ISP4520
LoRaWAN Pre-certification

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Reference: TR201002R1

Ref	Date	Comments
TR201002R0	21/10/2020	Creation
TR201002R1	05/02/2021	Updated for LoRaWan 1.0.4

![Insight SiP logo] **Technical Report**

Contents

1. Object

1.1 Scope

This document describes the tests that have been made to ensure that the ISP4520 meets the functional requirements of the LoRaWAN Specification Version 1.0.4 and the RP2-1.0.1 LoRaWAN Regional Parameters.

1.2 Reference Documents

The following table describes the documents used as references for the tests.

RD1	isp_lora_DS4520_R6.pdf	Data Sheet ISP4520 for LoRa - BLE-Module EU Rev E
RD2	LW1.0.4_End_Device_Certification_V1.0.pdf	End Device Certification Requirements for All Regions
RD3	LoRaWAN Link Layer Specification v1.0.4.pdf	LoRaWAN L2 1.0.4 Specification
RD4	lorawan_regional_parameters_v1.0.2_final_1944_1.pdf	LoRaWAN™1.0.2 Regional Parameters

RD1 can be found on Insight SiP website:
https://www.insightsip.com/fichiers_insightsip/pdf/ble/ISP4520/isp_lora_DS4520_R6.pdf

RD2 & RD3 can be found in the LoRaWAN 1.0.4 Specification Package on the LoRa Alliance website:
https://lora-alliance.org/resource_hub/lorawan-104-specification-package

RD4 can be found on the LoRa Alliance website under resources:
https://lora-alliance.org/resource_hub/rp2-101-lorawan-regional-parameters-2
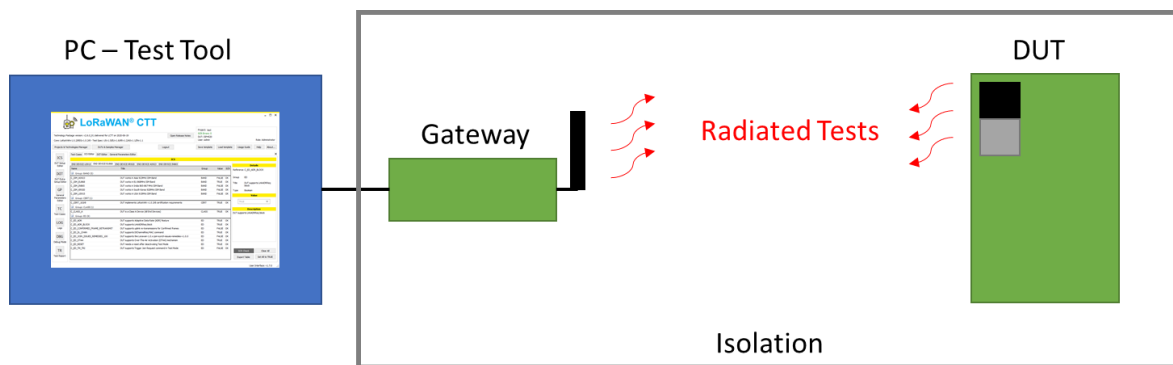
2. Test Setup

2.1 Setup

The setup consists in:

- A Device Under Test (called DUT)
- A Gateway
- A test tool installed on a computer.

The setup block diagram is below:

2.2 Test Tool

The DUT is tested using the official LoRaWAN Certification Test Tool (LCTT):
https://lora-alliance.org/lorawan-certification-test-tool.
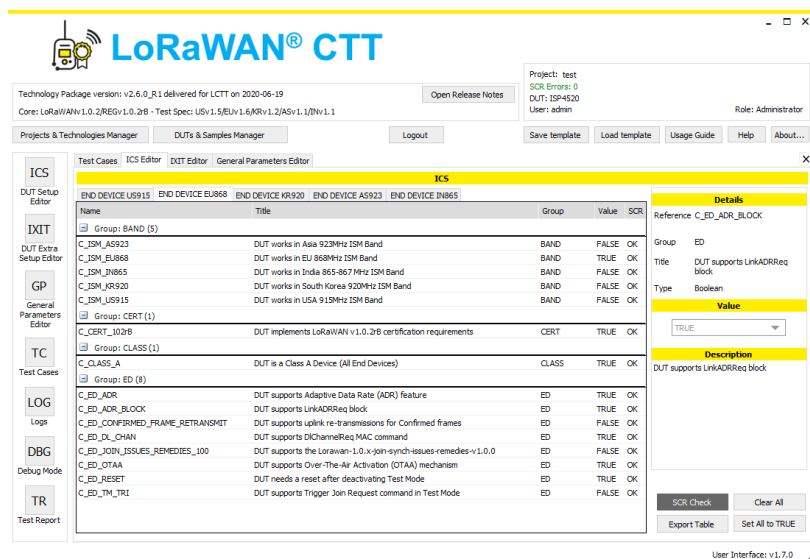This tool will automatically conduct a test campaign and generate a test report.

