



Test report No:

NIE: 1970398R-WLR001

Test Report

LoRa Alliance End Device Certification Requirements

Identification of item tested	RF Module
Trademark.....	HOPERF
Model or type reference.....	RFM6501
Final HW version.....	1.0
Final FW version	4.3
Final SW version.....	1.1
Features.....	LoRa Alliance End Device Certification Requirements for US/Canada 915MHz ISM Band Devices
Manufacturer	Shenzhen HOPE Microelectronics Co., Ltd 2/F,Building3,pingshan Private Enterprise science and Technology Park, xili Town, Nanshan District, 518071 Shenzhen, China
Test method requested.....	LoRa Alliance Certification
Standard.....	LoRa Alliance End Device Certification Requirements for US/Canada 915MHz ISM Band Devices Ver.1.4
Test According LoRaWAN™ Spec	V1.0.2
Supported optional features.....	YES
Test procedure(s).....	TERD-WTS-TP-02 – LORA_TSSTP_PART_1_v1.0
Summary.....	IN COMPLIANCE
Approved by (name / position & signature)	Jimmy Chang Project Manager
Date of issue.....	2019-12-06
Report template No	FLO001_01

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Usage of samples

Samples undergoing test have been selected by: Shenzhen HOPE Microelectronics Co., Ltd

Sample M/01, is composed of the following elements:

Control N° M/0x	DUT Label ID	PSR-1632290
	Model and/or type reference	RFM6501
	Serial number	N/A
	HW version	1.0
	FW version	4.3
	SW version	1.1
	Description of test sample	RFM6501 is a small size powerful LoRaWAN end device RF module.
	Date of reception	2019-08-01

The sample used for each test case is specified in the "Observations" field of the results annex

Identification of the client

Company name	Shenzhen HOPE Microelectronics Co., Ltd
Address	2/F,Building3,pingshan Private Enterprise science and Technology Park, xili Town, Nanshan District, 51807 Shenzhen, China

Testing period

Start Date	2019-08-02
Finish Date	2019-12-04

The tests have been performed at DEKRA Testing and Certification, Co., Ltd. (Taiwan)

Environmental conditions

The testing has been performed within the following limits:

Temperature	Min. = 15 °C Max. = 35 °C
Relative humidity	Min. = 20 % Max. = 80 %

Remarks and comments

Test Report Creator	Gavin Yang gavin.yang@dekra.com
Test Engineer	Gavin Yang gavin.yang@dekra.com

Change History

Revision	Description
01	Initial issued

Means of testing identification

Following equipment was used to perform the testing:

US915 SETUP			
Test System	CN. 556	TACS4 LPWAN Testing, Approvals & Certification System	
Hardware:	Control No.	Equipment	Serial No.
	0584	LoRa 64Ch Gateway TEKTELIC - MACO2LUS915	T0004537
Software:	0559	TACS4 LORA GUI v1.13.0 TACS4 LORA Reporting Module v1.5.0	
	0560	TACS4 LORA Technology Package v5.14.0_R1	

Appendix A – Test result

Test campaign report

The abbreviations used in the header row of the test campaign report tables are:

- Test Case ID: Test case identifier, as it can be found on the referred standard.
- Sample: Sample details.
- Description: Test case description, as it can be found on the referred standard.
- Date: Date of the beginning of the execution.
- Conformance: YES/NO. If the test case has been executed in accordance to the standard.
- Verdict: Records the verdict assigned to each Test case run to completion. Following verdicts are possible:
 - PASS:** If the Test case passed.
 - FAIL:** If the Test case failed.
 - INCONC:** Inconclusive. The test case did not reach a PASS or FAIL verdict.
 - NA:** Not applicable.
 - NM:** Not measured.
- Observations: Provides a reference to additional information relevant to the test (when required).

