RED-Radio Test Report

For

Shanghai Wenheng Electronics Technology Co., Ltd.

LoRa Module

Model No.: WH-L101， WH-L100， WH-L102， WH-L103， WH-L104， WH-L105，
WH-L106， WH-L107， WH-L108， WH-L109， WH-L200， WH-L201， WH-L202，
WH-L203， WH-L204， WH-L205， WH-L206， WH-L207， WH-L208， WH-L209，
WH-LR30， WH-LR31， WH-LR32， WH-LR33， WH-LR34， WH-LR35， WH-LR36，
WH-LR37， WH-LR38， WH-LR39

Prepared For	:	Shanghai Wenheng Electronics Technology Co., Ltd.
Address	:	Room 611, Building5, Xizi International Center No.898 Xiuwen Street, Minhang District, ShangHai
Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
Address	:	1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102 Tel: (86) 755-26066440 Fax: (86) 755-26014772
Date of Receipt	:	Sept. 12, 2018
Report Number	:	SZAWW180912006-04W
Date of Test	:	Sept. 13~ Nov. 5, 2018
Date of Report	:	Nov. 5, 2018

Contents

TEST REPORT

Applicant	:	Shanghai Wenheng Electronics Technology Co., Ltd.
Manufacturer	:	Shanghai Wenheng Electronics Technology Co., Ltd.
Product Name	:	LoRa Module
Model No.	:	WH-L101, WH-L100, WH-L102, WH-L103, WH-L104, WH-L105, WH-L106, WH-L107, WH-L108, WH-L109, WH-L200, WH-L201, WH-L202, WH-L203, WH-L204, WH-L205, WH-L206, WH-L207, WH-L208, WH-L209, WH-LR30, WH-LR31, WH-LR32, WH-LR33, WH-LR34, WH-LR35, WH-LR36, WH-LR37, WH-LR38, WH-LR39
Trade Mark	:	N.A.
Rating(s)	:	Input: DC 1.8V~3.6V, 200mA

Test Standard(s) : ETSI EN 300 220-1 V3.1.1 (2017-02)
ETSI EN 300 220-2 V3.2.0 (2017-09)

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the EN 300220-1&EN 300220-2 requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test: Sept. 13~ Nov. 5, 2018

Prepared by: (Engineer / Oliay Yang)

Reviewer: (Supervisor / Snowy Meng)

Approved & Authorized Signer: (Manager / Sally Zhang)

1. General Information

1.1. Client Information

Applicant	:	Shanghai Wenheng Electronics Technology Co., Ltd.
Address	:	Room 611, Building5, Xizi International Center No.898 Xiuwen Street, Minhang District, ShangHai
Manufacturer	:	Shanghai Wenheng Electronics Technology Co., Ltd.
Address	:	Room 611, Building5, Xizi International Center No.898 Xiuwen Street, Minhang District, ShangHai
Factory	:	Shanghai Wenheng Electronics Technology Co., Ltd.
Address	:	Room 611, Building5, Xizi International Center No.898 Xiuwen Street, Minhang District, ShangHai

1.2. Description of Device (EUT)

Product Name	:	LoRa Module	
Model No.	:	WH-L101，WH-L100，WH-L102，WH-L103，WH-L104，WH-L105，WH-L106，WH-L107，WH-L108，WH-L109，WH-L200，WH-L201，WH-L202，WH-L203，WH-L204，WH-L205，WH-L206，WH-L207，WH-L208，WH-L209，WH-LR30，WH-LR31，WH-LR32，WH-LR33，WH-LR34，WH-LR35，WH-LR36，WH-LR37，WH-LR38， WH-LR39 (Note: All samples are the same except the color of model appearance, the label and the name, so we prepare "WH-L101" for test only.)	
Trade Mark	:	N.A.	
Test Power Supply	:	AC 230V~ 50Hz for adapter	
Product Description	:	Operation Frequency:	863MHz, 864MHz, 865MHz, 866MHz, 867MHz, 868MHz, 869MHz, 870MHz
		Number of Channel:	8 Channels
		Modulation Type:	Lora
		Antenna Type:	Column Antenna（Auxiliary Antenna）
		Antenna Gain(Peak):	1 dBi
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			

1.3. Auxiliary Equipment Used During Test

Adapter	:	P/N: DQS051-0501000-16312 MODEL:DQS051-0501000-HV INPUT:AC 100-240V~ 50/60Hz, 0.15A Max Output: DC 5V, 1A

1.4. Description of Test Modes

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Test Items	EUT configure mode	Available Channel	Tested Channel
Unwanted emissions in the spurious domain	TX Mode	0~7	0, 3, 7
Effective radiated power	TX Mode	0~7	0, 3, 7
Occupied bandwidth	TX Mode	0~7	0, 3, 7
TX out of band emissions	TX Mode	0~7	0, 3, 7
Transient Power	TX Mode	0~7	0, 3, 7
Unwanted emissions in the spurious domain	RX Mode	0~7	0, 3, 7
Receiver Blocking	RX Mode	0~7	0, 3, 7

1.5. List of Channels

Channel	Freq.(MHz)	Channel	Freq.(MHz)
0	863	4	867
1	864	5	868
2	865	6	869
3	866	7	870

1.6. Test Conditions

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C ~ 35°C	-10°C ~ 45°C Note: (1)
Relative Humidity	20% ~ 75%	N/A
Supply Voltage	AC 230V~ 50Hz for adapter	N/A
Note: (1) The HT 45°C and LT -10°C was declared by manufacturer.		

