DEKRA Testing and Certification, S.A.U.
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DEKRA

LoRa accredited Test Lab

LoRa® Alliance

Test report No:
NIE: 73286RLR.005

Test report
LoRa Alliance End Device Certification Requirements

(*) Identification of item tested	STM32WL5M
(*) Trademark	STMicroelectronics
(*) Model and /or type reference tested	STM32WL5M
(*) Other identification of the product	Final HW version: B-WL5M-SUBG1 Final FW Version: STM32CubeWL v1.3.0
(*) Features	KR920-923 Band, Class A, OTAA and ABP activation modes, description of the tested product.
Manufacturer	STMicroelectronics Zone Industrielle, 190 Avenue Coq 13106 Rousset France
Test method requested, standard	Lora Alliance Certification Program
Standard……..:	LoRaWAN v1.0.4
Test Specification……..:	LoRa Alliance End-Device Certification Requirements for All Regions
LoRa_Certification_Questionnaire……..:	LoRaWAN_Certification_Questionnaire_V2.3
Test procedure(s)……..:	PELR000_00 LoRa Alliance Testing Procedure
Supported Optional Features	
Adaptive Data Rate (ADR)……..:	Yes
SF7BW250……..:	Yes
FSK50 ……..:	Yes
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Noemí Pérez Dans Noemi Perez Dans Firmado digitalmente por Noemi Perez Dans Fecha: 2022.10.28 14:47:09 +02'00'
Date of issue	2022-10-28
Report template No	FLR001_05 (*) "Data provided by the client"

Index

Competences and guarantees

DEKRA Testing and Certification S.A.U is a LoRa Alliance accredited Test Lab competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA Testing and Certification S.A.U. has a calibration and maintenance program for its measurement equipment.

DEKRA Testing and Certification S.A.U. 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 DEKRA Testing and Certification at the time of performance of the test.

DEKRA Testing and Certification S.A.U. 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.

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.
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Uncertainty

N/A

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of item tested ", "Trademark", "Model and /or type reference tested", "Derived model not tested", "Other identification of the product", "Features" and "Test Sample Description").

2. The ICS provided by the customer via the LoRa_Certification_Questionnaire_V2.3 and used for testing are indicated in Annex B.

DEKRA Testing and Certification S.A.U. declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: STMicroelectronics

Sample M/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
72386B/001	STM32WL5M	STM32WL5M	N/A	2022-10-13
	STM32CubeWL v1.3.0			2022-10-13
72386B/002	Antenna SubGHz	N/A	N/A	2022-10-13

1. Sample M/01 has undergone the test(s) specified in subclause "Test method requested".

(*)Test sample description

Long-range wireless STM32WL5MOC module

Complementing the STM32 RF connectivity portfolio, the STM32WL5MOC wireless module is a SIP LGA92 package (system in package land grid array) that integrates:

- *STM32WL55JC microcontroller (MCU).*
- *LSE 32 kHz XO (crystal oscillator)*
- *HSE 32 MHz TCXO (temperature compensated crystal oscillator)*
- *An IPD (integrated passive device) integrating matching network for transmission*
- *Output to matching network*
- *Passive components for SMPS*
- *An antenna matching*
- *STSAFE-A110 on specific part number*

Built on an Arm® Cortex®-M4 and Cortex-M0+ cores architecture, STM32WL5 microcontrollers also support multiple modulations– LoRa®, (G)FSK, (G)MSK, BPSK – to ensure flexibility in wireless applications with LoRaWAN® or any other suitable protocol in a fully open way.

STM32WLxx microcontrollers feature a sub-GHz radio based-on Semtech SX126x to meet the requirements of a wide range of Low-Power Wide Area Network (LPWAN) wireless applications in industrial and consumer Internet-of-Things (IoT).

The STM32WL5MOC does not require any RF expertise. It is the best way to speed up any development, and to reduce associated costs.

Thanks to a deep integration, the innovative and open architecture is optimized for LoRaWAN® legacy / proprietary protocols, flexible resource use, power management and helps lower BOM cost while offering a better user experience.

The STM32WL platform being fully open, a LoRaWAN stack is made available by STMicroelectronics.

Developed using the same technology as the one implemented in the ultra-low-power STM32L4 microcontrollers, the STM32WL5MOC module provides a similar, digital and analog, peripherals for basic or complex application use cases requiring an extended battery life and a long RF range through its sub-GHz transceiver.

To ensure worldwide compatibility, the STM32WL5MOC module feature a dual power-output and a wide linear frequency range fitting any unlicensed RF spectrum need.

Overall, the STM32WL series is the STM32 family's pioneer in sub-GHz wireless connectivity, offering ease-of-use and reliability, while being perfectly tailored for a wide range of industrial and consumer applications.

