

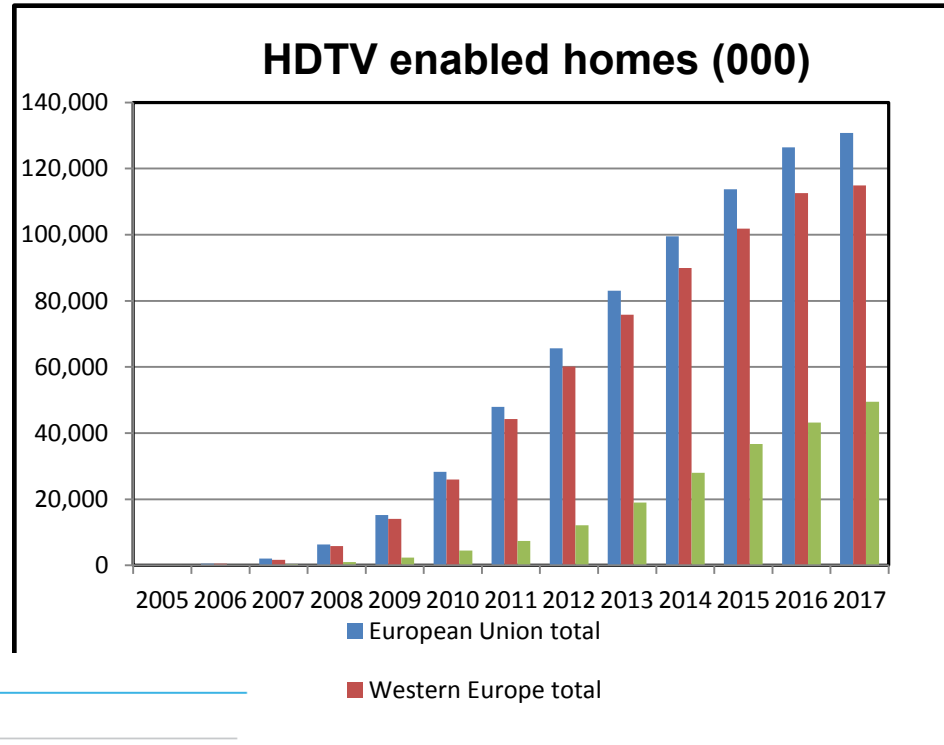
ITU-D Regional Seminar for Europe, 29-31 January 2014, Budapest

The roadmap for UHDTV

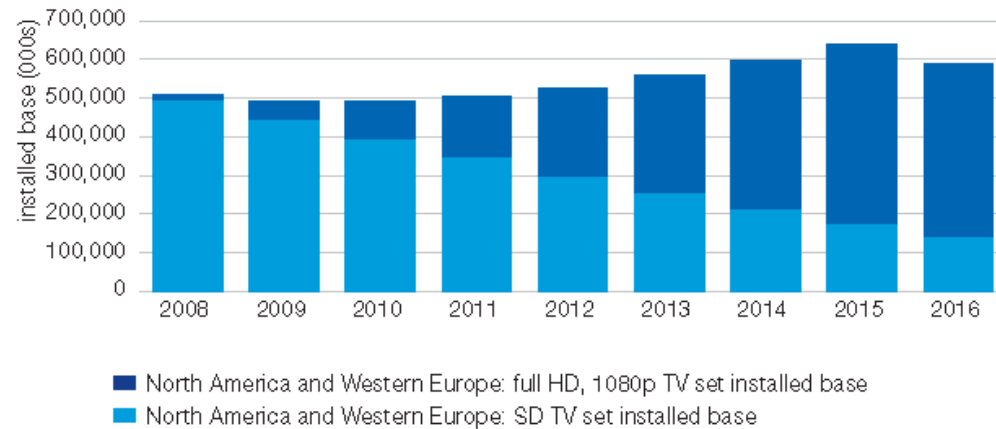
Elena Puigrefagut
European Broadcasting Union



HDTV IS AT THE 'STATE OF THE ART'