1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 17, 2017	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Nov. 17, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 17, 2017	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 17, 2017	1 Year
5.	Spectrum Analysis	Agilent	N9038A	MY53227295	Nov. 17, 2017	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Nov. 17, 2017	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESPI	101604	Nov. 17, 2017	1 Year
8.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 20, 2017	1 Year
9.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 20, 2017	1 Year
10.	Loop Antenna	Schwarzbeck	HFH2-Z2	100047	Nov. 17, 2017	1 Year
11.	Horn Antenna	Schewarzbeck	BBHA9170	9170-375	Nov. 17, 2017	1 Year
12.	Pre-amplifier	SONOMA	310N	186860	Nov. 17, 2017	1 Year
13.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
14.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 18, 2017	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 17, 2017	1 Year
16.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 17, 2017	1 Year
17.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 18, 2017	1 Year
18.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 18, 2017	1 Year
19.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 18, 2017	1 Year
20.	DC Power Supply	LW	TPR-6410D	349315	Nov. 01, 2017	1 Year
21.	Constant Temperature Humidity Chamber	Sertep	ZJ-HWHS80B	ZJ-17042804	Nov. 01, 2017	1 Year

1.8. Measurement Uncertainty

For the test methods, according to ETSI EN 300 220-1&-2 standard, the measurement uncertainty figures shall be calculated in accordance with ETR 100 028-1 [4] and shall correspond to an expansion factor (coverage factor) k = 1,96 or k = 2 (which provide confidence levels of respectively 95 % and 95,45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian)).

Maximum measurement uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1,5 dB
All emissions, conducted	±6 dB
All emissions, radiated	±6 dB
Temperature	±1 °C
Humidity	±5 %
DC and low frequency voltages	±3 %
Time	±5 %
Duty Cycle	±5 %

1.9. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

Harmonised Standard ETSI EN 300 220-2			
No.	Test Items	Clause No.	Results
1	Operating frequency	4.2.1	PASS
2	Unwanted emissions in the spurious domain	4.2.2	PASS
3	Effective radiated power	4.3.1	PASS
4	Maximum e.r.p. spectral density	4.3.2	N/A
5	Duty cycle	4.3.3	N/A
6	Occupied bandwidth	4.3.4	PASS
7	TX out of band emissions	4.3.5	PASS
8	Transient Power	4.3.6	PASS
9	Adjacent channel power	4.3.7	N/A
10	TX behaviour under low voltage conditions	4.3.8	N/A
11	Adaptive power control	4.3.9	N/A
12	FHSS	4.3.10	N/A
13	Short term behaviour	4.3.11	N/A
14	RX sensitivity	4.4.1	N/A
15	Receiver Blocking	4.4.2	PASS
16	Clear channel assessment threshold	4.5.2	N/A
17	Polite spectrum access timing parameters	4.5.3	N/A
18	Adaptive Frequency Agility	4.5.4	N/A
Note: “N/A” is an abbreviation for Not Applicable and means this test item is not applicable for this device according to the technology characteristic of device.			

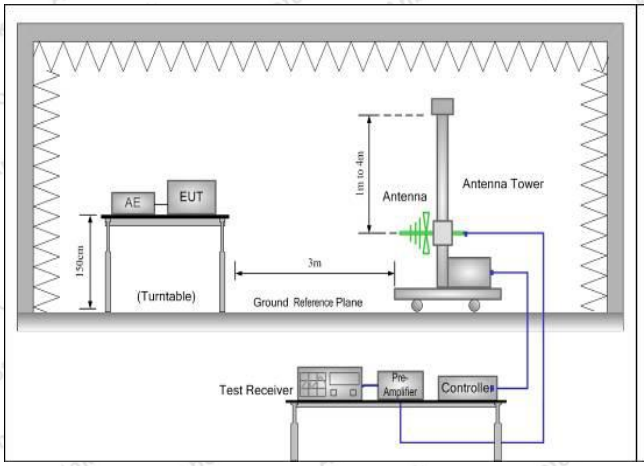
3. Unwanted Emissions In The Spurious Domain

