Report No.: DDT-R19050915-1E2

Issued Date: Aug. 01, 2019

EN 300 220 RADIO TEST REPORT

FOR

Applicant	:	LJ ELECTRONICS TECHNOLOGY LIMITED
Address	:	Suite 1003,10/F.,Chung Sheung Building,9 Queen Victoria Street,Centra,HONG KONG
Equipment under Test	:	LoRa Tranceiver Module
Model No	:	LJ1276-868
Trade Mark	:	LJelect
Manufacturer	:	GONGGUAN HOLCHAN ELECTRONICS TECHNOLOGY LIMITED
Address	:	The 2nd Floor (west side),JieAn Industrial Park, The 1st Industrial Road,TuTang Village,ChangPing Town,DongGuan City, GuangDong, ChinaChangPing Town,DongGuan City, GuangDong, China

Issued By: Dongguan Dongdian Testing Service Co., Ltd.

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808

Tel: +86-0769-38826678, **E-mail:** ddt@dgddt.com, http://www.dgddt.com

REPORT

TABLE OF CONTENTS

TEST REPORT DECLARE

Applicant	**:**	LJ ELECTRONICS TECHNOLOGY LIMITED
Address	**:**	Suite 1003,10/F.,Chung Sheung Building,9 Queen Victoria Street,Centra,HONG KONG
Equipment under Test	**:**	LoRa Tranceiver Module
Model No	**:**	LJ1276-868
Trade Mark	**:**	LJelect
Manufacturer	**:**	GONGGUAN HOLCHAN ELECTRONICS TECHNOLOGY LIMITED
Address	**:**	The 2nd Floor (west side),JieAn Industrial Park, The 1st Industrial Road,TuTang Village,ChangPing Town,DongGuan City, GuangDong, ChinaChangPing Town,DongGuan City, GuangDong, China

Test Standard Used: EN 300 220-1 V3.1.1, ETSI EN 300 220-2 V3.2.1 (2018-06)

We Declare:

The equipment is tested by Dongguan Dongdian Testing Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and Dongguan Dongdian Testing Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment in accordance with above standards about the electromagnetic compatibility requirements of Article 3.2 of the RE Directive.

Report No:	DDT-R19050915-1E2		
Date of Receipt:	Jul. 04, 2019	**Date of Test:**	Jul. 04, 2019~ Aug. 01, 2019

Prepared By: ***Approved By:***

Ella Gong/Engineer ***Damon Hu/EMC Manager***

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Dongguan Dongdian Testing Service Co., Ltd.

Revision history

Rev.	Revisions	Issue Date	Revised By
---	Initial issue	Aug. 01, 2019	

1. Summary of test results

1.1. Standard description

ETSI EN 300 220-1 V3.1.1 (2017-02): Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 1: Technical characteristics and methods of measurement
ETSI EN 300 220-2 V3.2.1 (2018-06): Short Range Devices (SRD) operating in the frequency range 25 MHz to 1 000 MHz; Part 2: Harmonised Standard for access to radio spectrum for non specific radio equipment

1.2. Test result

Harmonized Standard EN 300 220-2 The following requirements and test specifications are relevant to the presumption of conformity under article 3.2 of the RED Directive				
No	Test Parameter	Clause No	Condition	Results
1	Operating frequency	4.2.1	U	PASS
2	Unwanted emissions in the spurious domain	4.2.2	U	PASS
3	TX effective radiated power	4.3.1	U	PASS
4	TX Maximum e.r.p. spectral density	4.3.2	Applies to EUT using annex B band I. Applies to EUT using DSSS or wideband techniques other than FHSS modulation, using annex C band W, AA or AC.	PASS
5	TX Duty cycle	4.3.3	Not applicable to EUT with polite spectrum access where permitted in annex B, table B.1.	PASS
6	TX Occupied bandwidth	4.3.4	U	PASS
7	TX out of band emissions	4.3.5	Applies to EUT with OCW > 25 kHz.	PASS
8	TX Transient	4.3.6	U	PASS
9	TX Adjacent channel power	4.3.7	Applies to EUT with OCW ≤ 25 kHz.	N/A
10	TX behaviour under low voltage conditions	4.3.8	Applies to battery powered EUT.	N/A
11	TX Adaptive power control	4.3.9	Applies to EUT with adaptive power control using annex C band AF.	N/A
12	TX FHSS	4.3.10	Applies to FHSS EUT using the band 863 MHz to 870 MHz.	N/A
13	TX Short term behaviour	4.3.11	Applies to EUT using annex C bands AD, AE, AF, AG, AH, or AI.	N/A
14	RX sensitivity	4.4.1	Applies to EUT employing polite spectrum access.	N/A
15	RX Blocking	4.4.2	U	PASS
16	Clear channel assessment threshold	4.5.2	Applies to EUT employing polite spectrum access.	N/A
17	Polite spectrum access timing parameters	4.5.3	Applies to EUT employing polite spectrum access.	N/A
18	Adaptive Frequency Agility	4.5.4	Applies to EUT with AFA.	N/A
Note 1: The Operational Frequency of the EUT is 868-868.6MHz declared by the manufacturer. According to EN 300 220-2 Annex B, the EUT shall be using band M. Note 2: N/A is an abbreviation for not applicable, means according technology of EUT, this test item is not applicable for this reported device. Note 3: U means unconditionally applicable.				

2. General test information

2.1. Description of EUT

EUT* Name	:	LoRa Tranceiver Module
Model Number	:	LJ1276-868
EUT function description	:	Please reference user manual of this device
Power supply	:	DC 3.3 V
Operation frequency	:	868.1 MHz- 868.5 MHz
Number of Channel	:	3 Channels
Modulation	:	LoRa
Antenna Type	:	Dedicated Antenna, maximum PK gain: 1.2 dBi
Sample Type	:	Series production

Note: EUT is the ab. of equipment under test.

2.2. Accessories of EUT

Description of Accessories	Manufacturer	Model number or Type	Serial No.	Other
N/A	N/A	N/A	N/A	N/A

2.3. Assistant equipment used for test

Description of Assistant equipment	Manufacturer	Model number or Type	Serial No.	Other
Data transfer module demo board	LJ ELECTRONICS TECHNOLOGY LIMITED	DEMO_SX12M	N/A	N/A
Pinboard	LJ ELECTRONICS TECHNOLOGY LIMITED	S12_T	N/A	N/A

2.4. Block diagram of EUT configuration for test

EUT

Tested mode, channel information		
Mode	Channel	Frequency (MHz)
TX mode	Low	868.1 MHz
	High	868.5 MHz
RX mode	Low	868.1 MHz
	High	868.5 MHz

2.5. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

	Normal Conditions	Extreme Conditions
Temperature range	21-25℃	LT: -40℃ to HT: +85℃
Humidity range	20-75%	N/A
Power supply	DC 3.3 V	LV: DC 1.8 V and HV: DC 3.7 V
Note: The Extreme temperature range and extreme voltages are declared by the manufacturer.		

2.6. Test laboratory

Dongguan Dongdian Testing Service Co., Ltd.

Add: No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Industry Park, Dongguan City, Guangdong Province, China, 523808

Tel: +86-0769-38826678, http://www.dgddt.com, Email: ddt@dgddt.com

CNAS Accreditation No. L6451; A2LA Accreditation No. 3870.01

FCC Designation Number: CN1182; FCC Test Firm Registration Number: 540522

Industry Canada site registration number: 10288A-1

2.7. Measurement uncertainty

Test Item	Uncertainty
RF frequency	3×10^{-8}
Radiated RF power	±3.57dB
Peak Output Power (Conducted)(Spectrum analyzer)	0.86dB (10 MHz ≤ f < 3.6GHz);
	1.38dB (3.6GHz≤ f < 8GHz)
Peak Output Power (Conducted)(Power Sensor)	0.74dB
Maximum frequency deviation -within 300Hz and 6kHz of audio frequency -within 6kHz and 25kHz of audio frequency	2.1% 1.5dB
Adjacent channel power	1.2dB
Conducted spurious emission	0.86dB (10 MHz ≤ f < 3.6GHz);
	1.40dB (3.6GHz≤ f < 8GHz)
	1.66dB (8GHz≤ f < 22GHz)
Radiated Emissions	±3.57dB (f<26GHz)
Temperature	±0.4℃
Humidity	±2%
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

