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**Information technology — MPEG systems technologies — Part 10: Carriage of timed metadata metrics of media in ISO base media file format — Amendment 2: Support for attenuation maps**

WD stage

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Information technology — MPEG systems technologies — Part 10: Carriage of timed metadata metrics of media in ISO base media file format — Amendment 2: Support for attenuation maps

*Clause 5*

Add the following subclauses at the end of the clause:

* 1. ***Display Attenuation Map Metadata***

A display attenuation map video is a 2D video where each frame conveys pixel-wise information that can be applied to a corresponding frame in the original video sequence through a processing operation to reduce the total energy consumption resulting from rendering the frames of that video.

* + 1. ***Attenuation Map Information Box***

An AttenuationMapInformationBox contains information about the characteristics of the display attenuation map data stream carried by the track in which it is signalled. It is identified by the 4CC ‘amid’. The information in the payload of the track may include pre-processing operations that should be applied to the samples of the attenuation map sample as well as other information that may distinguish one display attenuation map track from another for the same content, which enables a player to select the most suitable track based on its energy reduction strategy.

* + - 1. ***Syntax***

aligned(8) class AMIApproximationModel() {

bit(4) reserved = 0;

unsigned int(4) ami\_map\_approx\_model;

}

aligned(8) class AMIWindowInfo() {

unsigned int(8) ami\_window\_x;

unsigned int(8) ami\_window\_y;

unsigned int(8) ami\_window\_width;

unsigned int(8) ami\_window\_height;

}

aligned(8) class AMIVideoQualityInfo() {

bit(5) reserved = 0;

unsigned int(3) ami\_quality\_metric;

unsigned int(8) ami\_quality\_reduction;

}

aligned(8) class AMIPreprocessingInfo() {

bit(6) reserved = 0;

unsigned int(2) ami\_preprocessing\_type;

unsigned int(8) ami\_max\_value;

unsigned int(8) ami\_preprocessing\_scale;

}

aligned(8) class AttenuationMapInformationBox() extends FullBox('amid', version = 0, flags) {

bit(3) reserved = 0;

unsigned int(1) ami\_preprocessing\_info\_present\_flag;

unsigned int(1) ami\_approx\_model\_present\_flag;

unsigned int(1) ami\_window\_info\_present\_flag;

unsigned int(1) ami\_video\_quality\_info\_present\_flag;

unsigned int(5) ami\_energy\_reduction\_rate;

unsigned int(4) ami\_display\_model;

unsigned int(4) ami\_attenuation\_use\_idc;

unsigned int(4) ami\_attenuation\_component\_idc;

if (ami\_preprocessing\_info\_present) {

AMIPreprocessingInfo();

}

if (ami\_approx\_model\_present\_flag) {

AMIApproximationModel();

}

if (ami\_window\_info\_present\_flag) {

AMIWindowInfo();

}

if (ami\_video\_quality\_info\_present\_flag) {

AMIVideoQualityInfo();

}

}

* + - 1. ***Semantics***

The semantics of the fields defined in AttenuationMapInformationBox are as follows:

ami\_processing\_info\_present\_flag is a flag indicating whether preprocessing information is present. Value 1 indicates that the box contains preprocessing information.

ami\_approx\_model\_present\_flag is a flag indicating whether approximation model information is present. Value 1 indicates that the box contains approximation model information.

ami\_window\_info\_present\_flag is a flag indicating whether window information is present. Value 1 indicates that the box contains window information.

ami\_video\_quality\_info\_present\_flag is a flag indicating whether video quality information is present. Value 1 indicates that the box contains video quality information.

ami\_energy\_reduction\_rate indicates the expected energy saving rate (percentage) when the video is displayed after applying the attenuation map sample values on the sample values of the associated video.

ami\_display\_model indicates the display models on which the attenuation map sample values may be used. The semantics of the bits of this field are as described in the following table (Table 1).

**Table 1 Semantics of the bits of the ami\_display\_model field**

|  |  |
| --- | --- |
| **Bit number** | **Display Model** |
| 0 | Transmissive pixel |
| 1 | Emissive pixel |
| 2 .. 3 | Reserved for future use |

ami\_attenuation\_use\_idc indicates which operation should be used to apply the attenuation map sample values to the corresponding frame in the associated video before rendering the frame on the display. The semantics of the values assigned to this field are as follows (summarized in Table xx for completeness):

* Value 0 indicates that the attenuation map sample values should be added to the video frame.
* Value 1 indicates that the attenuation map sample values should be subtracted from the video frame.
* Value 2 indicates that the attenuation map sample values should be multiplied by the video frame.
* Value 3 indicates that the attenuation map sample values should be applied to the video frame according to a proprietary used-defined process.

ami\_attenuation\_component\_idc indicates on which color component(s) of the associated video to apply the attenuation map using the operation defined by ami\_attenuation\_use\_idc. It also specifies how many components the attenuation map has. The semantics of the values assigned to this field are as follows (summarized in Table 2 for completeness):

* Value 0 indicates that the attenuation map contains only one component, and that this component should be applied to the luma component of media video.
* Value 1 indicates that the attenuation map contains two components, and that the first component should be applied to the luma component of the media video, and the second component should be applied to both chroma components of the media video.
* Value 2 indicates that the attenuation map contains only one component, and that this component should be applied to the luma component and the chroma components of the media video.
* Value 3 indicates that the attenuation map contains only one component, and that this component should be applied to the RGB components (after YUV to RGB conversion) of the media video.
* Value 4 indicates that the attenuation map contains three components and that these components should be applied respectively to the luma and chroma components of the media video.
* Value 5 indicates that the attenuation map contains three components and that these components should be applied, respectively, to the RGB components (after YUV to RGB conversion) of the media video.
* Value 6 indicates that the mapping between the components of the attenuation map and the components of which to apply the attenuation map on the media video corresponds to some proprietary user-defined process.

