



Recommendation ITU-R BT.2050-0
(02/2014)

**Use of ultra-high definition television
image systems for capturing, editing,
finishing and archiving high-quality
HDTV programmes**

BT Series
Broadcasting service
(television)

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

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Series of ITU-R Recommendations

(Also available online at <http://www.itu.int/publ/R-REC/en>)

Series	Title
BO	Satellite delivery
BR	Recording for production, archival and play-out; film for television
BS	Broadcasting service (sound)
BT	Broadcasting service (television)
F	Fixed service
M	Mobile, radiodetermination, amateur and related satellite services
P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R BT.2050-0

Use of ultra-high definition television¹ image systems for capturing, editing, finishing and archiving high-quality HDTV programmes

(2014)

Scope

This Recommendation addresses the use of ultra-high definition television (UHDTV) image systems described in Recommendation ITU-R BT.2020 to capture, post produce and archive programmes in the highest quality for HDTV delivery.

The UHDTV image systems specified in Recommendation ITU-R BT.2020 offer excellent picture quality, which provides improved headroom, throughout the production/post-production chain, for their release in HDTV (Recommendation ITU-R BT.709). Furthermore, television programmes so produced, if archived at their native UHDTV picture quality, stand a better chance of being further usable for release in those future media that may accommodate a very high picture quality.

The ITU Radiocommunication Assembly,

considering

- a) that Recommendation ITU-R BT.2020 – Parameter values for ultra-high definition television systems for production and international programme exchange, specifies the parameter values for the ultra-high definition television (UHDTV) image systems, which provide an improvement in the spatial and temporal resolution of the image, as well as in the image colour gamut and in the number of bits/sample of the digital video signal²;
- b) that Recommendation ITU-R BT.1662 – General reference chain and management of post-processing headroom for programme essence in large screen digital imagery applications, underlines how the quality of television images is adversely affected by their passage through a long chain of video codecs, or through a complex post-production treatment;

¹ Recommendation ITU-R BT.2020 defines both a $3\,840 \times 2\,160$ and a $7\,680 \times 4\,320$ system for UHDTV which primarily will find their main applications for the delivery of television programming to the home where they will provide viewers with an increased sense of “being there” and increased sense of reality by using large screen displays.

Presentation on tablet displays with extremely high resolution will also be attractive for viewers.

The $7\,680 \times 4\,320$ system will provide a more enhanced visual experience than the $3\,840 \times 2\,160$ system for a wider range of viewing environments.

Also see Report ITU-R BT.2246.

² UHDTV provides:

- increased spatial resolution over HDTV in both the vertical and horizontal directions, thus allowing image cropping and reframing down to HDTV resolution;
- a picture rate of up to 120 Hz, thus allowing picture rate conversion and slow motion down to the HDTV 50 and 60 Hz HDTV picture rates;
- with its colour system defined by pure RGB primaries, a wider colour gamut than HDTV;
- an image signal quantization of 10 or 12 bits/sample as compared to the 8 or 10 bits/sample currently specified for HDTV in Recommendation ITU-R BT.709, thus allowing extensive manipulation of the image appearance through modifications of the slope, the toe and the knee of the image signal transfer curve.

c) that Recommendation ITU-R BR.785 – The release of programmes in a multiple release media environment, recommends that, in the production of programmes, the programme quality should be commensurate with the quality capability of the most demanding release medium envisaged for the programme;

d) that some television broadcasters and programme makers around the world have started to implement new programme production and post-production processes, for those HDTV programmes that require complex image post-production, that is based on the use of UHDTV cameras for image capture, because programme material so captured offers adequate picture quality headroom to be post-produced, as necessary, through very demanding image manipulation processes, and the images of the finished programme master, when tailored for HDTV release, may still attain a picture quality that surpasses that of native HDTV;

e) that, although archiving UHDTV programmes requires a larger storage capacity than archiving HDTV programmes, this should be balanced against the consideration that television programmes produced as described in *considering* d) above, if archived in their native UHDTV image systems, stand a better chance of re-release in future media designed to provide a higher picture quality than HDTV;

f) that several production and post-production tools that enable production and post-production television programmes in UHDTV are becoming available,

recommends

1 that broadcasters and programme makers should wherever possible use the UHDTV image systems described in Recommendation ITU-R BT.2020 to capture those HDTV programmes that require complex image post-production, thus obtaining a UHDTV programme master that can be down-converted³ to HDTV;

2 that broadcasters and programme makers should wherever possible exchange programmes in the full quality UHDTV form whenever it is expected that further complex HDTV image post-processing will be required at the receiving end;

3 that programmes so produced in UHDTV for HDTV should wherever possible be archived in their original form, thus allowing their future re-release on any new television release medium that may require a picture quality up to that of UHDTV;

4 that the system parameter values of the UHDTV systems should be selected depending on the required quality headroom and technology availability;

5 that care should be taken in the down-conversion so that the final quality is maximized;

6 that the following Notes are considered as part of the Recommendation.

NOTE 1 – To facilitate the exchange of the programmes in the formats given in Recommendation ITU-R BT.2020, further studies are required to develop the necessary/appropriate interfaces.

NOTE 2 – Manufacturers of professional equipment for television programme production should continue to develop a complete inventory of production and post-production tools for broadcast use, in order to respond to the requirements identified by television broadcasters and programme makers as implied in this Recommendation. (See also Opinion ITU-R [Doc. 6/165]).

³ “Down-convert” means to convert from the higher system parameter values to those of the lower system.