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Metrolab XML Record (.mxr) File Specification

PT2026 / MFC2046 / EZMag3D / MFC8246

Version 1.1

(Revision 2.4)

REVISION HISTORY

v. 1.0 r. 1.0	23.02.16 – ST	First release
v. 1.0 r. 1.1	25.02.16 – ST	Update of the “body” and “dataset” structures after PK review and recommendations.
v. 1.0 r. 1.2	23.08.16 - ST	Status item added to the PT2026 dataset.
v. 1.0 r. 1.3	23.10.17 - ST/SB	New dataset added to cope with the new types created for the MFCTool software.
v. 1.0 r. 1.4	16.01.18 - SB	In the dataset associated to the MFCTool, tag “measComment” has been added and the unit for stdDev has been modified to “ppm”.
v. 1.0 r. 1.5	29.01.18 - ST	In the dataset associated to the MFCTool, a tag called “tag” has been added.
v. 1.0 r. 1.6	29.10.18 - SB	Filename convention added. Description of the tags relative to the MFCTool have been updated.
v. 1.1 r. 1.0	22.07.19 - JT	English translation of the original French document.
v. 1.1 r. 1.1	10.12.19 - SB	Add Instrument (muUniqId, muFwDescription, muInterface) and Probe Array (paDescription, paNbChannels) information to tMXR_BODY_MFCTOOL
v. 1.1 r. 1.2	12.12.19 - SB	Update tMXR_BODY_MFCTOOL to ver1.1 and show ver1.0
v. 1.1 r. 2.0	09.09.20 - PK	Updates for EZMag3D (THM1176 / TFM1186) Miscellaneous clean-up
v. 1.1 r. 2.1	30.09.21 - SB	Update tMXR_BODY_MFCTOOL to version 1.2 (add paWrPrChannel)
v. 1.1 r. 2.2	06.09.22- SB	Update tMXR_BODY_MFCTOOL to version 1.3 (add FCA information)
v. 1.1 r. 2.3	03.02.25 - MH	Update tMXR_DATASET_EZMAG3D_MEASUREMENT to version 1.2 (add uncertainty measurement) - fix bad links section 3.2.3 – Mention temperature element block section 3.3.4.
v. 1.1 r. 2.4	23.06.25 - JS	Adding section 3.2.4 and section 3.3.6 for single probe with MFC8246.

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1 Introduction

Metrolab XML record files, with file extension ".mxr.xml", have been developed to ensure all instruments developed by Metrolab Technology share a high-level file format.

This file format, and specifically the part that describes the data container, is inspired by the file format standard HDF5 (Hierarchical Data Format, revision 5) which aims to store measurement data along with other metadata. The metadata can be the measurement parameters, or any other information ensuring that the measurement conditions are clearly and exhaustively documented.

This format consists of several XML tags that allowing a clear identification of the file, the instrument used for the measurements, the configuration parameters, the data collected, and any user comments.

1.1 Tag versioning

This procedure is meant to document every XML tag. For each XML tag a description is provided, and a version number is given, allowing traceability.

1.2 Tag duplication

In the description of the tags, the number in between the curly braces provides the number of times the tag can be replicated: i.e. {1} signifies that the tag will appear only once, {0-n} means that the tag can be absent – as it may appear zero times – but you may have up to n times the same tag, encapsulating different contents.

2 Filename convention

Every filename must adhere to the following naming convention:

$$MODEL_SERIALNUMBER_DATE_xxx.mxr.xml$$

With:

- MODEL = The standard 4-digit model number; i.e. 2046, 2026, 3045.
- SERIALNUMBER = The product serial number (usually 8-digits).
- DATE = File creation date using format: YYYY-MM-DD.
- xxx = Optional field, free for the user.
- .mxr.xml = standard Metrolab xml file extension for measurements.

Every field of the name must be separated with the "_" (underscore) symbol.

Examples:

2046_00003109_2017-10-19.mxr.xml
3045_00004121_2016-02-13_Mapping.mxr.xml
1226_00080121_2018-01-01_Test.mxr.xml
2046_00020581_2018-01-10_Drift.mxr.xml

3 Common File Header

The header starting the XML file and common to every instrument and host software is the following.

```
<?xml version="1.0"?>
<MetrolabXmlRecord ver=”1.0”>
<header>
   <src>SourceOfThisFile</src>
   <datTim8601>YYYY-MM-DDTHH:MM:SS</datTim8601>
   <descr>DescriptionOfTheFile</descr>
</header>
<body type="BodyType" ver="x.y">
      BodyContent
</body>
</MetrolabXmlRecord>
```

It consists simply in a header and a body. The body is the important segment that contains the instrument reference number, its parametrization and all the recorded data.

header	{1}[1]	File header.
src	{1}	Name of the tool that created the file.
datTim8601	{1}	File creation date and time, according to standard ISO-8601.
descr	{1}	A short sentence describing the file content.
body	{1}	Body content, i.e. all the data that are recorded in the file, using the convention described below.

