

FCC REPORT

Applicant: Jinan USR IOT Technology Limited
Address of Applicant: Floor 2, Wuzhou Scientific Research Building, No.1100
Shunfeng Street, Gaoxin District, Jinan, Shandong, China

Equipment Under Test (EUT)

Product Name: LoRa Gateway
Model No.: USR-LG220, USR-LG210, USR-LG230, USR-LG240, USR-LG250, USR-LG260, USR-LG270, USR-LG280, USR-LG290

Applicable standards: FCC CFR Title 47 Part 15 Subpart B

Date of sample receipt: 10 Aug., 2018

Date of Test: 13 Aug., to 21 Spe., 2018

Date of report issued: 25 Spe., 2018

Test Result: PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

2 Version

Version No.	Date	Description
00	25 Spe., 2018	Original

Tested by:

Zora Lee

Date:

25 Spe., 2018

Test Engineer

Reviewed by:

Wimer Zhang

Date:

25 Spe., 2018

Project Engineer

3 Contents

Page

1	COVER PAGE.....	1
2	VERSION	2
3	CONTENTS	3
4	TEST SUMMARY.....	4
5	GENERAL INFORMATION.....	5
5.1	CLIENT INFORMATION	5
5.2	GENERAL DESCRIPTION OF E.U.T.	5
5.3	TEST MODE.....	5
5.4	MEASUREMENT UNCERTAINTY.....	5
5.5	DESCRIPTION OF SUPPORT UNITS	6
5.6	RELATED SUBMITTAL(s) / GRANT (s).....	6
5.7	LABORATORY FACILITY	6
5.8	LABORATORY LOCATION	6
5.9	TEST INSTRUMENTS LIST.....	7
6	TEST RESULTS AND MEASUREMENT DATA.....	8
6.1	CONDUCTED EMISSION.....	8
6.2	RADIATED EMISSION	11
7	TEST SETUP PHOTO	17
8	EUT CONSTRUCTIONAL DETAILS	18

4 Test Summary

Test Item	Section in CFR 47	Result
Conducted Emission	Part 15.107	Pass
Radiated Emission	Part 15.109	Pass
<i>Remark:</i> <i>Pass: The EUT complies with the essential requirements in the standard.</i> <i>N/A: The EUT not applicable of the test item.</i>		

5 General Information

5.1 Client Information

Applicant:	Jinan USR IOT Technology Limited
Address of Applicant:	Floor 2, Wuzhou Scientific Research Building, No.1100 Shunfeng Street, Gaoxin District, Jinan, Shandong, China
Manufacturer/Factory:	Jinan USR IOT Technology Limited
Address:	Floor 2, Wuzhou Scientific Research Building, No.1100 Shunfeng Street, Gaoxin District, Jinan, Shandong, China

5.2 General Description of E.U.T.

Product Name:	LoRa Gateway
Model No.:	USR-LG220, USR-LG210, USR-LG230, USR-LG240, USR-LG250, USR-LG260, USR-LG270, USR-LG280, USR-LG290
Power supply:	DC 5-36V(Nominal Match: 12V, 1A)
Test Sample Condition:	The test samples were provided in good working order with no visible defects.
Remark:	Mode No.: USR-LG220, USR-LG210, USR-LG230, USR-LG240, USR-LG250, USR-LG260, USR-LG270, USR-LG280, USR-LG290, were identical inside, the electrical circuit design, layout, components used and internal wiring, with only difference being model name.

5.3 Test Mode

Operating mode	Detail description
Working mode	Keep the EUT in Working mode
The sample was placed 0.8m above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.	

5.4 Measurement Uncertainty

Parameters	Expanded Uncertainty
Conducted Emission (9kHz ~ 30MHz)	±2.22 dB (k=2)
Radiated Emission (9kHz ~ 30MHz)	±2.76 dB (k=2)
Radiated Emission (30MHz ~ 1000MHz)	±4.28 dB (k=2)
Radiated Emission (1GHz ~ 18GHz)	±5.72 dB (k=2)
Radiated Emission (18GHz ~ 40GHz)	±2.88 dB (k=2)

5.5 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC ID/DoC
DELL	PC	OPTIPLEX745	N/A	DoC
DELL	MONITOR	E178FPC	N/A	DoC
DELL	KEYBOARD	SK-8115	N/A	DoC
DELL	MOUSE	MOC5UO	N/A	DoC
Jinan USR IOT	Adapter	DQS151-120100-VU	N/A	N/A

5.6 Related Submittal(s) / Grant (s)

This is an original grant, no related submittals and grants.

5.7 Laboratory Facility

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

- **FCC - Registration No.: 727551**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The Registration No. is 727551.

