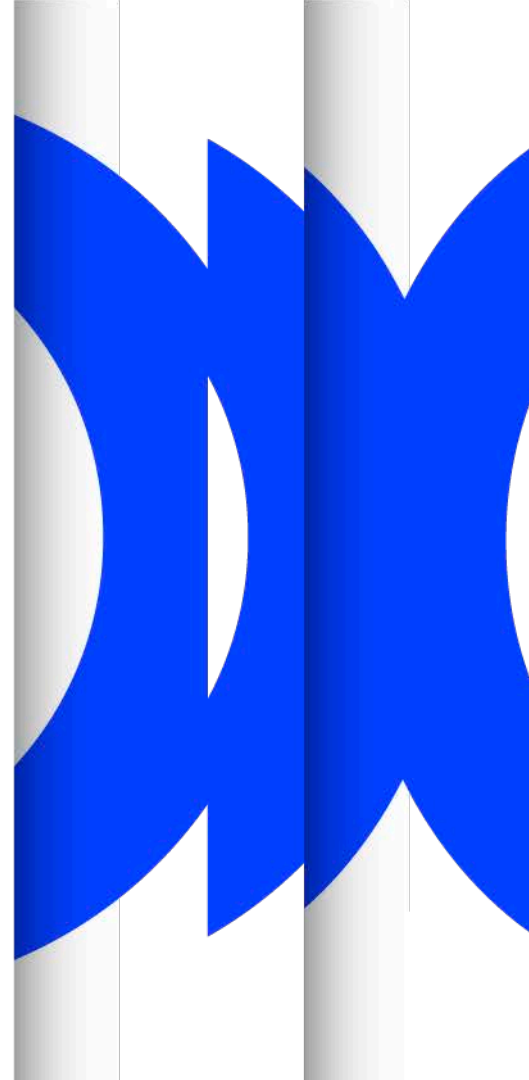


WEBINAR STARTING @ 14.00 CET

ULTRA HIGH DEFINITION TELEVISION IN EUROPE



ULTRA HIGH DEFINITION TELEVISION IN EUROPE

WHEN? WHY? HOW?

06 DECEMBER 2013



Hans Hoffmann



Adil Kouadio

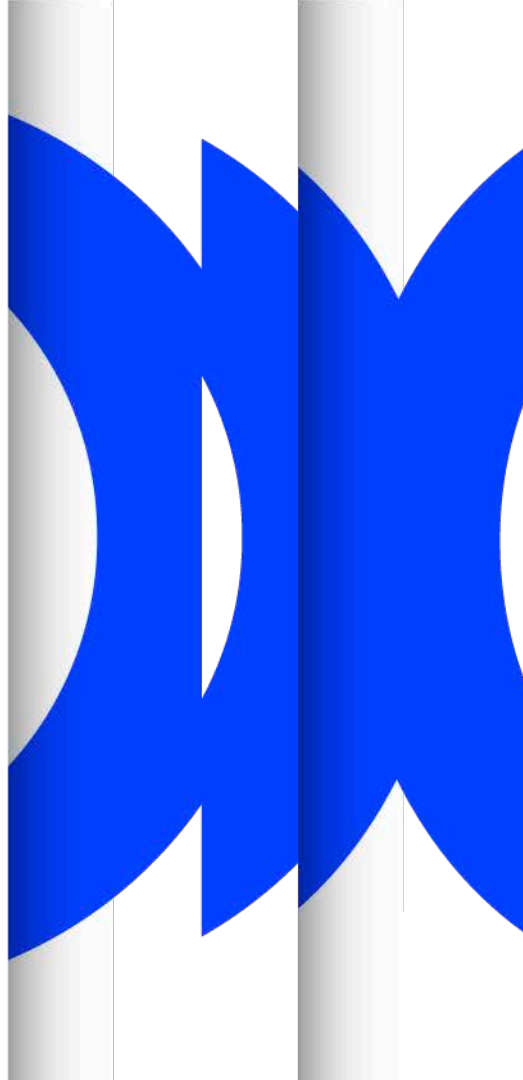


Yvonne Thomas



David Wood

INTRODUCTION



EBU

OPERATING EUROVISION AND EURORADIO



PRODUCTION TECHNOLOGY SEMINAR 2014

CHANGING TIMES,
CHALLENGING TIMES

28-30 January 2013
EBU, Geneva

KEY EBU EVENTS

BROADTHINKING 2014



BROADTHINKING 2014
*"Where Broadcast meets
Broadband"*
26-27 March



**NETWORK
TECHNOLOGY
SEMINAR 2014**
*"The Media & IT
Rendezvous"*
24-25 June

TECH.EBU.CH/EVENTS

WEBINAR OBJECTIVES

- **Communicate the recent trends on UHD**
- **Explain pros and cons of technology based on our results**
- **Phases of UHD TV and what does they mean**
- **EBU direction and work**
- **Operational impact**

AGENDA

- Setting the scene and UHD definitions
- What makes UHDTV immersive?
- “Immersive” Audio
- Test results

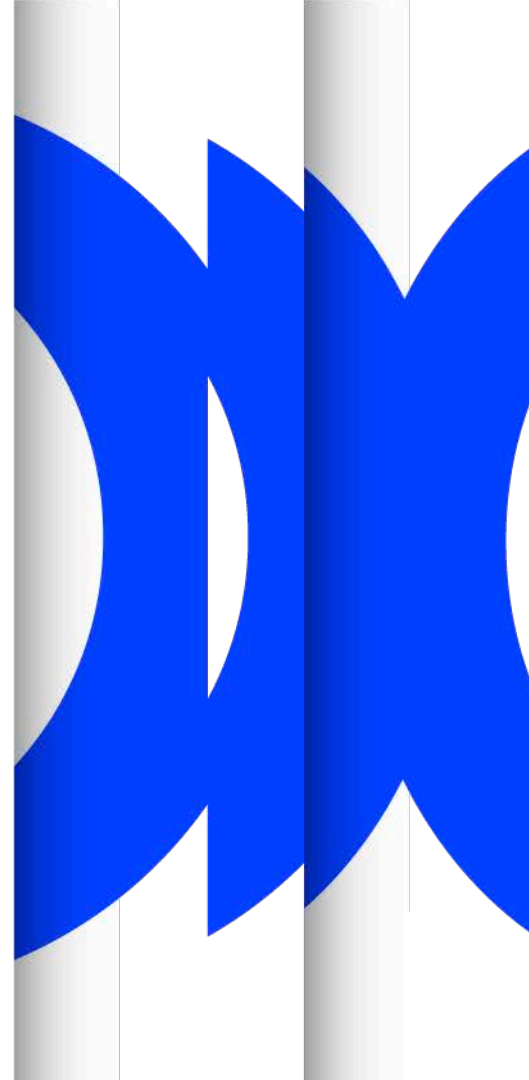
Questions

- What is the EBU targeting in its work?
- Phases and possible introductions for broadcasting
- The different perspectives of the content and the consumer industries

