

International Telecommunication Union

ITU-R
Radiocommunication Sector of ITU

Recommendation ITU-R BT.2038
(07/2013)

**Transport of HDTV 3DTV programmes
for international programme
exchange in broadcasting**

BT Series
Broadcasting service
(television)



Foreword

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Series of ITU-R Recommendations

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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.

Electronic Publication
Geneva, 2013

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RECOMMENDATION ITU-R BT.2038

Transport of HDTV 3DTV programmes for international programme exchange in broadcasting¹

(2013)

Scope

This Recommendation specifies the preferred method for transporting HDTV-based 3DTV programmes using bit rate reduction for various purposes related to international programme exchange.

The ITU Radiocommunication Assembly,

considering

- a) that Recommendation ITU-R BT.2024 specifies the HDTV image systems to be used for the production and international exchange of 3DTV television programmes for broadcasting; and it recommends that the Le and Re images² of a 3DTV image pair should be internationally exchanged as two full-resolution $1\,920 \times 1\,080$ images having the same pixel structure and picture repetition rate;
- b) that Recommendation ITU-R BT.2027 specifies the HDTV serial digital interface to be used for the transport of uncompressed HDTV-based 3DTV television programmes in production and international exchange;
- c) that Recommendation ITU-R BT.1662 provides guidelines on the management of television image quality post-processing headroom along a generic television chain (from image acquisition to image presentation);
- d) that Report ITU-R BT.2069-4 indicates the data rate normally required to source-code monoscopic television programmes for purposes of contribution (which includes international exchange), primary distribution and SNG network for broadcasting, using the source-coding method specified in Recommendation ITU-T H.264 (MPEG-4 AVC);
- e) that Recommendation ITU-T H.264 provides specifications for source-coding of 3DTV signals, offering improved efficiency by exploiting the redundancy between the left-eye (Le) and the right-eye (Re) signals;
- f) that there will be benefits in terms of programme image quality, if 3DTV television programme material will be internationally exchanged in transparent source-coded form³ in those cases whenever the programme material may need to undergo significant⁴ image post production at the receiving end, before it is broadcast;

¹ In the context of this Recommendation, the term 3DTV is used to convey a stereoscopic image or image pair.

² Le and Re are abbreviations for Left eye, and Right eye, respectively.

³ The ITU-R Terminology database defines “transparent bit-rate reduction” as “a bit-rate reduction process that does not affect the subjective quality of sound or picture sequences”. In this document, the term subjective quality includes all the attributes of a stereoscopic image including its ability to reproduce transparently the depth information of the original scene.

⁴ “Significant post production” would be described as a signal post processing such as colour correction or image rescaling or post production through devices using more than one intermediate bit rate reduction process.

g) that, in those cases when the programme material may require no or only a modest⁵ amount of image post production at the receiving end before it is broadcast, there will be benefits in terms of the required data rate, if 3DTV television programmes will be internationally exchanged in source-coded form at the quality level typical of contributions⁶;

h) that, in those cases when considerations of data rate override considerations of picture quality, as it may be the case of an ENG or SNG contribution to a news programme, some compromises in picture quality may need to be accepted in the international program exchange in order to reduce the data rate required to deliver such a contribution,

recommends

1 that, when it is necessary to transport HDTV-based 3DTV programme material in a virtually transparent or quasi-transparent form using a reduced bit rate, the $1\,920 \times 1\,080$ signals of Recommendation ITU-R BT.2024 should be source-coded as specified in Recommendation ITU-T H.264 (MPEG-4 AVC), at least until more efficient source coding methods will be widely introduced in broadcasting operations;

2 that,

- the source-coding method should meet, but preferably exceed, the indications contained in Report ITU R BT.2069-4 for virtually transparent, or quasi-transparent MPEG-4 AVC source-coding of monoscopic television programmes (see Notes 1 and 2);
- the source-coding separately applied to both Le and Re image signals should not introduce perceived picture quality difference between the two images;
- following source-coding, the Le and Re image signals may be transported in a Multi-Programme Transport Stream (MPTS), or they may be transported in two separate transport streams;
- the relative timing between Le and Re signals should be maintained after encoding, transporting and decoding;

3 that, in those cases of international programme exchange when it is necessary to use the lowest possible data rate, as it may be the case of an ENG or SNG for a broadcast news programme:

- the appropriate source-coding method specified in Recommendation ITU-T H.264 (MPEG-4 AVC) for 3DTV applications should be used, that offers the highest-efficiency source-coding of the Le and Re image signals, while preserving a picture quality adequate for programme distribution⁷ by exploiting the redundancy between the two signals;
- the relative timing between Le and Re signals should be maintained after encoding, transporting and decoding;

NOTE 1 – Informative Annex 1 provides a general estimation of the minimum bit rate typically to be expected from source-coding 3DTV programmes for purposes of international programme exchange, for the applications described above.

⁵ “Modest post production” would be described as signal post processing limited to cuts or re-ordering or processing requiring no further or intermediate bit rate reduction.

⁶ The ITU-R Terminology database defines “contribution” as “the use of a broadband service or channel for transferring audio or video information to a user for further post-production processing and subsequent distribution”.

⁷ Recommendation ITU-R BT.1687 defines the term “distribution” as “the carriage of television programs for which no further post-production processing is expected”.

NOTE 2 – It is likely that the source-coding method specified in Recommendation ITU-T H.262 (MPEG-2) will not be widely used to source-encode 3DTV programme material for international programme exchange, for reasons of data-rate economy.

Annex 1 (Informative)

Estimation of the data rate required when source-coding 3DTV television broadcasting programmes in virtually transparent and quasi-transparent form for international programme exchange

The table in this informative Annex provides an approximate estimate of the bit rate that would typically be required when source-coding 3DTV programmes in virtually transparent and quasi-transparent form for international exchange, when the left-eye (Le) and the right-eye (Re) images of the 3DTV programme are separately source-coded.

The table does not take into account the option to exploit the redundancy between the Le and the Re image signals, since that option should preferably only be used for distribution purposes and for the transport of ENG/SNG signals.

3DTV image system	Bit rate reduction	Level	Profile	Estimation of required bit rate (Mbit/s) for each image signal
1 920×1 080/60/50/I	H.264/AVC	4	High 4:2:2	35 or greater where no or modest post production processing is required or 60 or greater where complex post production processing is required
1 920×1 080/24/25/30/P	H.264/AVC	4	High	35 or greater no or modest post production processing is required or 60 or greater where complex post production processing is required
1 920×1 080/60/50/P	H.264/AVC	4.2	High	50 or greater where no or modest post production processing is required or 90 or greater where complex post production processing is required or both