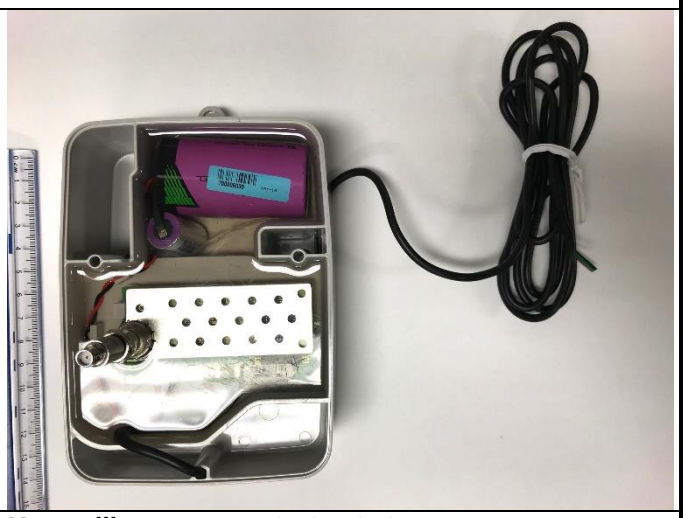
Prüfbericht-Nr.: *Test Report No.:*	31855211.001	**Auftrags-Nr.:** *Order No.:*	21564458	Seite 1 von 11 *Page 1 of 11*
Kunden Referenz-Nr.: Client Reference No.:	796428	**Auftragsdatum:** *Order date:*	10-26-2018 (mm-dd-yyyy)	
Auftraggeber: *Client:*	Neptune Technology Group, Inc. 1600 Alabama Highway 229 Tallassee, AL 36078 USA	Contact: David Hamilton E-Mail: dhamilton@neptunetg.com Phone: 334-283-7377		
Prüfgegenstand: *Test item:*	R900 Meter Interface Unit – US915			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	L900M			
Auftrags-Inhalt: *Order content:*	Test of Conformance to LoRaWAN™ Specification V1.0.1			
Prüfgrundlage: *Test specification:*	LoRa End Device Certification NA Version1.1			
Wareneingangsdatum: *Date of receipt:*	11-28-2018			
Prüfmuster-Nr.: *Test sample No.:*	700006030			
Prüfzeitraum: *Testing period:*	11-28-2018 to 11-29-2018			
Ort der Prüfung: *Place of testing:*	1279 Quarry Lane, Suite A Pleasanton, CA 94566			
Prüflaboratorium: *Testing laboratory:*	TUV Rheinland of North America, Inc.			
Prüfergebnis: *Test results:*	PASS			

Geprüft von *Tested by:*	Bernd Jungbluth	**Kontrolliert von** *Reviewed by:*	Adeola Alade
11-30-2018	Bernd Jungbluth / Principal Test Engineer	11-30-2018	Adeola Alade / Principal Test Engineer

Datum	**Name / Stellung**	**Unterschrift**	**Datum**	**Name / Stellung**	**Unterschrift**
Date (mm-dd-yyyy)	*Name / Position*	*Signature*	*Date (mm-dd-yyyy)*	*Name / Position*	*Signature*

Sontiges / *Other:*

-

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark

Revisions ***Revisions***			
Revision Revision	**Datum** Date (mm-dd-yyyy)	**Anmerkung** Remark	**Verfasser** Author
0	11-30-2018	Original Report	BMJ
Note: Latest revision report will replace all previous reports			

Table of contents

1 PRODUCT INFORMATION

The device under test (DUT) is a smart water endpoint providing advanced meter data, alert notifications, and supports walk-by, mobile, and fixed network meter reading.

