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Volume 2 PHY (Radio Parameters)

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Release

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1 Scope

The present document is part of the Compliance Test Specification used for certification of equipment according to the Open Metering System (OMS) specification.

5 This issue is applicable only together with [OMSCT-GEN].

This document specifies the tests to show compliance for the Physical Layer (PHY) and the Medium Access Layer (MAC) covering radio parameters and basic timing.

10 The parameters to be tested, and the test limits are based on OMS Specification Volume 2, Primary Communication [OMSS-Vol2], chapter 4, *Physical Layer*, and the referenced Wireless M-Bus specification [EN 13757-4].

Note:

This version of test specification does not cover all items of the current OMS Specification.

15 It is not the scope of this document to show compliance to the essential requirements of the R&TTE directive (1999/5/EC), Radio Equipment Directive 2014/53/EU (RED), or other national or international standards.

2 References

The used references are listed in [OMSCT-GEN].

However the following list overrules the listed standards in [OMSCT-GEN]:

- 5 • [EN13757-4] CEN EN 13757-4:2019 Communication systems for meters Part 4: Wireless M-Bus communication”.

3 Definitions, Symbols and Abbreviations

The used term definitions, symbols and abbreviations are defined in [OMSCT-GEN] (OMS Open Metering System – Conformance Test Volume 1 – General Part).

5 **Part 1:**

Wireless M-Bus (wMBus)

4 General Requirements

If the DUT has already been subject to other compliance tests (i.e. for RED essential requirements) using [EN 300 220-1], test results from such a test report can be used, and it is not required to repeat those tests where they are overlapping.

4.1 [T21-GR1] Operating Mode

The manufacturer shall state the operating mode; S1, S2, T1, T2, C1 and/or C2.

The manufacturer shall state the selected radio band: PHY_A (868 MHz) or PHY_B (433 MHz)

4.2 [T21-GR2] Receiver Category

The manufacturer shall state the receiver performance class, LR, MR or HR as defined in [EN 13757-4].

4.3 [T21-GR3] Transmitter Category

The manufacturer shall state the transmitter performance class, LT, MT or HT as defined in [EN 13757-4].

4.4 [T21-GR4] Temperature Range

The manufacturer shall state the operating temperature range.

4.5 [T21-GR5] Power Supply

The manufacturer shall state the power source.

In case of external power supply the manufacturer shall state nominal, minimum and maximum voltage and maximal current.

4.6 [T21-GR6] Antenna

The manufacturer shall state if the antenna is detachable or not, and if an antenna connector is available.

5 Test Conditions, Power Sources and Ambient Temperatures

Testing shall be performed under normal test conditions, and also, where stated, under extreme test conditions.

- 5 Extreme test conditions are as specified in [OMSCT-PHY] subclause 4.4 and 4.5.

Test conditions and procedures shall be as specified in [EN 300 220-1] subclause 4.3.

6 Transmitter Parameters

6.1 [T21-TX1] Nominal Frequency

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Table 1: Nominal frequency

	PHY_A 868 MHz	PHY_B 433 MHz
S-mode meter nominal frequency	868,300 MHz	433,500 MHz
S-mode other nominal frequency		
T-mode meter nominal frequency	868,950 MHz	434,475 MHz
T-mode other nominal frequency	868,300 MHz	433,500 MHz
C-mode meter nominal frequency	868,950 MHz	434,475 MHz
C-mode other nominal frequency	869,525 MHz	433,500 MHz

The relevant frequency from table 1 shall be recorded in the test report.

Note:

There are no relevant pass / fail criteria listed here. The test conditions are covered by [T21-TX3].

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6.2 [T21-TX2] Frequency Deviation

The frequency deviation, as defined in [EN 13757-4], shall comply with the following limits:

Table 2: Frequency deviation

	PHY_A 868 MHz		PHY_B 433 MHz	
	Minimum	Maximum	Minimum	Maximum
S-mode	±40 kHz	±80 kHz	±40 kHz	±60 kHz
T-mode	±40 kHz	±80 kHz	±40 kHz	±60 kHz
C-mode	±33,75 kHz	±56,25 kHz	±33,75 kHz	±56,25 kHz

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The frequency deviation shall be measured and the results shall be documented.