Questions

- Challenges for the future
- Business versus engineers’ dream
- Conclusions and take away

SETTING THE SCENE



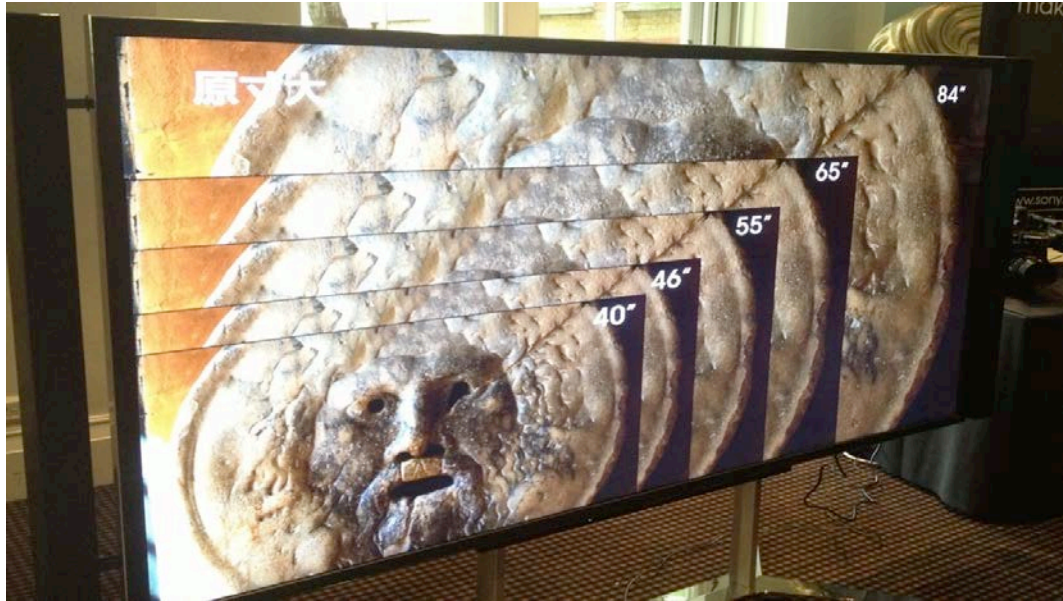
UHDTV AND EBU

- **We take note of developments on the market, driven by the consumer industry, with new UHD displays, and the professional industry.**
- **However, UHDTV is a longer term development and may become relevant in the years ahead. Current home displays concentrate on resolution increase only, this is not sufficient.**

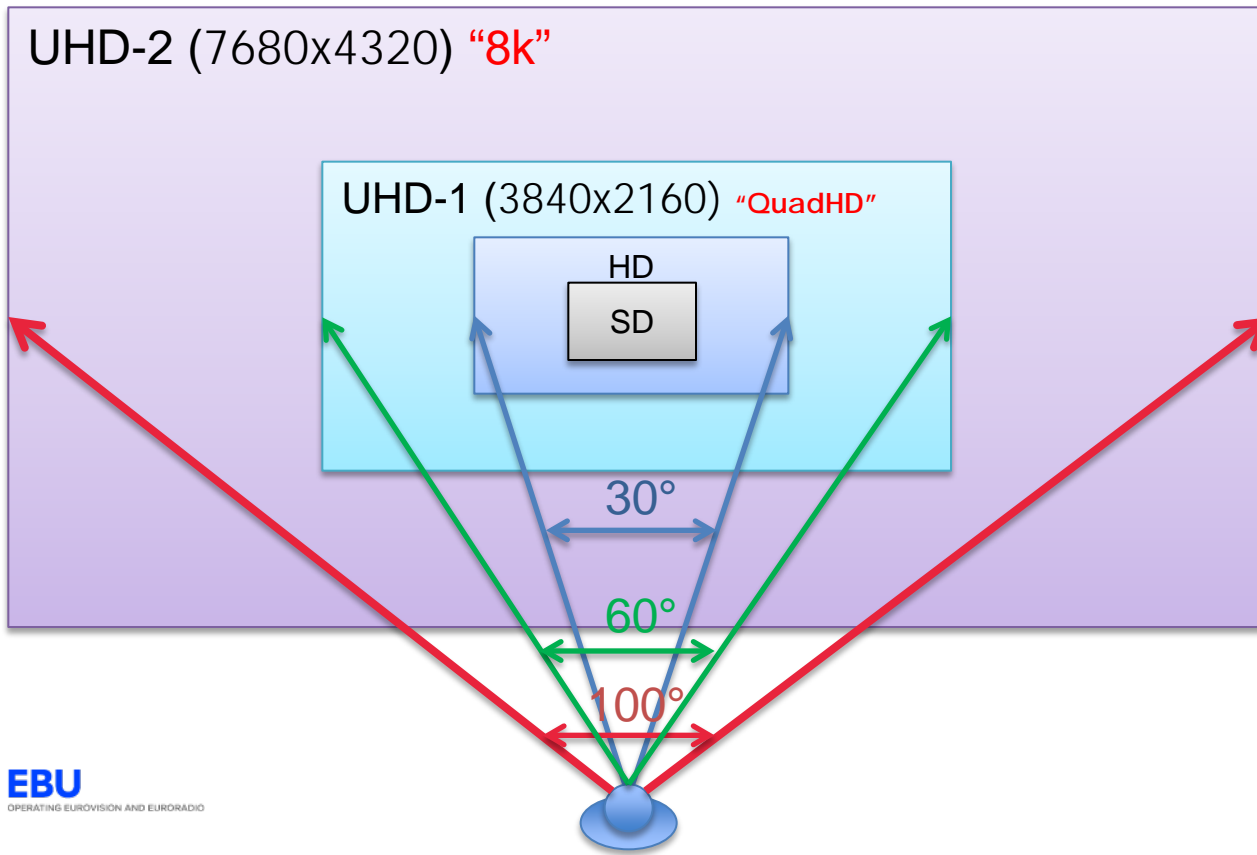
No Member has expressed interest in services for phase 1

- **Today is the time to set the standards and technology direction for the future (the window of opportunity to influence), which may be applied in 2017/18: in production, distribution and the home environment.**
- **Some UHD technologies (e.g. HEVC, HDR) will add value for enhanced HD services.**
- **Trials and tests may accompany the studies undertaken by the EBU and partners.**

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



DEFINITIONS : TWO UHDTV VARIANTS "4K" (MID TERM), AND "8K" (LONG TERM)



Completely filling the field of view to increase sense of being there

DEFINITIONS : UNDERSTANDING UHD...

UHD- 1:

- Resolution: 3840 x 2160 pixel
- Scanning format: progressive only
- Bit depth: 10 – 12 bit
- Frame rate: like HD, 100 and 120 Hz
- Colour: Recommendation BT.2020
- Sampling: 4:2:0 (distribution), 4:2:2, 4:4:4 production
- Aspect Ratio: 16x9

DEFINITIONS : UNDERSTANDING UHD...

