RADIO TEST REPORT
ETSI EN 300 220-1 V3.1.1 (2017-02)
ETSI EN 300 220-2 V3.2.1 (2018-06)

Product：	LoRa Wireless Module
Trade Mark：	G-NICERF
Model Name：	LoRa-CC68-868
Family Model：	N/A
Report No.：	S21071400401002

Prepared for

NiceRF Wireless Technology Co., Ltd.

309-314, 3/F, Bldg A, Hongdu business building, Zone 43, Baoan Dist, Shenzhen, China

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name	:	NiceRF Wireless Technology Co., Ltd.
Address	:	309-314, 3/F, Bldg A, Hongdu business building, Zone 43, Baoan Dist, Shenzhen, China
Manufacturer's Name	:	NiceRF Wireless Technology Co., Ltd.
Address	:	309-314, 3/F, Bldg A, Hongdu business building, Zone 43, Baoan Dist, Shenzhen, China

Product description

Product name	:	LoRa Wireless Module
Trademark	:	G-NICERF
Model and/or type reference	:	LoRa-CC68-868
Family Model	:	N/A
Rating(s)	:	DC 3.3V
Standards	:	ETSI EN 300 220-1 V3.1.1 (2017-02) ETSI EN 300 220-2 V3.2.1 (2018-06)

This device described above has been tested by Shenzhen NTEK, and the test results show that the equipment under test (EUT) is in compliance with the article 3.2 of Directive 2014/53/EU requirements.And it is applicable only to the tested sample identified in the report.

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Date of Test	:	
Date (s) of performance of tests	:	14 Jul. 2021 ~02 Aug. 2021
Date of Issue	:	03 Aug. 2021
Test Result	:	**Pass**

Testing Engineer : (Allen Liu)

Authorized Signatory : (Alex Li)

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1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:
ETSI EN 300 220-1 V3.1.1 (2017-02)
ETSI EN 300 220-2 V3.2.1 (2018-06)

Clause	Description of Test Item	Results(Pass/Fail)	N.T(Not Test)
Transmitter Parameters			
4.2.1	Operating frequency	Pass	
4.3.1	Effective Radiated Power	Pass	
4.3.2	Maximum Effective Radiated Power spectral density	Pass	
4.3.3	Duty Cycle	Pass	
4.3.4	Occupied Bandwidth	Pass	
4.3.5	Tx Out Of Band Emissions	Pass	
4.2.2	Unwanted emissions in the spurious domain	Pass	
4.3.6	Transient power	Pass	
4.3.7	Adjacent Channel Power		N.T
4.3.8	TX behaviour under Low Voltage Conditions	Pass	
4.3.9	Adaptive Power Control		N.T
4.4.1	RX sensitivity level	Pass	
4.4.2	Blocking	Pass	

1.1 TEST FACILITY

Shenzhen NTEK Testing Technology Co., Ltd.
Add. : 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street, Bao'an District, Shenzhen 518126 P.R. China
FCC Registered No.: 463705 IC Registered No.:9270A-1
CNAS Registration No.:L5516

1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement **y** ± **U**, where expended uncertainty **U** is based on a standard uncertainty multiplied by a coverage factor of **k=2**, providing a level of confidence of approximately **95** %.

No.	Item	Uncertainty
1	Conducted Emission Test	±1.38dB
2	RF power,conducted	±0.16dB
3	Spurious emissions,conducted	±0.21dB
4	All emissions,radiated(<1G)	±4.68dB
5	All emissions,radiated(>1G)	±4.89dB
6	Temperature	±0.5°C
7	Humidity	±2%

Revision History

Report No.	Version	Description	Issued Date
S21071400401002	Rev.01	Initial issue of report	23 Jun. 2021

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>Equipment</td><td>LoRa Wireless Module</td></tr>
<tr><td>Brand Name</td><td>G-NICERF</td></tr>
<tr><td>Model Name.</td><td>LoRa-CC68-868</td></tr>
<tr><td>Family Model</td><td>N/A</td></tr>
<tr><td>Model Difference</td><td>N/A</td></tr>
<tr><td>Product Description</td><td>The EUT is LoRa Wireless Module
<table>
<tr><td>Operation Frequency Band:</td><td>Band AC: 870MHz to 875.8MHz
Band AA: 863MHz to 870MHz</td></tr>
<tr><td>Modulation Type:</td><td>GFSK</td></tr>
<tr><td>Antenna Gain(Peak)</td><td>2dBi</td></tr>
<tr><td>Antenna Designation:</td><td>ANT 1: Wire Antenna
ANT 2: Spring antenna</td></tr>
<tr><td>Receiver Category</td><td>2</td></tr>
</table>
Based on the application, features, or specification exhibited in User's Manual, the EUT is considered as an ITE/Computing Device. More details of EUT technical specification, please refer to the User's Manual.</td></tr>
<tr><td>Channel List</td><td>Refer to below(Note 2)</td></tr>
<tr><td>Power Rating</td><td>DC 3.3V</td></tr>
<tr><td>Power Level Setting</td><td>5</td></tr>
<tr><td>Adapter</td><td>N/A</td></tr>
<tr><td>Battery</td><td>N/A</td></tr>
<tr><td>Hardware Version</td><td>V2.0</td></tr>
<tr><td>Software Version</td><td>V1.0</td></tr>
</table>

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2. Test Channel:

Band AC:

TX

Channel	Frequency (MHz)
01	870.5
02	871.5
03	872.5
04	873.5
05	874.5
06	875.5

RX

Channel	Frequency (MHz)
01	870.5
02	871.5
03	872.5
04	873.5
05	874.5
06	875.5

Band AA:

TX

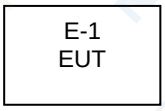
Channel	Frequency (MHz)
01	863.5
02	864.5
03	865.5
04	866.5
05	867.5
06	868.5
07	869.5

RX

Channel	Frequency (MHz)
01	863.5
02	864.5
03	865.5
04	866.5
05	867.5
06	868.5
07	869.5

2.2 DESCRIPTION OF TEST CONDITIONS

1. Test setup



2.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
E-1	LoRa Wireless Module	G-NICERF	LoRa-CC68-868	N/A	EUT

Item	Type	Shielded Type	Ferrite Core	Length	Note

Note:

(1) The support equipment was authorized by Declaration of Confirmation.
(2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

2.4 TEST CONDITIONS

	Normal Test Conditions	Extreme Test Conditions
Temperature	15°C - 35°C	-40°C ~ 85°C Note: (1)
Relative Humidity	20% - 75%	N/A
Supply Voltage	DC 3.3V	DC 1.8-3.7V

Note:

(1) Tests at extreme temperatures shall be made in accordance with the procedures specified in EN 300220-1 V3.1.1 clause 4.3.4.1.1 at the upper and lower temperatures of the operational profile declared by the manufacturer;

(2) The extreme test voltages for equipment to be connected to an DC mains source shall be the nominal mains voltage ±10 %.

2.5 EQUIPMENTS LIST FOR ALL TEST ITEMS

Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until	Calibration period
1	Spectrum Analyzer	Agilent	E4407B	MY45108040	2021.04.27	2022.04.26	1 year
2	Test Receiver	R&S	ESPI7	101318	2021.04.27	2022.04.26	1 year
3	Bilog Antenna	TESEQ	CBL6111D	31216	2021.03.29	2022.03.28	1 year
4	50Ω Coaxial Switch	Anritsu	MP59B	6200983705	2020.05.11	2023.05.10	3 year
5	Spectrum Analyzer	Agilent	N9020A	MY49100060	2021.07.01	2022.06.30	1 year
6	Horn Antenna	EM	EM-AH-10180	2011071402	2021.03.29	2022.03.28	1 year
7	Horn Ant	Schwarzbeck	BBHA 9170	9170-181	2021.04.27	2022.04.26	1 year
8	Amplifier	EMC	EMC051835SE	980246	2021.07.01	2022.06.30	1 year
9	Loop Antenna	ARA	PLA-2030/B	1029	2021.04.27	2022.04.26	1 year
10	Power Meter	Agilent	E4419B	MY45102538	2021.07.01	2022.06.30	1 year
11	ESG VETCTOR SIGNAL GENERARAOR	Agilent	E4438C	MY45093347	2021.07.01	2022.06.30	1 year
12	Temperature & Humitidy Chamber	GIANT FORCE	GTH-056P	GF-94454-1	2021.04.27	2022.04.26	1 year
13	Power Sensor	Agilent	E9301A.	MY41495644	2021.04.27	2022.04.26	1 year

3. OPERATING FREQUENCY

3.1 LIMITS OF OPERATING FREQUENCY

Refer to chapter 4.2.1.2 of ETSI EN 300 220-2 V3.2.1 (2018-06)

The manufacturer may declare either one or more operating frequencies and operating channels. Operating channel(s) shall be entirely within operational frequency bands allowed by annex B or any NRI.

3.2 TEST PROCEDURE

Refer to chapter 5.1.1 of ETSI EN 300 220-1 V3.1.1 (2017-02)

Measurement	
☒Conducted measurement	☐Radiated measurement

3.3 CONFORMANCE

The information shown in Table 6 shall be recorded in the test report.

Table 6: Information Recorded in the Test Report for Operating Frequency test

Value	Notes
Operational Frequency band or bands	Band AC: 870MHz to 875.8MHz Band AA: 863MHz to 870MHz
Nominal Operating Frequency or Frequencies	Refer to Channel list
Operating Channel width(s) - OCW	$130KHz_{Note}$

Note: The manufacturer declared the OCW=130kHz.

4. EFFECTIVE RADIATED POWER

4.1LIMITS OF EFFECTIVE RADIATED POWER

Refer to chapter 4.3.1.2 of ETSI EN 300 220-2 V3.2.1 (2018-06)

The effective radiated power shall not be greater than the value allowed in annex B or in any NRI for the chosen operational frequency band(s).

The limits please refer to ETSI EN 300 220-2 V3.2.1 Annex B:

Operational Frequency Band		Maximum Effective Radiated Power	Channel access and occupation rules	Additional spectrum access parameters	Maximum occupied bandwidth	Other usage restriction	Band number in CEPT/ERC/REC 70-03 [i.1]
AA	863 MHz to 870 MHz	25 mW e.r.p.	≤ 0,1 % duty cycle or polite spectrum access		300 kHz except for voice limited to 25 kHz	Sub-bands [868,6 MHz to 868,7 MHz], [869,250 MHz to 869,4 MHz], [869,650 MHz to 869,700 MHz] for alarms are excluded	Annex 1; h1.3 (Notes 1, 3, 4)
AC	870,000 MHz to 875,800 MHz	25 mW e.r.p.	≤ 1 % duty cycle For ER-GSM protection (873 MHz to 875,8 MHz, where applicable), the duty cycle is limited to ≤ 0,01 % and T_{on}_max is limited to 5 ms/1 s		600 kHz	See note	Annex 1; h2.1

4.2 TEST PROCEDURE

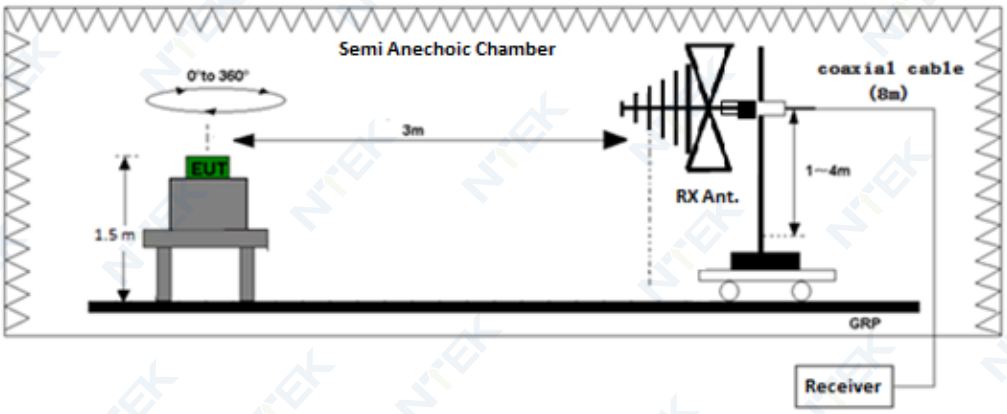
Refer to chapter 5.2.2.2 of ETSI EN 300 220-1 V3.1.1 (2017-02)

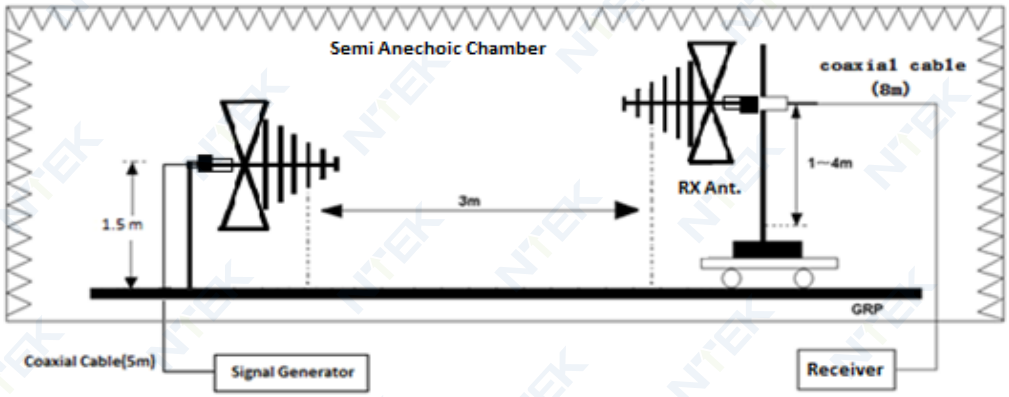
Measurement	
☐Conducted measurement	☒Radiated measurement

