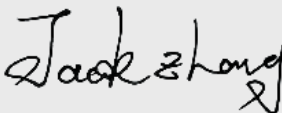


Test report No:
2260749R-RF-US-P06V01

FCC & ISED TEST REPORT

Product Name	LoRa module
Trademark	Murata
Model and /or type reference	1SJ
FCC ID	VPYLBAA0QB1SJ
IC	772C-LBAA0QB1SJ
Applicant's name / address	Murata Manufacturing Co., Ltd. 10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan
Test method requested, standard	FCC CFR Title 47 Part 15 Subpart C Section 15.247 ANSI C63.10: 2013 KD558074 D01 15.247 Meas Guidance v05r02 RSS-Gen Issue 5 / RSS-247 Issue 2
Verdict Summary	IN COMPLIANCE
Documented by (name / position & signature)	Tim Cao/Project Engineer 
Approved by (name / position & signature)	Jack Zhang/Manager 
Date of issue	2022-07-12
Report Version	V1.0
Report template No	Template_FCC Part 15C-RF-V1.0

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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

GENERAL CONDITIONS

Test Location	No. 99, Hongye Road, Suzhou Industrial Park Suzhou, 215006, P.R. China
Date(receive sample)	Jun. 23, 2022
Date (start test)	Jun. 27, 2022
Date (finish test)	Jul. 07, 2022

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not measured	N/M

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	: Equipment Under Test
QP	: Quasi-Peak
CAV	: CISPR Average
AV	: Average
CDN	: Coupling Decoupling Network
SAC	: Semi-Anechoic Chamber
OATS	: Open Area Test Site
BW	: Bandwidth
AM	: Amplitude Modulation
PM	: Pulse Modulation
HCP	: Horizontal Coupling Plane
VCP	: Vertical Coupling Plane
U_N	: Nominal voltage
T_x	: Transmitter
R_x	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report No.	Version	Description	Issued Date
2260749R-RF-US-P06V01	V1.0	Initial issue of report.	2022-07-12

REMARKS AND COMMENTS

1. The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with Part 15 Subpart C Paragraph 15.247, RSS-Gen Issue 5, RSS-247 Issue 2.
3. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to account the uncertainty associated with the measurement result.
4. The test results presented in this report relate only to the object tested.
5. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification (Suzhou) Co., Ltd.
6. This report will not be used for social proof function in China market.
7. DEKRA declines any responsibility with the following test data provided by customer that may affect the validity of result:
 - Chapter 1.1 General Description of the Item(s);
 - Chapter 1.2 Antenna Informaion;
 - Chapter 1.3 Channel List.
8. This product has been passed FCC & IC certification, now a new antenna is added, after retest output power and radiated surprious emission, this change confirm with class II premissive change and C2PC requirements.

USED EQUIPMENT

Emissions in non-restricted frequency bands/ Occupied Bandwidth/ Fundamental emission output power Power Spectral Density / TR8

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2021.07.11	2022.07.10
EXA Spectrum Analyzer	Keysight	N9010A	MY55370495	2021.08.12	2022.08.11
Coaxial Cable	Woken	A50-SMAMSMAM-1m	20111443	2022.01.18	2023.01.17
Temperature/Humidity Meter	RTS	RTS-8S	RF08	2021.07.09	2022.07.08
Dekra test software	Dekra	-	-	-	-

Radiated Emission(30MHz-1GHz) / AC3

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
EMI Test Receiver	R&S	ESCI	100176	2021.08.15	2022.08.14
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9168	1231	2022.05.21	2023.05.20
Coaxial Cable	Huber+Suhner	RG 214	AC3-C	2022.03.30	2023.03.29
Tunable Bandreject filter	Wainwright	WRCT890/960-5/40-8SSK	1	2021.07.19	2022.07.18
Temperature/Humidity Meter	RTS	RTS-8S	AC3-TH	2021.11.23	2022.11.22
Dekra test software	Dekra	-	-	-	-

Radiated Emission / AC5(1GHz-40GHz)(Chamber details)

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
MXA Signal Analyzer	Keysight	N9020B	MY60112218	2022.01.09	2023.01.08
Amplifier	Keleto	LNPA	SK20190225	2021.09.26	2022.09.25
Pre-Amplifier	EMCI	EMC184045SE	980263	2022.05.21	2023.05.20
DRG Horn Antenna	ETS-Lindgren	3117	167055	2021.08.06	2022.08.05
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2022.05.19	2023.05.18
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2022.03.12	2023.03.11
Coaxial Cable	ROSENBERGER	LA1-C011-2000/3000	AC5-40G	2022.03.21	2023.03.20
Temperature/Humidity Meter	RTS	RTS-8S	AC5-TH	2021.11.23	2022.11.22
Dekra test software	Dekra	-	-	-	-

UNCERTAINTY

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95% .

Test item	Uncertainty
AC Power Line Conducted Emission	9kHz~150kHz: 2.80dB 150kHz~30MHz: 2.40dB
Peak Power Output	± 1.27 dB
Radiated Emission(30MHz~1GHz)	Horizontal: 30MHz~200MHz: 3.50 dB 300MHz~1GHz: 3.60 dB Vertical: 30MHz~200MHz: 3.60 dB 300MHz~1GHz: 3.50 dB
Radiated Emission(1GHz~26.5GHz)	Horizontal: 1GHz~18GHz: 5.00 dB Vertical: 1GHz~18GHz: 4.80 dB
RF antenna conducted test	± 1.27 dB
Radiated Emission Band Edge	± 3.9 dB
DTS Bandwidth	± 150 Hz
Occupied Bandwidth	± 1 kHz
Power Density	± 1.27 dB

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Product Name	LoRa module
Model No.	1SJ
Trademark	Murata
FCC ID	VPYLBA0QB1SJ
IC.....	772C-LBAA0QB1SJ
Manufacturer.....	Murata Manufacturing Co., Ltd.
Manufacturer Address.....	10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan

Wireless specification.....	LoRa
Operating frequency range(s)	125kHz: 902.3 ~ 914.9 MHz; 500kHz: 903 ~914.2 MHz
Type of Modulation.....	LoRa
Spread Factor (SF)	125kHz: 7 ~ 10 500kHz: 7 ~ 12
Channel Space	125kHz: 200kHz 500kHz: 1.6MHz
Number of channel.....	125kHz: 64 channels 500kHz: 8 channels

Rated power supply	Voltage and Frequency	
	☐	AC: 220 – 240 V, 50/60 Hz
	☐	AC: 110 – 130 V, 50/60 Hz
	☒	DC: 3.0 – 3.6 V
	☐	Battery:
	☐	PoE:
Mounting position.....	☐	Table top equipment
	☐	Wall/Ceiling mounted equipment
	☐	Floor standing equipment
	☐	Hand-held equipment
	☒	Other: Wireless Module

1.2 Antenna Information

Antenna model / type number.....:	NN02-224		
Antenna serial number	N/A		
Antenna Delivery	☒	1TX + 1RX	
	☐	2TX + 2RX	
	☐	Others:.....	
Antenna technology.....:	☒	SISO	
	☐	MIMO	☐ CDD
			☐ Beam-forming
Antenna Type.....:	☒	External	☐ Dipole
			☒ Chip
			☐ Sectorized
	☐	Internal	☐ Chip
			☐ PIFA
			☐ PCB
			☐ Metal
			☐ Others:.....
Antenna Gain.....:	902~928MHz: 0.9 dBi		

1.3 Channel List

LoRa Working Frequency of Each Channel: (For 125kHz)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
01	902.3 MHz	02	902.5 MHz	03	902.7 MHz	04	902.9 MHz
05	903.1 MHz	06	903.3 MHz	07	903.5 MHz	08	903.7 MHz
09	903.9 MHz	10	904.1 MHz	11	904.3 MHz	12	904.5 MHz
13	904.7 MHz	14	904.9 MHz	15	905.1 MHz	16	905.3 MHz
17	905.5 MHz	18	905.7 MHz	19	905.9 MHz	20	906.1 MHz
21	906.3 MHz	22	906.5 MHz	23	906.7 MHz	24	906.9 MHz
25	907.1 MHz	26	907.3 MHz	27	907.5 MHz	28	907.7 MHz
29	907.9 MHz	30	908.1 MHz	31	908.3 MHz	32	908.5 MHz
33	908.7 MHz	34	908.9 MHz	35	909.1 MHz	36	909.3 MHz
37	909.5 MHz	38	909.7 MHz	39	909.9 MHz	40	910.1 MHz
41	910.3 MHz	42	910.5 MHz	43	910.7 MHz	44	910.9 MHz
45	911.1 MHz	46	911.3 MHz	47	911.5 MHz	48	911.7 MHz
49	911.9 MHz	50	912.1 MHz	51	912.3 MHz	52	912.5 MHz
53	912.7 MHz	54	912.9 MHz	55	913.1 MHz	56	913.3 MHz
57	913.5 MHz	58	913.7 MHz	59	913.9 MHz	60	914.1 MHz
61	914.3 MHz	62	914.5 MHz	63	914.7 MHz	64	914.9 MHz
LoRa Working Frequency of Each Channel: (For 500kHz)							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
65	903 MHz	66	904.6 MHz	67	906.2 MHz	68	907.8 MHz
69	909.4 MHz	70	911 MHz	71	912.6 MHz	72	914.2 MHz

1.4 Power Setting

	LoRa 125kHz				LoRa 500kHz			
	Channel	Frequency	SF	Power setting	Channel	Frequency	SF	Power setting
Lowest Channel	CH01	902.3 MHz	10	22	CH65	903 MHz	12	22
Middle Channel	CH32	908.5 MHz	10	22	CH68	907.8 MHz	12	22
Highest Channel	CH64	914.9 MHz	10	22	CH72	914.2 MHz	12	22

Note: The General Description of the Item , antenna information, Channel List and power setting for the EUT in clause 1 are provided and confirmed by the client.

