

<b>Prüfbericht-Nr.:</b> <i>Test Report No.:</i>	16093001 001	<b>Auftrags-Nr.:</b> <i>Order No.:</i>	89210788	Seite 1 von 8 Page 1 of 8	
<b>Kunden Referenz-Nr.:</b> <i>Client Reference No.:</i>	24095126	<b>Auftragsdatum</b> :	20-11-2016		
<b>Auftraggeber:</b> <i>Client:</i>	Murata Electronique SAS 18-22 avenue Edouard Herriot, Copernic-6 92356 LE-PLESSIS-ROBINSON CEDEX FRANCE		Samir Hennaoui +33 6 86 68 30 87 shennaoui@murata.com		
<b>Prüfgegenstand:</b> <i>Test item:</i>	Murata Open MCU Lora Module				
<b>Bezeichnung / Typ-Nr.:</b> <i>Identification / Type No.:</i>	CMWX1ZZABZ-078				
<b>Auftrags-Inhalt:</b> <i>Order content:</i>	Test of Conformance to LoRaWAN™ Specification V1.0.1				
<b>Prüfgrundlage:</b> <i>Test specification:</i>	LoRa End Device Certification EU Version 1.2				
<b>Wareneingangsdatum:</b> <i>Date of receipt:</i>	31-01-2017				
<b>Prüfmuster-Nr.:</b> <i>Test sample No.:</i>	001 and 002				
<b>Prüfzeitraum:</b> <i>Testing period:</i>	01-02-2017 - 02-02-2017				
<b>Ort der Prüfung:</b> <i>Place of testing:</i>	Leek, Netherlands				
<b>Prüflaboratorium:</b> <i>Testing laboratory:</i>	TÜV Rheinland NL B.V.				
<b>Prüfergebnis:</b> <i>Test results:</i>	PASS				
<b>Geprüft von</b> <i>Tested by:</i>	Lourens Koopmans				
02-02-2017		02-02-2017			
<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>	<b>Unterschrift</b> <i>Signature</i>	<b>Datum</b> <i>Date</i>	<b>Name / Stellung</b> <i>Name / Position</i>	<b>Unterschrift</b> <i>Signature</i>
<b>Sontiges /</b> <i>Other:</i> -					
<p><b>Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.</b>  <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark</i></p>					

**Prüfbericht-Nr.: 16093001 001**  
Test Report No.: 16093001 001

Seite 2 von 11  
Page 2 of 11

<b>Revisions</b> <i>Revisions</i>			
<b>Revision</b> Revision	<b>Datum</b> Date	<b>Anmerkung</b> Remark	<b>Verfasser</b> Author

Note: Latest revision report will replace all previous reports

## Table of contents

1	Product Information.....	4
	Submitted Documents:.....	5
	Remarks:.....	5
2	Test Equipment.....	6
3	Summary.....	7
	Verdicts of functional requirements:.....	7
	Verdict.....	7
	Supported optional features:.....	7
	YES / No.....	7
4	Test Case verdicts as per Test Specifications .....	8
	Test results per test case:.....	8
5	Test Results .....	10
	Detailed test results:.....	10
6	PHOTO DOCUMENTATION.....	11

Prüfbericht-Nr.: 16093001 001  
Test Report No.: 16093001 001

Seite 4 von 11  
Page 4 of 11

## 1 PRODUCT INFORMATION

The device under test (DUT) is a wireless Murata Open MCU Lora Module for LoRaWAN Certification testing

General information	
Product name:	Murata Open MCU Lora Module
Model:	CMWX1ZZABZ-078
Description:	LoRa Alliance LoRaWAN compliance testing
Manufacturer SKU	-
Hardware version:	MP
Software version:	1.0.3
Contact person:	Samir Hennaoui
Phone number:	+33 6 86 68 30 87