General information	
Product name:	R900 Meter Interface Unit
Model:	L900M
Description:	LoRa Alliance LoRaWAN compliance testing
Manufacturer SKU	Neptune Technology Group, Inc.
Hardware version:	Rev A
Software version:	N/A
Firmware version:	V1.1
Contact person:	David Hamilton
Phone number:	334-283-7377
E-mail Address:	dhamilton@neptunetg.com

LoRaWAN information	
Type of DUT	End Device
LoRa Device Class	A
Geographical area of operation	USA
Operating frequency	915 MHz
Adaptive Data Rate (ADR) supported?	Yes
Optional data rates supported?	N/A
Activation possibilities	Over the air
Test According LoRaWAN™ Spec	v1.0.1
Output Power	Up to 1000 mW
Number / Type of Antenna(s)	1
Antenna Gain	N/A
Test sample information	identical prototype

For OTA activation:	
Serial No of Device with OTAA	700006030
End-device identifier (DevEUI)	CC3ADF0029B93E8E
Application identifier (AppEUI)	CC3ADF0000000001
Application key (AppKey)	D77F1AD1C9EDAD2288AC14A972EABCFA
For activation by personalization:	
Serial No of Device with ABP	N/A
End-device identifier (DevAddr)	N/A
Application identifier (AppSKey)	N/A
Application key (NwkSKey)	N/A
Default RX2 Window Frequency	923.3MHz
Default RX2 Window Data Rate	DR8 (SF12, 500kHz)
RECEIVE_DELAY1	1 s
RECEIVE_DELAY2	2 s (must be RECEIVE_DELAY1 + 1s)
JOIN_ACCEPT_DELAY1	5 s
JOIN_ACCEPT_DELAY2	6 s
MAX_FCNT_GAP	16384
ADR_ACK_LIMIT	64
ADR_ACK_DELAY	32
ACK_TIMEOUT	2 +/- 1 s (random delay between 1 and 3 seconds)

Submitted Documents:

LoRa Certification Customer Questionnaire document.
LoRa Test Environment log files.

Remarks:

All test cases are tested with Over the Air Activation (OTAA).

2 TEST EQUIPMENT

Prüfmittel *Test equipment*	**Marke** *Brand*	**Version** *Version*
Comprehensive Testing Environment (CTE)	4ffCom AG	CTE - TMF V45.1 CTE - SIG - LoRaWAN V 3.3
Senet 915MHz Gateway 0005863 (SX1301 Array library version)	Senet	>=1.0.rc10
Senet 915MHz Gateway 0005863 (Semtech Packet Forwarder)	Senet	>=1.0.rc3

3 SUMMARY

Verdicts of functional requirements:	Verdict
Test Mode Activation (Activation by Personalization)	**PASS**
Test Mode Activation (Over the Air Activation) for both 1255kHz& 500kHz channels	**PASS**
Test Application Functionality with all channels use check	**PASS**
Packet Error Rate RX1 & RX2(SF12BW500)	**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 including channel management	**PASS**
Packet Error Rate RX1 Window	**PASS**
Packet Error Rate RX2 Window	**PASS**

Supported optional features:	YES / No
Adaptive Data Rate (ADR)	**YES**

Overall Test Result: PASS

4 TEST CASE VERDICTS AS PER TEST SPECIFICATIONS

Test results per test case:

Test item	Description	Implementation	Result
US902-928 2.1.1	Test Mode Activation	Mandatory	**PASS**
US902-928 2.1.2	Over The Air Activation	Mandatory	**PASS**
US902-928 2.2.1	Test Application Functionality	Mandatory	**PASS**
US902-928 2.2.2.a	AES Encryption	Mandatory	**PASS**
US902-928 2.2.2.b	MIC	Mandatory	**PASS**
US902-928 2.2.3	Downlink Error Rate	Mandatory	**PASS**
US902-928 2.2.4	Downlink Window Timing	Mandatory	**PASS**
US902-928 2.2.5.a	Uplink sequence Number	Mandatory	**PASS**
US902-928 2.2.5.b	Downlink sequence Number	Mandatory	**PASS**
US902-928 2.3.1	DevStatusReq MAC Command	Mandatory	**PASS**
US902-928 2.3.2	MAC Commands	Mandatory	**PASS**
US902-928 2.3.3.a & 2.3.3.b	Addition And Removal Of A Channel	Mandatory	**PASS**
US902-928 2.3.3.c	Addition And Removal Of Multiple channels	Mandatory	**PASS**
US902-928 2.3.4.a	Uplink Confirmed Packets	Mandatory	**PASS**
US902-928 2.3.4.b	Uplink Retransmission	Mandatory	**PASS**
US902-928 2.3.4.c	Downlink Confirmed Packets	Mandatory	**PASS**
US902-928 2.3.4.d	Downlink retransmission	Mandatory	**PASS**
US902-928 2.3.5	RXParamSetupReq MAC command	Mandatory	**PASS**
US902-928 2.3.6	RX1 Receive Window Test	Mandatory	**PASS**
US902-928 2.3.7	RX2 Receive Window Test	Mandatory	**PASS**
US902-928 2.3.8	RXTimingSetupReq MAC command	Mandatory	**PASS**
US902-928 2.3.9.a	ADR Bit	Mandatory	**PASS**
US902-928 2.3.9.b	TX Power	Mandatory	**PASS**
US902-928 2.3.9.c	125 KHz Channels Uplink Datarates	Mandatory	**PASS**
US902-928 2.3.9.d	500 KHz Channels Uplink Datarates	Mandatory	**PASS**
US902-928 2.3.9.e	Channel Management	Mandatory	**PASS**
US902-928 2.3.9.f	Redundancy	Mandatory	**PASS**
US902-928 2.3.9.g	ADRACKReq Bit	Mandatory	**PASS**

5 TEST RESULTS

Detailed test results:

Test item	Test Case Name	DataRate/ Timing	Limit	Results	Verdict
US902-928 2.2.3	Downlink Error Rate (RX1)	SF12BW500	5%	**3.33%**	**PASS**
	Downlink Error Rate (RX2)	SF12BW500	5%	**0.00%**	**PASS**
US902-928 2.2.4	Downlink window timing	-20us	-	**-**	**PASS**
		+20us	-	**-**	**PASS**
US902-928 2.3.6	RX1 Receive Window Test	SF12BW500	5%	**0.00%**	**PASS**
		SF11BW500	5%	**0.00%**	**PASS**
		SF10BW500	5%	**0.00%**	**PASS**
		SF9BW500	5%	**0.00%**	**PASS**
		SF8BW500	5%	**0.00%**	**PASS**
		SF7BW500	5%	**0.00%**	**PASS**
US902-928 2.3.7	RX2 Receive Window Test	SF12BW500	5%	**0.00%**	**PASS**
		SF11BW500	5%	**3.33%**	**PASS**
		SF10BW500	5%	**0.00%**	**PASS**
		SF9BW500	5%	**0.00%**	**PASS**
		SF8BW500	5%	**0.00%**	**PASS**
		SF7BW500	5%	**1.67%**	**PASS**

6 PHOTO DOCUMENTATION

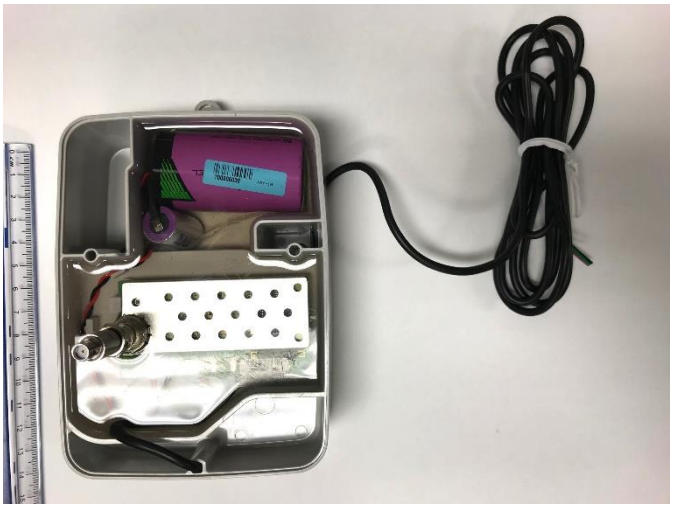


Photo 1: EUT top view

Photo 2: EUT top view (detail)

Photo 3: EUT Side view

Photo 4: EUT rear view

End of Test Report