Standard of Camera & Imaging Products Association

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# Exif 2.32 metadata for XMP

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# Introduction

The "Exchangeable image file format for digital still cameras" (Exif) defined a useful set of tag based metadata in binary form. This metadata set has been widely used as “Exif metadata” especially to store and transfer metadata of picture-taking conditions in various digital still-image files that are converted from Exif files.

Adobe Systems Incorporated first introduced the Extensible Metadata Platform (XMP) in 2001 for the definition, creation, and processing of metadata that can be embedded to various formats of files. XMP is used for workflows which prefer metadata in XML form and the "Exif metadata" has been an important part of XMP.

Since 2010, ISO had started projects to standardize XMP. The first one is ISO16684-1 in TC130 which is based on the Adobe Systems XMP Specification Part 1, version of July 2010 which provides a thorough understanding of the XMP data model. In 2011, TC42 started an XMP related project for an area of digital photography application, ISO12234-3, jointly with TC130. The project has direct relationship to the "Exif metadata".

To meet such trends on the “Exif metadata”, Camera and Imaging Products Association (CIPA) decided to develop a CIPA standard to define Exif metadata for XMP. The primary purpose is to keep the integrity of "Exif metadata" whose entire contents of the metadata are always identical to the most up-to-the-date Exif file format standard.

## Revision History

| Ver. | Date | Comments |
|---|---|---|
| 2.3 | January, 2012 | Published First Edition 2.3 |
| 2.31 | August, 2017 | Published Revision 2.31<br>Added newly defined metadata in Exif 2.31<br>Corrected misprints |
| 2.32 | April, 2020 | Published Revision 2.32<br>Added newly defined metadata in Exif 2.32<br>Updated Table 1, Table 6 and Annex A<br>Added Table A.5<br>Updated normative references,<br>Corrected misprints |

# 1 Scope

This standard defines a set of metadata-mapping definitions between the tag based ones defined in the Exif standard and the XML properties used in XMP for still-image files, but does not specify the full definition of each metadata item, methods of embedding the metadata set into image files or reconciliation policy when an image file can have different forms of metadata.

This standard is applicable to devices and application software that create image data files with Exif metadata in XMP.

# 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO 12232, *Photography — Digital still cameras — Determination of exposure index, ISO speed ratings, standard output sensitivity, and recommended exposure index*
ISO 12233, *Photography — Electronic still-picture cameras — Resolution measurements*

ISO 14524, *Photography — Electronic still-picture cameras — Methods for measuring opto-electronic conversion functions (OECFs)*

ISO 16684-1, *Extensible metadata platform (XMP) specification — Part 1: Data model, serialization, and core properties*

ISO/IEC 10464-1, *Information technology — Universal multiple-octet coded character set (UCS) — Part 1: Architecture and basic multilingual plane*

W3C Recommendation, *Namespaces in XML 1.0 (Third Edition),* December 8, 2009
http://www.w3.org/TR/REC-xml-names/

IETF RFC 3986, *Uniform Resource Identifier (URI): Generic Syntax*, January 2005
http://www.ietf.org/rfc/rfc3986.txt

Dublin Core Metadata Element Set, Version 1.1
https://www.dublincore.org/specifications/dublin-core/dces/

CIPA DC-008-2019 Exchangeable image file format for digital still cameras : Exif Version 2.32
http://www.cipa.jp/std/std-sec_e.html

# 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1**
**compressed data**
data referred to in the JPEG standard as "entropy coded data"

**3.2**
**DCF**
an abbreviation of "Design rule for camera file system"

**3.3**
**DSC**
an abbreviation of "Digital still camera"

**3.4**
**Exif**
an abbreviation of "Exchangeable image file format for digital still cameras"

**3.5**
**property**
named container for a metadata value at the top level of an XMP packet

**3.6**
**tag**
a field of ancillary data about an image which corresponds to "field" in TIFF

**3.7**
**thumbnail**
a small image used to index a primary image

**3.8**
**URI**
Uniform Resource Identifier as defined in IETF RFC 3986

# 4 General

Mappings between the tag based Exif metadata and the corresponding XML properties in XMP are defined in the following clauses and the metadata items are described in the properties tables. They appear in the tables in the identical orders as in the Exif specifications of CIPA.

Full definition of each metadata item is not given in the mapping tables. Description of each metadata item in this specification is for the reader's convenience. Refer to the corresponding normative references for the full definition. Yellow cells in the mapping tables denote additions or changes made in Exif 2.21 or later and blue cells indicate they are not used in XMP relevant to Exif 2.3.

For numeric Exif tags, other than 34855 PhotographicSensitivity, the count from the Exif specification defines the XMP value form. If the Exif count is 1, the XMP property shall be a simple value. If the Exif count is greater than 1 or ANY, the XMP property shall be an ordered array. When the Exif count is greater than 1 and not ANY, the XMP array shall have exactly the number of entries given by the Exif count.

NOTE Tag 34855 PhotographicSensitivity is a special case. The Exif count is ANY for historical reasons, Exif 2.3 recommends only writing 1 value. The XMP form of **exifEX:PhotographicSensitivity** is a simple value, mapped to the first tag value. The XMP form of the deprecated **exif:ISOSpeedRatings** property is an ordered array**.**

# 5 Exif metadata namespaces

## 5.1 Namespace and prefix

Namespaces in Table 1 are used in the scope of Exif metadata. When using those XML namespaces the URIs shall be as in Table 1 and the preferred namespace prefixes should be as in Table 1.

**Table 1 — Namespaces used in Exif metadata**

| Name | URI | Recommended prefix |
|---|---|---|
| Exif 2.31 or 2.32 | http://cipa.jp/exif/2.32/ | exifEX |
| Exif 2.21 or 2.3 | http://cipa.jp/exif/1.0/ | exifEX |
| Exif 2.2 or earlier | http://ns.adobe.com/exif/1.0/ | exif |
| TIFF Rev. 6.0 | http://ns.adobe.com/tiff/1.0/ | tiff |
| Dublin Core | http://purl.org/dc/elements/1.1/ | dc |
| XMP | http://ns.adobe.com/xap/1.0/ | xmp |

NOTE For convenience in this document, XMP names are commonly written in a **prefix:local** style, for example, **dc:title**. The relevant URI for the prefix used in this document is either explicit or clear from local context.