LoRaWAN information	
Type of DUT	End Device
LoRa Device Class	A
Geographical area of operation	Europe
Operating frequency	868 MHz
Adaptive Data Rate (ADR) supported?	Yes
Optional data rates supported?	DR6 (SF7BW250) and DR7 (FSK50)
Activation possibilities	Both Over the air and by personalization
Test According LoRaWAN™ Spec	V1.0.1
Output Power	Up to 25 mW
Number / Type of Antenna(s)	1
Antenna Gain	-
Test sample information	production unit

Prüfbericht-Nr.: 16093001 001  
Test Report No.: 16093001 001

Seite 5 von 11  
Page 5 of 11

<b>For OTA activation:</b>	
Serial No of Device with OTAA	002
End-device identifier (DevEUI)	383334315B36930F
Application identifier (AppEUI)	0101010101010101
Application key (AppKey)	2b7e151628aed2a6abf7158809cf4f3c
<b>For activation by personalization:</b>	
Serial No of Device with ABP	001
End-device identifier (DevAddr)	01B42AA5
Application identifier (AppSKey)	2B7E151628AED2A6ABF7158809CF4F3C
Application key (NwkSKey)	2B7E151628AED2A6ABF7158809CF4F3C
Default RX2 Window Frequency	869.525MHz
Default RX2 Window Data Rate	DR0 (SF12, 125kHz)
RECEIVE_DELAY1	1 s
RECEIVE_DELAY2	2 s (must be RECEIVE_DELAY1 + 1s)
JOIN_ACCEPT_DELAY1	5 s
JOIN_ACCEPT_DELAY2	6 s
MAX_FCNT_GAP	16384
ADR_ACK_LIMIT	63
ADR_ACK_DELAY	32
ACK_TIMEOUT	2 +/- 1 s (random delay between 1 and 3 seconds)

### Submitted Documents:

LoRa Certification Customer Questionnaire document.  
LoRa Test Environment log files.

### Remarks:

All test cases are tested with Activation by Personalization (ABP) mode, else explicitly Over the Air (OTA) to be tested.

Prüfbericht-Nr.: 16093001 001  
Test Report No.: 16093001 001

Seite 6 von 11  
Page 6 of 11

## 2 TEST EQUIPMENT

<b>Prüfmittel</b> <i>Test equipment</i>	<b>Marke</b> <i>Brand</i>	<b>Version</b> <i>Version</i>
Comprehensive Testing Environment (CTE)	4ffcom AG	CTE - TMF V44.0 CTE - SIG - LoRa V1.3
Semtech Development Kit (Semtech Gateway) for EU 863-870 Band	Semtech	SX1301-based concentrator reference design >=GW_V_3.1.0
Semtech Development Kit (Semtech Packet Forwarder) for EU 863-870 Band	Semtech	>= PF_V_2.2.0

Prüfbericht-Nr.: 16093001 001  
Test Report No.: 16093001 001

Seite 7 von 11  
Page 7 of 11

### 3 SUMMARY

Verdicts of functional requirements:	Verdict
Test Mode Activation (Activation by Personalization)	PASS
Test Mode Activation (Over the Air Activation)	PASS
Test Application Functionality	PASS
Over The Air Activation	PASS
Packet Error Rate RX2 SF12	PASS
Cryptography	PASS
Downlink Window Timing	PASS
Frame Sequence Number	PASS
Device Status Request	PASS
Mac Commands	PASS
New Channel Request	PASS
Confirmed packets	PASS
RX Parameter Setup Request	PASS
RX Timing Setup Request	PASS
Link ADR Request	PASS
Packet Error Rate RX1 Window	PASS
Packet Error Rate RX2 Window	PASS

Supported optional features:	YES / No
Adaptive Data Rate (ADR)	YES
SF7BW250	YES
FSK	YES