3.1. Test Standard and Limit

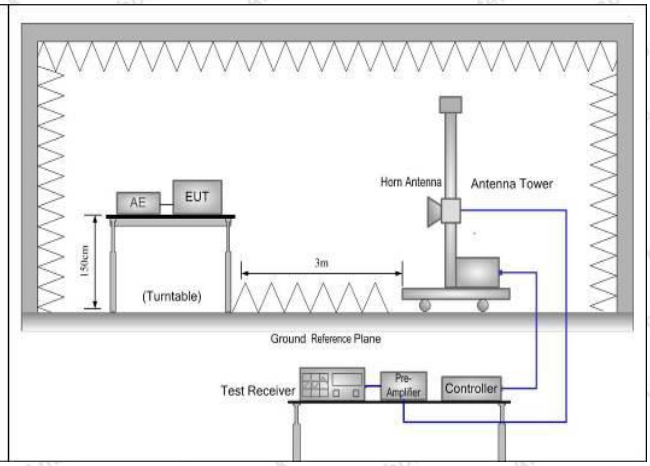
Test Standard	ETSI EN300220-2 V3.2.0 Clause 4.2.2			
Test Limit	Frequency / State	47 MHz to 74 MHz 87,5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 790 MHz	Other frequencies below 1 000 MHz	Frequencies above 1 000 MHz
	TX mode	-54 dBm	-36 dBm	-30 dBm
	RX and all other modes	-57 dBm	-57 dBm	-47 dBm

3.2. Test Setup

(A) Radiated Emission Test Set-Up Frequency Bellow 1 GHz.



(B) Radiated Emission Test Set-Up Frequency Above 1 GHz



3.3. Test Procedure

The conducted measurement procedure in clause 5.9.3.3.1 of ETSI EN 300 220-1 V3.1.1.
The radiated measurement procedure in clause 5.9.3.3.2 of ETSI EN 300 220-1 V3.1.1, with theantenna port terminated in a dummy load.
The measurements shall be performed during continuously transmitting.

3.4. Test Data

PASS

863MHz

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
50.95	-71.73	-54.00	-17.73	H	PASS
98.27	-68.96	-54.00	-14.96	H	
142.58	-51.48	-36.00	-15.48	H	
209.90	-73.87	-54.00	-19.87	H	
314.16	-46.22	-36.00	-10.22	H	
793.23	-64.01	-54.00	-10.01	H	
70.65	-66.94	-54.00	-12.94	V	
97.90	-69.35	-54.00	-15.35	V	
148.13	-60.10	-36.00	-24.10	V	
184.67	-69.30	-54.00	-15.30	V	
325.65	-46.27	-36.00	-10.27	V	
730.11	-68.54	-54.00	-14.54	V	

Test Result: above 1000MHz

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1726.00	-46.87	-30.00	-16.87	H	PASS
2589.00	-46.72	-30.00	-16.72	H	
3452.00	-43.61	-30.00	-13.61	H	
1726.00	-43.72	-30.00	-13.72	V	
2589.00	-44.98	-30.00	-14.98	V	
3452.00	-42.74	-30.00	-12.74	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
60.58	-71.31	-57.00	-14.31	H	PASS
97.33	-66.07	-57.00	-9.07	H	
125.09	-63.41	-57.00	-6.41	H	
220.71	-74.42	-57.00	-17.42	H	
253.38	-68.62	-57.00	-11.62	H	
722.38	-64.64	-57.00	-7.64	H	
54.59	-70.84	-57.00	-13.84	V	
88.84	-66.05	-57.00	-9.05	V	
148.87	-67.87	-57.00	-10.87	V	
202.91	-69.41	-57.00	-12.41	V	
254.65	-69.89	-57.00	-12.89	V	
774.02	-64.07	-57.00	-7.07	V	

Test Result: above 1000MHz

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1726.00	-66.91	-47.00	-19.91	H	PASS
2589.00	-67.46	-47.00	-20.46	H	
3452.00	-65.34	-47.00	-18.34	H	
1726.00	-70.36	-47.00	-23.36	V	
2589.00	-71.80	-47.00	-24.80	V	
3452.00	-66.43	-47.00	-19.43	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
60.16	-65.68	-57.00	-8.68	H	PASS
108.46	-67.94	-57.00	-10.94	H	
139.63	-62.35	-57.00	-5.35	H	
203.86	-69.35	-57.00	-12.35	H	
395.46	-66.92	-57.00	-9.92	H	
546.28	-67.24	-57.00	-10.24	H	
50.70	-66.95	-57.00	-9.95	V	
92.86	-66.59	-57.00	-9.59	V	
137.89	-62.43	-57.00	-5.43	V	
191.56	-73.84	-57.00	-16.84	V	
463.72	-67.98	-57.00	-10.98	V	
487.88	-67.75	-57.00	-10.75	V	

Test Result: above 1000MHz

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1726.00	-69.41	-47.00	-22.41	H	PASS
2589.00	-67.68	-47.00	-20.68	H	
3452.00	-67.91	-47.00	-20.91	H	
1726.00	-67.33	-47.00	-20.33	V	
2589.00	-66.30	-47.00	-19.30	V	
3452.00	-67.98	-47.00	-20.98	V	

866MHz

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
69.49	-70.62	-54.00	-16.62	H	PASS
105.67	-69.64	-54.00	-15.64	H	
117.78	-58.06	-36.00	-22.06	H	
183.84	-67.39	-54.00	-13.39	H	
323.24	-46.97	-36.00	-10.97	H	
511.65	-64.47	-54.00	-10.47	H	
67.84	-66.93	-54.00	-12.93	V	
99.08	-67.20	-54.00	-13.20	V	
112.77	-53.05	-36.00	-17.05	V	
219.46	-74.71	-54.00	-20.71	V	
317.82	-50.84	-36.00	-14.84	V	
752.91	-67.68	-54.00	-13.68	V	

