backwards compatible to DVB-UHD phase 1 receivers

- HLG10



- Single layer HEVC Main10 Bitstream
- Bitstream decodable by DVB-UHD phase 1 receivers as Standard Dynamic Range

HDR Phase A Formats



Primary Formats of HDR Phase B

DMCVT - Dynamic Metadata

Dynamic Metadata for Color Volume Transforms – with four vendor specific application approaches



ST.2094-10 - Dolby – Parametric Tone Mapping



ST.2094-20 – Philips – Parameter-based Color Volume Reconstruction

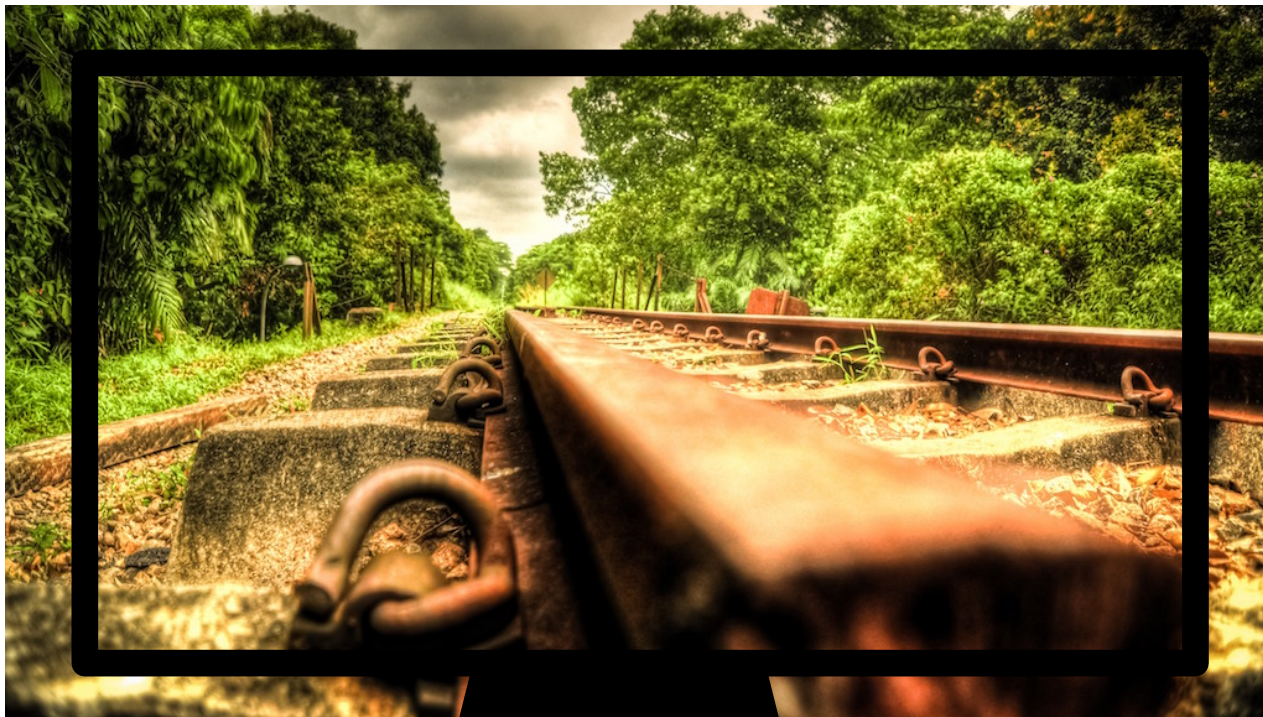


ST.2094-30 – Technicolor – Reference-based Color Volume Remapping



ST.2094-40 – Samsung HDR10+ - Scene-based Color Volume Mapping

The Display Future is Clear



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Interop Working Group

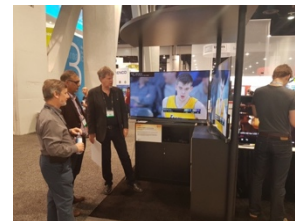
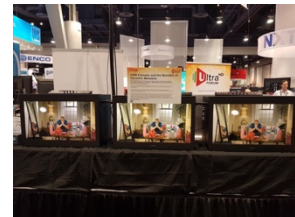
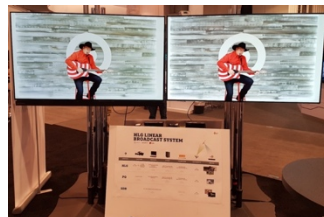
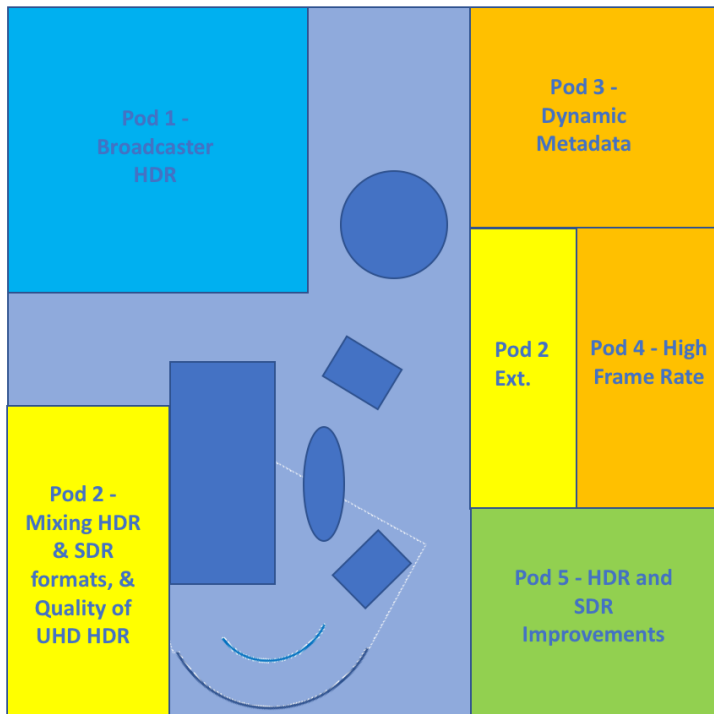
Facilitating interoperability work and plug-fests to test the usability and comprehensiveness of Ultra HD and related media standards including the Forum's Guidelines. Describe and promote the use of Ultra HD and related media services that meet the scope of the Ultra HD Forum.



