

TEST REPORT

Applicant Name : WIZZILAB SAS
Address : 29 boulevard Romain Rolland, Montrouge, France
Report Number : RA221108-52420E-RF
FCC ID: 2ARZVWTD-1-M

Test Standard (s)

FCC PART 15.247

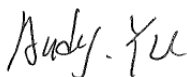
Sample Description

Product Type: WOLT-D7A-M
Model No.: WOLT-D7A-M
Trade Mark: N/A
Date Received: 2022-11-08
Date of Test: 2022-12-19 to 2023-01-30
Report Date: 2023-01-30

Test Result:	Pass*
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* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:



Audy.Yu
EMC Engineer

Approved By:



Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RA221108-52420E-RF	Original Report	2023-01-30

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product Name	WOLT-D7A-M
Model No.	WOLT-D7A-M
Frequency Range	902~928MHz (TX&RX)
Maximum Conducted Average Output Power	MOD1: Lora: 13.1dBm MOD2: FSK: 13.2dBm
Modulation Technique	MOD1: Lora (125kHz / SF 6 to 10) MOD2: FSK (1.8bpsk / 55kbps)
Antenna Specification*	Internal Antenna: -0.7dBi (provided by the applicant)
Voltage Range	DC 3.6V from battery
Sample serial number	RA221108-52420E-RF-S1 (Assigned by ATC)
Sample/EUT Status	Good condition

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.209 and 15.247 rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Emissions, Radiated	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
Temperature		1°C
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189.

Accredited by American Association for Laboratory Accreditation (A2LA). The Certificate Number is 4297.01

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0016. The Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in engineering mode.

Frequency Band: 902~928MHz

MOD1: Lora Bandwidth: 125 kHz, Spreading Factors: SF 6 to 10

MOD2: FSK Data Rate: 1.8bpsk / 55kbps

Operating channel:

Lower band B1: 903.9 / 904.1 / 904.3 / 904.5 / 904.7 / 904.9 / 905.1 / 905.3 MHz

Lower band B2: 906.9 / 907.1 / 907.3 / 907.5 / 907.7 / 907.9 / 908.1 / 908.3 MHz

EUT Exercise Software

“command character fixed frequency mode”* software was used to the EUT tested and power level is default*. The software and power level was provided by the applicant.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

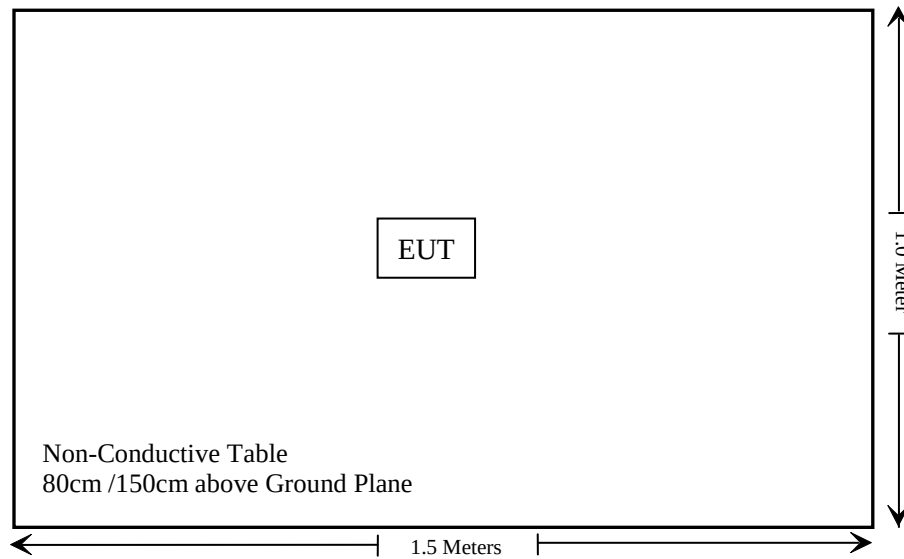
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup

For radiated emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result	Remark
§1.1307 (b)	RF Exposure	Compliant	/
§15.203	Antenna Requirement	Compliant	/
§15.207(a)	AC Line Conducted Emissions	Not applicable	/
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliant	/
§15.247(a)(1)	20 dB Emission Bandwidth	/	See Note
§15.247(a)(1)(i)	Channel Separation Test	/	See Note
§15.247(f)	Time of Occupancy (Dwell Time)	/	See Note
§15.247(b)(3)	Peak Output Power Measurement	Reporting only	See Note
§15.247(d)	Band edges	/	See Note
§15.247(f)	Power Spectral Density	/	See Note

Note:

1. Not Applicable – The EUT is powered by battery.
2. The manufacturer declares that the module installed in EUT is identical to the certified module (model: WM205X, FCC ID: 2ARZVWM), which granted on 06/13/2019.
3. The RF output power was spot checked and it's within the tune-up tolerance of the module report.
4. The ATC is responsible for all the information provided in this report, except when information is provided by the customer as identified in this report.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Rohde& Schwarz	Test Receiver	ESR	102725	2022/11/25	2023/11/24
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
SONOMA INSTRUMENT	Amplifier	310 N	186131	2022/11/08	2023/11/07
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2022/11/08	2023/11/07
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.11	N1000	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.12	N040	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.13	N300	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.14	N800	2022/11/25	2023/11/24
Radiated Emission Test Software: e3 19821b (V9)					
RF Conducted Test					
Rohde & Schwarz	Open Switch and ControlUnit	OSP120 + OSP-B157	101244 + 100866	2022/11/25	2023/11/24
WEINSCHL	10dB Attenuator	5324	AU 3842	2022/11/25	2023/11/24

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §1.1307 (b) – RF EXPOSURE

Applicable Standard

According to KDB 447498 D04 Interim General RF Exposure Guidance v01, clause 2.1.4 - MPE-Based Exemption:

An alternative to the SAR-based exemption is provided in § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power. For this case, a RF source is an RF exempt device if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form in Appendix B. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

Table to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$.
1.34-30	$3,450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1,500	$0.0128 R^2 f$.
1,500-100,000	$19.2 R^2$.

f = frequency in MHz;

R = minimum separation distance from the body of a nearby person (appropriate units, e.g., m);

Test Result

For worst case:

Mode	Frequency Range (MHz)	Tune-up Output Power		Antenna Gain		ERP		Evaluation Distance (cm)	MPE-Based Exemption Limit (mW)
		(dBm)	(mW)	(dBi)	(dBd)	(dBm)	(mW)		
Lora	903.9-908.3	14.0	25.12	-0.7	-2.85	11.15	13.03	20	462.8
FSK	903.9-908.3	14.0	25.12	-0.7	-2.85	11.15	13.03	20	462.8

Note 1: The tune-up power was declared by the applicant.

Note 2: Please refer to report number: 12522-FCC-IC-1 for the tune-up power for the module (model: WM205X, FCC ID: 2ARZVWM).

Note 3: 0dBd=2.15dBi.

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has one internal antenna arrangement, which was permanently attached and the antenna gain is -0.7 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

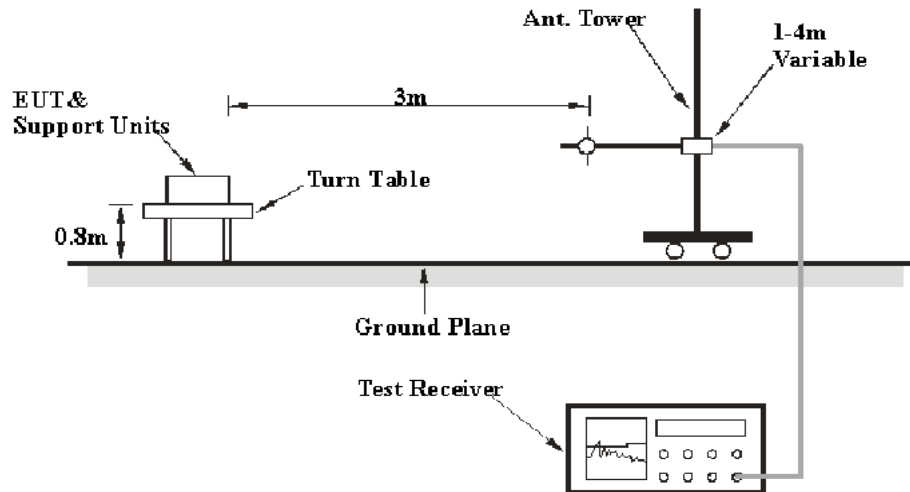
Result: Compliant.