Figure 1: LCTT window

2.3 Gateway

For European regional parameters, the gateway used with the test tool is the recommended Semtech Picocell SX1308P868GW. The gateway is directly connected to the computer where the LCTT software is running.

Figure 2: Picocell Gateway

2.4 DUT

The DUT is an ISP4520 module mounted on a test board. It is connected to ISP130603 which provides power supply and programming capabilities.
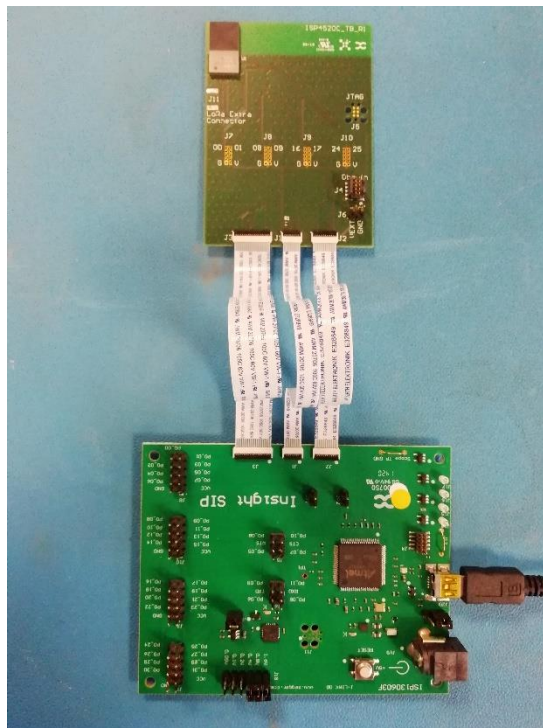

Figure 5: DUT

The module is loaded with the relevant regional variant of the "End-device" example. Proper OTAA commissioning is made to exchange with the test tool. The firmware is from the version 3.1.1 of the ISP4520-Examples package in the Insight SiP repository: https://github.com/insightsip/ISP4520-examples.

The Insight SiP v3.1.1 package is ported to the specific hardware used in ISP4520 from the v4.5.1 LoRaMac-Node from the Stackforce repository: https://github.com/Lora-net/LoRaMac-node/tree/v4.5.1. The original code runs on STM32 whereas the ported code runs on nRF52832 inside the ISP4520.

3. Test Results

3.1 ISP4520-EU

The DUT used for the test is an ISP4520 with the following details:

- Model: EU
- HW revision: E
- SW revision 3.1.0

Below the test results:

Test Case	Date	Verdict	Observations
Activation Pre-Test	2021-02-02	**PASS**	
Over The Air activation	2021-02-02	**PASS**	
Cryptography	2021-02-02	**PASS**	
Downlink Sequence Number	2021-02-02	**PASS**	
Confirmed Frames	2021-02-02	**PASS**	
DevStatusReq MAC command	2021-02-02	**PASS**	
NewChannelReq MAC command for Dynamic Channel plan devices only	2021-02-02	**PASS**	
DlChannelReq for Dynamic Channel plan devices only	2021-02-02	**PASS**	
RXParameterSetupReq MAC command	2021-02-02	**PASS**	
RXTimingSetupReq MAC command	2021-02-02	**PASS**	
TXParamSetupReq MAC command	2021-02-02	**PASS**	
LinkCheckReq MAC Command	2021-02-02	**PASS**	

LinkADRReq MAC command	2021-02-02	**PASS**	
DutyCycleReq MAC command	2021-02-02	**PASS**	
DeviceTimeReq MAC command	2021-02-02	**PASS**	
RX1 Receive Window Test	2021-02-02	**PASS**	
RX2 Receive Window Test	2021-02-02	**PASS**	
RX1 and RX2 simultaneous frames	2021-02-02	**PASS**	
RX Oversized Payload	2021-02-02	**PASS**	
Maximum Allowed Payload	2021-02-02	**PASS**	
MAC Command(s) in App-Payload and/or Frame Options	2021-02-02	**PASS**	
Multiple MAC commands prioritization	2021-02-02	**PASS**	
FPort 224 Deactivation	2021-02-02	**PASS**	