- **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

5.8 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.
Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road,
Bao'an District, Shenzhen, Guangdong, China
Tel: +86-755-23118282, Fax: +86-755-23116366
Email: info@ccis-cb.com, Website: http://www.ccis-cb.com

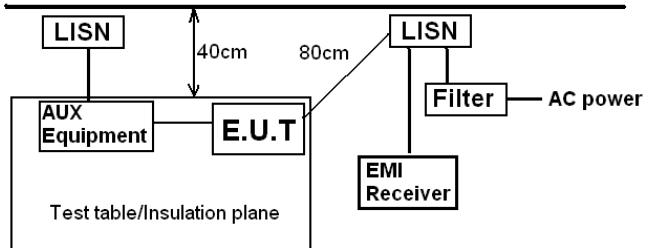
5.9 Test Instruments list

Radiated Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
3m SAC	SAEMC	9m*6m*6m	966	07-22-2017	07-21-2020
Loop Antenna	SCHWARZBECK	FMZB1519B	00044	03-16-2018	03-15-2019
BiConiLog Antenna	SCHWARZBECK	VULB9163	497	03-16-2018	03-15-2019
Horn Antenna	SCHWARZBECK	BBHA9120D	916	03-16-2018	03-15-2019
Horn Antenna	SCHWARZBECK	BBHA9120D	1805	06-22-2017	06-21-2020
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170582	11-21-2017	11-20-2018
EMI Test Software	AUDIX	E3	Version: 6.110919b		
Pre-amplifier	HP	8447D	2944A09358	03-07-2018	03-06-2019
Pre-amplifier	CD	PAP-1G18	11804	03-07-2018	03-06-2019
Spectrum analyzer	Rohde & Schwarz	FSP30	101454	03-07-2018	03-06-2019
Spectrum analyzer	Rohde & Schwarz	FSP40	100363	11-21-2017	11-20-2018
EMI Test Receiver	Rohde & Schwarz	ESRP7	101070	03-07-2018	03-06-2019
Cable	ZDECL	Z108-NJ-NJ-81	1608458	03-07-2018	03-06-2019
Cable	MICRO-COAX	MFR64639	K10742-5	03-07-2018	03-06-2019
Cable	SUHNER	SUCOFLEX100	58193/4PE	03-07-2018	03-06-2019

Conducted Emission:					
Test Equipment	Manufacturer	Model No.	Serial No.	Cal. Date (mm-dd-yy)	Cal. Due date (mm-dd-yy)
EMI Test Receiver	Rohde & Schwarz	ESCI	101189	03-07-2018	03-06-2019
Pulse Limiter	SCHWARZBECK	OSRAM 2306	9731	03-07-2018	03-06-2019
LISN	CHASE	MN2050D	1447	03-19-2018	03-18-2019
LISN	Rohde & Schwarz	ESH3-Z5	8438621/010	07-21-2018	07-20-2019
Cable	HP	10503A	N/A	03-07-2018	03-06-2019
EMI Test Software	AUDIX	E3	Version: 6.110919b		