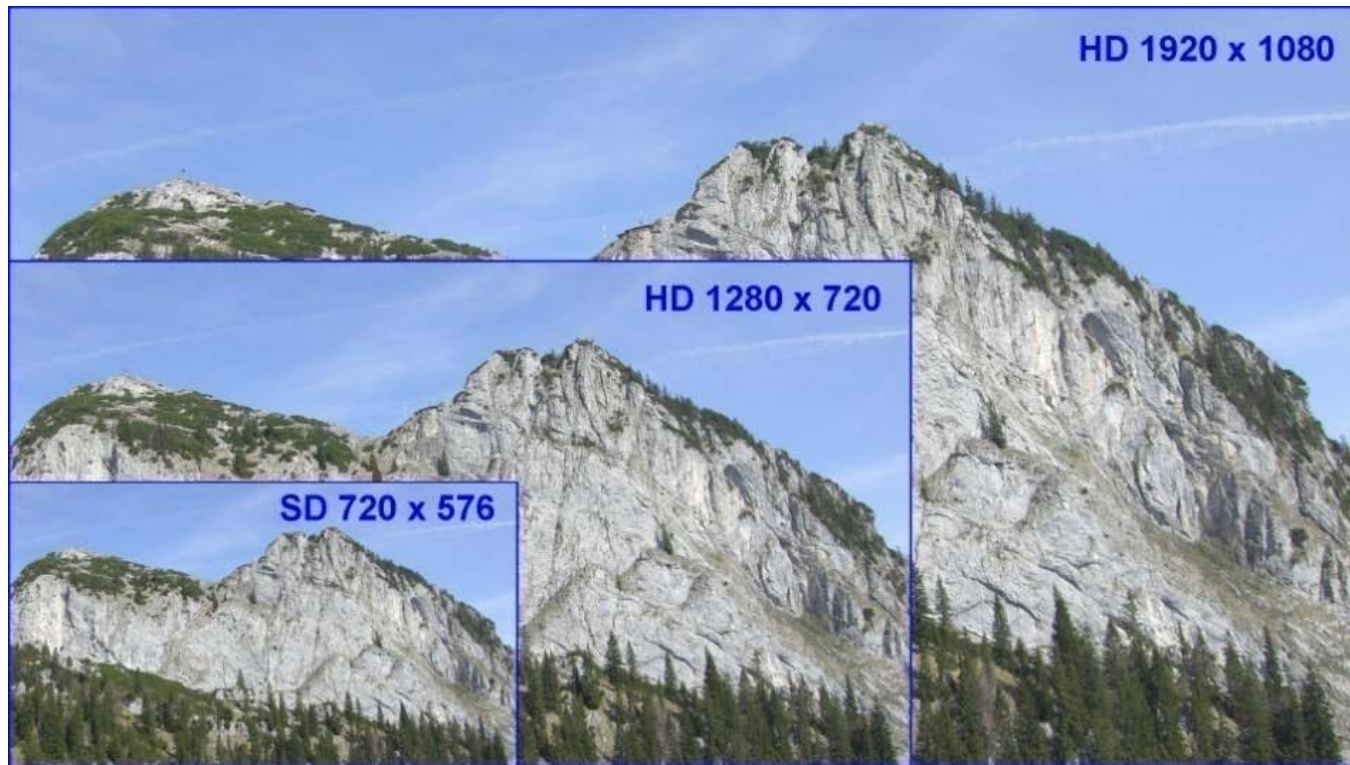


HD vs. SD TV set installed base dynamics



THE IMMERSIVE EXPERIENCE OF HDTV (1)

Spatial resolution = number of pixels = Static resolution



1080 format has a higher spatial resolution than 720 format but it requires a higher bit rate/bandwidth.

THE IMMERSIVE EXPERIENCE OF HDTV (2)