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

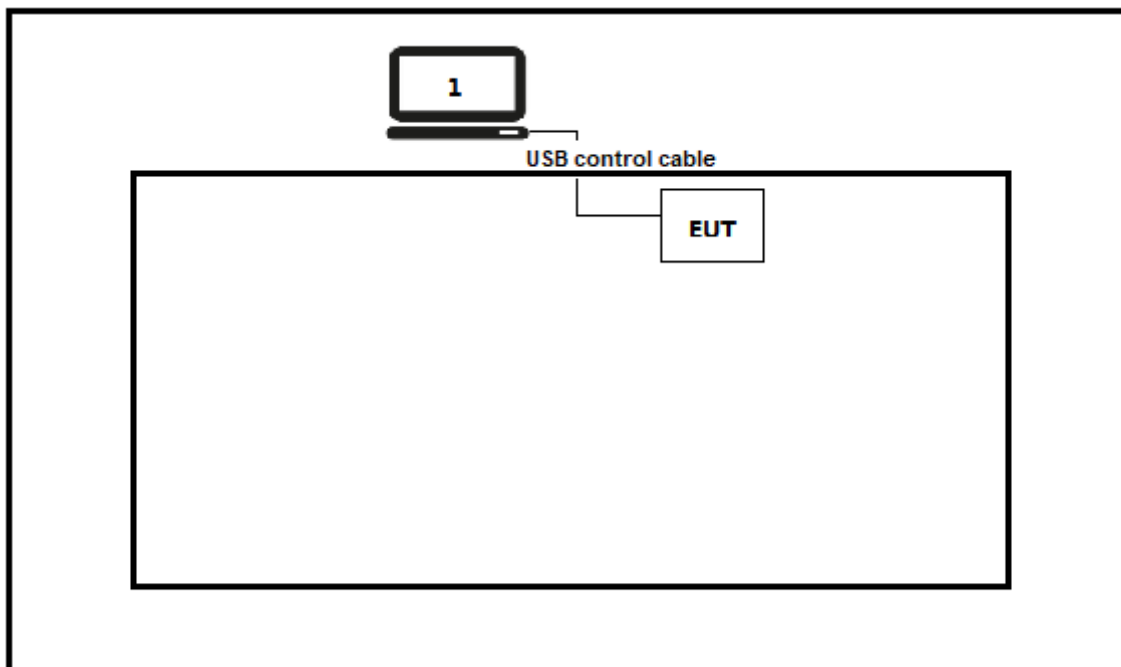
Test Mode For LoRa	Mode 1: Transmit by LoRa_125kHz
	Mode 2: Transmit by LoRa_500kHz

2.2 Auxiliary equipment / Test software for the EUT

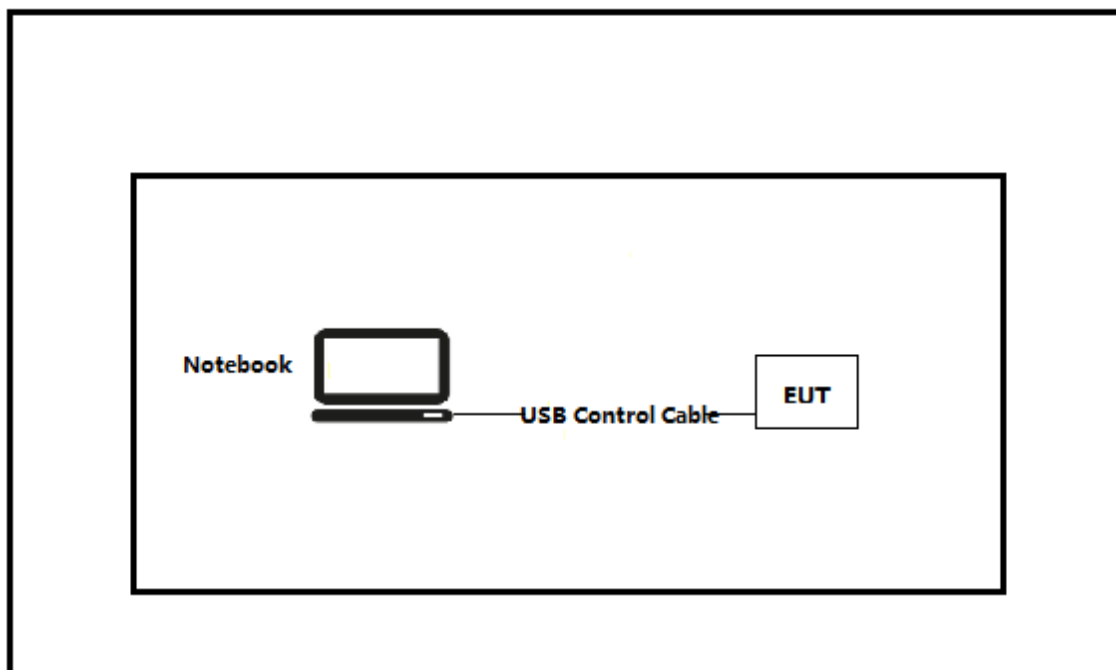
Auxiliary equipment	Type / Version	Manufacturer	Supplied by
Notebook	Think pad x220	Lenovo	Adapter
software	Type / Version	Manufacturer	Supplied by
MurataLoRaModuleTestTool	V0.0.01	N/A	N/A

2.3 Test Configuration / Block diagram used for tests

Test setup Diagram- AC Line Conducted Emission Test



Test setup Diagram- Conducted test



2.4 Testing process

1	Setup the EUT as shown in Section 2.3.
2	Execute the [MurataLoRaModuleTestTool] on the notebook.
3	Configure the test mode, the test channel, and the data rate.
4	Verify that the EUT works properly.

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
FCC CFR Title 47 Part 15 Subpart C Section 15.247	2022	Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 558074 D01 v05r02	2019	Guidance for performing compliance measurements on Digital Transmission System (DTS) operating under section 15.247
RSS-Gen Issue 5 Amendment 1	2019	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 2	2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

3.2 Deviation(s) from the Standard(s) / Test Specification(s)

The following deviation(s) was / were made from the published requirements of the listed standards: N/A.

(Please define the deviations from the standard(s) if applicable)

3.3 Overview of results

For FCC

Requirement – Test case	Basic standard(s)	Verdict	Remark
Emissions in restricted frequency bands	FCC 15.247(b)(3)	PASS	---
Fundamental emission output power	FCC 15.247(d), FCC 15.209	PASS	---

For ISED

Requirement – Test case	Basic standard(s)	Verdict	Remark
Emissions in restricted frequency bands	RSS-Gen Issue 5 Section 8.9	PASS	---
Fundamental emission output power	RSS-247 Issue 2 Section 5.4(d)	PASS	---

3.4 Test Facility

USA	:	FCC Designation Number: CN1199
CA	:	ISED CAB identifier: CN0040

4 TEST RESULTS

4.1 Emissions in restricted frequency bands

VERDICT: PASS

4.1.1 Limit

Standard		FCC Part 15 Subpart C Paragraph 15.207	
Restricted Bands of operation			
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 –16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.81425 – 8.81475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975–12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675–12.57725	322 – 335.4	3600 – 4400	
13.36 – 13.41			
Restricted Bands of operation for IC			
0.090 - 0.110	13.36 - 13.41	960 - 1427	9.0 - 9.2
0.495 - 0.505	16.42 - 16.423	1435 - 1626.5	9.3 - 9.5
2.1735 - 2.1905	16.69475 - 16.69525	1645.5 - 1646.5	10.6 - 12.7
3.020 - 3.026	16.80425 - 16.80475	1660 - 1710	13.25 - 13.4
4.125 - 4.128	25.5 - 25.67	1718.8 - 1722.2	14.47 - 14.5
4.17725 - 4.17775	37.5 - 38.25	2200 - 2300	15.35 - 16.2
4.20725 - 4.20775	73 - 74.6	2310 - 2390	17.7 - 21.4
5.677 - 5.683	74.8 - 75.2	2483.5 - 2500	22.01 - 23.12
6.215 - 6.218	108 - 138	2655 - 2900	23.6 - 24.0
6.26775 - 6.26825	149.9 - 150.05	3260 - 3267	31.2 - 31.8
6.31175 - 6.31225	156.52475 - 156.52525	3332 - 3339	36.43 - 36.5
8.291 - 8.294	156.7 - 156.9	3345.8 - 3358	Above 38.6
8.362 - 8.366	162.0125 - 167.17	3500 - 4400	
8.37625 - 8.38675	167.72 - 173.2	4500 - 5150	
8.41425 - 8.41475	240 - 285	5350 - 5460	
12.29 - 12.293	322 - 335.4	7250 - 7750	
12.51975 - 12.52025	399.9 - 410	8025 - 8500	
12.57675 - 12.57725	608 - 614	--	

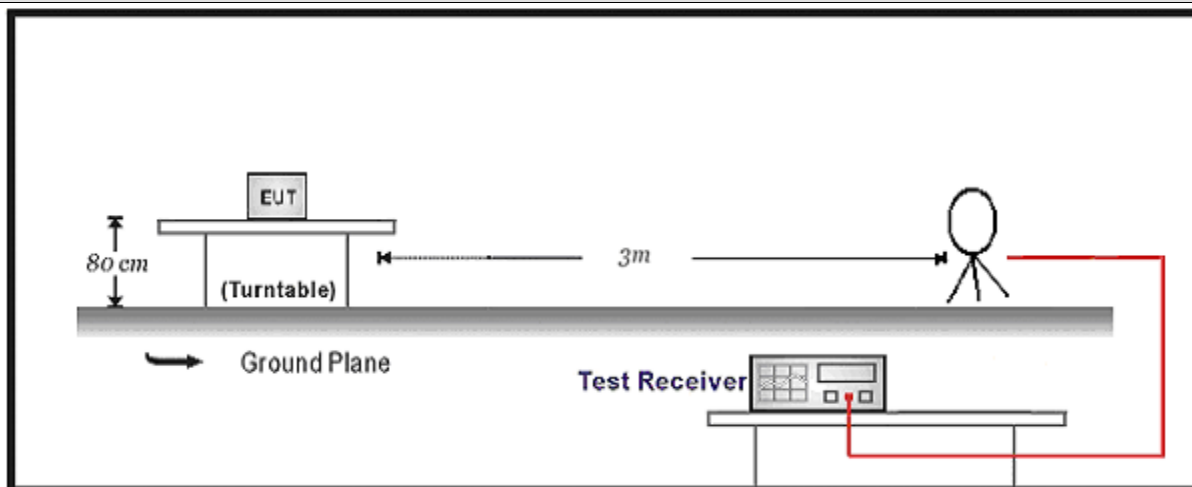
Restricted Band Emissions Limit			
Frequency (MHz)	Field strength ($\mu\text{V/m}$)	Field strength ($\text{dB}\mu\text{V/m}$)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 – 13.8	300 _(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30 _(Note 1)
1.705 - 30	30	29.5	30 _(Note 1)
30 - 88	100	40	3 _(Note 2)
88 - 216	150	43.5	3 _(Note 2)
216 - 960	200	46	3 _(Note 2)
Above 960	500	54	3 _(Note 2)

Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

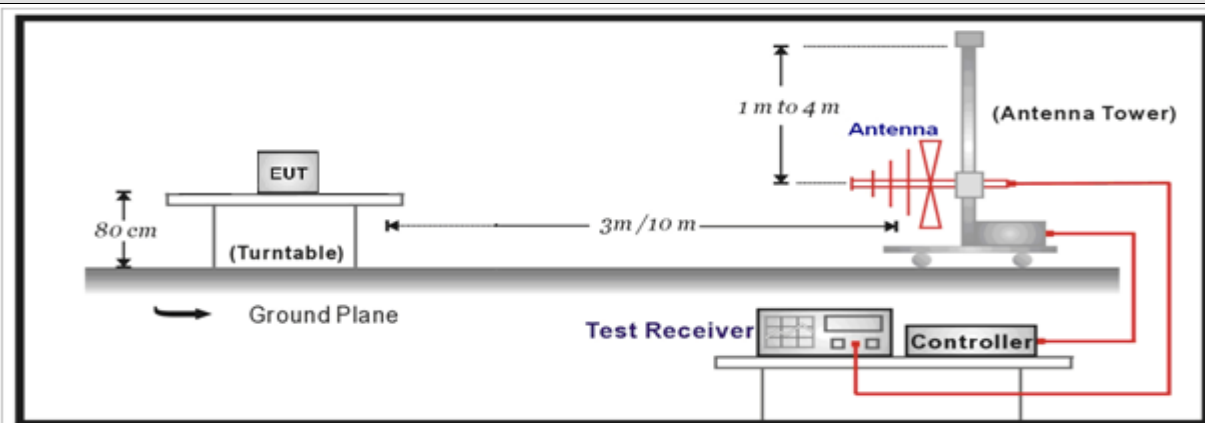
Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

4.1.2 Test Setup

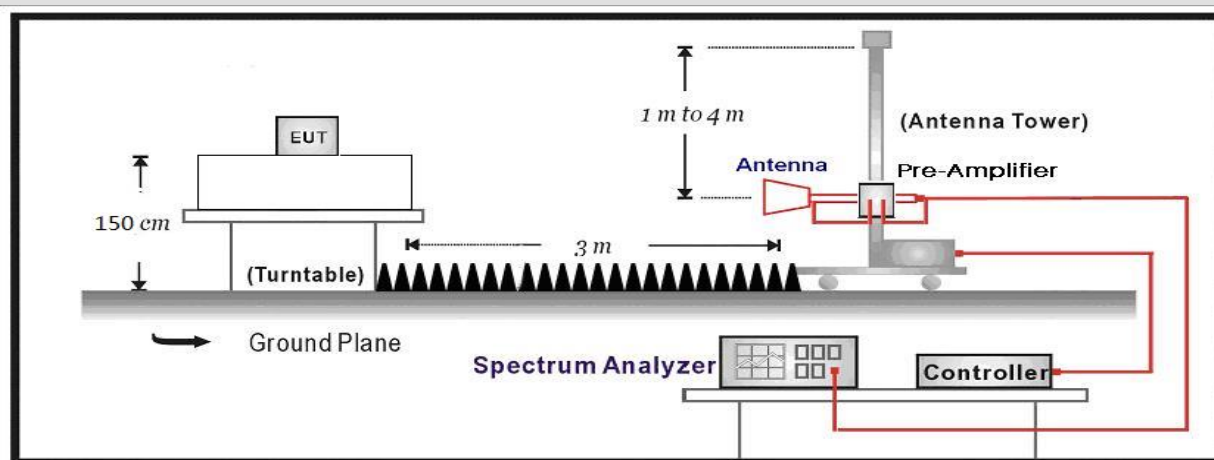
Below 30MHz Test Setup:



30MHz-1GHz Test Setup:



Above 1GHz Test Setup:

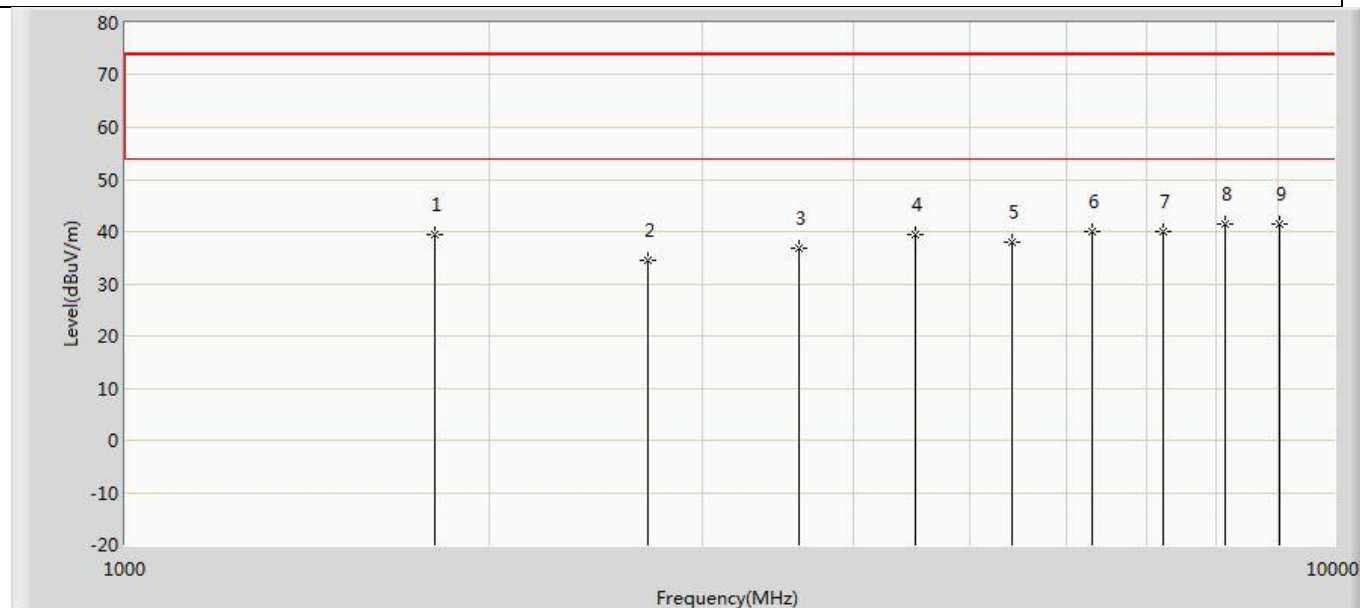


4.1.3 Test Procedure

	References Rule		Chapter	Description
☒	ANSI C63.10		11.12	Emissions in restricted frequency bands
	☒	ANSI C63.10	11.12.1	Radiated emission measurements
	☒	ANSI C63.10	11.12.2.7	Radiated spurious emission test
		☒ ANSI C63.10	6.4	Radiated emissions from unlicensed wireless devices below 30 MHz
		☒ ANSI C63.10	6.5	Radiated emissions from unlicensed wireless devices in the frequency range of 30 MHz to 1000 MHz
		☒ ANSI C63.10	6.6	Radiated emissions from unlicensed wireless devices above 1 GHz

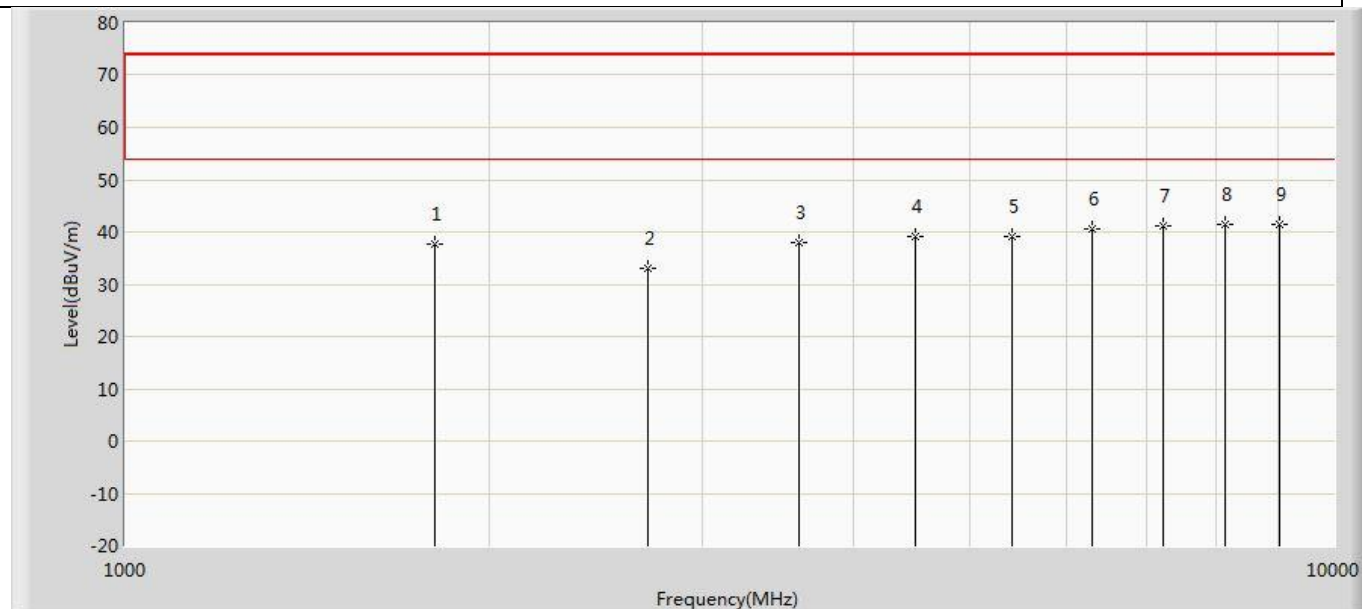
4.1.4 Test Data

Profile: 2260749R	Page No.: 13
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: 1SJ	Power: DC 3.3V
Note: Mode 1: Transmit by LoRa_125kHz at 902.3MHz	