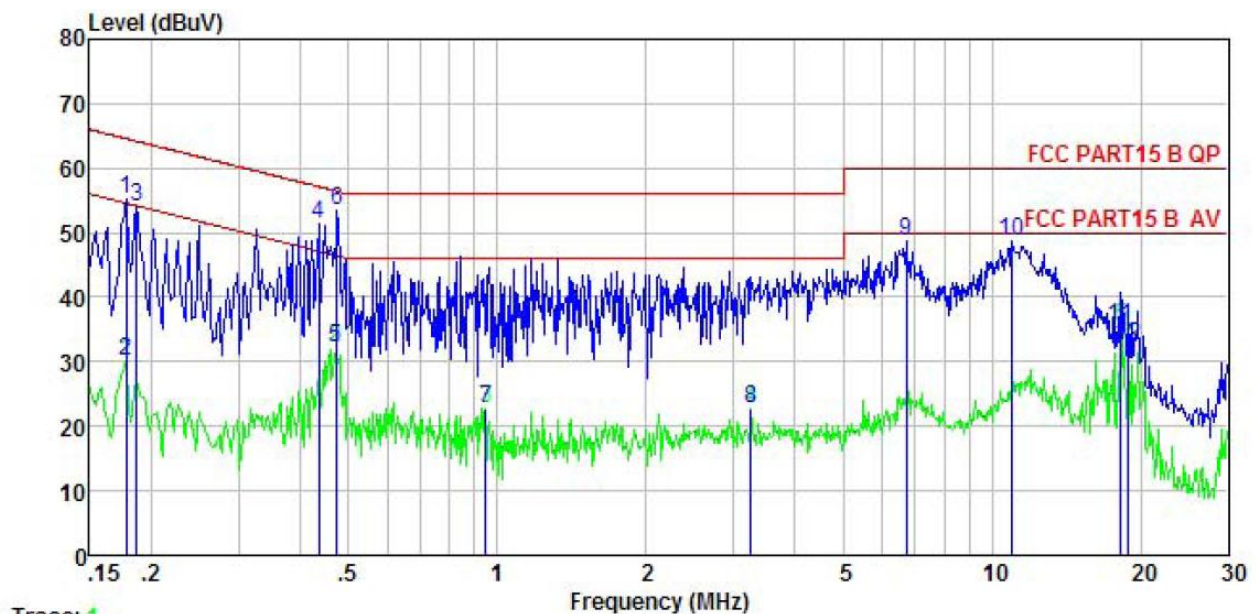
6 Test results and Measurement Data

6.1 Conducted Emission

Test Requirement:	FCC Part 15 B Section 15.107					
Test Method:	ANSI C63.4:2014					
Test Frequency Range:	150kHz to 30MHz					
Class / Severity:	Class B					
Receiver setup:	RBW=9kHz, VBW=30kHz					
Limit:	Frequency range (MHz)	Limit (dBμV)				
		Quasi-peak		Average		
		0.15-0.5		66 to 56*		56 to 46*
		0.5-5		56		46
	0.5-30		60		50	
* Decreases with the logarithm of the frequency.						
Test setup:	<div><p style="text-align: center;">Reference Plane</p><p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div>					
Test procedure	<div>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network(L.I.S.N.). The provide a 50ohm/50uH coupling impedance for the measuring equipment.</div> <div>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs).</div> <div>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.</div>					
Test environment:	Temp.:	23 °C	Humid.:	56%	Press.:	101kPa
Test Instruments:	Refer to section 5.9 for details					
Test mode:	Refer to section 5.3 for details					
Test results:	Pass					

Measurement data:

Product name:	LoRa Gateway	Product model:	USR-LG220
Test by:	Zora	Test mode:	Working mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Line
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5℃ Humi: 55%

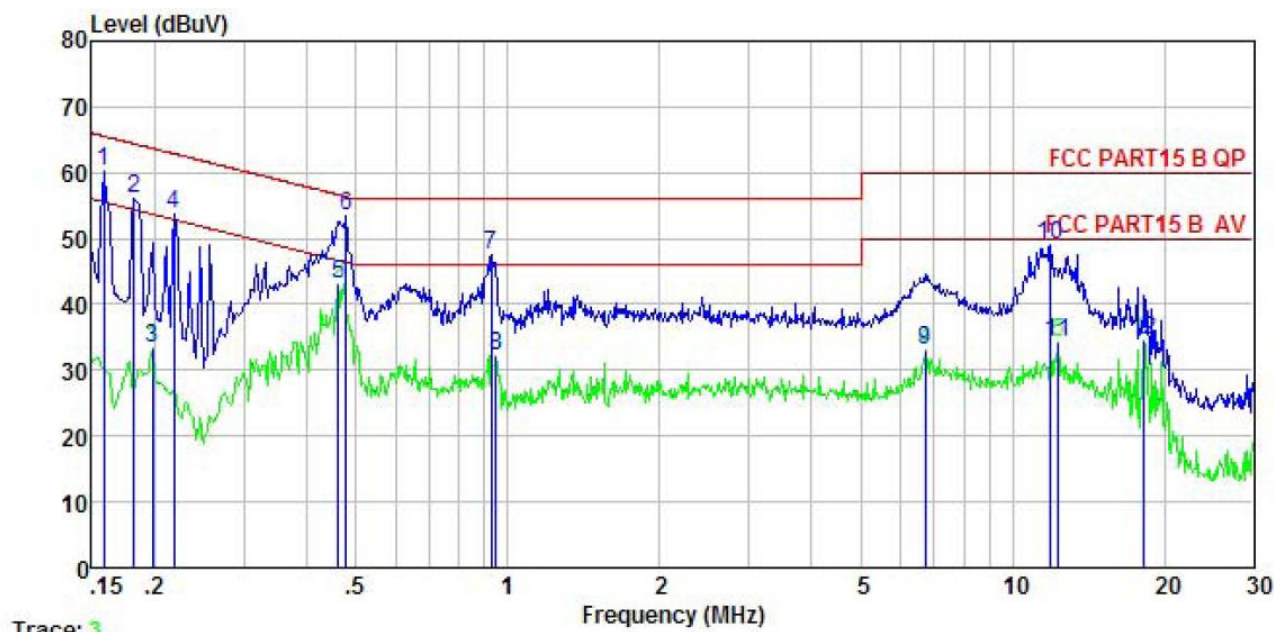


	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.178	44.22	0.16	10.77	55.15	64.59	-9.44	QP
2	0.178	19.13	0.16	10.77	30.06	54.59	-24.53	Average
3	0.186	42.97	0.16	10.76	53.89	64.20	-10.31	QP
4	0.435	40.66	0.12	10.73	51.51	57.15	-5.64	QP
5	0.471	21.24	0.12	10.75	32.11	46.49	-14.38	Average
6	0.474	42.42	0.12	10.75	53.29	56.45	-3.16	QP
7	0.948	11.65	0.13	10.85	22.63	46.00	-23.37	Average
8	3.258	11.70	0.17	10.91	22.78	46.00	-23.22	Average
9	6.698	37.56	0.24	10.81	48.61	60.00	-11.39	QP
10	10.963	37.54	0.32	10.93	48.79	60.00	-11.21	QP
11	18.232	24.14	0.29	10.92	35.35	50.00	-14.65	Average
12	18.920	21.23	0.28	10.92	32.43	50.00	-17.57	Average

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss.