4.3 DEVIATION FROM TEST STANDARD

No deviation

4.4 TEST SETUP




Semi Anechoic Chamber
coaxial cable
(8m)
1~4m
RX Ant.
3m
1.5 m
GRP
Coaxial Cable(5m)
Signal Generator
Receiver

4.5 TEST RESULTS

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX Mode		

Band AC (870.5M):

Frequency	Ant	SG Level	Pcl	Ga	Correction	(ERP)	ERP	Limits	RESULT
(MHz)	H / V	(dBm)	(dB)	(dB)	(dBi)	(dBm)	(mW)	(mW)	
870.5	H	1.71	2.38	12.34	2.15	9.52	8.954	25	PASS
	V	1.75	2.38	12.34	2.15	9.56	9.036	25	PASS

Band AC (875.5M):

Frequency	Ant	SG Level	Pcl	Ga	Correction	(ERP)	ERP	Limits	RESULT
(MHz)	H / V	(dBm)	(dB)	(dB)	(dBi)	(dBm)	(mW)	(mW)	
875.5	H	1.82	2.38	12.34	2.15	9.63	9.183	25	PASS
	V	1.84	2.38	12.34	2.15	9.65	9.226	25	PASS

Note: Pcl= cable loss
Ga= Antenna Gain
Peak EIRP(dBm)= SGLevel -Pcl +Ga
ERP(dBm)=EIRP-2.15

Band AA (863.5M):

Frequency	Ant	SG Level	Pcl	Ga	Correction	(ERP)	ERP	Limits	
(MHz)	H / V	(dBm)	(dB)	(dB)	(dBi)	(dBm)	(mW)	(mW)	RESULT
863.5	H	1.77	2.38	12.34	2.15	9.58	9.078	25	PASS
	V	1.8	2.38	12.34	2.15	9.61	9.141	25	PASS

Band AA (869.5M):

Frequency	Ant	SG Level	Pcl	Ga	Correction	(ERP)	ERP	Limits	
(MHz)	H / V	(dBm)	(dB)	(dB)	(dBi)	(dBm)	(mW)	(mW)	RESULT
869.5	H	1.73	2.38	12.34	2.15	9.54	8.995	25	PASS
	V	1.82	2.38	12.34	2.15	9.63	9.183	25	PASS

Note: Pcl= cable loss
Ga= Antenna Gain
Peak EIRP(dBm)= SGLevel -Pcl +Ga
ERP(dBm)=EIRP-2.15

5. MAXIMUM EFFECTIVE RADIATED POWER SPECTRAL DENSITY

5.1 APPLICABILITY

Maximum e.r.p. power spectral density applies to transmitters using annex B bands I.
Maximum e.r.p. power spectral density applies to transmitters using DSSS or wideband techniques other than FHSS modulation, in annex C band W, AA or AC.

5.2 LIMITS OF MAXIMUM EFFECTIVE RADIATED POWER SPECTRAL DENSITY

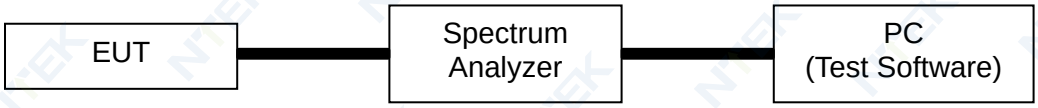
The Maximum e.r.p. power spectral density shall not be greater than the value allowed in annex B or any NRI for the chosen operational frequency band(s).

5.3 TEST PROCEDURES

Refer to chapter 5.3.4 of ETSI EN 300 220-1 V3.1.1 (2017-02)

Measurement	
☒Conducted measurement	☐Radiated measurement

5.4 TEST SETUP



5.5 TEST RESULTS

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	60 %
Pressure:	1012 hPa	Test Voltage:	N/A
Test Mode:	N/A		

The Maximum e.r.p. spectral density shall not be required for EUT operating.

6. DUTY CYCLE

6.1 APPLICABILITY

Duty cycle applies to all transmitters except EUT with polite spectrum access (described in EN 300220-2 V3.2.1 clause 4.5) where permitted in annex B, table B.1 or annex C, table C.1 or any NRI

6.2 LIMITS OF DUTY CYCLE

The limits please refer to ETSI EN 300 220-2 V3.2.1 Annex B:

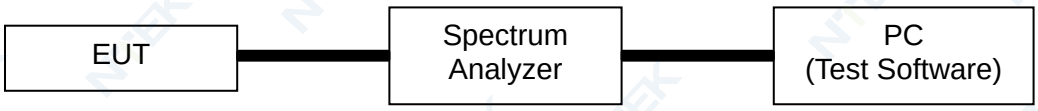
Operational Frequency Band		Maximum Effective Radiated Power	Channel access and occupation rules	Additional spectrum access parameters	Maximum occupied bandwidth	Other usage restriction	Band number in CEPT/ERC/REC 70-03 [i.1]
AA	863 MHz to 870 MHz	25 mW e.r.p.	≤ 0,1 % duty cycle or polite spectrum access		300 kHz except for voice limited to 25 kHz	Sub-bands [868,6 MHz to 868,7 MHz], [869,250 MHz to 869,4 MHz], [869,650 MHz to 869,700 MHz] for alarms are excluded	Annex 1; h1.3 (Notes 1, 3, 4)
AC	870,000 MHz to 875,800 MHz	25 mW e.r.p.	≤ 1 % duty cycle For ER-GSM protection (873 MHz to 875,8 MHz, where applicable), the duty cycle is limited to ≤ 0,01 % and T_{on}_max is limited to 5 ms/1 s		600 kHz	See note	Annex 1; h2.1

6.3 TEST PROCEDURE

Refer to chapter 5.4 of ETSI EN 300 220-1 V3.1.1 (2017-02)

Measurement	
☒Conducted measurement	☐Radiated measurement

6.4 TEST SETUP



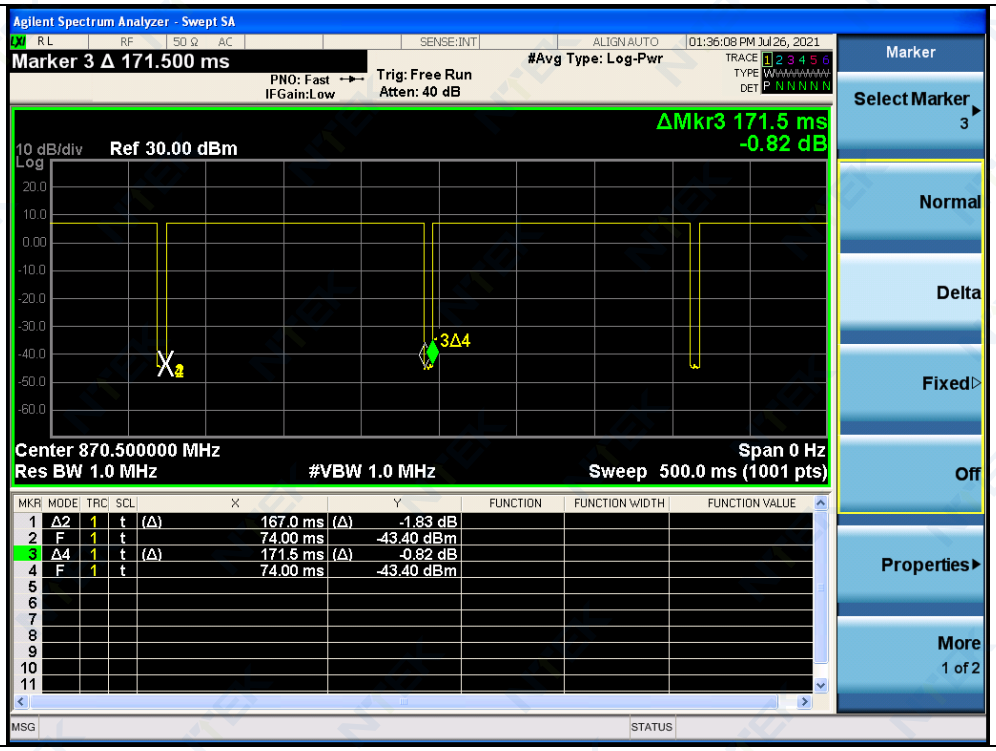
6.5 TEST RESULTS

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX-Band AC (870.5)		

Duty Cycle	Limit	Result
0.46%	1%	Complies

T_{on}=167ms
DC=(T on×N)/1hour
DC=（167*100）/3600000=0.0046=0.46%
Note: N represents the number of times the EUT is transmitter within 1 hour,
The customer claims that the maximum number of launches in the 1 hour is 100.

Test Plot

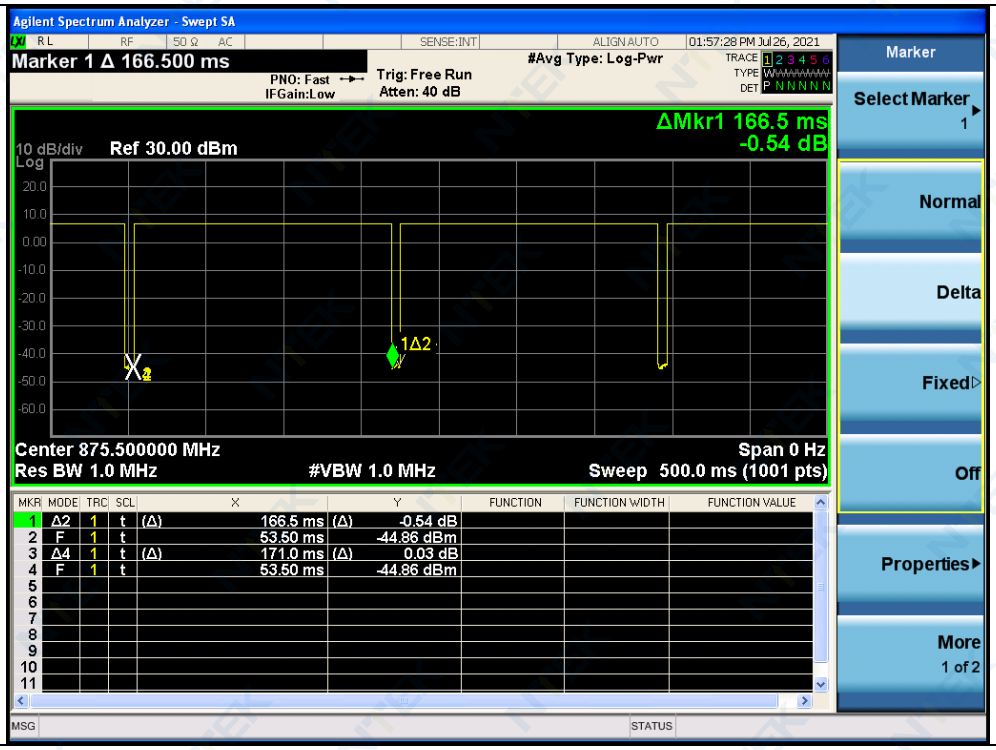


EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX-Band AC (875.5)		

Duty Cycle	Limit	Result
0.46%	1%	Complies

T_{on}=166.5ms
DC=(T on×N)/1hour
DC=（166.5*100）/3600000=0.0046=0.46%
Note: N represents the number of times the EUT is transmitter within 1 hour,
The customer claims that the maximum number of launches in the 1 hour is 100.

Test Plot

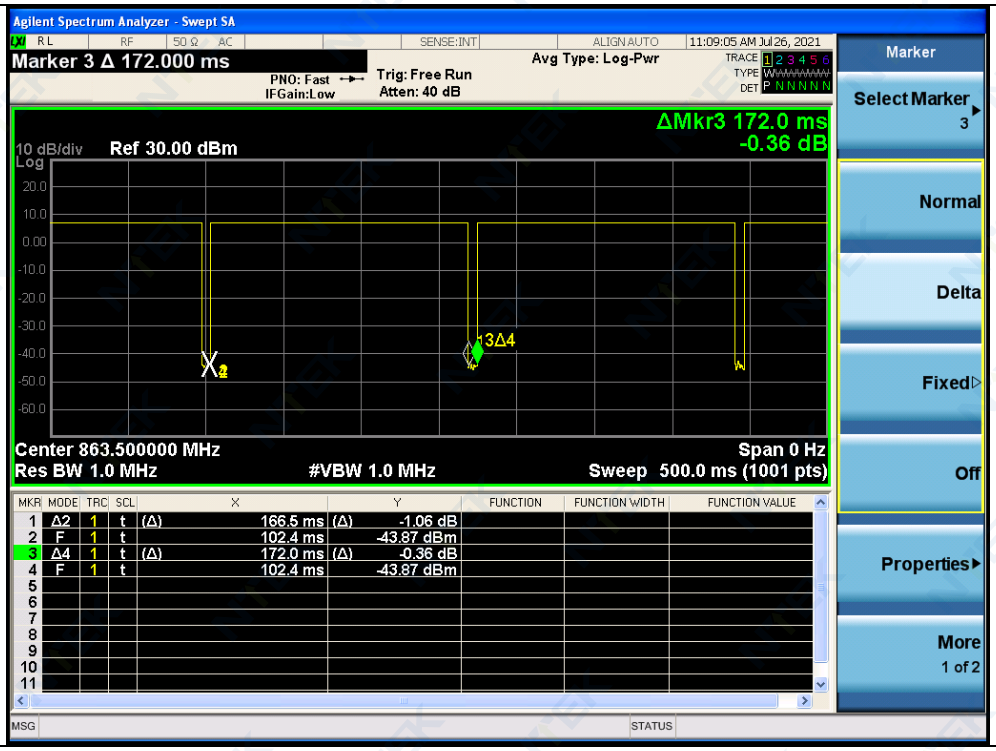


EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX-Band AA (863.5)		

Duty Cycle	Limit	Result
0.0925%	0.1%	Complies

T_{on}=166.5ms
DC=(T on×N)/1hour
DC=（166.5*20）/3600000=0.000925=0.0925%
Note: N represents the number of times the EUT is transmitter within 1 hour,
The customer claims that the maximum number of launches in the 1 hour is 20.