The method how to measure is up to the manufacturer.

The measurement can be done by the manufacturer or an authorized laboratory.

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The measurement procedure has to be documented and provided to the OMS certification body.

6.3 [T21-TX3] Frequency Error or Drift

The frequency error or frequency drift shall comply with the limits as defined in [EN 13757-4] for PHY_A and in OMS-S2, Annex O for PHY_B:

Table 3: Frequency error or drift

	PHY_A 868 MHz			PHY_B 433 MHz		
	+/- ppm	Minimum	Maximum	+/- ppm	Minimum	Maximum
S1/S2 meter to other (uplink)	60	868,250 MHz	868,350 MHz	60	433,474 MHz	433,526 MHz
S2 other to meter (downlink)	25	868,278 MHz	868,322 MHz	25	433,489 MHz	433,511 MHz
T1/T2 meter to other (uplink)	60	868,900 MHz	869,000 MHz	60	434,449 MHz	434,501 MHz
T2 other to meter (downlink)	25	868,278 MHz	868,322 MHz	25	433,489 MHz	433,511 MHz
C1/C2 meter to other (uplink)	25	868,928 MHz	868,972MHz	25	434,464 MHz	434,486 MHz
C2 other to meter (downlink)	25	869,503MHz	869,547MHz	25	433,489 MHz	433,511 MHz

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The frequency error or frequency drift of Battery operated equipment, as defined in [EN 300 220-1] sub clause 5.7, shall not exceed the limits given above.

The test shall be performed at normal and extreme test conditions.

- 10 The measurement shall be performed with an unmodulated carrier test signal of the nominal frequency.

If the DUT is not able to transmit such a signal the nominal frequency can be calculated from frequencies CW0 and CW1 by

$$\text{Nominal frequency} = (\text{CW0} + \text{CW1})/2$$

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If the DUT is not able to transmit any unmodulated carrier, the nominal frequency can be derived from the measurement of the occupied bandwidth according to [EN 300 220-1] subclause 5.6.

- 20 The nominal frequency is then the midpoint between the frequencies which correspond to the $+\beta/2$ - and $-\beta/2$ -fractions of the occupied bandwidth.

The minimal value and the maximal value of the frequency measured at a certain condition shall be recorded in the test report.

Each of these values shall not exceed the respective limits given in table 3.

6.4 Transmission Power

Depending on the declaration of [OMSCT-PHY] subclause 4.6 (Antenna) transmission power was measured conducted or radiated.

6.4.1 [T21-TX4] Average Power (Conducted)

The average power (conducted), as defined in [EN 300 220-1] subclause 5.2.2.1, shall comply with the following limits after the antenna gain is taken into consideration:

Transmitter class LT: Minimum -5 dBm ERP

Transmitter class MT: Minimum 0 dBm ERP

Transmitter class HT, meter: Minimum +5 dBm ERP

Transmitter class HT, other: Minimum +8 dBm ERP

The test shall be performed at normal conditions.

The nominal value from test report according to [EN 300 220-1] shall exceed the minimum value of the declared transmitter class.

6.4.2 [T21-TX5] Effective Radiated Power (ERP)

The effective radiated power, as defined in [EN 300 220-1] sub clause 5.2.2.2, shall comply with the following limits:

Transmitter class LT: Minimum -5 dBm ERP

Transmitter class MT: Minimum 0 dBm ERP

Transmitter class HT, meter: Minimum +5 dBm ERP

Transmitter class HT, other: Minimum +8 dBm ERP

The nominal value from test report according to [EN 300 220-1] shall exceed the minimum value of the declared transmitter class

6.5 [T21-TX6] Chip Rate, Chip Rate Tolerance, Chip Rate Variation within the Header, Bit Jitter and Data Rate

The manufacturer shall state compliance to [EN 13757-4] within [OMSCT-ManDec].