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS**Applicable Standard**

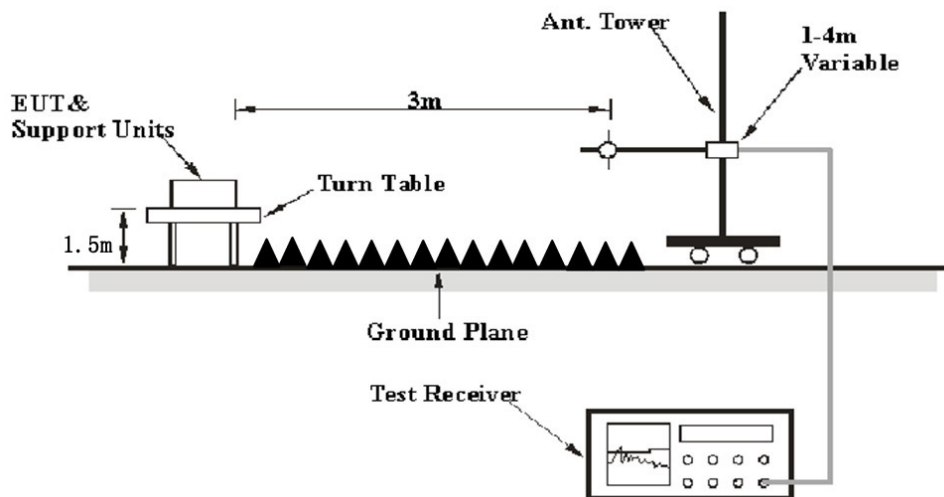
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

EMI Test Receiver & Spectrum Analyzer Setup

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurements
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz	/	Ave.

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

If the maximized peak measured value complies with the limit, then it is unnecessary to perform an QP/Average measurement

Factor & Margin Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

$$\text{Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Over Limit/Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit/margin of -7dB means the emission is 7dB below the limit. The equation for calculation is as follows:

$$\begin{aligned} \text{Over Limit/Margin} &= \text{Level} / \text{Corrected Amplitude} - \text{Limit} \\ \text{Level} / \text{Corrected Amplitude} &= \text{Read Level} + \text{Factor} \end{aligned}$$

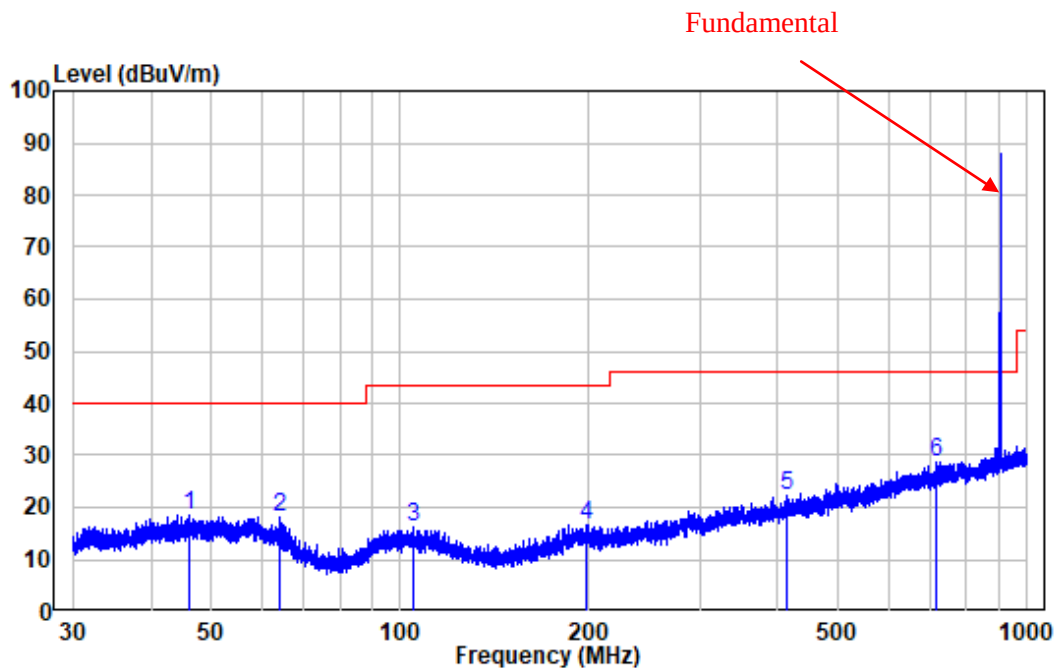
Test Data

Environmental Conditions

Temperature:	24-25 °C
Relative Humidity:	55-58 %
ATM Pressure:	101.0 kPa

The testing was performed by Jason Liu from 2022-12-19 to 2022-12-21.