Temporal resolution = frame rate = Dynamic resolution

50 i.e. 50 full frames per second

**25 i.e. 25 full frames per second or
50 half frames per second**

**1080i/25: offers a high spatial resolution which enhances
static pictures**

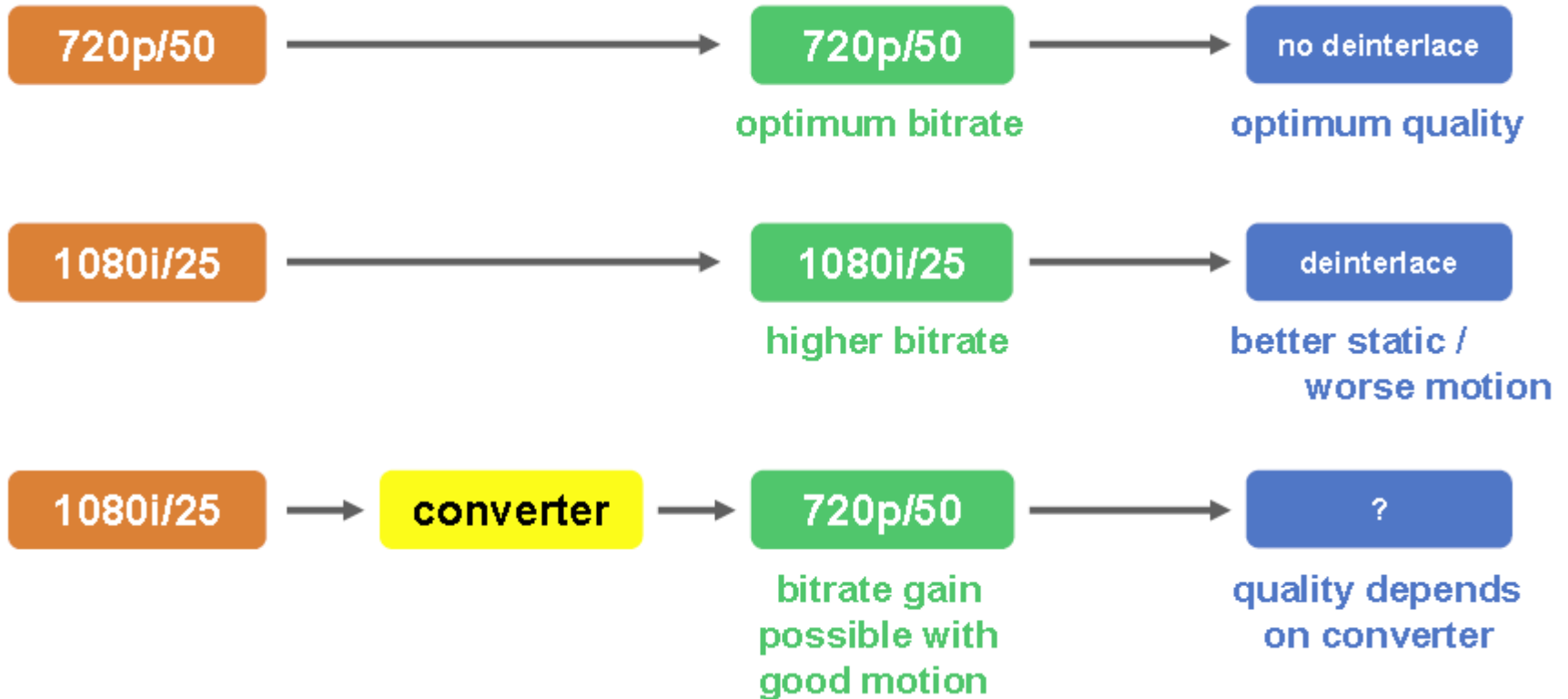
**720p/50: offers double the number of full frames per second
which offers detailed motion rendition and increased
sharpness of moving scenes**