3.1 Body description

Every “body” description is instrument specific. The “type” attribute of the body tag states to which specification the content of the body conforms to.

3.2 Body types

3.2.1 tMXR_BODY_PT2026

Describes the body structure specific to the measurements recorded using the host software that drives the PT2026, “Metrolab PT2026”.

```
<body type="tMXR_BODY_PT2026" ver="1.0">
   <comment>Comment</comment>
   <instr>Model SerialNumber</instr>
   <dataset type="type" ver="x.y">DatasetContent</dataset>
</body>
```

comment	{1}[1]	User comment.
instr	{1}	Instrument model and serial number.
dataset	{0 - n}	Data set.

3.2.2 tMXR_BODY_MFCTOOL

Describes the body structure specific to the measurements recorded using the host software that drives the NMR Magnetic Field Cameras, “MFCTool”. This file is common to the MFC2046 and the MFC3045 systems.

3.2.2.1 Ver 1.3

```
<body type="tMXR_BODY_MFCTOOL" ver="1.3">
   <instrument>
```

```
      <muModel>Main Unit Model</muModel>
      <muSerialNumber>Main Unit Serial Number</muSerialNumber>
      <muCalibrationDate>Main unit calibration date</muCalibrationDate>
      <muUniqId> Main Unit Unique Id</muUniqId>
      <muFwDescription> Main Unit Firmware Description</muFwDescription>
      <muInterface> Main Unit Interface</muInterface>
      <fcaDescription> FCA Description</fcaDescription>
      <fcaSerialNumber> FCA serial number</fcaSerialNumber>
      <fcaFwVersion> FCA firmware version</fcaFwVersion>
      <paModel>Probe-Array Model</paModel>
      <paSerialNumber>Probe-Array Serial Number</paSerialNumber>
      <paDescription> Probe-Array Description</paDescription>
      <paNormalizationDate>Probe-Array Normalization date</paNormalizationDate>
      <fmin>Minimum Probe-Array Frequency</fmin>
      <fmax>Maximum Probe-Array Frequency</fmax>
      <gyromagneticFactor>Probe-Array gyromagnetic Factor</gyromagneticFactor>
      <period>Acquisition period</period>
      <paNbChannels> Probe-Array channel Quantity</paNbChannels>
      <paWrPrChannel> Wide range probe channel number</paWrPrChannel>
   </instrument>
   <dataset type="type" ver="x.y">DatasetContent</dataset>
</body>
```

instrument {1}[1] Provides all the details concerning the instrument and probe-array used to record the data.

Name	Units	Description
muModel	[-]	Main unit model.
muSerialNumber	[-]	Main unit serial number.
muCalibrationDate	[-]	Main unit calibration date.
muUniqId	[-]	Main Unit unique id.
muFwDescription	[-]	Main Unit firmware description.
muInterface	[-]	Main Unit interface.
fcaDescription	[-]	Field Camera Amplifier (FCA) description.
fcaSerialNumber	[-]	FCA serial number.
fcaFwVersion	[-]	FCA firmware version.
paModel	[-]	Probe-array model.
paSerialNumber	[-]	Probe-array serial number.
paDescription	[-]	Probe-Array description.
paNormalizationDate	[-]	Probe-array normalization date.
Fmin	[MHz]	Probe-array minimum operating frequency.
Fmax	[MHz]	Probe-array maximum operating frequency.
gyromagneticFactor	[MHz/T]	Probe-array gyromagnetic factor.
Period	[sec]	Acquisition period of the NMR signal.
paNbChannels	[-]	Probe-Array channels quantity.
paWrPrChannel	[-]	Wide range probe channel number.

dataset {0 - n} See the chapter 4 for detailed description of the associated dataset.