Test Result: above 1000MHz

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1732.00	-43.60	-30.00	-13.60	H	PASS
2598.00	-48.78	-30.00	-18.78	H	
3464.00	-47.10	-30.00	-17.10	H	
1732.00	-49.63	-30.00	-19.63	V	
2598.00	-47.33	-30.00	-17.33	V	
3464.00	-47.67	-30.00	-17.67	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
50.45	-65.27	-57.00	-8.27	H	PASS
90.79	-66.81	-57.00	-9.81	H	
172.12	-65.01	-57.00	-8.01	H	
228.60	-71.13	-57.00	-14.13	H	
314.46	-61.90	-57.00	-4.90	H	
583.91	-65.67	-57.00	-8.67	H	
66.24	-65.92	-57.00	-8.92	V	
101.09	-65.03	-57.00	-8.03	V	
152.16	-64.12	-57.00	-7.12	V	
206.20	-72.47	-57.00	-15.47	V	
259.78	-77.88	-57.00	-20.88	V	
569.29	-68.51	-57.00	-11.51	V	

Test Result: above 1000MHz

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1732.00	-64.99	-47.00	-17.99	H	PASS
2598.00	-66.58	-47.00	-19.58	H	
3464.00	-66.09	-47.00	-19.09	H	
1732.00	-65.38	-47.00	-18.38	V	
2598.00	-68.24	-47.00	-21.24	V	
3464.00	-70.30	-47.00	-23.30	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
62.13	-73.31	-57.00	-16.31	H	PASS
93.34	-66.05	-57.00	-9.05	H	
166.23	-69.08	-57.00	-12.08	H	
209.91	-69.66	-57.00	-12.66	H	
250.30	-62.83	-57.00	-5.83	H	
763.10	-71.99	-57.00	-14.99	H	
72.14	-66.45	-57.00	-9.45	V	
101.80	-65.00	-57.00	-8.00	V	
156.80	-65.56	-57.00	-8.56	V	
217.11	-68.83	-57.00	-11.83	V	
439.62	-71.35	-57.00	-14.35	V	
660.39	-63.92	-57.00	-6.92	V	

Test Result: above 1000MHz

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1732.00	-61.63	-47.00	-14.63	H	PASS
2598.00	-68.27	-47.00	-21.27	H	
3464.00	-67.74	-47.00	-20.74	H	
1732.00	-68.40	-47.00	-21.40	V	
2598.00	-67.26	-47.00	-20.26	V	
3464.00	-67.53	-47.00	-20.53	V	

870MHz

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
62.12	-74.46	-54.00	-20.46	H	PASS
103.84	-65.67	-54.00	-11.67	H	
122.51	-56.12	-36.00	-20.12	H	
211.96	-69.64	-54.00	-15.64	H	
235.10	-51.65	-36.00	-15.65	H	
569.21	-63.00	-54.00	-9.00	H	
65.40	-73.17	-54.00	-19.17	V	
95.70	-69.77	-54.00	-15.77	V	
117.57	-56.33	-36.00	-20.33	V	
217.36	-68.83	-54.00	-14.83	V	
271.32	-48.61	-36.00	-12.61	V	
588.69	-62.12	-54.00	-8.12	V	

Test Result: above 1000MHz

Test Mode: TX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1740.00	-46.73	-30.00	-16.73	H	PASS
2610.00	-48.44	-30.00	-18.44	H	
3480.00	-44.60	-30.00	-14.60	H	
1740.00	-50.39	-30.00	-20.39	V	
2610.00	-44.40	-30.00	-14.40	V	
3480.00	-44.19	-30.00	-14.19	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
70.00	-64.93	-57.00	-7.93	H	PASS
108.38	-66.13	-57.00	-9.13	H	
152.80	-71.07	-57.00	-14.07	H	
222.10	-72.17	-57.00	-15.17	H	
265.39	-67.89	-57.00	-10.89	H	
690.27	-66.10	-57.00	-9.10	H	
67.09	-70.54	-57.00	-13.54	V	
98.64	-65.84	-57.00	-8.84	V	
144.49	-71.26	-57.00	-14.26	V	
225.54	-72.84	-57.00	-15.84	V	
335.19	-68.76	-57.00	-11.76	V	
836.26	-67.35	-57.00	-10.35	V	

Test Result: above 1000MHz

Test Mode: Standby Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1740.00	-60.11	-47.00	-13.11	H	PASS
2610.00	-68.24	-47.00	-21.24	H	
3480.00	-65.36	-47.00	-18.36	H	
1740.00	-71.49	-47.00	-24.49	V	
2610.00	-67.87	-47.00	-20.87	V	
3480.00	-64.20	-47.00	-17.20	V	

Test Results (25~1000MHz)