Product name:	LoRa Gateway	Product model:	USR-LG220
Test by:	Zora	Test mode:	Working mode
Test frequency:	150 kHz ~ 30 MHz	Phase:	Neutral
Test voltage:	AC 120 V/60 Hz	Environment:	Temp: 22.5℃ Humi: 55%



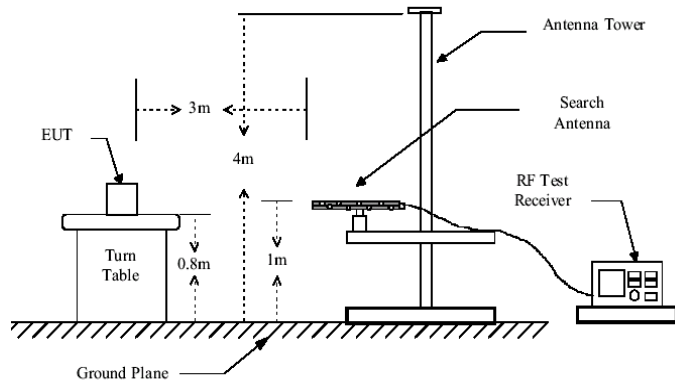
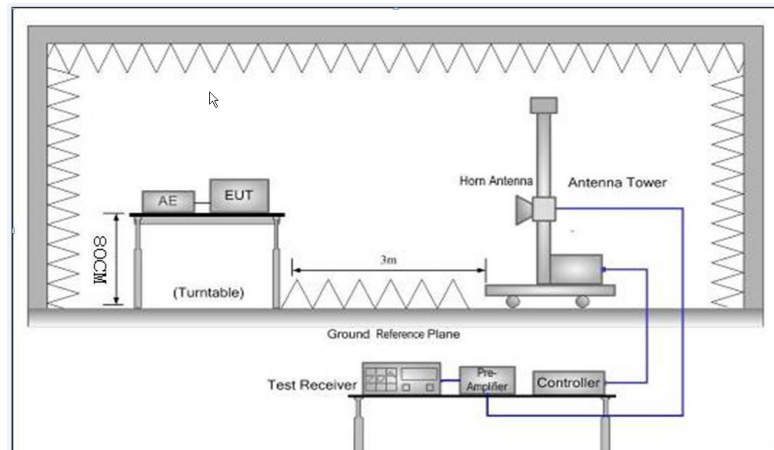
Trace: 3

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.158	48.34	0.98	10.77	60.09	65.56	-5.47	QP
2	0.182	44.36	0.94	10.77	56.07	64.42	-8.35	QP
3	0.198	21.60	0.92	10.76	33.28	53.71	-20.43	Average
4	0.219	41.95	0.93	10.76	53.64	62.88	-9.24	QP
5	0.461	31.34	0.97	10.74	43.05	46.67	-3.62	Average
6	0.479	41.64	0.97	10.75	53.36	56.36	-3.00	QP
7	0.928	35.64	0.97	10.85	47.46	56.00	-8.54	QP
8	0.948	20.39	0.97	10.85	32.21	46.00	-13.79	Average
9	6.698	21.15	1.02	10.81	32.98	50.00	-17.02	Average
10	11.870	37.06	0.97	10.92	48.95	60.00	-11.05	QP
11	12.318	22.37	0.96	10.92	34.25	50.00	-15.75	Average
12	18.232	22.93	0.76	10.92	34.61	50.00	-15.39	Average

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss.

