




Test report No:

**NIE: 2230038R-A332250010-A**

## Test Report

# LoRa Alliance End Device Certification Requirements

Identification of item tested..... :	Noah Multifunction Leak/Temp Sensor
Trademark .....	KAIROS
Model or type reference..... :	N2-OTAA-02
Final HW version..... :	V1.6
Final FW version..... :	3.5.16
Final SW version..... :	V1.1
Features .....	LoRa Alliance End Device Certification Requirements for EU 868MHz ISM Band Devices
Manufacturer .....	KAIROS WATER, INC. 1700 Northside Drive, Suite A7, Unit #5543, Atlanta GA 30318, USA
Test method requested..... :	LoRa Alliance Certification
Standard .....	LoRa Alliance End Device Certification Requirements for EU 868MHz ISM Band Devices Ver.1.6
Test According LoRaWAN™ Spec .....	V1.0.2
Supported optional features..... :	YES
Adaptive Data Rate..... :	YES
→ SF7BW250 .....	YES
→ FSK.....	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  2022-05-05
Date of issue..... :	2022-05-05
Report Revision..... :	01

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## Uncertainty

N/A

## Usage of samples

Samples undergoing test have been selected by: KAIROS WATER, INC.

DUT Label ID	PSR-2009184
Model or type reference	N2-OTAA-02
Serial number	NA
HW version	V1.6
FW version	3.5.16
SW version	V1.1
Description of test sample	The Noah Multifunction Leak Sensor continuously monitors temperature, tampering, and the presence of water when connected to a Noah Leak Detection Membrane. It installs discretely in seconds while providing data for up to 10 years.
Date of reception	2022-03-10

## Identification of the client

Company name	KAIROS WATER, INC.
Address	1700 Northside Drive, Suite A7, Unit #5543, Atlanta GA 30318, USA

## Testing period

Start Date	2022-03-15
Finish Date	2022-04-11

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 <a href="mailto:gavin.yang@dekra.com">gavin.yang@dekra.com</a>
Test Engineer	Gavin Yang <a href="mailto:gavin.yang@dekra.com">gavin.yang@dekra.com</a>

## Revision History

Revision	Modification Date	Description
01	NA	Initial Report

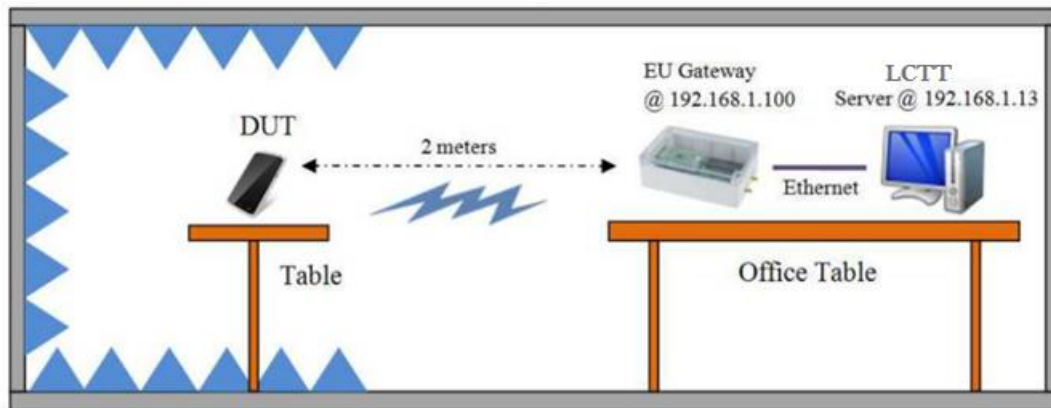
## Means of testing identification

Following equipment was used to perform the testing:

EU868 SETUP			
Test System	CN. 556	TACS4 LPWAN Testing, Approvals & Certification System	
Hardware:	Control No.	Equipment	Serial No.
	0557	LoRa Gateway for EU868 SEMTECH - IOT868STKLM1	0915
Software:	NA	LoRaWAN LCTT - UI version: 2.0.0 - Reporting Module v1.5.0	
	NA	Technology Package: LCTT v3.4.0_R2	

## Test setup

The configuration used for Test Cases in nominal temperature conditions was the following one:



# Appendix A – Test result

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).