Temperature:	25° C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
50.55	-66.61	-57.00	-9.61	H	PASS
91.45	-69.08	-57.00	-12.08	H	
161.48	-65.27	-57.00	-8.27	H	
214.14	-71.06	-57.00	-14.06	H	
293.33	-65.03	-57.00	-8.03	H	
550.03	-69.06	-57.00	-12.06	H	
72.36	-70.36	-57.00	-13.36	V	
91.94	-67.98	-57.00	-10.98	V	
167.41	-62.07	-57.00	-5.07	V	
176.26	-74.95	-57.00	-17.95	V	
312.78	-66.42	-57.00	-9.42	V	
496.93	-68.44	-57.00	-11.44	V	

Test Result: above 1000MHz

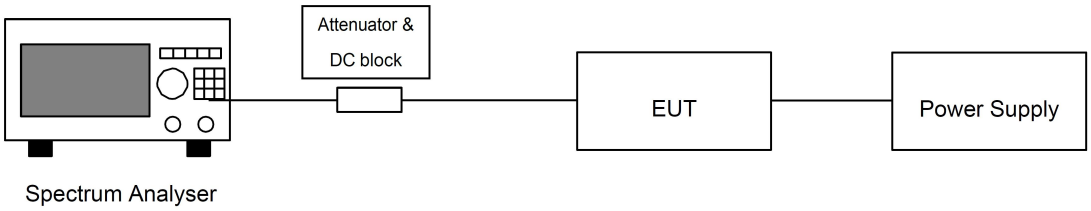
Test Mode: RX Mode					
Frequency (MHz)	Level(dBm)	Limit (dBm)	Margin(dB)	Polarization	Test Result
1740.00	-62.17	-47.00	-15.17	H	PASS
2610.00	-65.95	-47.00	-18.95	H	
3480.00	-64.86	-47.00	-17.86	H	
1740.00	-67.52	-47.00	-20.52	V	
2610.00	-68.33	-47.00	-21.33	V	
3480.00	-66.71	-47.00	-19.71	V	

4. Effective Radiated Power

4.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.2.0 Clause 4.3.1	
Test Limit	The effective radiated power shall not be greater than the value allowed in annexes B or C (EN 300 220-2) for the chosen operational frequency band(s).	
	Frequency Band	Maximum effective radiated power
	433.04MHz to 434.79MHz	10mW
	863MHz to 870MHz	25mW

4.2. Test Setup



4.3. Test Procedure

The conducted measurement procedure in clause 5.2.2.1 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

4.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

863MHz

Test Mode:	TX CH00			
Test Conditions				Total e.r.p (dBm)
T nom (°C)	25.00	V nom (V)	AC 230V~ 50Hz for adapter	10.12
T min (°C)	-10.00	V nom (V)	AC 230V~ 50Hz for adapter	10.04
T max (°C)	45.00	V nom (V)	AC 230V~ 50Hz for adapter	10.07
Max RF Power				10.12

Limits	14
Result	PASS

866MHz

Test Mode:	TX CH03			
Test Conditions				Total e.r.p (dBm)
T nom (°C)	25.00	V nom (V)	AC 230V~ 50Hz for adapter	9.91
T min (°C)	-10.00	V nom (V)	AC 230V~ 50Hz for adapter	9.97
T max (°C)	45.00	V nom (V)	AC 230V~ 50Hz for adapter	9.87
Max RF Power				9.97
Limits				14
Result				PASS

870MHz

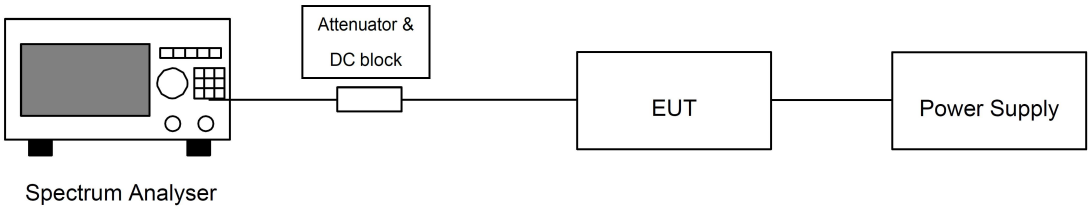
Test Mode:	TX CH07			
Test Conditions				Total e.r.p (dBm)
T nom (°C)	25.00	V nom (V)	AC 230V~ 50Hz for adapter	9.73
T min (°C)	-10.00	V nom (V)	AC 230V~ 50Hz for adapter	9.71
T max (°C)	45.00	V nom (V)	AC 230V~ 50Hz for adapter	9.69
Max RF Power				9.73
Limits				14
Result				PASS

5. Occupied Bandwidth

5.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.2.0 Clause 4.3.4
Test Limit	The Operating Channel shall be declared and shall reside entirely within the Operational Frequency Band. The Maximum Occupied Bandwidth at 99 % shall reside entirely withinthe Operating Channel defined by F_{low} and F_{high}.

