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Exif 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

Date	Comments
January, 2012	Published First Edition 2.3
August, 2017	Published Revision 2.31 Added mapping with newly defined metadata in Exif 2.31 Corrected misprints
April, 2020	Published Revision 2.32 Added mapping with newly defined metadata in Exif 2.32 Updated Table 1, Table 6 and Annex A Added Table A.5 Updated normative references Corrected misprints
January, 2024	Published 2024 Edition Changed the namespace URI of “exifEX:” properties in clause 5.1 and 7.2 (Table 1 and 6) Changed value type of three properties from ProperName to Text in clause 6.6 (Table 5) Changed description of DateTimeOriginal and description and value type of DateTimeDigitized in clause 7.8 (Table 12) Divided Table 13 to Tables 13 and 14 (former Table 14 became Table 15) Added mapping with newly defined metadata in Exif 3.0 (clause 7.11; Table 15) and new sections of annotation metadata (clause 10 and annex C) in Exif 3.0 Deleted clause A.2.3.4 “ProperName” Added new informative Annexes B and C. Updated normative references and bibliography 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.

Further, this standard also defines XMP properties for Annotation Data defined in Exif Standard.

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 9834-8, *Information technology — Procedures for the operation of object identifier registration authorities — Part 8: Generation of universally unique identifiers (UUIDs) and their use in object identifiers*

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
https://www.w3.org/TR/REC-xml-names/

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

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

CIPA DC-008-2023 Exchangeable image file format for digital still cameras : Exif Version 3.0
https://www.cipa.jp/e/std/std-sec.html

3 Terms and definitions

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

3.1
DCF
an abbreviation of "Design rule for camera file system"

3.2
DSC
an abbreviation of "Digital still camera"

3.3
Exif
an abbreviation of "Exchangeable image file format for digital still cameras"

3.4
property
named container for a metadata value at the top level of an XMP packet

3.5
tag
a field of ancillary data about an image which corresponds to "field" in TIFF

3.6
thumbnail
a small image used to index a primary image

3.7
URI
Uniform Resource Identifier as defined in IETF RFC 3986

4 General

Mappings between the tag based Exif metadata and the corresponding XMP properties are defined in the following clauses. They appear in the identical orders in the mapping tables 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. Blue cells in the mapping tables indicate they are not used in XMP relevant to Exif 3.0.

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. These rules do not apply to the annotation properties.

NOTE Tag 34855 PhotographicSensitivity is a special case. The Exif count is ANY for historical reasons, Exif 3.0 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. To record Exif metadata with XMP names, at least one of the following namespaces shall be used. The URIs shall be as in Table 1 and the preferred namespace prefixes should be as in Table 1. Choice of XMP names in each namespace to be recorded is optional.

XML namespace and URI are defined in W3C Recommendation, *Namespaces in XML 1.0 (Third Edition),*

December 8, 2009 and IETF RFC 3986 respectively and this document follows the definitions.

Table 1 — Namespaces used in Exif metadata

Name	URI	Recommended prefix
Exif 2.21 or later	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 3.0 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-derived metadata

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 3.0 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: 1 = Uncompressed 6 = JPEG.	**tiff:Compression**	Closed choice of Integer
PhotometricInterpretation	262	106	Pixel Composition: 2 = RGB 6 = YCbCr.	**tiff: PhotometricInterpretation**	Closed choice of Integer
Orientation	274	112	Orientation: 1 = 0th row at top, 0th column at left 2 = 0th row at top, 0th column at right 3 = 0th row at bottom, 0th column at right 4 = 0th row at bottom, 0th column at left 5 = 0th row at left, 0th column at top 6 = 0th row at right, 0th column at top 7 = 0th row at right, 0th column at bottom 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
XResolution	282	11A	Horizontal resolution in pixels per ResolutionUnit.	**tiff:XResolution**	Rational
YResolution	283	11B	Vertical resolution in pixels per ResolutionUnit.	**tiff:YResolution**	Rational
PlanarConfiguration	284	11C	Data layout 1 = chunky 2 = planar	**tiff:PlanarConfiguration**	Closed choice of Integer

ResolutionUnit	296	128	Unit used for XResolution and YResolution. Value is one of: 2 = inches 3 = centimeters	**tiff:ResolutionUnit**	Closed choice of Integer
YCbCrSubSampling	530	212	Sampling ratio of chrominance components: [2, 1] = YCbCr4:2:2 [2, 2] = YCbCr4:2:0	**tiff:YCbCrSubSampling**	Closed choice of ordered array of Integer
YCbCrPositioning	531	213	Position of chrominance vs. Luminance components: 1 = centered 2 = co-sited	**tiff:YCbCrPositioning**	Closed choice of Integer

6.4 Properties for recording offset

No mapping to XMP property is given to each of the following tag fields that relates to configuration of Exif image files since they are Exif file format specific.