Wireless connectivity

STM32WL series comply with the physical layer requirements of the LoRaWAN® specification released by the LoRa Alliance®. Available LoRa®, (G)FSK, (G)MSK, BPSK and LR-FHSS modulations can also be used in legacy and proprietary protocols.

Continuous frequency coverage from 150 to 960 MHz enables the support of all major sub-GHz ISM bands around the world.

System peripherals

The STM32WL5MOC line includes a wide variety of communication features including an integrated SMPS for power consumption optimization, multiple low-power modes to maximize battery life. A dual-power output and a wide linear frequency range ensure worldwide compatibility.

Security & ID

In addition to its wireless and ultra-low-power features, STM32WL series include embedded security hardware functions such as 128- / 256-bit AES hardware encryption, PCROP read / write protection, and public-key cryptography with an elliptic curve encryption engine.

On top of these, the dual-core STM32WL5x line includes advanced security features such as: Key Management Services (KMS), hardware isolation with trusted zones, secure boot and secure firmware update.

Identification of the client

STMicroelectronics

Address: Zone Industrielle, 190 Avenue Coq

Postal code, City: 13106, Rousset

Country: France

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2022-10-18
Date (finish)	2022-10-19

Document history

Report number	Date	Description
73286RLR.001	2022-10-28	First release (test report without logs to be uploaded to the public area of LoRa Alliance website) – Band EU863-870.
73286RLR.002	2022-10-28	First release (test report without logs to be uploaded to the public area of LoRa Alliance website) – Band US902-928.
73286RLR.003	2022-10-28	First release (test report without logs to be uploaded to the public area of LoRa Alliance website) – Band AS923 Group 1.
73286RLR.004	2022-10-28	First release (test report without logs to be uploaded to the public area of LoRa Alliance website) – Band IN865-867.
73286RLR.005	2022-10-28	First release (test report without logs to be uploaded to the public area of LoRa Alliance website) – Band KR920-923.
73286RLR.006	2022-10-28	First release (test report without logs to be uploaded to the public area of LoRa Alliance website) – Band AU915-928.

Remarks and comments

Testing was performed by: Martín Sánchez Revuelta

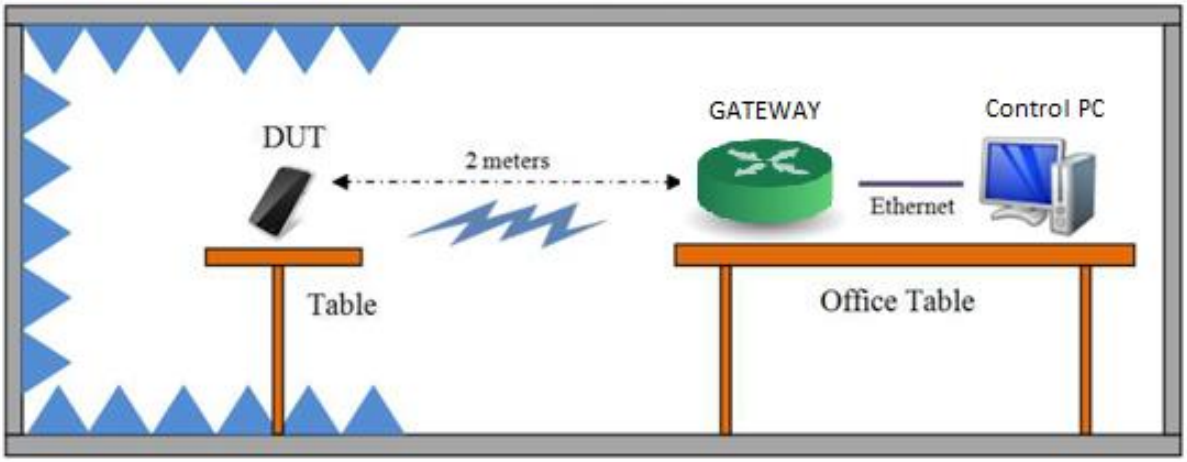
Means of testing identification

DEKRA Authorized Test Lab used the approved test environment recipe for their certification test results as follows:

LCTT GUI version	LCTT Test Cases Package Version	DUT inside RF Chamber	Gateways model
V2.3.0	V3.8.0_R1	Yes	2 x Corecell SX1302C868GW1

Test setup

This Test Setup has been used for testing:



Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Appendix A: Test results

Test campaign report

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

Test Case ID :	As it can be found on the standard
Verdict:	Records the verdict assigned to each Test Case run to completion (Testing verdicts)
Date:	Date of the beginning of the execution.
Observations:	Provides a reference to additional information relevant to the test presented in "Test Setup" section.