**Overall Test Result: PASS**

#### 4 TEST CASE VERIDCTS AS PER TEST SPECIFICATIONS

##### Test results per test case (OTAA):

Test item	Description	Implementation	Result
EU863-870 1.0	Device Activation	Mandatory	PASS
EU863-870 2.0	Test application functionality	Mandatory	PASS
EU863-870 3.0	Over The Air Activation	Mandatory	PASS
EU863-870 4.0	Packet Error Rate Part 1	Mandatory	PASS
EU863-870 5.0	Cryptography	Mandatory	PASS
EU863-870 5.a	AES encryption	Mandatory	PASS
EU863-870 5.b	MIC	Mandatory	PASS
EU863-870 6.0	Downlink window timing	Mandatory	PASS
EU863-870 7.0	Frame sequence number	Mandatory	PASS
EU863-870 7.a	Uplink sequence number	Mandatory	PASS
EU863-870 7.b	Downlink sequence number	Mandatory	PASS
EU863-870 8.0	DevStatusReq MAC command	Mandatory	PASS
EU863-870 9.0	MAC Commands	Mandatory	PASS
EU863-870 10.0	New Channel Request	Mandatory	PASS
EU863-870 10.a	Read-only default channels	Mandatory	PASS
EU863-870 10.b	Addition and removal of multiple channels	Mandatory	PASS
EU863-870 10.c & 10.d	Addition and removal of a single channel	Mandatory	PASS
EU863-870 11.0	Confirmed packets	Mandatory	PASS
EU863-870 11.a	Uplink confirmed packets	Mandatory	PASS
EU863-870 11.b	Uplink retransmission	Mandatory	PASS
EU863-870 11.c	Downlink confirmed packets	Mandatory	PASS
EU863-870 11.d	Downlink retransmission	Mandatory	PASS
EU863-870 12.0	RXParamSetupReq MAC command	Mandatory	PASS
EU863-870 13.0	RXTimingSetupReq MAC command	Mandatory	PASS
EU863-870 14.0	Link ADR Request	Mandatory	PASS
EU863-870 14.a	ADR bit	Mandatory	PASS
EU863-870 14.b	TXPower	Mandatory	PASS
EU863-870 14.c	Required DataRates	Mandatory	PASS
EU863-870 14.d	Optional DataRates	Mandatory	PASS
EU863-870 14.e	ChannelMask	Mandatory	PASS
EU863-870 14.f	Redundancy	Mandatory	PASS
EU863-870 14.g	ADRACKReq bit	Mandatory	PASS
EU863-870 15.0	Packet Error Rate RX1	Mandatory	PASS
EU863-870 16.0	Packet Error Rate RX2	Mandatory	PASS



**Test results per test case (ABP):**

Test item	Description	Implementation	Result
EU863-870 1.0	Device Activation	Mandatory	PASS
EU863-870 2.0	Test application functionality	Mandatory	PASS
EU863-870 4.0	Packet Error Rate Part 1	Mandatory	PASS
EU863-870 5.0	Cryptography	Mandatory	PASS
EU863-870 5.a	AES encryption	Mandatory	PASS
EU863-870 5.b	MIC	Mandatory	PASS
EU863-870 6.0	Downlink window timing	Mandatory	PASS
EU863-870 7.0	Frame sequence number	Mandatory	PASS
EU863-870 7.a	Uplink sequence number	Mandatory	PASS
EU863-870 7.b	Downlink sequence number	Mandatory	PASS
EU863-870 8.0	DevStatusReq MAC command	Mandatory	PASS
EU863-870 9.0	MAC Commands	Mandatory	PASS
EU863-870 10.0	New Channel Request	Mandatory	PASS
EU863-870 10.a	Read-only default channels	Mandatory	PASS
EU863-870 10.b	Addition and removal of multiple channels	Mandatory	PASS
EU863-870 10.c & 10.d	Addition and removal of a single channel	Mandatory	PASS
EU863-870 11.0	Confirmed packets	Mandatory	PASS
EU863-870 11.a	Uplink confirmed packets	Mandatory	PASS
EU863-870 11.b	Uplink retransmission	Mandatory	PASS
EU863-870 11.c	Downlink confirmed packets	Mandatory	PASS
EU863-870 11.d	Downlink retransmission	Mandatory	PASS
EU863-870 12.0	RXParamSetupReq MAC command	Mandatory	PASS
EU863-870 13.0	RXTimingSetupReq MAC command	Mandatory	PASS
EU863-870 14.0	Link ADR Request	Mandatory	PASS
EU863-870 14.a	ADR bit	Mandatory	PASS
EU863-870 14.b	TXPower	Mandatory	PASS
EU863-870 14.c	Required DataRates	Mandatory	PASS
EU863-870 14.d	Optional DataRates	Mandatory	PASS
EU863-870 14.e	ChannelMask	Mandatory	PASS
EU863-870 14.f	Redundancy	Mandatory	PASS
EU863-870 14.g	ADRACKReq bit	Mandatory	PASS