3.2.2.2 Ver 1.2

```
<body type="tMXR_BODY_MFCTOOL" ver="1.2">
   <instrument>
      <muModel>Main Unit Model</muModel>
      <muSerialNumber>Main Unit Serial Number</muSerialNumber>
      <muCalibrationDate>Main unit calibration date</muCalibrationDate>
```

```
      <muUniqId> Main Unit Unique Id</muUniqId>
      <muFwDescription> Main Unit Firmware Description</muFwDescription>
      <muInterface> Main Unit Interface</muInterface>
      <paModel>Probe-Array Model</paModel>
      <paSerialNumber>Probe-Array Serial Number</paSerialNumber>
      <paDescription> Probe-Array Description</paDescription>
      <paNormalizationDate>Probe-Array Normalization date</paNormalizationDate>
      <fmin>Minimum Probe-Array Frequency</fmin>
      <fmax>Maximum Probe-Array Frequency</fmax>
      <gyromagneticFactor>Probe-Array gyromagnetic Factor</gyromagneticFactor>
      <period>Acquisition period</period>
      <paNbChannels> Probe-Array channel Quantity</paNbChannels>
      <paWrPrChannel> Wide range probe channel number</paWrPrChannel>
   </instrument>
   <dataset type="type" ver="x.y">DatasetContent</dataset>
</body>
```

instrument {1}[1] Provides all the details concerning the instrument and probe-array used to record the data.

Name	Units	Description
muModel	[-]	Main unit model.
muSerialNumber	[-]	Main unit serial number.
muCalibrationDate	[-]	Main unit calibration date.
muUniqId	[-]	Main Unit unique id.
muFwDescription	[-]	Main Unit firmware description.
muInterface	[-]	Main Unit interface.
paModel	[-]	Probe-array model.
paSerialNumber	[-]	Probe-array serial number.
paDescription	[-]	Probe-Array description.
paNormalizationDate	[-]	Probe-array normalization date.
Fmin	[MHz]	Probe-array minimum operating frequency.
Fmax	[MHz]	Probe-array maximum operating frequency.
gyromagneticFactor	[MHz/T]	Probe-array gyromagnetic factor.
Period	[sec]	Acquisition period of the NMR signal.
paNbChannels	[-]	Probe-Array channels quantity.
paWrPrChannel	[-]	Wide range probe channel number.

dataset {0 - n} See the chapter 4 for detailed description of the associated dataset.

3.2.2.3 Ver 1.1

```
<body type="tMXR_BODY_MFCTOOL" ver="1.1">
   <instrument>
      <muModel>Main Unit Model</muModel>
      <muSerialNumber>Main Unit Serial Number</muSerialNumber>
      <muCalibrationDate>Main unit calibration date</muCalibrationDate>
      <muUniqId> Main Unit Unique Id</muUniqId>
      <muFwDescription> Main Unit Firmware Description</muFwDescription>
      <muInterface> Main Unit Interface</muInterface>
      <paModel>Probe-Array Model</paModel>
      <paSerialNumber>Probe-Array Serial Number</paSerialNumber>
      <paDescription> Probe-Array Description</paDescription>
      <paNormalizationDate>Probe-Array Normalization date</paNormalizationDate>
      <fmin>Minimum Probe-Array Frequency</fmin>
      <fmax>Maximum Probe-Array Frequency</fmax>
      <gyromagneticFactor>Probe-Array gyromagnetic Factor</gyromagneticFactor>
      <period>Acquisition period</period>
      <paNbChannels> Probe-Array channel Quantity</paNbChannels>
   </instrument>
   <dataset type="type" ver="x.y">DatasetContent</dataset>
```

```
</body>
```

instrument {1}[1] Provides all the details concerning the instrument and probe-array used to record the data.

Name	Units	Description
muModel	[-]	Main unit model.
muSerialNumber	[-]	Main unit serial number.
muCalibrationDate	[-]	Main unit calibration date.
muUniqId	[-]	Main Unit unique id.
muFwDescription	[-]	Main Unit firmware description.
muInterface	[-]	Main Unit interface.
paModel	[-]	Probe-array model.
paSerialNumber	[-]	Probe-array serial number.
paDescription	[-]	Probe-Array description.
paNormalizationDate	[-]	Probe-array normalization date.
Fmin	[MHz]	Probe-array minimum operating frequency.
Fmax	[MHz]	Probe-array maximum operating frequency.
gyromagneticFactor	[MHz/T]	Probe-array gyromagnetic factor.
Period	[sec]	Acquisition period of the NMR signal.
paNbChannels	[-]	Probe-Array channels quantity.

dataset {0 - n} See the chapter 4 for detailed description of the associated dataset.

