

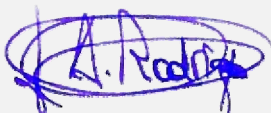


Test report No:

NIE: 201703.003

Test Report

LoRa Alliance End Device Certification Requirements

Identification of item tested	51487_Pycom_US915_ABP + 51487_Pycom_US915_OTAA
DUT	LoPy 1.0
Model or type reference	LoRa Programmable Module
Final HW version	1.0r
Final SW version	1.0.0
Final FW version	1.0.0
Features	LoRa + WiFi + Bluetooth module programmable with MicroPython
Manufacturer	Pycom Ltd
Test method requested	Lora Alliance Certification
Standard	LoRa Alliance End Device Certification Requirements for US and Canada 915MHz ISM Band Devices ver1.1/2017-01-13
Test procedure(s)	PELO001_01 TERD WTS TP 02 LORA_TSSTP_PART_2_v2.0
Summary	IN COMPLIANCE
Approved by (name / position & signature)	José Aurelio Rodrigo Simón Wireless Test Solution Manager 
Date of issue	2017-03-22
Report template No	FLO001_01

Competences and guarantees

AT4 wireless is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of AT4 wireless.

General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

Usage of samples

Samples undergoing test have been selected and supplied by: Pycom Ltd

Sample M/01 is composed of the following elements:

CONTROL Nº	DESCRIPTION	MODEL	HW VERSION	SW VERSION	FW VERSION	SERIAL Nº	DATE OF RECEPTION
51487/1	LoRa module	LoPy 1.0	1.0r	1.0.0	1.0.0	1639003594	2016-12-05
51487/2	LoRa module	LoPy 1.0	1.0r	1.0.0	1.0.0	1639003202	2016-12-05
51487/3	Antenna						2016-12-05

Test sample description

The test sample consists on 51425/1 programmed with ABP FW v1.0.0.

The test sample consists on 51425/2 programmed with OTAA FW v1.0.0.

Identification of the client

Pycom Ltd

Daniel Campora (daniel@pycom.io)

+31 (0) 613274750

Testing period

The performed test started on 2017-03-20 and finished on 2017-03-22.

The tests have been performed at AT4 wireless S.A.U. (Spain).

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

The tests have been performed by the technical personnel:

Antonio Castillo

acverdugo@at4wireless.com

+34 952 619 401

Diego Bartolomé

dbartolome@at4wireless.com

+34 952 619 403

Testing verdicts

As detailed in Appendix A.

Means of testing identification

Following equipment was used to perform the testing:

ITEM	EU868 SETUP		US915 SETUP	
TEST SYSTEM	TACS4 LORA			
CONTROL NUMBER	5866			
HARDWARE	Equipment	Serial N°	Equipment	Serial N°
	Semtech GW IOT SX1301 Starter Kit	PCB_E340V02A 0915	Senet Gateway	0005863-01000206-0716 FCC ID X94-0005845
SOFTWARE	Equipment		Equipment	
	TACS4 LORA GUI v1.7.0 TACS4 LORA Reporting Module v1.5.0 TACS4 LORA Technology Package v3.0.0_R1 TACS4 LORA ED Certification EU v1.3		TACS4 LORA GUI v1.7.0 TACS4 LORA Reporting Module v1.5.0 TACS4 LORA Technology Package v3.0.0_R1 TACS4 LORA ED Certification US & Canada v1.1	

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).

0 test cases have been executed with SCR errors
 17 test cases selected of 17 executed
 17 test cases executed of 17 applicable

Test Case ID	Date	Conf	Verdict	Observations
TP_A_US915_ED_MAC_BV_000 Test mode activation	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_001 Over The Air activation	2017-03-21	Yes	PASS	OTAA
TP_A_US915_ED_MAC_BV_002 Test application functionality	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_003 AES encryption and message integrity	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_004 Downlink error rate	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_005 Downlink window timing	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA

TP_A_US915_ED_MAC_BV_006 Frame sequence number	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_007 DevStatusReq MAC command	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_008 MAC Commands	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_009 NewChannelReq MAC command	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_010 Confirmed packets	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_011 RXParamSetupReq MAC command	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_012 RX1 Receive window test	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_013 RX2 Receive window test	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_014 RXTimingSetupReq MAC command	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_015_A LinkADRReq MAC command	2017-03-22 2017-03-22	Yes Yes	PASS PASS	ABP OTAA
TP_A_US915_ED_MAC_BV_015_B LinkADRReq MAC command	2017-03-20 2017-03-21	Yes Yes	PASS PASS	ABP OTAA

Appendix B – ICS

ABP

NAME	VALUE
DUT is a Class A Device (All End Devices)	TRUE
DUT works in USA 915MHz ISM Band	TRUE
DUT supports Adaptive Data Rate (ADR) feature	TRUE

OTAA

NAME	VALUE
DUT is a Class A Device (All End Devices)	TRUE
DUT works in USA 915MHz ISM Band	TRUE
DUT supports Over-The-Air Activation (OTAA) mechanism	TRUE
DUT supports Adaptive Data Rate (ADR) feature	TRUE
DUT supports Trigger Join Request command in Test Mode	TRUE
DUT needs a reset after deactivating Test Mode	TRUE

Appendix C – IXIT

ABP

NAME	VALUE
Minimum transmission power	0
Maximum transmission power	0
Application session key (AppSKey)	'2B7E151628AED2A6ABF7158809CF4F3C'O
Network session key (NwkSKey)	'2B7E151628AED2A6ABF7158809CF4F3C'O
Application key (AppKey)	'11B0282A189B75B0B4D2D8C7FA38548B'O
Application identifier (AppEUI)	'ADA4DAE3AC12676B'O
End-device Address (DevAddr)	'0A000000'O

OTAA

NAME	VALUE
Minimum transmission power	0
Maximum transmission power	0
Application session key (AppSKey)	'2B7E151628AED2A6ABF7158809CF4F3C'O
Network session key (NwkSKey)	'2B7E151628AED2A6ABF7158809CF4F3C'O
Application key (AppKey)	'11B0282A189B75B0B4D2D8C7FA38548B'O
Application identifier (AppEUI)	'ADA4DAE3AC12676B'O
End-device Address (DevAddr)	'0A000000'O

Appendix D – General Parameters

NAME	VALUE
US915 RX2 Receive window DR	SF12BW500
General Timer	60
Gateway IP Address	192.168.110.88
Socket port communication between Test Tool and Gateway	1780
Default Tx Power (dBm)	14
Default Tx Antenna	0
EU868 RECEIVE_DELAY1 (s)	1.0
EU868 RECEIVE_DELAY2 (s)	2.0
EU868 JOIN_ACCEPT_DELAY1 (s)	5.0
EU868 JOIN_ACCEPT_DELAY2(s)	6.0
EU868 RX2 Receive window frequency	869.525
EU868 RX2 Receive window DR	SF12BW125
US915 RECEIVE_DELAY1 (s)	1.0
US915 RECEIVE_DELAY2 (s)	2.0
US915 JOIN_ACCEPT_DELAY1(s)	5.0
US915 JOIN_ACCEPT_DELAY2(s)	6.0
US915 RX2 Receive window frequency	923.3

Appendix E – Photographs

Sample M/01