Quad HD (actually an undefined format):

- Resolution: 4 x HD: 3840 x 2160 pixel
- Scanning format: progressive
- Bit depth: 8 bit distribution or 10 bit production
- Frame rate: like HD, up to 60p
- Colour: Recommendation 709
- Sampling: 4:2:0 (distribution), 4:2:2, 4:4:4 production
- Aspect Ratio: 16x9

- 4k the digital cinema format has 4096x2160 pixel.
- 4K is the marketing term for QuadHD.

DEFINITIONS : UNDERSTANDING UHD ...

UHD- 2:

- Resolution: 7680 x 4320 pixel
- Scanning format: progressive
- Bit depth: 10 – 12 bit
- Frame rate: like HD, 100 und 120 Hz
- Colour: Recommendation BT.2020
- Sampling: 4:2:0 (distribution), 4:2:2, 4:4:4 production
- Aspect Ratio: 16x9

– Also known as 8k or SHV – Super High Vision.

TRENDS : IN PRACTICE MANY TRIALS.....FOR "4K" AND "8K"



2014

2015

2016

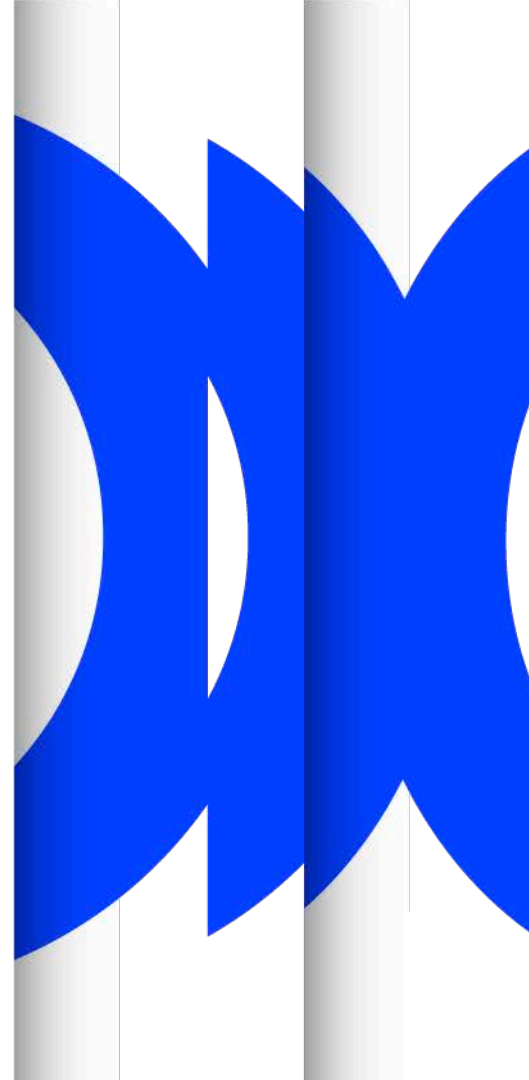
2017

2018

2019

2020

WHAT MAKES UHDTV IMMERSIVE?



WHAT MAKES UHDTV IMMERSIVE

immersive [ɪ'mɜːsɪv]adj

(Electronics) providing information or stimulation for a number of senses, not only sight and sound immersive television sets.



Source: <http://mashable.com/2013/04/25/immersive-experience/>

It is NOT resolution only

It is NOT HFR only

It is NOT HDR only

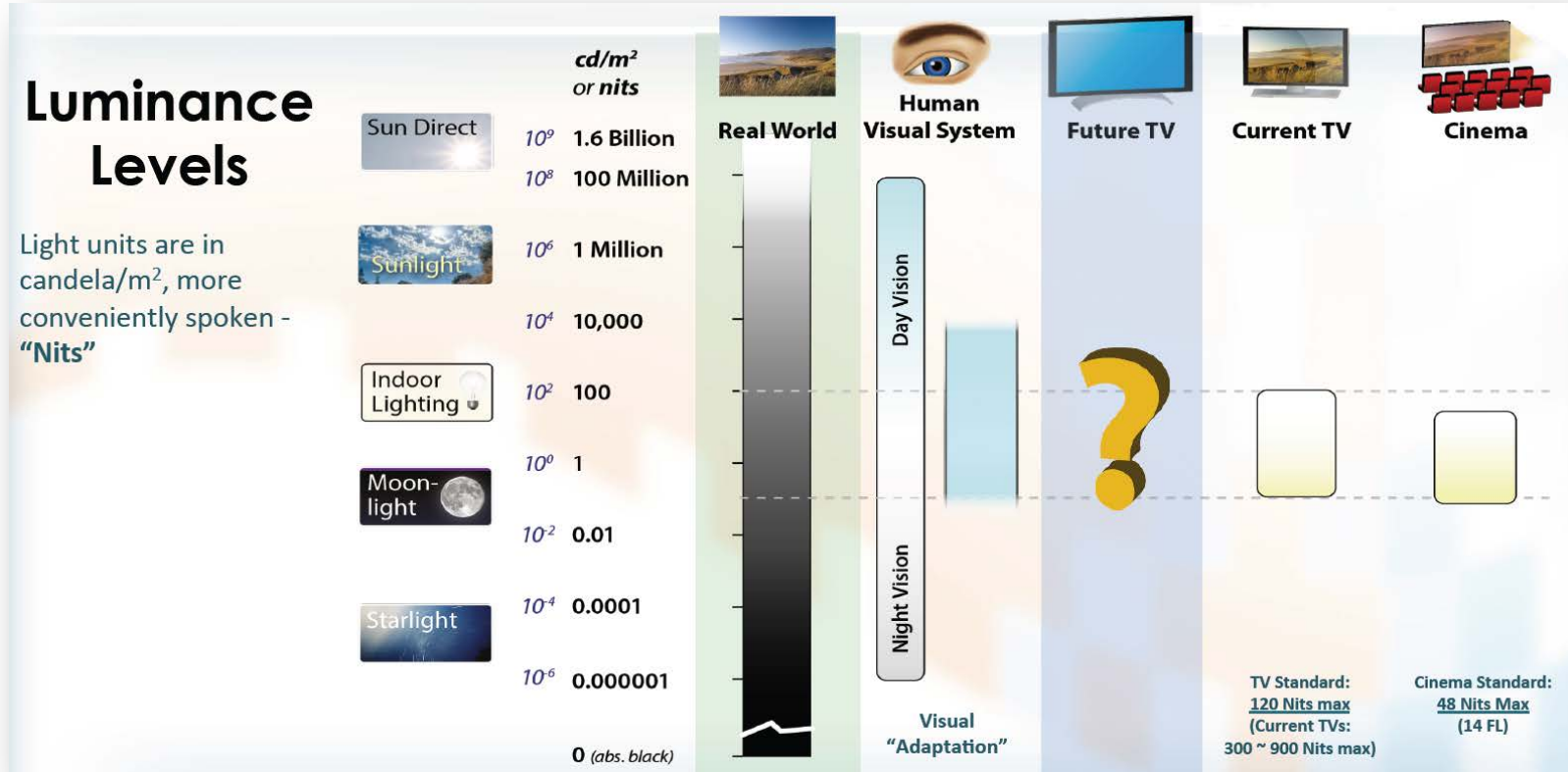
It is NOT better colours only

It is NOT immersive audio only

It is NOT an application only

It is a reasonable combination of all !!!