# 6 Mapping for TIFF metadata

## 6.1 Overview

The following clauses define the properties for TIFF-derived data. Only those TIFF properties that are mentioned in the Exif 2.3 specification are included here.

## 6.2 Namespace and prefix

Namespaces in Table 2 are used in the scope of TIFF-derived metadata. When using those XML namespaces the URIs shall be as in Table 2 and the preferred namespace prefixes should be as in Table 2.

**Table 2 — Namespaces used in TIFF namespace**

| Name | URI | Recommended prefix |
|---|---|---|
| TIFF Rev. 6.0 | http://ns.adobe.com/tiff/1.0/ | tiff |
| Dublin Core | http://purl.org/dc/elements/1.1/ | dc |
| XMP | http://ns.adobe.com/xap/1.0/ | xmp |

## 6.3 Properties for image data structure

Table 3 lists the properties for TIFF-derived image data structure metadata. Only those TIFF properties that are mentioned in the Exif 2.3 specification are included here. Mapping between the tag based metadata and the XMP properties shall follow the list in Table 3.

**Table 3 — TIFF properties for image data structure**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| ImageWidth | 256 | 100 | Image width in pixels. | **tiff:ImageWidth** | Integer |
| ImageLength | 257 | 101 | Image height in pixels. | **tiff:ImageLength** | Integer |
| BitsPerSample | 258 | 102 | Number of bits per component in each channel. | **tiff:BitsPerSample** | Ordered array of Integer |
| Compression | 259 | 103 | Compression scheme:<br>1 = Uncompressed<br>6 = JPEG. | **tiff:Compression** | Closed choice of Integer |
| PhotometricInterpretation | 262 | 106 | Pixel Composition:<br>2 = RGB<br>6 = YCbCr. | **tiff: PhotometricInterpretation** | Closed choice of Integer |
| Orientation | 274 | 112 | Orientation:<br>1 = 0th row at top, 0th column at left<br>2 = 0th row at top, 0th column at right<br>3 = 0th row at bottom, 0th column at right<br>4 = 0th row at bottom, 0th column at left<br>5 = 0th row at left, 0th column at top<br>6 = 0th row at right, 0th column at top<br>7 = 0th row at right, 0th column at bottom<br>8 = 0th row at left, 0th column at bottom | **tiff:Orientation** | Closed choice of Integer |
| SamplesPerPixel | 277 | 115 | Number of components per pixel. | **tiff:SamplesPerPixel** | Integer |
| PlanarConfiguration | 284 | 11C | Data layout<br>1 = chunky<br>2 = planar | **tiff:PlanarConfiguration** | Closed choice of Integer |
| YCbCrSubSampling | 530 | 212 | Sampling ratio of chrominance components:<br>[2, 1] = YCbCr4:2:2<br>[2, 2] = YCbCr4:2:0 | **tiff:YCbCrSubSampling** | Closed choice of ordered array of Integer |
| YCbCrPositioning | 531 | 213 | Position of chrominance vs. Luminance components:<br>1 = centered<br>2 = co-sited | **tiff:YCbCrPositioning** | Closed choice of Integer |

| | | | | | |
|---|---|---|---|---|---|
| XResolution | 282 | 11A | Horizontal resolution in pixels per ResolutionUnit. | **tiff:XResolution** | Rational |
| YResolution | 283 | 11B | Vertical resolution in pixels per ResolutionUnit. | **tiff:YResolution** | Rational |
| ResolutionUnit | 296 | 128 | Unit used for XResolution and YResolution. Value is one of:<br>2 = inches<br>3 = centimeters | **tiff:ResolutionUnit** | Closed choice of Integer |

## 6.4 Properties for recording offset

No mapping is given to each of the Exif metadata that relates to configuration of Exif image files since they are Exif file format specific. The field names of such Exif metadata are:

StripOffsets
RowsPerStrip
StripByteCounts
JPEGInterchangeFormat
JPEGInterchangeFormatLength

## 6.5 Properties for image data characteristics

Table 4 lists the properties for TIFF-derived image data characteristics metadata. Only those TIFF properties that are mentioned in the Exif 2.3 specification are included here. Mapping between the tag based metadata and the XML properties shall follow the list in Table 4.

**Table 4 — TIFF properties for image data characteristics**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| TransferFunction | 301 | 12D | Transfer function for image described in tabular style with 3 * 256 entries. | **tiff:TransferFunction** | Ordered array of Integer |
| WhitePoint | 318 | 13E | Chromaticity of white point. | **tiff:WhitePoint** | Ordered array of Rational |
| PrimaryChromaticities | 319 | 13F | Chromaticity of the three primary colours. | **tiff: PrimaryChromaticities** | Ordered array of Rational |
| YCbCrCoefficients | 529 | 211 | Matrix coefficients for RGB to YCbCr transformation. | **tiff:YCbCrCoefficients** | Ordered array of Rational |
| ReferenceBlackWhite | 532 | 214 | Reference black and white point values. | **tiff:ReferenceBlackWhite** | Ordered array of Rational |

## 6.6 Other properties

Table 5 lists the properties for TIFF-derived other metadata. Only those TIFF properties that are mentioned in the Exif 2.3 specification are included here. Mapping between the tag based metadata and the XML properties shall follow the list in Table 5.

**Table 5 — Other TIFF properties**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| DateTime | 306 | 132 | Date and time when the file was last modified (no time zone in Exif), stored in ISO 8601 format, not in the original Exif format. This property includes the value for the Exif SubSecTime (37520, 0x9290) attribute. | **xmp:ModifyDate** | Date |
| ImageDescription | 270 | 10E | The title of the image as an ASCII string. | **dc:description** | Language Alternative |
| Make | 271 | 10F | Manufacturer of recording equipment as an ASCII string. | **tiff:Make** | Proper-Name |
| Model | 272 | 110 | Model name or number of the equipment as an ASCII string. | **tiff:Model** | Text |
| Software | 305 | 131 | Software or firmware used to generate image as an ASCII string | **xmp:CreatorTool** | Agent-Name |
| Artist | 315 | 13B | Camera owner, photographer or image creator as an ASCII string | **dc:creator** | Ordered array of Proper-Name |
| Copyright | 33432 | 8298 | Copyright information as an ASCII string | **dc:rights** | Language Alternative |

# 7 Mapping for Exif-specific metadata

## 7.1 Overview

The following clauses define the properties for Exif specific metadata.

