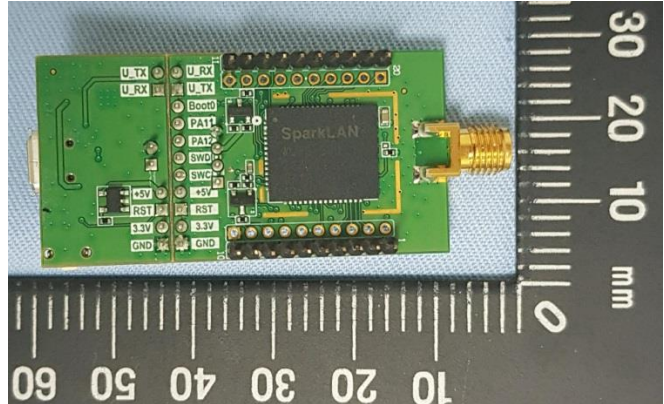




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Kunden Referenz-Nr.: <i>Client Reference No.:</i>	60004468	Auftragsdatum: <i>Order date:</i>	25-01-2018		
Auftraggeber: <i>Client:</i>	SparkLAN Communications, Inc. 8F., No.257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493 Taiwan (R.O.C.)	Sandy Ku +886-2-26591880#350 Sandy.ku@sparklan.com			
Prüfgegenstand: <i>Test item:</i>	WLRS-590				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	WLRS-590				
Auftrags-Inhalt: <i>Order content:</i>	Test of Conformance to LoRaWAN™ Specification V1.0.2				
Prüfgrundlage: <i>Test specification:</i>	LoRa Alliance End Device Certification Requirements for EU 868MHz ISM Band Devices Version 1.5				
Wareneingangsdatum: <i>Date of receipt:</i>	25-01-2018				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000701659-001 A000701659-002				
Prüfzeitraum: <i>Testing period:</i>	26-02-2018 - 27-02-2018				
Ort der Prüfung: <i>Place of testing:</i>	Taipei, Taiwan				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Taiwan Ltd.				
Prüfergebnis: <i>Test results:</i>	PASS				
Geprüft von <i>Tested by:</i>	Stanislas Charles Project Engineer	Kontrolliert von <i>Reviewed by:</i>	Justin K.C. Yu Section Manager		
02-03-2018		02-03-2018			
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sontiges / Other: -					
<p>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. <i>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</i></p>					

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Revisions <i>Revisions</i>			
Revision Revision	Datum Date	Anmerkung Remark	Verfasser Author

Note: Latest revision report will replace all previous reports

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1 PRODUCT INFORMATION

The device under test (DUT) is a WLRS-590 for LoRaWAN Certification testing

General information	
Product name:	WLRS-590
Model:	WLRS-590
Description:	LoRa Alliance LoRaWAN compliance testing
Manufacturer SKU	-
Hardware version:	V.3
Firmware version:	V1.0.0
Contact person:	Sandy Ku
Phone number:	+886-2-26591880#350

LoRaWAN information	
Type of DUT	End Device
LoRa Device Class	A
Geographical area of operation	Europe
Operating frequency	868 MHz
Adaptive Data Rate (ADR) supported?	Yes
Optional data rates supported?	DR6 (SF7BW250) and DR7 (FSK50)
Activation possibilities	Both Over the air and by personalization
Test According LoRaWAN™ Spec	V1.0.2
Output Power	7 ~ 20 dBm
Number / Type of Antenna(s)	SMA
Antenna Gain	1.3 dBi
Test sample information	production unit

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For OTA activation:	
Serial No of Device with OTAA	A000701659-001
End-device identifier (DevEUI)	000e 8eff fe99 0001
Application identifier (AppEUI)	1234 5678 90ff 0001
Application key (AppKey)	0001 0203 0405 0607 0809 0a0b 0c0d 0e0f
For activation by personalization:	
Serial No of Device with ABP	A000701659-002
End-device identifier (DevAddr)	0e8e0000
Application identifier (AppSKey)	1a2b 3c4d 5e6f 0099 1a2b 3c4d 5e6f 0099
Application key (NwkSKey)	1a2b 3c4d 5e6f 0099 1a2b 3c4d 5e6f 0099
Default RX2 Window Frequency	869.525MHz
Default RX2 Window Data Rate	DR0 (SF12, 125kHz)
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	63
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 Activation by Personalization (ABP) mode, else explicitly Over the Air (OTA) to be tested.