Test Plot

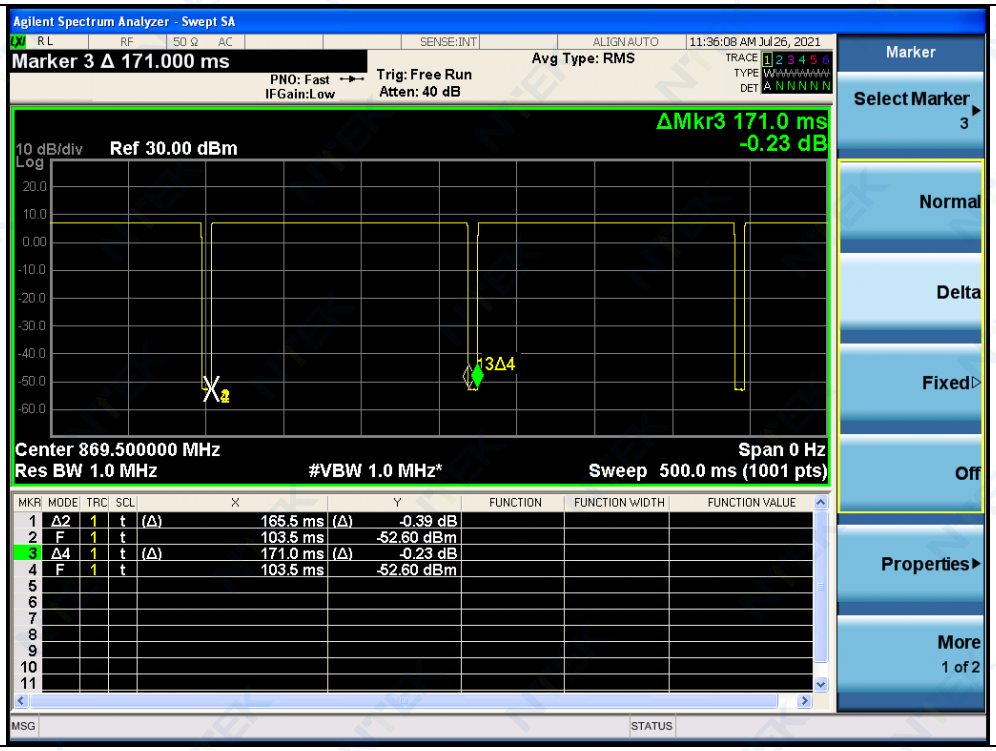


EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX-Band AA (869.5)		

Duty Cycle	Limit	Result
0.0919%	0.1%	Complies

T_{on}=165.5ms
DC=(T on×N)/1hour
DC=（165.5*20）/3600000=0.000919=0.0919%
Note: N represents the number of times the EUT is transmitter within 1 hour,
The customer claims that the maximum number of launches in the 1 hour is 20.

Test Plot



7. OCCUPIED BANDWIDTH

7.1 APPLICABILITY

Maximum occupied bandwidth applies to all transmitters.

7.2 LIMITS OF OCCUPIED BANDWIDTH

The occupied bandwidth of the EUT according to ETSI EN 300 220-1 [1], clause 5.6.2 shall comply with the limits in annex B or any NRI for the chosen operational frequency band(s).

The limits please refer to ETSI EN 300 220-2 V3.2.1 Annex B:

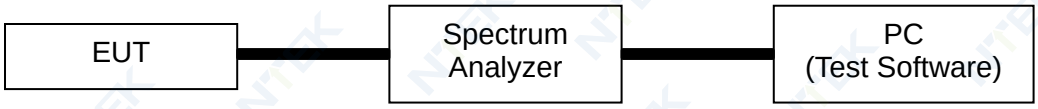
Operational Frequency Band		Maximum Effective Radiated Power	Channel access and occupation rules	Additional spectrum access parameters	Maximum occupied bandwidth	Other usage restriction	Band number in CEPT/ERC/REC 70-03 [i.1]
AA	863 MHz to 870 MHz	25 mW e.r.p.	≤ 0,1 % duty cycle or polite spectrum access		300 kHz except for voice limited to 25 kHz	Sub-bands [868,6 MHz to 868,7 MHz], [869,250 MHz to 869,4 MHz], [869,650 MHz to 869,700 MHz] for alarms are excluded	Annex 1; h1.3 (Notes 1, 3, 4)
AC	870,000 MHz to 875,800 MHz	25 mW e.r.p.	≤ 1 % duty cycle For ER-GSM protection (873 MHz to 875,8 MHz, where applicable), the duty cycle is limited to ≤ 0,01 % and T_{on}_max is limited to 5 ms/1 s		600 kHz	See note	Annex 1; h2.1

7.3 TEST PROCEDURE

Refer to chapter 5.3.5 of ETSI EN 300 220 V3.1.1 (2017-02)

Measurement	
☒Conducted measurement	☐Radiated measurement

7.4 TEST SETUP



7.5 TEST RESULTS

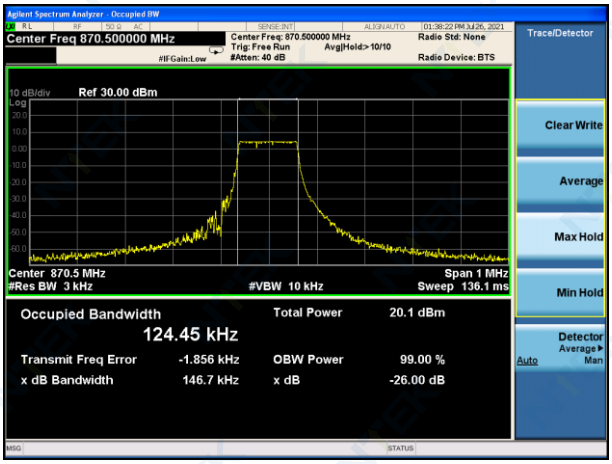
EUT：	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature：	26°C	Relative Humidity：	60 %
Pressure：	1012 hPa	Test Voltage ：	DC 3.3V
Test Mode ：	TX-Band AC (870.5)		

CHANNEL	CHANNEL FREQUENCY (MHz)	99%OCCUPIED BANDWIDTH (KHz)	Measured frequencies		Limit	PASS /FAIL
			FL (MHz)	FH (MHz)		
1	870.5	124.45	870.435	870.565	600 kHz	PASS

Note: $F_L(f_{LOW})= F_c$(Center Frequency)-OCW/2; $F_H(F_{HIGH})= F_c$(Center Frequency)+OCW/2

Test Plot

99% Power Bandwidth plot on channel 01



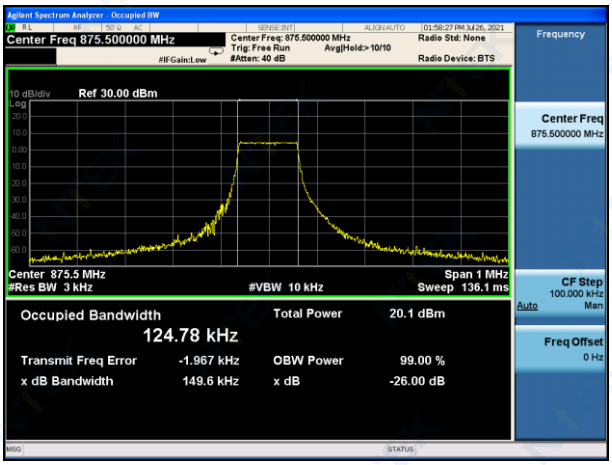
EUT：	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature：	26°C	Relative Humidity：	60 %
Pressure：	1012 hPa	Test Voltage ：	DC 3.3V
Test Mode ：	TX-Band AC (875.5)		

CHANNEL	CHANNEL FREQUENCY (MHz)	99%OCCUPIED BANDWIDTH (KHz)	Measured frequencies		Limit	PASS /FAIL
			FL (MHz)	FH (MHz)		
6	875.5	119.78	875.435	875.565	600 kHz	PASS

Note: $F_L(f_{LOW})= F_c$(Center Frequency)-OCW/2; $F_H(F_{HIGH})= F_c$(Center Frequency)+OCW/2

Test Plot

99% Power Bandwidth plot on channel 01



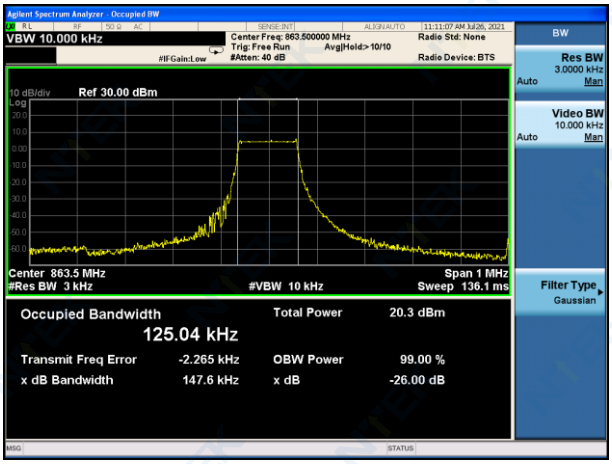
EUT：	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature：	26°C	Relative Humidity：	60 %
Pressure：	1012 hPa	Test Voltage ：	DC 3.3V
Test Mode ：	TX-Band AA (863.5)		

CHANNEL	CHANNEL FREQUENCY (MHz)	99%OCCUPIED BANDWIDTH (KHz)	Measured frequencies		Limit	PASS /FAIL
			FL (MHz)	FH (MHz)		
1	863.5	125.04	863.435	863.565	300 kHz	PASS

Note: $F_L(f_{LOW})= F_c$(Center Frequency)-OCW/2; $F_H(F_{HIGH})= F_c$(Center Frequency)+OCW/2

Test Plot

99% Power Bandwidth plot on channel 01



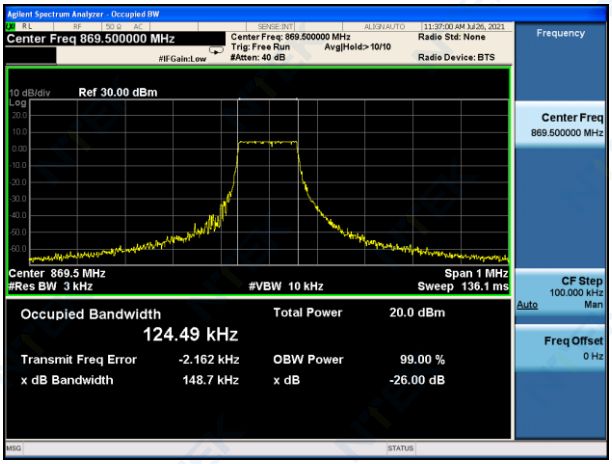
EUT：	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature：	26°C	Relative Humidity：	60 %
Pressure：	1012 hPa	Test Voltage ：	DC 3.3V
Test Mode ：	TX-Band AA (869.5)		

CHANNEL	CHANNEL FREQUENCY (MHz)	99%OCCUPIED BANDWIDTH (KHz)	Measured frequencies		Limit	PASS /FAIL
			FL (MHz)	FH (MHz)		
7	869.5	124.49	869.435	869.565	300 kHz	PASS

Note: $F_L(f_{LOW})= F_c$(Center Frequency)-OCW/2; $F_H(F_{HIGH})= F_c$(Center Frequency)+OCW/2

Test Plot

99% Power Bandwidth plot on channel 01



8. TX OUT OF BAND EMISSIONS

8.1 APPLICABILITY

TX Out of Band Emissions applies to all transmitters with OCW > 25 kHz.

8.2 LIMITS OF TX OUT OF BAND EMISSIONS

The EUT shall comply with reference limits defined in ETSI EN 300 220-1 [1], clause 5.8.2.

The EUT emissions level in OOB domains for the Operating Channel and the Operational Frequency Band shall be less or equal to Table 15 spectrum mask.

Table 15: Emission limits in the Out Of Band domains

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 ≤ f ≤ f_{low_OFB} - 200 kHz	1 kHz	-36 dBm
	f_{low} - 200 kHz ≤ 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 ≤ f_{high_OFB} + 200 kHz	1 kHz	See Figure 6
	F_{high_OFB} + 200 kHz ≤ f ≤ f_{high_OFB} + 400 kHz	1 kHz	-36 dBm
	F_{high_OFB} + 400 kHz ≤ 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 ≤ f ≤ 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 ≤ f ≤ 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.			

8.3 TEST PROCEDURES

Refer to chapter 5.8 of ETSI EN 300 220-1 V3.1.1 (2017-02)

Measurement	
☒Conducted measurement	☐Radiated measurement

8.4 TEST SETUP



These measurements only were performed at normal test conditions. The measurement shall be performed only on the lowest and the highest frequency within the ststed frequency range. In case of conducted measurements the transmitter shall be connected to the measuring equipment via a suitable attenuator. Controlling software has been activated to set the EUT on specific status.