5.2. Test Setup



5.3. Test Procedure

The conducted measurement procedure in clause 5.6.3.4 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

5.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

Test Mode:	TX	
Test Channel	Test Freq. (MHz)	99% Bandwidth (KHz)
CH0	863MHz	660.12
CH7	870MHz	607.22

6. Out Of Band Emissions

6.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.2.0 Clause 4.3.5			
Test Limit	Domain	Frequency Range	RBW_{REF}	Max power limit
	OOB limits applicable to Operational Frequency Band (See Figure 6)	$f \le f_{low\_OFB}$ - 400 kHz	10 kHz	-36 dBm
		F_{low_OFB} - 400 kHz $\le f \le f_{low\_OFB}$ - 200 kHz	1 kHz	-36 dBm
		f_{low} - 200 kHz $\le f < f_{low\_OFB}$	1 kHz	See Figure 6
		$f = f_{low\_OFB}$	1 kHz	-36 dBm
		$f = f_{high\_OFB}$	1 kHz	-36 dBm
		$F_{high\_OFB} < f \le f_{high\_OFB}$ + 200 kHz	1 kHz	0 dBm
		F_{high_OFB} + 200 kHz $\le f \le f_{high\_OFB}$ + 400 kHz	1 kHz	-36 dBm
		F_{high_OFB} + 400 kHz $\le f$	10 kHz	-36 dBm
	OOB limits applicable to Operating Channel (See Figure 5)	$f = f_c$- 2.5 x OCW	1 kHz	-36 dBm
		f_c – 2.5 x OCW $\le f \le f_c$ – 0.5 x OCW	1 kHz	See Figure 5
		$f = f_c$ – 0.5 x OCW	1 kHz	0 dBm
		$f = f_c$ + 0.5 x OCW	1 kHz	0 dBm
		f_c + 0.5 x OCW $\le f \le f_c$ + 2.5 x OCW	1 kHz	See Figure 5
		$f = f_c$+ 2.5 x OCW	1 kHz	-36 dBm
	NOTE: f is the measurement frequency. f_c is the Operating Frequency. F_{low_OFB} is the lower edge of the Operational Frequency Band. F_{high_OFB} is the upper edge of the Operational Frequency Band. OCW is the operating channel bandwidth.			

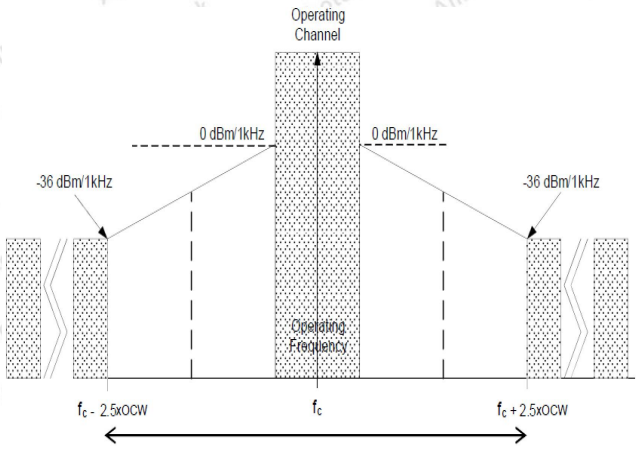


Figure 5: Out Of Band Domain for Operating Channel with reference BW

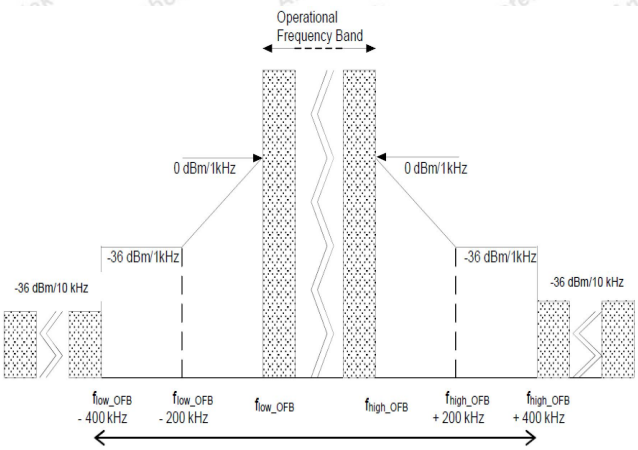
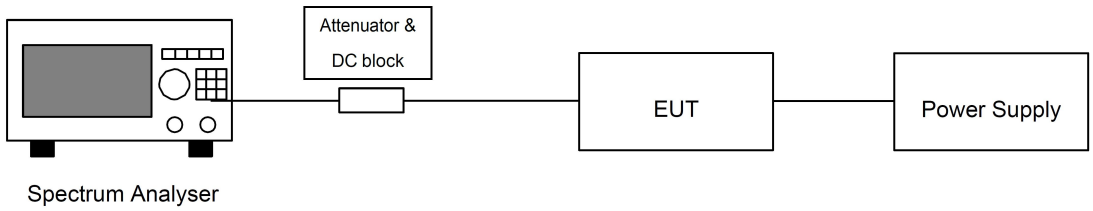


Figure 6: Out Of Band Domain for Operational Frequency Band with reference BW

6.2. Test Setup



6.3. Test Procedure

The conducted measurement procedure in clause 5.8.3.3 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

