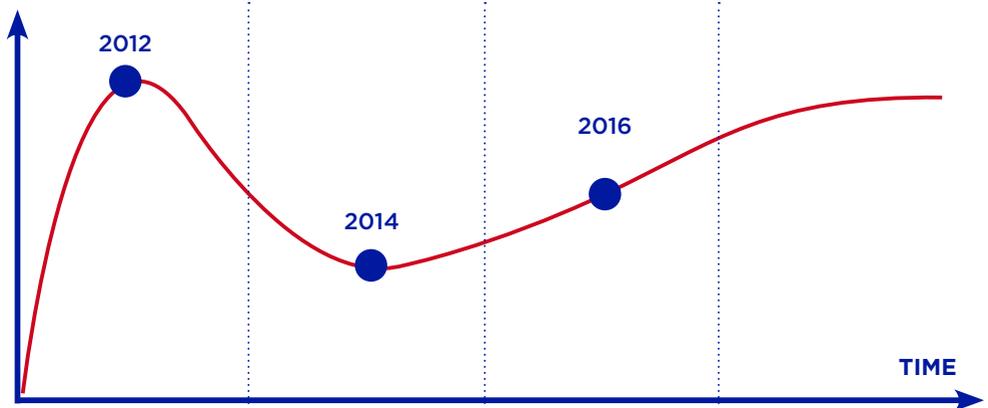


# THE TIME IS NOW TO MOVE BEYOND HDTV!

## VISIBILITY



### "Peak of inflated expectations"

In 2012 the industry introduced «4k» as the next big thing for beyond HDTV leading to a huge hype and unrealistic expectations.

### "Trough of disillusionment"

In 2014 the industry realized that 4k only provides limited immersive experience for the viewers. Understanding what makes better pixels was deemed as a necessary step.

### "Slope of enlightenment"

In 2014 investigations made by EBU and others showed that HDR and HFR could be the game changers to go successfully beyond HDTV.

**Four possible scenarios are now considered.**

### "Plateau of productivity"

The industry has reached agreement on standards on HDR and HFR. It is now time for broadcasters to produce content accordingly.

#### **1080p advanced 1**

Resolution: 1080p  
Frame rate: 50Hz  
HDR: Yes  
WCG: Yes

#### **1080p advanced 2**

Resolution: 1080p  
Frame rate: 100Hz  
HDR: Yes  
WCG: Yes

#### **UHD phase 2a**

Resolution: 2160p  
Frame rate: 50Hz  
HDR: Yes  
WCG: Yes

#### **UHD phase 2a**

Resolution: 2160p  
Frame rate: 100Hz  
HDR: Yes  
WCG: Yes

# TECHNOLOGY MATURITY

## **1 ) 1080P ADVANCED 1 (1080P/50 + HDR):**

*1080p advanced 1* is the “quick to market” of all scenarios. In fact, current production workflows can be reutilized. In addition 1080p resolution provides an efficient bandwidth usage in distribution. Moreover, *1080p advanced 1* could address the already installed base of full HD displays and UHD displays in conjunction with a proper Set Top Box. On the other side this scenario might have marketing problems as it could be perceived as an incomplete leap in the future. In addition, international program sales might require that the resolution is UHD.

## **2 ) 1080P ADVANCED 2 (1080P/100 + HDR):**

*1080p advanced 2* shares the immediate value of *1080p advanced 1* but it also guarantees high benefit for motion portrayal (sport programs) at minimum bandwidth increase. Overall it provides the maximum achievable increase in quality for the 1080p resolution. Unfortunately at the moment the whole content production to distribution chain is not fully supported, even though few prototypes already exist. A realistic forecast would see the industry ready to roll out this scenario in 2017.

## **3 ) UHD PHASE 2A (2160P/50 + HDR):**

*UHD phase 2a* is the industry preferred format as well as the international programs sales format. From this perspective, it is clear that additionally to the increase of resolution and the introduction of HDR, the real added value for this scenario is the industry support. Nevertheless to roll out this scenario new infrastructures in production are needed, potentially coupled with the move to IP. It also requires higher bandwidth in production and distribution compared to 1080p advanced profiles. A realistic forecast would see the industry ready to roll out this scenario in 2017.

