DJI Media File Metadata White Paper

Part 2: Metadata in Still Image

Version 1.1

2020-05-07

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Contents

Version History

Version	Date	Description
1.1	2020-05-07	First release version based on version 1.0 of DJI Media File Metadata Whitepaper Part 1.

1. Introduction

1.1 Organization of Document Set

The metadata whitepaper has three parts:

- *Part 1, Overview*, introduce the basic concept and organization of metadata in media files product by DJI. It's an overview of what kinds of metadata we provide and the basic representation model for metadata in media files.
- *Part2, Metadata in Still Image*, describe metadata specifications and contents in the still-image. This part mainly contains metadata in Exif and XMP standards, both metadata follow industrial standards and extend by DJI to give more rich information.
- *Part3, Metadata in Video*, describe metadata in video contains both metadata for whole video (global metadata) and metadata carried on every video frame (timed metadata). DJI introduce our own data model and specification in this part for video timed metadata.

1.2 About This Document

This document, *DJI Media File Metadata Whitepaper Part 2: Metadata in Still Image*, describes serial metadata specifications we followed in still image files and detailed contents of some metadata. From this document you can find that metadata support lists in still image files and technical descriptions and guarantees on metadata.

2. Exif

Exif is Exchangeable image file format for digital still cameras, which is industry standard of still image. Exif is widely used and is supported on a lots of software for viewing and editing. You can analyze or export metadata with tools like Exiftool. DJI follows Exif specification on JPEG and DNG files. You can find most camera related metadata like shutter speed, focal length, f-number, ISO, etc.

For historical reasons, Exif information is detailed in various specification: Exif, TIFF Rev. 6.0 specification and Adobe DNG specification. Both of this standards are focus on camera related metadata, and is not intend to extend new metadata. DJI's product line contains various cameras of different form, with our advanced gimbal and drone technologies. In storing information like gimbal status and drone's postures, which not presented in common cameras, we also exploit the DJI defined metadata in maker notes and other format like XMP.

NOTICE: Although both Exif and XMP stores GPS related metadata, we describe some additional technical details of GPS metadata in XMP section, which is also appropriate for metadata in Exif GPS IFD.

2.1 Supported tags in Exif

Our implementation of Exif tag support levels are as follows. See section 4.6.8 of Exif specification for details.

Support levels described by Exif:

M: Mandatory (shall be recorded)

R: Recommended

O: Optional

N: It is not allowed to record

J: It is not allowed to record (included in JPEG marker)

Implementation of support level described by DJI:

Y: It is supported by DJI

N: It is not supported by DJI

V: It is supported DJI only on visible light cameras but not on thermal cameras.

2.1.1 0th IFD TIFF Tags Support Levels

Field Name	Tag ID	DNG		JPEG	
		Exif	DJI	Exif	DJI
ImageWidth	100.H	M	Y	J	N
ImageLength	101.H	M	Y	J	N
BitsPerSample	102.H	M	Y	J	N
Compression	103.H	M	Y	J	N
PhotometricInterpretation	106.H	M	Y	N	N
ImageDescription	10E.H	R	Y	R	Y
Make	10F.H	R	Y	R	Y
Model	110.H	R	Y	R	Y
StripOffsets	111.H	M	Y	N	N
Orientation	112.H	R	Y	R	Y
SamplesPerPixel	115.H	M	Y	J	N
RowsPerStrip	116.H	M	Y	N	N
StripByteCounts	117.H	M	Y	N	N
XResolution	11A.H	M	Y	M	Y
YResolution	11B.H	M	Y	M	Y
PlanarConfiguration	11C.H	O	N	J	N
ResolutionUnit	128.H	M	Y	M	Y
TransferFunction	12D.H	O	N	O	N
Software	131.H	O	Y	O	Y
DateTime	132.H	R	Y	R	Y
Artist	13B.H	O	N	O	N
WhitePoint	13E.H	O	N	O	N