WHAT MAKES UHDTV IMMERSIVE – HIGHER DYNAMIC RANGE



WHAT MAKES UHDTV IMMERSIVE – HIGHER DYNAMIC RANGE



WHAT MAKES UHDTV IMMERSIVE – HIGHER DYNAMIC RANGE

Higher Dynamic Range

...provides more picture information

...requires min. 10 bit

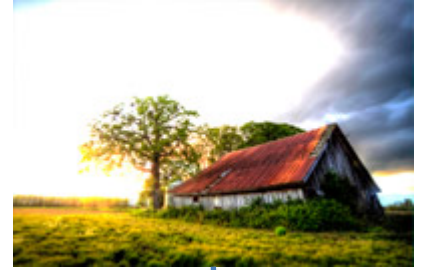
...might effect the colour perception

...is not yet clearly defined

...is independent from the viewing distance

...requires the OLED technology

...requires up to max 20% more data rate - to be confirmed



WHAT MAKES UHDTV IMMERSIVE – HIGHER RESOLUTION

Higher Resolution

- ...provides more detail in the image**
- ...is dependent on the viewing distance**
- ...had different definitions**
- ...requires up to max 50% more data rate**



WHAT MAKES UHDTV IMMERSIVE – HIGHER FRAME RATE

Higher Frame Rate

...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



<http://gfxspeak.com/2012/07/25/landau-trumbull-lead-all-star-siggraph-2012-high-frame-rate-cinema-panel/24fps-image-left-next-to-high-frame-rate-image-simulated-saved/>

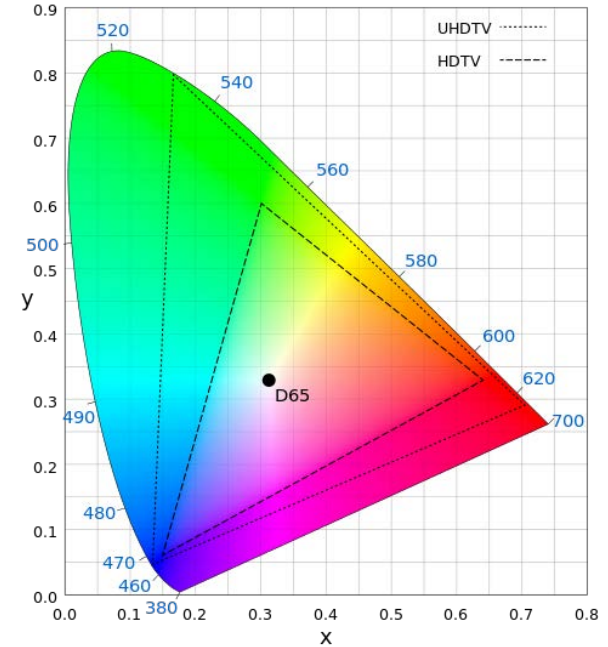
WHAT MAKES UHDTV IMMERSIVE – WIDER COLOUR GAMUT

Wider colour gamut

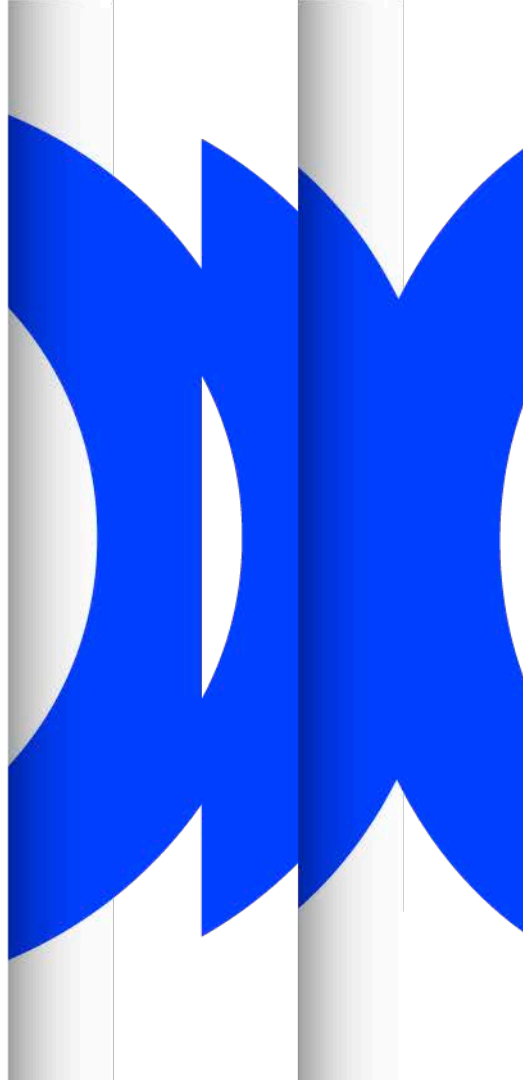
...provides more details in the image

...might effect the perceived image resolution

...is independent of the viewing distance



IMMERSIVE AUDIO



WHAT MAKES UHDTV IMMERSIVE – IMMERSIVE AUDIO

Immersive audio

...provides more realistic experience

...might require personalized audio technologies

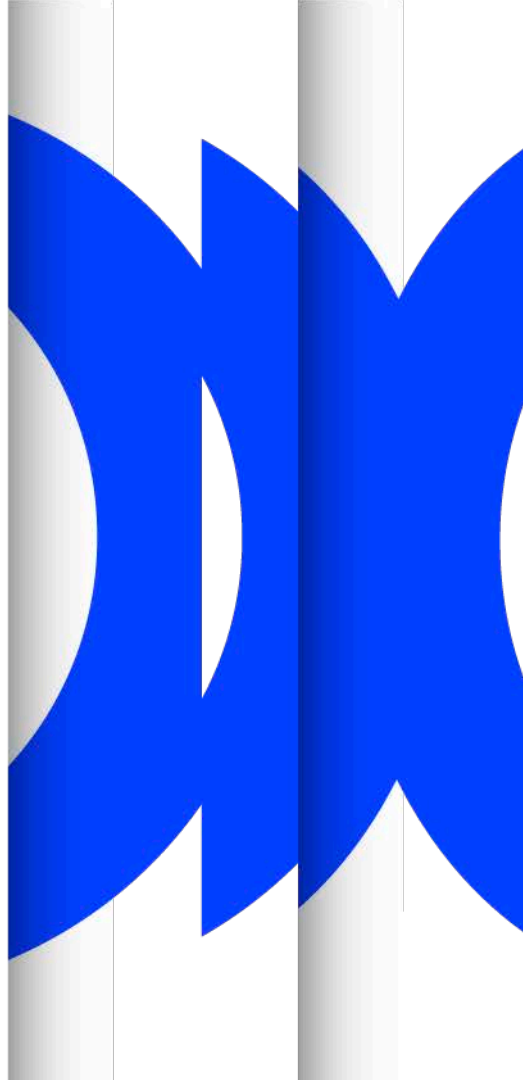
...might require a new HDMI version

IMMERSIVE AUDIO : SOUND ADVICE FOR UHDTV

- Very large UHD screens call for lateral and vertical localisation of audio ('3D sound') for 'immersiveness'.
- A system is needed to also cope with a wide range of screen sizes and viewing environments – from Tablets to 100” displays.
- New ITU-agreed system uses broadcast 'metadata' and 'audio elements' .
- System can provide for **discrete audio channels, object-based system, or hybrid**, and for viewer adjustments.
- 5.1 suggested for DVB Phase 1 broadcast system.
- New ITU system may be part of Phase 2 UHD-1 and UHD-2