HDTV IN THE WHOLE VALUE CHAIN

Production

Distribution

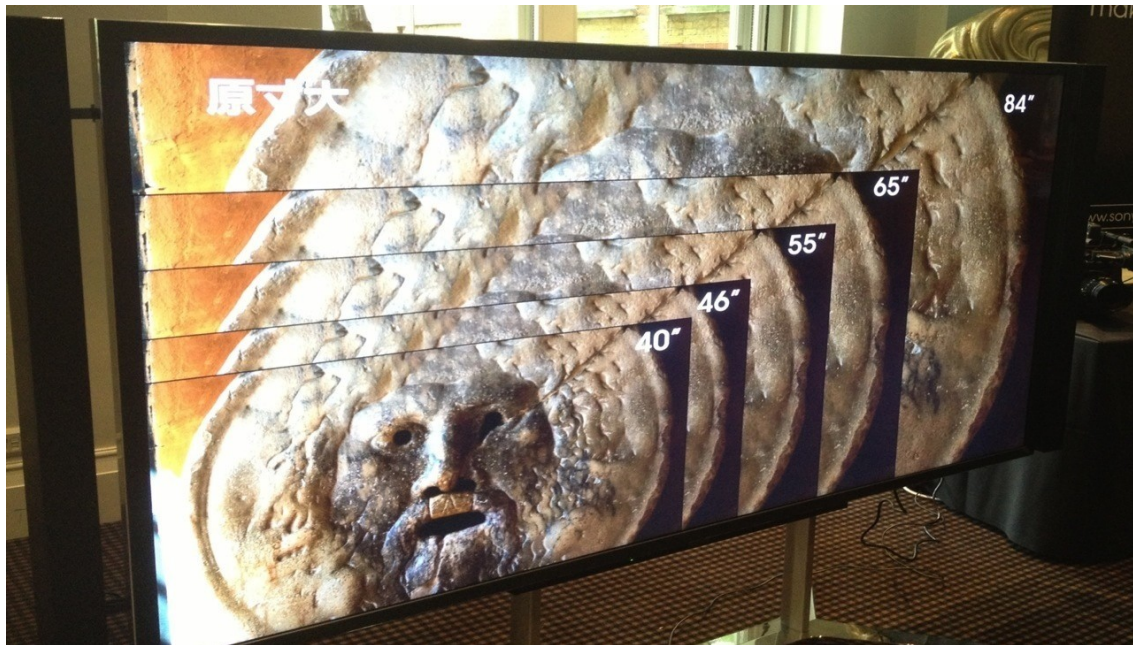
Home display



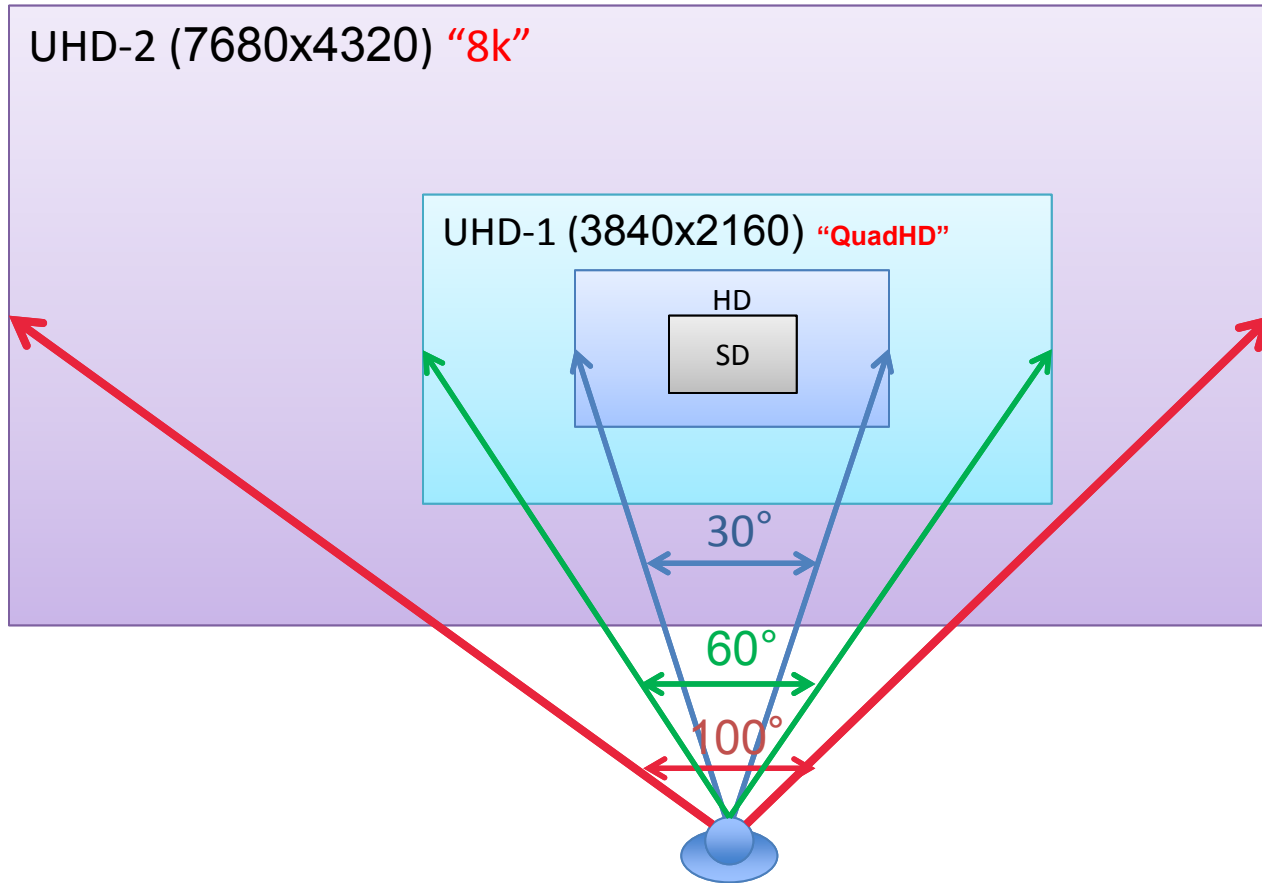
FULL HDTV 1080P/50 OR 60

- **It combines the higher dynamic resolution of 720p/50 and the higher static resolution of 1080i/25.**
- **A perfect master but it requires new infrastructure (and therefore investments) in production and at home (new set top box)**
- **It is the next generation of HDTV in production for premium services**
- **Still many open issues in distribution**