## 7.2 Namespace and prefix

Namespaces in Table 2 are used in the scope of Exif specific metadata. When using those XML namespaces the URIs shall be as in Table 6 and the preferred namespace prefixes should be as in Table 6.

**Table 6 — Namespaces used in Exif namespace**

| Name | URI | Recommended prefix |
|---|---|---|
| Exif 2.31 or 2.32 | http://cipa.jp/exif/2.32/ | exifEX |
| Exif 2.21 or 2.3 | http://cipa.jp/exif/1.0/ | exifEX |
| Exif 2.2 or earlier | http://ns.adobe.com/exif/1.0/ | exif |
| XMP | http://ns.adobe.com/xap/1.0/ | xmp |

## 7.3 Properties for version related information

Table 7 lists the properties for Exif version related metadata. Mapping between the tag based metadata and the XML properties shall follow the list in Table 7.

**Table 7 — Exif properties for version related metadata**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| ExifVersion | 36864 | 9000 | Exif version number. Version 2.3 is written as "0230". | **exif:ExifVersion** | Text |
| FlashpixVersion | 40960 | A000 | Version of FlashPix. "0100" is the fixed value. | **exif:FlashpixVersion** | Closed choice of Text |

## 7.4 Properties for image data characteristics

Table 8 lists the properties for image data characteristics. Mapping between the tag based metadata and the XML properties shall follow the list in Table 8.

**Table 8 — Exif properties for image data characteristics**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| ColorSpace | 40961 | A001 | Colour space information:<br>1 = sRGB<br>65535 = uncalibrated | **exif:ColorSpace** | Closed choice of integer |
| Gamma | 42240 | A500 | Indicates the value of coefficient gamma. | **exifEX:Gamma** | Rational |

## 7.5 Properties for image configuration

Table 9 lists the properties for image configuration. Mapping between the tag based metadata and the XML properties shall follow the list in Table 9.

**Table 9 — Exif properties for image configuration**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| ComponentsConfiguration | 37121 | 9101 | Configuration of components in data:<br>4 5 6 0 (if RGB uncompressed data),<br>1 2 3 0 (other cases).<br>0 = does not exist<br>1 = Y<br>2 = Cb<br>3 = Cr<br>4 = R<br>5 = G<br>6 = B | **exif: ComponentsConfiguration** | Closed choice of ordered array of Integer |
| CompressedBitsPerPixel | 37122 | 9102 | Compression mode used for a compressed image is indicated in unit bits per pixel. | **exif: CompressedBitsPerPixel** | Rational |
| PixelXDimension | 40962 | A002 | Valid image width, in pixels. | **exif:PixelXDimension** | Integer |
| PixelYDimension | 40963 | A003 | Valid image height, in pixels. | **exif:PixelYDimension** | Integer |

## 7.6 Properties for user information

Table 10 lists the property for user information. Mapping between the tag based metadata and the XML property shall follow the list in Table 10..

**Table 10 — Exif properties for user information**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| MakerNote | 37500 | 927C | Records any desired information. The contents are up to the manufacture. | Not used [a] | - |
| UserComment | 37510 | 9286 | Comments from user | **exif:UserComment** | Language Alternative |

[a] The value type of the 37500 MakerNote tag field is not defined in the Exif specification and its usage is fully vendor unique. Mapping to XMP property is not given to this tag field because no unified valid value type can be defined.

## 7.7 Properties for file information

Table 11 lists the property for file information. Mapping between the tag based metadata and the XML property shall follow the list in Table 11.

**Table 11 — Exif property for file information**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| RelatedSoundFile | 40964 | A004 | An ASCII string of “8.3” characters of file name and file extension for the related sound file. | **exif:RelatedSoundFile** | Text |

## 7.8 Properties for date and time

Table 12 lists the properties for date and time. Mapping between the tag based metadata and the XML properties shall follow the list in Table 12.

**Table 12 — Exif properties for date and time**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| DateTimeOriginal | 36867 | 9003 | Date and time when the original data was generated (no time zone in Exif), stored in ISO 8601 format, not in the original Exif format. This property includes the value for the Exif SubSecTimeOriginal (37521, 0x9291) attribute. | **exif:DateTimeOriginal** | Date |
| DateTimeDigitized | 36868 | 9004 | The date and time when the image was stored as digital data (no time zone in Exif), stored in ISO 8601 format, not in the original Exif format. This property includes the value for the Exif SubSecTimeDigitized (37522, 0x9292) attribute. | **xmp:CreateDate** | Date |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| OffsetTime | 36880 | 9010 | Offset from UTC of the time of DateTime. | **Not used** [a] | - |
| OffsetTimeOriginal | 36881 | 9011 | Offset from UTC of the time of DateTimeOriginal. | **Not used** [a] | - |
| OffsetTimeDigitized | 36882 | 9012 | Offset from UTC of the time of DateTimeDigitized. | **Not used** [a] | - |
| SubSecTime | 37520 | 9290 | Fractions of seconds for the DateTime. Merged to DateTime. | **Not used** [a] | - |
| SubSecTimeOriginal | 37521 | 9291 | Fractions of seconds for the DateTime-Original. Merged to DateTimeOriginal. | **Not used** [a] | - |
| SubSecTimeDigitized | 37522 | 9292 | Fractions of seconds for the DateTime-Digitized. Merged to DateTimeDigitized. | **Not used** [a] | - |
| [a] Mapping to XMP property is not given to this Exif tag field because the value of this tag field is mapped to an XMP property corresponding to a different Exif tag field. | | | | | |

## 7.9 Properties for picture-taking conditions & shooting situation

Table 13 lists the properties for picture-taking conditions. Mapping between the tag based metadata and the XML properties shall follow the list in Table 13.

