



# ThingPark Wireless Device Interoperability Test Report

Manufacturer:	RAKwireless
Product:	Module
Part number:	RAK811
Hardware version:	1.0
Software version:	2.0.2.2
LoRaWAN:	<b>1.0.2</b>
Band:	AS 923

Date:	<b>2017/11/29</b>
Test operator:	<b>C. C. Sun</b>
Test result:	<b>PASS</b>
Test plan version:	1.5

Test Report No:	00000127-00000853
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## 1 Abstract

The ThingPark Wireless Interoperability Test Report exposes the result of the tests described in the ThingPark Wireless Interoperability Test Plan.

The Not Applicable tests will be identified as N/A, all other tests result as Passed, Failed or Not Tested in case the test cannot be performed.

## 2 Device description

LoRa RF:

- ☒ LoRaWAN Modem, specify manufacturer/partNumber: RAKwireless / RAK811
- ☐ LoRa Module, specify manufacturer/partNumber:
- ☐ Proprietary RF

Antenna:

- ☒ External
- ☐ Wire
- ☐ PCB
- ☐ Other:

Device description:

RAK811 Low-Power Long Range LoRa Technology Transceiver module, provides an easy to use, small size, low-power solution for long range wireless data transmission.



### 3 Test conditions

#### 3.1 Device

DevEUI: 303734365B359201

ABP	
DevAddr	00112233
NwkSKey	3432567AFDE4525A7890BCDE234F5A2B
AppSKey	A48DBDC393D0DE4F83A92BC37D11C900

OTAA	
AppEUI	70B3D57EF00046A4
AppKey	A6B08140DAE1D795EBFA5A6DEE1F4DBD

Profile	Value
Class	A
Rx2 datarate	2
Spreading Factor min	7
Spreading Factor max	10
Test Port number	224

Profile	YES	NO
Support Uplink Confirmed	•	
Support Uplink UnConfirmed	•	
Frame counter-up up to 32 bits	•	
Frame counter-down up to 32 bits	•	
Test Port enable	•	

#### 3.2 ThingPark Platform

LRC version: 1.8.12

InterOP Engine: 1.1.8.4

LRR model: Kerlink

LRR version: 2.2.11

ThingPark OSS version: 4.3.0.2



## 4 General comment about the test

- DevEUI range specified in TPIT 1.0.1 belongs to the Beijing LTHonway Technology Co., Ltd which is the former entity of Shenzhen RAK wireless Technology Co. Ltd.
- Manual at+join=otaa is required to test re-join for TPIT 1.2.2
- Not easy to pass TPIT 4.4 due to timeout seen in Rx window
- TPIT 3.2.3 is tested and passed by RAKwireless (Reference: 2017111102092)
- Manual at+dr=3 (or at+set\_config=dr:3) is required to pass TPIT 4.5.1



## 5 ThingPark Wireless Interoperability Test Report

### 5.1 TPIT 1.0 – IEEE Address Compliance

TPIT #	Description	Result	Pass/Fail
1.0.1	DevEUI range	60C5A8 (hex)	PASS
1.0.2	AppEUI range		INFO

### 5.2 TPIT 1.1 – Activation By Personalization

TPIT #	Description	Result	Pass/Fail
1.1.1	DevAddr		PASS
1.1.2	NwkSKey		PASS
1.1.3	MIC test		PASS

### 5.3 TPIT 1.2 – Over-The-Air Activation

TPIT #	Description	Result	Pass/Fail
1.2.1	AppKey		PASS

#### 5.3.1 TPIT 1.2.2 – Join accept testing

TPIT #	Description	Result	Pass/Fail
1.2.2.1	JoinRequest → JoinAccept		PASS
1.2.2.2	Uplink following JoinAccept		PASS
1.2.2.3	Uplink following JoinAccept with wrong NwkSKey		NOT TESTED
1.2.2.4	No reply from NetworkServer		PASS
1.2.2.5	Re-join request		NOT TESTED
1.2.2.6	CF List		NOT TESTED

#### 5.3.2 TPIT 1.2.3 – Join Request testing

TPIT #	Description	Result	Pass/Fail
1.2.3.1	JoinRequest duty cycle	Questionnaire partner	INFO



#### 5.4 TPIT 2.1 – Uplink Message compliance

TPIT #	Description	Result	Pass/Fail
2.1.1	Unconfirmed message		PASS
2.1.2	Confirmed message		PASS
2.1.3	Check all SF	SF7 ~ SF10	PASS
2.1.4	Check packet loss	pkt rcv = 60/60 lost = 0 Ratio = 1	PASS
2.1.5	Downlink disabled		PASS

#### 5.5 TPIT 2.2 – Downlink message compliance

TPIT #	Description	Result	Pass/Fail
2.2.1	Unconfirmed message		PASS
2.2.2	Confirmed message		PASS
2.2.3	Check all SF	SF7 ~ SF10	PASS
2.2.4	Check packet loss	pkt snd= 60 pkt rcv = 60 Ratio = 1	PASS
2.2.5	Check RX2		PASS

#### 5.6 TPIT 2.3 – Application payload encryption

TPIT #	Description	Result	Pass/Fail
2.3.1	Check AppSKey encryption		NOT TESTED

#### 5.7 TPIT 3.1 – Default Uplink RF channel usage

TPIT #	Description	Result	Pass/Fail
3.1.1	Default LC1 LC2		PASS
3.1.2	Communication over the 2 channels		PASS