8.5 TEST RESULTS

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX-Band AC(870.5)		

870.5MHz OCW=130KHz

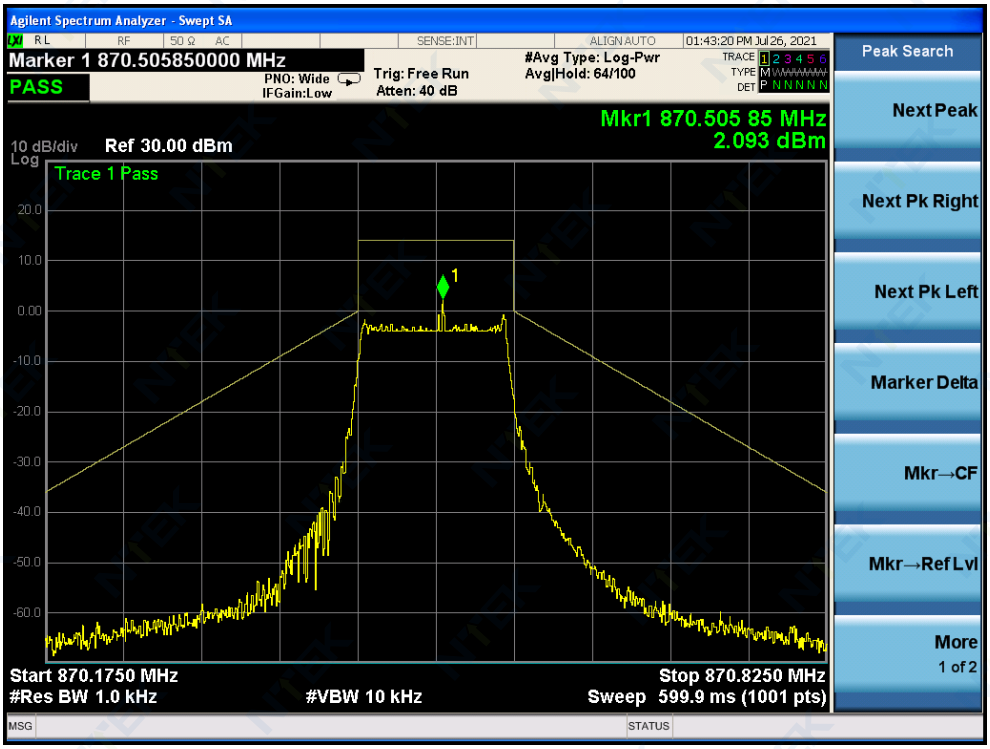


Figure 5 Out Of Band Domain for Operating Channel with reference BW

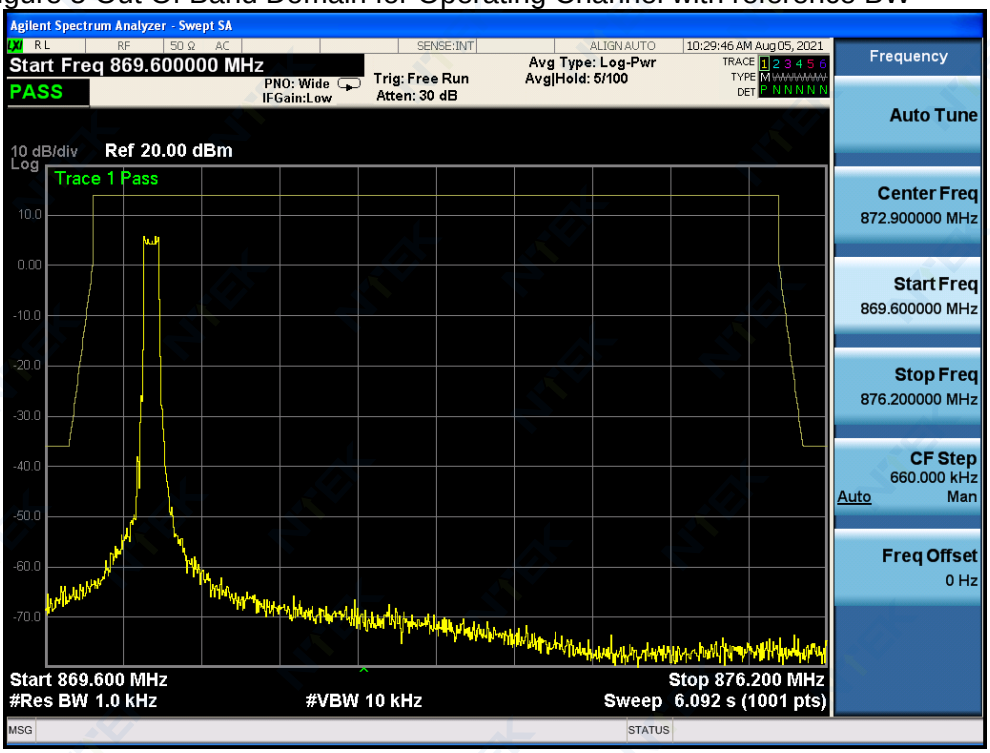


Figure 6 Out Of Band Domain for Operational Frequency Band with reference BW

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX-Band AC(875.5)		

875.5MHz OCW=130KHz

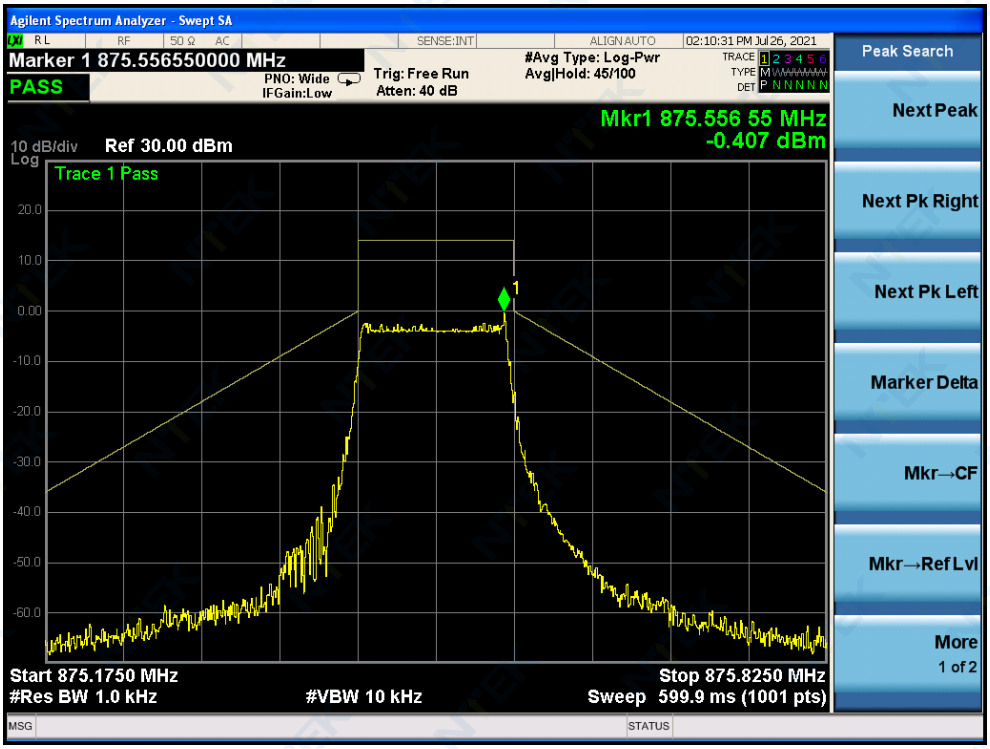


Figure 5 Out Of Band Domain for Operating Channel with reference BW

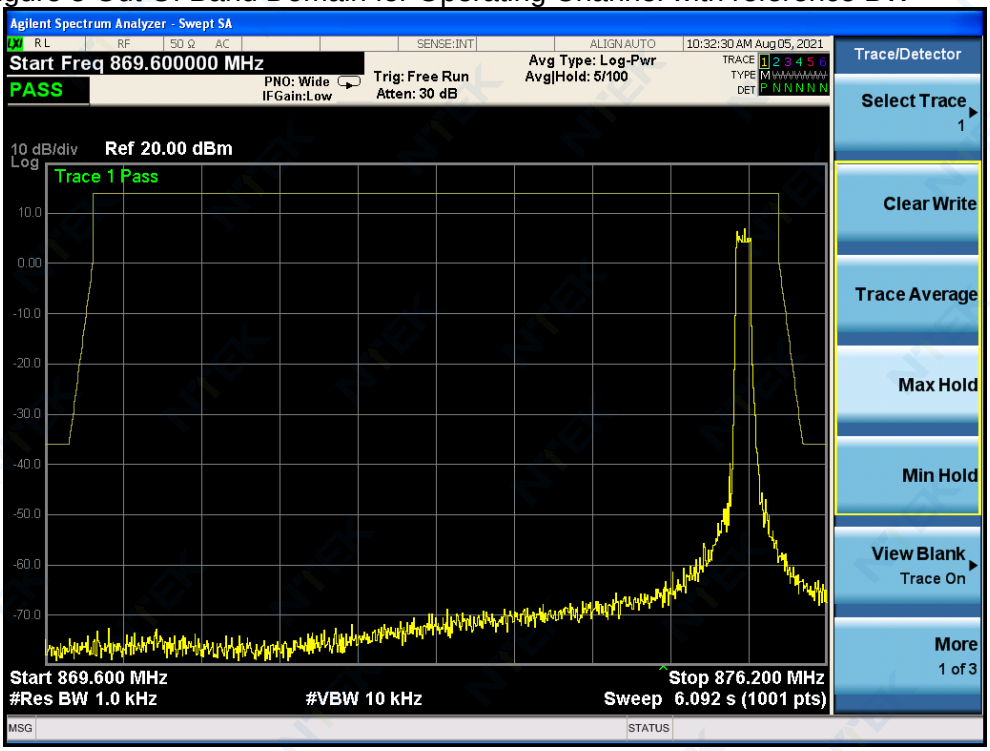


Figure 6 Out Of Band Domain for Operational Frequency Band with reference BW

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX-Band AA(863.5)		

863.5MHz OCW=130KHz

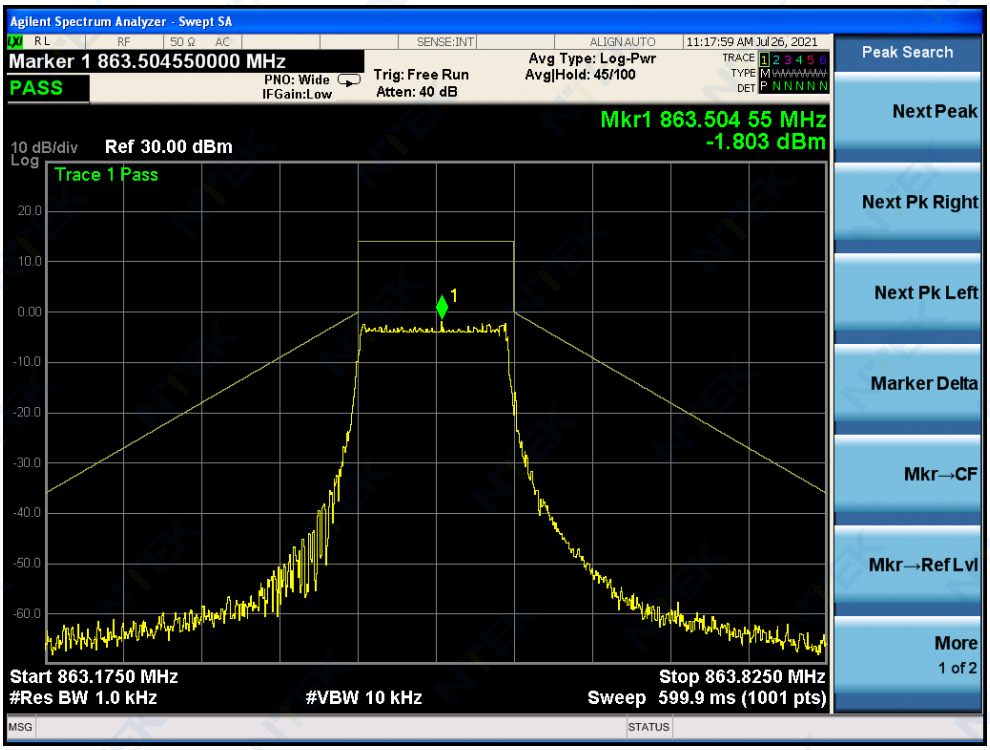


Figure 5 Out Of Band Domain for Operating Channel with reference BW

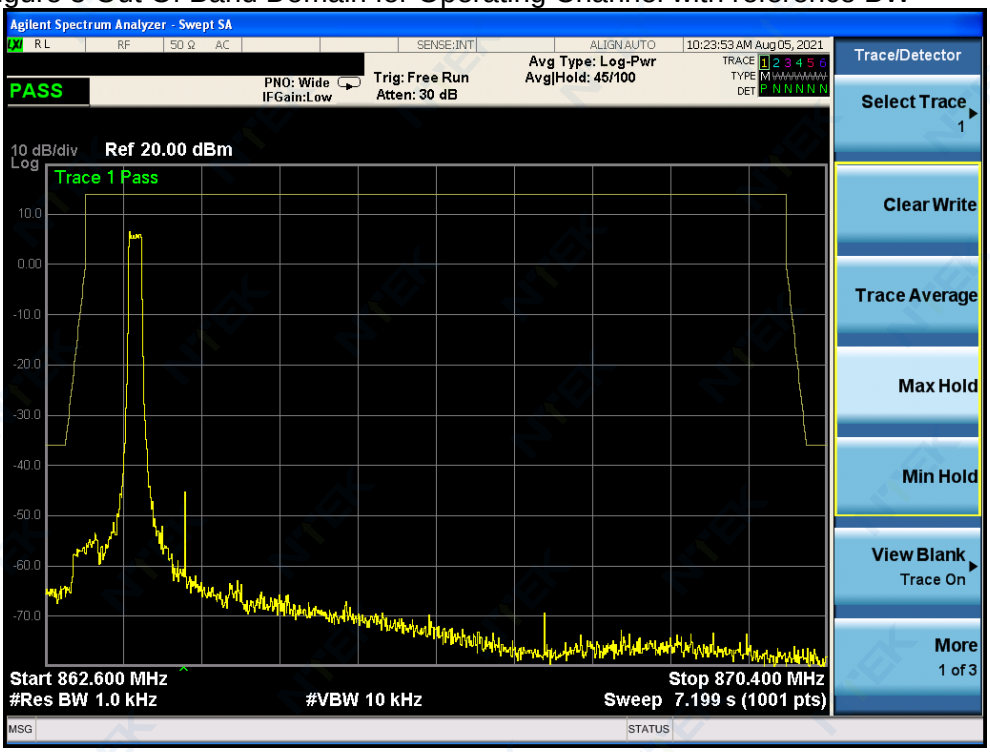


Figure 6 Out Of Band Domain for Operational Frequency Band with reference BW

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX-Band AA(869.5)		