Interop Events to Date

- Plugfest 1 - March 2016
 - Base HDR Interoperability inc. PQ
- Plugfest 2 - September 2016
 - Operator Demonstration – SDR, PQ & HLG
- Plugfest 3 - October 2016
 - HDR Interoperability inc SDR, PQ, HLG & SL-HDR1
- Plugfest 4 – December 2016
 - Comparative performance SDR, PQ & HLG at DTG/DTVP 5th Plugfest
- Phase A (HDR/SDR) and Future Technologies Demonstration – April 2017
 - HLG/SDR, PQ<>HLG<>SDR Conversions, Dynamic Metadata and High Frame Rate

NAB17 Demonstrations



The Lessons of Interop

- Identification of Video Streams with correct signalling and metadata
- Firmware update and support for HDR formats
- Content suitability for end to end and platform validation
- Issues of reproducibility and quantitative measurement
- User Interface and Display Configuration Issues
- Color Reproduction & Enhanced Display Processing problems

Next Steps in Interop – Subject Areas

- **Conversions (SDR, HLG, PQ)**
- **Content Switching SDR/HDR**
- **Next Generation Audio - NGA**
- HDR Brightness / Loudness
- Testing and Measurement Methods and Test Patterns
- High Frame Rate
- Signalling and Metadata in Delivery
- Mobile Displays