StripOffsets
RowsPerStrip
StripByteCounts
JPEGInterchangeFormat
JPEGInterchangeFormatLength
Exif IFD Pointer
GPSInfo IFD Pointer
Interoperability IFD Pointer

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 3.0 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 3.0 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 content description of the image as an ASCII or UTF-8 string.	**dc:description**	Language Alternative
Make	271	10F	Manufacturer of recording equipment as an ASCII or UTF-8 string.	**tiff:Make**	Text
Model	272	110	Model name or number of the equipment as an ASCII or UTF-8 string.	**tiff:Model**	Text
Software	305	131	Software or firmware used to generate image as an ASCII or UTF-8 string	**xmp:CreatorTool**	Agent-Name

Artist	315	13B	The name of the main person who created the image as an ASCII or UTF-8 string	**dc:creator**	Ordered array of Text
Copyright	33432	8298	Copyright information as an ASCII or UTF-8 string	**dc:rights**	Language Alternative

7 Mapping for Exif specific data

7.1 Overview

The following clauses define the properties for Exif specific metadata.

7.2 Namespace and prefix

Namespaces in Table 6 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 2.21 or later	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

NOTE: The namespace http://cipa.jp/exif/2.32/ in the previous version of this document is no longer used. Some of the tag fields for picture-taking condition were mapped to the XMP properties in the abandoned namespace in the previous version. They are now mapped to XMP properties and a value in the namespace http://cipa.jp/exif/1.0/. The names and description of the tag fields, the local names and the value type of such XMP properties remain the same to the ones in the http://cipa.jp/exif/2.32/ but theoretically the same local names in the previous and current namespaces are considered to have no logical connection by the rule of the namespace extension in XMP.

The tag fields names described in the above NOTE are found in Table 13:

CompositeImage
SourceImageNumberOfCompositeImage
SourceExposureTimesOfCompositeImage

The value type described in the above NOTE is found in clause A.2.4.7:

SourceExposureTimesOfCompositeImage

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 information

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
ExifVersion	36864	9000	Exif version number. Version 3.0 is written as "0300".	**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: 1 = sRGB 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: 4 5 6 0 (if RGB uncompressed data), 1 2 3 0 (other cases). 0 = does not exist 1 = Y 2 = Cb 3 = Cr 4 = R 5 = G	**exif: ComponentsConfiguration**	Closed choice of ordered array of Integer

			6 = B		
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.	**No mapping given** [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 image was captured, 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 , 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** [a]	Date
DateTimeDigitized	36868	9004	The date and time when the image was stored as digital data stored in ISO 8601 format, not in the original Exif format. This property includes the value for the Exif SubSecTimeDigitized (37522, 0x9292) attribute.	**exif:DateTimeDigitized** [b]	Date
OffsetTime	36880	9010	Offset from UTC of the time of DateTime.	**No mapping given** [c]	-
OffsetTimeOriginal	36881	9011	Offset from UTC of the time of DateTimeOriginal.	**No mapping given** [c]	-
OffsetTimeDigitized	36882	9012	Offset from UTC of the time of DateTimeDigitized.	**No mapping given** [c]	-
SubSecTime	37520	9290	Fractions of seconds for the DateTime. Merged to DateTime.	**No mapping given** [c]	-

SubSecTimeOriginal	37521	9291	Fractions of seconds for the DateTime-Original. Merged to DateTimeOriginal.	**No mapping given** [c]	-
SubSecTimeDigitized	37522	9292	Fractions of seconds for the DateTime-Digitized. Merged to DateTimeDigitized.	**No mapping given** [c]	-

a This XMP name is given only for backward compatibility purpose and obsolete in this version of this document. It is recommended to use the XMP name **exif:DateTimeDigitized** for this field.

b For DSC, **DateTimeDigitized** will have the same content as **DateTimeOriginal**. For film scan, the date and time when the film was scanned and stored as digital data are recorded for **DateTimeDigitized**.

c 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

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

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: 0 = not defined 1 = Manual 2 = Normal program 3 = Aperture priority 4 = Shutter priority 5 = Creative program 6 = Action program 7 = Portrait mode 8 = Landscape mode	**exif:ExposureProgram**	Closed choice of Integer
SpectralSensitivity	34852	8824	Spectral sensitivity of each channel by an ASTM standard.	**exif: SpectralSensitivity**	Text