## Certification Testing - OTAA

Test Case ID	Description	Verdict	Date	Observations
TP_A_EU868_ED_MAC_BV_000	Device Activation	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_001_A	Over The Air activation	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_002	Test application functionality	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_003	AES encryption and message integrity	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_004	Downlink error rate	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_005	Downlink window timing	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_006	Frame sequence number	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_007	DevStatusReq MAC command	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_008	MAC Commands	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_009	NewChannelReq MAC command	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_010	DIChannelReq MAC command	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_011	Confirmed packets	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_012	RXParamSetupReq MAC command	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_013	RXTimingSetupReq MAC command	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_014_A	LinkADRReq MAC command (part 1)	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_014_B	LinkADRReq MAC command (part 2)	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_015_A	RX1 Receive window test (part 1)	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_015_B	RX1 Receive window test (part 2)	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_016	RX2 Receive window test	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_017	RX1 and RX2 simultaneous frames	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_018	TXParamSetupReq MAC command	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_019	LinkCheckReq MAC command	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_020	RX Oversized payload	Pass	2022-04-11	
TP_A_EU868_ED_MAC_BV_021	Maximum Allowed payload	Pass	2022-04-11	

## Appendix B – ICS

Name	Value
DUT is a Class A Device (All End Devices)	TRUE
DUT is a Class B Device (Beacon Mode)	FALSE
DUT is a Class C Device (Continuously Listening)	FALSE
DUT works in EU 868MHz ISM Band	TRUE
DUT works in EU 443MHz ISM Band	FALSE
DUT works in USA 915MHz ISM Band	FALSE
DUT works in Asia 923MHz ISM Band	FALSE
DUT works in South Korea 920MHz ISM Band	FALSE
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 supports DiChannelReq MAC command	TRUE
DUT needs a reset after deactivating Test Mode	TRUE
DUT supports LinkADRReq block	TRUE
DUT implements LoRaWAN v1.0.2rB certification requirements	TRUE
DUT implements LoRaWAN v1.1 certification requirements	FALSE
DUT works in India 865-867 MHz ISM Band	FALSE
DUT supports the Lorawan-1.0.x-join-synch-issues-remedies-v1.0.0	FALSE
DUT implements Data Rate Decay	FALSE
DUT implements LoRaWAN v1.0.4 certification requirements	FALSE
DUT supports uplink re-transmissions for Confirmed frames	TRUE
DUT works in Rusia 864MHz ISM Band	FALSE
DUT works in Australia 915MHz ISM Band	FALSE
DUT permanently enabled Class C	FALSE

## Appendix C – IXIT

Name	Value
Minimum transmission power	14
Maximum transmission power	2
End-device identifier (DevEUI)	'8CF9572000089B15'O
End-device Address assigned during activation (DevAddr)	'00089B15'O
Maximum number of uplinks re-transmission	2
Frame counter size	32
Application session key (AppSKey)	'00000000000000000000000000000000'O
Network session key (NwkSKey)	'00000000000000000000000000000000'O
Application key (AppKey)	'EA8E356BEF64FCF0D26C896BEF54FACE'O
Application identifier (AppEUI)	'8CF9572000000000'O
End-device Address (DevAddr)	'00000000'O



## Appendix D – General Parameters

Name	Value
Verbosity level for Logs	TRUE
General Timer	120
Network Server IP Address	192.168.1.13
Gateway IP Address	192.168.1.100
Gateway socket port	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
Number of supported channels in Gateway	8
EU868 pingSlot DR	SF9BW125
Gateway model	IOT868STKLM1