**Table 13 — Exif properties for picture-taking conditions & shooting situation**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| ExposureTime | 33434 | 829A | Exposure time in seconds. | **exif:ExposureTime** | Rational |
| FNumber | 33437 | 829D | F number. | **exif:FNumber** | Rational |
| ExposureProgram | 34850 | 8822 | Class of program used for exposure:<br>0 = not defined<br>1 = Manual<br>2 = Normal program<br>3 = Aperture priority<br>4 = Shutter priority<br>5 = Creative program<br>6 = Action program<br>7 = Portrait mode<br>8 = Landscape mode | **exif:ExposureProgram** | Closed Choice of Integer |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| SpectralSensitivity | 34852 | 8824 | Spectral sensitivity of each channel by an ASTM standard. | **exif: SpectralSensitivity** | Text |
| PhotographicSensitivity (Exif 2.3 or later) | 34855 | 8827 | Indicates the sensitivity of the camera or input device when the image was shot up to the value of 65535 with one of the following parameters that are defined in ISO 12232: standard output sensitivity (SOS), recommended exposure index (REI), or ISO speed. | **exifEX: PhotographicSensitivity** | Integer |
| ISOSpeedRatings [a] (till Exif 2.21) | 34855 | 8827 | ISO Speed and ISO Latitude of the input device as specified in ISO 12232 up to the value of 65535.<br><br>The field name ISOSpeedRatings was used till Exif 2.21 and changed to PhotographicSensitivity in Exif 2.3.<br><br>This mapping is included only for backward compatibility purpose.<br><br>Otherwise **exif:ISOSpeedRatings** property should not be used. | **exif:ISOSpeedRatings** [b] | Ordered array of Integer |
| OECF | 34856 | 8828 | Opto-Electronic Conversion Function as specified in ISO 14524. | **exif:OECF** | OECF/ SFR |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| SensitivityType | 34864 | 8830 | Indicates which one of the parameters of ISO12232 is used for PhotographicSensitivity:0 = Unknown<br>1 = Standard output sensitivity (SOS)<br>2 = Recommended exposure index (REI)<br>3 = ISO speed<br>4 = Standard output sensitivity (SOS) and recommended exposure index (REI)<br>5 = Standard output sensitivity (SOS) and ISO speed<br>6 = Recommended exposure index (REI) and ISO speed<br>7 = Standard output sensitivity (SOS) and recommended exposure index (REI) and ISO speed | **exifEX:SensitivityType** | Closed choice of Integer |
| StandardOutputSensitivity | 34865 | 8831 | Indicates the standard output sensitivity value of a camera or input device defined in ISO 12232. | **exifEX: StandardOutput-Sensitivity** | Integer |
| RecommendedExposureIndex | 34866 | 8832 | Indicates the recommended exposure index value of a camera or input device defined in ISO 12232. | **exifEX: RecommendedExposureIndex** | Integer |
| ISOSpeed | 34867 | 8833 | Indicates the ISO speed value of a camera or input device that is defined in ISO 12232. | **exifEX:ISOSpeed** | Integer |
| ISOSpeedLatitudeyyy | 34868 | 8834 | Indicates the ISO speed latitude yyy value of a camera or input device that is defined in ISO 12232. | **exifEX: ISOSpeedLatitudeyyy** | Integer |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| ISOSpeedLatitudezzz | 34869 | 8835 | Indicates the ISO speed latitude zzz value of a camera or input device that is defined in ISO 12232. | **exifEX: ISOSpeedLatitudezzz** | Interger |
| ShutterSpeedValue | 37377 | 9201 | Time value, unit is APEX. | **exif:ShutterSpeedValue** | Rational |
| ApertureValue | 37378 | 9202 | Aperture value, unit is APEX | **exif:ApertureValue** | Rational |
| BrightnessValue | 37379 | 9203 | Brightness value, unit is APEX. | **exif:BrightnessValue** | Rational |
| ExposureBiasValue | 37380 | 9204 | Exposure bias in exposure value, unit is APEX. | **exif:ExposureBiasValue** | Rational |
| MaxApertureValue | 37381 | 9205 | Smallest F number of lens in aperture value, unit is APEX. | **exif:MaxApertureValue** | Rational |
| SubjectDistance | 37382 | 9206 | Distance to subject, in meters. | **exif:SubjectDistance** | Rational |
| MeteringMode | 37383 | 9207 | Metering mode:<br>0 = unknown<br>1 = Average<br>2 = Center Weighted Average<br>3 = Spot<br>4 = Multi Spot<br>5 = Pattern<br>6 = Partial<br>255 = other | **exif:MeteringMode** | Closed choice of Integer |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| LightSource | 37384 | 9208 | Light source:<br>0 = unknown<br>1 = Daylight<br>2 = Fluorescent<br>3 = Tungsten<br>4 = Flash<br>9 = Fine weather<br>10 = Cloudy weather<br>11 = Shade<br>12 = Daylight fluorescent (D 5700 – 7100K)<br>13 = Day white fluorescent (N 4600 – 5500K)<br>14 = Cool white fluorescent (W 3800 – 4500K)<br>15 = White fluorescent (WW 3250 – 3800K)<br>16 = Warm white fluorescent (L2600 - 3250K)<br>17 = Standard light A<br>18 = Standard light B<br>19 = Standard light C<br>20 = D55<br>21 = D65<br>22 = D75<br>23 = D50<br>24 = ISO studio tungsten<br>255 = other | **exif:LightSource** | Closed choice of Integer |
| Flash | 37385 | 9209 | Strobe light (flash) source data. | **exif:Flash** | Flash |
| FocalLength | 37386 | 920A | Focal length of the lens, in millimeters | **exif:FocalLength** | Rational |
| SubjectArea | 37396 | 9214 | The location and area of the main subject in the overall scene. | **exif:SubjectArea** | Ordered array of Integer |
| FlashEnergy | 41483 | A20B | Strobe energy during image capture. | **exif:FlashEnergy** | Rational |
| SpatialFrequencyResponse | 41484 | A20C | Input device spatial frequency table and SFR values as specified in ISO 12233. | **exif: SpatialFrequencyResponse** | OECF/ SFR |
| FocalPlaneXResolution | 41486 | A20E | Horizontal focal resolution, measured pixels per FocalPlaneResolution Unit. | **exif: FocalPlaneXResolution** | Rational |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| FocalPlaneYResolution | 41487 | A20F | Vertical focal resolution, measured pixels per FocalPlaneResolution Unit. | **exif: FocalPlaneYResolution** | Rational |