PrimaryChromaticities	13F.H	O	N	O	N
JPEGInterchangeFormat	201.H	N	N	N	N
JPEGInterchangeFormatLength	202.H	N	N	N	N
YCbCrCoefficients	211.H	N	N	O	N
YCbCrSubSampling	212.H	N	N	J	N
YCbCrPositioning	213.H	N	N	M	Y
ReferenceBlackWhite	214.H	O	N	O	N
Copyright	8298.H	O	N	O	N
Exif IFD Pointer	8769.H	M	Y	M	Y
GPSInfo IFD Pointer	8825.H	O	Y	O	Y

2.1.2 0th IFD Exif Tags Support Level

Field Name	Tag ID	DNG		JPEG	
		Exif	DJI	Exif	DJI
ExposureTime	829A.H	R	Y	R	V
FNumber	829D.H	O	Y	O	Y
ExposureProgram	8822.H	O	Y	O	V
SpectralSensitivity	8824.H	O	N	O	N
PhotometricInterpretation	8827.H	O	Y	O	Y
OECF	8828.H	O	N	O	N
SensitivityType	8830.H	O	N	O	V
StandardOutputSensitivity	8831.H	O	N	O	N
RecommendedExposureIndex	8832.H	O	N	O	N
ISOSpeed	8833.H	O	N	O	N
ISOSpeedLatitudeyyy	8834.H	O	N	O	N
ISOSpeedLatitudezzz	8835.H	O	N	O	N

ExifVersion	9000.H	M	Y	M	Y
DateTimeOriginal	9003.H	O	Y	O	Y
DateTimeDigitized	9004.H	O	Y	O	Y
OffsetTime	9010.H	O	N	O	N
OffsetTimeOriginal	9011.H	O	Y	O	Y
OffsetTimeDigitized	9012.H	O	Y	O	Y
ComponentsConfiguration	9101.H	N	N	M	Y
CompressedBitsPerPexel	9102.H	N	N	O	N
ShutterSpeedValue	9201.H	O	Y	O	V
ApertureValue	9202.H	O	Y	O	Y
BrightnessValue	9203.H	O	Y	O	V
ExposureBiasValue	9204.H	O	Y	O	V
MaxApertureValue	9205.H	O	Y	O	Y
SubjectDistance	9206.H	O	N	O	N
MeteringMode	9207.H	O	Y	O	V
LightSource	9208.H	O	Y	O	Y
Flash	9209.H	R	Y	R	Y
FocalLength	920A.H	O	Y	O	Y
SubjectArea	9214.H	O	N	O	N
MakerNote	927C.H	O	Y	O	Y
UserComment	9286.H	O	N	O	N
SubSecTime	9290.H	O	N	O	N
SubSecTimeOriginal	9291.H	O	N	O	N
SubSecTimeDigitized	9292.H	O	N	O	N
Temperature	9400.H	O	N	O	N
Humidity	9401.H	O	N	O	N

Pressure	9402.H	O	N	O	N
WaterDepth	9403.H	O	N	O	N
Acceleration	9404.H	O	N	O	N
CameraElevationAngle	9405.H	O	N	O	N
FlashpixVersion	A000.H	M	Y	M	Y
ColorSpace	A001.H	M	Y	M	Y
PixelXDimension	A002.H	N	N	M	Y
PixelYDimension	A003.H	N	N	M	Y
RelatedSoundFile	A004.H	O	N	O	N
Interoperability IFD Pointer	A005.H	N	N	O	N
FlashEnergy	A20B.H	O	N	O	N
SpatialFrequencyResponse	A20C.H	O	N	O	N
FocalPlaneXResolution	A20E.H	O	N	O	N
FocalPlaneYResolution	A20F.H	O	N	O	N
FocalPlaneResolutionUnit	A210.H	O	N	O	N
SubjectLocation	A214.H	O	N	O	N
ExposureIndex	A215.H	O	N	O	N
SensingMethod	A217.H	O	N	O	N
FileSource	A300.H	O	Y	O	Y
SceneType	A301.H	O	Y	O	Y
CFAPattern	A302.H	O	N	O	N
CustomRedered	A401.H	O	N	O	N
ExposureMode	A402.H	R	Y	R	V
WhiteBalance	A403.H	R	Y	R	V
DigitalZoomRatio	A404.H	O	Y	O	Y
FocalLengthIn35mmFilm	A405.H	O	Y	O	Y