TEST RESULTS



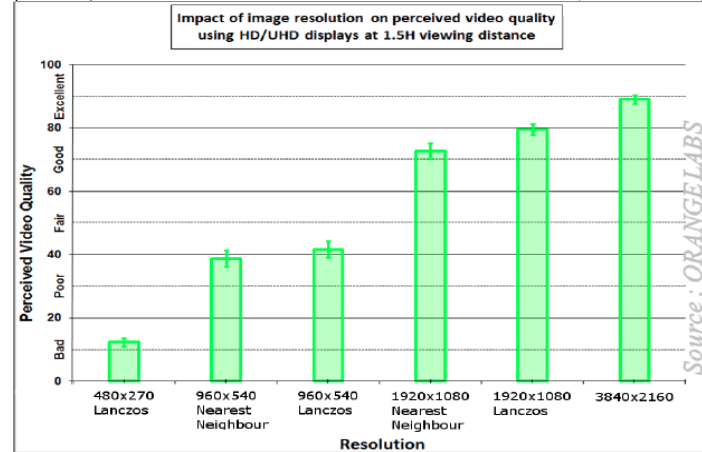
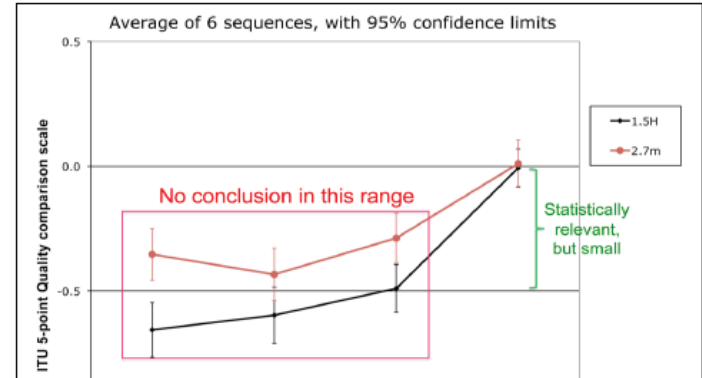
TEST RESULTS – IS RESOLUTION ENOUGH ?

No!

- 1st Experiment by EBU Jan'13 comparing **uncompressed 2160p/50 – Rec 709** content with down-converted HD versions. **ITU BT. 500 DSCQS**
- 2 viewing distances (1.5H and 2.7m)
- 56" UHD Monitor – TVLogic
- Difference is **hardly** perceptible especially at 2.7m (red curve)

Confirmed by experiment done at OrangeLabs Q3'14

- 1 viewing Distance 1.5H
- 55" TOSHIBA display.



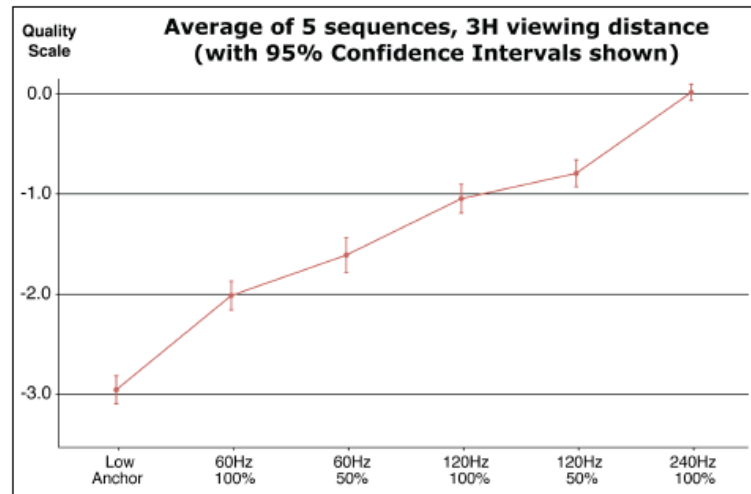
TEST RESULTS – WHAT ABOUT FRAME RATE?

Experiment conducted under the BTF (Jun'13)

- 60Hz / 120Hz vs. 240Hz .
 - ... At HDTV resolution (1080p)!
- 50" HDTV screens.
- **Doubling the resolution increases drastically the quality.**

Notes

- The production style may have been different for certain native frame rates as 30fps.
- HFR is relevant for content with motion especially sports.
- Internal display Motion Compensation will be tested in 2014

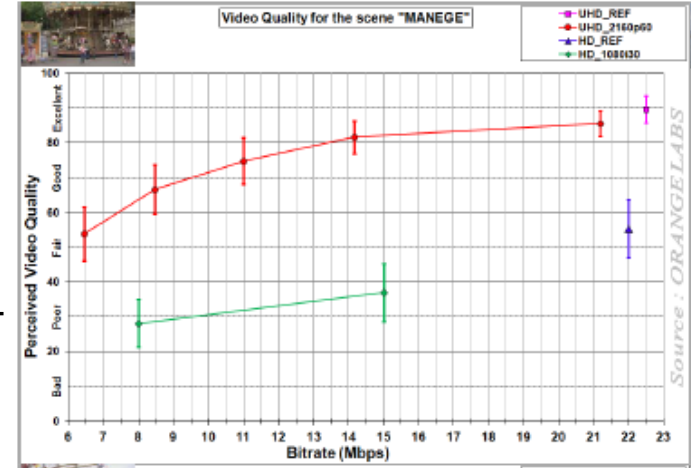


TEST RESULTS – BUT HOW MUCH BIT RATE WILL IT COST ?