6.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

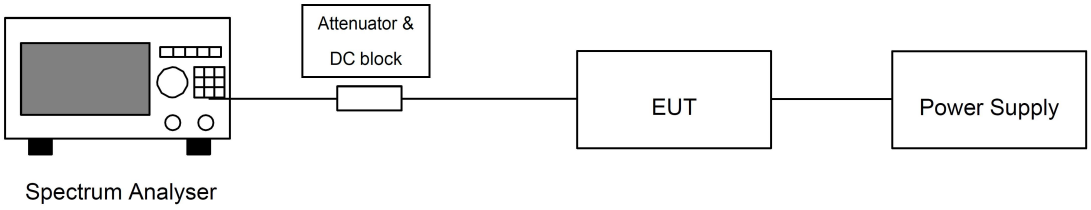
PASS

7. Transient Power

7.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.2.0 Clause 4.3.6		
Test Limit	Absolute offset from centre frequency	RBW_{REF}	Peak power limit applicable at measurement
	⩽ 400 kHz	1 kHz	0 dBm
	> 400 kHz	1 kHz	-27 dBm

7.2. Test Setup



7.3. Test Procedure

The conducted measurement procedure in clause 5.10.3.2 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously transmitting.

7.4. Test Data

Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

CH0

Measurement points: offset from centre frequency	Peak power limit applicable at measurement points (dBm)	Test Result (dBm)
-0,5 x OCW - 3 kHz	0	-9.52
0,5 x OCW + 3 kHz	0	-11.06
-OCW	0	-9.95
+OCW	0	-10.85
-0,5 x OCW - 400 kHz	-27	-35.45
0,5 x OCW + 400 kHz	-27	-33.92
-0,5 x OCW -1 200 kHz	-27	-37.13
0,5 x OCW + 1 200 kHz	-27	-32.24

CH7

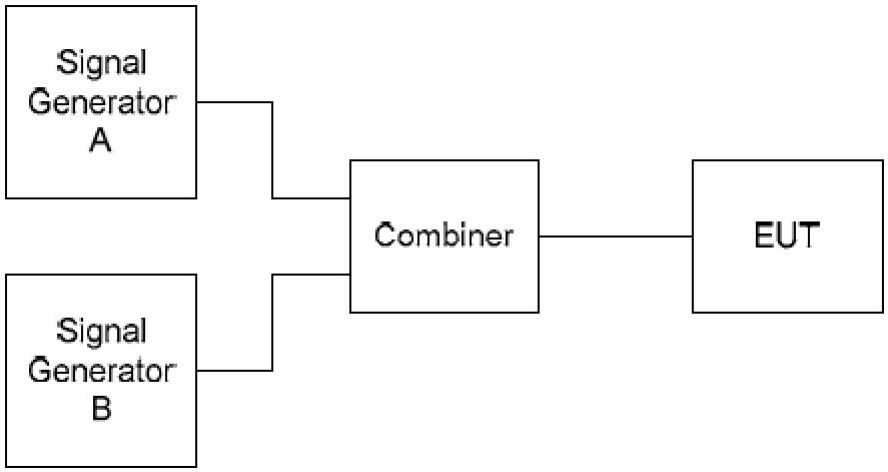
Measurement points: offset from centre frequency	Peak power limit applicable at measurement points (dBm)	Test Result (dBm)
-0,5 x OCW - 3 kHz	0	-10.15
0,5 x OCW + 3 kHz	0	-11.67
-OCW	0	-9.66
+OCW	0	-11.57
-0,5 x OCW - 400 kHz	-27	-35.32
0,5 x OCW + 400 kHz	-27	-33.19
-0,5 x OCW -1 200 kHz	-27	-37.17
0,5 x OCW + 1 200 kHz	-27	-32.57

9. Receiver Blocking

9.1. Test Standard and Limit

Test Standard	ETSI EN300220-2 V3.2.0 Clause 4.4.2				
Test Limit	Requirement	Limits			
		Receiver category 3	Receiver category 2	Receiver category 1.5	Receiver category 1
	Blocking at ±2 MHz from OC edge f_{high} and f_{low}	⩾ -80 dBm	⩾ -69 dBm	⩾ -43 dBm	⩾ -20 dBm
	Blocking at ±10 MHz from OC edge f_{high} and f_{low}	⩾ -60 dBm	⩾ -44 dBm	⩾ -33 dBm	⩾ -20 dBm
	Blocking at ±5 % of Centre Frequency or 15 MHz, whichever is the greater	⩾ -60 dBm	⩾ -44 dBm	⩾ -33 dBm	⩾ -20 dBm

9.2. Test Setup



9.3. Test Procedure

The conducted measurement procedure in clause 5.18.6.3 of ETSI EN 300 220-1 V3.1.1.
The measurements shall be performed during continuously receiving.

