EBU
TECHNOLOGY
FACT SHEET

BEYOND HDTV

The transition to digital television and HDTV is well under way. At the same time, broadcasters must have an eye to the future. They must recognize the inevitable evolution of the viewing experience, and study whether steps need to be taken now to be future-proof. The options beyond HDTV include: a more advanced HDTV system 1080p/50; 3DTV with various resolutions and characteristics; and two levels of Ultra High Definition Television, UHD-1 and UHD-2. In all cases there are production and delivery aspects to consider.

BACKGROUND

Television image quality has shown continuous evolution over the last 50 years and is unlikely to stop abruptly now. The factors affecting this have been the improvements in television displays and, in the digital age, the continuous improvements in video compression efficiency and the increases in chip gate density. All of these trends will continue.

Television systems that provide a greater viewing experience will be driven by the combination of the consumer electronics industry's need for new selling propositions and the public demand for ever better and more immersive experiences. Complete or partial worldwide standards are now available for the following future options for broadcasters:

- **1080p/50** – a version of the HDTV format with greater vertical-temporal resolution; this has twice as many pixels as the HDTV formats used today, and would provide somewhat more detail and processing headroom.
- **Stereoscopic 3DTV** based on an HDTV broadcast channel – there are several ways in which S-3DTV can be broadcast, from the simplest form using colour-casts to provide left and right eye images, through systems for 'squashing' filtered versions of the left and right eye images into an HDTV Frame (the 'Frame Compatible' or DVB Phase 1 system), to systems that provide a 2D HDTV image and a 'top-up' signal that allows the receiver to generate the full left and right eye HDTV images (the 'Service Compatible' or DVB Phase 2a system). Each has advantages and disadvantages for broadcasters and the public. Frame Compatible services are already available in several countries in Europe. For each system the option of viewing in autostereoscopic (i.e. glassless) mode will further improve the viewing experience.
- **Ultra High Definition Television –** there are two levels of UHDTV. Level 1, the '4k' level, provides 8 Megapixel images, the equivalent of four 1080p/50 images. Level 2, also called Super Hi-Vision, provides 32 Megapixel images, the equivalent of sixteen 1080p/50 images.

A new and more efficient video compression system – **HEVC** – is being developed by the MPEG standards group. It may be up to 50% more efficient that currently used compression systems. This may significantly affect the practicability of broadcasting these new television formats.

THE CHALLENGE FOR BROADCASTERS

Broadcasters are obliged to look beyond today's HDTV, and to ask "what's next?" They need to understand the options, their practicability, their cost, and the potential impact on their business models.

They need, for example, to decide on whether production in the 1080p/50 format would be valuable, and in which circumstances. Broadcasting in 1080p/50 is becoming more practical with current receiver generations. With many 'quality steps' ahead, broadcasters need to decide whether to take or to 'step over' one or other steps.

Within the range of 3DTV broadcast systems, broadcasters need to decide whether one or other is right for their circumstances. There are also issues to resolve concerning 3DTV programme making and the rules and constraints that should be apply.

The UHDTV standards include a number of options for elements such as colour encoding, frame rate, and bit depth, and here too broadcasters need to make choices. The performance of the HEVC compression system also needs to be evaluated. This will help judgements to be made about where, when, and how the systems beyond HDTV will be practical. Such systems may be delivered by broadcasting or by combinations of broadcast and broadband.

For the specific case of UHDTV Level 1, there are several flavours with small differences, leading to some confusion over nomenclature. For example, we have the actual ITU UHDTV Level 1, with 3840x2160 pixels; the Digital Cinema 4k format, with 4096x2160 pixels; and then several undefined terms such as 'Quad HD', often used for marketing purposes. The industry needs to agree on common terminology to avoid confusion and ensure interoperability.

WHAT IS THE EBU DOING?

The EBU provides a unique forum for the exchange of knowledge and opinions about beyond HDTV systems. Under its Strategic Programme on Future Television and Production Formats (FTV), there is a dedicated project group, BeyondHD, looking at all of these issues.

An appraisal of 3DTV for broadcast management (EBU Tech Report 010) was published and the EBU contributed to the standardization of the exchange formats for 3DTV within the ITU during 2012.

In order to make accurate appraisals of the alternative options beyond HDTV, scientifically based assessments are needed of the viewing experience. A principal factor here is the perceived image quality. To make the evaluations, known test sequences are needed which will exercise the capabilities of the systems. The EBU has recently prepared tests sequences for evaluating UHDTV Level 1 and at least service compatible 3DTV.

New EBU test sequences for assessing future television formats were shot at RAI Production Centre in Turin, June 2012.

In 2012, the EBU also published a status report (EBU Tech Report 014) on 1080p/50 and 4k addressed to senior management. The report describes key features to consider when selecting between 4k or 1080p/50 as future production formats.

FIND OUT MORE

EBU Future Television and Production Formats group	tech.ebu.ch/groups/ftv
EBU Technical Reports	tech.ebu.ch/publications