869.5MHz OCW=130KHz

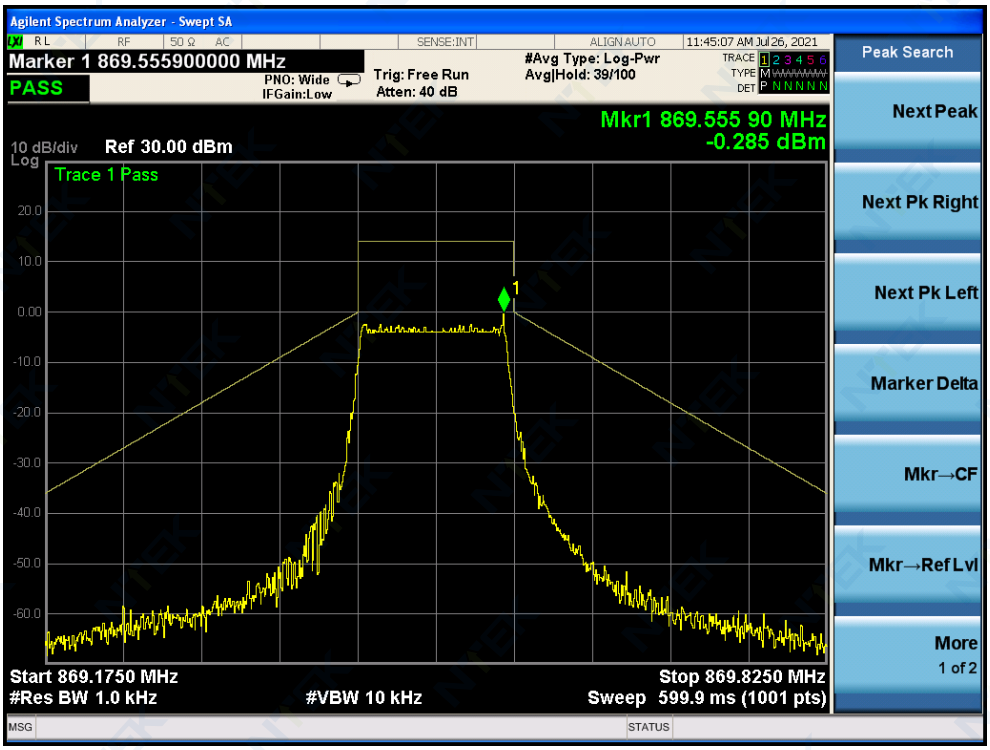


Figure 5 Out Of Band Domain for Operating Channel with reference BW

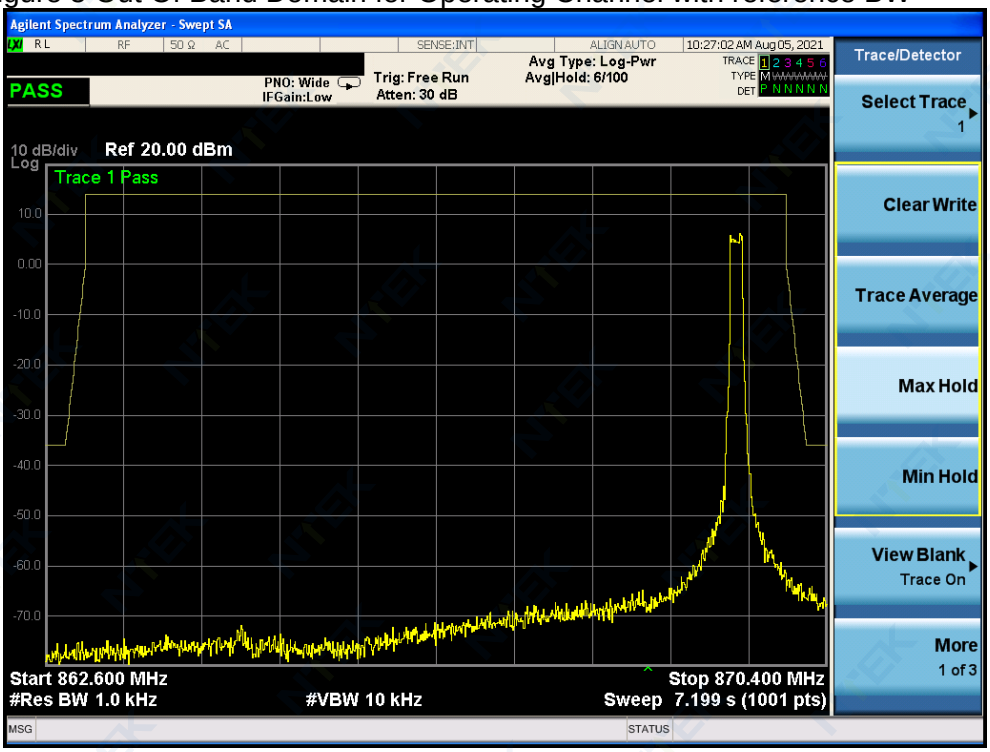


Figure 6 Out Of Band Domain for Operational Frequency Band with reference BW

9. UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

9.1 APPLICABILITY

This items applies to all equipment.

9.2 LIMITS OF UNWANTED EMISSIONS IN THE SPURIOUS DOMAIN

Refer to chapter 5.9.2 of ETSI EN 300 220-1 V3.1.1

The power of any unwanted emission in the spurious domain shall not exceed the values given in Table 19.

Table 19: Spurious domain emission limits

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

9.3 MEASURING INSTRUMENTS AND SETTING

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.

Table 22: Spurious Radiations radiated Measurement Frequency Range

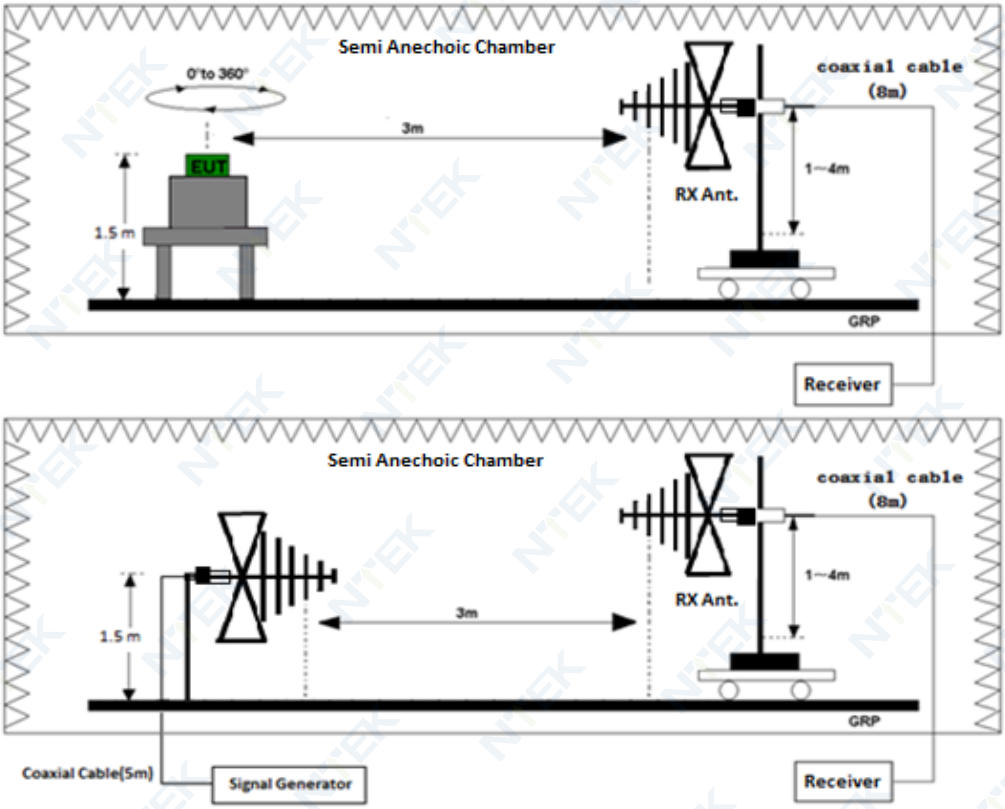
Frequency Range
25 MHz to 6 GHz
NOTE: The measurements need only to be performed over the frequency range 4 GHz to 6 GHz if emissions are detected within 10 dB of the specified limit between 1,5 GHz and 4 GHz.

9.4 TEST PROCEDURES

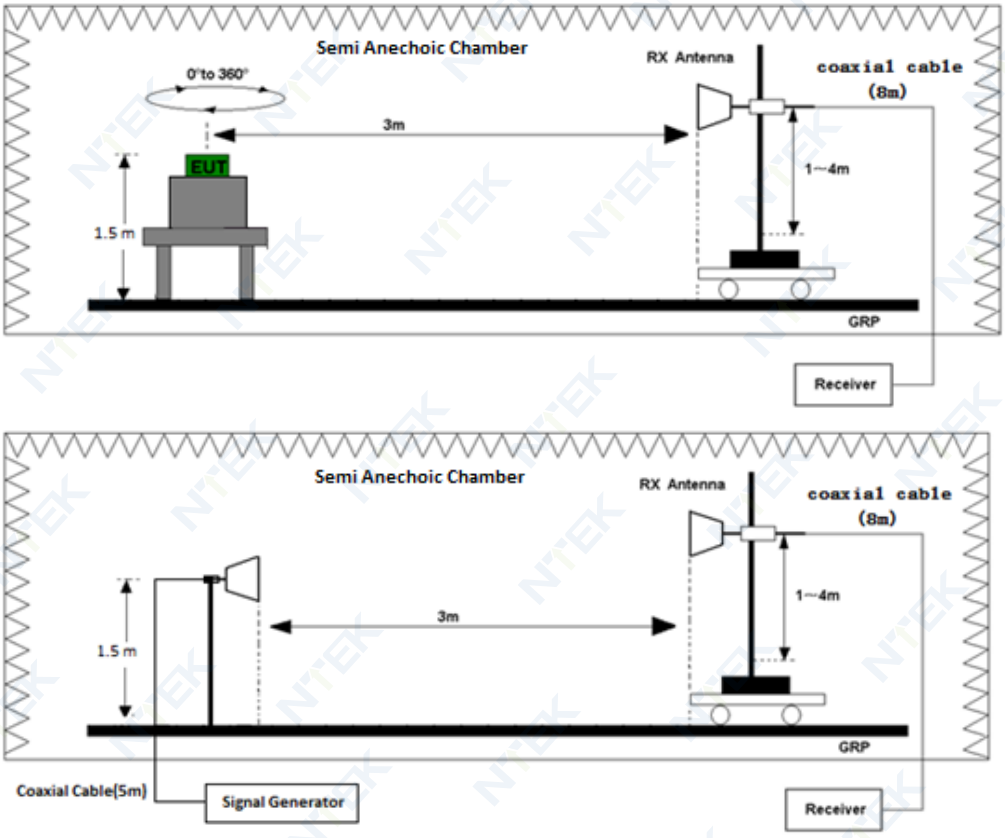
Refer to chapter 5.9.3.3.2 of ETSI EN 300 220-1 V3.1.1 (2017-02)

Measurement	
☐Conducted measurement	☒Radiated measurement

9.5 TEST SETUP LAYOUT



Test set-up of radiated disturbance (30MHz-1GHz)



Test set-up of radiated disturbance (above 1GHz)

9.6 EUT OPERATION DURING TEST

The EUT was programmed to be in continuously transmitting mode.

9.7 TEST RESULTS

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	23 ℃	Relative Humidity:	53%
Pressure:	1010 hPa	Test Power:	DC 3.3V
Test Mode:	TX for Band AC (870.5)		

ANT 1:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	36.729	-72.29	11.08	-61.21	-36	-25.21	peak
V	94.917	-74.86	9.95	-64.91	-54	-10.91	peak
V	181.854	-73.93	11.04	-62.89	-54	-8.89	peak
V	464.58	-70.03	9.57	-60.46	-36	-24.46	peak
V	672.819	-75.17	10.86	-64.31	-54	-10.31	peak
H	37.611	-69.13	10.51	-58.62	-36	-22.62	peak
H	113.105	-74.98	9.86	-65.12	-54	-11.12	peak
H	200.86	-67.38	9.67	-57.71	-54	-3.71	peak
H	366.325	-69.51	11.36	-58.15	-36	-22.15	peak
H	495.536	-69.68	10.32	-59.36	-54	-5.36	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	2794.737	-67.79	10.04	-57.75	-30	-27.75	peak
V	5467.523	-75.93	9.58	-66.35	-30	-36.35	peak
V	2718.421	-73	10.53	-62.47	-30	-32.47	peak
V	3008.681	-77.49	10.65	-66.84	-30	-36.84	peak
H	2973.764	-70.08	10.83	-59.25	-30	-29.25	peak
H	5403.511	-67.14	11.07	-56.07	-30	-26.07	peak
H	2233.323	-75	10.74	-64.26	-30	-34.26	peak
H	5986.654	-75.89	11.31	-64.58	-30	-34.58	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