6.6 [T21-TX7a] Preamble Length and Postamble Length

The manufacturer shall state compliance to [EN 13757-4] within [OMSCT-ManDec].

The manufacturer shall additionally state compliance with the limits of [OMSS-Vol2] subclause 4.3.3.2 within [OMSCT-ManDec].

Otherwise → ERROR

7 Receiver Parameters

7.1 [T21-RX1] Sensitivity

The sensitivity, as defined in [EN 300 220-1] sub clause 5.14, shall be measured using the method of measurement with messages. The test message shall consist of 20 bytes (including length byte and CRC bytes).

The following test limits shall be met for a PER less than 80%:

Performance class LR: Minimum -80 dBm

Performance class MR: Minimum -90 dBm

Performance class HR: Minimum -100 dBm

The test shall be performed at normal conditions.

Note: For a meter using C2, S2 or T2 mode with reception window, the test message must be triggered by a meter transmission (e.g. by the use of a “golden receiver unit”), if a “receiver always on” test mode is not available.

7.2 [T21-RX2] Blocking or Desensitization

The blocking or desensitization, as defined in [EN 300 220-1] sub clause 5.18, shall comply with the following limits:

Performance class LR, MR, HR: Requirement as category 2 in [EN 300 220-1] sub clause 5.18.3

7.3 [T21-RX3] Reserved for future use

7.4 [T21-RX4] Receiver Immunity

The receiver immunity, as defined in [EN 301 489-1] sub clause 9.2, for continuous phenomena shall comply with the performance criterion A given in [EN 301 489-3] sub clause 6.2

The test shall be performed over the range 80 MHz to 6 GHz with the exception of the exclusion bands defined in clause 4.6. of [EN 301 489-3].

7.5 [T21-RX5] Acceptable Frequency Offset

The frequency offset tolerance shall be measured using a “marginal transmitter unit” where the frequency offset is as in clause [T21-TX3]. The test messages shall be as per section 7.1.

The measurement shall be done with a signal level of -60 dBm at the receiver input. The PER shall be less than 20% as measured over 100 messages.

The test shall be performed at normal test conditions only.

7.6 [T21-RX6] Acceptable Chip Rate Tolerance

The nominal chip rate is 32.768 kcps for S2-mode and T2-mode and 50 kcps for C2-Mode (meter to other).

The manufacturer shall state compliance to the following tolerances within [OMSCT-ManDec]:

- +/- 2% for S2-mode and T2-mode as defined in [EN 13757-4] and
- 100ppm for C2-Mode.

Appendix A: Applicable Test Cases of OMS-CT (Normative)

Test Cases of Wireless M-Bus Devices

Table 4: Test Cases related to DUT type

Test case	Description	UDM ¹⁾	BDM ²⁾		
[T21-GR1]	Operating mode	X	X		
[T21-GR2]	Receiver category		X		
[T21-GR3]	Transmitter category	X	X		
[T21-GR4]	Temperature range	X	X		
[T21-GR5]	Power supply	X	X		
[T21-GR6]	Antenna	X	X		
[T21-TX1]	Nominal frequency	X	X		
[T21-TX2]	Frequency deviation	X	X		
[T21-TX3]	Frequency error or drift	X	X		
[T21-TX4]	Carrier power (conducted)	A1	A1		
[T21-TX5]	Effective radiated power (ERP)	A1	A1		
[T21-TX6]	Chip rate, Chip rate tolerance	X	X		
[T21-TX7a]	Preamble length and Postamble length	X	X		
[T21-RX1]	Sensitivity		X		
[T21-RX2]	Blocking or desensitization		X		
[T21-RX4]	Receiver immunity		X		
[T21-RX5]	Acceptable frequency offset		X		
[T21-RX6]	Acceptable chip rate tolerance		X		
<p>Note:</p> <p>X This Test case is mandatory</p> <p>Ax One of the Test cases marked with same number "x" shall be applied</p> <p>¹⁾ UDM = Unidirectional Meter</p> <p>²⁾ BDM = Bidirectional Meter</p>					

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