SceneCaptureType	A406.H	R	Y	R	Y
GainControl	A407.H	O	Y	O	Y
Contrast	A408.H	O	Y	O	Y
Saturation	A409.H	O	Y	O	Y
Sharpness	A40A.H	O	Y	O	Y
DeviceSettingDescription	A40B.H	O	Y	O	Y
SubjectDistanceRange	A40C.H	O	N	O	N
ImageUniqueID	A420.H	O	N	O	N
CameraOwnerName	A430.H	O	N	O	N
BodySerialNumber	A431.H	O	Y	O	Y
LensSpecification	A432.H	O	Y	O	Y
LensMake	A433.H	O	N	O	N
LensModel	A434.H	O	N	O	N
LensSerialNumber	A435.H	O	N	O	N
CompositeImage	A460.H	R	N	R	N
SourceImageNumberOfCompositeImage	A461.H	O	N	O	N
SourceExposureTimesOfcompositeImage	A462.H	O	N	O	N
Gamma	A500.H	O	N	O	N

2.1.3 0th IFD GPS Tags Support Level

Field Name	Tag ID	DNG		JPEG	
		Exif	DJI	Exif	DJI
GPSVersionID	0.H	O	Y	O	Y
GPSLatitudeRef	1.H	O	Y	O	Y
GPSLatitude	2.H	O	Y	O	Y
GPSLongitudeRef	3.H	O	Y	O	Y

GPSLongitude	4.H	O	Y	O	Y
GPSAltitudeRef	5.H	O	Y	O	Y
GPSAltitude	6.H	O	Y	O	Y
GPSStatus	9.H	O	Y	O	Y
GPSMapDatum	12.H	O	Y	O	Y

3. XMP

The Extensible Metadata Platform (XMP) is an ISO standard, originally created by Adobe Systems Inc. XMP is powerful for adding custom metadata and embedding into various media formats. We use the XMP as a complement for Exif.

3.1 XMP in different formats

3.1.1 DNG

XMP is embedded in DNG file with XMP metadata tag (700) in IFD0. Please refer to section 2.1.1 of XMP Specification Part 3 for details.

3.1.2 JPEG

XMP metadata is embedded in JPEG file with marker segment APP1. Please refer to section 2.1.3 of XMP Specification Part 3 for details.

3.2 Native XMP properties

3.2.1 tiff:Make

Type: text

The manufacturer of the product.

3.2.2 tiff:Model

Type: text

Product model name.

3.2.3 dc:format

Type: text

The file type that XMP segment embedded, such as 'image/jpg', 'image/dng' or ‘video/mp4’, ‘video/mov’.

3.2.4 xmp:ModifyDate

Type: date

The date and time media file was modified. When image is captured, we will fill the value of this property as same as "xmp:CreateDate".

On some old products, date format was YYYY-MM-DD. For new product, we change to the more accurate time description: YYYY-MM-DDThh:mm:ssTZD. You can refer to section 8.2.1.2 of XMP specification Part 1 for format details.

3.2.5 xmp:CreateDate

Type: date

The date and time when media file was created. Format of this property is described in "xmp:ModifyDate".

NOTICE: This value is NOT the accurate moment at which camera sensor exposed. It's only guaranteed during the media file was generated.

3.3 DJI defined XMP properties

We found that existing name space could not support our requirement. We defined the DJI XMP name space as 'drone-dji'. In this name space, we defined our extended properties, as described below.

3.3.1 drone-dji:SurveyingMode

Type: integer
Introduced since: XMP v1.1
Recorded when: always

In surveying and mapping fields, high accuracy are required on many metadata. It needs lots of special designs to make metadata is truly usable for surveying applications. For example, it's very important that metadata is correspond to exactly when camera sensor do exposure. So, only product which support surveying application will record metadata to an accurate moment at image sensor exposure. Otherwise, it only guaranteed in the duration that picture was generating.

Several surveying mode is supported to have different accuracy in metadata.

"0":

Surveying mode 0 means this product does NOT support surveying applications, which means we have no further guarantees about accuracy of other properties.