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2 TEST EQUIPMENT

Prüfmittel <i>Test equipment</i>	Marke <i>Brand</i>	Version <i>Version</i>
Comprehensive Testing Environment (CTE)	4ffcom AG	CTE - TMF V44.5 CTE - SIG - LoRa V3.2
Semtech Development Kit (Semtech Gateway) for EU 863-870 Band	Semtech	SX1301-based concentrator reference design >=GW_V_3.1.0
Semtech Development Kit (Semtech Packet Forwarder) for EU 863-870 Band	Semtech	>= PF_V_2.2.0

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3 SUMMARY

Verdicts of functional requirements:	Verdict
Device Activation (Activation by Personalization)	PASS
Device Activation (Over the Air Activation)	PASS
Test Application Functionality	PASS
Over The Air Activation	PASS
Packet Error Rate RX2 default DR	PASS
Cryptography	PASS
Downlink Window Timing	PASS
Frame Sequence Number	PASS
Device Status Request MAC command	PASS
Mac Commands	PASS
New Channel Request MAC command	PASS
DIChannelReq MAC command	PASS
Confirmed packets	PASS
RX Parameter Setup Request MAC command	PASS
RX Timing Setup Request MAC command	PASS
Link ADR Request MAC command	PASS
Packet Error Rate RX1 Window	PASS
Packet Error Rate RX2 Window	PASS

Supported optional features:	YES / NO
Adaptive Data Rate (ADR)	YES
SF7BW250	YES
FSK	YES

Overall Test Result: PASS

4 TEST CASE VERIDCTS AS PER TEST SPECIFICATIONS

Test results per test case (OTAA):

Test item	Description	Implementation	Result
EU863-870 2.1	Device Activation	Mandatory	PASS
EU863-870 2.2	Test application functionality	Mandatory	PASS
EU863-870 2.3	Over The Air Activation	Mandatory	PASS
EU863-870 2.4	Packet Error Rate RX2 Default DR	Mandatory	PASS
EU863-870 2.5	Cryptography	Mandatory	PASS
EU863-870 2.5.a	AES encryption	Mandatory	PASS
EU863-870 2.5.b	MIC	Mandatory	PASS
EU863-870 2.6	Downlink window timing	Mandatory	PASS
EU863-870 2.7	Frame sequence number	Mandatory	PASS
EU863-870 2.7.a	Uplink sequence number	Mandatory	PASS
EU863-870 2.7.b	Downlink sequence number	Mandatory	PASS
EU863-870 2.8	DevStatusReq MAC command	Mandatory	PASS
EU863-870 2.9	MAC Commands	Mandatory	PASS
EU863-870 2.10	New Channel Request	Mandatory	PASS
EU863-870 2.10.a	Read-only default channels	Mandatory	PASS
EU863-870 2.10.b	Addition and removal of multiple channels	Mandatory	PASS
EU863-870 2.10.c & 10.d	Addition and removal of a single channel	Mandatory	PASS
EU863-870 2.11	DL Channel Request MAC command	Mandatory	PASS
EU863-870 2.12	Confirmed packets	Mandatory	PASS
EU863-870 2.12.a	Uplink confirmed packets	Mandatory	PASS
EU863-870 2.12.b	Uplink retransmission	Mandatory	PASS
EU863-870 2.12.c	Downlink confirmed packets	Mandatory	PASS
EU863-870 2.12.d	Downlink retransmission	Mandatory	PASS
EU863-870 2.13	RXParamSetupReq MAC command	Mandatory	PASS
EU863-870 2.14	RXTimingSetupReq MAC command	Mandatory	PASS
EU863-870 2.15	Link ADR Request	Mandatory	PASS
EU863-870 2.15.a	ADR bit	Mandatory	PASS
EU863-870 2.15.b	TXPower	Mandatory	PASS
EU863-870 2.15.c	Required DataRates	Mandatory	PASS
EU863-870 2.15.d	Optional DataRates	Mandatory	PASS
EU863-870 2.15.e	ChannelMask	Mandatory	PASS
EU863-870 2.15.f	Redundancy	Mandatory	PASS
EU863-870 2.15.g	ADRACKReq bit	Mandatory	PASS
EU863-870 2.15.h	LinkADRReq commands block	Mandatory	PASS
EU863-870 2.16	Packet Error Rate RX1	Mandatory	PASS
EU863-870 2.17	Packet Error Rate RX2	Mandatory	PASS

Test results per test case (ABP):