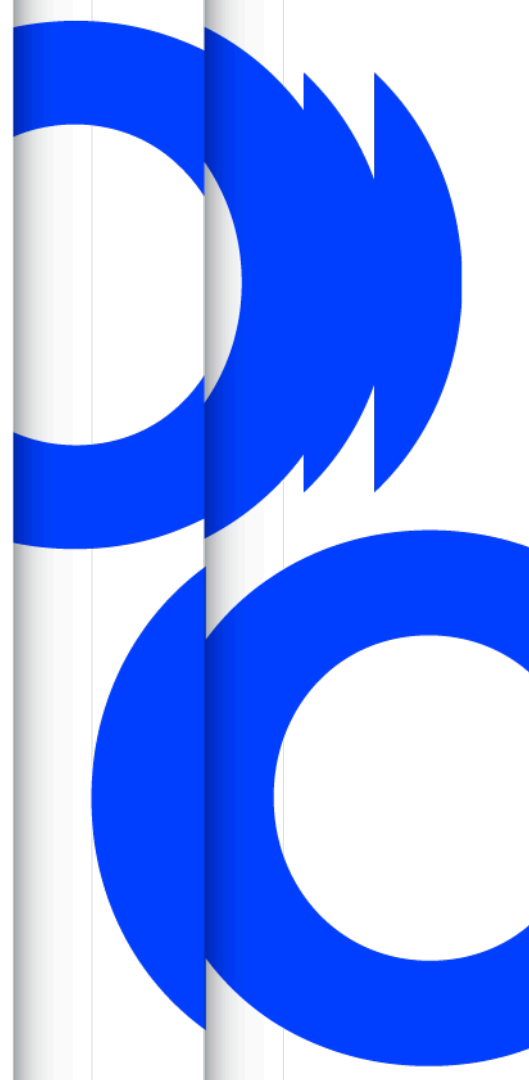
HEVC can exist without UHD but

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

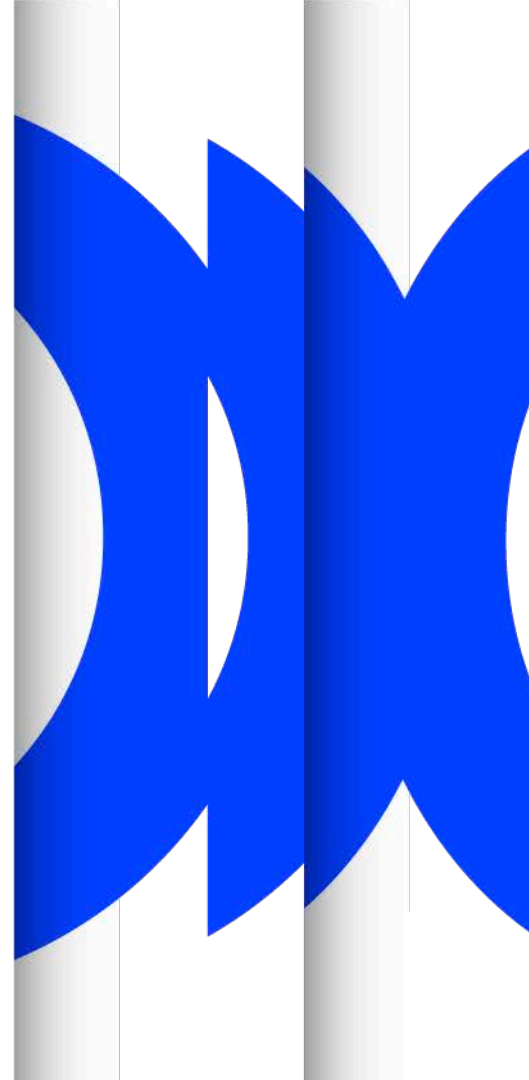
- Experiment by EBU BeyondHD HEVC AHG.
- Based on Reference Software (HM v10.0).
- Preliminary result show **12 – 16Mbps** coded UHD-1 (2160p/50-60) appreciated as good.
- Further test to be done with more complex content (e.g. sport content).
- HEVC HFR show 20% overhead more test to be done – (BBC)



QUESTIONS ?



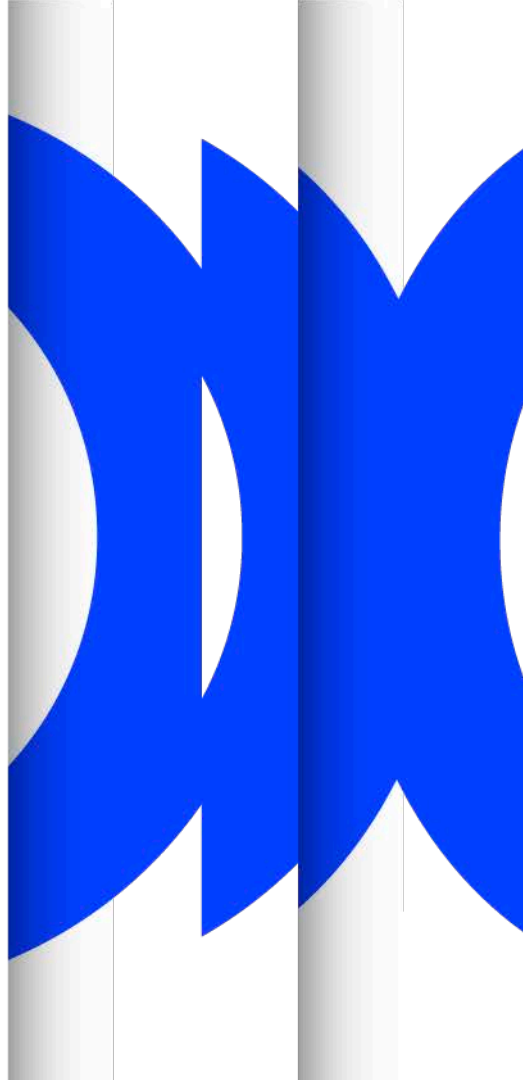
WHAT IS THE EBU TARGETING?



WHAT IS THE EBU TARGETING IN ITS WORK

- **Lobbying for a truly immersive system**
- **Developing open standards**
- **Harmonization if competing standards exist**
- **Making the right choice for UHD TV in the longer term**
- **Don't confuse the consumer**
- **Create the overall experience**
- **Define the applications**
- **Improve HD services**
- **Get evidence and understanding of the link between parameters**
- **Voices and choices and follow up**