Test Case ID	Description	Date	Verdict	Observations
TP_A_KR920_ED_MAC_104_BV_000 (ABP)	Activation Pre-test	19/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_000 (OTA)	Activation Pre-test	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_001_A	Over The Air Activation	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_001_B	Activation by Personalization	19/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_002	Cryptography	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_003	Downlink Sequence Number	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_004	Confirmed Frames	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_005	DevStatusReq MAC command	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_006	NewChannelReq MAC command for Dynamic Channel plan devices only	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_007	DlChannelReq for Dynamic Channel plan devices only	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_008	RXParameterSetupReq MAC command	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_009	RXTimingSetupReq MAC command	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_010	TxParamSetupReq MAC Command	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_011	LinkCheckReq MAC Command	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_012_A	LinkADDReq MAC command (Part 1)	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_012_B	LinkADDReq MAC command (Part 2)	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_013	DutyCycleReq MAC Command	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_014	DeviceTimeReq MAC Command	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_015_A	RX1 Receive Window Test (Part 1)	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_015_B	RX1 Receive Window Test (Part 2)	18/10/2022	P	
TP_A_KR920_ED_MAC_104_BV_016	RX2 Receive Window Test	18/10/2022	P	

TP_A_KR920_ED_MAC_104_BV_017	RX1 and RX2 simultaneous frames	18/10/2022	P
TP_A_KR920_ED_MAC_104_BV_018	RX Oversized Payload	18/10/2022	P
TP_A_KR920_ED_MAC_104_BV_019_A	Maximum Allowed Payload (Part 1)	18/10/2022	P
TP_A_KR920_ED_MAC_104_BV_019_B	Maximum Allowed Payload (Part 2)	18/10/2022	P
TP_A_KR920_ED_MAC_104_BV_020	MAC Command(s) in App-Payload and/or Frame Options	18/10/2022	P
TP_A_KR920_ED_MAC_104_BV_021	Multiple MAC commands prioritation	18/10/2022	P
TP_A_KR920_ED_MAC_104_BV_022	FPort 224 Deactivation	19/10/2022	P

Appendix B: ICS

Implementation Conformance Statement (ICS)

Name	Title	Groupname	Mandatory	Value
C_ISM_AS923	DUT works in Asia 923MHz ISM Band	BAND	-	FALSE
C_ISM_AU915	DUT works in Australia 915MHz ISM	BAND	-	FALSE
C_ISM_EU868	DUT works in EU 868MHz ISM Band	BAND	-	FALSE
C_ISM_IN865	DUT works in India 865-867 MHz ISM	BAND	-	FALSE
C_ISM_KR920	DUT works in South Korea 920MHz ISM	BAND	-	TRUE
C_ISM_RU864	DUT works in Rusia 864MHz ISM Band	BAND	-	FALSE
C_ISM_US915	DUT works in USA 915MHz ISM Band	BAND	-	FALSE
C_CERT_102rB	DUT implements LoRaWAN v1.0.2rB certification requirements	CERT	-	FALSE
C_CERT_104	DUT implements LoRaWAN v1.0.4 certification requirements	CERT	-	TRUE
C_CLASS_A	DUT is a Class A Device (All End Devices)	CLASS	-	TRUE
C_CLASS_B	DUT is a Class B Device (Beacon Mode)	CLASS	-	FALSE
C_CLASS_C	DUT is a Class C Device (Continuously	CLASS	-	FALSE
C_ED_ADR	DUT supports Adaptive Data Rate (ADR)	ED	-	TRUE
C_ED_ADR_BLOCK	DUT supports LinkADRReq block	ED	-	TRUE
C_ED_AS923_GROUP1	DUT works in Asia 923MHz ISM Band Group 1	ED	-	FALSE
C_ED_AS923_GROUP2	DUT works in Asia 923MHz ISM Band	ED	-	FALSE
C_ED_AS923_GROUP3	DUT works in Asia 923MHz ISM Band	ED	-	FALSE
C_ED_AS923_GROUP4	DUT works in Asia 923MHz ISM Band Group 4	ED	-	FALSE
C_ED_DL_CHAN	DUT supports DlChannelReq MAC	ED	-	TRUE
C_ED_OTAA	DUT supports Over-The-Air Activation	ED	-	TRUE
C_ED_PERMANENT_CLASS_C	DUT permanently enabled Class C	ED	-	FALSE
C_ED_RESET	DUT needs a reset after deactivating	ED	-	FALSE
C_ED_TM_TRI	DUT supports Trigger Join Request	ED	-	TRUE

Appendix C: Photographs

Front view

Rear view