6.2 Radiated Emission

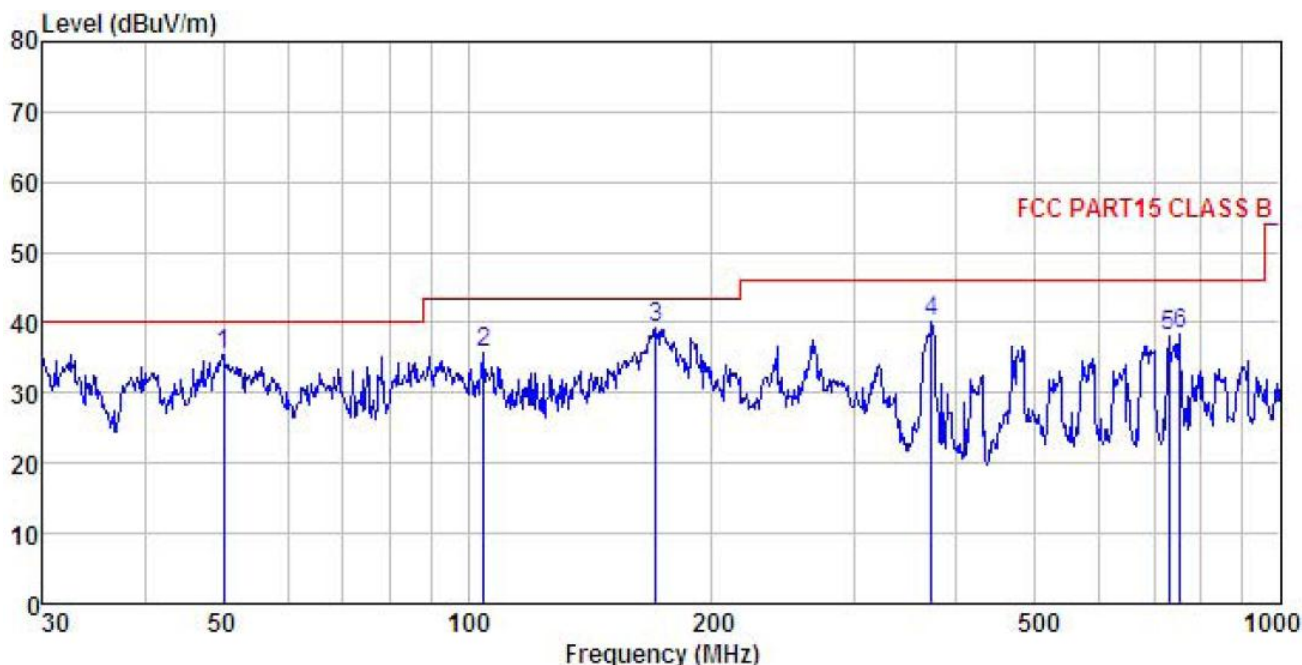
Test Requirement:	FCC Part 15 B Section 15.109				
Test Method:	ANSI C63.4:2014				
Test Frequency Range:	30MHz to 6000MHz				
Test site:	Measurement Distance: 3m (Semi-Anechoic Chamber)				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
RMS		1MHz	3MHz	Average Value	
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
	30MHz-88MHz		40.0		Quasi-peak Value
	88MHz-216MHz		43.5		Quasi-peak Value
	216MHz-960MHz		46.0		Quasi-peak Value
	960MHz-1GHz		54.0		Quasi-peak Value
	Above 1GHz		54.0		Average Value
74.0			Peak Value		
Test setup:	Below 1GHz				
					
Test setup:	Above 1GHz				
					

Test Procedure:	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. 4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 					
Test environment:	Temp.:	25 °C	Humid.:	55%	Press.:	1 01kPa
Test Instruments:	Refer to section 5.9 for details					
Test mode:	Refer to section 5.3 for details					
Test results:	Passed					
Remark:	All of the observed value above 6GHz were the noise floor , which were not recorded					

Measurement Data:

Below 1GHz:

Product Name:	LoRa Gateway	Product model:	USR-LG220
Test By:	Zora	Test mode:	Working mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Vertical
Test Voltage:	AC 120V/60Hz	Environment:	Temp: 24℃ Humi: 57%