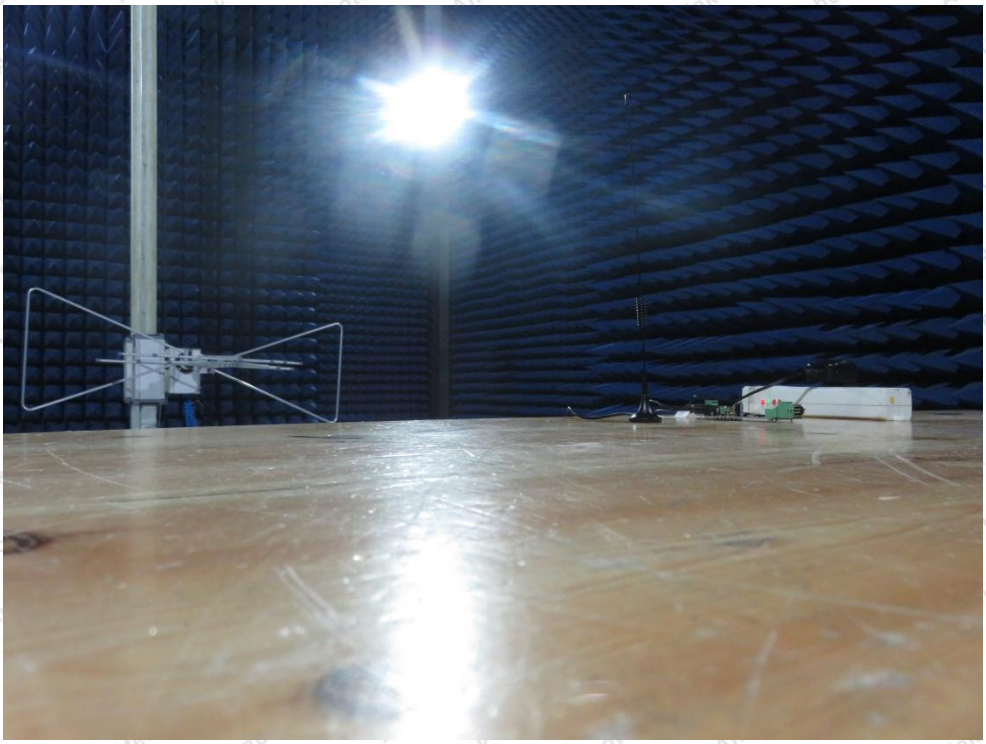
9.4. Test Data

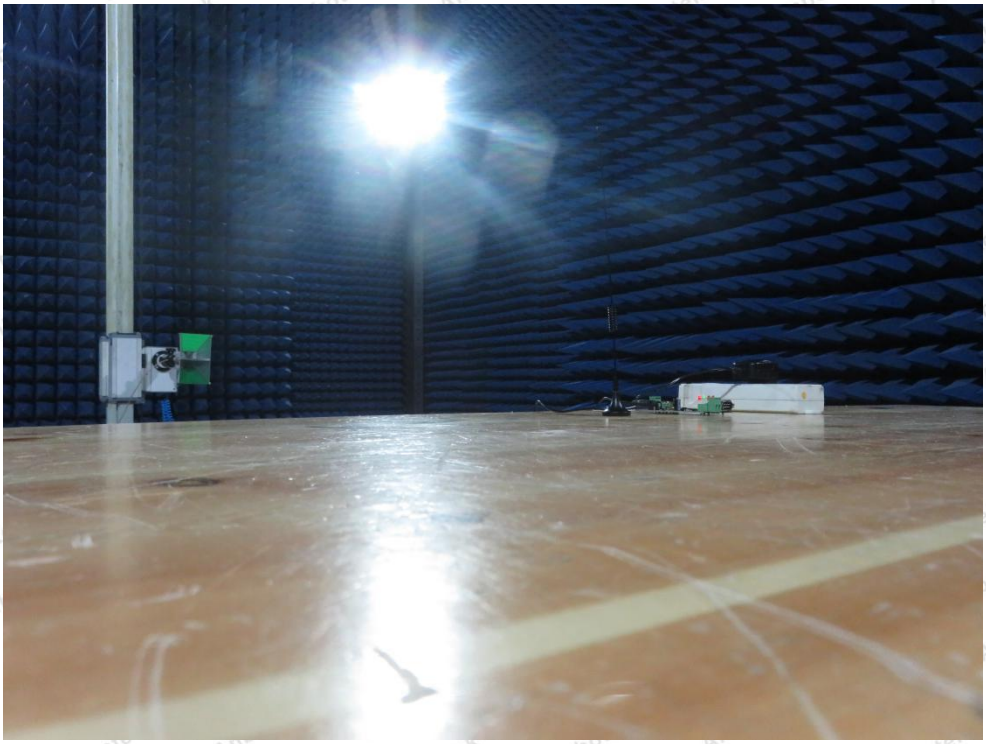
Temperature:	See below	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	AC 230V~ 50Hz for adapter

EUT category:category 2		Operating Channel:RX Mode
Requirement	Limit	Results
Blocking at -2 MHz from Operating Channel	≥ -69 dBm	PASS
Blocking at +2 MHz from Centre Frequency	≥ -69 dBm	PASS
Blocking at -10 MHz from Centre Frequency	≥ -44 dBm	PASS
Blocking at +10 MHz from Centre Frequency	≥ -44 dBm	PASS
Blocking at -5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -44 dBm	PASS
Blocking at +5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -44 dBm	PASS

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Radiation Emission Test





---------- End of Report----------