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
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.	**exif:ISOSpeedRatings** [b]	Ordered array of Integer
OECF	34856	8828	Opto-Electronic Conversion Function as specified in ISO 14524.	**exif:OECF**	OECF/ SFR
SensitivityType	34864	8830	Indicates which one of the parameters of ISO12232 is used for PhotographicSensitivity: 0 = Unknown 1 = Standard output sensitivity (SOS) 2 = Recommended exposure index (REI) 3 = ISO speed 4 = Standard output sensitivity (SOS) and recommended exposure index (REI) 5 = Standard output sensitivity (SOS) and ISO speed 6 = Recommended exposure index (REI) and ISO speed 7 = Standard output sensitivity (SOS) and recommended exposure index (REI) and ISO speed	**exifEX:SensitivityType**	Closed choice of Integer

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
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
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

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
MeteringMode	37383	9207	Metering mode: 0 = unknown 1 = Average 2 = Center Weighted Average 3 = Spot 4 = Multi Spot 5 = Pattern 6 = Partial 255 = other	**exif:MeteringMode**	Closed choice of Integer
LightSource	37384	9208	Light source: 0 = unknown 1 = Daylight 2 = Fluorescent 3 = Tungsten 4 = Flash 9 = Fine weather 10 = Cloudy weather 11 = Shade 12 = Daylight fluorescent (D 5700 – 7100K) 13 = Day white fluorescent (N 4600 – 5500K) 14 = Cool white fluorescent (W 3800 – 4500K) 15 = White fluorescent (WW 3250 – 3800K) 16 = Warm white fluorescent (L2600 - 3250K) 17 = Standard light A 18 = Standard light B 19 = Standard light C 20 = D55 21 = D65 22 = D75 23 = D50 24 = ISO studio tungsten 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

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
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
FocalPlaneYResolution	41487	A20F	Vertical focal resolution, measured pixels per FocalPlaneResolution Unit.	**exif: FocalPlaneYResolution**	Rational
FocalPlaneResolutionUnit	41488	A210	Unit used for FocalPlaneXResolution and FocalPlaneYResolution: 2 = inches 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: 1 = Not defined 2 = One-chip colour area sensor 3 = Two-chip colour area sensor 4 = Three-chip colour area sensor 5 = Colour sequential area sensor 7 = Trilinear sensor 8 = Colour sequential linear sensor	**exif:SensingMethod**	Closed choice of Integer

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
FileSource	41728	A300	Indicates image source: 0 = others 1 = scanner of transparent type 2 = scanner of reflex type 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: 0 = Normal process 1 = Custom process	**exif:CustomRendered**	Closed choice of Integer
ExposureMode	41986	A402	Indicates the exposure mode set when the image was shot: 0 = Auto exposure 1 = Manual exposure 2 = Auto bracket	**exif:ExposureMode**	Closed choice of Integer
WhiteBalance	41987	A403	Indicates the white balance mode set when the image was shot: 0 = Auto white balance 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 0 means the focal length is unknown.	**exif: FocalLengthIn35mmFilm**	Integer

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
SceneCaptureType	41990	A406	Indicates the type of scene shot: 0 = Standard 1 = Landscape 2 = Portrait 3 = Night scene	**exif:SceneCaptureType**	Closed choice of Integer
GainControl	41991	A407	Indicates the degree of overall image gain adjustment: 0 = None 1 = Low gain up 2 = High gain up 3 = Low gain down 4 = High gain down	**exif:GainControl**	Closed choice of Integer
Contrast	41992	A408	Indicates the direction of contrast processing applied by the camera: 0 = Normal 1 = Soft 2 = Hard	**exif:Contrast**	Closed choice of Integer
Saturation	41993	A409	Indicates the direction of saturation processing applied by the camera: 0 = Normal 1 = Low saturation 2 = High saturation	**exif:Saturation**	Closed choice of Integer
Sharpness	41994	A40A	Indicates the direction of sharpness processing applied by the camera: 0 = Normal 1 = Soft 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

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
SubjectDistanceRange	41996	A40C	Indicates the distance to the subject: 0 = Unknown 1 = Macro 2 = Close view 3 = Distant view	**exif: SubjectDistanceRange**	Closed choice of Integer
CompositeImage	42080	A460	Indicates whether the recorded image is a composite image* or not. * A composite image generated from multiple taken images (source images) is subjected 1 = non-composite image 2 = General composite image 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
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. b It is not recommended to use this property to indicate sensitivity. The mapping is given only for backward compatibility purpose.					

7.10 Properties for shooting situation

Table 14 lists the properties for shooting situation. Mapping between the tag based metadata and the XML

properties shall follow the list in Table 14.