3. Equipment used during test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
RF Connected Test (Tonscend RF Measurement System)					
Spectrum analyzer	R&S	FSU26	200071	Oct. 12, 2018	1 Year
Wideband Radio Communication tester	R&S	CMW500	117491	Jun. 25, 2019	1 Year
Vector Signal Generator	Agilent	E8267D	US49060192	Oct. 12, 2018	1 Year
Vector Signal Generator	Agilent	N5182A	MY48180737	Jun. 25, 2019	1 Year
Power Sensor	Agilent	U2021XA	MY55150010	Jun. 28, 2019	1 Year
Power Sensor	Agilent	U2021XA	MY55150011	Jun. 28, 2019	1 Year
DC Power Source	MATRIS	MPS-3005L-3	D813058W	Aug. 18, 2018	1 Year
Attenuator	Mini-Circuits	BW-S10W2	101109	Aug. 18, 2018	1 Year
RF Cable	Micable	C10-01-01-1	100309	Oct. 21, 2018	1 Year
Temp&Humi Programmable	ZHIXIANG	ZXGDJS-150L	ZX170110-A	Oct. 21, 2018	1 Year
Test Software	JS Tonscend	JS1120-3	Ver.2.7	N/A	N/A
Radiated Emission Test Chamber 1#					
EMI Test Receiver	R&S	ESU8	100316	Oct. 12, 2018	1 Year
Spectrum analyzer	Agilent	E4447A	MY50180031	Jun. 25, 2019	1 Year
Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	Nov. 09, 2018	1 Year
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	Oct. 20, 2018	1 Year
Double Ridged Horn Antenna	R&S	HF907	100276	Nov. 16, 2018	1 Year
Broad Band Horn Antenna	Schwarzbeck	BBHA 9170	790	Oct. 25, 2018	1 Year
Pre-amplifier	A.H.	PAM-0118	360	Oct. 12, 2018	1 Year
Pre-amplifier	TERA-MW	TRLA-0040G35	101303	Oct. 12, 2018	1 Year
RF Cable	HUBSER	CP-X2+ CP-X1	W11.03+ W12.02	Oct. 21, 2018	1 Year
RF Cable	N/A	SMAJ-SMAJ-1M+ 11M	17070133+17070 131	Nov. 08, 2018	1 Year
MI Cable	HUBSER	C10-01-01-1M	1091629	Oct. 21, 2018	1 Year
Test software	Audix	E3	V 6.11111b	N/A	N/A

4. Operating frequency

4.1. Information Recorded

Parameter	Value	Notes
Operational Frequency band or bands	868.000 MHz to 868.600 MHz	Declared by the standard
Nominal Operating Frequency or Frequencies	868.1 MHz, 868.3 MHz and 868.5 MHz	Declared by the manufacturer
Operating Channel width(s) - OCW	200 kHz	Declared by the manufacturer

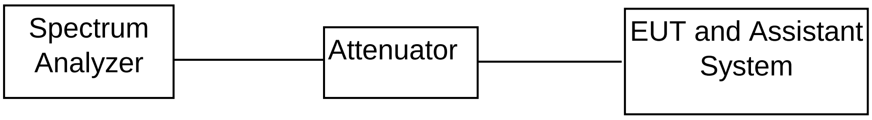
Note 1: The Operational Frequency of the EUT is 868.1 MHz- 868.5 MHz declared by the manufacturer. According to EN 300 220-2 Annex B, the EUT shall be using bands M.

M	868,000 MHz to 868,600 MHz	25 mW e.r.p.	≤ 1 % duty cycle or polite spectrum access	The whole band		48

Note 2: The Operating Channel Width (OCW) of the EUT: 200 kHz, and two frequency edges values: F_{low}=868.00 MHz and F_{high}=868.60 MHz, are declared by the manufacturer.

5. Frequency error

5.1. Block diagram of test setup



5.2. Description

Frequency error is the difference between the measured unmodulated carrier frequency under extreme conditions and the nominal Centre Frequency as stated by the manufacturer. This measurement procedure only applies if the EUT can generate an unmodulated carrier (test signal D-M1).

5.3. Test Procedure

(1) Refer to ETSI EN300220-1 Sub-clause 5.6.3.1 for the test conditions.

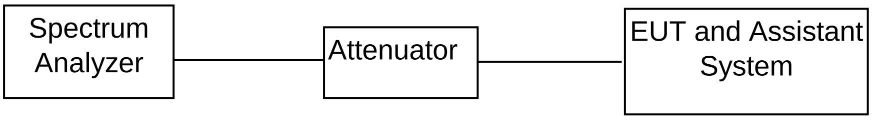
(2) Refer to ETSI EN300220-1 Sub-clause 5.7.2.4 for the test Measurement procedure (Conducted measurement).

5.4. Test Result

Test Conditions (in Normal & Extreme)		Channel(MHz)	Measurement (MHz)
Volt.	Temp.		
Normal Volt.	Normal Temp.	868.1	868.102
Low Volt.	Low Temp.	868.1	868.102
Low Volt.	High Temp.	868.1	868.102
High Volt.	Low Temp.	868.1	868.102
High Volt.	High Temp.	868.1	868.102
Normal Volt.	Normal Temp.	868.5	868.502
Low Volt.	Low Temp.	868.5	868.502
Low Volt.	High Temp.	868.5	868.502
High Volt.	Low Temp.	868.5	868.502
High Volt.	High Temp.	868.5	868.502

6. TX Occupied bandwidth

6.1. Block diagram of test setup



6.2. Limit

Limits apply under normal and extreme conditions

The Operating Channel shall be declared and shall reside entirely within the Operational Frequency Band. The Maximum Occupied Bandwidth at 99% shall reside entirely within the Operating Channel defined by F_{low} and F_{high}.

Refer to clause 4.1, F_{low}=868.00 MHz and F_{high}=868.60 MHz, declared by the manufacturer.

6.3. Test Procedure

(1) Refer to ETSI EN300220-1 Sub-clause 5.6.3.1 for the test conditions.

(2) Refer to ETSI EN300220-1 Sub-clause 5.6.3.4 for the test Measurement procedure (Conducted measurement).

(3) The spectrum analyser shall be configured as appropriate for the parameters shown in Table 12.

Table 12: Test Parameters for Max Occupied Bandwidth Measurement

Setting	Value	Notes
Centre frequency	The nominal Operating Frequency	The highest or lowest Operating Frequency as declared by the manufacturer
RBW	1 % to 3 % of OCW without being below 100 Hz	
VBW	3 x RBW	Nearest available analyser setting to 3 x RBW
Span	At least 2 x Operating Channel width	Span should be large enough to include all major components of the signal and its side bands
Detector Mode	RMS	
Trace	Max hold	

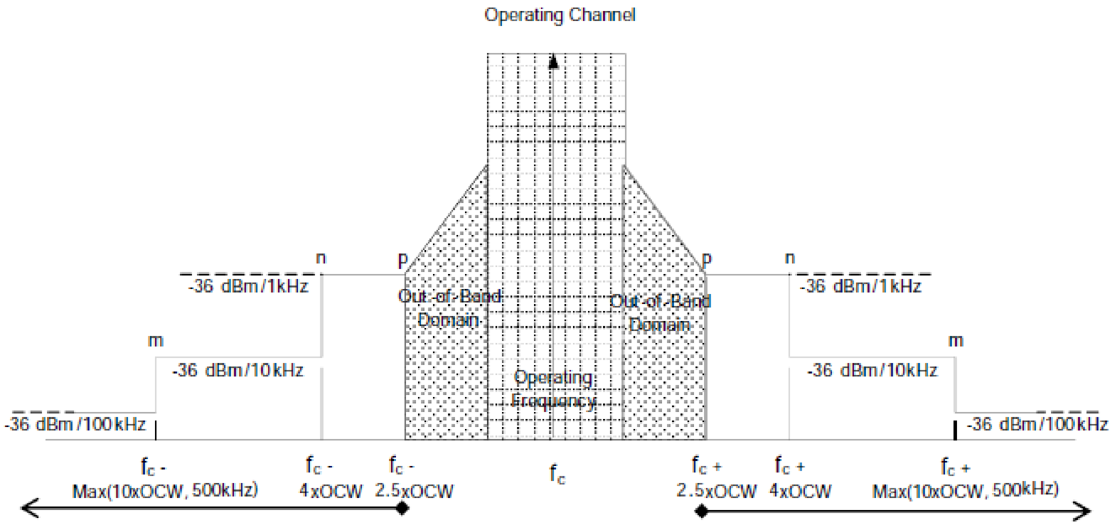
6.4. Test Result

Test Conditions (in Normal & Extreme)		Channel	F_L (MHz)	F_H (MHz)	Occupied Bandwidth (kHz)	Limit (MHz)	Result
Volt.	Temp.						
Normal Volt.	Normal Temp.	Low	868.038	868.167	128.205	868.00-868.60	PASS
Low Volt.	Low Temp.	Low	868.038	868.167	128.205	868.00-868.60	PASS
Low Volt.	High Temp.	Low	868.038	868.167	128.205	868.00-868.60	PASS
High Volt.	Low Temp.	Low	868.038	868.167	128.205	868.00-868.60	PASS
High Volt.	High Temp.	Low	868.038	868.167	128.205	868.00-868.60	PASS
Normal Volt.	Normal Temp.	High	868.437	868.565	128.205	868.00-868.60	PASS
Low Volt.	Low Temp.	High	868.437	868.565	128.205	868.00-868.60	PASS
Low Volt.	High Temp.	High	868.437	868.565	128.205	868.00-868.60	PASS
High Volt.	Low Temp.	High	868.437	868.565	128.205	868.00-868.60	PASS
High Volt.	High Temp.	High	868.437	868.565	128.205	868.00-868.60	PASS
Maximum Occupied Bandwidth= 128.205 kHz							

7. Unwanted emissions in the spurious domain

7.1. Limits

Unwanted emissions for a TX mode:

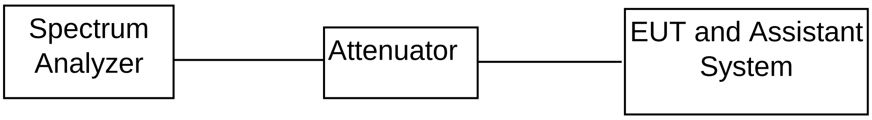


Unwanted emissions for all other modes:

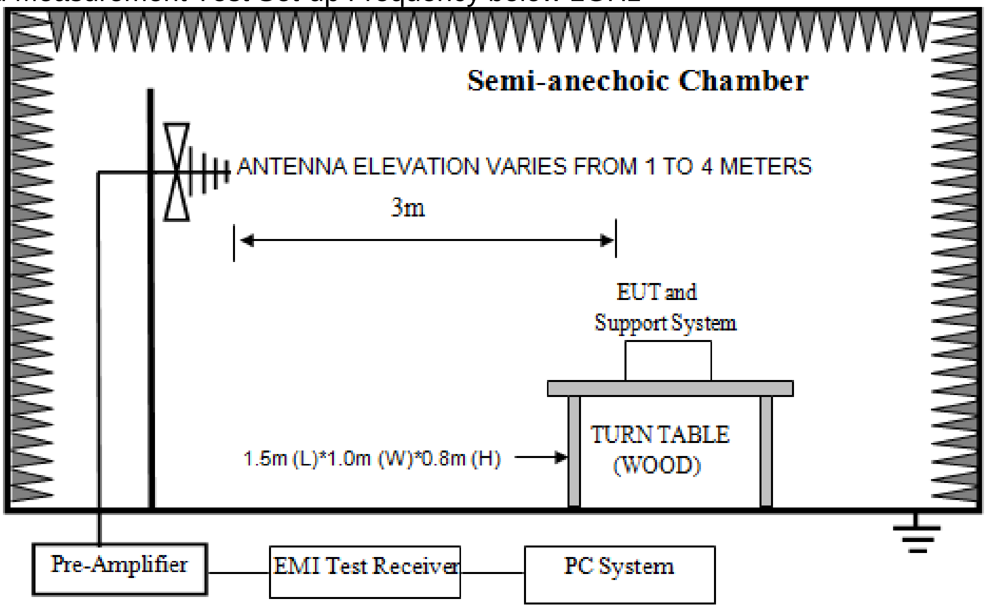
State	47 MHz to 74 MHz 87.5 MHz to 118 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other frequencies ≤1 000 MHz	Frequencies >1 000 MHz
TX mode	-54dBm	-36dBm	-30dBm
RX and all other modes	-57dBm	-57dBm	-47dBm

7.2. Block diagram of test setup

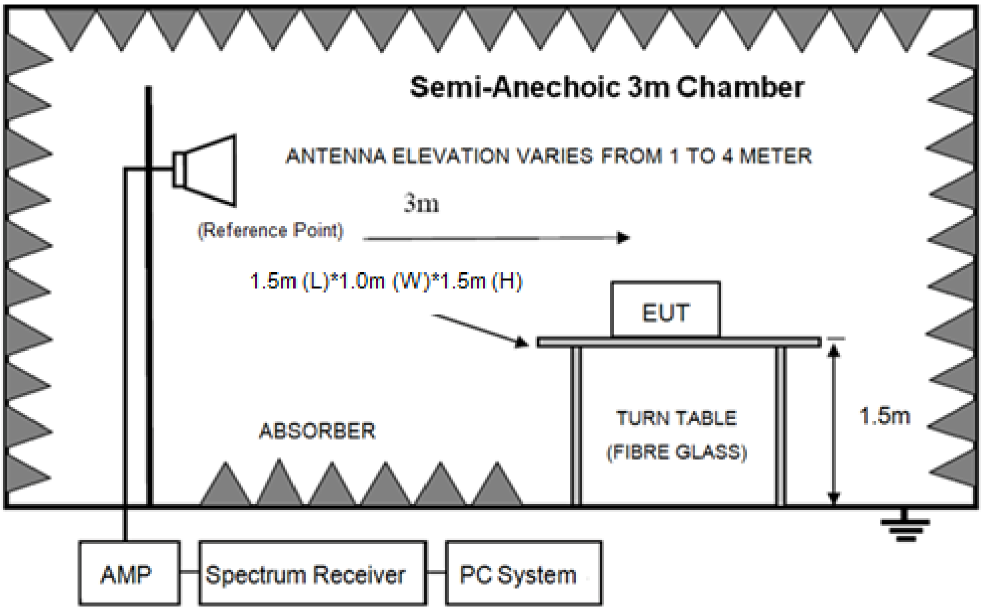
Conducted Measurement Test Set-up



Radiated Measurement Test Set-up Frequency below 1GHz



Radiated Measurement Test Set-up Frequency above 1GHz



7.3. Test procedure

1. Pls. refer to ETSI EN300220-1 Sub-clause 5.9.3.1/Sub-clause 5.9.3.2 for the test conditions.
2. Pls. refer to ETSI EN300220-1 Sub-clause 5.9.3.3/5.9.3.3.1 and Sub-clause 5.9.3.3/5.9.3.3.2 for the measurement method.
3. Parameters for TX Spurious Radiations Measurement:

Operating Mode	Frequency Range	RBW_{REF} (see note 2)
Transmit mode	9 kHz ≤ f < 150 kHz	1 kHz
	150 kHz ≤ f < 30 MHz	10 kHz
	30 MHz ≤ f < f_c - m	100 kHz
	f_c - m ≤ f < f_c - n	10 kHz
	f_c - n ≤ f < f_c - p	1 kHz
	f_c + p < f ≤ f_c + n	1 kHz
	f_c + n < f ≤ f_c + m	10 kHz
	f_c + m < f ≤ 1 GHz	100 kHz
	1 GHz < f ≤ 6 GHz	1 MHz

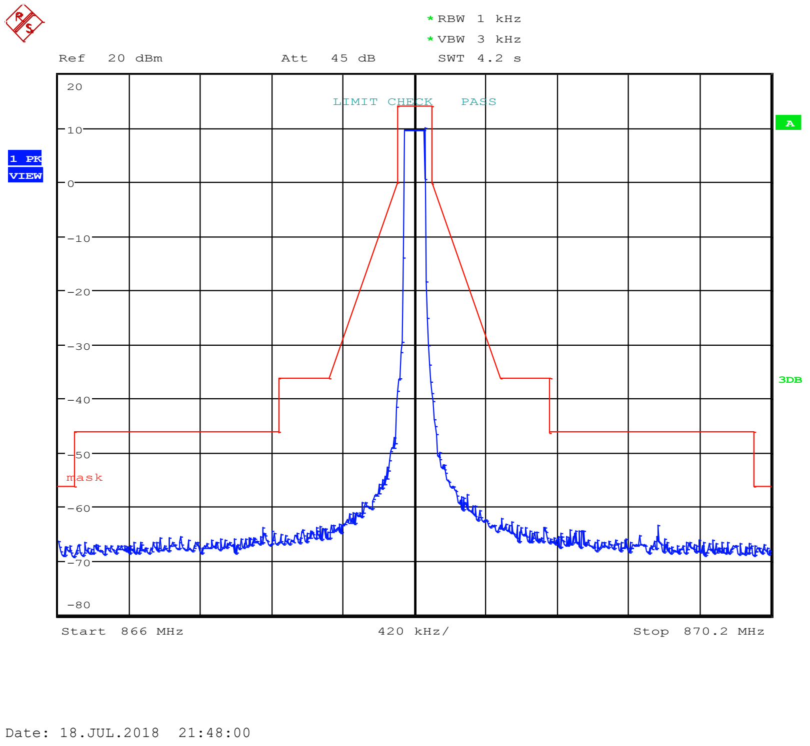
NOTE 1: f is the measurement frequency.
f_c is the Operating Frequency.
m is 10 x OCW or 500 kHz, whichever is the greater.
n is 4 x OCW or 100 kHz, whichever is the greater.
p is 2,5 x OCW.
NOTE 2: If the value of RBW used for measurement is different from RBW_{REF}, use bandwidth correction from clause 4.3.10.1.

