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SMPTE RECOMMENDED PRACTICE

MPEG-2 Operating Ranges



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1 Scope

This practice specifies the structure and parameters of the data for interfacing MPEG-2 4:2:2 profile and digital audio in the professional environment.

The purpose of this practice is to facilitate video and audio bitstream interchange between MPEG-2 compliant equipment.

An overview of associated documents is given in annex C.

The combination of this document and those referenced in annex C will assist design and application of MPEG-2-based professional television equipment that facilitates bitstream interchange among different applications and over a wide set of user requirements.

This practice is limited to the video and audio parameters of such a system.

This practice defines the MPEG-2 operating ranges. These ranges constrain characteristics of the MPEG-2 4:2:2 profile to ensure bitstream interchange in the professional environment. These operating ranges are subsets of ISO/MPEG profiles and levels. This practice defines two operating ranges for standard-definition television and three operating ranges for

high-definition television. It also defines a hierarchical relationship among the ranges.

All the MPEG-2 data structures defined in this practice are ISO/IEC 13818-2 4:2:2 profile compliant and as such are decodable by MPEG-2 4:2:2 profile compliant stand-alone decoders at the appropriate level. Inasmuch as the 4:2:2 profile also requires stand-alone decoders to decode main profile structures (4:2:0), existing main profile sources can be accommodated.

2 Normative references

The following standards contain provisions, which, through reference in this text, constitute provisions of this practice. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this practice are encouraged to investigate the possibility of applying the most recent edition of the standards indicated below.

AES3-1992, Digital Audio Engineering — Serial Transmission Format for Two-Channel Linearly Represented Digital Audio Data

ANSI/SMPTE 293M-1996, Television — 720 x 483 Active Line at 59.94-Hz Progressive Scan Production — Digital Representation

SMPTE 274M-1998, Television — 1920 x 1080 Scanning and Analog and Parallel Digital Interfaces for Multiple Picture Rates

SMPTE 296M-2001, Television — 1280 x 720 Progressive Image Sample Structure — Analog and Digital Representation and Analog Interface

SMPTE 302M-1998, Television — Mapping of AES3 Data into MPEG-2 Transport Stream

SMPTE 308M-1998, Television — MPEG-2 4:2:2 Profile at High Level

SMPTE 327M-2000, Television — MPEG-2 Video Recoding Data Set

SMPTE 328M-2000, Television — MPEG-2 Video Elementary Stream Editing Information

SMPTE RP 202-2000, Video Alignment for MPEG-2 Coding

ISO/IEC 13818-2:2000, Information Technology — Generic Coding of Moving Pictures and Associated Audio Information: Video

ITU-R BT.601-5 (10/95), Studio Encoding Parameters of Digital Television for Standard 4:3 and Wide-Screen 16:9 Aspect Ratios

ITU-R BT.709-4 (09/00), Parameter Values for the HDTV Standards for Production and International Programme Exchange

ITU-R BT.1358 (02/98), Studio Parameters of 625 and 525 Line Progressive Scan Television Systems

3 Application

The flexibility of MPEG-2 compression allows MPEG-2-based equipment to meet the diverse operational requirements of a broad range of professional television applications. Although some applications might be served by choosing a specific operating point, different users have different constraints and objectives, and may choose different specific operating parameters.

Cognizant of these considerations, this practice specifies the following:

- Operating ranges including constrained bit rates and group-of-pictures (GoP) structures;
- Operating ranges created for random access and editing capability;
- Spatial alignment of coded images;
- Use of 48-kHz sampled digital audio.

This practice, in conjunction with documents specified in annex C, describe parameter choices available in MPEG-2 and the factors to be taken into account when

defining an MPEG-2-based system. Specific operating parameter choices will depend on the individual application requirements, including editing capability, storage capacity, contribution feeds, and distribution/emission bandwidth.

In making this selection for a given application environment, it is further recognized that tradeoffs among many different parameters must be considered. Such considerations include the bitstream overhead imposed by various operating range constraints, the required degree of bitstream interoperability among various types of broadcast equipment, and overall system complexity.

Additional information about system interoperability is given in annex B.

For audio, no single worldwide compressed standard has been adopted; various transmission systems are in use depending upon geographic area. Global audio interchange can, therefore, only be achieved by specifying a noncompressed audio format.

4 MPEG-2 video parameters

4.1 Operating ranges

Within professional applications of MPEG-2, including the HDTV extensions to MPEG-2 as defined by SMPTE 308M, five operating ranges are defined in this clause as shown in figure 1. Separate long- and short-GoP ranges are defined for both main level and high level systems. Additional operating ranges may be added as required to meet future HDTV requirements.

Operating ranges 1 and 2 cover the MPEG-2 4:2:2P@ML options including the standard 525-line and 625-line SDTV formats.

Operating ranges 3 and 4 cover the MPEG-2 4:2:2@HL including:

- 480-line progressive scan
- 576-line progressive scan
- 720-line progressive scan
- 1080-line interlaced scan
- 1080-line progressive scan (up to 30-Hz frame rate)

Net bit rates specified for each operating range are maximum video bit rates and shall include all data that are included in video buffer verifier (VBV) calculation.