## 5.8 TPIT 3.2 – Adaptive Data Rate

TPIT #	Description	Result	Pass/Fail
3.2.1	SF fallback unconfirmed		PASS
3.2.2	SF fallback confirmed	SF7 ~ SF10	PASS
3.2.3	Change Tx power	<u>Send from network server:</u> Mac (hex) : 0930 / 0934 – TxParamSetupReq.EIRP_DwellTime.MaxEIRP : 0 / 4  Power: 8 dBm → 14 dBm, RSSI: -71 dBm → -66 dBm  <u>Received from network DUT:</u> Mac (hex): 09 – TxParamSetupAns	PASS
3.2.4	Change redundancy	<u>Send from network server:</u> Mac (hex): 0355ff0003 – LinkADDRReq.Redundancy  03  <u>Received from network DUT:</u> Mac (hex): 0307 - LinkADRsAns	PASS

## 5.9 TPIT 3.3 – Deactivated ADR (mobility)

TPIT #	Description	Result	Pass/Fail
3.3.1	Deactivated ADR		PASS

## 5.10 TPIT 4.1 – MAC Command RXTimingSetup

TPIT #	Description	Result	Pass/Fail
4.1.1	LRC sends RXTimingSetupReq with non-default timing (e.g. 3 seconds)	<u>Send from network server:</u> Mac (hex) : 0803 - RXTimingSetupReq  Delay : 3  <u>Received from network DUT:</u> Mac (hex) : 08 - RXTimingSetupAns	PASS
4.1.1.1	Check repeat RXTimingSetupAns		PASS

## 5.11 TPIT 4.2 – MAC Command RXParamSetup

TPIT #	Description	Result	Pass/Fail
4.2.1	Change RXParamSetupReq with RX1DRoffset, RX2DataRate, and RX2Frequency	<u>Send from network server:</u> Mac (hex) : 051250e68c – RXParamSetupReq  RX1DRoffset: 1 RX2DataRate: 2	PASS



		Frequency (Hz): 923400000  <u>Received from network DUT:</u> Mac (hex) : 0507 – RXParamSetupAns  ChannelACK: 1 RX2DataRateACK: 1 RX1DRoffset: 1	
4.2.1.1	Check repeat RXParamSetupAns		PASS

## 5.12 TPIT 4.3 – MAC Command DevStatus

TPIT #	Description	Result	Pass/Fail
4.3.1	LRC to send a <i>DevStatusReq</i> to the device	<u>Send from network server:</u> Mac (hex) : 06 – DevStatusReq  <u>Received from network DUT:</u> Mac (hex) : 06fe1d – DevStatusAns  Battery: 254 Margin: 29	PASS

## 5.13 TPIT 4.4 – MAC Command NewChannel/DIChannel

TPIT #	Description	Result	Pass/Fail
4.4.1 4.4.2	Add new channel (4.4.1) and Delete channel (4.4.2)		PASS
4.4.3	Modify Downlink channel	<u>Send from network server:</u> Mac (hex) : 0a0080de8c0a0150e68c0a0210c78c0a03e0ce8c0 a04b0d68c0a0590828d0a06608a8d0a0730928d - DIChannelReq  <u>Received from network DUT:</u> Mac (hex) : 0a030a030a030a030a030a030a03 - DIChannelAns	PASS

## 5.14 TPIT 4.5 – MAC command over port 0

TPIT #	Description	Result	Pass/Fail
4.5.1	The LRC will send a command MAC with more 15 bytes	<u>Send from network server:</u> Mac (hex): 090503507f00010503805b8d0707b0d68c50 – TxParamSetupReq / LinkADDRReq / RXParamSetup / NewChannelReq	PASS





		Received from network DUT: Mac (hex): 09030605070703 – TxParamSetupAns / LinkADRAAns / RXParamSetupAns / NewChannelAns	
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### 5.15 TPIT 4.6 – MAC Command TxParamSetup

TPIT #	Description	Result	Pass/Fail
4.6.1	Uplink Dwell time test	<u>Send from network server:</u> Mac (hex): 0934 – TxParamSetupReq /  UplinkDwellTime : 1 UplinkDwellTime : 400 ms  <u>Received from network DUT:</u> Mac (hex): 09 – TxParamSetupAns	PASS
4.6.2	Downlink Dwell time test	<u>Send from network server:</u> Mac (hex): 0924 – TxParamSetupReq /  DownlinkDwellTime : 1 DownlinkDwellTime : 400 ms  <u>Received from network DUT:</u> Mac (hex): 090307 – TxParamSetupAns	PASS

### 5.16 TPIT 5.1 – Class C receive window

TPIT #	Description	Result	Pass/Fail
5.1.1	Downlink message		NA
5.1.2	DUT saved previous RF settings after a soft reboot		NA

### 5.17 TPIT 5.2 – Class C Multicast for downlink messages

TPIT #	Description	Result	Pass/Fail
5.2.1	Downlink message		NA

### 5.18 TPIT 6 – Application behavior

#### 5.18.1 TPIT 6.1 – ADR behavior

TPIT #	Description	Result	Pass/Fail
6.1.1	SF at startup	SF = 10	PASS



### 5.18.2 TPIT 6.2 – FCnt management

TPIT #	Description	Result	Pass/Fail
6.2.1	At startup FCntUp <=1 if the device does not implement a reset MAC command	FCntUp = 0	PASS
6.2.2	FCntUp/Down must be able to be higher than 65536	Questionnaire partner	INFO
6.2.3	Reject frame with a bad frame FCntDown		PASS

### 5.19 TPIT 7 – Radio Frequency testing

#### 5.19.1 TPIT 7.1 – RF

TPIT #	Description	Result	Pass/Fail
7.1.1	Uplink / Downlink SNR		NOT TESTED