The Testcenter facility ‘LoRa® Test Lab’ within IMST GmbH is recognized by the LoRa™ Alliance for testing in accordance to the LoRaWAN™ Specification V1.0.1

Report for Test of Conformance to LoRaWAN™ V1.0.1

for the Device

“ArrowWAN"

for the Customer

“Maddalena S.p.A”

Markus Ridder
Yavuz Turan

04. Sep. 2017
Administrative Summary

Location: IMST GmbH, Test Centre, Kamp-Lintfort, Germany
Responsible Test Engineer: Yavuz Turan, Markus Ridder

Subject: Test of Conformance to LoRaWAN™ Specification V1.0.1

Company and Contact Information:
Maddalena S.p.A.
Mr. Alessandro Budai
Via G.B. Maddalena 2/4, 33040 Povoletto
Italy
Tested Device: ArrowWAN
Firmware version: 1.0
Hardware version: 1.4.8
End-device identifier: 15008617b000d878
LoRa Device Class: A
LoRaWAN Specification version: V1.0.1
Certification requirements: LoRa End Device Certification EU Version 1.2
Frequency band(s) tested: 868 MHz
Test Equipment: Test Software Version: 1.1.11
Semtech IOT SX1301 Starter Kit: Gateway software version 3.1.0
Packet forwarder software version 2.1.0

Test Result: PASS

Chief Test Engineer: Markus Ridder
Dept. Test Center

Date: September 4th , 2017

The Test Report, No. 6171298 has the following conclusion:

The device has PASSED the tests hereunder.

Responsibility: Approved:
Yavuz Turan Markus Ridder
Test Engineer Quality Engineer

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1 Description of the Device Under Test (DUT)

1.1 General

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product name</td>
<td>ArrowWAN</td>
</tr>
<tr>
<td>Kind of product</td>
<td>Compact radio module for volumetric water meter</td>
</tr>
<tr>
<td>Series (if any)</td>
<td>ArrowWAN</td>
</tr>
<tr>
<td>Hardware Version</td>
<td>1.0</td>
</tr>
<tr>
<td>Firmware Version</td>
<td>1.4.8</td>
</tr>
<tr>
<td>Type of DUT</td>
<td>☒ Module / End Device ☐ Gateway / Concentrator</td>
</tr>
<tr>
<td>Geographical area of operation</td>
<td>☒ Europe ☐ USA</td>
</tr>
<tr>
<td>Operating frequency</td>
<td>☐ 433 MHz ☒ 868 MHz ☐ 915 MHz</td>
</tr>
<tr>
<td>Adaptive Data Rate (ADR) supported?</td>
<td>☒ Yes ☐ No</td>
</tr>
<tr>
<td>Optional data rates supported?</td>
<td>☨ DR6 ☨ DR7</td>
</tr>
<tr>
<td>Activation possibilities</td>
<td>☨ Over the air ☨ by personalization ☒ both</td>
</tr>
<tr>
<td>Test According LoRaWAN™ Spec</td>
<td>☨ V1.0 ☨ V1.0.1</td>
</tr>
<tr>
<td>Output Power</td>
<td>Up to 14 dBm</td>
</tr>
<tr>
<td>Number / Type of Antenna(s)</td>
<td>1 / Helix</td>
</tr>
<tr>
<td>Antenna Gain</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 Device Information

1.2 DUT Modes of Operation

During the tests the device operated in the following modes:

- Test mode according to document “LoRa End Device Certification EU V1_2” Chapter 3.

1.3 DUT Setup

Figure 1 DUT Setup
Applied Methods of Measurement

1.4 Protocol Testing according to LoRaWAN™ specification V1.0.1

Detailed Test Results:

Test Mode Activation (Activation by Personalization): **PASS**
Test Mode Activation (Over the Air Activation): **PASS**
Test Application Functionality: **PASS**
Packet Error Rate RX2 SF12: **PASS**
Cryptography: **PASS**
Downlink Window Timing: **PASS**
Frame Sequence Number: **PASS**
Device Status Request: **PASS**
Mac Commands: **PASS**
New Channel Request: **PASS**
Confirmed packets: **PASS**
RX Parameter Setup Request: **PASS**
RX Timing Setup Request: **PASS**
Link ADR Request: **PASS**
Packet Error Rate RX1 Window: **PASS**
Packet Error Rate RX2 Window: **PASS**

Supported Optional Features:

Adaptive Data Rate (ADR): Yes
DR6 (SF7BW250): No
DR7 (FSK50): No

Remarks: None.

Result: The device passed the test without limitations.