| FocalPlaneResolutionUnit | 41488 | A210 | Unit used for FocalPlaneXResolution and FocalPlaneYResolution:<br><br>2 = inches<br>3 = centimeters | **exif: FocalPlaneResolutionUnit** | Closed choice of Integer |
| SubjectLocation | 41492 | A214 | Indicates the location of the main subject in the scene. | **exif:SubjectLocation** | ordered array of Integer |
| ExposureIndex | 41493 | A215 | Exposure index of input device. | **exif:ExposureIndex** | Rational |
| SensingMethod | 41495 | A217 | Image sensor type on input device:<br>1 = Not defined<br>2 = One-chip colour area sensor<br>3 = Two-chip colour area sensor<br>4 = Three-chip colour area sensor<br>5 = Colour sequential area sensor<br>7 = Trilinear sensor<br>8 = Colour sequential linear sensor | **exif:SensingMethod** | Closed choice of Integer |
| FileSource | 41728 | A300 | Indicates image source: 0 = others<br>1 = scanner of transparent type<br>2 = scanner of reflex type<br>3 = DSC | **exif:FileSource** | Closed choice of Integer |
| SceneType | 41729 | A301 | Indicates the type of scene: 1 (directly photographed image) is the only choice. | **exif:SceneType** | Closed choice of Integer |
| CFAPattern | 41730 | A302 | Colour filter array geometric pattern of the image sensor. | **exif:CFAPattern** | CFA-Pattern |
| CustomRendered | 41985 | A401 | Indicates the use of special processing on image data:<br>0 = Normal process<br>1 = Custom process | **exif:CustomRendered** | Closed choice of Integer |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| ExposureMode | 41986 | A402 | Indicates the exposure mode set when the image was shot:<br>0 = Auto exposure<br>1 = Manual exposure<br>2 = Auto bracket | **exif:ExposureMode** | Closed choice of Integer |
| WhiteBalance | 41987 | A403 | Indicates the white balance mode set when the image was shot:<br>0 = Auto white balance<br>1 = Manual white balance | **exif:WhiteBalance** | Closed choice of Integer |
| DigitalZoomRatio | 41988 | A404 | Indicates the digital zoom ratio when the image was shot. | **exif:DigitalZoomRatio** | Rational |
| FocalLengthIn35mmFilm | 41989 | A405 | Indicates the equivalent focal length assuming a 35mm film camera, in mm. A value of<br>0 means the focal length is unknown. | **exif: FocalLengthIn35mmFilm** | Integer |
| SceneCaptureType | 41990 | A406 | Indicates the type of scene shot:<br>0 = Standard<br>1 = Landscape<br>2 = Portrait<br>3 = Night scene | **exif:SceneCaptureType** | Closed choice of Integer |
| GainControl | 41991 | A407 | Indicates the degree of overall image gain adjustment:<br>0 = None<br>1 = Low gain up<br>2 = High gain up<br>3 = Low gain down<br>4 = High gain down | **exif:GainControl** | Closed choice of Integer |
| Contrast | 41992 | A408 | Indicates the direction of contrast processing applied by the camera:<br>0 = Normal<br>1 = Soft<br>2 = Hard | **exif:Contrast** | Closed choice of Integer |
| Saturation | 41993 | A409 | Indicates the direction of saturation processing applied by the camera:<br>0 = Normal<br>1 = Low saturation<br>2 = High saturation | **exif:Saturation** | Closed choice of Integer |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| Sharpness | 41994 | A40A | Indicates the direction of sharpness processing applied by the camera:<br>0 = Normal<br>1 = Soft<br>2 = Hard | **exif:Sharpness** | Closed choice of Integer |
| DeviceSettingDescription | 41995 | A40B | Indicates information on the picture-taking conditions of a particular camera model. | **exif: DeviceSettingDescription** | Device-Settings |
| SubjectDistanceRange | 41996 | A40C | Indicates the distance to the subject:<br>0 = Unknown<br>1 = Macro<br>2 = Close view<br>3 = Distant view | **exif: SubjectDistanceRange** | Closed choice of Integer |
| CompositeImage | 42080 | A460 | Indicates whether the recorded image is a composite image* or not.<br>* A composite image generated from multiple taken images (source images) is subjected<br>1 = non-composite image<br>2 = General composite image<br>3 = Composite image captured when shooting | **exifEX:CompositeImage** | Closed choice of Integer |
| SourceImageNumberOfCompositeImage | 42081 | A461 | Indicates the number of the source images (tentatively recorded images) captured for a composite Image. | **exifEX:SourceImageNumberOfCompositeImage** | Ordered array of Integer |
| SourceExposureTimesOfCompositeImage | 42082 | A462 | For a composite image, this tag records the parameters relating exposure time of the exposures for generating the said composite image, such as respective exposure times of captured source images (tentatively recorded images). The unit is seconds (sec). | **exifEX:SourceExposureTimesOfCompositeImage** | Source ExposureTimesOfCompositeImage |
| Temperature | 37888 | 9400 | Temperature as the ambient situation at the shot. The unit is °C | **exifEX:Temperature** | Rational |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| Humidity | 37889 | 9401 | Humidity as the ambient situation at the shot. The unit is %. | **exifEX:Humidity** | Rational |
| Pressure | 37890 | 9402 | Pressure as the ambient situation at the shot. The unit is hPa. | **exifEX:Pressure** | Rational |
| WaterDepth | 37891 | 9403 | Water depth as the ambient situation at the shot. The unit is m. | **exifEX:WaterDepth** | Rational |
| Acceleration | 37892 | 9404 | Acceleration (a scalar regardless of direction) as the ambient situation at the shot. The unit is mGal. | **exifEX:Acceleration** | Rational |
| CameraElevationAngle | 37893 | 9405 | Elevation/depression. angle of the orientation of the camera(imaging optical axis) as the ambient situation at the shot. The unit is degree(°). | **exifEX:CameraElevation Angle** | Rational |
| a Field name and definition of 34855 ISOSpeedRatings tag field are changed in Exif 2.3. See the tag field 34855 PhotographicSensitivity. The mapping is given only for backward compatibility purpose.<br>b It is not recommended to use this property to indicate sensitivity. | | | | | |