7.4. Test result

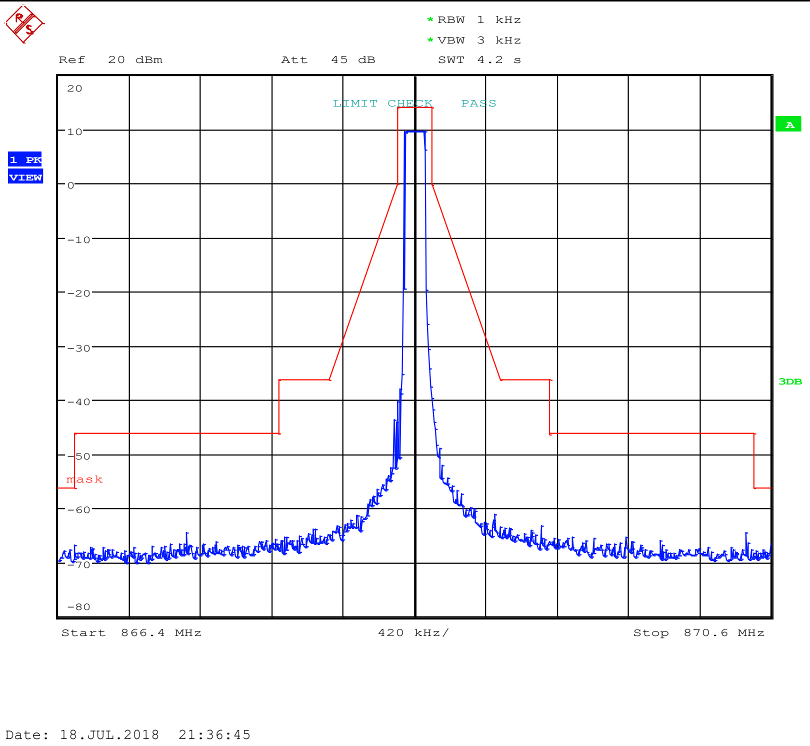
Unwanted emissions for Low CH TX mode			
Test Conditions	Frequency Band(MHz)	Limit(dBm)	Rusult
NTNV	Low~868.1-10*OCW	-36dB/100kHz	PASS
	868.1-10*OCW~868.1*OCW	-36dB/10kHz	PASS
	868.1-4*OCW~868.1-2.5*OCW	-36dB/1kHz	PASS
	868.1+2.5*OCW ~868.1+4*OCW	-36dB/1kHz	PASS
	868.1+4*OCW~868.1+10*OCW	-36dB/10kHz	PASS
	868.1+10*OCW~High	-36dB/100kHz	PASS

Unwanted emissions for High CH TX mode			
Test Conditions	Frequency Band(MHz)	Limit(dBm)	Rusult
NTNV	Low~868.5-10*OCW	-36dB/100kHz	PASS
	868.5-10*OCW~868.5*OCW	-36dB/10kHz	PASS
	868.5-4*OCW~868.5-2.5*OCW	-36dB/1kHz	PASS
	868.5+2.5*OCW ~868.5+4*OCW	-36dB/1kHz	PASS
	868.5+4*OCW~868.5+10*OCW	-36dB/10kHz	PASS
	868.5+10*OCW~High	-36dB/100kHz	PASS

Spectrum Mask for Low CH Unwanted Emissions in the Spurious Domain



Spectrum Mask for High CH Unwanted Emissions in the Spurious Domain



Unwanted emissions for Low CH TX mode (25 MHz to 6 GHz)				
Frequency (MHz)	Result (dBm)	Limit (dBm)	Antenna polarization	Conclusion
50.76	-76.35	-54.00	H	PASS
101.64	-73.83	-54.00	H	PASS
239.15	-76.80	-36.00	H	PASS
350.48	-70.00	-36.00	H	PASS
494.20	-68.44	-54.00	H	PASS
684.75	-63.47	-54.00	H	PASS
1735.00	-39.22	-30.00	H	PASS
2610.00	-32.63	-30.00	H	PASS
3475.00	-41.35	-30.00	H	PASS
4340.00	-46.36	-30.00	H	PASS
5210.00	-41.42	-30.00	H	PASS
5750.00	-40.78	-30.00	H	PASS
47.49	-76.71	-54.00	V	PASS
107.13	-74.29	-54.00	V	PASS
151.60	-76.41	-36.00	V	PASS
350.48	-70.35	-36.00	V	PASS
520.89	-68.45	-54.00	V	PASS
729.36	-64.10	-54.00	V	PASS
1735.00	-43.20	-30.00	V	PASS
2610.00	-30.64	-30.00	V	PASS
3475.00	-35.60	-30.00	V	PASS
4340.00	-41.39	-30.00	V	PASS
5210.00	-40.60	-30.00	V	PASS
5760.00	-50.17	-30.00	V	PASS

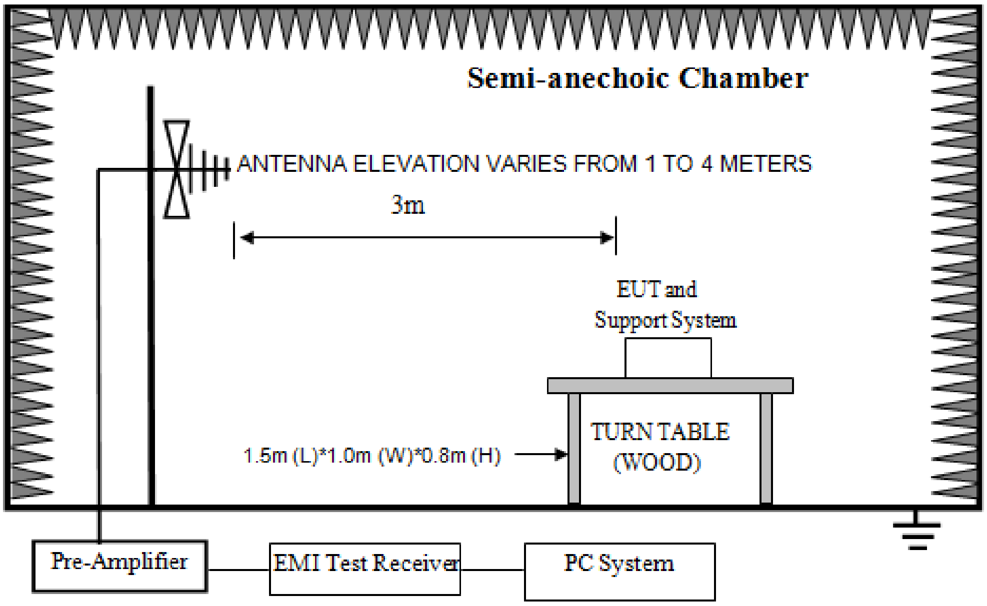
Unwanted emissions for High CH TX mode (25 MHz to 6 GHz)				
Frequency (MHz)	Result (dBm)	Limit (dBm)	Antenna polarization	Conclusion
52.95	-76.97	-54.00	H	PASS
104.17	-73.81	-54.00	H	PASS
204.96	-77.30	-54.00	H	PASS
349.25	-69.54	-36.00	H	PASS
547.10	-67.99	-54.00	H	PASS
704.23	-63.43	-54.00	H	PASS
1735.00	-39.54	-30.00	H	PASS
2610.00	-32.42	-30.00	H	PASS
3475.00	-41.34	-30.00	H	PASS
4340.00	-45.90	-30.00	H	PASS
5210.00	-41.30	-30.00	H	PASS
5750.00	-50.65	-30.00	H	PASS
52.76	-76.60	-54.00	V	PASS
111.35	-73.98	-54.00	V	PASS
147.92	-77.50	-36.00	V	PASS
253.84	-76.05	-36.00	V	PASS
408.95	-70.51	-36.00	V	PASS
699.31	-64.96	-54.00	V	PASS
1735.00	-43.30	-30.00	V	PASS
2610.00	-30.68	-30.00	V	PASS
3475.00	-35.54	-30.00	V	PASS
4340.00	-41.88	-30.00	V	PASS
5210.00	-40.57	-30.00	V	PASS
5835.00	-49.79	-30.00	V	PASS

Unwanted emissions for Low CH RX mode (25 MHz to 6 GHz)				
Frequency (MHz)	Result (dBm)	Limit (dBm)	Antenna polarization	Conclusion
53.69	-77.40	-57.00	H	PASS
92.14	-76.36	-57.00	H	PASS
114.92	-74.76	-57.00	H	PASS
324.46	-71.91	-57.00	H	PASS
595.13	-68.33	-57.00	H	PASS
706.70	-64.78	-57.00	H	PASS
2025.00	-61.51	-47.00	H	PASS
2635.00	-60.10	-47.00	H	PASS
3300.00	-58.29	-47.00	H	PASS
4160.00	-55.81	-47.00	H	PASS
4985.00	-55.70	-47.00	H	PASS
5600.00	-55.79	-47.00	H	PASS
50.41	-76.82	-57.00	V	PASS
92.79	-76.79	-57.00	V	PASS
235.82	-77.44	-57.00	V	PASS
348.03	-70.37	-57.00	V	PASS
618.54	-67.47	-57.00	V	PASS
711.67	-64.37	-57.00	V	PASS
2115.00	-60.40	-47.00	V	PASS
3050.00	-59.71	-47.00	V	PASS
3810.00	-56.77	-47.00	V	PASS
4615.00	-55.53	-47.00	V	PASS
5175.00	-54.61	-47.00	V	PASS
5640.00	-55.89	-47.00	V	PASS

Unwanted emissions for High CH RX mode (25 MHz to 6 GHz)				
Frequency (MHz)	Result (dBm)	Limit (dBm)	Antenna polarization	Conclusion
44.74	-78.34	-57.00	H	PASS
103.08	-73.78	-57.00	H	PASS
244.23	-75.64	-57.00	H	PASS
352.94	-69.87	-57.00	H	PASS
501.18	-68.63	-57.00	H	PASS
900.15	-63.60	-57.00	H	PASS
2000.00	-60.40	-47.00	H	PASS
3060.00	-58.42	-47.00	H	PASS
3410.00	-56.09	-47.00	H	PASS
3960.00	-56.18	-47.00	H	PASS
4360.00	-55.62	-47.00	H	PASS
5060.00	-55.55	-47.00	H	PASS
51.84	-77.45	-57.00	V	PASS
99.88	-74.59	-57.00	V	PASS
147.92	-77.84	-57.00	V	PASS
293.08	-73.50	-57.00	V	PASS
354.18	-70.22	-57.00	V	PASS
620.71	-68.64	-57.00	V	PASS
1935.00	-62.25	-47.00	V	PASS
2565.00	-60.18	-47.00	V	PASS
3325.00	-58.53	-47.00	V	PASS
3935.00	-55.70	-47.00	V	PASS
4785.00	-55.95	-47.00	V	PASS
5115.00	-55.24	-47.00	V	PASS