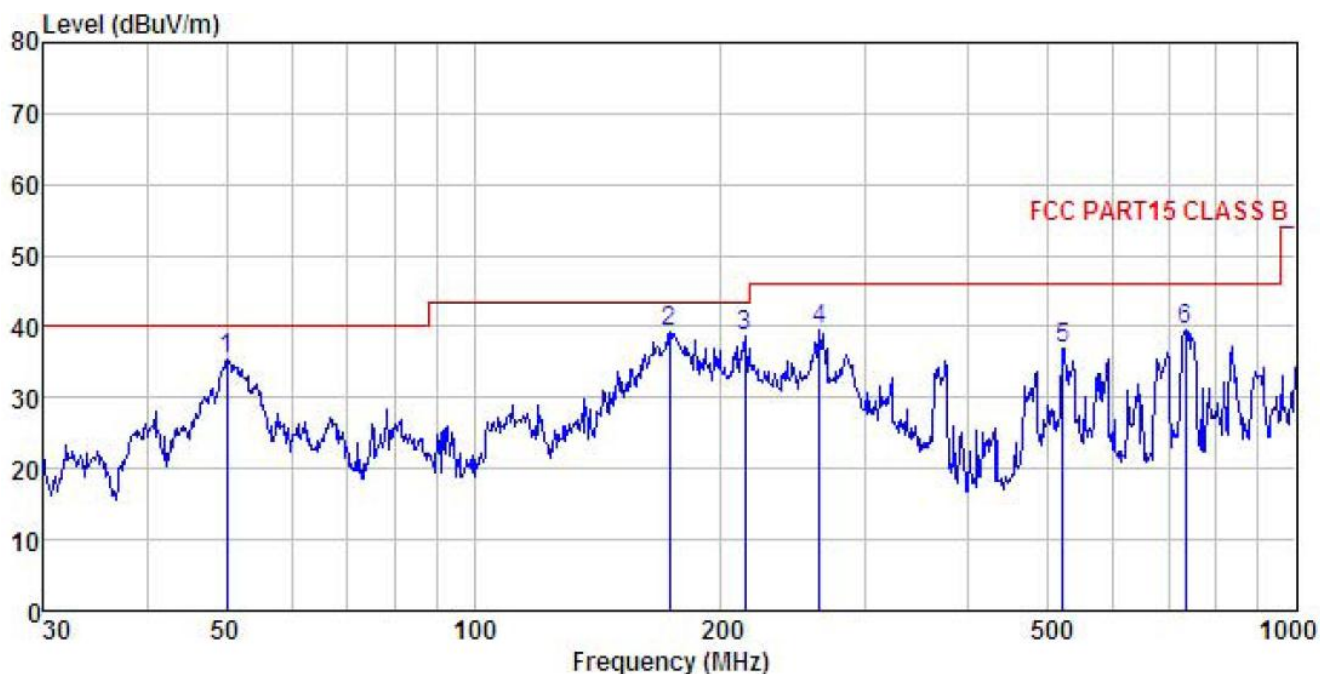


	Freq	ReadAntenna	Cable	Aux	Preamp	Level	Limit	Over	Remark
	MHz	Level	Factor	Loss	Factor	Factor	Level	Line	Limit
		dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB
1	50.057	49.80	14.09	1.25	0.00	29.82	35.32	40.00	-4.68 QP
2	104.536	51.14	11.98	1.99	0.00	29.50	35.61	43.50	-7.89 QP
3	170.195	56.11	9.41	2.66	0.00	29.05	39.13	43.50	-4.37 QP
4	372.005	50.71	15.01	3.09	0.00	28.66	40.15	46.00	-5.85 QP
5	729.358	41.95	20.51	4.29	0.00	28.56	38.19	46.00	-7.81 QP
6	752.743	41.61	21.00	4.36	0.00	28.46	38.51	46.00	-7.49 QP

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	LoRa Gateway	Product model:	USR-LG220
Test By:	Zora	Test mode:	Working mode
Test Frequency:	30 MHz ~ 1 GHz	Polarization:	Horizontal
Test Voltage:	AC 120V/60Hz	Environment:	Temp: 24°C Humi: 57%



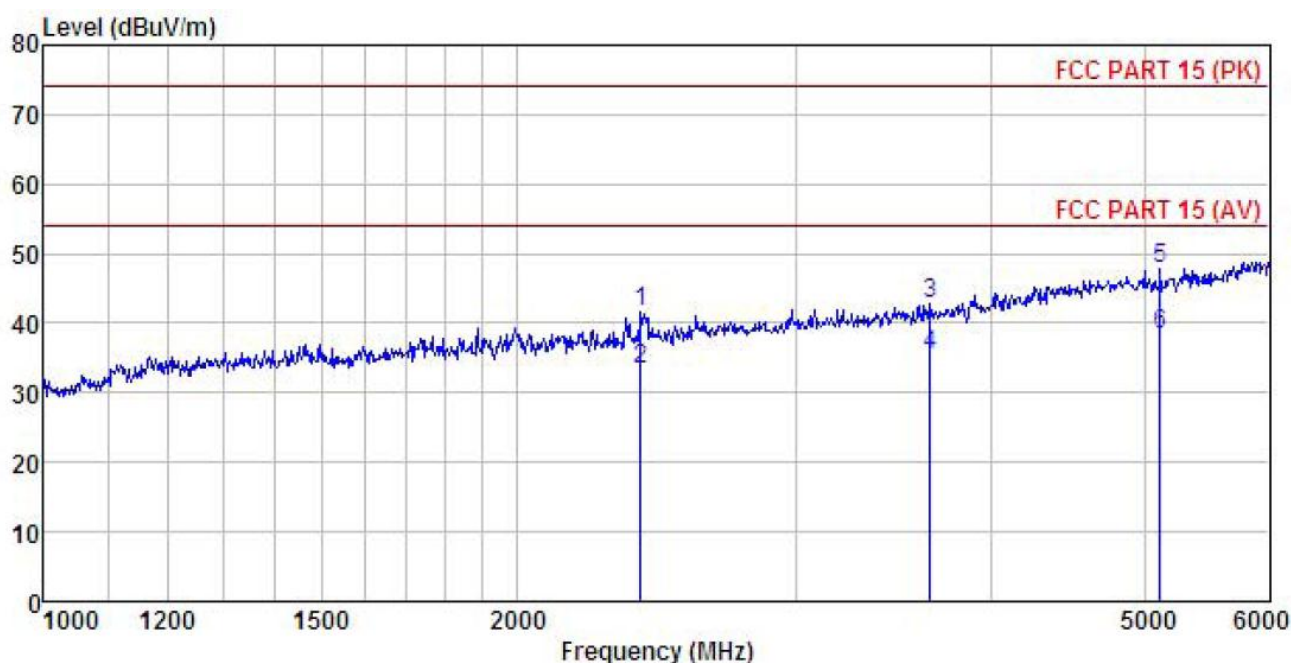
	Freq	ReadAntenna	Cable	Aux	Preamp	Level	Limit	Over	Remark
	MHz	Level	Factor	Loss	Factor	Factor	Line	Limit	
		dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB
1	50.057	49.79	14.09	1.25	0.00	29.82	35.31	40.00	-4.69 QP
2	173.205	55.93	9.53	2.68	0.00	29.02	39.12	43.50	-4.38 QP
3	213.763	52.41	12.04	2.85	0.00	28.74	38.56	43.50	-4.94 QP
4	262.896	51.85	13.38	2.84	0.00	28.52	39.55	46.00	-6.45 QP
5	520.888	44.57	17.71	3.73	0.00	29.01	37.00	46.00	-9.00 QP
6	734.491	43.07	20.64	4.30	0.00	28.54	39.47	46.00	-6.53 QP