## 5 TEST RESULTS

### Detailed test results (OTAA):

Test item	Test Case Name	DataRate/ Timing	Limit	Results	Verdict
EU863-870 4.0	Packet Error Rate Part 1 (RX2)	SF12BW125	5%	3.33 %	PASS
EU863-870 6.0	Downlink window timing	-20ms	-	-	PASS
		+20ms	-	-	PASS
EU863-870 15.0	Packet Error Rate RX1	SF12BW125	5%	1.66 %	PASS
		SF11BW125	5%	0.00 %	PASS
		SF10BW125	5%	0.00 %	PASS
		SF9BW125	5%	5.00 %	PASS
		SF8BW125	5%	0.00 %	PASS
		SF7BW125	5%	0.00 %	PASS
		SF7BW250	5%	0.00 %	PASS
		FSK 50kbps	5%	0.00 %	PASS
EU863-870 16.0	Packet Error Rate RX2	SF11BW125	5%	1.66 %	PASS
		SF10BW125	5%	0.00 %	PASS
		SF9BW125	5%	3.33 %	PASS
		SF8BW125	5%	3.33 %	PASS
		SF7BW125	5%	0.00 %	PASS
		SF7BW250	5%	0.00 %	PASS
		FSK 50kbps	5%	1.66 %	PASS

## 6 PHOTO DOCUMENTATION



Photo 1: EUT front view

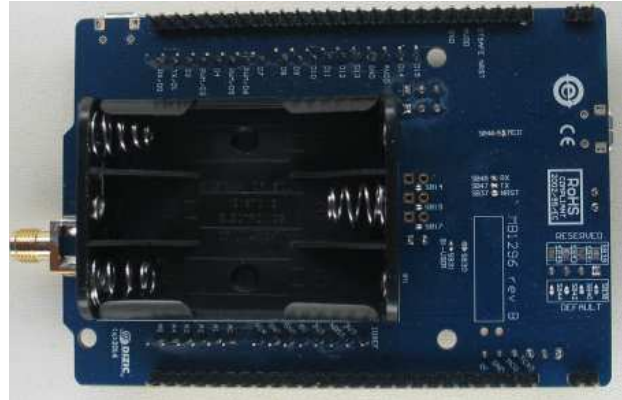


Photo 2: EUT rear view



Photo 3: Radio module top view

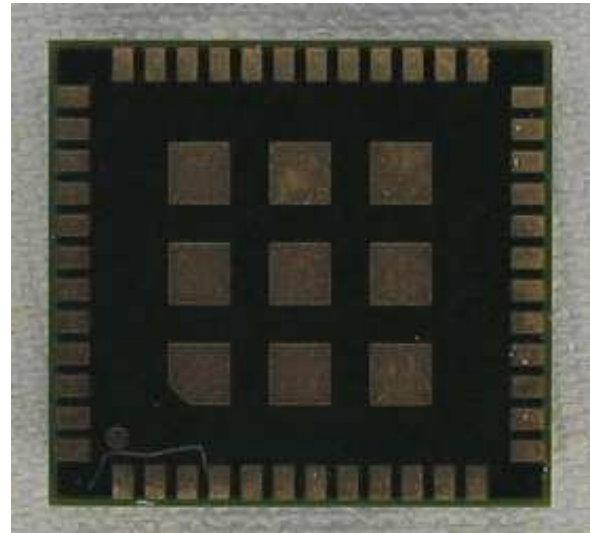


Photo 4: Radio module bottom view