"1":

Surveying mode 1 means this product can give more guarantees on following metadata to support surveying applications.

1. Metadata that bound to the accurate exposure moment contains: *3.3.3 drone-dji:GpsLongitude*, *3.3.4 drone-dji:GpsLatitude*, *3.3.5 drone-dji:AbsoluteAltitude*.
2. Location information (*3.3.3 drone-dji:GpsLongitude*, *3.3.4 drone-dji:GpsLatitude*, *3.3.5 drone-dji:AbsoluteAltitude*) is calibrated to optical center of camera image sensor. (In multi-camera system, corresponding to the camera which generate this picture).

NOTICE: For products that not support this property, you should ask our FAE for technical details that specify in this section.

3.3.2 drone-dji:GpsStatus

Type: integer
Introduced since: XMP v1.1
Recorded when: hardware is supported

GPS working status. This property may not exist on some products.

Status definitions:

"GPS":

Working with non-RTK GPS.

"Invalid":

GPS signal is non-available, measurement interrupted. *3.3.5 drone-dji:AbsoluteAltitude* and *3.3.6 drone-dji:RelativeAltitude* could be still available from barometer.

"RTK":

Working with RTK (Real-Time Kinematic). It means *3.3.3 drone-dji:GpsLongitude*, *3.3.4 drone-dji:GpsLatitude*, *3.3.5 drone-dji:AbsoluteAltitude*, and *3.3.6 drone-dji:RelativeAltitude* is provided by RTK. If RTK function is turned on and is connected, but this property is not "RTK", you can refer to *3.3.18 drone-dji:RtkFlag* for details of RTK status.

NOTICE: For products that don't support this property, you can only get this information by checking GPS data or RTK flag property.

3.3.3 drone-dji:GpsLongitude

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported

Longitude in degree follow WGS-84 coordinate system, ranging from 0° at the Prime Meridian to +180° eastward and −180° westward. You should check *3.3.2 drone-dji:GpsStatus* first before reading this property to make sure if GPS is working or in high accuracy mode.

NOTICE: Unless otherwise stated in *3.3.1 drone-dji:SurveyingMode*, GPS location may not exactly describe the center of camera or camera image sensor. For example, on drone products, GPS information actually describe the location of the drone body. As explained in *3.3.1 drone-dji:SurveyingMode*, high accuracy is an integrated project, which is meaningful until every special designs are done. Commonly, in non-surveying application, you don't have to worried about this trivial inaccuracy or where is the exactly location of drone be described.

3.3.4 drone-dji:GpsLatitude

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported

Latitude in degree follow WGS-84 standard, ranging from 0° at the Equator to +90° (North) or -90° (South) at the poles. You should check *3.3.2 drone-dji:GpsStatus* first before reading this property to get if GPS is working or in high accuracy mode.

3.3.5 drone-dji:AbsoluteAltitude

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported

If *3.3.2 drone-dji:GpsStatus* is “RTK”, this value is the ellipsoidal height in meter follow WGS-84 standard provided by RTK module. If RTK is non-available, it is height in meter provided by barometer.

3.3.6 drone-dji:RelativeAltitude

Type: real
Introduced since: XMP v1.0

Recorded when: hardware is supported

Height in meter relative to the drone takeoff point. If *3.3.2 drone-dji:GpsStatus* is “RTK”, this value is provided by RTK module. If RTK is non-available, this value is provided by barometer.

3.3.7 drone-dji:GimbalRollDegree

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported

The roll Euler angle of gimbal in degree relative to the NED (North, East, Down) coordinate system. Rotation sequence of the Euler angle is ZXY (yaw, roll, pitch), intrinsic. For upward gimbal, the Euler angles translate from the real quaternion of gimbal after rotate 180 degree around the X axis of moving body. Precision of this value is 0.1 degree if no special description.

3.3.8 drone-dji:GimbalYawDegree

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported

The yaw Euler angle of gimbal in degree relative to the NED (North, East, Down) coordinate system. Rotation sequence of the Euler angle is ZXY (yaw, roll, pitch), intrinsic. For upward gimbal, the Euler angles translate from the real quaternion of gimbal after rotate 180 degree around the X axis of moving body. Precision of this value is 0.1 degree if no special description.