Test Case ID	Description	Verdict	Date	Observations
TP_A_US915_MAC_BV_000	Test Mode Activation	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_002	Test Application functionality	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_003	AES Encryption and Message Integrity	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_004	Downlink Error Rate	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_005	Downlink Window Timing	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_006A	Frame Sequence Number	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_006B	Downlink Sequence Number Roller	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_007	DevstatusReq Mac Command	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_008A	Mac Commands	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_008B	Mac Commands in App-Payload & Fopts	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_009	NewChannelReq Mac Command	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_010	Confirm Packets	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_011	RXParamSetupReq Mac Command	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_012	RX1 Receive Window Test	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_013	RX2 Receive Window Test	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_014	RX TimingSetupReq Mac Command	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_015A	LinkADRReq Mac Command	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_015B	LinkADRReq Mac Command	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_016	RX Oversized Payload	Pass	2019-12-03	ABP
TP_A_US915_MAC_BV_017	Maximum Allowed Payload	Pass	2019-12-03	ABP

0 test cases have been executed with SCR errors
 20 test cases selected of 20 executed
 20 test cases executed of 20 applicable

Test Case ID	Description	Verdict	Date	Observations
TP_A_US915_MAC_BV_000	Test Mode Activation	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_001	Over The Air Activation	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_002	Test Application functionality	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_003	AES Encryption and Message Integrity	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_004	Downlink Error Rate	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_005	Downlink Window Timing	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_006A	Frame Sequence Number	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_006B	Downlink Sequence Number Roller	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_007	DevstatusReq Mac Command	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_008A	Mac Commands	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_008B	Mac Commands in App-Payload & Fopts	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_009	NewChannelReq Mac Command	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_010	Confirm Packets	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_011	RXParamSetupReq Mac Command	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_012	RX1 Receive Window Test	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_013	RX2 Receive Window Test	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_014	RX TimingSetupReq Mac Command	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_015A	LinkADRReq Mac Command	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_015B	LinkADRReq Mac Command	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_016	RX Oversized Payload	Pass	2019-12-04	OTAA
TP_A_US915_MAC_BV_017	Maximum Allowed Payload	Pass	2019-12-04	OTAA

0 test cases have been executed with SCR errors

21 test cases selected of 21 executed

21 test cases executed of 21 applicable

Appendix B – ICS

Item	Name	Value
1	DUT works in USA 915MHz ISM Band	TRUE
2	DUT implements LoRaWAN v1.0.1 certification requirements	FALSE
3	DUT implements LoRaWAN v1.0.2rB certification requirements	TRUE
4	DUT is a Class A Device (All End Device)	TRUE
5	DUT is a Class B Device (Beacon Mode)	TRUE
6	DUT is a Class C Device (Continuously Listening)	TRUE
7	DUT supports Adaptive Data Rate (ADR) feature	TRUE
8	DUT supports LinkADRReq block	TRUE
9	DUT supports Over-The-Air Activation (OTAA) mechanism	TRUE
10	DUT needs a reset after deactivating Test Mode	TRUE
11	DUT supports Trigger Join Request command in Test Mode	TRUE

Appendix C – IXIT

Item	Name	Value
1	End-Device Address (DvAddr)	6672237A
2	Application Session Key (AppSKey)	EF6D6E2503F57AE2FA151CDA87455F18
3	Network Session Key (NwkSKey)	2E8C8650B4041672BBB9A399F2DEB427
4	Application Identifier (AppEUI)	D896E0E000005203
5	Maximum Transmission Power	22 dBm
6	Minimum Transmission Power	10 dBm
7	Application Key (AppKey)	077EE45C6E4564D96D76AE55AFD3AA89
11	Device Identifier (DevEUI)	D896E0FF00000241

Appendix D – General Parameters

Item	Name	Value
GW	Default TX Antenna	0
	Gateway IP Address	192.168.32.3
	Gateway Model	Tektelic
	Default TX Power	14 dBm
	Gateway Socket Port	1780
TM – US915	US915 Join_Accept_Delay1	5.0 s
	US915 Join_Accept_Delay2	6.0 s
	US915 Receive_Delay1	1.0 s
	US915 Receive_Delay2	2.0 s
	US915 RX2 Receive Window DR	SF12BW500
	US915 RX2 Receive Window Frequency	923.3 MHz
	General Timer	120 s