8. TX effective radiated power

8.1. Block diagram of test setup



8.2. Limits

Frequency Bands	Power limit	Application
868.000MHz to 868.600MHz	25 mW e. r. p	≤1% duty cycle or polite spectrum access, the whole band except for audio & video applications limited to 300 kHz

8.3. Test procedure

Radiated measurement (substitution method)

Refer to ETSI EN 300 220-1 annex C

8.4. Test result

Test Conditions (in Normal & Extreme)		Operating Frequency (MHz)	Maximum effective radiated power		Limit (mW)	Result
Volt.	Temp.		dBm	mW		
Normal Volt.	Normal Temp.	868.1	13.29	21.33	25	PASS
Low Volt.	Low Temp.	868.1	13.28	21.28	25	PASS
Low Volt.	High Temp.	868.1	13.29	21.33	25	PASS
High Volt.	Low Temp.	868.1	13.27	21.23	25	PASS
High Volt.	High Temp.	868.1	13.29	21.33	25	PASS
Normal Volt.	Normal Temp.	868.5	13.24	21.09	25	PASS
Low Volt.	Low Temp.	868.5	13.23	21.04	25	PASS
Low Volt.	High Temp.	868.5	13.25	21.13	25	PASS
High Volt.	Low Temp.	868.5	13.21	20.94	25	PASS
High Volt.	High Temp.	868.5	13.20	20.89	25	PASS

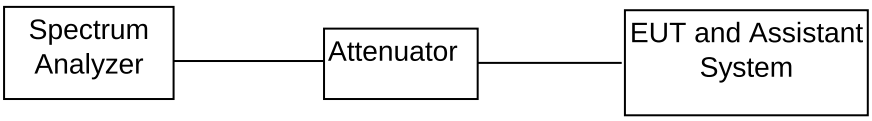
9. TX Transient

9.1. Limits

Transmitter transient power is power falling into frequencies other than the operating channel as a result of the transmitter being switched on and off, the transient power shall not exceed the values given in below table

Absolute offset from Centre Frequency	RBW_{REF}	Peak power limit applicable at measurement points
≤ 400 kHz	1 kHz	0 dBm
> 400 kHz	1 kHz	-27 dBm

9.2. Block diagram of test setup



9.3. Test procedure

Refer to ETSI EN300220-1 Sub-clause 5.10.3. 1. for the test conditions.

Refer to ETSI EN300220-1 Sub-clause 5.10.3. 2. for the test conditions.

RBW for Transient Measurement:

Measurement points: offset from centre frequency	**Analyser RBW**	**RBW_{REF}**
-0,5 x OCW - 3 kHz 0,5 x OCW + 3 kHz Not applicable for OCW < 25 kHz	1 kHz	1kHz
±12,5 kHz or ±OCW whichever is the greater	Max (RBW pattern 1, 3, 10 kHz) ≤ Offset frequency/6 (see note)	1 kHz
-0,5 x OCW - 400 kHz 0,5 x OCW + 400 kHz	100 kHz	1 kHz
-0,5 x OCW -1 200 kHz 0,5 x OCW + 1 200 kHz	300 kHz	1 kHz
NOTE: Max (RBW pattern 1, 3, 10 kHz) means the maximum bandwidth that falls into the commonly implemented 1, 3, 10 kHz RBW filter bandwidth incremental pattern of spectrum analysers. EXAMPLE: If OCW is 25 kHz then the RBW value corresponding to one OCW offset frequency is 3 kHz. The rest of the analyser settings are listed in Table 25, and if OCW is 250 kHz then the RBW value corresponding to one OCW offset frequency is 30 kHz.		

Parameters for Transient Measurement:

Spectrum Analyser Setting	Value	Notes
VBW/RBW	10	At higher RBW values VBW may be clipped to its maximum value
Sweep time	500 ms	
RBW filter	Gaussian	
Trace Detector Function	RMS	
Trace Mode	Max hold	
Sweep points	501	
Measurement mode	Continuous sweep	
NOTE: The ratio between the number of sweep points and the sweep time shall be the same ratio as above if different number of sweep points is used.		

9.4. Test result

Offset from centre frequency	Value (RBW) dBm	Limit dBm	Conclusion
-0.5 * OCW-3kHz	-40.58	0	PASS
0.5 * OCW+3kHz	-38.44	0	PASS
-OCW	-59.85	0	PASS
+OCW	-58.22	0	PASS
-0.5 * OCW-400kHz	-71.76	-27	PASS
0.5 * OCW+400kHz	-71.06	-27	PASS
-0.5 * OCW-1200kHz	-65.75	-27	PASS
0.5 * OCW+1200kHz	-65.78	-27	PASS

10. TX out of band emissions

10.1. Limits

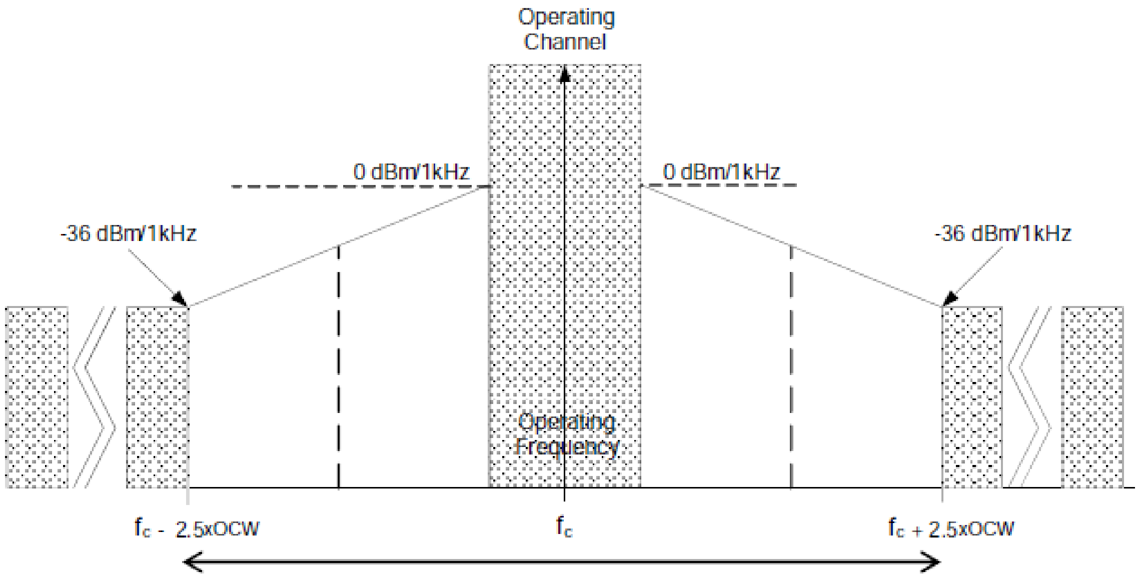


Figure 5: Out Of Band Domain for Operating Channel with reference BW

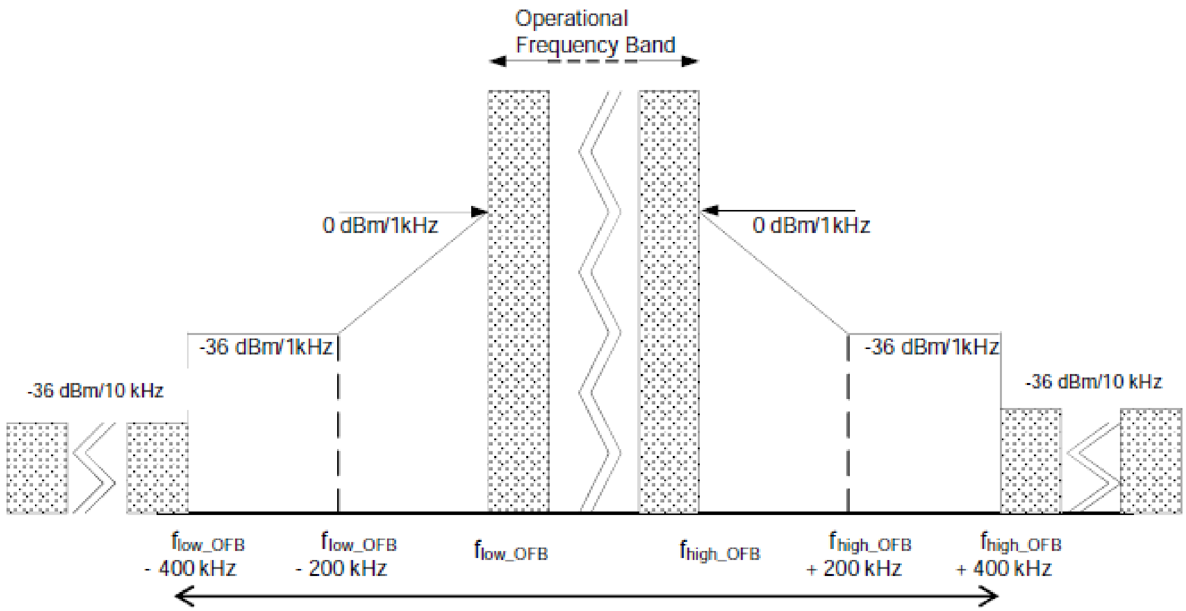
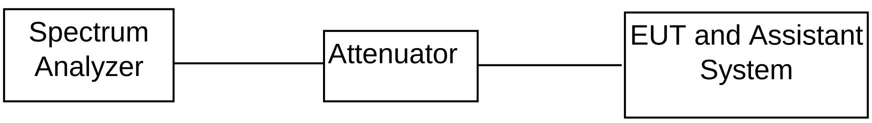


Figure 6: Out Of Band Domain for Operational Frequency Band with reference BW

10.2. Block diagram of test setup



10.3. Test procedure

Refer to ETSI EN300220-1 Sub-clause 5.8.3.2. for the test conditions.