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3.2 ISP4520-AS

The DUT used for the test is an ISP4520 with the following details:

- Model: AS
- HW revision: B
- SW revision 3.1.0

Below the test results:

Test Case	Date	Verdict	Observations
Activation Pre-Test	2021-02-04	**PASS**	
Over The Air activation	2021-02-04	**PASS**	
Cryptography	2021-02-04	**PASS**	
Downlink Sequence Number	2021-02-04	**PASS**	
Confirmed Frames	2021-02-04	**PASS**	
DevStatusReq MAC command	2021-02-04	**PASS**	
NewChannelReq MAC command for Dynamic Channel plan devices only	2021-02-04	**PASS**	
DlChannelReq for Dynamic Channel plan devices only	2021-02-04	**PASS**	
RXParameterSetupReq MAC command	2021-02-04	**PASS**	
RXTimingSetupReq MAC command	2021-02-04	**PASS**	
TXParamSetupReq MAC command	2021-02-04	**PASS**	
LinkCheckReq MAC command	2021-02-04	**PASS**	
LinkADRReq MAC command	2021-02-04	**PASS**	

DutyCycleReq MAC command	2021-02-04	**PASS**	
DeviceTimeReq MAC command	2021-02-04	**PASS**	
RX1 Receive Window Test	2021-02-04	**PASS**	
RX2 Receive Window Test	2021-02-04	**PASS**	
RX1 and RX2 simultaneous frames	2021-02-04	**PASS**	
RX Oversized Payload	2021-02-04	**PASS**	
Maximum Allowed Payload	2021-02-04	**PASS**	
MAC Command(s) in App-Payload and/or Frame Options	2021-02-04	**PASS**	
Multiple MAC commands prioritization	2021-02-04	**PASS**	
FPort 224 Deactivation	2021-02-04	**PASS**	

3.3 ISP4520-US

The DUT used for the test is an ISP4520 with the following details:

- Model: US
- HW revision: B
- SW revision 3.1.1

Below the test results:

Test Case	Date	Verdict	Observations
Activation Pre-Test	2021-02-04	**PASS**	
Over The Air activation	2021-02-04	**PASS**	
Cryptography	2021-02-04	**PASS**	
Downlink Sequence Number	2021-02-04	**PASS**	
Confirmed Frames	2021-02-04	**PASS**	
DevStatusReq MAC command	2021-02-04	**PASS**	
NewChannelReq MAC command for Dynamic Channel plan devices only	2021-02-04	**PASS**	
DlChannelReq for Dynamic Channel plan devices only	2021-02-04	**PASS**	
RXParameterSetupReq MAC command	2021-02-04	**PASS**	
RXTimingSetupReq MAC command	2021-02-04	**PASS**	
TXParamSetupReq MAC command	2021-02-04	**PASS**	
LinkCheckReq MAC Command			
LinkADRReq MAC command	2021-02-04	**PASS**	

DutyCycleReq MAC command	2021-02-04	**PASS**	
DeviceTimeReq MAC command	2021-02-04	**PASS**	
RX1 Receive Window Test	2021-02-04	**PASS**	
RX2 Receive Window Test	2021-02-04	**PASS**	
RX1 and RX2 simultaneous frames	2021-02-04	**PASS**	
RX Oversized Payload	2021-02-04	**PASS**	
Maximum Allowed Payload	2021-02-04	**PASS**	
MAC Command(s) in App-Payload and/or Frame Options	2021-02-04	**PASS**	
Multiple MAC commands prioritization	2021-02-04	**PASS**	
FPort 224 Deactivation	2021-02-04	**PASS**	

4. Conclusion

ISP4520-EU, ISP4520-AS and ISP4520-US passed all tests for the LoRaWAN Specification Version 1.0.4 using the official LoRaWAN pre-certification tool and the "end-device" example firmware supplied by Insight SIP.

LoRaWAN certification of an end-product that incorporates the ISP4520 is the responsibility of the customer. The finished product with the customer application should be tested by an accredited LoRaWAN test house.