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Above 1GHz:

Product Name:	LoRa Gateway	Product model:	USR-LG220
Test By:	Zora	Test mode:	Working mode
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Vertical
Test Voltage:	AC 120V/60Hz	Environment:	Temp: 24℃ Humi: 57%

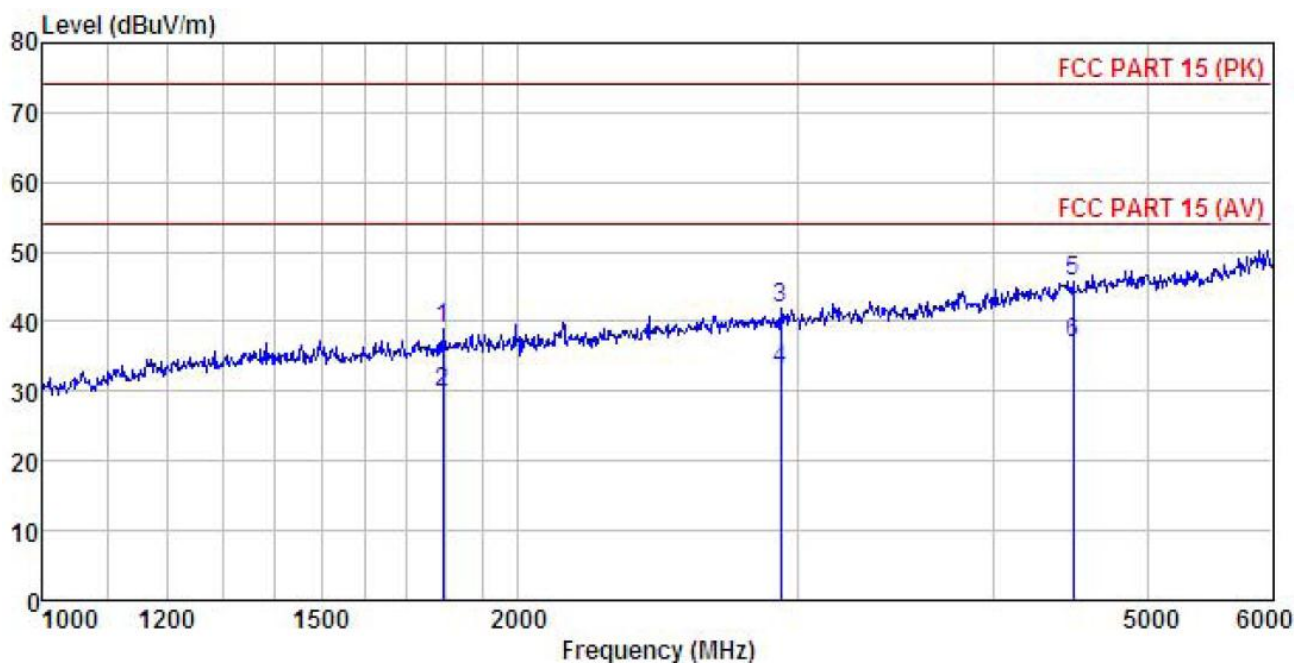


	Freq	ReadAntenna	Cable	Aux	Preamp	Level	Limit	Over	
	MHz	Level	Factor	Loss	Factor	Factor	Line	Limit	Remark
		dBuV	dB/m	dB	dB	dB	dBuV/m	dBuV/m	dB
1	2393.094	48.65	27.37	4.69	2.83	41.92	41.62	74.00	-32.38 Peak
2	2393.094	40.36	27.37	4.69	2.83	41.92	33.33	54.00	-20.67 Average
3	3652.610	46.04	29.32	5.94	2.97	41.61	42.66	74.00	-31.34 Peak
4	3652.610	38.78	29.32	5.94	2.97	41.61	35.40	54.00	-18.60 Average
5	5115.591	46.81	32.02	7.03	3.78	41.92	47.72	74.00	-26.28 Peak
6	5115.591	37.58	32.02	7.03	3.78	41.92	38.49	54.00	-15.51 Average

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product Name:	LoRa Gateway	Product model:	USR-LG220