- Next Interop at DTG, DTVP **Late June 2017**

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Arian Koster








OPERATOR PERSPECTIVE OF HIGH DYNAMIC RANGE IN IPTV AND IT'S LIMITATIONS

KPN IPTV operator

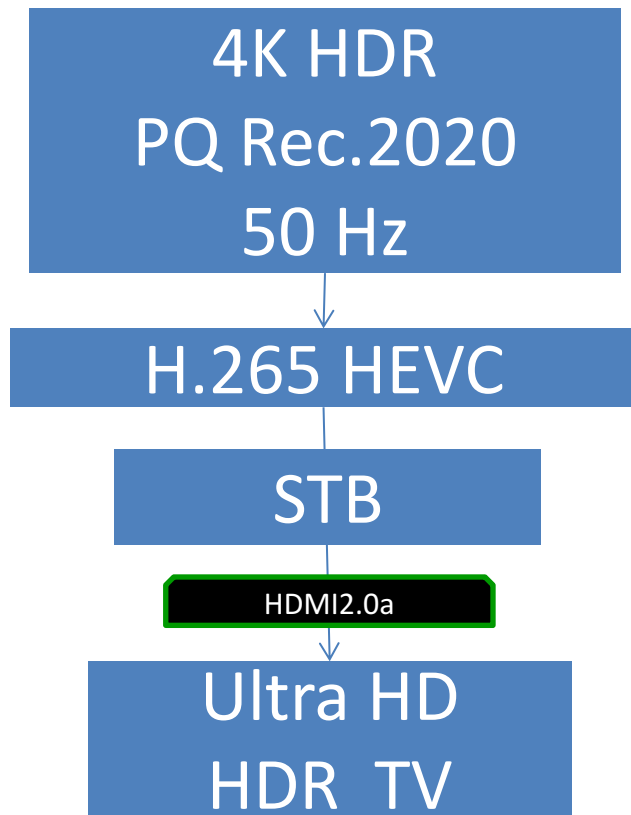
- KPN is a Telco and TV operator with 2 million TV subs
 - 200+ channels linear TV
 - Radio and PPV channels.
 - NPVR, Start over TV, replay TV, TV Apps
- Small scale 4K TV service launched to 1k subs in 2016
 - 2 channels, VoD Netflix 4K



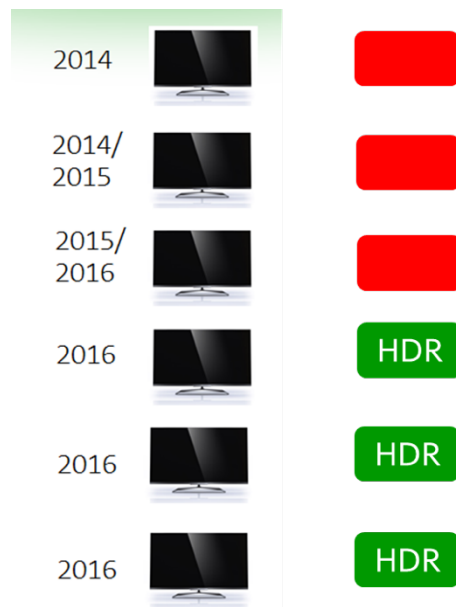
There are 6 types of UHD TV panels on the market

2014		HDMI 1.4, AVC 8 bit panel, Rec 709	←	Only suitable for OTT UHD TV service, not via STB due to lack of HDCP 2.2
2014/ 2015		HDMI 2.0, HDCP 2.2 , AVC 8 bit panel, Rec 709	←	Can support KPN “4K-only” service
2015/ 2016		HDMI 2.0, HDCP 2.2, HEVC 8/10 bit panel, Rec 2020	←	Can support KPN “4K-only” service. And can interpret HLG signals.
2016		HDMI 2.0a , HDCP 2.2, HEVC 10 bit panel, Rec 2020 HDR10	←	First HDR devices on the market. Will render HLG signals as SDR image
2016		HDMI 2.0a, HDCP 2.2, HEVC 10 bit panel, Rec 2020 HDR10, “ HLG ”	←	Supports HLG, but needs upgrade to HDMI 2.0b. to support HLG <u>signalling</u>
2016		HDMI 2.0a/b?, HDCP 2.2, HEVC 10 bit panel, Rec 2020 HDR10, HLG, Dolby Vision		
Future		HDMI 2.1 High Frame Rate, 8K, Dynamic Metadata (ST.2094) + all of the above		

Experiment: Start HDR service









Who will be able to see this service?