## 7.10 Other properties

Table 14 lists the properties of other Exif information. Mapping between the tag based metadata and the XML properties shall follow the list in Table 14.

**Table 14 — Exif properties for other information**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| ImageUniqueID | 42016 | A420 | An identifier assigned uniquely to each image. It is recorded as a 32 character ASCII string, equivalent to hexadecimal notation and 128-bit fixed length. | **exif:ImageUniqueID** | Text |
| CameraOwnerName | 42032 | A430 | This tag records the owner of a camera used in photography as an ASCII string. | **exifEX:CameraOwnerName** | Proper-Name |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| BodySerialNumber | 42033 | A431 | The serial number of the camera or camera body used to take the photograph. | **exifEX:BodySerialNumber** | Text |
| LensSpecification | 42034 | A432 | notes minimum focal length, maximum focal length, minimum F number in the minimum focal length, and minimum F number in the maximum focal length, which are specification information for the lens that was used in photography. | **exifEX:LensSpecification** | Ordered array of Rational |
| LensMake | 42035 | A433 | Records the lens manufacturer as an ASCII string. | **exifEX:LensMake** | Proper-Name |
| LensModel | 42036 | A434 | Records the lens's model name and model number as an ASCII string. | **exifEX:LensModel** | Text |
| LensSerialNumber | 42037 | A435 | This tag records the serial number of the interchangeable lens that was used in photography as an ASCII string. | **exifEX:LensSerialNumber** | Text |

# 8 Mapping for Exif GPS specific metadata

## 8.1 Overview

The following clauses define the properties for Exif specific metadata related to GPS information.

## 8.2 Namespace and prefix

The XML namespace URI for the GPS information shall be: http://ns.adobe.com/exif/1.0/

The preferred namespace prefix should be: exif

## 8.3 Properties for GPS information

Table 15 lists the properties of other Exif information. Mapping between the tag based metadata and the XML properties shall follow the list in Table 15.

**Table 15 — Exif properties for GPS information**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| GPSVersionID | 0 | 0 | A decimal encoding of each of the four Exif bytes with period separators. The current value is “2.3.0.0”. | **exif:GPSVersionID** | Text |
| GPSLatitudeRef | 1 | 1 | Indicates whether the latitude is north or south latitude. Merged to GPSLatitude. | **Not used** [a] | - |
| GPSLatitude | 2 | 2 | Indicates latitude. Consists of position and North/South. | **exif:GPSLatitude** | GPSCoordinate |
| GPSLongitudeRef | 3 | 3 | Indicates whether the longitude is east or west longitude. Merged to GPSLongitude. | **Not used** [a] | - |
| GPSLongitude | 4 | 4 | Indicates longitude. Consists of position and East/West. | **exif:GPSLongitude** | GPSCoordinate |
| GPSAltitudeRef | 5 | 5 | Indicates whether the altitude is above or below sea level:<br>0 = Above sea level<br>1 = Below sea level | **exif:GPSAltitudeRef** | Closed choice of Integer |
| GPSAltitude | 6 | 6 | Indicates altitude in meters. | **exif:GPSAltitude** | Rational |
| GPSTimeStamp | 7 | 7 | Time stamp of GPS data consists of Date and Time, in Coordinated Universal Time. | **exif:GPSTimeStamp** | Date |
| GPSSatellites | 8 | 8 | Satellite information in an ASCII string, format is unspecified. | **exif:GPSSatellites** | Text |
| GPSStatus | 9 | 9 | Status of GPS receiver at image creation time:<br>"A" = measurement in progress<br>"V" = measurement interrupted | **exif:GPSStatus** | Closed choice of Text |
| GPSMeasureMode | 10 | A | GPS measurement mode:<br>"2" = two-dimensional measurement<br>"3" = three-dimensional measurement | **exif: GPSMeasureMode** | Closed choice of Integer |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| GPSDOP | 11 | B | Degree of precision for GPS data. | **exif:GPSDOP** | Rational |
| GPSSpeedRef | 12 | C | Units used to speed measurement:<br>"K" = kilometers per hour<br>"M" = miles per hour<br>"N" = knots | **exif:GPSSpeedRef** | Closed choice of Text |
| GPSSpeed | 13 | D | Speed of GPS receiver movement. | **exif:GPSSpeed** | Rational |
| GPSTrackRef | 14 | E | Reference for movement direction:<br>"T" = true direction<br>"M" = magnetic direction | **exif:GPSTrackRef** | Closed choice of Text |
| GPSTrack | 15 | F | Direction of GPS movement, values range from 0 to 359.99. | **exif:GPSTrack** | Rational |
| GPSImgDirectionRef | 16 | 10 | Reference for movement direction:<br>"T" = true direction<br>"M" = magnetic direction | **exif: GPSImgDirectionRef** | Closed choice of Text |
| GPSImgDirection | 17 | 11 | Direction of image when captured, values range from 0 to 359.99. | **exif: GPSImgDirection** | Rational |
| GPSMapDatum | 18 | 12 | Geodetic survey data as an ASCII string. | **exif:GPSMapDatum** | Text |
| GPSDestLatitudeRef | 19 | 13 | Indicates whether the latitude of the destination point is north or south latitude. Merged to GPSDestLatitude | **Not used** [a] | - |
| GPSDestLatitude | 20 | 14 | Indicates destination latitude. Consists of position and North/South. | **exif:GPSDestLatitude** | GPSCoordinate |
| GPSDestLongitudeRef | 21 | 15 | Indicates whether the longitude of the destination point is east or west longitude. Merged to GPSDestLongitude. | **Not used** [a] | - |
| GPSDestLongitude | 22 | 16 | Indicates destination longitude. Consists of position and East/West. | **exif: GPSDestLongitude** | GPSCoordinate |
| GPSDestBearingRef | 23 | 17 | Reference for movement direction:<br>"T" = true direction<br>"M" = magnetic direction | **exif: GPSDestBearingRef** | Closed choice of Text |
| GPSDestBearing | 24 | 18 | Destination bearing, values from 0 to 359.99. | **exif:GPSDestBearing** | Rational |

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| GPSDestDistanceRef | 25 | 19 | Units used for distance measurement:<br>"K" = kilometers<br>"M" = miles<br>"N" = Nautical miles | **exif: GPSDestDistanceRef** | Closed choice of Text |
| GPSDestDistance | 26 | 1A | Distance to destination. | **exif:GPSDestDistance** | Rational |
| GPSProcessingMethod | 27 | 1B | An ASCII string recording the name of the method used for location finding. | **exif: GPSProcessingMethod** | Text |
| GPSAreaInformation | 28 | 1C | An ASCII string recording the name of the GPS area. | **exif: GPSAreaInformation** | Text |
| GPSDateStamp | 29 | 1D | A character string recording date information relative to UTC (Coordinated Universal Time). Merged to GPSTimeStamp. | **Not used** [a] | - |
| GPSDifferential | 30 | 1E | Indicates whether differential correction is applied to the GPS receiver:<br>0 = Without correction<br>1 = Correction applied | **exif:GPSDifferential** | Closed choice of Integer |
| GPSHPositioningError | 31 | 1F | Indicates horizontal positioning errors in meters. | **exif:GPSHPositioning-Error** [b] | Rational |

[a] Mapping to XMP property is not given to this Exif tag field because the value of this tag field is mapped to an XMP property corresponding to a different Exif tag field.