ANT 2:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	44.849	-72.47	11.08	-61.39	-36	-25.39	peak
V	99.1	-75.62	9.95	-65.67	-54	-11.67	peak
V	187.282	-77.17	11.04	-66.13	-54	-12.13	peak
V	319.973	-69.74	9.57	-60.17	-36	-24.17	peak
V	690.425	-72.52	10.86	-61.66	-54	-7.66	peak
H	36.861	-67.09	10.51	-56.58	-36	-20.58	peak
H	115.671	-76.27	9.86	-66.41	-54	-12.41	peak
H	221.986	-70.95	9.67	-61.28	-54	-7.28	peak
H	396.621	-69.47	11.36	-58.11	-36	-22.11	peak
H	668.02	-69.97	10.32	-59.65	-54	-5.65	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	2861.994	-67.92	10.04	-57.88	-30	-27.88	peak
V	5170.362	-73.91	9.58	-64.33	-30	-34.33	peak
V	2655.495	-71.09	10.53	-60.56	-30	-30.56	peak
V	3019.837	-72.05	10.65	-61.40	-30	-31.40	peak
H	2095.817	-69.69	10.83	-58.86	-30	-28.86	peak
H	4888.8	-71.31	11.07	-60.24	-30	-30.24	peak
H	2604.859	-75.54	10.74	-64.80	-30	-34.80	peak
H	4699.304	-68.07	11.31	-56.76	-30	-26.76	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	23 ℃	Relative Humidity:	53%
Pressure:	1010 hPa	Test Power:	DC 3.3V
Test Mode:	TX for Band AC (875.5)		

ANT 1:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	40.996	-69.34	11.08	-58.26	-36	-22.26	peak
V	101.366	-73.07	9.95	-63.12	-54	-9.12	peak
V	211.792	-70.06	11.04	-59.02	-54	-5.02	peak
V	317.64	-71.6	9.57	-62.03	-36	-26.03	peak
V	680.85	-70.11	10.86	-59.25	-54	-5.25	peak
H	40.971	-67.25	10.51	-56.74	-36	-20.74	peak
H	94.262	-69	9.86	-59.14	-54	-5.14	peak
H	223.457	-73.57	9.67	-63.90	-54	-9.90	peak
H	293.644	-72.73	11.36	-61.37	-36	-25.37	peak
H	614.924	-69.39	10.32	-59.07	-54	-5.07	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	2556.498	-71.13	10.04	-61.09	-30	-31.09	peak
V	3768.96	-69.06	9.58	-59.48	-30	-29.48	peak
V	2975.125	-71.49	10.53	-60.96	-30	-30.96	peak
V	4793.331	-68.79	10.65	-58.14	-30	-28.14	peak
H	2798.149	-67.53	10.83	-56.70	-30	-26.70	peak
H	3908.039	-67.71	11.07	-56.64	-30	-26.64	peak
H	2681.469	-76.72	10.74	-65.98	-30	-35.98	peak
H	3342.283	-71.75	11.31	-60.44	-30	-30.44	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

ANT 2:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	44.448	-72.32	11.08	-61.24	-36	-25.24	peak
V	106.499	-67.57	9.95	-57.62	-54	-3.62	peak
V	196.483	-70.2	11.04	-59.16	-54	-5.16	peak
V	454.512	-67.62	9.57	-58.05	-36	-22.05	peak
V	548.97	-76.05	10.86	-65.19	-54	-11.19	peak
H	41.94	-75.36	10.51	-64.85	-36	-28.85	peak
H	99.28	-67.4	9.86	-57.54	-54	-3.54	peak
H	196.772	-67.52	9.67	-57.85	-54	-3.85	peak
H	416.624	-70.05	11.36	-58.69	-36	-22.69	peak
H	478.583	-74.78	10.32	-64.46	-54	-10.46	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	2741.986	-76.47	10.04	-66.43	-30	-36.43	peak
V	3130.961	-70.99	9.58	-61.41	-30	-31.41	peak
V	2771.466	-75.43	10.53	-64.90	-30	-34.90	peak
V	3386.796	-71.9	10.65	-61.25	-30	-31.25	peak
H	2132.45	-74.71	10.83	-63.88	-30	-33.88	peak
H	5797.369	-68.79	11.07	-57.72	-30	-27.72	peak
H	2466.148	-77.41	10.74	-66.67	-30	-36.67	peak
H	3310.476	-73.87	11.31	-62.56	-30	-32.56	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	24 ℃	Relative Humidity:	57%
Pressure:	1010 hPa	Test Power:	DC 3.3V
Test Mode:	RX for Band AC (870.5)		

ANT 1:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	41.745	-79.3	12.98	-66.32	-57	-9.32	peak
V	117.224	-83.26	11.67	-71.59	-57	-14.59	peak
V	207.585	-84.91	18.94	-65.97	-57	-8.97	peak
V	335.928	-83.77	11.65	-72.12	-57	-15.12	peak
V	516.043	-83.81	11.45	-72.36	-57	-15.36	peak
H	41.586	-79.69	18.60	-61.09	-57	-4.09	peak
H	102.188	-78.87	18.11	-60.76	-57	-3.76	peak
H	176.663	-78.74	10.30	-68.44	-57	-11.44	peak
H	327.626	-80.05	15.00	-65.05	-57	-8.05	peak
H	517.945	-78.42	14.63	-63.79	-57	-6.79	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	2837.69	-80.8	9.94	-70.86	-47	-23.86	peak
V	5688.584	-77.52	9.82	-67.70	-47	-20.70	peak
V	2917.667	-81.9	10.02	-71.88	-47	-24.88	peak
V	3093.625	-82.07	16.13	-65.94	-47	-18.94	peak
H	2898.052	-77.98	10.11	-67.87	-47	-20.87	peak
H	3942.956	-79.49	10.68	-68.81	-47	-21.81	peak
H	2315.962	-82.05	7.00	-75.05	-47	-28.05	peak
H	5801.664	-78.43	14.56	-63.87	-47	-16.87	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

ANT 2:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	33.368	-77.14	12.98	-64.16	-57	-7.16	peak
V	116.75	-80.56	11.67	-68.89	-57	-11.89	peak
V	229.392	-83.09	18.94	-64.15	-57	-7.15	peak
V	464.491	-80.96	11.65	-69.31	-57	-12.31	peak
V	476.713	-80.9	11.45	-69.45	-57	-12.45	peak
H	31.351	-84.62	18.60	-66.02	-57	-9.02	peak
H	91.833	-82.46	18.11	-64.35	-57	-7.35	peak
H	226.422	-83.31	10.30	-73.01	-57	-16.01	peak
H	424.117	-77.42	15.00	-62.42	-57	-5.42	peak
H	636.815	-78.12	14.63	-63.49	-57	-6.49	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	2627.42	-80.52	9.94	-70.58	-47	-23.58	peak
V	3628.784	-81.55	9.82	-71.73	-47	-24.73	peak
V	2942.278	-78.79	10.02	-68.77	-47	-21.77	peak
V	5715.304	-79.37	16.13	-63.24	-47	-16.24	peak
H	2073.811	-81.85	10.11	-71.74	-47	-24.74	peak
H	3927.888	-81.72	10.68	-71.04	-47	-24.04	peak
H	2840.325	-80.91	7.00	-73.91	-47	-26.91	peak
H	5273.47	-80.79	14.56	-66.23	-47	-19.23	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	24 ℃	Relative Humidity:	57%
Pressure:	1010 hPa	Test Power:	DC 3.3V
Test Mode:	RX for Band AC (875.5)		

ANT 1:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	46.658	-78.3	12.98	-65.32	-57	-8.32	peak
V	116.923	-80.65	11.67	-68.98	-57	-11.98	peak
V	182.587	-83.18	18.94	-64.24	-57	-7.24	peak
V	403.795	-78.58	11.65	-66.93	-57	-9.93	peak
V	650.273	-80.27	11.45	-68.82	-57	-11.82	peak
H	39.316	-79.22	18.60	-60.62	-57	-3.62	peak
H	112.99	-78.21	18.11	-60.10	-57	-3.10	peak
H	212.178	-83.12	10.30	-72.82	-57	-15.82	peak
H	341.613	-77.69	15.00	-62.69	-57	-5.69	peak
H	513.142	-79.48	14.63	-64.85	-57	-7.85	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	2681.713	-82.79	9.94	-72.85	-47	-25.85	peak
V	4743.251	-81.3	9.82	-71.48	-47	-24.48	peak
V	2436.965	-84.61	10.02	-74.59	-47	-27.59	peak
V	4136.771	-81.91	16.13	-65.78	-47	-18.78	peak
H	2169.828	-83.53	10.11	-73.42	-47	-26.42	peak
H	5186.701	-84.9	10.68	-74.22	-47	-27.22	peak
H	2821.804	-82.25	7.00	-75.25	-47	-28.25	peak
H	3674.748	-84.08	14.56	-69.52	-47	-22.52	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

ANT 2:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	36.1	-77.17	12.98	-64.19	-57	-7.19	peak
V	99.426	-80.98	11.67	-69.31	-57	-12.31	peak
V	185.746	-84.95	18.94	-66.01	-57	-9.01	peak
V	269.59	-79.74	11.65	-68.09	-57	-11.09	peak
V	565.67	-80.8	11.45	-69.35	-57	-12.35	peak
H	38.319	-78.85	18.60	-60.25	-57	-3.25	peak
H	111.772	-83.95	18.11	-65.84	-57	-8.84	peak
H	221.619	-77.31	10.30	-67.01	-57	-10.01	peak
H	417.706	-78.15	15.00	-63.15	-57	-6.15	peak
H	662.783	-82.6	14.63	-67.97	-57	-10.97	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	2271.976	-82.47	9.94	-72.53	-47	-25.53	peak
V	4098.724	-80.01	9.82	-70.19	-47	-23.19	peak
V	2736.424	-84.17	10.02	-74.15	-47	-27.15	peak
V	3393.112	-84.66	16.13	-68.53	-47	-21.53	peak
H	2369.731	-84.39	10.11	-74.28	-47	-27.28	peak
H	5225.437	-84.73	10.68	-74.05	-47	-27.05	peak
H	2874.568	-83.29	7.00	-76.29	-47	-29.29	peak
H	3700.838	-80.2	14.56	-65.64	-47	-18.64	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	23 ℃	Relative Humidity:	53%
Pressure:	1010 hPa	Test Power:	DC 3.3V
Test Mode:	TX for Band AA (863.5)		

ANT 1:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	43.225	-67.72	11.08	-56.64	-36	-20.64	peak
V	116.478	-69.34	9.95	-59.39	-54	-5.39	peak
V	206.8	-70.48	11.04	-59.44	-54	-5.44	peak
V	386.887	-75.04	9.57	-65.47	-36	-29.47	peak
V	659.472	-71.9	10.86	-61.04	-54	-7.04	peak
H	45.173	-76.85	10.51	-66.34	-36	-30.34	peak
H	107.475	-71.53	9.86	-61.67	-54	-7.67	peak
H	192.026	-73.66	9.67	-63.99	-54	-9.99	peak
H	435.369	-73.39	11.36	-62.03	-36	-26.03	peak
H	650.392	-76.49	10.32	-66.17	-54	-12.17	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	2368.829	-70.67	10.04	-60.63	-30	-30.63	peak
V	3134.625	-69.34	9.58	-59.76	-30	-29.76	peak
V	2172.279	-77.54	10.53	-67.01	-30	-37.01	peak
V	3493.131	-74.82	10.65	-64.17	-30	-34.17	peak
H	2950.773	-75.31	10.83	-64.48	-30	-34.48	peak
H	3065.264	-75.49	11.07	-64.42	-30	-34.42	peak
H	2914.431	-77.89	10.74	-67.15	-30	-37.15	peak
H	5489.99	-70.37	11.31	-59.06	-30	-29.06	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

ANT 2:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	43.762	-77.03	11.08	-65.95	-36	-29.95	peak
V	114.727	-74.02	9.95	-64.07	-54	-10.07	peak
V	213.484	-70.17	11.04	-59.13	-54	-5.13	peak
V	244.646	-72.44	9.57	-62.87	-36	-26.87	peak
V	551.89	-71.48	10.86	-60.62	-54	-6.62	peak
H	45.705	-69.15	10.51	-58.64	-36	-22.64	peak
H	105.335	-68.76	9.86	-58.90	-54	-4.90	peak
H	227.588	-69.39	9.67	-59.72	-54	-5.72	peak
H	460.984	-73.1	11.36	-61.74	-36	-25.74	peak
H	499.549	-73.38	10.32	-63.06	-54	-9.06	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	2641.862	-72.16	10.04	-62.12	-30	-32.12	peak
V	4807.248	-74.49	9.58	-64.91	-30	-34.91	peak
V	2107.482	-77.12	10.53	-66.59	-30	-36.59	peak
V	5539.416	-76.14	10.65	-65.49	-30	-35.49	peak
H	2888.929	-72.09	10.83	-61.26	-30	-31.26	peak
H	5359.319	-69.17	11.07	-58.10	-30	-28.10	peak
H	2927.014	-76.18	10.74	-65.44	-30	-35.44	peak
H	3794.341	-72.34	11.31	-61.03	-30	-31.03	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	23 ℃	Relative Humidity:	53%
Pressure:	1010 hPa	Test Power:	DC 3.3V
Test Mode:	TX for Band AA (869.5)		

ANT 1:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	45.583	-76.79	11.08	-65.71	-36	-29.71	peak
V	113.575	-72.91	9.95	-62.96	-54	-8.96	peak
V	200.384	-76.19	11.04	-65.15	-54	-11.15	peak
V	424.501	-70.85	9.57	-61.28	-36	-25.28	peak
V	523.229	-68.32	10.86	-57.46	-54	-3.46	peak
H	46.198	-72.77	10.51	-62.26	-36	-26.26	peak
H	91.283	-70.98	9.86	-61.12	-54	-7.12	peak
H	210.537	-68.66	9.67	-58.99	-54	-4.99	peak
H	302.201	-72.83	11.36	-61.47	-36	-25.47	peak
H	687.018	-73.92	10.32	-63.60	-54	-9.60	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	2317.528	-76.82	10.04	-66.78	-30	-36.78	peak
V	4572.174	-69.67	9.58	-60.09	-30	-30.09	peak
V	2413.021	-72.1	10.53	-61.57	-30	-31.57	peak
V	5848.923	-75.5	10.65	-64.85	-30	-34.85	peak
H	2938.62	-70.43	10.83	-59.60	-30	-29.60	peak
H	3665.969	-72.63	11.07	-61.56	-30	-31.56	peak
H	2618.913	-76.44	10.74	-65.70	-30	-35.70	peak
H	5579.7	-69.47	11.31	-58.16	-30	-28.16	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