3.3.9 drone-dji:GimbalPitchDegree

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported

The pitch Euler angle of gimbal in degree relative to the NED (North, East, Down) coordinate system. Rotation sequence of the Euler angle is ZXY (yaw, roll, pitch), intrinsic. For upward gimbal, the Euler angles translate from the real quaternion of gimbal after rotate 180 degree around the X axis of moving body. Precision of this value is 0.1 degree if no special description.

3.3.10 drone-dji:FlightRollDegree

Type: real

Introduced since: XMP v1.0
Recorded when: hardware is supported

The roll Euler angles of drone body in degree relative to the NED (North, East, Down) coordinate system. Rotation sequence of the Euler angle is ZYX (yaw, pitch, roll), intrinsic. Precision of this value is 0.1 degree if no special description.

3.3.11 drone-dji:FlightYawDegree

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported

The yaw Euler angles of drone body in degree relative to the NED (North, East, Down) coordinate system. Rotation sequence of the Euler angle is ZYX (yaw, pitch, roll), intrinsic. Precision of this value is 0.1 degree if no special instructions.

3.3.12 drone-dji:FlightPitchDegree

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported

The pitch Euler angles of drone body in degree relative to the NED (North, East, Down) coordinate system. Rotation sequence of the Euler angle is ZYX (yaw, pitch, roll), intrinsic. Precision of this value is 0.1 degree if no special instructions.

3.3.13 drone-dji:FlightSpeedX

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported

The drone body speed component in m/s on X axis (north) of NED (North, East, Down) coordinate system.

3.3.14 drone-dji:FlightSpeedY

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported

The drone body speed component in m/s on Y axis (east) of NED (North, East, Down) coordinate system.

3.3.15 drone-dji:FlightSpeedZ

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported

The drone body speed component in m/s on Z axis (down) of NED (North, East, Down) coordinate system. downward positive, upward negative.

3.3.16 drone-dji:CamReverse

Type: integer
Introduced since: XMP v1.0
Recorded when: always

The reverse status of the camera body.

"0":

Camera body is not rotated, e.g. using a downward gimbal.

"1":

Indicate camera has a 180 degree rotation round the imaging optical axis (roll axis). For example, if you use an upward gimbal on Matrice serial drone, camera is in a reverse status.

3.3.17 drone-dji:GimbalReverse

Type: integer
Introduced since: XMP v1.0
Recorded when: always

This property is deprecated.

3.3.18 drone-dji:RtkFlag

Type: integer
Introduced since: XMP v1.0
Recorded when: hardware is supported and function is opened

RTK working status, definition are as follows:

"0":

No satellite signal is available.

“15”:

No position solution is available.

“16”:

Single point position solution with precision of meters.

“34”:

Floating ambiguity position solution or pseudo-range differential solution with precision of decimeters.

“50”:

Integer narrow-lane ambiguity position solution with precision of centimeters.

3.3.19 drone-dji:RtkStdLon

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported and function is opened

Standard deviation of RTK’s longitude.

3.3.20 drone-dji:RtkStdLat

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported and function is opened

Standard deviation of RTK’s latitude.

3.3.21 drone-dji:RtkHgt

Type: real
Introduced since: XMP v1.0
Recorded when: hardware is supported and function is opened

Standard deviation of RTK’s altitude.

3.3.22 drone-dji:CalibratedFocalLength

Type: real
Introduced since: XMP v1.0

Calibrated focal length of lens in pixel.

3.3.23 drone-dji:CalibratedOpticalCenterX

Type: real
Introduced since: XMP v1.0

Calibrated position of lens optical center in pixel on X axis (horizontal direction). Origin of coordinate system is top left corner of image sensor.

3.3.24 drone-dji:CalibratedOpticalCenterY

Type: real
Introduced since: XMP v1.0

Calibrated position of lens optical center in pixel on Y axis (vertical direction). Origin of coordinate system is top left corner of image sensor.