3.2.2.4 Ver 1.0

```
<body type="tMXR_BODY_MFCTOOL" ver="1.0">
      <instrument>
            <muModel>Main Unit Model</muModel>
            <muSerialNumber>Main Unit Serial Number</muSerialNumber>
            <muCalibrationDate>Main unit calibration
date</muCalibrationDate>
            <paModel>Probe-Array Model</paModel>
            <paSerialNumber>Probe-Array Serial Number</paSerialNumber>
            <paNormalizationDate>Probe-Array Normalization
date</paNormalizationDate>
            <fmin>Minimum Probe-Array Frequency</fmin>
            <fmax>Maximum Probe-Array Frequency</fmax>
            <gyromagneticFactor>Probe-Array gyromagnetic
Factor</gyromagneticFactor>
            <period>Acquisition period</period>
      </instrument>
      <dataset type="type" ver="x.y">DatasetContent</dataset>
</body>
```

instrument {1}[1] Provides all the details concerning the instrument and probe-array used to record the data.

Name	Units	Description
muModel	[-]	Main unit model.
muSerialNumber	[-]	Main unit serial number.

muCalibrationDate	[-]	Main unit calibration date.
paModel	[-]	Probe-array model.
paSerialNumber	[-]	Probe-array serial number.
paNormalizationDate	[-]	Probe-array normalization date.
Fmin	[MHz]	Probe-array minimum operating frequency.
Fmax	[MHz]	Probe-array maximum operating frequency.
gyromagneticFactor	[MHz/T]	Probe-array gyromagnetic factor.
Period	[sec]	Acquisition period of the NMR signal.

dataset {0 - n} See the chapter 4 for detailed description of the associated dataset.

3.2.3 tMXR_BODY_EZMAG3D

Describes the body structure specific to the measurements recorded using the host software that drives the Three-Axis Magnetometer family of instruments (THM1176 / TFM1186), “EZMag3D”.

3.2.3.1 Ver 1.1

```
<body type="tMXR_BODY_EZMAG3D" ver="1.1">
   <comment>Comment</comment>
   <instrument>Model SerialNumber</instrument>
   <dataset type="type" ver="x.y">DatasetContent</dataset>
</body>
```

comment {1}[1] User comment.
instrument {1} Full instrument model (e.g. THM1176-MF) and serial number.

dataset {0 - n} See paragraph 3.3.4 (v1.1 & v1.2) for detailed description of the associated dataset.

3.2.3.2 Ver 1.0

```
<body type="tMXR_BODY_EZMAG3D" ver="1.0">
   <comment>Comment</comment>
   <instr>Model-SerialNumber</instr>
   <dataset type="type" ver="x.y">DatasetContent</dataset>
</body>
```

comment {1}[1] User comment.
instrument {1} Full instrument model (e.g. THM1176-MF) and serial number.

dataset {0 - n} See 3.3.4 (v1.0) for detailed description of the associated dataset.

All measurements are stored in datasets. As stated in the introduction, the aim of the dataset is not only to contain the collected measurements, but also to save with these measurements the experimental conditions. This includes the instrument type and serial number, as well as the full

probe description and the specific parametrization of the instrument. It may also include a comment from the user.

3.2.4 tMXR_BODY_SINGLEPROBE

Describes the body structure specific to the measurements recorded using the host software that drives the Magnetic Field Camera MFC8246 “PT2026-Scan”.

3.2.4.1 Ver 1.0

```
<body type="tMXR_BODY_SINGLEPROBE" ver="1.1">
   <instrument>
      <muModel>Main Unit Model</muModel>
      <muSerialNumber>Main Unit Serial Number</muSerialNumber>
      <muCalibrationDate>Main unit calibration date</muCalibrationDate>
      <muUniqId> Main Unit Unique Id</muUniqId>
      <muFwDescription> Main Unit Firmware Description</muFwDescription>
      <muInterface> Main Unit Interface</muInterface>
      <spModel>Single Probe Model</spModel>
      <spSerialNumber>Single Probe Serial Number</spSerialNumber>
      <spDescription> Single Probe Description</spDescription>
      <fmin>Minimum Single Probe Frequency</fmin>
      <fmax>Maximum Single Probe Frequency</fmax>
      <gyromagneticFactor>Single probe gyromagnetic Factor</gyromagneticFactor>
      <spNbChannels> Single Probe channel Quantity</spNbChannels>
      <spRadius> Single Probe radius to rotational axis </spRadius>
   </instrument>
   <dataset type="type" ver="x.y">DatasetContent</dataset>
</body>
```

instrument {1}[1] Provides all the details concerning the instrument and single probe used to record the data.