Table 14 — Exif properties for shooting situation

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
Temperature	37888	9400	Temperature as the ambient situation at the shot. The unit is °C	**exifEX:Temperature**	Rational
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

7.11 Other properties

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 other information

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
ImageUniqueID [a]	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** [a]	Text

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
ImageUniqueID	42016	A420	An identifier assigned uniquely to each image recorded as an ASCII string in hexadecimal notation equivalent to 128-bit fixed length UUID compliant with ISO/IEC 9834-8.	**exifEX:ImageUniqueID**	GUID
CameraOwnerName	42032	A430	This tag records the owner of a camera used in photography as a text string.	**exifEX:CameraOwnerName**	Proper-Name
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 a text string.	**exifEX:LensMake**	Text
LensModel	42036	A434	Records the lens's model name and model number as a text string.	**exifEX:LensModel**	Text

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
LensSerialNumber	42037	A435	This tag records the serial number of the interchangeable lens that was used in photography	**exifEX:LensSerialNumber**	Text
ImageTitle	42038	A436	Title of the image as a text string	**exifEX:ImageTitle**	Text
Photographer	42039	A437	The name of the photographer as a text string	**exifEX:Photographer**	Text
ImageEditor	42040	A438	The name of the main person who edited the image as a text string	**exifEX:ImageEditor**	Text
CameraFirmware	42041	A439	The name and version of the software or firmware of the camera as a text string	**exifEX:CameraFirmware**	Text
RAWDevelopingSoftware	42042	A43A	The name and version of the software used to develop the RAW image as a text string	**exifEX: RAWDevelopingSoftware**	Text
ImageEditingSoftware	42043	A43B	The name and version of the main software used for processing and editing the image as a text string	**exifEX: ImageEditingSoftware**	Text
MetadataEditingSoftware	42044	A43C	The name and version of one software used to edit the metadata as a text string	**exifEX: MetadataEditingSoftware**	Text

[a] Field definition of 42016 ImageUniqueID tag is changed in Exif 3.0. The mapping is given only for backward compatibility purpose.

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

Namespaces in Table 16 are used in the scope of GPS information metadata. When using those XML namespaces, the URIs shall be as in Table 16 and the preferred namespace prefixes should be as in Table 16.

Table 16 — Namespaces used in GPS metadata

Name	URI	Recommended prefix
Exif 2.21 or later	http://cipa.jp/exif/1.0/	exifEX
Exif 2.2 or earlier	http://ns.adobe.com/exif/1.0/	exif

8.3 Properties for GPS information

Table 17 lists the properties of other Exif information. Mapping between the tag based metadata and the XML properties shall follow the list in Table 17.

Table 17 — 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 “2.4.0.0”.	**exif:GPSVersionID**	Text
GPSLatitudeRef	1	1	Indicates whether the latitude is north or south latitude. Merged to GPSLatitude.	**No mapping given** [a]	-
GPSLatitude	2	2	Indicates latitude of the shootin location. Consists of position and North/South.	**exif:GPSLatitude**	GPSCoordinate
GPSLongitudeRef	3	3	Indicates whether the longitude is east or west longitude. Merged to GPSLongitude.	**No mapping given** [a]	-
GPSLongitude	4	4	Indicates longitude of the shooting location. Consists of position and East/West.	**exif:GPSLongitude**	GPSCoordinate

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
GPSAltitudeRef [b]	5	5	Indicates whether the altitude is above or below sea level: 0 = Above sea level 1 = Below sea level	**exif:GPSAltitudeRef** [b]	Closed choice of Integer
GPSAltitudeRef	5	5	Indicates the altitude of shooting location used as the reference altitude. 0 = Positive ellipsoidal height (at or above ellipsoidal surface) 1 = Negative ellipsoidal height (below ellipsoidal surface) 2 = Positive sea level value (at or above sea level reference) 3 = Negative sea level value (below sea level reference)	**exifEX:GPSAltitudeRef**	Closed choice of Integer
GPSAltitude	6	6	Indicates altitude of the shooting location 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: "A" = measurement in progress "V" = measurement interrupted	**exif:GPSStatus**	Closed choice of Text
GPSMeasureMode	10	A	GPS measurement mode: "2" = two-dimensional measurement "3" = three-dimensional measurement	**exif: GPSMeasureMode**	Closed choice of Integer
GPSDOP	11	B	Degree of precision for GPS data.	**exif:GPSDOP**	Rational

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
GPSSpeedRef	12	C	Units used to speed measurement: "K" = kilometers per hour "M" = miles per hour "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: "T" = true direction "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: "T" = true direction "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	**No mapping given** [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.	**No mapping given** [a]	-
GPSDestLongitude	22	16	Indicates destination longitude. Consists of position and East/West.	**exif: GPSDestLongitude**	GPSCoordinate

Exif field name	Tag ID		Description	XMP name	Type
	Dec	Hex			
GPSDestBearingRef	23	17	Reference for movement direction: "T" = true direction "M" = magnetic direction	**exif: GPSDestBearingRef**	Closed choice of Text
GPSDestBearing	24	18	Destination bearing, values from 0 to 359.99.	**exif:GPSDestBearing**	Rational
GPSDestDistanceRef	25	19	Units used for distance measurement: "K" = kilometers "M" = miles "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. Examples are found in clause 4.6.7.1.28 of Exif 3.0 Specification (CiPA DC-008-2023).	**exif: GPSProcessingMethod**	Text
GPSAreaInformation	28	1C	A 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.	**No mapping given** [a]	-
GPSDifferential	30	1E	Indicates whether differential correction is applied to the GPS receiver: 0 = Without correction 1 = Correction applied	**exif:GPSDifferential**	Closed choice of Integer
GPSHPositioningError	31	1F	Indicates horizontal positioning errors in meters.	**exif:GPSHPositioning-Error**	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] Field definition of 5 GPSAltitudeRef tag is changed in Exif 3.0. The mapping is given only for backward compatibility purpose.