Refer to ETSI EN300220-1 Sub-clause 5.8.3.4. for the test conditions.

RBW for Transient Measurement:

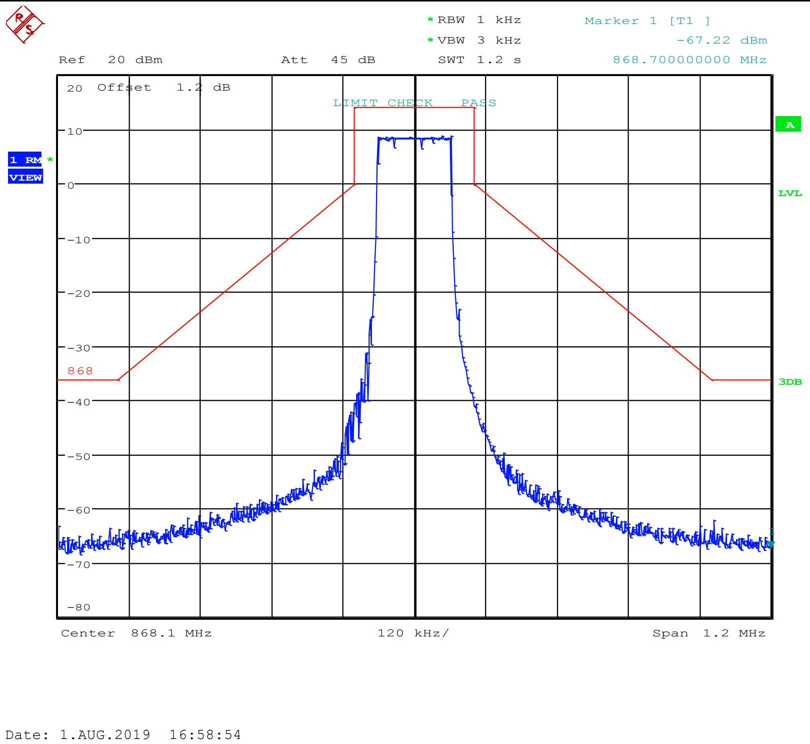
Domain	Frequency Range	RBW_{REF}	Max power limit
OOB limits applicable to Operational Frequency Band (See Figure 6)	$f \le f_{low\_OFB}$ - 400 kHz	10 kHz	-36 dBm
	F_{low_OFB} - 400 kHz $\le f \le f_{low\_OFB}$ - 200 kHz	1 kHz	-36 dBm
	f_{low} - 200 kHz $\le f < f_{low\_OFB}$	1 kHz	See Figure 6
	$f = f_{low\_OFB}$	1 kHz	0 dBm
	$f = f_{high\_OFB}$	1 kHz	0 dBm
	$F_{high\_OFB} < f \le f_{high\_OFB}$ + 200 kHz	1 kHz	See Figure 6
	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.			

10.4. Test result

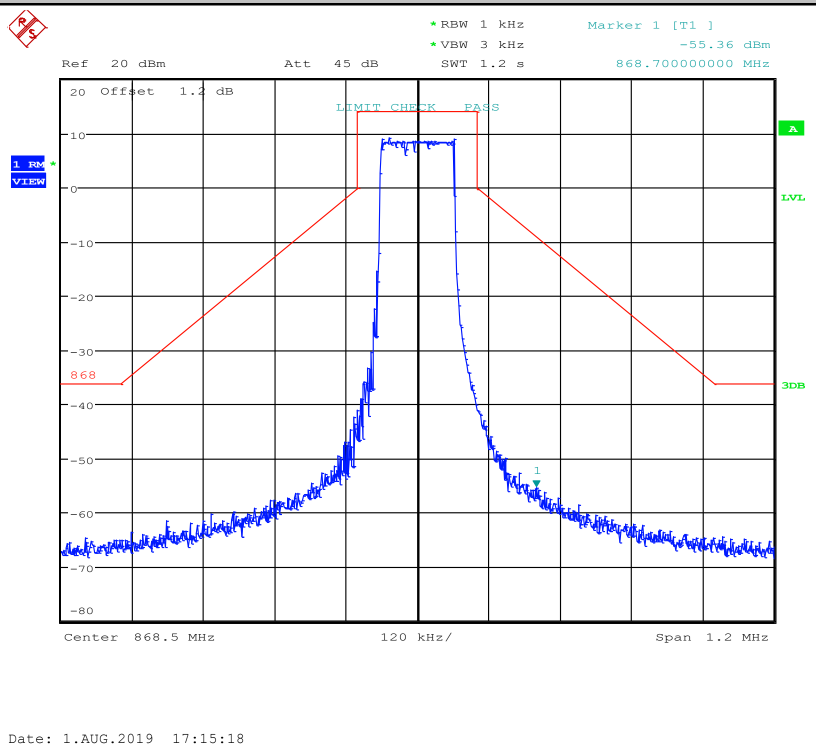
Pass.

10.5. Original test data

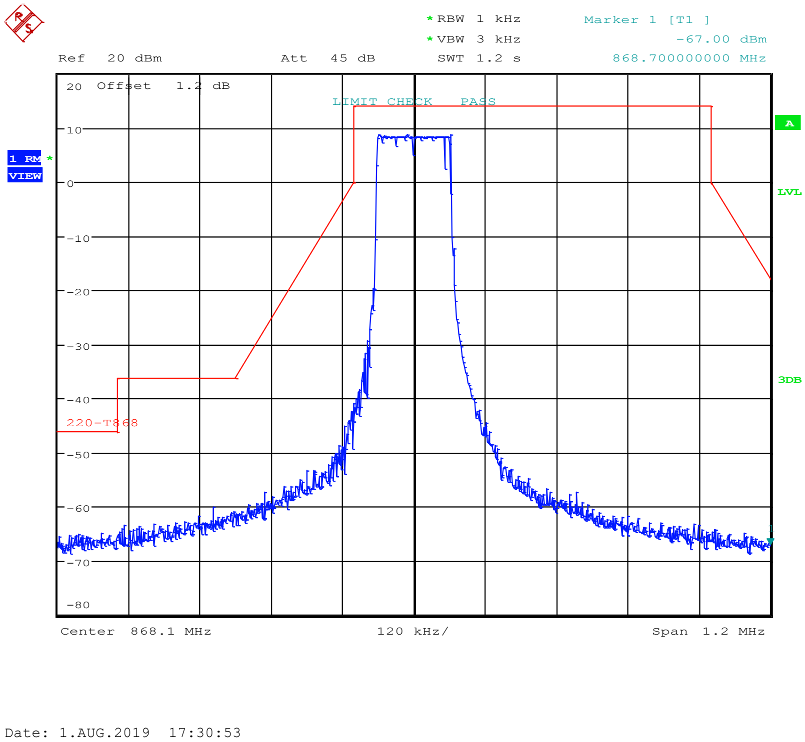
Out of Band Domain for Operating Channel with reference BW_Low CH



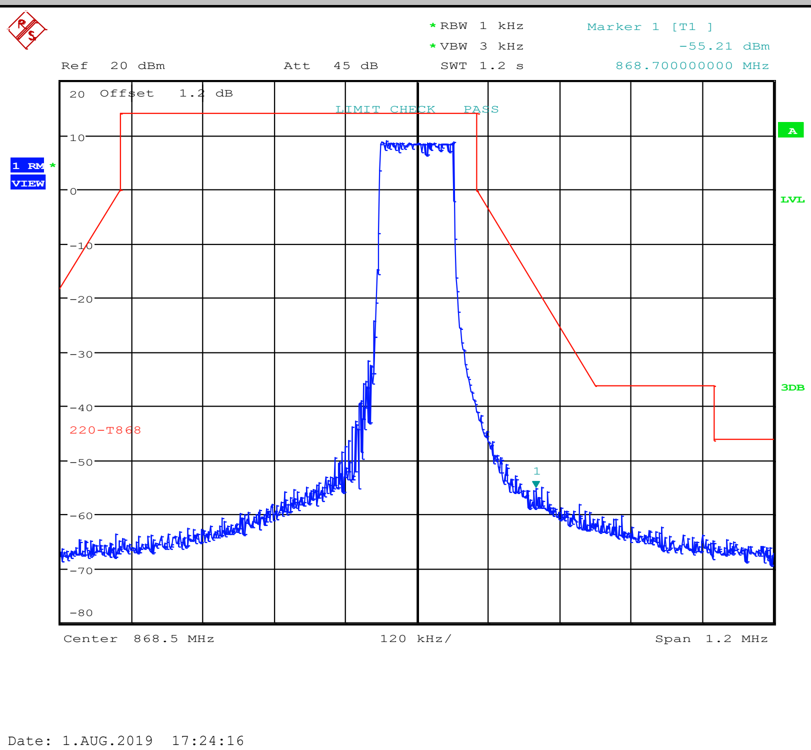
Out of Band Domain for Operating Channel with reference BW _ High CH