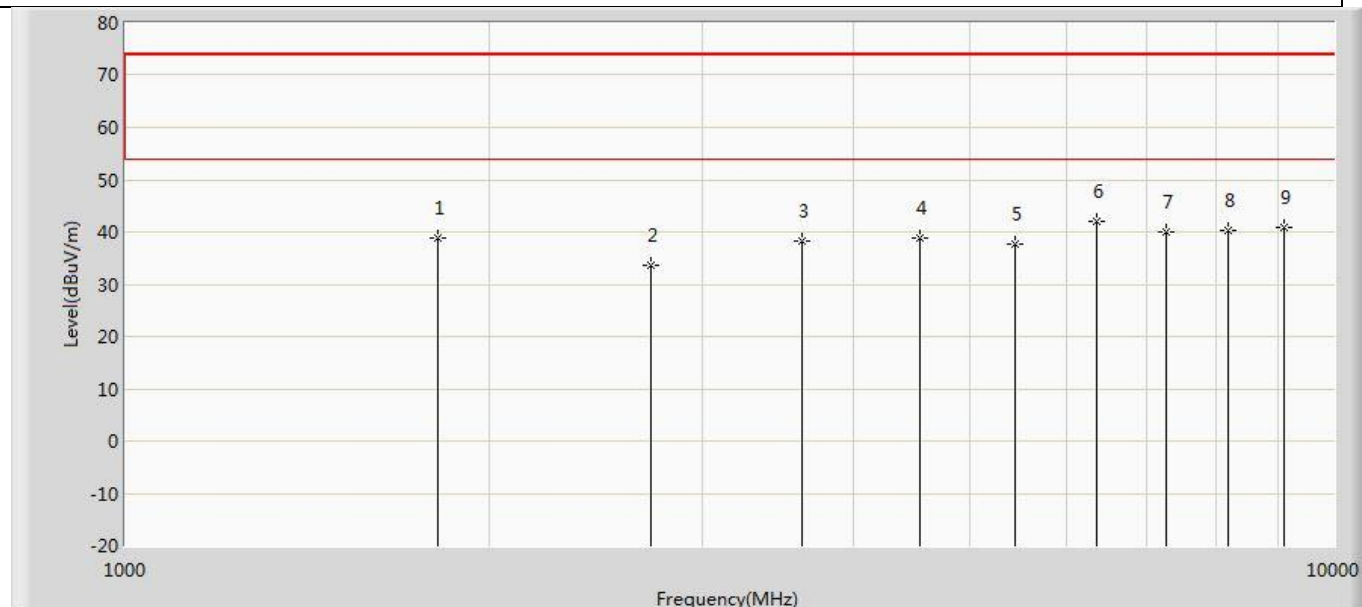
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1804.600	39.537	57.091	-34.463	74.000	-17.554	PK
2		2706.900	34.378	49.663	-39.622	74.000	-15.284	PK
3		3609.200	36.914	49.258	-37.086	74.000	-12.344	PK
4		4511.500	39.449	49.794	-34.551	74.000	-10.344	PK
5		5413.800	38.035	48.307	-35.965	74.000	-10.271	PK
6		6316.100	40.054	47.958	-33.946	74.000	-7.904	PK
7		7218.400	39.913	46.586	-34.087	74.000	-6.674	PK
8		8120.700	41.361	47.741	-32.639	74.000	-6.380	PK
9	*	9023.000	41.578	48.350	-32.422	74.000	-6.772	PK

Profile: 2260749R	Page No.: 14
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: 1SJ	Power: DC 3.3V
Note: Mode 1: Transmit by LoRa_125kHz at 902.3MHz	



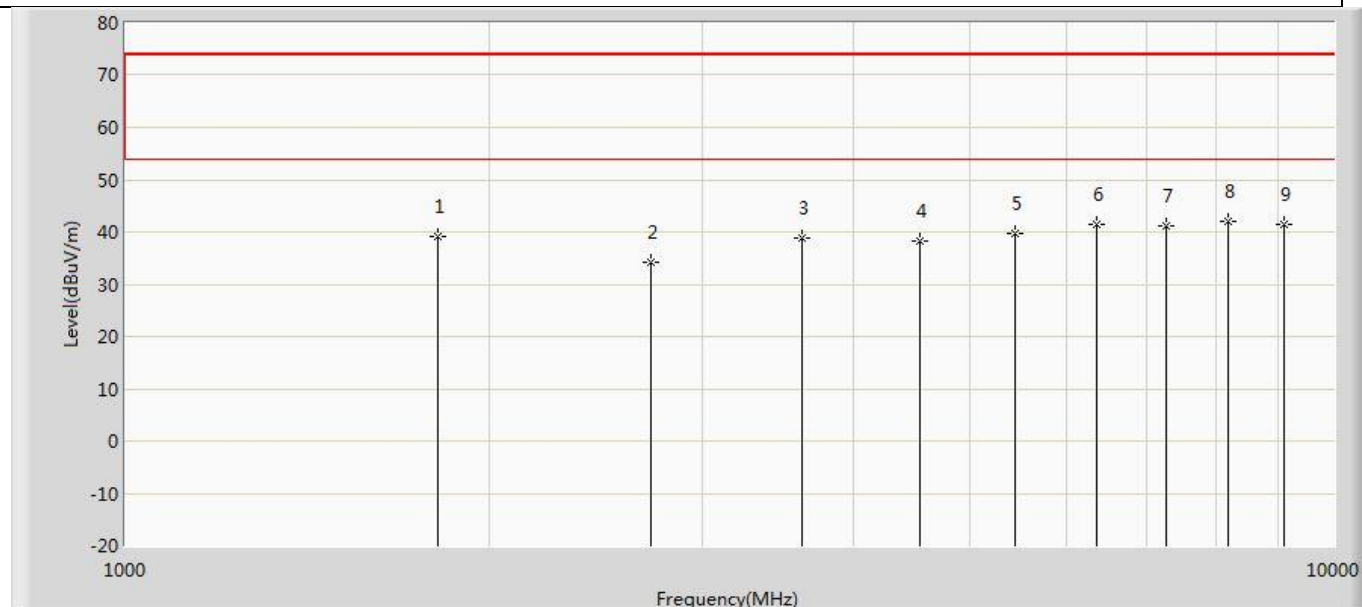
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1804.600	37.624	55.178	-36.376	74.000	-17.554	PK
2		2706.900	33.044	48.329	-40.956	74.000	-15.284	PK
3		3609.200	37.898	50.242	-36.102	74.000	-12.344	PK
4		4511.500	38.989	49.334	-35.011	74.000	-10.344	PK
5		5413.800	39.201	49.473	-34.799	74.000	-10.271	PK
6		6316.100	40.627	48.531	-33.373	74.000	-7.904	PK
7		7218.400	41.081	47.754	-32.919	74.000	-6.674	PK
8		8120.700	41.330	47.710	-32.670	74.000	-6.380	PK
9	*	9023.000	41.414	48.186	-32.586	74.000	-6.772	PK

Profile: 2260749R	Page No.: 17
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: 1SJ	Power: DC 3.3V
Note: Mode 1: Transmit by LoRa_125kHz at 908.5MHz	



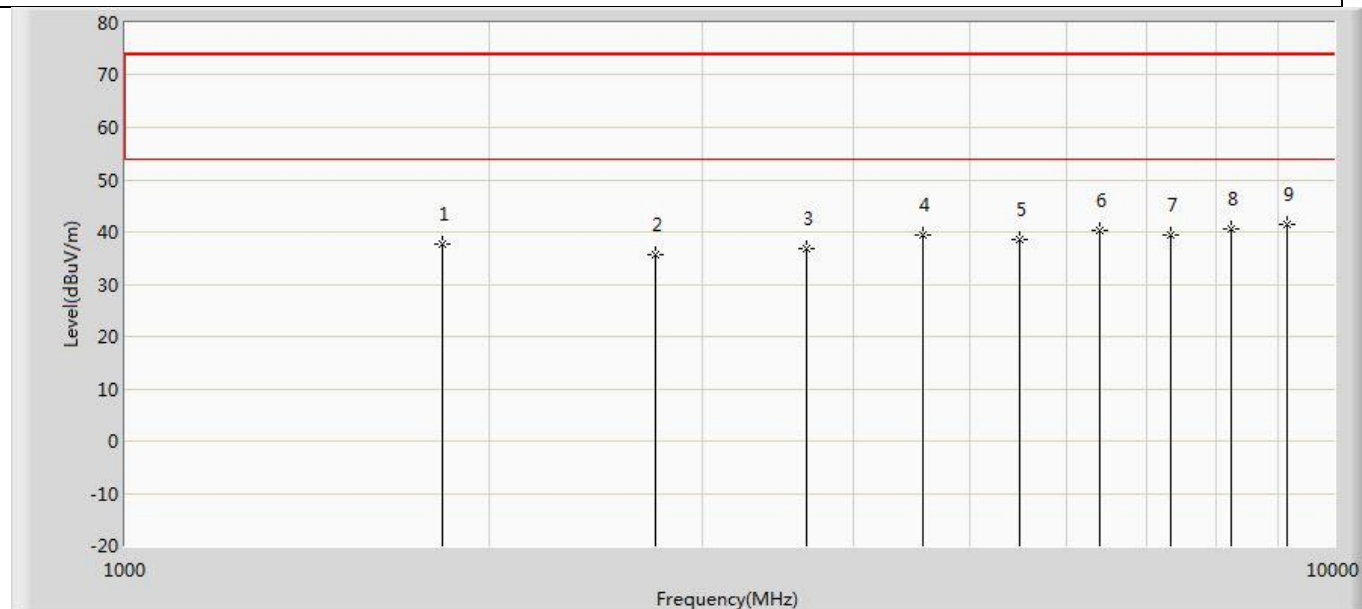
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1817.000	38.805	56.243	-35.195	74.000	-17.439	PK
2		2725.500	33.509	48.833	-40.491	74.000	-15.325	PK
3		3634.000	38.190	50.530	-35.810	74.000	-12.340	PK
4		4542.500	38.747	49.632	-35.253	74.000	-10.884	PK
5		5451.000	37.803	48.047	-36.197	74.000	-10.243	PK
6	*	6359.500	42.099	49.405	-31.901	74.000	-7.306	PK
7		7268.000	40.022	46.489	-33.978	74.000	-6.468	PK
8		8176.500	40.199	46.879	-33.801	74.000	-6.681	PK
9		9085.000	41.013	47.167	-32.987	74.000	-6.154	PK