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

Namespace in Table 2 is used in the scope of Exif interoperability metadata. When using the XML namespace, the URIs shall be as in Table 18 and the preferred namespace prefixes should be: exifEX.

Table 18 — Exif namespace used in Exif interoperability metadata

Name	URI	Recommended prefix
Exif 2.21 or later	http://cipa.jp/exif/1.0/	exifEX

9.3 Property for interoperability

Table 19 lists the property of interoperability. Mapping between the tag based metadata and the XML property shall follow the list in Table 19.

Table 19 — Exif properties for interoperability

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). "THM" = Indicates a file conforming to DCF thumbnail file stipulated by Design rule for Camera File System. “R03” = Indicates a file conforming to DCF Option File stipulated by Design rule for Camera File System.	**exifEX: InteroprabilityIndex**	Closed choice of Text

10 XMP names for Annotation Data

10.1 Namespace and prefix

Namespaces in Table 20 are used in the scope of Exif metadata. Recording the annotation metadata is optional, but when using those XML namespaces, the URIs shall be as in Table 20 and the preferred namespace prefixes should be as in Table 20.

Table 20 — Namespaces used in Exif metadata

Name	URI	Recommended prefix
Exif 2.21 or later	http://cipa.jp/exif/1.0/	exifEX
Dublin Core	http://purl.org/dc/elements/1.1/	dc

10.2 Property for Annotation Data

10.2.1 General

Clause 10.2 defines the description of annotation metadata. For further details of annotation metadata, see clause 6.2; Annotation Data of the “CIPA DC-008” also. Requirements of each XMP name in the following clauses is applicable when the Annotation Data is recorded as a part of Exif metadata.

10.2.2 Annotation

Annotations shall be described within the exifEX:ExifAN (Exif ANotation metadata) with a complex value type of configurationoflayers as defined in Table 21..

Table 21 — Annotation field

Name	Type	Description
exifEX:exifAN	Unordered array of Layer	Annotation defines wrapper structure of annotation metadata with one or more Layer(s).

10.2.3 Layer related properties

10.2.3.1 Layer

A structure containing the characteristics of a layer and region. Layer fields are defined in Table 22. Among the fields in the structure, dc:title, exifEX:ANW, exifEX:ANH are optional.

Table 22 — Layer fields

Name	Type	Description
dc:title	Text	Title of a layer
exifEX:ANW	Closed choice of ANF	Denormalization factor for image width.
exifEX:ANH	Closed choice of ANF	Denormalization factor for image height.
exifEX:region	Unordered array of Region	One or more Region(s) and its description as an annotation text

When the values exifEX:ANW and/or exifEX:ANH are empty, its/their value(s) shall be considered to be the same to the pixel value(s) of the main image.

10.2.3.2 ANF

ANF is a complex value as a part of Layer structure. ANF fields are defined in Table 23.

Table 23 — ANF fields

Name	Type	Description
exifEX:ANF1	Text	Value is “1” when the location values are normalized to the range from 0 to 1.
exifEX:ANF100	Text	Value is “100” when the location values are expressed as a percentage or position when image width (height) is 100
exifEX:ANFP	Text	Number of pixels of image width or height

10.2.4 Region related properties

10.2.4.1 Region

Region is a complex value as a part of Layer structure which is an unordered array and consists of a Closed choice of Regionshape and an annotation text as defined in Table 24.

Table 24 — Region fields

Name	Type	Description
exifEX:regionshape	Closed choice of Regionshape	The shape of the boundary of a region inside an image.
dc:description	Text	Annotation text of a region.

10.2.4.2 Regionshape

Regionshape fields are defined in Table 25.

Table 25 — Regionshape fields

Name	Type	Description
exifEX:rectangle	Rectangle	A structure which indicates size and location of a rectangular region. See clause 10.2.4.3.
exifEX:multiplepoints	Multiplepoints	Location of points related to an annotation metadata. See clause 10.2.5.1.
exifEX:line	Multiplepoints	End points of a line or all the points of a polyline. See clause 10.2.4.4.
exifEX:polygon	Multiplepoints	A polygon region expressed by the locations of all the

		corner points. See clause 10.2.4.5.
exifEX:circle	Circle	A structure which indicates size and location of a circle region. See clause 10.2.4.6.
exifEX:ellipse	Ellipse	A structure which indicates size, angle of major axis and location of an ellipse region. See clause 10.2.4.7.
exifEX:whole	Text	A blank text depicts the entire image. See clause 10.2.4.8.