TRENDS : DISPLAY INDUSTRY IS THE DRIVER – BIGGER DISPLAYS NEED ULTRA HIGH DEFINITION TELEVISION

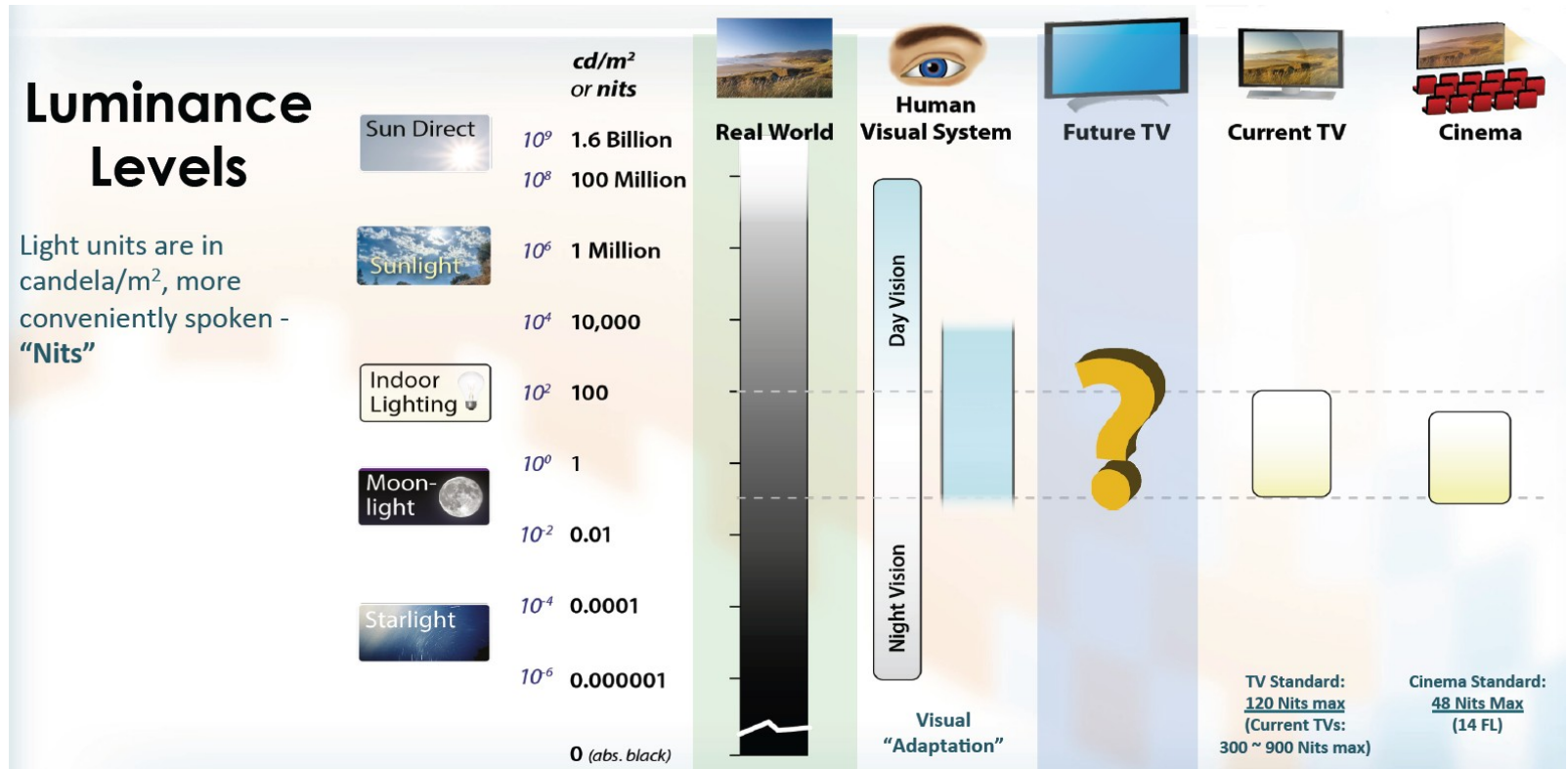


UHDTV IMMERSION - HIGHER PIXEL RESOLUTION



Completely filling the field of view to increase
sense of being there **BUT**
it requires up to max 50% more data rate