[b] Prefix **exif:** is used for the backward compatibility with existing application software even though this field is an addition in Exif 2.3.

# 9 Mapping for Exif interoperability metadata

## 9.1 Overview

The following clauses define the properties for Exif specific metadata related to interoperability.

## 9.2 Namespace and prefix

The XML namespace URI for the Exif version 2.21 or later shall be: http://cipa.jp/exif/1.0/

The preferred namespace prefix should be: exifEX

## 9.3 Property for interoperability

Table 16 lists the property of interoperability. Mapping between the tag based metadata and the XML property shall follow the list in Table 16.

**Table 16 — Exif properties for intreopreability**

| Exif field name | Tag ID | | Description | XMP name | Type |
|---|---|---|---|---|---|
| | Dec | Hex | | | |
| InteroperabilityIndex | 1 | 1 | Indicates the identification of the Interoperability rule. "R98" = Indicates a file conforming to R98 file specification of Recommended Exif Interoperability Rules (Exif R 98) or to DCF basic file stipulated by Design Rule for Camera File System (DCF).<br><br>"THM" = Indicates a file conforming to DCF thumbnail file stipulated by Design rule for Camera File System.<br><br>“R03” = Indicates a file conforming to DCF Option File stipulated by Design rule for Camera File System. | **exifEX: InteroprabilityIndex** | Closed choice of Text |

# Annex A
(normative)

# Value forms and value types

## A.1 Value forms

XMP value forms are defined in clause 6.3, ISO 16684-1. Especially, "Ordered array" type is defined in clause 6.3.4.

## A.2 Value types

### A.2.1 Overview

Core value types are defined in ISO 16684-1. Following types shall be used in properties described in this specification when applicable.

### A.2.2 Basic value types

#### A.2.2.1 Boolean

Boolean values shall be "True" or "False".

#### A.2.2.2 Date

Date is a date-time value, which is represented using a subset of Date and Time Formats formatting:

YYYY

YYYY-MM

YYYY-MM-DD

YYYY-MM-DDThh:mmTZD

YYYY-MM-DDThh:mm:ssTZD

YYYY-MM-DDThh:mm:ss.sTZD

In which:

- YYYY = four-digit year
- MM = two-digit month (01=January)
- DD = two-digit day of month (01 through 31)
- hh = two digits of hour (00 through 23)
- mm = two digits of minute (00 through 59)

- ss = two digits of second (00 through 59)
- s = one or more digits representing a decimal fraction of a second
- TZD = time zone designator (Z or +hh:mm or -hh:mm)

The time zone designator need not be present in XMP. When not present, the time zone is unknown, and an XMP processor should not assume anything about the missing time zone.

Local time-zone designators `+hh:mm` or `-hh:mm` should be used when possible instead of converting to UTC.

NOTE If a file was saved at noon on October 23, a timestamp of `2004-10-23T12:00:00-06:00` conveys more information than `2004-10-23T18:00:00Z`.

#### A.2.2.3 Integer

Integer is a signed or unsigned numeric string used as an integer number representation. The string consists of an arbitrary length decimal numeric string with an optional leading “+” or “–” sign.

#### A.2.2.4 Text

Text is a possibly empty Unicode string.

### A.2.3 Derived value types

#### A.2.3.1 AgentName

Value of Agent Name is the name of an XMP processor, a Text value. It is recommended that the value use this format convention:

Organization Software_name Version (token;token;...)

- Organization: The name of the company or organization providing the software, no SPACEs.
- Software_name: The full name of the software, SPACEs allowed.
- version: The version of the software, no SPACEs.
- tokens: Can be used to identify an operating system, plug-in, or more detailed version information.

EXAMPLE "Adobe Acrobat 9.0 (Mac OS X 10.5)"

#### A.2.3.2 Choice

Choice is a value chosen from a vocabulary of values. Vocabularies provide a means of specifying a limited and possibly extensible set of values for a property.

A choice can be *open* or *closed*:

- An open choice has one or more lists of preferred values, but other values can be used freely.
- A closed choice has one or more lists of allowed values, other values shall not be used.

NOTE An XMP reader would be more robust if it tolerates unexpected values for closed choice types when the set of allowed values can be expected to grow over time.

#### A.2.3.3 LanguageAlternative

Value of LanguageAlternative is an alternative array of simple text items. Language alternatives facilitate the selection of a simple text item based on a desired language. Each array item shall have an **xml:lang** qualifier. Each **xml:lang** value shall be unique among the items. As defined in IETF RFC 3066, the **xml:lang** value is composed of one or more parts: A primary language subtag and a (possibly empty) series of subsequent subtags. The same primary subtag may be used alone and in conjunction with one or more lower-level subtags. A default value, if known, should be the first array item. The order of other array items is not specified by this document.

An xml:lang value of "x-default" may be used to explicitly denote a default item. If used, the "x-default" item shall be first in the array and its simple text value should be repeated in another item in which xml:lang specifies its actual language. However, an "x-default" item may be the only item, in which case there is only a default value in no defined language.

EXAMPLE 1 Language alternative with an "x-default" item:

```
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
         xmlns:dc="http://purl.org/dc/elements/1.1/">

   <rdf:Description rdf:about="">

<!-- Line wrapping of rdf:li elements is for presentation in this example. -->
<!-- Leading and trailing white space is part of the array item values. -->

      <dc:title>
         <rdf:Alt>
            <rdf:li xml:lang="x-default">
               XMP - Extensible Metadata Platform
            </rdf:li>
            <rdf:li xml:lang="en-us">
               XMP - Extensible Metadata Platform
            </rdf:li>
            <rdf:li xml:lang="fr">
               XMP - Une Platforme Extensible pour les Métadonnées
                  </rdf:li>
               </rdf:Alt>
            </dc:title>

         </rdf:Description>

      </rdf:RDF>
```

#### A.2.3.4 ProperName

ProperName is a simple text value denoting the name of a person or organization.

### A.2.4 Exif namespace value types

Core value types are defined in the Adobe Systems XMP Specification Part 2, July 2011. Following clauses are citation from the Adobe Systems XMP Specification Part 2, July 2011.

These types are used only within Exif specific namespaces.