10.2.4.3 Rectangle

Rectangle fields are defined in Table 26.

Size and location of a rectangle shall be expressed with one of the following two methods:

1) With the upper left corner position (exifEX:UX, exifEX:UY) and the lower right corner position (exifEX:BX, exifEX:BY) of the rectangle
2) With the upper left corner position (exifEX:UX, exifEX:UY), and the width (exifEX:W) and the height (exifEX:H) of the rectangle.

Table 26 — Rectangle fields

Name	Type	Description
exifEX:UX	Text	The value obtained by multiplying the horizontal reference width ANW by the horizontal position value of the upper left corner of the rectangle normalized to 0 to 1 in the horizontal direction in the image.
exifEX:UY	Text	The value obtained by multiplying the vertical reference height ANH by the vertical position value of the upper left corner of the rectangle normalized to 0 to 1 in the vertical direction in the image.
exifEX:BX	Text	The value obtained by multiplying the horizontal reference width ANW by the horizontal position value of the lower right corner of the rectangle normalized to 0 to 1 in the horizontal direction in the image.
exifEX:BY	Text	The value obtained by multiplying the vertical reference height ANH by the vertical position value of the lower right corner of the rectangle normalized to 0 to 1 in the vertical direction in the image.
exifEX:W	Text	The value obtained by multiplying the horizontal reference width ANW by the horizontal width value of the rectangle normalized to 0 to 1 in the horizontal direction in the image.
exifEX:H	Text	The value obtained by multiplying the vertical reference height ANH by the vertical height value of the rectangle normalized to 0 to 1 in the vertical direction in the image.

10.2.4.4 Line

Line is constructed by describing the positions of all vertices of a polyline using Multiplepoints, and the polyline is connecting the points in the order in which the Points are described. For Multiplepoints see clause 10.2.5.1

10.2.4.5 Polygon

Polygon is described by the positions of all corners of the polygon using Multipoints and the polygon is defined by the polyline line described by Multipoints and a line connecting the last point and the first point. For Multiplepoints see clause 10.2.5.1.

10.2.4.6 Circle

Circle fields are defined in Table 27.

Table 27 — Circle fields

Name	Type	Description
exifEX:CX	Text	The value obtained by multiplying the horizontal reference width ANW by the horizontal position value of the center point of the circle normalized to 0 to 1 in the horizontal direction in the image.
exifEX:CY	Text	The value obtained by multiplying the vertical reference height ANH by the vertical position value of the center point of the circle normalized to 0 to 1 in the vertical direction in the image.
exifEX:R	Text	The value obtained by multiplying the horizontal reference width ANW by the radius value of the circle normalized to 0 to 1 in the horizontal direction in the image.

10.2.4.7 Ellipse

Ellipse fields are defined in Table 28.

Table 28 — Ellipse fields

Name	Type	Description
exifEX:CX	Text	The value obtained by multiplying the horizontal reference width ANW by the horizontal position value of the ellipse center point normalized to 0 to 1 in the horizontal direction in the image.
exifEX:CY	Text	The value obtained by multiplying the vertical reference height ANH by the vertical position value of the ellipse center point normalized to 0 to 1 in the vertical direction in the image.
exifEX:LR	Text	The value obtained by multiplying the horizontal reference width ANW by the value of the ellipse long radius normalized to 0 to 1 in the horizontal direction in the image.
exifEX:SR	Text	The value obtained by multiplying the horizontal reference width ANW by the value of the ellipse short radius normalized to 0 to 1 in the horizontal direction in the image.

exifEX:L	Text	The value obtained by multiplying the horizontal reference width ANW by the value of the ellipse long diameter normalized to 0 to 1 in the horizontal direction in the image.
exifEX:S	Text	The value obtained by multiplying the horizontal reference width ANW by the value of the ellipse short diameter normalized to 0 to 1 in the horizontal direction in the image.
exifEX:Angle	Text	Indicates the rotational angle of the ellipse in the image and is specified by the clockwise angle (degrees) to the major axis with 0 degrees as the X axis direction

10.2.4.8 Whole

Entire image as Regionshape entry. Text value is always blank.

10.2.5 Multiple points related properties

10.2.5.1 Multiplepoints

Multiplepoints field is defined in Table 29.

Table 29 — Multiplepoints fields

Name	Type	Description
exifEX:multiplepoints	Ordered array of point	The location(s) of one or more Point(s)

10.2.5.2 Point

Point field is defined in Table 30.