## **4 ) UHD PHASE 2B (2160P/100 + HDR):**

*UHD phase 2b* is certainly the best possible scenario for viewers who want to enjoy a fully immersive experience. It adopts the best of all worlds, spatial resolution, dynamic range and frame rate. It requires the highest bandwidth for delivery and the longest waiting time to market. A realistic forecast would see the industry ready to roll out this scenario in 2019.

		1080p advanced 1	1080p advanced 2	UHD phase 2 a	UHD phase 2 b
<b>Production</b> 	Cameras	●	●	●	●
	Studio interfaces	●	●	●	●
	Wireless links	●	●	●	●
	Mixers	●	●	●	●
	Graphic engines	●	●	●	●
	Professional monitors	●	●	●	●
<b>Contribution</b> 	Encoders	●	●	●	●
	Decoders	●	●	●	●
	Modulators	●	●	●	●
	Demodulators	●	●	●	●
<b>Distribution</b> 	Encoders	●	●	●	●
	Decoders	●	●	●	●
	Modulators	●	●	●	●
	Demodulators	●	●	●	●
<b>Consumer</b> 	TVs	●	●	●	●
	Portables devices	●	●	●	●
	Set Top Boxes	●	●	●	●
	Consumer interfaces	●	●	●	●

**Legend:**

- Product available for purchase
- Specification/standard available – prototype available
- No agreed standard nor product available

**Notes:**

- All scenarios shall use a 10 bit codec to enable HDR, for example HEVC main10.
- Wireless camera links should be considered only for live production.- 6G/12G/24G.
- SDI single link studio interfaces are already standardised for 1080p/100, 2160p/50 and 2160p/100, but they are not widely adopted by product manufacturers. IP-based interfaces may be the solution.
- It should be considered that the production format can differ from the distribution format (e.g. production in *UHD phase 2a* and distribution in *1080p advanced 1*).



### **EBU Tech Report 037**

The report discusses video system requirements for UHDTV and an advanced 1080p HDTV format, to help inform broadcasters making decisions on infrastructures and flexible workflows.

<https://tech.ebu.ch/docs/techreports/tr037.pdf>



### **EBU Tech Report 036**

This report analyses the number of TV programmes that can be accommodated in a DVB-T2 multiplex when using HEVC video coding.

<https://tech.ebu.ch/docs/techreports/tr036.pdf>



### **EBU policy statement**

on UHD Television This document is intended to guide strategic decisions in regard to UHDTV and future TV services.

<https://tech.ebu.ch/docs/techreports/tr028.pdf>



### **EBU UHDTV factsheet**

The transition to digital television and HDTV is well under way. The options beyond HDTV include: a more advanced HDTV system 1080p/50 and two levels of UHDTV, UHD-1 and UHD-2.

[https://tech.ebu.ch/docs/factsheets/ebu\\_tech\\_fs\\_uhdtv.pdf](https://tech.ebu.ch/docs/factsheets/ebu_tech_fs_uhdtv.pdf)



### **Recommendation ITU-R BT.2100**

This Recommendation specifies HDR-TV image parameters for use in production and international programme exchange using the PQ and HLG methods.

[http://www.itu.int/dms\\_pubrec/itu-r/rec/bt/R-REC-BT.2100-0-201607-1!!PDF-E.pdf](http://www.itu.int/dms_pubrec/itu-r/rec/bt/R-REC-BT.2100-0-201607-1!!PDF-E.pdf)



### **Report ITU-R BT.2246**

The present state of ultra-high definition television.

[https://www.itu.int/dms\\_pub/itu-r/opb/rep/R-REP-BT.2246-2-2012-PDF-E.pdf](https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-BT.2246-2-2012-PDF-E.pdf)



### **Recommendation ITU-R BT.2020**

Parameter values for ultra-high definition television systems for production and international programme exchange.

[https://www.itu.int/dms\\_pubrec/itu-r/rec/bt/R-REC-BT.2020-2-201510-1!!PDF-E.pdf](https://www.itu.int/dms_pubrec/itu-r/rec/bt/R-REC-BT.2020-2-201510-1!!PDF-E.pdf)



### **Report ITU-R BT.2390**

This report provides background information on HDR in general, and for the perceptual quality (PQ) and hybrid log-gamma (HLG) HDR signal parameters specified in the Recommendation.

[https://www.itu.int/dms\\_pub/itu-r/opb/rep/R-REP-BT.2390-2016-PDF-E.pdf](https://www.itu.int/dms_pub/itu-r/opb/rep/R-REP-BT.2390-2016-PDF-E.pdf)