Profile: 2260749R	Page No.: 18
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: 1SJ	Power: DC 3.3V
Note: Mode 1: Transmit by LoRa_125kHz at 908.5MHz	



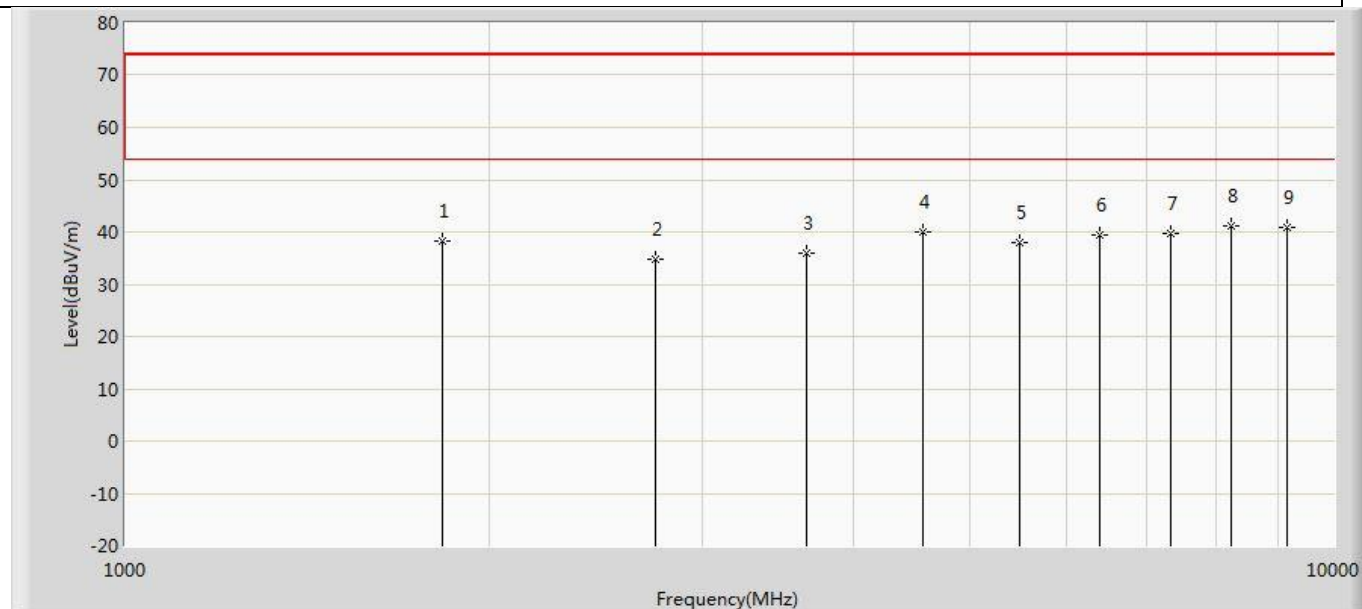
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1817.000	39.037	56.475	-34.963	74.000	-17.439	PK
2		2725.500	34.228	49.552	-39.772	74.000	-15.325	PK
3		3634.000	38.875	51.215	-35.125	74.000	-12.340	PK
4		4542.500	38.136	49.021	-35.864	74.000	-10.884	PK
5		5451.000	39.769	50.013	-34.231	74.000	-10.243	PK
6		6359.500	41.381	48.687	-32.619	74.000	-7.306	PK
7		7268.000	41.250	47.717	-32.750	74.000	-6.468	PK
8	*	8176.500	42.057	48.737	-31.943	74.000	-6.681	PK
9		9085.000	41.412	47.566	-32.588	74.000	-6.154	PK

Profile: 2260749R	Page No.: 21
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: 1SJ	Power: DC 3.3V
Note: Mode 1: Transmit by LoRa_125kHz at 914.9MHz	



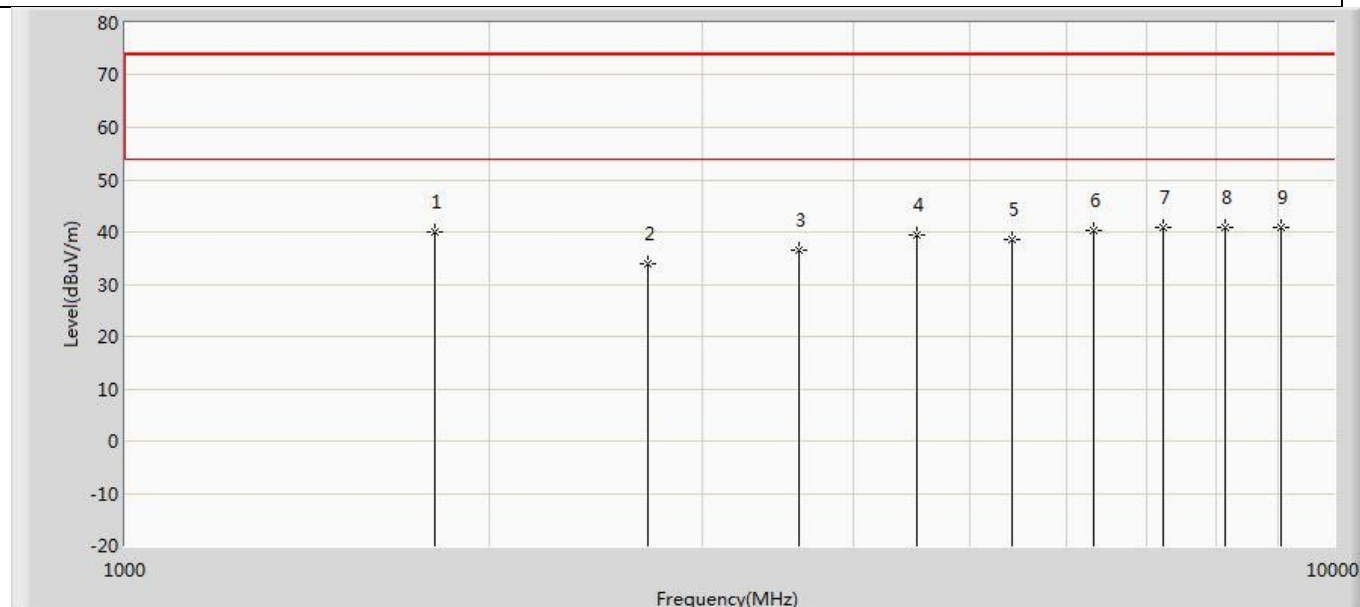
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1829.800	37.814	55.191	-36.186	74.000	-17.377	PK
2		2744.700	35.701	51.104	-38.299	74.000	-15.402	PK
3		3659.600	36.944	49.305	-37.056	74.000	-12.361	PK
4		4574.500	39.479	50.438	-34.521	74.000	-10.958	PK
5		5489.400	38.498	48.513	-35.502	74.000	-10.015	PK
6		6404.300	40.339	48.272	-33.661	74.000	-7.933	PK
7		7319.200	39.344	46.054	-34.656	74.000	-6.710	PK
8		8234.100	40.592	46.870	-33.408	74.000	-6.278	PK
9	*	9149.000	41.398	48.040	-32.602	74.000	-6.642	PK

Profile: 2260749R	Page No.: 22
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: 1SJ	Power: DC 3.3V
Note: Mode 1: Transmit by LoRa_125kHz at 914.9MHz	