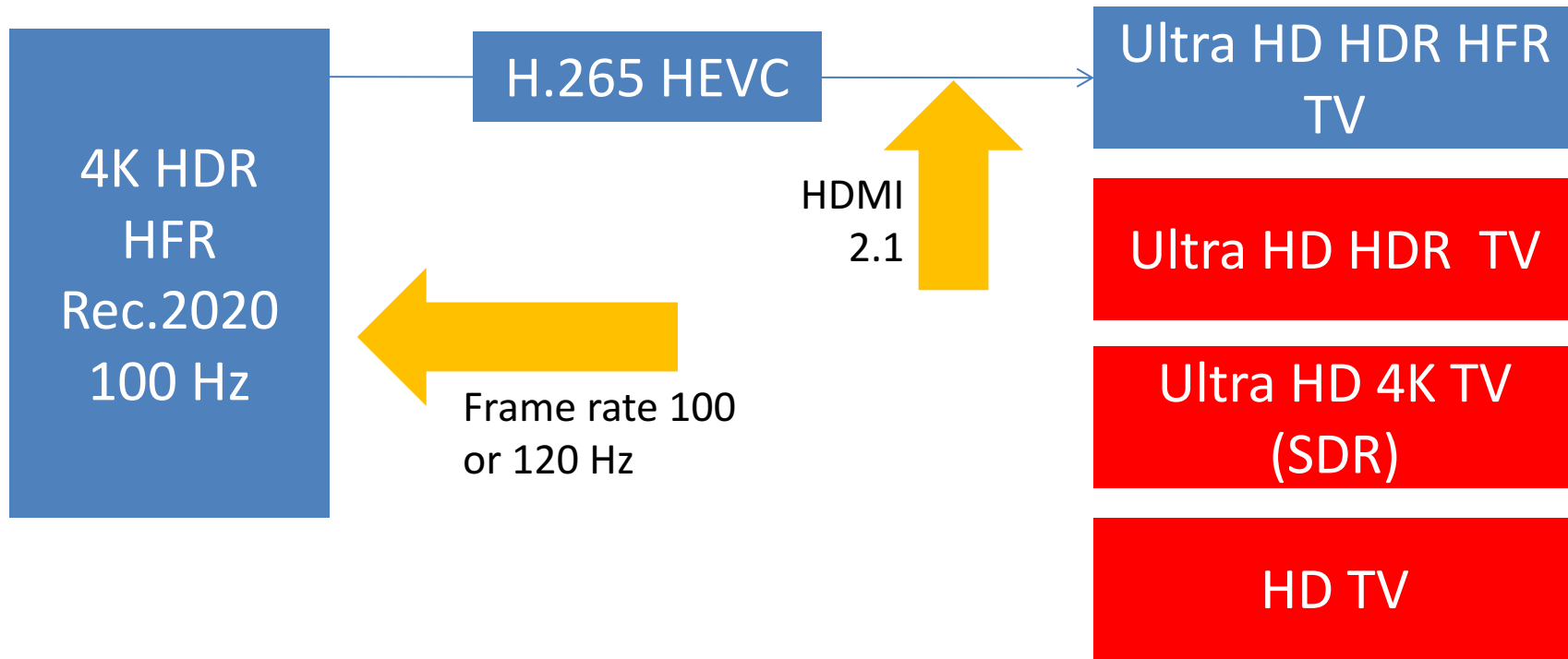


- 3 out of 6 UHD types
- Covering 2/3 of the TV sets in the market

Mapping of 4K PQ and HLG services on UHD TV's. Without and with HD Simulcast

		PQ	HLG	PQ HD	HLG HD
2014		Red	Red	HD	HD
2014/ 2015		Red	Red	HD	HD
2015/ 2016		Red	HDR	HD	HDR
2016		HDR	SDR	HDR	SDR
2016		HDR	HDR	HDR	HDR
2016		HDR	HDR	HDR	HDR

HDR HFR



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