Name	Units	Description
muModel	[-]	Main unit model.
muSerialNumber	[-]	Main unit serial number.
muCalibrationDate	[-]	Main unit calibration date.
muUniqId	[-]	Main Unit unique id.
muFwDescription	[-]	Main Unit firmware description.
muInterface	[-]	Main Unit interface.
spModel	[-]	Single probe model.
spSerialNumber	[-]	Single probe serial number.
spDescription	[-]	Single probe description.
Fmin	[MHz]	Single probe minimum operating frequency.
Fmax	[MHz]	Single probe maximum operating frequency.
gyromagneticFactor	[MHz/T]	Single probe gyromagnetic factor.
spNbChannels	[-]	Single probe channels quantity.
spRadius	[-]	Single probe radius wrt the rotational axis

dataset {0 - n} See the chapter 4 for detailed description of the associated dataset

3.3 Dataset types

3.3.1 tMXR_DATASET_PT2026_MEASUREMENT

This dataset describes the measurements recorded using the PT2026 host software.

```
<dataset type="tMXR_DATASET_PT2026_MEASUREMENT" ver="1.0">
   <headings>Heading1 Heading2   …Headingn</headings>
   <parms>parm1=X  parm2=Y …parmn=Z</parms>
   <meas>Timestamp Flux sDev Uniformity Channel      Status
      Timestamp  Flux sDev Uniformity   Channel      Status
      Timestamp  Flux sDev Uniformity   Channel      Status</meas>
</dataset>
```

headings {1}[1] Column names.

parms {1} Parameters used to collect the data.

Parameter name	Description
units	[-] – units used for the current dataset.
…	**TBD, future extension.**

meas {0 – n} Measurements in TSV format.

measurement name	Description
Timestamp	Local timestamp associated with the current measurement.
Flux	Magnetic field density.
sDev	1-σ deviation of the measurement. The standard deviation is computed according to the selected measurement averaging mode: None, exponential, moving, block averaging.
Uniformity	Magnetic field uniformity: ratio between the measured T2* and the nominal T2 stored in the probe.
Channel	Instrument channel on which the measurement was made.
Status	Current status associated with the measurement, expressed in hexadecimal.

3.3.2 tMXR_DATASET_MFCTOOL_MAPPING

This dataset describes how a measurement is recorded when using the MFCTool host software in mapping mode.

```
<dataset type="tMXR_DATASET_MFCTOOL_MAPPING" ver="1.0" scenario="FieldMapping" >
   <comment>Comment</comment>
   <parameters>
      <fieldUnit>Field_Unit</fieldUnit>
      <nbChannels>Channels_Number</nbChannels>
      <averaging>Averaging</averaging>
      <centralFreq>Central_Frequency</centralFreq>
      <centralFreqTol>Central_freq_tol_ppm</centralFreqTol>
      <minimalPeriod>Minimal_period</minimalPeriod>
      <nbMeasurementsDriftCalc>Drift_number</nbMeasurementsDriftCalc>
      <channels>chan1 chan2 ... chanN</channels>
```

```
      <positionsCount>position count</positionsCount>
      <angleIncrement>angle increment</angleIncrement>
      <repeatFirstPosition>repeat first position</repeatFirstPosition>
   </parameters>
   <measurements>
      <measurement index="n">
         <timestamp>timestamp</timestamp>
         <angle units="deg">angle_value</angle>
         <freq units="MHz">freq1 freq2 ... freqN</freq>
         <stdDev units="ppm">stdDev1 stdDev2 ... stdDevN</stdDev>
         <nbValid>nbValid1 nbValid2 ... nbValidN</nbValid>
         <stats>
            <average units="MHz">Average_stat</average>
            <min units="MHz" probe="1">Min_stat</min>
            <max units="MHz" probe="24">Max_stat</max>
            <stdDev units="ppm">stdDev_stat</stdDev>
         </stats>
      </measurement>
   </measurements>
</dataset>
```

comment {1}[1] User comment for the dataset.

parameters {1} Parameters used to gather this set of measurements:

Parameter name	Units	Description
fieldUnit	[-]	Magnetic field density units.
nbChans	[-]	Number of channels in use.
averaging	[-]	Number of measurements used for averaging.
centralFreq	[MHz]	Central frequency.
centralFreqTol	[ppm]	Relative tolerance of the central frequency.
minimalPeriod	[ms]	Minimum period of the NMR measurement.
nbMeasurementsDriftCalc	[-]	Measurement number used to compute the slope.
channels	[-]	Measurement channel list.
positionsCount	[-]	Angular position count for this measurement set.
angleIncrement	[deg]	Angle increment.
repeatFirstPosition	[-]	States whether the dataset contains duplicated measurements of the first position or not. If so, first and last recorded measurements correspond to the same position. Useful for drift cancellation.

measurement {0 – n} Measurement block. The “index” attribute states the position / angle at which the measurement was taken.

Measurement name	Units	Description
timestamp	[ms]	Timestamp associated with the first measurement of the block. All other data are (allegedly) sampled at the minimalPeriod rate.
angle	Specified in the heading “units” attributes	Probe-array angular value for the current set of measurements.
freq	Specified in the heading “units” attributes	Average of all frequencies measured. This list follows the order stated in the field “channels”, allowing the user to reconcile the measurements with the measurement head number (and position).
stdDev	Specified in the heading “units” attributes	1-σ standard deviation for the measured frequencies. The ordering of these value is identical to the one used for the frequencies.
nbValid	[-]	Number of valid measurements for each channel. The ordering of these values is identical to the one used for the frequencies.
stats	[-]	Statistics for the current measurement block.

The “stats” subtype is specified as follow:

Nom	Units	Description
average	Specified in the heading “units” attributes	Average of all measurements made during the current acquisition frame.
min	Specified in the heading “units” attributes	Minimum value found during the current acquisition frame.
max	Specified in the heading “units” attributes	Maximum value found during the current acquisition frame.
stdDev	Specified in the heading “units” attributes. Always set to [ppm]	1-σ standard deviation for the current acquisition frame. This deviation is computed over the whole measurement block using the following equation: $$\frac{\max(\text{measurements}) - \min(\text{measurements})}{\text{mean}(\text{measurements})} \cdot 10^6$$

3.3.3 tMXR_DATASET_MFCTOOL_MEASUREMENT

This dataset describes how a measurement is recorded when using the MFCTool host software in every mode but the mapping one (see previous chapter).

```
<dataset type="tMXR_DATASET_MFCTOOL_MEASUREMENT" ver="1.0" scenario="Advanced">
   <comment>Comment</comment>
   <parameters>
      <fieldUnit>Field_Unit</fieldUnit>
      <nbChannels>Channels_Number</nbChannels>
```

```
      <averaging>Averaging</averaging>
      <centralFreq>Central_Frequency</centralFreq>
      <centralFreqTol>Central_freq_tol_ppm</centralFreqTol>
      <minimalPeriod>Minimal_period</minimalPeriod>
      <nbMeasurementsDriftCalc>Drift_number</nbMeasurementsDriftCalc>
      <channels>chan1 chan2 ... chanN</channels>
   </parameters>
   <headings>
      <col index="1" units="MHz">NMR Field [MHz]</col>
      <col index="2" units="ppm">Standard Deviation [ppm]</col>
      <col index="3"            >No.Valid Acquisitions</col>
      <col index="4" units="ppm/h">Slope [ppm/h]</col>
   </headings>
   <measurements>
      <measurement index="1">
         <timestamp>3135628</timestamp>
         <data>63.8842459;0.020;5;nan
            63.8842709;0.034;5;nan
            63.8849228;0.033;5;nan
            63.8851033;0.049;5;nan
            63.8848449;0.029;5;nan
            63.8852153;0.069;5;nan
            63.8853260;0.028;5;nan
            63.8851997;0.019;5;nan
            63.8843322;0.042;5;nan
            63.8845087;0.006;5;nan
            63.8844367;0.030;5;nan
            63.8837469;0.022;5;nan
            63.8838097;0.039;5;nan
            63.8845073;0.019;5;nan
            63.8844596;0.023;5;nan
            63.8843189;0.036;5;nan
            63.8852914;0.035;5;nan
            63.8853930;0.009;5;nan
            63.8851339;0.019;5;nan
            63.8848558;0.038;5;nan
            63.8852745;0.019;5;nan
            63.8848307;0.013;5;nan
            63.8842997;0.022;5;nan
            63.8844367;0.020;5;nan</data>
      </measurement>
   </measurements>
</dataset>
```

Comment {1}[1] User comments.