Table 30 — Point field

Name	Type	Description
exifEX:point	Text	The location of a point defined as X and Y coordinate values in text string in the order of X value and Y value separated by ",". The X value is obtained by multiplying the horizontal reference width ANW by the horizontal position value of the point normalized to 0 to 1 in the horizontal direction in the image. The Y value is obtained by multiplying the vertical reference height ANH by the vertical position value of the point normalized to 0 to 1 in the vertical direction in the image.

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 consist of basic and derived value types and they 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. The Unicode string shall be UTF-8 which is defined in ISO/IEC 10464-1.

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 GUID

An ASCII string of 128-bit fixed length hexadecimal notation representing a “globally unique identifier” compliant with ISO/IEC 9834-8.

A.2.3.4 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.2.4 Exif namespace value types

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: value [0,0] ... value [n − 1, 0] value [0, m − 1] ... 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: 0 = unknown 1 = compulsory flash firing 2 = compulsory flash suppression 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: 0 = no strobe return detection 2 = strobe return light not detected 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: value [0,0] ... value [*n* − 1, 0] value [0, *m* − 1] ... 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/1.0/

・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 rational	Exposure time of the source image.
		`Exposure time of the 1st source image.`
		`Exposure time of the 2nd source image.`
		`Exposure time of the 3rd source image.`
		`...`
		`Exposure time of the n-th source image.`
		
		`Repeat above m times.`

Annex B
(Informative)

Serialization of XMP of annotation data

B.1 RDF/XML serialization

RDF/XML serialization of XMP was defined in ISO 16684-1:2012. See a sample in clause C.1.2.

B.2 JSON-LD serialization

In addition, JSON-LD serialization of XMP was defined in ISO 16884-3:2021. See a sample in clause C.1.3.

JSON-LD is a World Wide Web Consortium (W3C) Recommendation, which is a lightweight syntax to serialize Linked Data in JSON (RFC4627).

Annex C
(Informative)

Sample codes of annotation data

C.1 XMP sample

C.1.1 Overview

The following clauses show sample XMP and JSON-LD serializations related to annotations. RDF and JSON-LD based serializations are defined in ISO 16684-1 and 16684-3 respectively.

C.1.2 XMP

```
<?xpacket begin="□" id="W5M0MpCehiHzreSzNTczkc9d"?>
  <x:xmpmeta xmlns:x="adobe:ns:meta/" x:xmptk="XMP Core 5.5.0">
    <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">
      <rdf:Description rdf:about=""
        xmlns:exifEX="http://cipa.jp/exif/1.0/"
        xmlns:exif="http://ns.adobe.com/exif/1.0/"
        xmlns:dc="http://purl.org/dc/elements/1.1/">
        <exifEX:ExifAN>
          <dc:title>Example of layer</dc:title>
          <exifEX:ANW>
            <exifEX:ANFP>3000</exifEX:ANFP>
          </exifEX:ANW>
          <exifEX:ANH>
            <exifEX:ANFP>2000</exifEX:ANFP>
          </exifEX:ANH>
          <exifEX:region>
            <exifEX:regionshape>
              <exifEX:rectangle>
                <exifEX:UX>1200</exifEX:UX>
                <exifEX:UY>400</exifEX:UY>
                <exifEX:BX>1800</exifEX:BX>
                <exifEX:BY>800</exifEX:BY>
              </exifEX:rectangle>
            </exifEX:regionshape>
            <dc:description>Examples of rectangle shape</dc:description>
          </exifEX:region>
          <exifEX:region>
            <exifEX:regionshape>
              <exifEX:multiplepoints>
                <exifEX:point>300,500</exifEX:point>
                <exifEX:point>500,300</exifEX:point>
                <exifEX:point>600,600</exifEX:point>
                <exifEX:point>800,500</exifEX:point>
              </exifEX:multiplepoints>
            </exifEX:regionshape>
            <dc:description>Example of point shape</dc:description>
          </exifEX:region>
          <exifEX:region>
```

```
      <exifEX:regionshape>
        <exifEX:line>
          <exifEX:multiplepoints>
            <exifEX:point>300,1300</exifEX:point>
            <exifEX:point>500,1100</exifEX:point>
            <exifEX:point>600,1500</exifEX:point>
            <exifEX:point>800,1000</exifEX:point>
          </exifEX:multiplepoints>
        </exifEX:line>
      </exifEX:regionshape>
      <dc:description>Example of polygonal line shape</dc:description>
    </exifEX:region>
    <exifEX:region>
      <exifEX:regionshape>
        <exifEX:polygon>
          <exifEX:multiplepoints>
            <exifEX:point>1300,1200</exifEX:point>
            <exifEX:point>1500,1300</exifEX:point>
            <exifEX:point>1500,1500</exifEX:point>
            <exifEX:point>1300,1600</exifEX:point>
            <exifEX:point>1100,1500</exifEX:point>
            <exifEX:point>1100,1300</exifEX:point>
          </exifEX:multiplepoints>
        </exifEX:polygon>
      </exifEX:regionshape>
      <dc:description>Example of polygon shape</dc:description>
    </exifEX:region>
    <exifEX:region>
      <exifEX:regionshape>
        <exifEX:circle>
          <exifEX:CX>2400</exifEX:CX>
          <exifEX:CY>500</exifEX:CY>
          <exifEX:R>300</exifEX:R>
        </exifEX:circle>
      </exifEX:regionshape>
      <dc:description>Example of circle shape</dc:description>
    </exifEX:region>
    <exifEX:region>
      <exifEX:regionshape>
        <exifEX:ellipse>
          <exifEX:CX>2400</exifEX:CX>
          <exifEX:CY>1500</exifEX:CY>
          <exifEX:LR>300</exifEX:LR>
          <exifEX:SR>200</exifEX:SR>
          <exifEX:Angle>45</exifEX:Angle>
        </exifEX:ellipse>
      </exifEX:regionshape>
      <dc:description>Example of ellipse shape</dc:description>
    </exifEX:region>
    <exifEX:region>
      <exifEX:regionshape>
        <exifEX:whole></exifEX:whole>
      </exifEX:regionshape>
      <dc:description>Example of whole shape</dc:description>
    </exifEX:region>
  </exifEX:ExifAN>
</rdf:Description>
```

```
    </rdf:RDF>
  </x:xmpmeta>
<?xpacket end="w"?>
```