Out of Band Domain for Operational Frequency Band with reference BW_Low CH



Out of Band Domain for Operational Frequency Band with reference BW_High CH



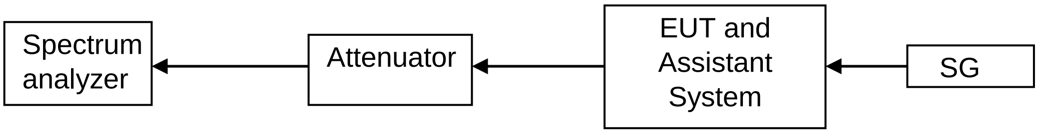
11. TX Adjacent channel power

11.1. Limits

The adjacent channel power shall not exceed the maximum values give below:

/	Test conditions	Adjacent Channel power integrated power 0.7*OCW	Alternate adjacent channel power integrated over 0.7*OCW
OCW<20 kHz	Normal	-20 dBm	-20 dBm
	Extreme	-15 dBm	-20 dBm
OCW≥20 kHz	Normal	-37 dBm	-40 dBm
	Extreme	-32 dBm	-37 dBm

11.2. Block diagram of test setup



11.3. Test procedure

Pls. refer to ETSI EN300220-1 Sub-clause 5.11.3. 1. for the test conditions.
Pls. refer to ETSI EN300220-1 Sub-clause 5.11.3. 3/ 5.11.3.4for the test conditions

11.4. Test result

Not Applicable. Only applies to EUT with OCW ≤ 25 kHz.

12. TX behaviour under low voltage conditions

12.1. Limits

The equipment shall either:

(1) Remain in the Operating Channel without exceeding any applicable(e.g. duty cycle);or

(2) Reduce its effective radiated power below the spurious emission limits without exceeding any applicable limits(e.g. Duty Cycle) or

(3) Shut down, (e.g. no emission above EMC levels) as the voltage falls

(4) below the providers declared operating voltage

12.2. Test procedure

Refer to ETSI EN300220-1 Sub-clause 5.12.3. 1. for the test conditions.

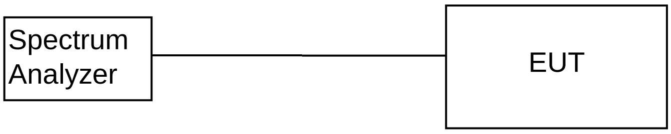
Refer to ETSI EN300220-1 Sub-clause 5.12.3. 2. for the test conditions.

12.3. Test result

Not Applicable, since the EUT is not a battery-operated device.

13. Duty cycle

13.1. Block diagram of test setup



13.2. Limit

An assessment of the overall Duty Cycle shall be made for a representative period of Tobs over the observation bandwidth Fobs. Unless otherwise specified, Tobs is 1 hour and the observation bandwidth Fobs is the operational frequency band

The representative period shall be most active one in normal use of device, as a guide “Normal use” is considered as representing the behavior of the device during transmission of 99% of traffic generated during its operational lifetime

Procedures such as test and development of equipment and setup and configuration during Installation and maintenance are not considered part of normal operation. Where an acknowledgement is used, the additional transmitter on-time from a message responder shall be declared only once whether included in message initiator Duty Cycle or in the message responder Duty Cycle.

13.3. Test Procedure

(1) Connect EUT’s antenna output to spectrum analyzer though sutiable attenuator.
(2) Configure EUT work in normal trasmit mode.
(3) Measure the total transmit ON time of each transmit once triggered with spectrum analyzer set as below:
RBW= 1MHz; VBW=3MHz; Span: 0MHz; Detector: PK; Center frequency: transmit frequency.
(4) Duty cycle =Ton/Ton+Toff

13.4. Test Result

The EUT was defined as manually operated without software controlled functions and the Duty Cycle was random. The manufacture declared duty cycle less than 1%.

14. Blocking

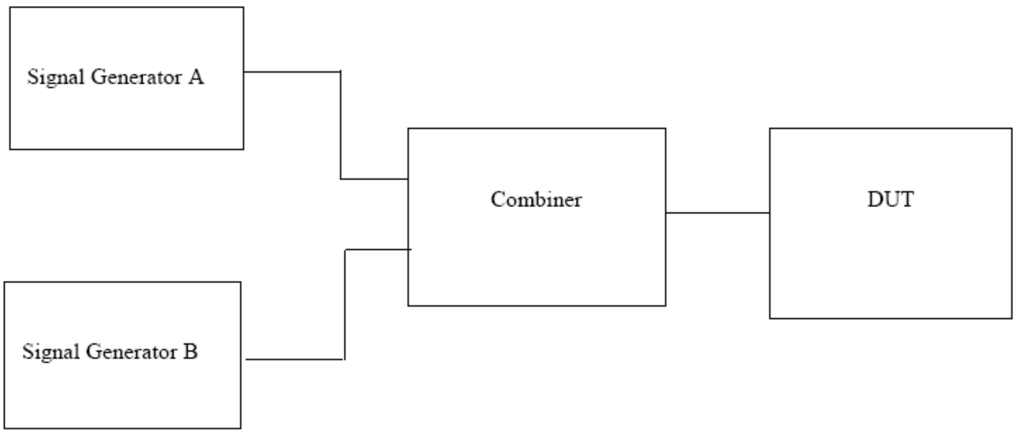
14.1. Limits

Blocking is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted input signal at any frequencies other than those of the spurious responses or the adjacent channels or bands.

The blocking level shall not be less than the values given in below table, except at frequencies on which spurious responses are found:

Requirement	Limits
	Receiver category 2
Blocking at ±2 MHz from OC edge f_{high} and f_{low}	≥ -69 dBm
Blocking at ±10 MHz from OC edge f_{high} and f_{low}	≥ -44 dBm
Blocking at ±5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -44 dBm

14.2. Block diagram of test setup



14.3. Test procedure

(1) Configure EUT and test equipment as clause 13.2, EUT's antenna output was connected to spectrum analyzer by RF cable. The RF cable's loss was input to spectrum analyzer as amplitude offset.

(2) Follow the test method described in clause 5.18.6.3 of EN300 220-1 to measure out the blocking level of transmitter.

14.4. Test result

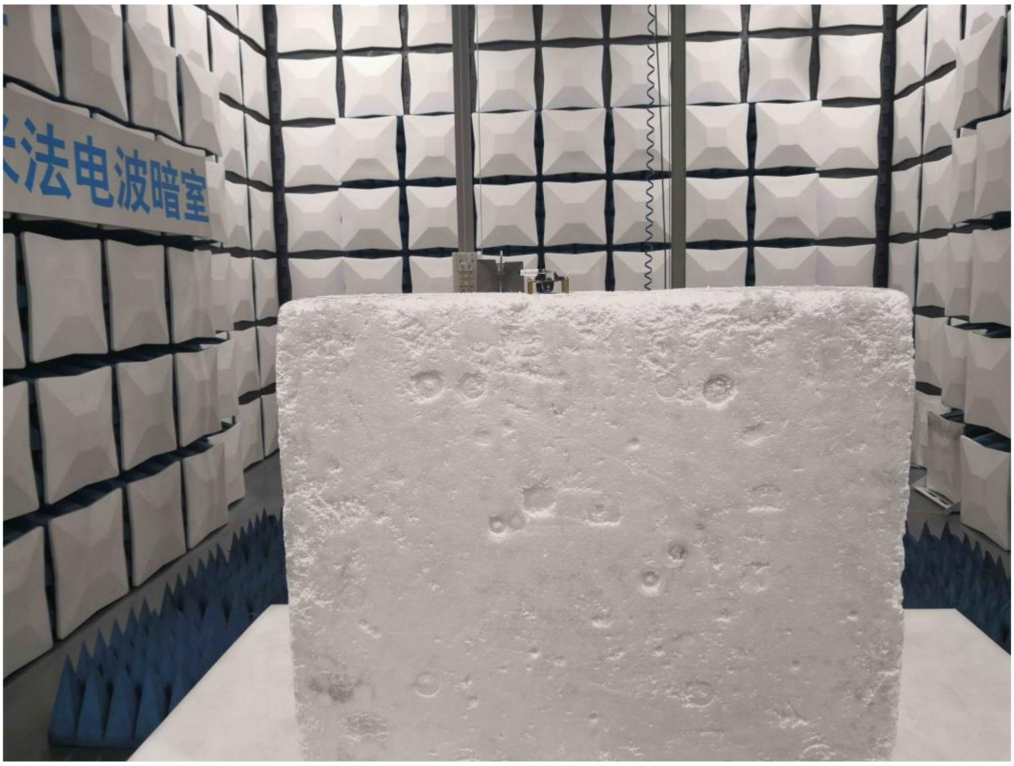
Not Applicable, since Blocking applies to all receivers.