UHDTV IMMERSION - HIGHER DYNAMIC RANGE



Source: SMPTE annual Conference 2013, Pat Griffis, Making better pixel

It requires up to 20% more data rate – to be confirmed

UHDTV IMMERSION - HIGHER DYNAMIC RANGE

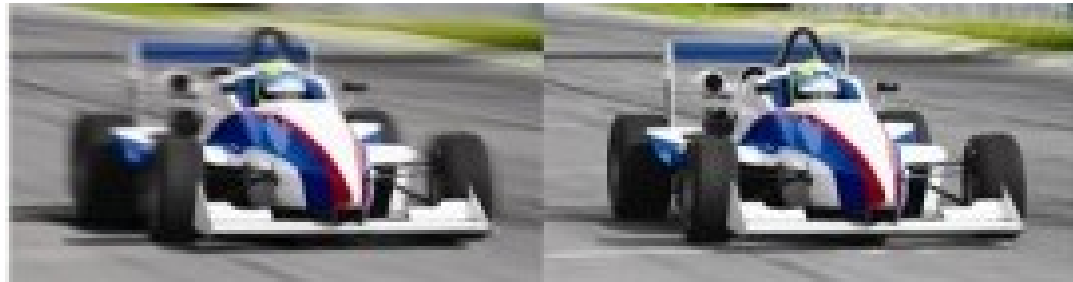


Source: <http://www.digitaltrends.com/photography/what-is-hdr-beginners-guide-to-high-dynamic-range-photography/>

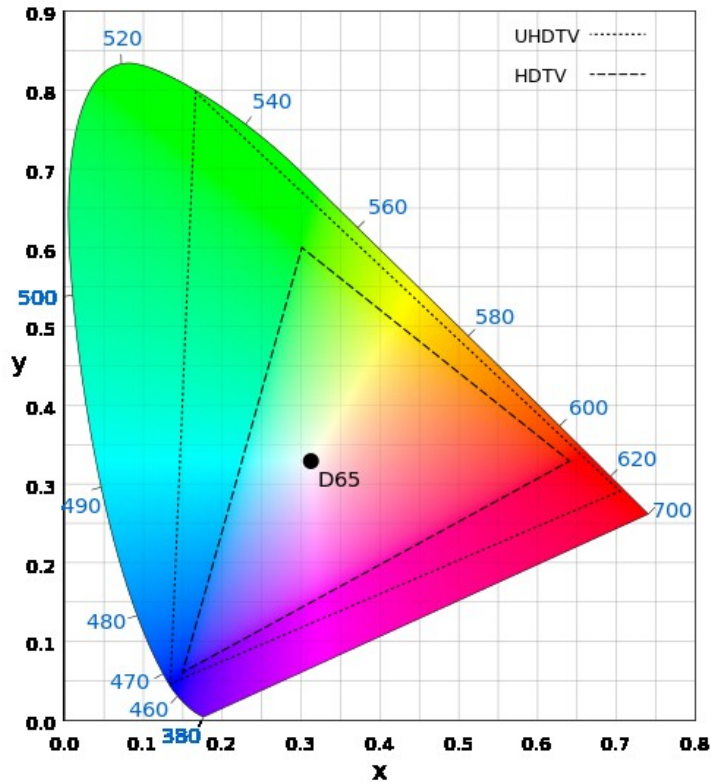
UHDTV IMMERSION – HIGHER TEMPORAL RESOLUTION

Higher Frame Rate – from 50, 60 to 100, 120

- ... provides smoother motion and provides details that can't be recognized in lower frame rate images
 - ... might effect the perceived image resolution
 - ... is **less** dependent on the viewing distance
 - ... will require a new HDMI version
- ... requires up to max 20% more data rate