ANT 2:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	44.255	-68.35	11.08	-57.27	-36	-21.27	peak
V	94.528	-76.06	9.95	-66.11	-54	-12.11	peak
V	219.636	-71.45	11.04	-60.41	-54	-6.41	peak
V	352.378	-75.7	9.57	-66.13	-36	-30.13	peak
V	599.365	-72.39	10.86	-61.53	-54	-7.53	peak
H	41.109	-73.45	10.51	-62.94	-36	-26.94	peak
H	114.123	-74.25	9.86	-64.39	-54	-10.39	peak
H	193.826	-67.62	9.67	-57.95	-54	-3.95	peak
H	249.401	-77.13	11.36	-65.77	-36	-29.77	peak
H	473.381	-76.38	10.32	-66.06	-54	-12.06	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Detector Type
V	2369.992	-67.08	10.04	-57.04	-30	-27.04	peak
V	4244.31	-74.64	9.58	-65.06	-30	-35.06	peak
V	2734.978	-67.93	10.53	-57.40	-30	-27.40	peak
V	3516.874	-75.57	10.65	-64.92	-30	-34.92	peak
H	2135.816	-70.7	10.83	-59.87	-30	-29.87	peak
H	5335.741	-67.92	11.07	-56.85	-30	-26.85	peak
H	2725.96	-70.28	10.74	-59.54	-30	-29.54	peak
H	5292.477	-67.61	11.31	-56.30	-30	-26.30	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	24 ℃	Relative Humidity:	57%
Pressure:	1010 hPa	Test Power:	DC 3.3V
Test Mode:	RX for Band AA (863.5)		

ANT 1:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	32.636	-82.77	12.98	-69.79	-57	-12.79	peak
V	111.374	-81.17	11.67	-69.50	-57	-12.50	peak
V	187.406	-83.6	18.94	-64.66	-57	-7.66	peak
V	405.986	-84.64	11.65	-72.99	-57	-15.99	peak
V	652.552	-81.17	11.45	-69.72	-57	-12.72	peak
H	32.206	-84.89	18.60	-66.29	-57	-9.29	peak
H	94.701	-81.5	18.11	-63.39	-57	-6.39	peak
H	212.864	-80.77	10.30	-70.47	-57	-13.47	peak
H	431.944	-80.4	15.00	-65.40	-57	-8.40	peak
H	559.441	-80.47	14.63	-65.84	-57	-8.84	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	2818.366	-77.56	9.94	-67.62	-47	-20.62	peak
V	5074.188	-79.42	9.82	-69.60	-47	-22.60	peak
V	2140.002	-80.29	10.02	-70.27	-47	-23.27	peak
V	5303.111	-83.91	16.13	-67.78	-47	-20.78	peak
H	2464.516	-79.15	10.11	-69.04	-47	-22.04	peak
H	3487.664	-82.89	10.68	-72.21	-47	-25.21	peak
H	2806.009	-81.09	7.00	-74.09	-47	-27.09	peak
H	4905.839	-84.28	14.56	-69.72	-47	-22.72	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

ANT 2:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	36.143	-79.07	12.98	-66.09	-57	-9.09	peak
V	101.086	-82.48	11.67	-70.81	-57	-13.81	peak
V	218.902	-79.87	18.94	-60.93	-57	-3.93	peak
V	266.755	-77.87	11.65	-66.22	-57	-9.22	peak
V	561.21	-78.21	11.45	-66.76	-57	-9.76	peak
H	33.822	-82.78	18.60	-64.18	-57	-7.18	peak
H	96.296	-78.34	18.11	-60.23	-57	-3.23	peak
H	225.945	-77.7	10.30	-67.40	-57	-10.40	peak
H	323.367	-78.04	15.00	-63.04	-57	-6.04	peak
H	688.688	-80.39	14.63	-65.76	-57	-8.76	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	2392.781	-83.77	9.94	-73.83	-47	-26.83	peak
V	5747.834	-79.61	9.82	-69.79	-47	-22.79	peak
V	2514.303	-79.89	10.02	-69.87	-47	-22.87	peak
V	3099.614	-81.41	16.13	-65.28	-47	-18.28	peak
H	2693.129	-84.34	10.11	-74.23	-47	-27.23	peak
H	5296.452	-78.35	10.68	-67.67	-47	-20.67	peak
H	2068.75	-80.11	7.00	-73.11	-47	-26.11	peak
H	3098.045	-82.08	14.56	-67.52	-47	-20.52	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	24 ℃	Relative Humidity:	57%
Pressure:	1010 hPa	Test Power:	DC 3.3V
Test Mode:	RX for Band AA (869.5)		

ANT 1:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	42.704	-82.74	12.98	-69.76	-57	-12.76	peak
V	102.405	-82.96	11.67	-71.29	-57	-14.29	peak
V	193.018	-82.2	18.94	-63.26	-57	-6.26	peak
V	454.141	-77.32	11.65	-65.67	-57	-8.67	peak
V	661.565	-81.68	11.45	-70.23	-57	-13.23	peak
H	42.381	-81.41	18.60	-62.81	-57	-5.81	peak
H	98.693	-79.13	18.11	-61.02	-57	-4.02	peak
H	216.081	-82.19	10.30	-71.89	-57	-14.89	peak
H	383.196	-82.49	15.00	-67.49	-57	-10.49	peak
H	621.754	-84.64	14.63	-70.01	-57	-13.01	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	2728.356	-78.88	9.94	-68.94	-47	-21.94	peak
V	4994.547	-82.28	9.82	-72.46	-47	-25.46	peak
V	2072.525	-81.76	10.02	-71.74	-47	-24.74	peak
V	4336.241	-84.18	16.13	-68.05	-47	-21.05	peak
H	2088.371	-84.94	10.11	-74.83	-47	-27.83	peak
H	5110.261	-79.03	10.68	-68.35	-47	-21.35	peak
H	2590.997	-84.69	7.00	-77.69	-47	-30.69	peak
H	5258.68	-80.45	14.56	-65.89	-47	-18.89	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

ANT 2:

BELOW 1 GHz WORST- CASE DATA (30 MHz ~ 1GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	45.865	-78.32	12.98	-65.34	-57	-8.34	peak
V	89.442	-79.05	11.67	-67.38	-57	-10.38	peak
V	191.315	-81.54	18.94	-62.60	-57	-5.60	peak
V	322.557	-81.16	11.65	-69.51	-57	-12.51	peak
V	606.896	-84.76	11.45	-73.31	-57	-16.31	peak
H	37.697	-83.82	18.60	-65.22	-57	-8.22	peak
H	89.557	-79.96	18.11	-61.85	-57	-4.85	peak
H	223.686	-78.3	10.30	-68.00	-57	-11.00	peak
H	371.782	-84.2	15.00	-69.20	-57	-12.20	peak
H	487.398	-81.87	14.63	-67.24	-57	-10.24	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

ABOVE 1 GHz WORST- CASE DATA (1GHz ~ 12.75GHz)

Polar (H/V)	Frequency (MHz)	Meter Reading (dBm)	Factor (dB)	Emission Level (dBm)	Limits (dBm)	Margin (dB)	Remark
V	2313.108	-80.39	9.94	-70.45	-47	-23.45	peak
V	5862.681	-79.73	9.82	-69.91	-47	-22.91	peak
V	2573.152	-80.37	10.02	-70.35	-47	-23.35	peak
V	3874.994	-78.16	16.13	-62.03	-47	-15.03	peak
H	2113.63	-78.98	10.11	-68.87	-47	-21.87	peak
H	5410.374	-81.4	10.68	-70.72	-47	-23.72	peak
H	2936.046	-80.56	7.00	-73.56	-47	-26.56	peak
H	5355.947	-84.95	14.56	-70.39	-47	-23.39	peak

Remark:
Emission Level= Meter Reading+ Factor, Margin= Emission Level- Limit

Note: All modes had been tested, but only the worst data recorded in the report.

10 TRANSIENT POWER

10.1 APPLICABILITY

Transient power applies to all transmitters.

10.2 LIMITS OF TRANSIENT POWER

The EUT shall comply with reference limits defined in ETSI EN 300 220-1 [1], clause 5.10.2.

The transient power shall not exceed the values given in Table 23.

Table 23: Transmitter Transient Power limits

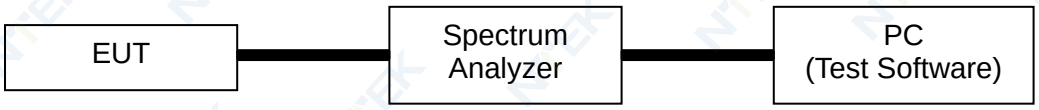
Absolute offset from centre frequency	RBW_{REF}	Peak power limit applicable at measurement points
≤ 400 kHz	1 kHz	0 dBm
> 400 kHz	1 kHz	-27 dBm

10.3 TEST PROCEDURES

Refer to chapter 5.10.3.2 of ETSI EN 300 220-1 V3.1.1 (2017-02)

Measurement	
☒Conducted measurement	☐Radiated measurement

10.4 TEST SETUP



10.5 TEST RESULT

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX -Band AC (870.5)		

870.5MHz OCW=130KHz

Frequency	Center Frequency	RBW	Max Vaule	Limit	Results
MHz	MHz	(kHz)	(dBm)	(dBm)	(P/F)
-0,5 x OCW - 3 kHz	870.432	1kHz	-45.426	0 dBm	PASS
0,5 x OCW + 3 kHz	870.568	1kHz	-44.604	0 dBm	PASS
-OCW	870.37	3kHz	-49.405	0 dBm	PASS
+OCW	870.63	3kHz	-49.816	0 dBm	PASS
-0,5 x OCW - 400 kHz	870.035	100kHz	-46.515	-27 dBm	PASS
0,5 x OCW + 400 kHz	870.965	100kHz	-47.018	-27 dBm	PASS
-0,5 x OCW -1200 kHz	869.235	300kHz	-52.782	-27 dBm	PASS
0,5 x OCW +1200 kHz	871.765	300kHz	-51.997	-27 dBm	PASS

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX -Band AC (875.5)		

875.5MHz OCW=130KHz

Frequency	Center Frequency	RBW	Max Vaule	Limit	Results
MHz	MHz	(kHz)	(dBm)	(dBm)	(P/F)
-0,5 x OCW - 3 kHz	875.432	1kHz	-46.406	0 dBm	PASS
0,5 x OCW + 3 kHz	875.568	1kHz	-45.584	0 dBm	PASS
-OCW	875.37	3kHz	-50.385	0 dBm	PASS
+OCW	875.63	3kHz	-50.796	0 dBm	PASS
-0,5 x OCW - 400 kHz	875.035	100kHz	-47.495	-27 dBm	PASS
0,5 x OCW + 400 kHz	875.965	100kHz	-47.998	-27 dBm	PASS
-0,5 x OCW -1200 kHz	874.235	300kHz	-53.762	-27 dBm	PASS
0,5 x OCW +1200 kHz	876.765	300kHz	-52.977	-27 dBm	PASS

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX -Band AA (863.5)		

863.5MHz OCW=130KHz

Frequency	Center Frequency	RBW	Max Vaule	Limit	Results
	MHz	(kHz)	(dBm)	(dBm)	(P/F)
-0,5 x OCW - 3 kHz	863.432	1kHz	-44.656	0 dBm	PASS
0,5 x OCW + 3 kHz	863.568	1kHz	-43.834	0 dBm	PASS
-OCW	863.37	3kHz	-48.635	0 dBm	PASS
+OCW	863.63	3kHz	-49.046	0 dBm	PASS
-0,5 x OCW - 400 kHz	863.035	100kHz	-45.745	-27 dBm	PASS
0,5 x OCW + 400 kHz	863.965	100kHz	-46.248	-27 dBm	PASS
-0,5 x OCW -1 200 kHz	862.235	300kHz	-52.012	-27 dBm	PASS
0,5 x OCW +1 200 kHz	864.765	300kHz	-51.227	-27 dBm	PASS

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	TX -Band AA (869.5)		

869.5MHz OCW=130KHz

Frequency	Center Frequency	RBW	Max Vaule	Limit	Results
	MHz	(kHz)	(dBm)	(dBm)	(P/F)
-0,5 x OCW - 3 kHz	869.432	1kHz	-44.076	0 dBm	PASS
0,5 x OCW + 3 kHz	869.568	1kHz	-43.254	0 dBm	PASS
-OCW	869.37	3kHz	-48.055	0 dBm	PASS
+OCW	869.63	3kHz	-48.466	0 dBm	PASS
-0,5 x OCW - 400 kHz	869.035	100kHz	-45.165	-27 dBm	PASS
0,5 x OCW + 400 kHz	869.965	100kHz	-45.668	-27 dBm	PASS
-0,5 x OCW -1 200 kHz	868.235	300kHz	-51.432	-27 dBm	PASS
0,5 x OCW +1 200 kHz	870.765	300kHz	-50.647	-27 dBm	PASS

11. ADJACENT CHANNEL POWER

11.1 APPLICABILITY

Adjacent channel power applies to all transmitters with OCW ≤ 25 kHz.

11.2 LIMITS OF ADJACENT CHANNEL POWER

Where the Operating Channel Width is less than or equal to 25 kHz, the power in the adjacent channels shall not exceed the reference limits defined in ETSI EN 300 220-1 [1], clause 5.11.2.