Signal A		Signal B	Blocking level (dBm)	Limit(dBm)	Result
Operation Frequency	Test level dB	Blocking Frequency			
868.1 MHz	-90	+2MHz	-29	≥-69 dBm	Pass
		-2MHz	-28	≥-69 dBm	Pass
		+10MHz	-19	≥-44 dBm	Pass
		-10MHz	-20	≥-44 dBm	Pass
		+5%	-18	≥-44 dBm	Pass
		-5%	-18	≥-44 dBm	Pass

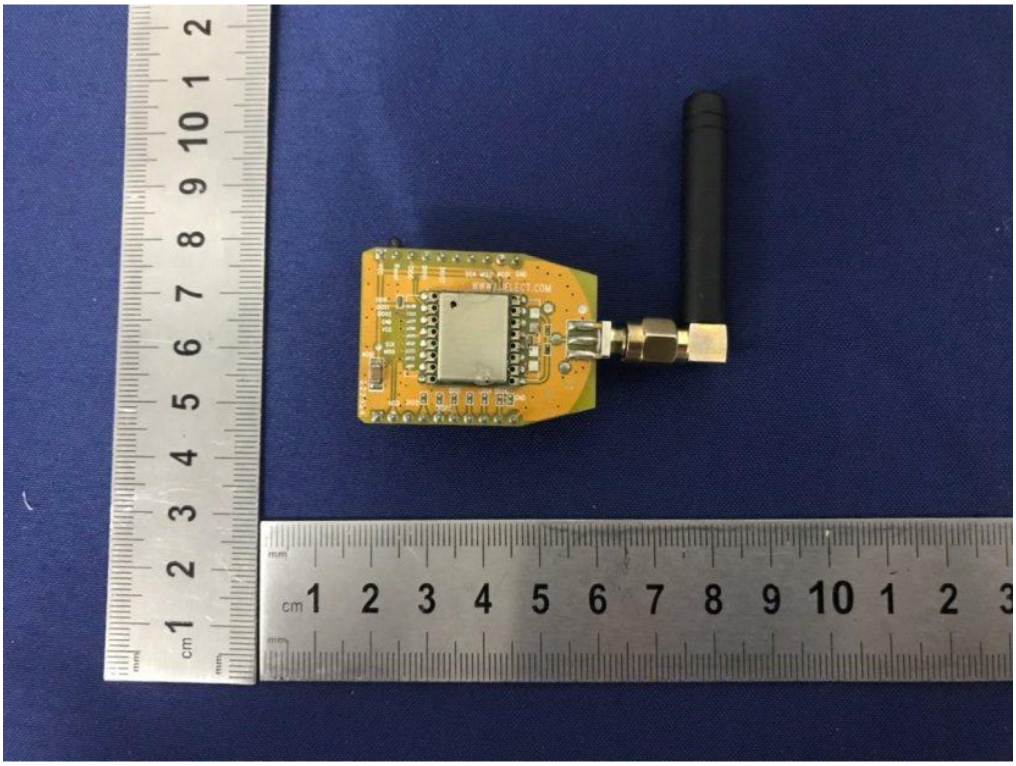
Signal A		Signal B	Blocking level (dBm)	Limit(dBm)	Result
Operation Frequency	Test level dB	Blocking Frequency			
868.3 MHz	-90	+2MHz	-26	≥-69 dBm	Pass
		-2MHz	-27	≥-69 dBm	Pass
		+10MHz	-18	≥-44 dBm	Pass
		-10MHz	-21	≥-44 dBm	Pass
		+5%	-16	≥-44 dBm	Pass
		-5%	-17	≥-44 dBm	Pass

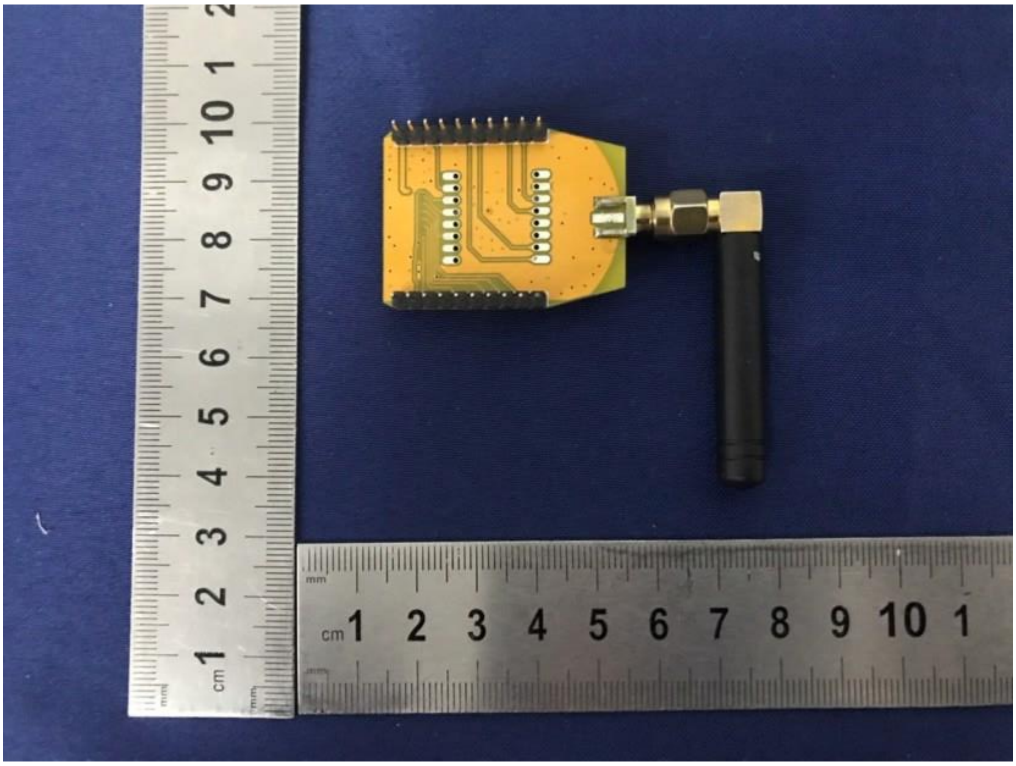
Signal A		Signal B	Blocking level (dBm)	Limit(dBm)	Result
Operation Frequency	Test level dB	Blocking Frequency			
868.5 MHz	-90	+2MHz	-29	≥-69 dBm	Pass
		-2MHz	-27	≥-69 dBm	Pass
		+10MHz	-18	≥-44 dBm	Pass
		-10MHz	-21	≥-44 dBm	Pass
		+5%	-18	≥-44 dBm	Pass
		-5%	-18	≥-44 dBm	Pass

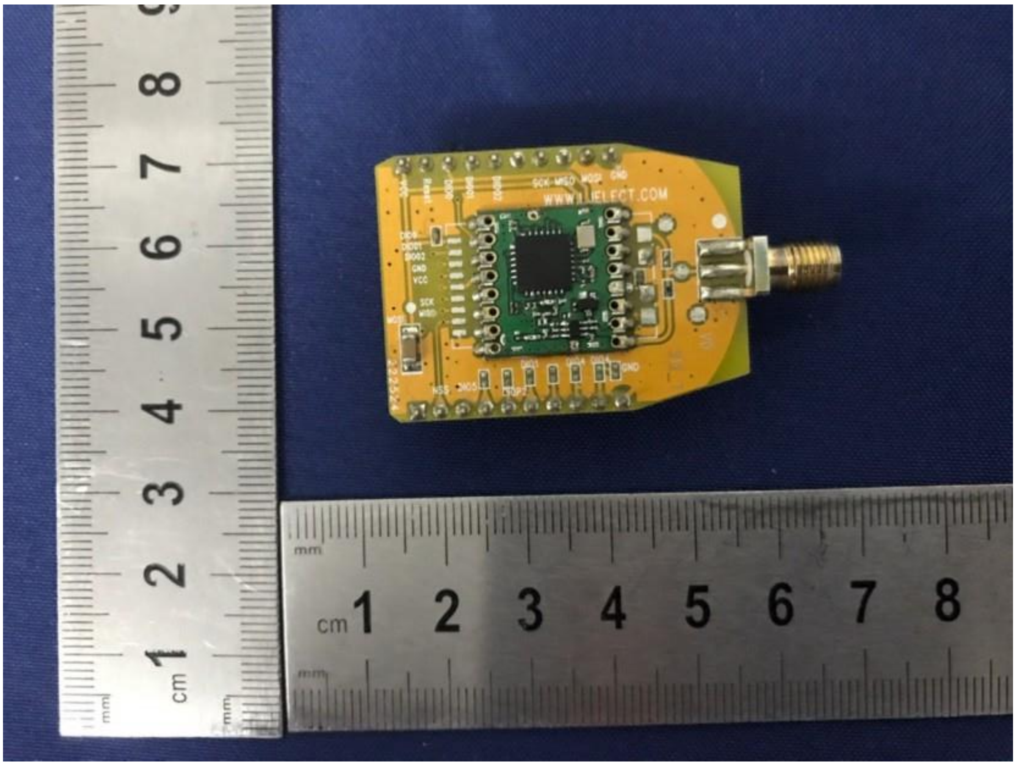
15. Test setup photograph



16. Photos of the EUT







END OF REPORT