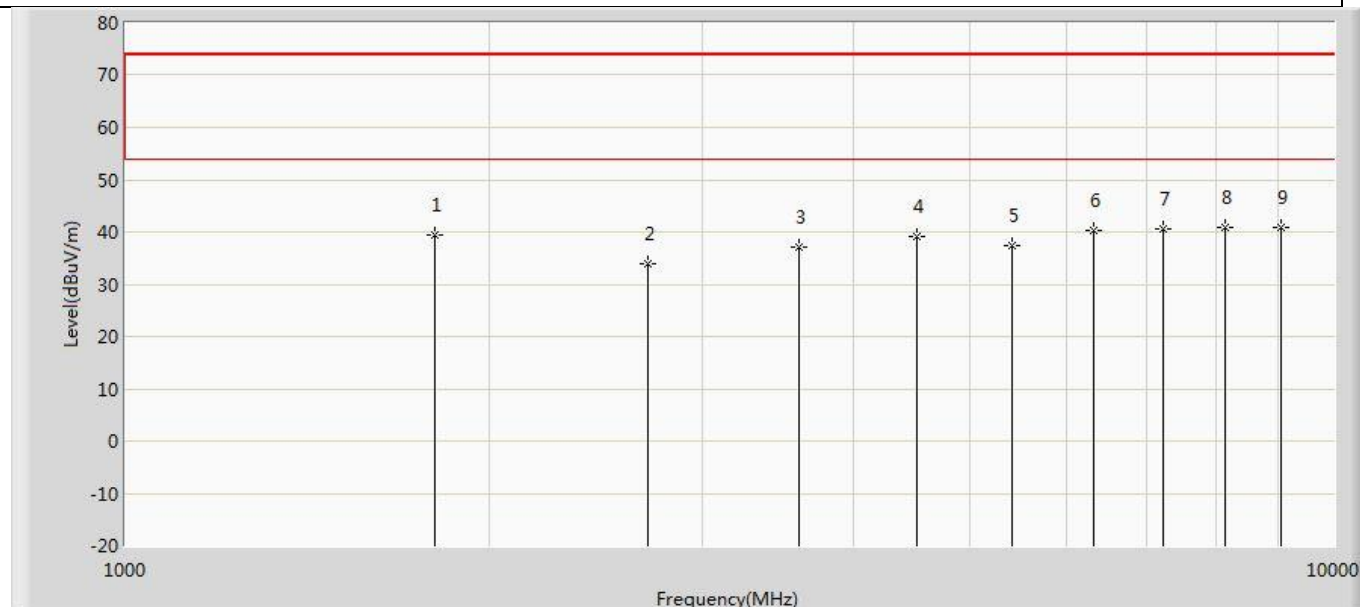
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1829.800	38.359	55.736	-35.641	74.000	-17.377	PK
2		2744.700	34.905	50.308	-39.095	74.000	-15.402	PK
3		3659.600	35.806	48.167	-38.194	74.000	-12.361	PK
4		4574.500	39.859	50.818	-34.141	74.000	-10.958	PK
5		5489.400	38.019	48.034	-35.981	74.000	-10.015	PK
6		6404.300	39.336	47.269	-34.664	74.000	-7.933	PK
7		7319.200	39.667	46.377	-34.333	74.000	-6.710	PK
8	*	8234.100	41.101	47.379	-32.899	74.000	-6.278	PK
9		9149.000	40.931	47.573	-33.069	74.000	-6.642	PK

Profile: 2260749R	Page No.: 15
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: 1SJ	Power: DC 3.3V
Note: Mode 2: Transmit by LoRa_500kHz at 903MHz	



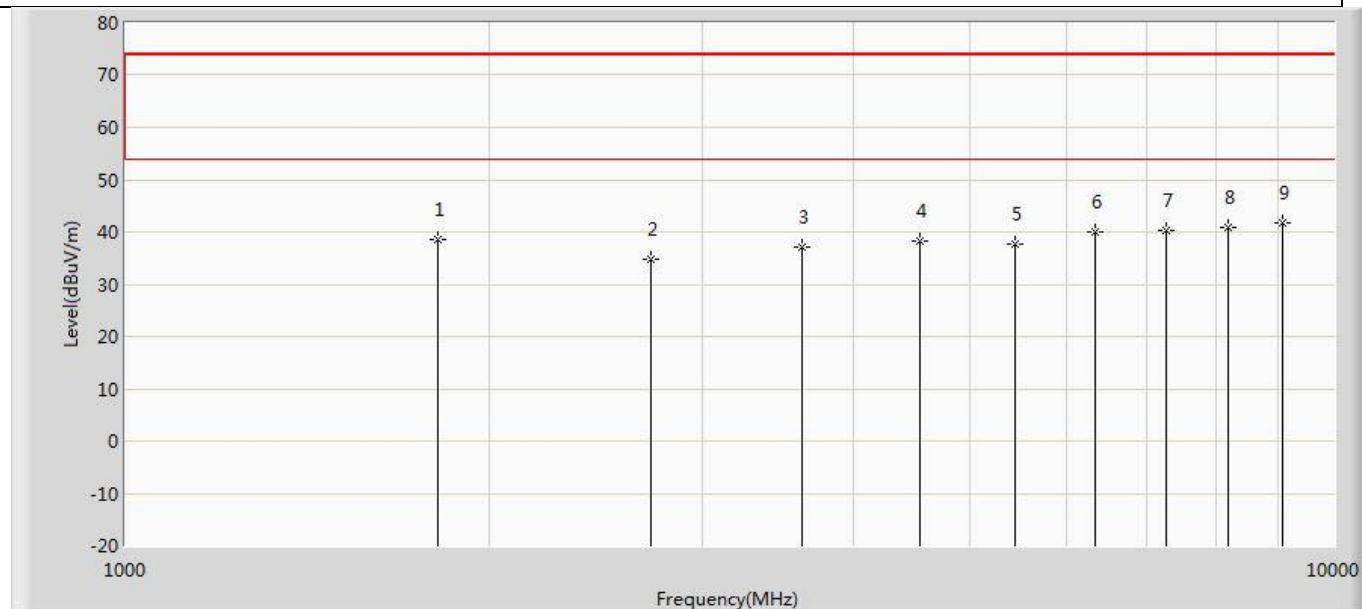
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1806.000	40.120	57.661	-33.880	74.000	-17.541	PK
2		2709.000	33.927	49.196	-40.073	74.000	-15.269	PK
3		3612.000	36.526	48.830	-37.474	74.000	-12.304	PK
4		4515.000	39.326	49.546	-34.674	74.000	-10.220	PK
5		5418.000	38.448	48.768	-35.552	74.000	-10.321	PK
6		6321.000	40.285	48.252	-33.715	74.000	-7.967	PK
7		7224.000	40.828	47.415	-33.172	74.000	-6.587	PK
8		8127.000	40.870	47.195	-33.130	74.000	-6.324	PK
9	*	9030.000	40.913	47.715	-33.087	74.000	-6.802	PK

Profile: 2260749R	Page No.: 16
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: 1SJ	Power: DC 3.3V
Note: Mode 2: Transmit by LoRa_500kHz at 903MHz	



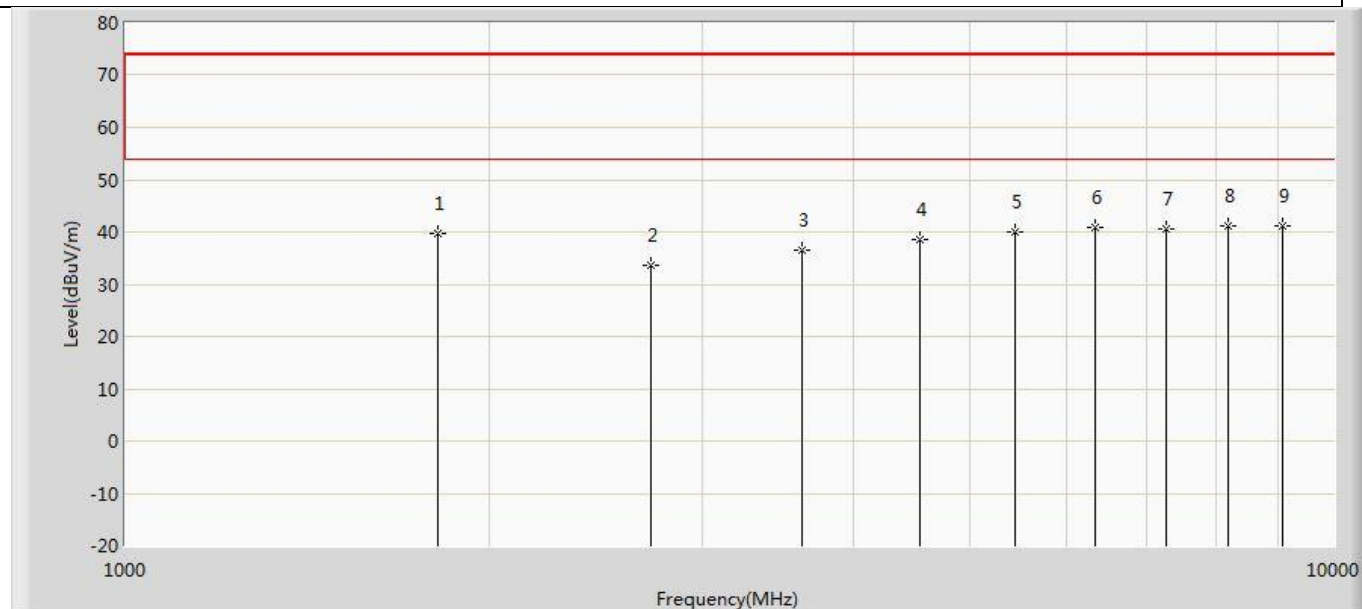
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1806.000	39.416	56.957	-34.584	74.000	-17.541	PK
2		2709.000	33.940	49.209	-40.060	74.000	-15.269	PK
3		3612.000	37.078	49.382	-36.922	74.000	-12.304	PK
4		4515.000	39.054	49.274	-34.946	74.000	-10.220	PK
5		5418.000	37.519	47.839	-36.481	74.000	-10.321	PK
6		6321.000	40.285	48.252	-33.715	74.000	-7.967	PK
7		7224.000	40.545	47.132	-33.455	74.000	-6.587	PK
8		8127.000	40.980	47.305	-33.020	74.000	-6.324	PK
9	*	9030.000	41.006	47.808	-32.994	74.000	-6.802	PK

Profile: 2260749R	Page No.: 19
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: 1SJ	Power: DC 3.3V
Note: Mode 2: Transmit by LoRa_500kHz at 907.8MHz	



