DICOM Correction Proposal

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Person Assigned	David Clunie <dclunie@dclunie.com>
Submitter Name	Kari Jyrkkälä <kari.jyrkkala@varian.com>
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Correction Number CP-2587
Log Summary: Monochrome MPEG2 Profile Clarification
Name of Standard PS3.5
Rationale for Correction: In chapter 8.2.5 MPEG2 Main Profile / Main Level Video Compression the standard contains the following sentence: *"Photometric Interpretation (0028,0004) shall be YBR_PARTIAL_420 in the case of multi-component data, and MONOCHROME2 in the case of single component data (even though the MPEG2 bit stream itself is always encoded as three components, one luminance and two chrominance)."* However, in the same chapter we have a summary: *"In summary:* • *Samples per Pixel (0028,0002) shall be 3* • *Photometric Interpretation (0028,0004) shall be YBR_PARTIAL_420* • *Bits Allocated (0028,0100) shall be 8* • *Bits Stored (0028,0101) shall be 8* • *High Bit (0028,0102) shall be 7* • *Pixel Representation (0028,0103) shall be 0* • *Planar Configuration (0028,0006) shall be 0"* In the summary the single component use case has been forgotten, and it needs to be added to summary.
Correction Wording:

Edit PS5, 8.2.5 MPEG2 Main Profile / Main Level Video Compression

8.2.5 MPEG2 Main Profile / Main Level Video Compression

DICOM provides a mechanism for supporting the use of MPEG2 Main Profile / Main Level Video Compression through the Encapsulated Format. Annex A defines Non-Fragmentable and Fragmentable Encapsulated Transfer Syntaxes that reference the MPEG2 Main Profile / Main Level Standard.

Note

MPEG2 compression is inherently lossy. The context where the usage of lossy compression of medical images is clinically acceptable is beyond the scope of the DICOM Standard. The policies associated with the selection of appropriate compression parameters (e.g., compression ratio) for MPEG2 Main Profile / Main Level are also beyond the scope of this Standard.

The use of the DICOM Encapsulated Format to support MPEG2 Main Profile / Main Level compressed Pixel Data requires that the Data Elements that are related to the Pixel Data encoding (e.g., Photometric Interpretation, Samples per Pixel, Planar Configuration, Bits Allocated, Bits Stored, High Bit, Pixel Representation, Rows, Columns, etc.) shall contain Values that are consistent with the characteristics of the compressed data stream, with some specific exceptions noted here. The Pixel Data characteristics included in the MPEG2 Main Profile / Main Level bit stream shall be used to decode the compressed data stream.

Note

These requirements are specified in terms of consistency with what is encapsulated, rather than in terms of the uncompressed Pixel Data from which the compressed data stream may have been derived.

When decompressing, should the characteristics explicitly specified in the compressed data stream be inconsistent with those specified in the DICOM Data Elements, those explicitly specified in the compressed data stream should be used to control the decompression. The DICOM Data Elements, if inconsistent, can be regarded as suggestions as to the form in which an uncompressed Data Set might be encoded, subject to the general and IOD-specific rules for uncompressed Photometric Interpretation and Planar Configuration, which may require that decompressed data be converted to one of the permitted forms.

The MPEG2 Main Profile / Main Level bit stream specifies whether or not a reversible or irreversible multi-component (color) transformation, if any, has been applied. If no multi-component transformation has been applied, then the components shall correspond to those specified by the DICOM Attribute Photometric Interpretation (0028,0004). MPEG2 Main Profile / Main Level applies an irreversible multi-component transformation, so DICOM Attribute Photometric Interpretation (0028,0004) shall be YBR_PARTIAL_420 in the case of multi-component data, and MONOCHROME2 in the case of single component data (even though the MPEG2 bit stream itself is always encoded as three components, one luminance and two chrominance).

Note

1. If MPEG2 Compressed Pixel Data is decompressed and re-encoded in Native (uncompressed) form, then the Data Elements that are related to the Pixel Data encoding are updated accordingly. If color components are converted from YBR_PARTIAL_420 to RGB during decompression and Native re-encoding, the Photometric Interpretation will be changed to RGB in the Data Set with the Native encoding.

2. MPEG2 proposes some video formats. Each of the standards specified is used in a different market, including: ITU-R BT.470-2 System M for SD NTSC and ITU-R BT.470-2 System B/G for SD PAL/SECAM. A PAL based system should therefore be based on ITU-BT.470 System B for each of Color Primaries, Transfer Characteristic (gamma) and matrix coefficients and should take a value of 5 as defined in [ISO/IEC 13818-2].

The Value of Planar Configuration (0028,0006) is irrelevant since the manner of encoding components is specified in the MPEG2 Main Profile / Main Level standard, hence it shall be set to 0.

In summary**, the DICOM Attributes shall have the following values**:

- ~~**Samples per Pixel (0028,0002) shall be 3**~~
- ~~**Photometric Interpretation (0028,0004) shall be YBR_PARTIAL_420**~~
- ~~**Bits Allocated (0028,0100) shall be 8**~~
- ~~**Bits Stored (0028,0101) shall be 8**~~
- ~~**High Bit (0028,0102) shall be 7**~~
- ~~**Pixel Representation (0028,0103) shall be 0**~~
- ~~**Planar Configuration (0028,0006) shall be 0**~~

Attribute	**Multi-component**	**Single component**
Samples per Pixel (0028,0002)	**3**	**1**
Photometric Interpretation (0028,0004)	**YBR_PARTIAL_420**	**MONOCHROME2**

Bits Allocated (0028,0100)	**8**	**8**
Bits Stored (0028,0101)	**8**	**8**
High Bit (0028,0102)	**7**	**7**
Pixel Representation (0028,0103)	**0**	**0**
Planar Configuration (0028,0006)	**0**	**Absent**

- Rows (0028,0010), Columns (0028,0011), Cine Rate (0018,0040) and Frame Time (0018,1063) or Frame Time Vector (0018,1065) shall be consistent with the limitations of Main Profile / Main Level, as specified in Table 8-1.