Test item	Description	Implementation	Result
EU863-870 2.1	Device Activation	Mandatory	PASS
EU863-870 2.2	Test application functionality	Mandatory	PASS
EU863-870 2.3	Over The Air Activation	Mandatory	PASS
EU863-870 2.4	Packet Error Rate RX2 Default DR	Mandatory	PASS
EU863-870 2.5	Cryptography	Mandatory	PASS
EU863-870 2.5.a	AES encryption	Mandatory	PASS
EU863-870 2.5.b	MIC	Mandatory	PASS
EU863-870 2.6	Downlink window timing	Mandatory	PASS
EU863-870 2.7	Frame sequence number	Mandatory	PASS
EU863-870 2.7.a	Uplink sequence number	Mandatory	PASS
EU863-870 2.7.b	Downlink sequence number	Mandatory	PASS
EU863-870 2.8	DevStatusReq MAC command	Mandatory	PASS
EU863-870 2.9	MAC Commands	Mandatory	PASS
EU863-870 2.10	New Channel Request	Mandatory	PASS
EU863-870 2.10.a	Read-only default channels	Mandatory	PASS
EU863-870 2.10.b	Addition and removal of multiple channels	Mandatory	PASS
EU863-870 2.10.c & 10.d	Addition and removal of a single channel	Mandatory	PASS
EU863-870 2.11	DL Channel Request MAC command	Mandatory	PASS
EU863-870 2.12	Confirmed packets	Mandatory	PASS
EU863-870 2.12.a	Uplink confirmed packets	Mandatory	PASS
EU863-870 2.12.b	Uplink retransmission	Mandatory	PASS
EU863-870 2.12.c	Downlink confirmed packets	Mandatory	PASS
EU863-870 2.12.d	Downlink retransmission	Mandatory	PASS
EU863-870 2.13	RXParamSetupReq MAC command	Mandatory	PASS
EU863-870 2.14	RXTimingSetupReq MAC command	Mandatory	PASS
EU863-870 2.15	Link ADR Request	Mandatory	PASS
EU863-870 2.15.a	ADR bit	Mandatory	PASS
EU863-870 2.15.b	TXPower	Mandatory	PASS
EU863-870 2.15.c	Required DataRates	Mandatory	PASS
EU863-870 2.15.d	Optional DataRates	Mandatory	PASS
EU863-870 2.15.e	ChannelMask	Mandatory	PASS
EU863-870 2.15.f	Redundancy	Mandatory	PASS
EU863-870 2.15.g	ADRACKReq bit	Mandatory	PASS
EU863-870 2.15.h	LinkADRRReq commands block	Mandatory	PASS

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5 TEST RESULTS

Detailed test results (OTAA):

Test item	Test Case Name	DataRate/ Timing	Limit	Results	Verdict
EU863-870 2.4	Packet Error Rate RX2 Default DR	SF12BW125	5%	3.33%	PASS
EU863-870 2.6	Downlink window timing	-20ms	-	-	PASS
		+20ms	-	-	PASS
EU863-870 2.16	Packet Error Rate RX1	SF12BW125	5%	1.66%	PASS
		SF11BW125	5%	0.00%	PASS
		SF10BW125	5%	1.66%	PASS
		SF9BW125	5%	0.00%	PASS
		SF8BW125	5%	0.00%	PASS
		SF7BW125	5%	3.33%	PASS
		SF7BW250	5%	0.00%	PASS
		FSK 50kbps	5%	0.00%	PASS
EU863-870 2.17	Packet Error Rate RX2	SF11BW125	5%	0.00%	PASS
		SF10BW125	5%	1.66%	PASS
		SF9BW125	5%	0.00%	PASS
		SF8BW125	5%	0.00%	PASS
		SF7BW125	5%	0.00%	PASS
		SF7BW250	5%	5.00%	PASS
		FSK 50kbps	5%	0.00%	PASS

6 PHOTO DOCUMENTATION

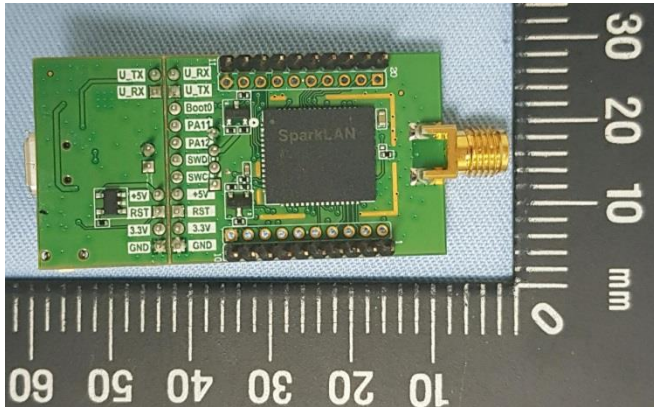


Photo 1: EUT front view

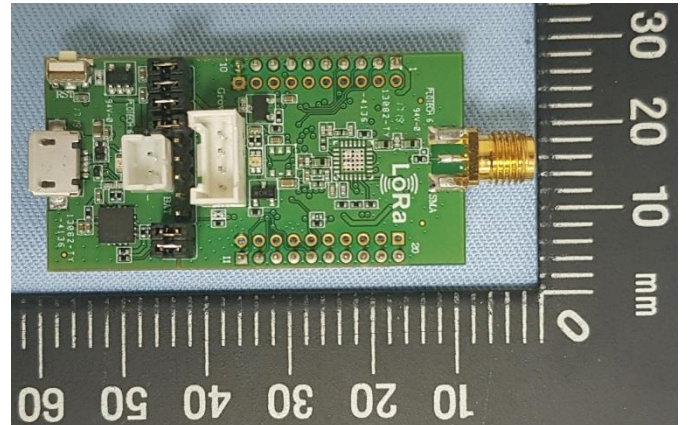


Photo 2: EUT rear view