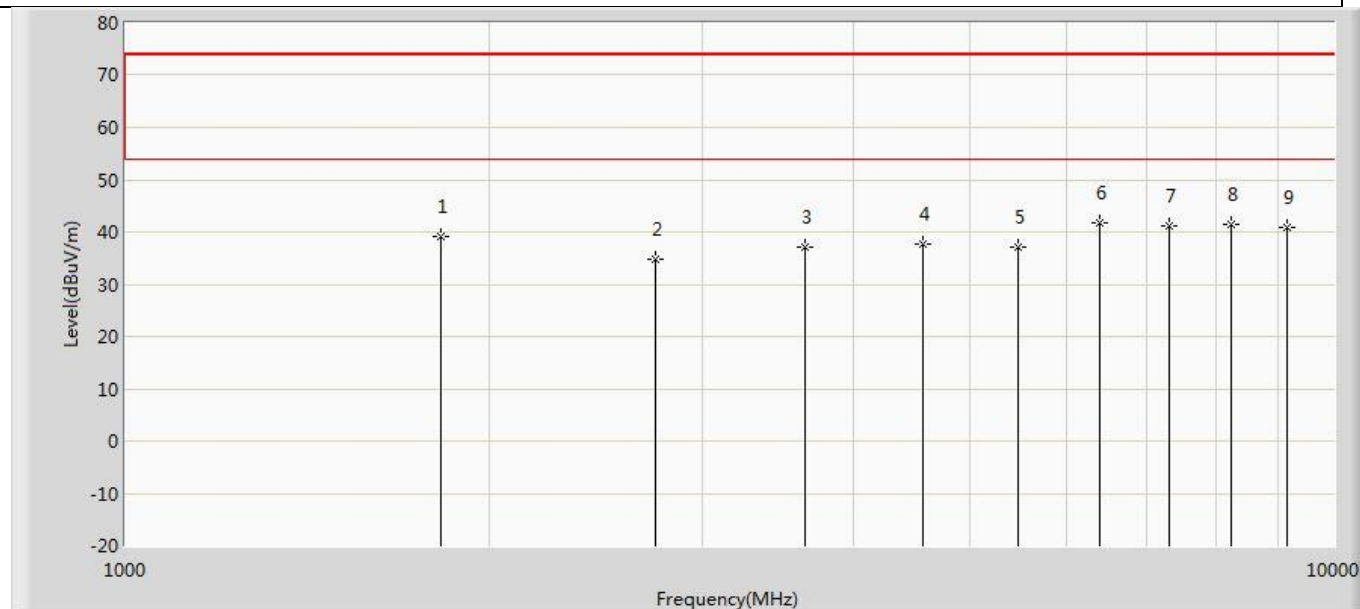
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1815.600	38.627	56.074	-35.373	74.000	-17.447	PK
2		2723.400	34.908	50.204	-39.092	74.000	-15.296	PK
3		3631.200	37.229	49.548	-36.771	74.000	-12.319	PK
4		4539.000	38.246	49.127	-35.754	74.000	-10.881	PK
5		5446.800	37.778	48.064	-36.222	74.000	-10.287	PK
6		6354.600	40.033	47.220	-33.967	74.000	-7.187	PK
7		7262.400	40.263	46.569	-33.737	74.000	-6.307	PK
8		8170.200	40.980	47.780	-33.020	74.000	-6.801	PK
9	*	9078.000	41.644	48.236	-32.356	74.000	-6.592	PK

Profile: 2260749R	Page No.: 20
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: 1SJ	Power: DC 3.3V
Note: Mode 2: Transmit by LoRa_500kHz at 907.8MHz	



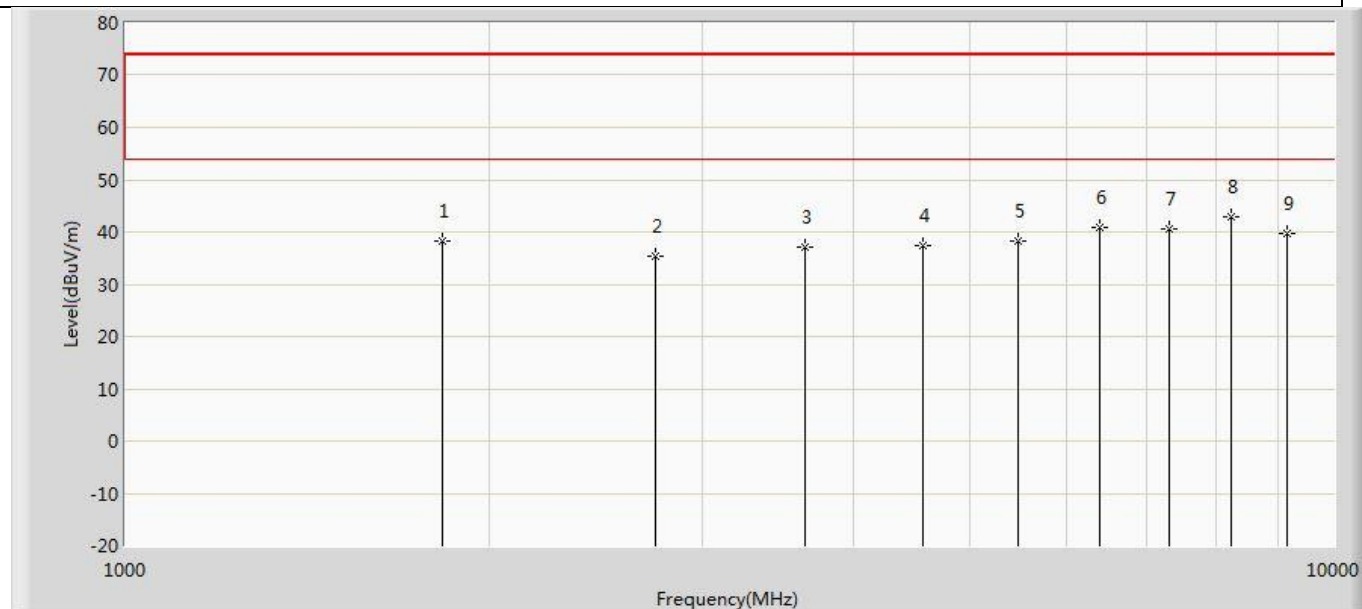
No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1815.600	39.629	57.076	-34.371	74.000	-17.447	PK
2		2723.400	33.748	49.044	-40.252	74.000	-15.296	PK
3		3631.200	36.550	48.869	-37.450	74.000	-12.319	PK
4		4539.000	38.649	49.530	-35.351	74.000	-10.881	PK
5		5446.800	39.994	50.280	-34.006	74.000	-10.287	PK
6		6354.600	40.919	48.106	-33.081	74.000	-7.187	PK
7		7262.400	40.572	46.878	-33.428	74.000	-6.307	PK
8	*	8170.200	41.286	48.086	-32.714	74.000	-6.801	PK
9		9078.000	41.171	47.763	-32.829	74.000	-6.592	PK

Profile: 2260749R	Page No.: 23
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: 1SJ	Power: DC 3.3V
Note: Mode 2: Transmit by LoRa_500kHz at 914.2MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1824.400	39.165	56.568	-34.835	74.000	-17.403	PK
2		2742.600	34.694	50.104	-39.306	74.000	-15.410	PK
3		3656.800	37.093	49.481	-36.907	74.000	-12.388	PK
4		4571.000	37.759	48.748	-36.241	74.000	-10.989	PK
5		5485.200	37.009	47.057	-36.991	74.000	-10.049	PK
6	*	6399.400	41.878	49.538	-32.122	74.000	-7.659	PK
7		7313.600	41.018	47.553	-32.982	74.000	-6.536	PK
8		8227.800	41.542	47.298	-32.458	74.000	-5.756	PK
9		9142.000	40.745	47.367	-33.255	74.000	-6.622	PK

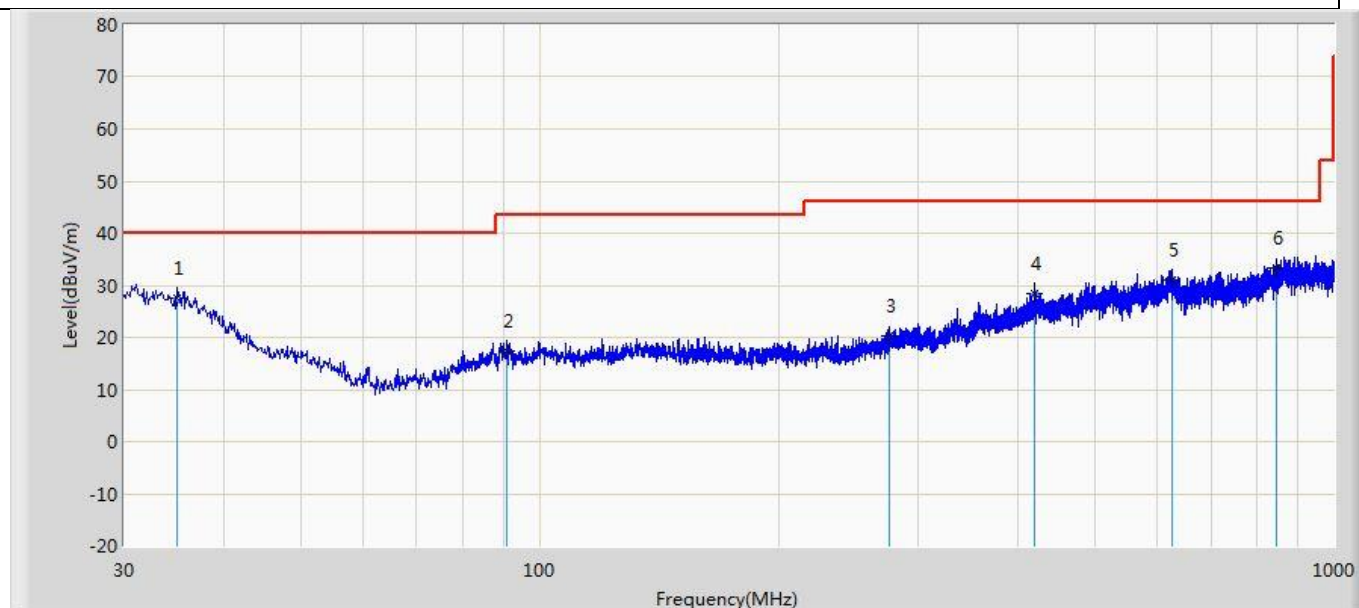
Profile: 2260749R	Page No.: 24
Engineer: Yu. Liu	
Site: AC5	Time: 2022/07/06 - 23:24
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: 1SJ	Power: DC 3.3V
Note: Mode 2: Transmit by LoRa_500kHz at 914.2MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		1828.400	38.211	55.595	-35.789	74.000	-17.384	PK
2		2742.600	35.281	50.691	-38.719	74.000	-15.410	PK
3		3656.800	37.095	49.483	-36.905	74.000	-12.388	PK
4		4571.000	37.509	48.498	-36.491	74.000	-10.989	PK
5		5485.200	38.358	48.406	-35.642	74.000	-10.049	PK
6		6399.400	40.878	48.538	-33.122	74.000	-7.659	PK
7		7313.600	40.580	47.115	-33.420	74.000	-6.536	PK
8	*	8227.800	42.756	48.512	-31.244	74.000	-5.756	PK
9		9142.000	39.762	46.384	-34.238	74.000	-6.622	PK