C.1.3 JSON-LD

```
{
  "@context":{
    "exifEX":"http://cipa.jp/exif/1.0/",
    "exif":"http://ns.adobe.com/exif/1.0/",
    "dc":"http://purl.org/dc/elements/1.1/"
  },
  "exifEX:ExifAN":{
    "@set":[
      {
        "dc:title":"Example of layer",
        "exifEX:ANW":{
          "exifEX:ANFP":"3000"
        },
        "exifEX:ANH":{
          "exifEX:ANFP":"2000"
        },
        "exifEX:region":{
          "@set":[
            {
              "exifEX:regionshape":{
                "exifEX:rectangle":{
                  "exifEX:UX":"1200",
                  "exifEX:UY":"400",
                  "exifEX:BX":"1800",
                  "exifEX:BY":"800"
                }
              },
              "dc:description":"Examples of rectangle shape"
            },
            {
              "exifEX:regionshape":{
                "exifEX:multiplepoints":{
                  "@list":[
                    {"exifEX:point":"300,500"},
                    {"exifEX:point":"500,300"},
                    {"exifEX:point":"600,600"},
                    {"exifEX:point":"800,500"}
                  ]
                }
              },
              "dc:description": "Example of point shape"
            },
            {
              "exifEX:regionshape":{
                "exifEX:line":{
                  "exifEX:multiplepoints":{
                    "@list":[
                      {"exifEX:point":"300,1300"},
                      {"exifEX:point":"500,1100"},
                      {"exifEX:point":"600,1500"},
                      {"exifEX:point":"800,1000"}
```

```
                ]
              }
            }
          },
          "dc:description": "Example of polygonal line shape"
        },
        {
          "exifEX:regionshape":{
            "exifEX:polygon":{
              "exifEX:multiplepoints":{
                "@list":[
                  {"exifEX:point":"1300,1200"},
                  {"exifEX:point":"1500,1300"},
                  {"exifEX:point":"1500,1500"},
                  {"exifEX:point":"1300,1600"},
                  {"exifEX:point":"1100,1500"},
                  {"exifEX:point":"1100,1300"}
                ]
              }
            }
          },
          "dc:description": "Example of polygon shape"
        },
        {
          "exifEX:regionshape":{
            "exifEX:circle":{
              "exifEX:CX":"2400",
              "exifEX:CY":"500",
              "exifEX:R":"300"
            }
          },
          "dc:description": "Example of circle shape"
        },
        {
          "exifEX:regionshape":{
            "exifEX:ellipse":{
              "exifEX:CX":"2400",
              "exifEX:CY":"1500",
              "exifEX:LR":"300",
              "exifEX:SR":"200",
              "exifEX:Angle":"45"
            }
          },
          "dc:description":"Example of ellipse shape"
        },
        {
          "exifEX:regionshape":{
            "exifEX:whole":{}
          },
          "dc:description":"Example of whole shape"
        }
      ]
    }
  }
]
}
}
```

Bibliography

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Participating members

The bulk of the deliberations over the formulation of the standards described in this document was performed by the Exif Metadata Sub-Working Group.

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Please refer to the past edition (available on CIPA WEB) for past deliberation members.

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