

Prüfbericht-Nr.: <i>Test Report No.:</i> 50244661-001		Auftrags-Nr.: <i>Order No.:</i> 0133056142		Seite 1 von 10 Page 1 of 10	
Kunden Referenz-Nr.: <i>Client Reference No.:</i> 680411		Auftragsdatum : 01-06-2018 <i>Order date:</i>			
Auftraggeber: <i>Client:</i> RedwoodComm #14008 Section Bldg, SK M-City Tower, 195 Baengma-ro, Ilsandong-gu Goyang-si		Yujin Mun +82-10-810-4606 yujin@redwoodcomm.com			
Prüfgegenstand: <i>Test item:</i> RWC5020B LoRaWAN Tester					
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i> RWC5020B					
Auftrags-Inhalt: <i>Order content:</i> Test of Conformance to LoRaWAN™ Specification V1.0.2					
Prüfgrundlage: <i>Test specification:</i> LoRa End Device Certification EU Version1.5					
Wareneingangsdatum: <i>Date of receipt:</i> 01-06-2018					
Prüfmuster-Nr.: <i>Test sample No.:</i> RWC50201720002					
Prüfzeitraum: <i>Testing period:</i> 25-09-2019~26-09-2019					
Ort der Prüfung: <i>Place of testing:</i> Seoul, Rep. of Korea					
Prüflaboratorium: <i>Testing laboratory:</i> TÜV Rheinland Korea Ltd.					
Prüfergebnis: <i>Test results:</i> PASS					
Geprüft von <i>Tested by:</i> MyoungHyun Choi / Engineer		Kontrolliert von <i>Reviewed by:</i> Wonjung Kim / Section Manager			
27-09-2019		27-09-2019			
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sontiges / <i>Other:</i> -					
<p>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. <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.: 50077235 001
Test Report No.: 50077235 001

Seite 2 von 10
Page 2 of 10

Revisions Revisions			
Revision Revision	Datum Date	Anmerkung Remark	Verfasser 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	9
	Detailed test results:.....	9
6	PHOTO DOCUMENTATION.....	10

Prüfbericht-Nr.: 50077235 001
Test Report No.: 50077235 001

Seite 4 von 10
Page 4 of 10

1 PRODUCT INFORMATION

The device under test (DUT) is a wireless SoluM LoRa Module for LoRaWAN Certification testing

General information	
Product name:	RWC5020B LoRaWAN Tester
Model:	RWC5020B
Description:	LoRa Alliance LoRaWAN compliance testing
Manufacturer SKU	-
Hardware version:	1.0
Software version:	V.1.20
Contact person:	Yujin Mun
Phone number:	+82-10-810-4606

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?	Yes
Activation possibilities	Over the air
Test According LoRaWAN™ Spec	v1.0.2
Output Power	0 ~ -150 dBm
Number / Type of Antenna(s)	1 / External Dipole
Antenna Gain	2dBi
Test sample information	production unit

Prüfbericht-Nr.: 50077235 001
Test Report No.: 50077235 001

Seite 5 von 10
Page 5 of 10

For OTA activation:	
Serial No of Device with OTAA	RWC5020170002
End-device identifier (DevEUI)	0x0000000000000001
Application identifier (AppEUI)	0x0000000000000001
Application key (AppKey)	0x00000000000000000000000000000001
For activation by personalization:	
Serial No of Device with ABP	N / A
End-device identifier (DevAddr)	N / A
Application identifier (AppSKey)	N/ A
Application key (NwkSKey)	N/ A
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	64
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.

2 TEST EQUIPMENT

Prüfmittel <i>Test equipment</i>	Marke <i>Brand</i>	Version <i>Version</i>
Comprehensive Testing Environment (CTE)	TUV Rheinland	CTE - TMF V45.1 CTE - SIG - LoRaWAN V1.5
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.: 50077235 001
Test Report No.: 50077235 001

Seite 7 von 10
Page 7 of 10

3 SUMMARY

Verdicts of functional requirements:	Verdict
Test Mode Activation (Over the Air Activation)	PASS
Test Application Functionality	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:

Test item	Description	Implementation	Result
EU863-870 1.0	Device Activation (Over the Air 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.a.	AES encryption	Mandatory	PASS
EU863-870 5.b.	MIC	Mandatory	PASS
EU863-870 6.0	Downlink window timing	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.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	DL Channel Request MAC command	Mandatory	PASS
EU863-870 12.a.	Uplink confirmed packets	Mandatory	PASS
EU863-870 12.b.	Uplink retransmission	Mandatory	PASS
EU863-870 12.c.	Downlink confirmed packets	Mandatory	PASS
EU863-870 12.d.	Downlink retransmission	Mandatory	PASS
EU863-870 13.0	RXParamSetupReq MAC command	Mandatory	PASS
EU863-870 14.0	RXTimingSetupReq MAC command	Mandatory	PASS
EU863-870 15.a.	ADR bit	Mandatory	PASS
EU863-870 15.b.	TXPower	Mandatory	PASS
EU863-870 15.c.	Required DataRates	Mandatory	PASS
EU863-870 15.d.	Optional DataRates	Optional	PASS
EU863-870 15.e.	ChannelMask	Mandatory	PASS
EU863-870 15.f	Redundancy	Mandatory	PASS
EU863-870 15.g.	ADRACKReq bit	Mandatory	PASS
EU863-870 15.h.	LinkADRReq commands block	Mandatory	PASS
EU863-870 16.0	Packet Error Rate RX1	Mandatory	PASS
EU863-870 17.0	Packet Error Rate RX2	Mandatory	PASS

Prüfbericht-Nr.: 50077235 001
Test Report No.: 50077235 001

Seite 9 von 10
Page 9 of 10

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%	1.66%	PASS
EU863-870 6.0	Downlink window timing	-20us	-	-	PASS
		+20us	-	-	PASS
EU863-870 16.0	Packet Error Rate RX1	SF12BW125	5%	0%	PASS
		SF11BW125	5%	0%	PASS
		SF10BW125	5%	0%	PASS
		SF9BW125	5%	0%	PASS
		SF8BW125	5%	0%	PASS
		SF7BW125	5%	0%	PASS
EU863-870 17.0	Packet Error Rate RX2	SF11BW125	5%	0%	PASS
		SF10BW125	5%	0%	PASS
		SF9BW125	5%	0%	PASS
		SF8BW125	5%	0%	PASS
		SF7BW125	5%	0%	PASS

6 PHOTO DOCUMENTATION



Photo 1