PHASES

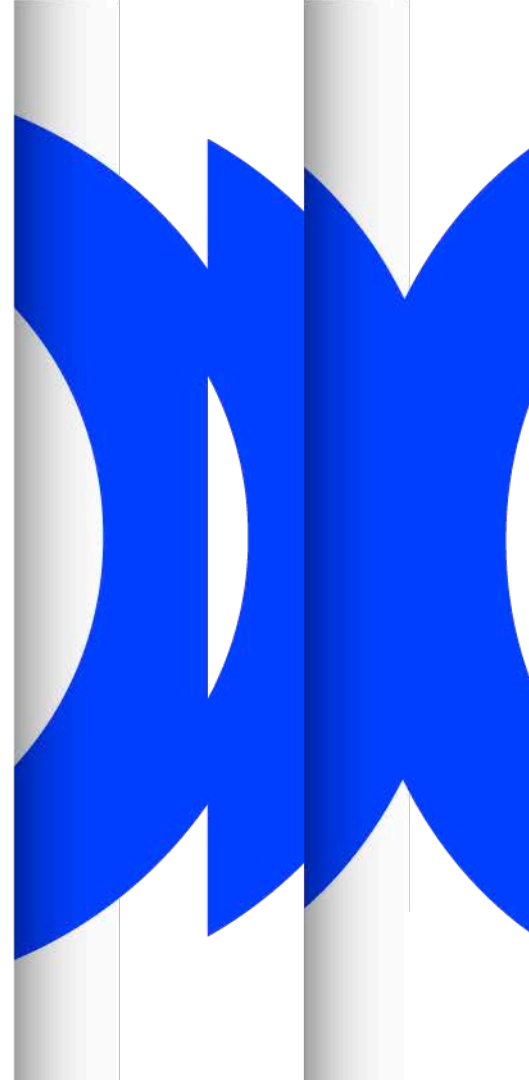


PHASES AND POSSIBLE INTRODUCTIONS

- **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.**



CONTENT & CONSUMER INDUSTRY PERSPECTIVES



THE DIFFERENT PERSPECTIVES OF THE CONSUMER AND CONTENT INDUSTRIES

- **CE manufacturers:**
 - Look for early market entry, maximum profit margins, and low costs for consumers.
 - Anticipate early services via Internet at 'quad HD' rather than ITU UHDTV level.
 - Cautious about ITU UHDTV until there are announced plans by broadcasters.
- Today about six CE manufacturers are selling '4K' TV displays in Europe (at less than 10k Euros).
- Displays use 709 colorimetry. Essentially 'Quad HD'.
- Smart phones/tablets may also be used for UHD in future.



ULTRAHD



ULTRAHD
3840 × 2160

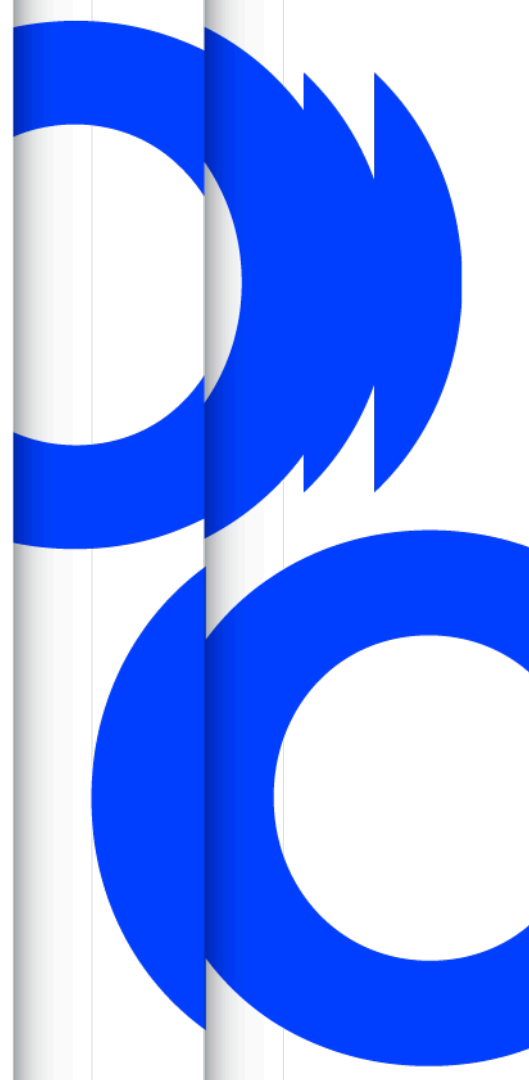
THE DIFFERENT PERSPECTIVES OF THE CONSUMER AND CONTENT INDUSTRIES

- **Broadcasters would like a large quality increase compared to HDTV in order to justify the infrastructure change. They would like a large ‘wow’ factor.**
- **Movie studios would like even greater increment in quality for drama delivered by file.**
- **In addition, movie studios request ‘built-in’ measures for piracy prevention.**

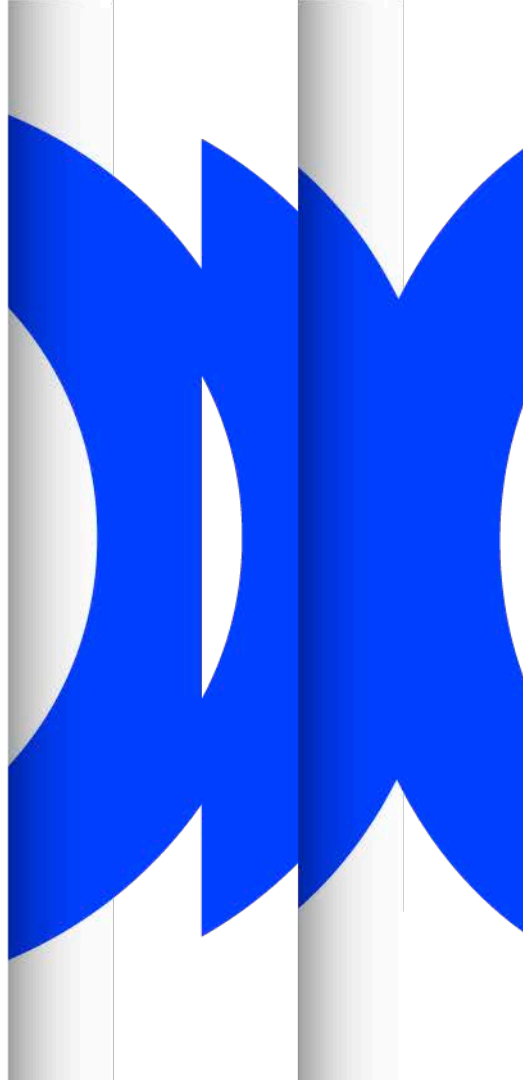
EBU



QUESTIONS ?



CHALLENGES FOR THE FUTURE



WHAT ARE THE ISSUES AND THE CHALLENGE FOR PSM



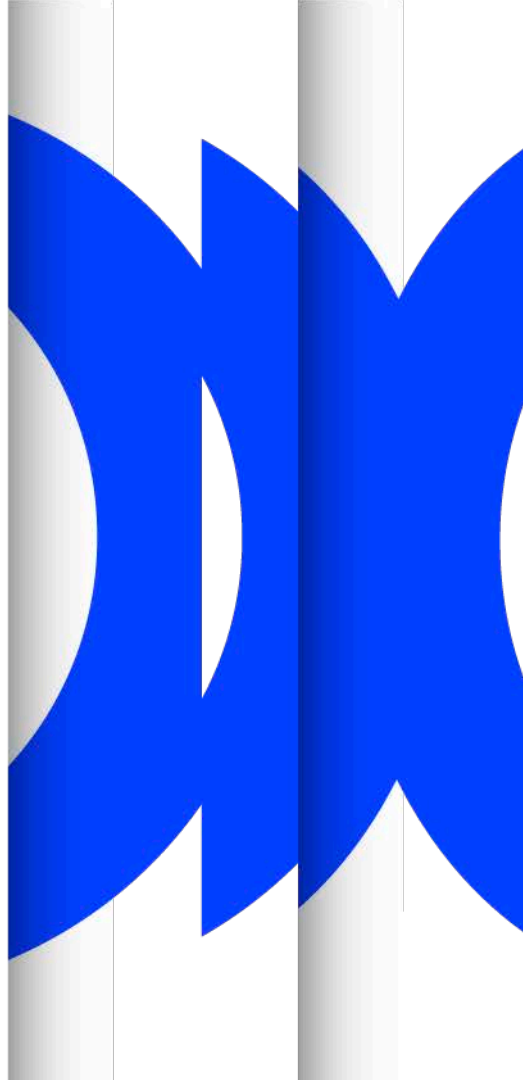
- Industry seeks short term revenue – little improvement over HDTV
- Market penetration of 4k UHDTV displays in the years ahead difficult to predict
- Changing from HD to UHDTV is very costly, many times technology not ready yet
- EBU strategic approach:
 - Collaborate with industry and partners on a UHDTV system that is really immersive
 - Provide objective information to the market and PSM
 - Set standards and technology, so that PSM have save technology grounds when the time of UHDTV comes