**Table 2 Semantics of the values assigned to ami\_attenuation\_component\_idc**

|  |  |
| --- | --- |
| **Value** | **Description** |
| 0 | Attenuation map contains only one component, and this component should be applied to the luma component of media video. |
| 1 | Attenuation map contains two components, and the first component should be applied to the luma component of the media video, and the second component should be applied to both chroma components of the media video. |
| 2 | Attenuation map contains only one component, and this component should be applied to the luma component and the chroma components of the media video. |
| 3 | Attenuation map contains only one component, and this component should be applied to the RGB components (after YUV to RGB conversion) of the media video. |
| 4 | Attenuation map contains three components and these components should be applied respectively to the luma and chroma components of the media video. |
| 5 | Attenuation map contains three components and these components should be applied, respectively, to the RGB components (after YUV to RGB conversion) of the media video. |
| 6 | User-defined |
| 7 .. 15 | Reserved for future use |

ami\_preprocessing\_type indicates which type of pre-processing interpolation model should be used to re-sample the attenuation map sample values at the same resolution as the associated video before applying it to the associated video frame.

* Value 0 specifies an interpolation of type bicubic.
* Value 1 specifies an interpolation of type bilinear.
* Value 2 specifies an interpolation of type Lanczos.
* Value 3 specifies that a proprietary user-defined process is used.

ami\_max\_value indicates the maximum value of the attenuation map. This value can be optionally used to further adjust the dynamic range of the encoded attenuation map in the scaling process.

ami\_preprocessing\_scale indicates which scaling should be applied to obtain the attenuation map sample values before applying them on the sample values of the associated video.

* Value 0 specifies that a scaling of 1/255 should be applied.
* Value 1 specifies that a proprietary user-defined scaling operation is applied.

ami\_map\_approx\_model specifies the model used to extrapolate the attenuation map with individual energy reduction rate to another set of attenuation map with a different energy reduction rate. The semantics of the values assigned to this field are as follows:

* Value 0 specifies a linear scaling of the attenuation map sample values given its ami\_energy\_reduction\_rate value.
* Value 1-3 are reserved for future use
* Value 4 specifies that a proprietary user-defined process is used to perform the approximation and infer the attenuation map sample values for different energy reduction rates.

ami\_window\_x indicates the x-coordinate of the top-left corner of the bounding window defining a region of the associated media video to apply the attenuation map carried by the display attenuation map track to.

ami\_window\_y indicates the y-coordinate of the top-left corner of the bounding window defining a region of the associated media video to apply the attenuation map carried by the display attenuation map track to.

ami\_window\_width indicates the width, in number of pixels, of the bounding window defining a region of the associated media video to apply the attenuation map carried by the display attenuation map track to.

ami\_window\_height indicates the height, in number of pixels, of the bounding window defining a region of the associated media video to apply the attenuation map carried by the display attenuation map track to.

ami\_quality\_metric indicates the type of the objective quality metric used for the measured quality reduction value resulting from applying the attenuation map to the video content and assigned to the ami\_quality\_reduction field. The semantics of the values assigned to this field are as follows (Table 3).

**Table 3 Semantics of the values assigned to ami\_quality\_metric**

|  |  |
| --- | --- |
| **Value** | **Quality Metric** |
| 0 | PSNR |
| 1 | SSIM |
| 2 | wPSNR |
| 3 | WS-PSNR |
| 4 | User-defined |

ami\_quality\_reduction specifies the percentage of quality reduction in the media video as a result of applying the attenuation map to it.

* + 1. ***Display attenuation map tracks***

A display attenuation map track is a restricted video track with the sample entry type ‘resv’. The original sample entry type, which is based on the video codec used for encoding the stream, is stored within the OriginalFormatBox in the RestrictedSchemeInfoBox. The scheme\_type field in SchemeTypeBox shall be set to 'gmat', indicating an *attenuation map restricted scheme*. The SchemeInformationBox shall include an AttenuationMapInformationBox, as defined in the previous section. In the track header, the track\_in\_movie flag shall be set to 0 to indicate that this track should not be presented alone.

* + - 1. ***Association with Video Tracks***

A TrackReferenceTypeBox with the reference type 'gmam' shall be added to a TrackReferenceBox within the TrackBox of the track carrying the attenuation map data. The TrackReferenceTypeBox shall contain an array of track\_IDs designating the identifiers for the referenced video tracks.

* + - 1. ***Sample Format***

Each sample in an attenuation map track carries a sequence of video NAL units corresponding to the encoded attenuation map for a single access unit (AU) in the associated video track(s) and are encapsulated based on the sample formats defined in ISO/IEC 14496-15 ‎[3].

* + - 1. ***Signaling Alternative Attenuation Map Tracks***

Multiple display attenuation map tracks may be present in a ISOBMFF file. When more than one version of an attenuation map is available for the same video track in the ISOBMFF container (e.g., different energy consumption levels, different video qualities, etc.), each version is carried in a separate display attenuation map track.

Display attenuation map tracks that are alternatives of each other shall be signalled as alternatives of each other by either setting the alternate\_group field in their respective TrackHeaderBox(es) to the same value or grouping the tracks together with an EntityToGroupBox with grouping\_type equal to 'altr', indicating that the attenuation map tracks which are mapped to this grouping are alternatives to each other, and only one of them should be processed.