International Telecommunication Union

ITU-R

Radiocommunication Sector of ITU

Recommendation ITU-R BT.1122-3
(01/2019)

User requirements for codecs for emission and secondary distribution systems for SDTV, HDTV, UHDTV and HDR-TV

BT Series

Broadcasting service (television)

Foreword

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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.*

Electronic Publication
Geneva, 2020

RECOMMENDATION ITU-R BT.1122-3[1]*

User requirements for codecs for emission and secondary distribution systems for SDTV, HDTV, UHDTV and HDR-TV

(1994-1995-2011-2019)

Scope

This Recommendation defines user requirements for codecs that should be applied for the specifications, design and testing of systems for the secondary distribution and emission of SDTV, HDTV, UHDTV and HDR-TV signals.

The ITU Radiocommunication Assembly,

considering

a) that Recommendations ITU-R BT.601, ITU-R BT.709, ITU-R BT.2020 and ITU-R BT.2100 define the parameters of video signals for SDTV, HDTV, UHDTV and HDR-TV, respectively;

b) that Recommendations ITU-R BS.775 and ITU-R BS.2051 define channel configurations for audio signals;

c) that these video and audio signals are transmitted through digital secondary distribution networks or emission systems (terrestrial, satellite, cable, etc.);

d) that bit rate reduction coding is used to enable such transmission;

e) that general advice on methods of assessment for video signals is contained within ITU-R texts, and that, in particular, subjective evaluation methods are defined in Recommendation ITU-R BT.500;

f) that general advice on methods of assessment for audio signals is contained within ITU-R texts, and that in particular, subjective evaluation methods are defined in Recommendations ITU-R BS.1116, ITU-R BS.1284 and ITU-R BS.1534;

g) that such assessment will need to take account of basic picture quality and the failure characteristic in the presence of errors on the transmission and emission link;

h) that both the design of codecs and their assessment will need to take account of user requirements;

i) that in order to be complete, the user requirements should specify the test procedures and test material that should be used to check that the requirements are being met,

noting

a) that Recommendation ITU-R BS.1548 specifies the requirements for audio source coding systems used for sound and television broadcasting;

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[1] This Recommendation should be brought to the attention of Telecommunication Standardization Study Group 9.

* Radiocommunication Study Group 6 made editorial amendments to this Recommendation in February 2020 in accordance with Resolution ITU-R 1.

b) that Recommendation ITU-R BT.1203 provides user requirements for video bit-rate reduction coding of digital TV signals for an end-to-end television system;

c) that Recommendation ITU-R BT.1868 describes user requirements for codecs for contribution, primary distribution and SNG networks,

recommends

that the following user requirements for codecs should be applied for the specifications, design and testing of systems for the secondary distribution and emission of SDTV, HDTV, UHDTV and HDR-TV signals.

TABLE 1

User requirements for secondary distribution and emission codecs

Item		Specification
Input video signal format at the digital interface		As per Rec. ITU-R BT.601 for SDTV As per Rec. ITU-R BT.709 for HDTV As per Rec. ITU-R BT.2020 for UHDTV As per Rec. ITU-R BT.2100 for HDR-TV
Video signal format represented by the bitstream		Sampling: 4:2:2 or 4:2:0 (Y', C'_B, C'_R), Non-Constant Luminance format 8 or 10 bits per sample for each component for SDTV and HDTV 10 or 12 bits per sample for each component for UHDTV and HDR-TV
Input audio signal format at the digital interface		Sampling: 48 kHz 16 bits or more As per Rec. ITU-R BS.646
Audio signal format represented by the bitstream		Quantization, sampling frequency, and bandwidth as per Rec. ITU-R BS.1548 Annex 2
Number of audio channels(1)		Six channels for a main audio service (typical, including LFE) as per Rec. ITU-R BS.775 Up to 24 channels for a main audio service (typical, including LFE) as per Rec. ITU-R BS.2051 Additional channels for a multilingual service and audio services for the hearing and visually impaired may be provided
Maximum relative audio/video delay		±2 ms per codec
Basic picture quality (in error-free condition)(2)	Single codec	Quality difference: ≤ 12% with DSCQS method using at least four sequences taken from Rec. ITU-R BT.1210, at least half of which should be high-activity sequences. The given quality grade should be met using at least 75% of the sequences chosen; the rest must achieve ≤ 30%.
	Codecs in cascade	Cascade of one contribution codec, one primary distribution codec and one secondary distribution codec.
		Quality difference: ≤ 18% with DSCQS method using at least four sequences taken from Rec. ITU-R BT.1210, at least half of which should be high-activity sequences. The given quality grade should be met using at least 75% of the sequences chosen; the rest must achieve ≤ 36%.
Basic audio quality		See Rec. ITU-R BS.1548, Annex 2
Failure characteristics/error performance		Quasi-error-free at decoder input for normal condition Error-concealment functionality is desirable for decoders

TABLE 1 (*end*)

Item	Specification
Vision/audio failure characteristics	Vision failure first
Recovery time	500 ms after a break of 50 ms
Change in overall delay after signal interruption/major disturbance	Less than 20 μs
Auxiliary signal	Auxiliary signals may be provided for data services and access control.

DSCQS: double stimulus continuous quality scale.

(1) The number of audio channels may be determined on the basis of intended broadcast service.

(2) Subjective assessment of picture quality should be carried out in accordance with Recommendation ITU-R BT.500. The quality of picture is considered virtually transparent if the performance of a codec or a transmission chain is such that the picture quality loss is hardly visible (virtual transparency).