CHALLENGES IN PRODUCTION AND DISTRIBUTION

- **Costs ?**
- **Equipment is not mainstream yet**
 - E.g. what about lenses ?
- **Interfaces**
 - A mess on variants of standards proposals for UHD
 - We need a single RT interface
- **Look into the end-to-end chain**
 - Have a holistic view. Studio, Contribution, Distribution (also IP), and the home



BUSINESS VS. ENGINEERS' DREAM



BUSINESS VERSUS ENGINEERS' DREAM

- **BUSINESS**
- **New Format – new opportunity!**
 - For some...(VoD, IPTV, ...)
 - Be first! Occupy the terrain (Depending on business case).
 - Different phases = Different products to sell (not matter the added value for some)

- *How do you sell your UHD production with ROI with regard to an HD one?(when you are not CE) if there is a barely visible difference compared to HD.*
- *Is a change in production grammar realistic?*
- *How would you cope with the change in infrastructure?*
- *Being too early may kill it?*



COMMON SENSE

Just because you can, doesn't mean you should.

BUSINESS VERSUS ENGINEERS' DREAM

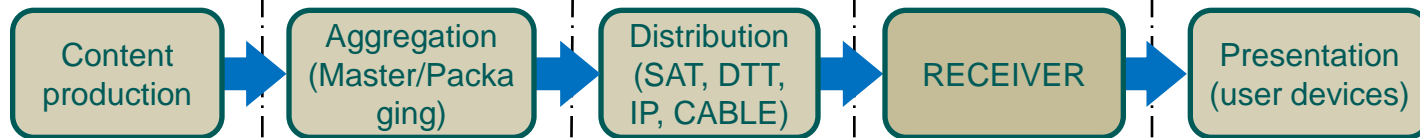


- **ENGINEER**
- **New format – new challenges!**
- **Bring the Best of all worlds to the world!**
 - HFR + HDR + High Res + WCG

•*Too costly to implement ?*

- HFR may be challenging on the decoding memory management or TV panel interface but not impossible for the envisaged timescales.
- HDR is being defined.

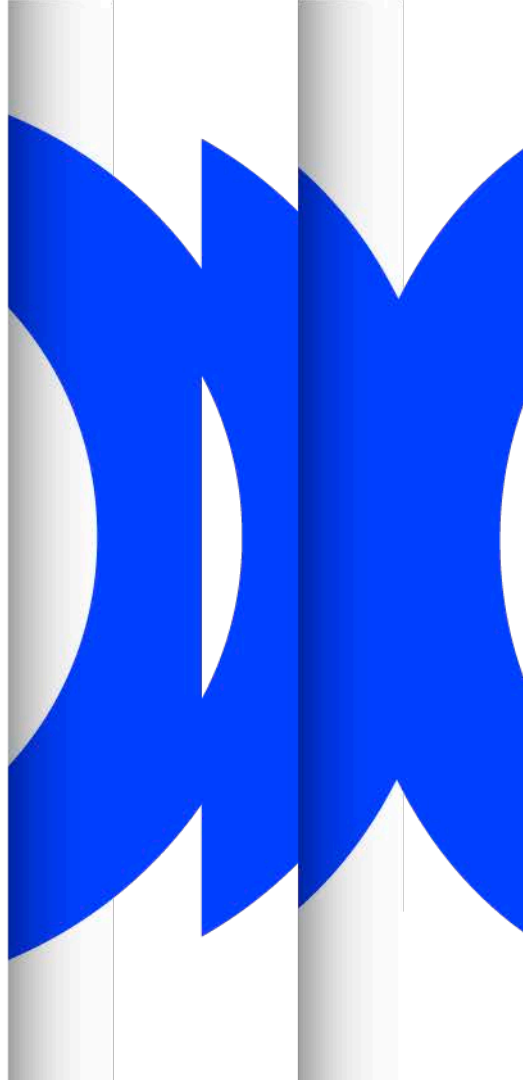
OUR COLLABORATION PARTNERS.....



HOME



CONCLUSIONS



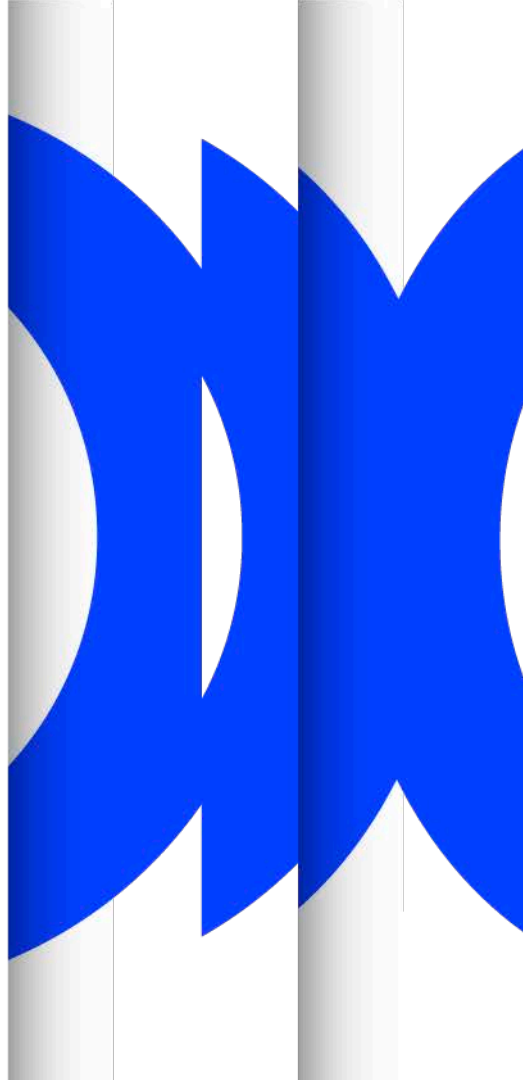
CONCLUSIONS AND TAKE AWAY

- **Quad HD displays will not necessarily create immersive UHDTV**
- **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: this means we need to act now.**
- **“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**
 - Stay tuned for the tests we conduct with our partners

QUESTIONS ?



NEXT EBU EVENTS



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