Parameters {1} Parameter list for this dataset according to the following table.

Parameter name	Description	
fieldUnit	[-]	Magnetic field density units.
nbChans	[-]	Number of channels in use.
averaging	[-]	Number of measurements used for averaging.
centralFreq	[MHz]	Central frequency.
centralFreqTol	[ppm]	Central frequency tolerance.
minimalPeriod	[ms]	Minimum period of the NMR measurement.
nbMeasurementsDriftCalc	[-]	Measurement number used to compute the slope.
channels	[-]	Measurement channel list.

Headings {1} Content description for each column of the measurement set. The “index” attribute states which column is described and the “unit” attribute states in which unit the associated data was recorded.

Measurement {0 – n} Measurement block. Each measurement is indexed (field “index”). The content of this tag is described in the following table.

Nom	Units	Description
timestamp	[ms]	Timestamp associated to the first measurement of the block. All other data are (allegedly) sampled at the minimal period rate.
Data	Specified in the heading “units” attributes	Measurement data for the current block. Each line represents measurement made on a specific channel in the order stated in the field “channels” of this record. For each channel, measurements are stored in column using the type as described in the “heading” field and are semicolon (;) separated.

3.3.4 tMXR_DATASET_EZMAG3D_MEASUREMENT

This dataset describes how single-point measurements are recorded when using the EZMag3D software.

3.3.4.1 Ver 1.2

```
<dataset type="tMXR_DATASET_EZMAG3D_MEASUREMENT" ver="1.2">
	<headings colsep=";">Timestamp;B;B.B';Bx;By;Bz;Temp;dB</headings>
	<parameters>Parameters</parameters>
	<measurements>
		<comment>Comment</comment>
		<flux>Block of measurements</flux>
	</measurements>
</dataset>
```

headings {1}[1] Column names. This version adds the variable “dB”, representing the degree of uncertainty of each measurement.

parameters {1} List of measurement parameters used for this dataset, with their values, in the form “name=value”, separated by spaces.

measurements {0 – n} Blocks of measurement data.

comment {1} Comment for this measurement block, consisting of a comment entered by the user, optionally followed by any warnings issued during the measurement. For example:

```
My comment {Code : xxx Description : … Context : …}
```

flux {1} Block of measurement data. Each line represents one measurement, consisting of the timestamp, the magnitude B, the “auto-rotated” field B.B’, the field components B_x, B_y, B_z, the measured temperature, and the degree of uncertainty (dB) for this measurement, all separated by semicolons.

3.3.4.2 Ver 1.1

```
<dataset type="tMXR_DATASET_EZMAG3D_MEASUREMENT" ver="1.1">
```

```
        <headings colsep=";">Timestamp;B;B.B';Bx;By;Bz;Temp</headings>
        <parameters>Parameters</parameters>
        <measurements>
                <comment>Comment</comment>
                <flux>Block of measurements</flux>
        </measurements>
</dataset>
```

headings	{1}[1]	Column names.
parameters	{1}	List of measurement parameters used for this dataset, with their values, in the form “name=value”, separated by spaces.
measurements	{0 – n}	Blocks of measurement data.
comment	{1}	Comment for this measurement block, consisting of a comment entered by the user, optionally followed by any warnings issued during the measurement. For example: `My comment {Code : xxx Description : … Context : …}`
flux	{1}	Block of measurement data. Each line represents one measurement, consisting of the timestamp, the magnitude B, the “auto-rotated” field B.B’, the field components B_x, B_y, B_z, and the temperature, all separated by semicolons.

3.3.4.3 Ver 1.0

```
<dataset type="tMXR_DATASET_EZMAG3D_MEASUREMENT" ver="1.0">
                <headings colsep=";">Timestamp;B;B.B';Bx;By;Bz;Temp</headings>
                <parms>Parameters</parms>
                <meas>
                        <comment></comment>
                        <flux>Block of measurements</flux>
                </meas>
</dataset>
```

headings	{1}[1]	Column names.
parms	{1}	List of measurement parameters used for this dataset, with their values, in the form “name=value”, separated by spaces.
meas	{0 – n}	Blocks of measurement data.
flux	{1}	Block of measurement data. Each line represents one measurement, consisting of the timestamp, the magnitude B, the “auto-rotated” field B.B’, the field components B_x, B_y, B_z, and the temperature, all separated by semicolons.