#### A.2.4.1 CFAPattern

Value type of CFAPattern is a structure describing the CFA pattern.

- The field namespace URI is http://ns.adobe.com/exif/1.0/

- The preferred field namespace prefix is **exif**

**Table A.1 — CFAPattern fields**

| Name | Type | Description |
|---|---|---|
| **exif:Columns** | Integer | Number of columns, $n$. |
| **exif:Rows** | Integer | Number of rows, $m$. |
| **exif:Values** | Ordered array of Integer | CFA values, sequence should be, in order:<br>value [0,0]<br>...<br>value [$n$ − 1, 0]<br>value [0, $m$ − 1]<br>...<br>value [$n$ − 1, $m$ − 1] |

#### A.2.4.2 DeviceSettings

Value type of DeviceSettings is a structure describing the device settings.

- The field namespace URI is http://ns.adobe.com/exif/1.0/
- The preferred field namespace prefix is **exif**

**Table A.2 — DeviceSettings fields**

| Name | Type | Description |
|---|---|---|
| **exif:Columns** | Integer | Display columns |
| **exif:Rows** | Integer | Display rows |
| **exif:Values** | ordered array of Text | Camera settings, in order |

#### A.2.4.3 Flash

Value type of Flash is a structure describing the flash state.

- The field namespace URI is http://ns.adobe.com/exif/1.0/
- The preferred field namespace prefix is exif

**Table A.3 — Flash fields**

| Name | Type | Description |
|---|---|---|
| **exif:Fired** | Boolean | True if flash fired. |
| **exif:Function** | Boolean | True if flash function is not present. |

| | | |
|---|---|---|
| **exif:Mode** | Closed choice of Integer | The flash mode. One of:<br><br>0 = unknown<br>1 = compulsory flash firing<br>2 = compulsory flash suppression<br>3 = auto mode |
| **exif:RedEyeMode** | Boolean | True if red-eye reduction is supported. |
| **exif:Return** | Closed choice of Integer | Whether strobe return is supported and if supported, detected. One of:<br>0 = no strobe return detection<br>2 = strobe return light not detected<br>3 = strobe return light detected |

#### A.2.4.4 GPSCoodinate

Value type of GPSCoodinate is a Text value in the form "*DDD,MM,SSk*" or "*DDD,MM.mmk*", where:

- *DDD* is a number of degrees
- *MM* is a number of minutes
- *SS* is a number of seconds
- *mm* is a fraction of minutes
- *k* is a single character N, S, E, or W indicating a direction (north, south, east, west)

Leading zeros are not necessary for the for *DDD*, *MM*, and *SS* values. The *DDD,MM.mmk* form should be used when any of the native Exif component rational values has a denominator other than 1. There can be any number of fractional digits.

#### A.2.4.5 OECF/SFR

Value type of OECF/SFR is a structure describing the OECF/SFR.

- The field namespace URI is http://ns.adobe.com/exif/1.0/
- The preferred field namespace prefix is exif

**Table A.4 — OECF/SFR fields**

| Name | Type | Description |
|---|---|---|
| **exif:Columus** | Integer | Number of columns, *n* |
| **exif:Names** | Ordered array of Text | Column item names, *n* entries |
| **exif:Rows** | Integer | Number of rows, *m* |

| | | |
|---|---|---|
| **exif:Values** | Ordered array of Rational | OECF/SFR values, sequence should be, in order:<br>value [0,0]<br>...<br>value [*n* − 1, 0]<br>value [0, *m* − 1]<br>...<br>value [*n* − 1, *m* − 1] |

#### A.2.4.6 Rational

To represent Exif rational values in XMP, they must be converted to text. The recommended approach is to use a value of type Text of the form *numerator* /*denominator*. For example, the value 2/3 becomes the text value "2/3" when converted to XMP.

#### A.2.4.7 SourceExposureTimesOfCompositeImage

Value type of SourceExposureTimesOfCompositeImage is a structure describing the number of the source images (tentatively recorded images) captured for a composite Image.

- The field namespace URI is http://cipa.jp/exif/2.32/
- The preferred field namespace prefix is **exifEX**

**Table A.5 — SourceExposureTimesOfCompositeImage**

| Name | Type | Description |
|---|---|---|
| **exifEX:TotalExposurePeriod** | Rational | Total exposure period (from the first beginning of exposure to the last ending of exposure, including non-exposure periods). |
| **exifEX:SumOfExposureTimesOfAll** | Rational | Sum of respective exposure times of all source images. |
| **exifEX:SumOfExposureTimesOfUsed** | Rational | Sum of respective exposure times of used source images. |
| **exifEX:MaxExposureTimesOfAll** | Rational | Max exposure time of all source images. |
| **exifEX:MaxExposureTimesOfUsed** | Rational | Max exposure time of used source images. |
| **exifEX:MinExposureTimesOfAll** | Rational | Minimum exposure time of all source images. |
| **exifEX:MinExposureTimesOfUsed** | Rational | Minimum exposure time of used source images. |
| **exifEX:NumberOfSequences** | Integer | Number of sequences: m (m ≥ 1) |
| **exifEX:NumberOfImagesInSequences** | Integer | Number of source images in the sequence: n (n x m ≥ 2) |
| **exifEX:Values** | Ordered array of | Exposure time of the source image.<br>Exposure time of the 1st source |

| | | |
|---|---|---|
| | rational | image.<br>Exposure time of the 2nd source image.<br>Exposure time of the 3rd source image.<br>...<br>Exposure time of the n-th source image.<br><br>Repeat above m times. |

# Bibliography


[1] ISO 12231: 1997 Photography - Electronic still picture imaging – Vocabulary

[2] TIFF (Tag Image File Format), Revision 6.0, June 1992, Adobe Systems Incorporated

[3] The Adobe Systems XMP Specification Part 2, July 2010

[4] CIPA DC-009-2010 “Design rule for Camera File system: DCF: Version 2.0 (Edition 2010)"

## Participating members

The bulk of the deliberations over the formulation of the standards described in this document was performed by the Standard Development Working Group.

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| NIKON CORPORATION | Hokoi Hayato |
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| Olympus Corporation | Yoshida Hideaki |
| Panasonic Corporation | Fukushima Tsumoru |
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| Sony Imaging Products & Solutions Inc. | Kanehashi Kenichi |
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Please refer to the past edition (available on CIPA WEB) for past deliberation members.

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