UHDTV IMMERSION - WIDER COLOUR GAMUT



...provides more details in the image

...might effect the perceived image resolution

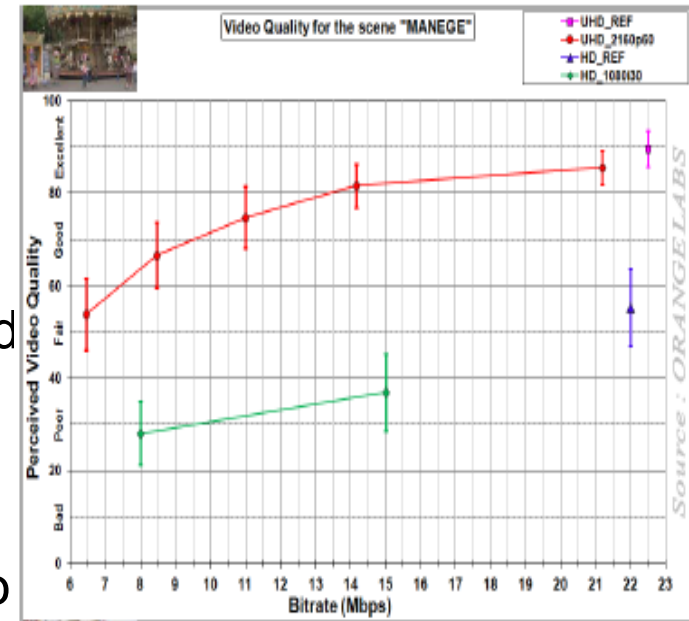
...is independent of the viewing distance

BUT HOW MUCH BIT RATE WILL IT COST? - TEST RESULTS

HEVC can exist without UHD but

UHD **cannot** exist without HEVC *or a better codec...*

- Experiment by EBU BeyondHD HEVC AHG.
- Based on Reference Software (HM v10.0).
- Preliminary results show **12 – 16Mbps** coded UHD-1 (2160p/50-60) appreciated as good.
- Further test to be done with more complex content (e.g. sport content).
- HEVC HFR show 20% overhead more test to be done – (BBC)



UHDTV PARAMETERS

	QuadHDTV	UHDTV- 1	UHDTV-2
Resolution	4 x HD: 3840 x 2160 pixel	3840 x 2160 pixel	<u>7680 x 4320 pixel</u>
Scanning format	progressive	progressive	progressive
Bit depth	8 bit distribution or 10 bit production	10 – 12 bit	10 – 12 bit
Frame rate	like HD: 50 & 60 Hz	like HD + 100 and 120 Hz	like HD + 100 and 120 Hz
Colour	ITU-R Rec. 709	ITU-R Rec. BT.2020	ITU-R Rec. BT.2020
Sampling	4:2:0 (distribution), 4:2:2, 4:4:4 production	4:2:0 (distribution), 4:2:2, 4:4:4 production	4:2:0 (distribution), 4:2:2, 4:4:4 production
Aspect Ratio	16 x 9	16 x 9	16 x 9

- 4k is the digital cinema format and has 4096x2160 pixel.
- 4K is the marketing term for QuadHD.
- UHDTV-2 is also known as 8k or SHV – Super High Vision.

PHASES AND POSSIBLE INTRODUCTIONS

- DVB Project plans a phased introduction, linked to the availability of HEVC decoders ICs. The practical ‘memory bandwidth’ should rise in steps over the coming years.
- ***DVB Phase 1***. For decoders available in **2014/15**. Main limitation is frame rate. Limit is 10 bit/s and 60 frames/second. 8 M pixel images.
- ***DVB Phase 2***. For decoders available in **2017/18**. Frame rate can now be up to 120 frames/second
- ***DVB Phase 3***. For the upper quality layer. UHD-2. With 33 M pixel images. Decoders available in 20XX.



THE UHDTV ROAD MAP...



2014

2015

2016

2017

2018

2019

2020

EBU

OPERATING EUROVISION AND EURORADIO

SUMMARY POINTS

- **Quad HD displays will not necessarily create immersive UHDTV. No EBU Member has expressed interest in services for phase 1**
- **EBU projects work together with the Members and the industry on a more immersive UHD system for the future years to come**
- **Target is to have standards and systems ready in the time frame 2017/18 when first reinvestments on HD infrastructures are required**
- **“Real” UHD requires a combination of advanced image parameters and immersive audio and new infrastructures technologies in the whole chain**
- **Some of these parameter like HDR will offer ideas for HD too**

THANK YOU
FOR YOUR ATTENTION !

QUESTIONS?

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