3.3.5 tMXR_DATASET_EZMAG3D_MAPPING

This dataset describes how field maps are recorded when using the EZMag3D software.

```
<dataset type="tMXR_DATASET_EZMAG3D_MAPPING" ver="1.0">
                <headings colsep=";">Timestamp;B;B.B';Bx;By;Bz;Temp</headings>
                <parameters>Parameters</parameters>
                <measurements>
                        <comment>Comment</comment>
                        <position unit="">Position</position>
                        <orientation unit="degree">Orientation</orientation>
```

```
                <flux>Block of messurements</flux>
            </measurements>
</dataset>
```

headings	{1}[1]	Column names.
parameters	{1}	List of measurement parameters used for this dataset, with their values, in the form “name=value”, separated by spaces.
measurements	{0 – n}	Blocks of measurement data.
comment	{1}	Comment for this measurement block.
position	{1}	Position for this measurement block: X, Y, Z, separated by semi-colons.
orientation	{1}	Probe orientation for this measurement block: Roll, Pitch, Yaw, separated by semi-colons.
flux	{1}	Block of measurement data. Each line represents one measurement, consisting of the timestamp, the magnitude B, the “auto-rotated” field B.B’, and the field components B_x, B_y, B_z, all separated by semicolons.

3.3.6 tMXR_DATASET_MFC8246_SINGLEPROBE

This dataset describes how a measurement is recorded when using the PT2026 software with the MFC8246.

```
<dataset type="tMXR_DATASET_MFC_SINGLEPROBE" ver="1.0" scenario="Mapping">
   <comment>Comment</comment>
   <parameters>
      <fieldUnit>Field_Unit</fieldUnit>
      <nbChannels>1</nbChannels>
      <averaging>Averaging</averaging>
      <fmin>Minimum frequency Selected by User</fmin>
      <fmax>Maximum frequency Selected by User</fmax>
      <channels>1</channels>
      <nameProfile>Profile Name</nameProfile>
      <measurementTimeout>Maximum Time Spent Per Measure</measurementTimeout>
      <positionCount>Number of Points Measured</positionCount>
   </parameters>
   <measurements>
      <measurement index="1">
         <time>23.06.2025 10:11:12</time>
         <timestamp>6666</timestamp>
         <expRelativeZ units="mm">Exp. Rel. Pos. form Profile</expRelativeZ>
         <curRelativeZ units="mm">Cur. Rel. Pos. form Profile </curRelativeZ>
         <expAbsoluteZ units="mm">Exp. Abs. Pos. form Profile </expAbsoluteZ>
         <curAbsoluteZ units="mm">Cur. Abs. Pos. form Profile </curAbsoluteZ>
         <expTheta units="deg">Exp. Angle Pos. form Profile </expTheta>
         <curTheta units="deg">Cur. Angle Pos. form Profile </curTheta>
         <freq>Frequency measurement</freq>
         <stdDev units="ppm">Standard Deviation</stdDev>
      </measurement>
   </measurements>
</dataset>
```

Comment	{1}[1]	User comments.
Parameters	{1}	Parameter list for this dataset according to the following table.

Parameter name	Units	Description
fieldUnit	[-]	Magnetic field density units.
nbChans	[-]	Number of channels in use.
averaging	[-]	Number of measurements used for averaging.
fmin	[MHz]	Minimal frequency selected by user.
fmax	[MHz]	Maximal frequency selected by user.
channels	[-]	Measurement channel list.
nameProfile	[-]	Profile name
measurementTimeout	[ms]	Maximum time spent per measurement
positionCount	[-]	Number of points Measured

Measurement {0 – n} Measurement block. Each measurement is indexed (field "index"). The content of this tag is described in the following table.

Nom	Units	Description
time	[-]	Time associated with measurement
timestamp	[ms]	Timestamp associated with the measurement
expRelativeZ	[mm]	Expected Relative Z position from profile
curRelativeZ	[mm]	Current Relative Z position from profile
expAbsoluteZ	[mm]	Expected Absolute Z position from profile
curAbsoluteZ	[mm]	Current Absolute Z position from profile
expTheta	[mm]	Expected Theta angle position from profile
curTheta	[mm]	Current Theta angle from profile
freq	Specified in the parameter "fieldUnits" attributes	Measurement point at the specific above coordinate
stdDev	[ppm]	1-σ standard deviation for the current acquisition frame. This deviation is computed in the case of averaging.

NOTES

[1] Read paragraph Tag duplication