Table 26: Adjacent channel power limits for transmitters with OCW ≤ 25 kHz

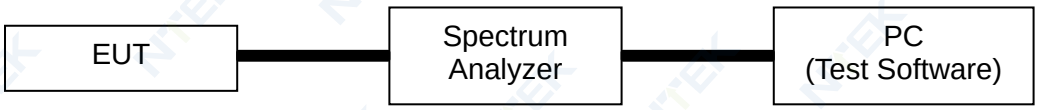
		Adjacent Channel power integrated over 0,7 x OCW	Alternate Adjacent Channel power integrated over 0,7 x OCW
OCW < 20 kHz	Normal test conditions	-20 dBm	-20 dBm
	Extreme test conditions	-15 dBm	-20 dBm
OCW ≥ 20 kHz	Normal test conditions	-37 dBm	-40 dBm
	Extreme test conditions	-32 dBm	-37 dBm

11.3 TEST PROCEDURES

Refer to chapter 5.11.3.3 of ETSI EN 300 220-1 V3.1.1 (2017-02)

Measurement	
☒Conducted measurement	☐Radiated measurement

11.4 TEST SETUP



11.5 TEST RESULT

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	N/A
Test Mode:	N/A		

Note: Not applicable.

12. TX BEHAVIOUR UNDER LOW VOLTAGE CONDITIONS

12.1 APPLICABILITY

TX behaviour under low voltage condition applies to battery powered EUT.

12.2 LIMITS OF TX BEHAVIOUR UNDER LOW VOLTAGE CONDITIONS

The EUT shall comply with reference limits defined in ETSI EN 300 220-1 [1], clause 5.12.2.

The equipment shall either:

a) remain in the Operating Channel OC without exceeding any applicable limits (e.g. Duty Cycle); or

b) reduce its effective radiated power below the Spurious Emission limits without exceeding any applicable limits(e.g. Duty Cycle); or

c) shut down, (ceasing function);

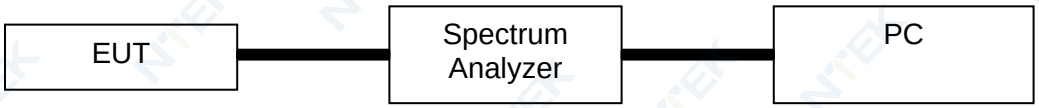
as the voltage falls below the manufacturers declared operating voltage.

12.3 TEST PROCEDURES

Refer to chapter 5.12.3.2 of ETSI EN 300 220-1 V3.1.1 (2017-02)

Measurement	
☒Conducted measurement	☐Radiated measurement

12.4 TEST SETUP



12.5 TEST RESULT

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26 °C	Relative Humidity:	60 %
Pressure:	1010 hPa	Test Power:	N/A
Test Mode:	N/A		

Note: Not Applicable

13. ADAPTIVE POWER CONTROL

13.1 APPLICABILITY

Adaptive power control applies to all EUT with adaptive power control using annex C band AF.

13.2 LIMITS OF ADAPTIVE POWER CONTROL

The EUT shall comply with reference limits defined in ETSI EN 300 220-1 [1], clause 5.13.2.

The peak power measured when active APC function at its minimum setting shall not exceed the value shown in Table 29.

Table 29: APC power limit

Parameter	Limit
Transmitted e.r.p.	+7 dBm

13.3 TEST PROCEDURES

Refer to chapter 5.12.3.2 of ETSI EN 300 220-1 V3.1.1 (2017-02)

Measurement	
☒Conducted measurement	☐Radiated measurement

13.4 TEST SETUP

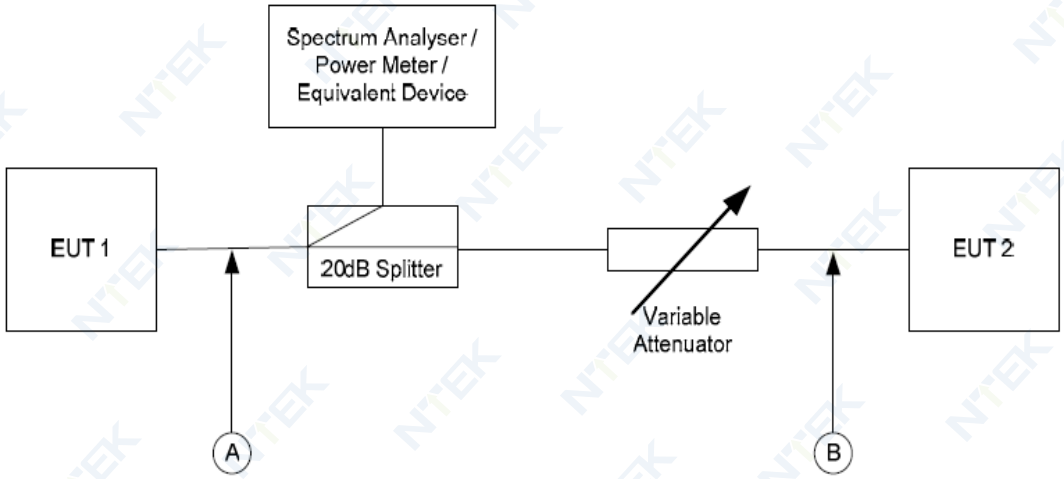


Figure 8: APC Measurement Setup

The EUTs shall be set to communicate with each other for at least the APC settling time.

The test equipment shall then be used to measure power for at least 60 seconds.

NOTE: The power measuring interval should be sufficiently long to capture transmissions from the EUT.

13.5 TEST RESULT

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26 °C	Relative Humidity:	60 %
Pressure:	1010 hPa	Test Power:	N/A
Test Mode:	N/A		

Note: The equipment is not applicable for adaptive power control.

14. RX SENSITIVITY LEVEL

14.1 APPLICABILITY

Rx sensitivity requirement is applicable to all EUT employing polite spectrum access as set out in clause 4.5.1.

14.2 LIMITS OF RX SENSITIVITY LEVEL

Refer to chapter 4.4.1.2 of ETSI EN 300 220-2 V3.2.1& EN 300 220-1 V3.1.1, clause 5.14.2.

The sensitivity for receivers shall be below or equal to Table 32 level.

Table 32: Limits for Receiver sensitivity

$$S = 10\log RB_{kHz} - 4 \quad dB\mu V \ emf \text{; or}$$

$$S_P = 10\log RB_{kHz} - 117 dBm$$

where:

- S_P is the sensitivity in dBm.
- RB is the declared receiver bandwidth in kHz.

The receiver bandwidth RB shall be declared by the manufacturer. RB is the usually 3 dB receiver bandwidth selectivity.

For example, the sensitivity for a 25 kHz Operating Channel equipment with a 16 kHz bandwidth shall be better than +8 dBµV emf for a 50 Ω receiver input impedance. This corresponds to a receiver sensitivity of -105 dBm.

14.3 TEST PROCEDURES

Refer to chapter 5.14.3.3 of ETSI EN 300 220-1 V3.1.1 (2017-02)

Measurement	
☒Conducted measurement	☐Radiated measurement

14.4 TEST SETUP



14.5 TEST RESULTS

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	N/A
Test Mode:	N/A		

Note: The EUT has no function of polite spectrum access. So this test is not applicable.

15. BLOCKING

15.1 APPLICABILITY

Blocking applies to all receivers.

15.2 LIMITS OF BLOCKING

The blocking level shall be better or equal to category 2 reference limits level defined in ETSI EN 300 220-1 [1], clause 5.18.3.

Table 41: Blocking level parameters for RX category 2

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

The blocking levels at the specified frequency offsets shall be equal to or greater than the limits Table 42, except at frequencies where spurious responses are found.

Table 42: Blocking level parameters for RX category 1.5

Requirement	Limits
	Receiver category 1.5
Blocking at ±2 MHz from OC edge f_{high} and f_{low}	≥ -43 dBm
Blocking at ±10 MHz from OC edge f_{high} and f_{low}	≥ -33 dBm
Blocking at ±5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -33 dBm

The blocking levels at the specified frequency offsets shall be equal to or greater than the limits Table 43, except at frequencies where spurious responses are found.

Table 43: Blocking level parameters for RX category 1

Requirement	Limits
	Receiver category 1
Blocking at ±2 MHz from Centre Frequency	≥ -20 dBm
Blocking at ±10 MHz from Centre Frequency	≥ -20 dBm
Blocking at ±5 % of Centre Frequency or 15 MHz, whichever is the greater	≥ -20 dBm

15.3 TEST PROCEDURES

Refer to chapter 5.18.6.3&5.18.6.4 of ETSI EN 300 220-1 V3.1.1 (2017-02)

Measurement	
☒Conducted measurement	☐Radiated measurement

15.4 TEST SETUP

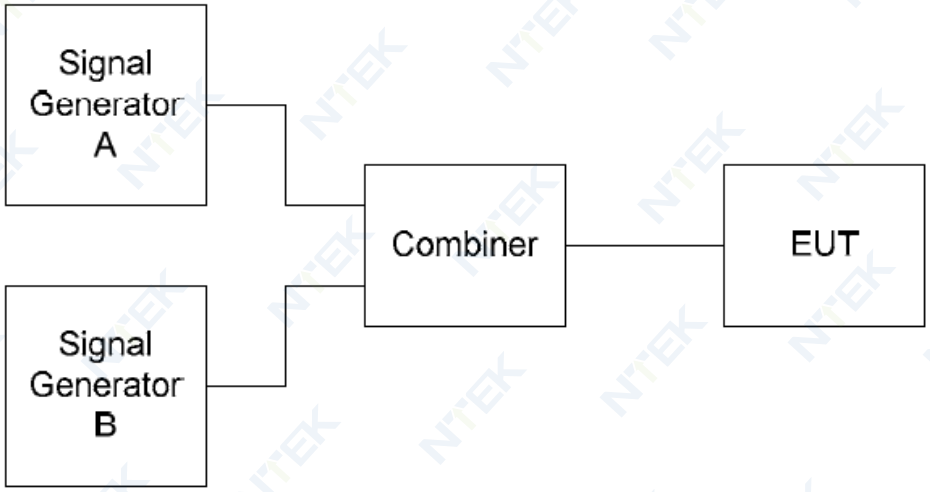


Figure 10: Blocking measurement arrangement

15.5 TEST RESULTS

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	RX-Band AC (870.5)		

870.5MHz

Flow=870.435MHz; Fhigh=870.565MHz

Receiver category	Frequency offset	Test Frequency (MHz)	Reciever BW(kHz)	Measurement Vause(dB)	≧Limit(dB)
2	+2 MHz of Flow	872.435	130	-27	-69
	-2 MHz of Flow	868.435	130	-24	-69
	+2 MHz of Fhigh	872.565	130	-23	-69
	-2 MHz of Fhigh	868.565	130	-22	-69
	+10 MHz of Fhigh	880.565	130	-26	-44
	-10 MHz of Fhigh	860.565	130	-22	-44
	+10 MHz of Flow	880.435	130	-21	-44
	-10 MHz of Flow	860.435	130	-20	-44
	-43.53MHz	826.97	130	-19	-44
	+43.53 MHz	914.03	130	-23	-44

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	RX-Band AC (875.5)		

875.5MHz

Flow=875.435MHz; Fhigh=875.565MHz

Receiver category	Frequency offset	Test Frequency (MHz)	Reciever BW(kHz)	Measurement Vause(dB)	≧Limit(dB)
2	+2 MHz of Flow	877.435	130	-30	-69
	-2 MHz of Flow	873.435	130	-27	-69
	+2 MHz of Fhigh	877.565	130	-26	-69
	-2 MHz of Fhigh	873.565	130	-25	-69
	+10 MHz of Fhigh	885.565	130	-29	-44
	-10 MHz of Fhigh	865.565	130	-25	-44
	+10 MHz of Flow	885.435	130	-24	-44
	-10 MHz of Flow	865.435	130	-23	-44
	-43.78MHz	831.72	130	-22	-44
	+43.78 MHz	919.28	130	-26	-44

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	RX-Band AA (863.5)		

863.5MHz

Flow=863.435MHz; Fhigh=863.565MHz

Receiver category	Frequency offset	Test Frequency (MHz)	Reciever BW(kHz)	Measurement Vause(dB)	≧Limit(dB)
2	+2 MHz of Flow	865.435	130	-31	-69
	-2 MHz of Flow	861.435	130	-28	-69
	+2 MHz of Fhigh	865.565	130	-27	-69
	-2 MHz of Fhigh	861.565	130	-26	-69
	+10 MHz of Fhigh	873.565	130	-30	-44
	-10 MHz of Fhigh	853.565	130	-26	-44
	+10 MHz of Flow	873.435	130	-25	-44
	-10 MHz of Flow	853.435	130	-24	-44
	-43.18MHz	820.32	130	-23	-44
	+43.18 MHz	906.68	130	-27	-44

EUT:	LoRa Wireless Module	Model Name:	LoRa-CC68-868
Temperature:	26°C	Relative Humidity:	53 %
Pressure:	1012 hPa	Test Voltage:	DC 3.3V
Test Mode:	RX-Band AA (869.5)		

869.5MHz

Flow=869.435MHz; Fhigh=869.565MHz

Receiver category	Frequency offset	Test Frequency (MHz)	Reciever BW(kHz)	Measurement Vause(dB)	≧Limit(dB)
2	+2 MHz of Flow	871.435	130	-29	-69
	-2 MHz of Flow	867.435	130	-26	-69
	+2 MHz of Fhigh	871.565	130	-25	-69
	-2 MHz of Fhigh	867.565	130	-24	-69
	+10 MHz of Fhigh	879.565	130	-28	-44
	-10 MHz of Fhigh	859.565	130	-24	-44
	+10 MHz of Flow	879.435	130	-23	-44
	-10 MHz of Flow	859.435	130	-22	-44
	-43.48MHz	826.02	130	-21	-44
	+43.48 MHz	912.98	130	-25	-44

APPENDIX-PHOTOGRAPHS OF EUT CONSTRUCTIONAL DETAILS

Radiated Measurement Photos





END OF REPORT