ATSC Standard: A/335:2016 Amendment No. 1, Additional Video Resolutions

Doc. A/335:2016 Amendment No. 1
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Advanced Television Systems Committee
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Revision History

Version	Date
Amendment approved	9 December 2019

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1. OVERVIEW

1.1 Definition

An Amendment is generated to document an enhancement, an addition or a deletion of functionality to previously agreed technical provisions in an existing ATSC document. Amendments shall be published as attachments to the original ATSC document. Distribution by ATSC of existing documents shall include any approved Amendments.

1.2 Scope

This document describes how video watermarking can be supported for video encodings whose horizontal resolution is not evenly divisible by the number of encoded symbols per video frame (240). The specified approach employs "fractional pixels" in a manner that ensures that the video watermark signaling maintains a consistent position within the video frame independent of video resolution and facilitates recovery in the event of video resolution conversion.

1.3 Rationale for Changes

The A/335:2016 specification includes video watermark specifications only for those video encodings having horizontal resolutions that are evenly divisible by the number of encoded symbols per video frame. No specification of the video watermark is provided for other video resolutions. An example of an unsupported video resolution is of 1280x720, which, when divided in the horizontal dimension by the number of symbols (240), results in 5⅓ pixels per symbol. Thus, for an ATSC 3.0 transmission that uses 1280x720 video resolution, use of the video watermark is unsupported.

1.4 Compatibility Considerations

The changes described in this document are backward-compatible relative to the currently published version of the standard to which this Amendment pertains and any previously approved Amendments for that standard because the previous version of the specification did not support encoding of video watermarks in video resolutions addressed by the amendment. Implementations built to the A/335:2016 specification will not encode or recover watermarks in video with previously-unsupported resolutions.

2. LIST OF CHANGES

Change instructions are given below in *italics*. Unless otherwise noted, inserted text, tables, and drawings are shown in blue; deletions of existing text are shown in ~~red strikeout~~. The text "[ref]" indicates that a cross reference to a cited referenced document should be inserted.

2.1 Normative References

No changes.

2.2 Informative References

No changes.

2.3 Acronyms and Abbreviations

No changes.

2.4 Terms

No changes.

2.5 Change Instructions

In Section 5.2, *change the wording of the first paragraph as follows*:

For the 1X system, two-level encoding is used so that each symbol represents one bit of payload data, while for the 2X system, four-level encoding is used and each symbol represents two bits of data. For both the 1X and 2X systems, 240 symbols shall be encoded across~~within~~ the full extent of the video line, regardless of the horizontal resolution of the video. Thus, for HD encodings of 1920 pixels horizontally, 8 pixels will convey the information of one symbol. For HD encodings of 1440 pixels, 6 pixels will encode one symbol. All symbols within a line shall be encoded across the same number of pixels. Table 5.1 summarizes the number of pixels per symbol for typical horizontal resolutions.

After Table 5.1**,** *insert the following text and diagram*:

When the number of pixels of a video line divided by 240 does not result in an integer value (e.g., for video resolutions of 1280x720 or 2560x1440), the luma value of the pixel shared by two adjacent symbols shall be set to the weighted sum of the luma encoding values of the adjacent symbols, in proportion to the fractional spatial contribution of the symbol.

For example, for encodings of 1280 pixels, 5⅓ pixels will encode one symbol. Figure [X.Y] illustrates the mapping of symbols to pixels and the resulting luma values for 32 pixels in the payload of a 1280-pixel-wide video frame, using 1X and modulation level 40 for symbol value '1'. In this example, the luma values for each pixel (abbreviated as "px" below) shared by two symbols are:

- px *i*+5: (⅓ * 40) + (⅔ * 40) = 40
- px *i*+10: (⅔ * 40) + (⅓ * 4) = 28
- px *i*+21: (⅓ * 40) + (⅔ * 4) = 16
- px *i*+26: (⅔ * 4) + (⅓ * 4) = 4

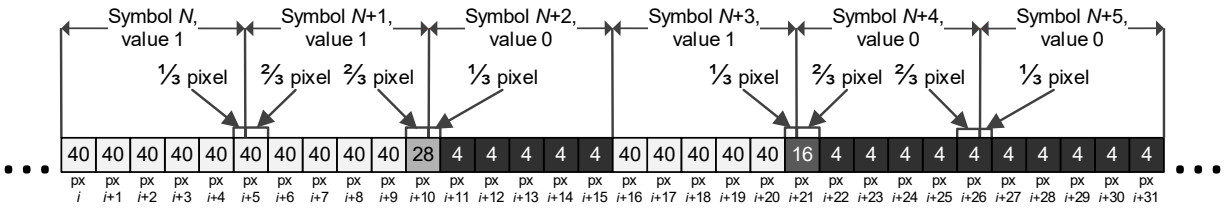

Figure [X.Y] Luma value calculation example.

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