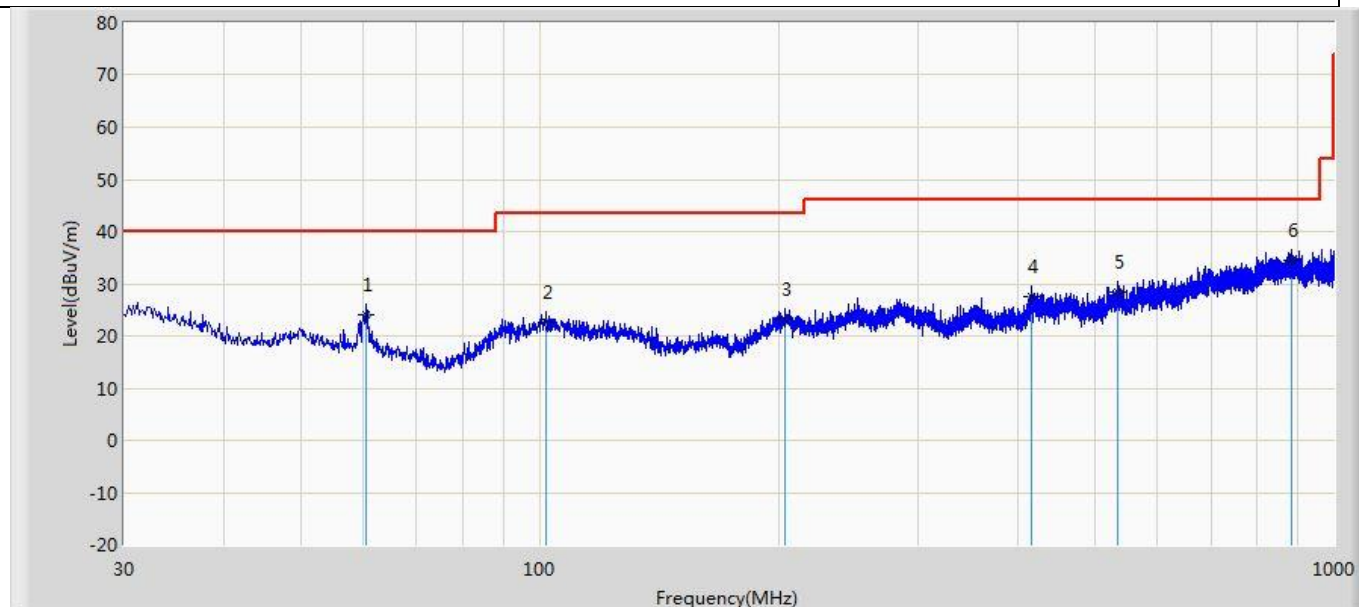
The worst case of Radiated Emission below 1GHz:

Profile: 2260749R	Page No.: 77
Engineer: Yu. Liu	
Site: AC2	Time: 2022/07/07 - 00:07
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Horizontal
EUT: 1SJ	Power: DC 3.3V
Note: Mode 1: Transmit by LoRa_125kHz at 902.3MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	34.971	27.545	0.598	-12.455	40.000	26.947	QP
2		91.110	17.309	3.510	-26.191	43.500	13.799	QP
3		276.138	20.146	0.756	-25.854	46.000	19.390	QP
4		420.688	28.434	1.281	-17.566	46.000	27.153	QP
5		626.914	30.979	0.457	-15.021	46.000	30.522	QP
6		846.982	33.212	1.807	-12.788	46.000	31.405	QP

Profile: 2260749R	Page No.: 78
Engineer: Yu. Liu	
Site: AC2	Time: 2022/07/07 - 00:07
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: AC2_3M(30-1000M)	Polarity: Vertical
EUT: 1SJ	Power: DC 3.3V
Note: Mode 1: Transmit by LoRa_125kHz at 902.3MHz	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		60.555	24.087	7.892	-15.913	40.000	16.194	QP
2		101.780	22.593	0.519	-20.907	43.500	22.074	QP
3		203.994	23.331	-0.150	-20.169	43.500	23.481	QP
4		416.424	27.440	1.114	-18.560	46.000	26.326	QP
5		533.915	28.396	1.341	-17.604	46.000	27.055	QP
6	*	885.782	34.471	1.540	-11.529	46.000	32.931	QP

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).
4. The test frequency range 9kHz~30MHz, worst case are at least 6dB below the limits, therefore no data appear in the report.

4.2 Fundamental emission output power

VERDICT: PASS

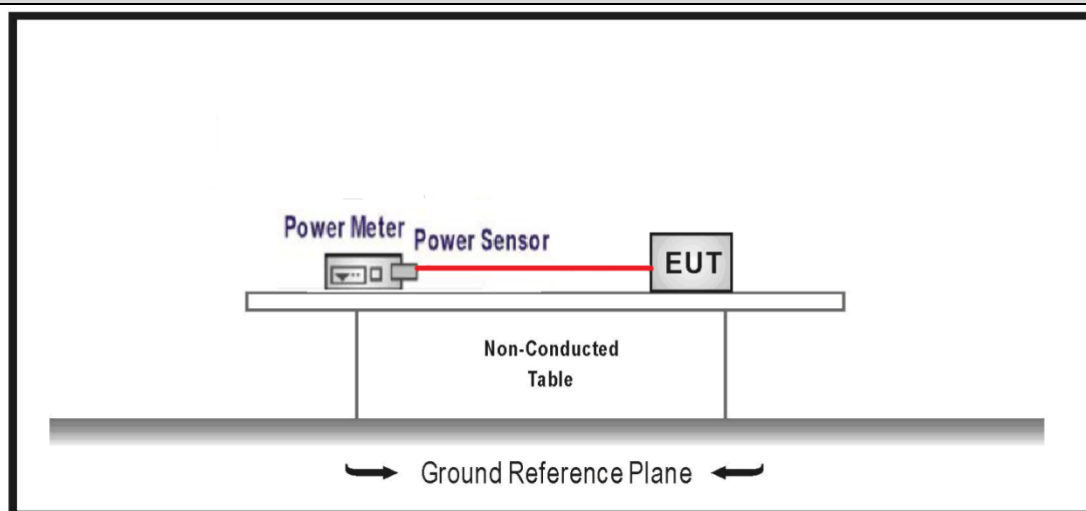
4.2.1 Limit

Standard		FCC Part 15 Subpart C Paragraph 15.247 (b)(3)
☒	GTX < 6dBi	Pout ≤ 30dBm
☐	GTX > 6dBi	
☐	Non-Fix point-point	Pout ≤ 30 - (GTX - 6)
☐	Fix point-point	Pout ≤ 30 - [(GTX - 6)]/3
☐	Point-to-multipoint	Pout ≤ 30 - (GTX - 6)
☐	Overlap Beams	Pout ≤ 30 - [(GTX - 6)]/3
☐	Aggregate power transmitted simultaneously on all beams	Pout ≤ 30 - [(GTX - 6)]/3
☐	single directional beam	Pout ≤ 30 - [(GTX - 6)]/3 + 8dB

Note 1 : GTX directional gain of transmitting antennas.

Note 2 : Pout is maximum peak conducted output power .

4.2.2 Test Setup



4.2.3 Test Procedure

	References Rule			Chapter	Description		
☒	ANSI C63.10			11.9	Fundamental emission output power		
	☐	ANSI C63.10			11.9.1	Maximum peak conducted output power	
		☐	ANSI C63.10	11.9.1.1	RBW ≥ DTS bandwidth		
		☐	ANSI C63.10	11.9.1.2	Integrated band power method		
		☐	ANSI C63.10	11.9.1.3	PKPM1 Peak power meter method		
	☒	ANSI C63.10			11.9.2	Maximum conducted (average) output power	
		☐	ANSI C63.10			11.9.2.2	Measurement using a spectrum analyzer (SA)
			☐	ANSI C63.10	11.9.2.2.2	Method AVGSA-1(Duty cycle ≥98%)	
			☐	ANSI C63.10	11.9.2.2.3	Method AVGSA-1A(Duty cycle ≥98%)	
			☐	ANSI C63.10	11.9.2.2.4	Method AVGSA-2(Duty cycle ≤98%)	
			☐	ANSI C63.10	11.9.2.2.5	Method AVGSA-2A(Duty cycle ≤98%)	
			☐	ANSI C63.10	11.9.2.2.4	Method AVGSA-3	
			☐	ANSI C63.10	11.9.2.2.5	Method AVGSA-3A	
		☒	ANSI C63.10			11.9.2.3	Measurement using a power meter (PM)
			☒	ANSI C63.10	11.9.2.3.1	Method AVGPM	
			☐	ANSI C63.10	11.9.2.3.2	Method AVGPM-G	

4.2.4 Test Data

Mode	Channel	Test Frequency (MHz)	Power Output (dBm)	Limit (dBm)	Result
Mode 1	01	902.3	21.11	≤30	Pass
	32	908.5	21.13	≤30	Pass
	64	914.9	21.07	≤30	Pass
Mode 2	65	903.0	21.28	≤30	Pass
	68	907.8	21.27	≤30	Pass
	72	914.2	21.22	≤30	Pass

5 TEST SETUP PHOTO AND EUT PHOTO

Remark: The test setup photo and EUT Photo please see appendix.

_____ The End _____