Test By:	Zora	Test mode:	Working mode
Test Frequency:	1 GHz ~ 6 GHz	Polarization:	Horizontal
Test Voltage:	AC 120V/60Hz	Environment:	Temp: 24℃ Humi: 57%



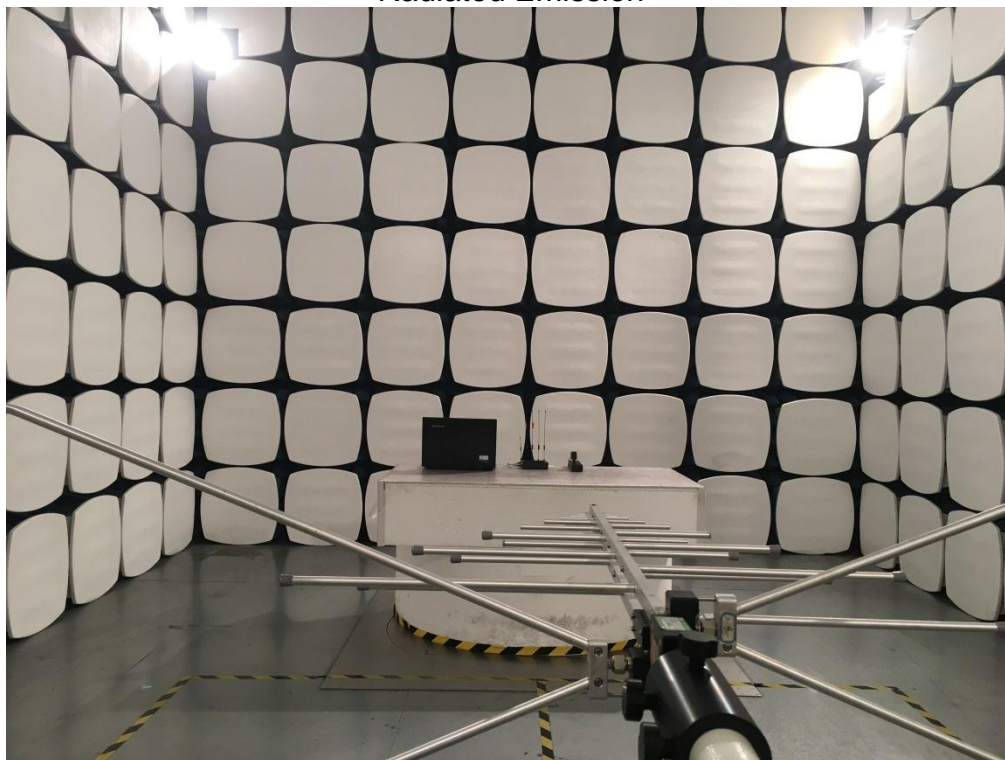
	Freq	Read Level	Antenna Factor	Cable Loss	Aux Factor	Preamp Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB		dB	dBuV/m	dBuV/m	dB	
1	1790.190	47.71	25.94	4.10	2.37	41.19	38.93	74.00	-35.07	Peak
2	1790.190	38.69	25.94	4.10	2.37	41.19	29.91	54.00	-24.09	Average
3	2930.156	46.96	28.47	5.28	2.90	41.56	42.05	74.00	-31.95	Peak
4	2930.156	37.85	28.47	5.28	2.90	41.56	32.94	54.00	-21.06	Average
5	4488.392	46.38	31.08	6.79	3.53	42.04	45.74	74.00	-28.26	Peak
6	4488.392	37.62	31.08	6.79	3.53	42.04	36.98	54.00	-17.02	Average

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

7 Test Setup Photo

Radiated Emission



Conducted Emission



8 EUT Constructional Details

Reference to the test report No. CCISE180803501

-----End of report-----