3.3.25 drone-dji:DewarpData

Type: text
Introduced since: XMP v1.0

Image distortion correction parameters using OpenCV method. Excerpt OpenCV theory here. Check https://docs.opencv.org/4.3.0/d4/d94/tutorial_camera_calibration.html for details.

For the distortion OpenCV takes into account the radial and tangential factors. For the radial factor one uses the following formula:

$$x_{distorted} = x(1 + k_1 r^2 + k_2 r^4 + k_3 r^6)$$

$$y_{distorted} = y(1 + k_1 r^2 + k_2 r^4 + k_3 r^6)$$

So for an undistorted pixel point at (x, y) *coordinates, its position on the distorted image will be* $(x_{distorted}, y_{distorted})$*. The presence of the radial distortion manifests in form of the "barrel" or "fish-eye" effect.*

Tangential distortion occurs because the image taking lenses are not perfectly parallel to the imaging plane. It can be represented via the formulas:

$$x_{distorted} = x + [2p_1 xy + p_2 (r^2 + 2x^2)]$$

$$y_{distorted} = y + [p_1(r^2 + 2y^2) + 2p_2 xy]$$

So we have five distortion parameters which in OpenCV are presented as one row matrix with 5 columns:

$$distortion\_coefficients = (k_1\ k_2\ p_1\ p_2\ k_3)$$

Now for the unit conversion we use the following formula:

$$\begin{bmatrix} x \\ y \\ w \end{bmatrix} = \begin{bmatrix} f_x & 0 & c_x \\ 0 & f_y & c_y \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}$$

Here the presence of w *is explained by the use of homography coordinate system (and* $w = Z$*).*

Parameters store in this property as following format:

$\text{Calibration date};\ f_x, f_y, c_x, c_y, k_1, k_2, p_1, p_2, k_3$

Where:

(f_x, f_y) are camera focal length expressed in pixels.

(c_x, c_y) are optical centers expressed in pixels. Origin of coordinate system is the center of image.

3.3.26 drone-dji:DewarpFlag

Type: integer
Introduced since: XMP v1.0

"0":

Image distortion correction function is disabled.

"1":

Image distortion correction with default parameters in camera.

3.3.27 drone-dji:LRFStatus

Type: integer
Introduced since: XMP v1.1
Recorded when: hardware is supported and function is opened

Laser Ranging Finder working status. Definition are as follows:

"Normal":

Laser Ranging Finder works fine.

"TooClose":

Target distance is less than minimum range of Laser Ranging Finder.

"TooFar":

Target distance is larger than maximum range of Laser Ranging Finder.

3.3.28 drone-dji:LRFTargetDistance

Type: real
Introduced since: XMP v1.1
Recorded when: hardware is supported and function is opened

Distance between camera and ranging target in meter. This property is valid only when *3.3.27 drone-dji:LRFStatus* is "Normal".

3.3.29 drone-dji:LRFTargetLon

Type: real
Introduced since: XMP v1.1
Recorded when: hardware is supported and function is opened

Longitude of target measurement point in degree. This property is valid only if *3.3.27 drone-dji:LRFStatus* is "Normal" and *3.3.2 drone-dji:GpsStatus* is NOT "Invalid".

3.3.30 drone-dji:LRFTargetLat

Type: real
Introduced since: XMP v1.1
Recorded when: hardware is supported and function is opened

Latitude of target measurement point in degree. This property is valid only if *3.3.27 drone-dji:LRFStatus* is "Normal" and *3.3.2 drone-dji:GpsStatus* is NOT "Invalid".

3.3.31 drone-dji:LRFTargetAlt

Type: real
Introduced since: XMP v1.1
Recorded when: hardware is supported and function is opened

Height relative to take-off point of target measurement point in meter. This property is valid only if *3.3.27 drone-dji:LRFStatus* is "Normal" and *3.3.2 drone-dji:GpsStatus* is NOT "Invalid".

4. References

1. Extensible Metadata Platform (XMP) Specification: Part 1, Data Model, Seriallization, and Core Properties.
2. Adobe XMP Specification: Part 2: Additional Properties.
3. Adobe XMP Specification: Part 3: Storage in Files.
4. Exchangeable image file format for digital still cameras: Exif Version 2.32.