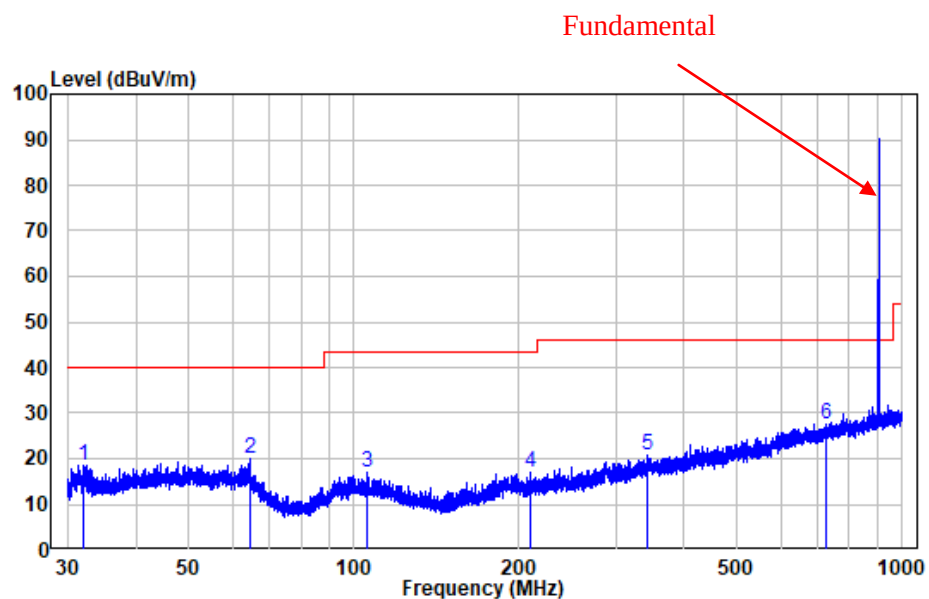
EUT operation mode: Transmitting (Pre-scan in the X,Y and Z axes of orientation, the worst case Y-axis of orientation was recorded)

30 MHz~1 GHz:**Lora Band1 High Channel (worst case)****Horizontal**

Site : chamber
Condition: 3m HORIZONTAL
Job No. : RA221108-52420E-RF
Test Mode: Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	46.178	-9.99	28.46	18.47	40.00	-21.53	Peak
2	64.179	-12.21	30.15	17.94	40.00	-22.06	Peak
3	104.720	-11.80	27.86	16.06	43.50	-27.44	Peak
4	198.327	-11.51	28.19	16.68	43.50	-26.82	Peak
5	413.996	-6.25	28.55	22.30	46.00	-23.70	Peak
6	715.427	-1.32	30.12	28.80	46.00	-17.20	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : RA221108-52420E-RF
Test Mode: Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	32.039	-12.16	30.54	18.38	40.00	-21.62	Peak
2	64.773	-12.43	32.29	19.86	40.00	-20.14	Peak
3	105.595	-11.89	28.70	16.81	43.50	-26.69	Peak
4	209.130	-11.85	28.74	16.89	43.50	-26.61	Peak
5	341.829	-7.36	28.20	20.84	46.00	-25.16	Peak
6	727.124	-1.13	28.70	27.57	46.00	-18.43	Peak

1 GHz ~ 10 GHz & Band Edge:

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)				
Lora Band1 Low 903.9MHz									
902	40.16	QP	320	2.4	H	1.49	41.65	46	-4.35
902	38.63	QP	343	1	V	1.49	40.12	46	-5.88
7231.2	51.68	PK	6	1.2	H	2.85	54.53	74	-19.47
7231.2	42.84	AV	6	1.2	H	2.85	45.69	54	-8.31
7231.2	54.91	PK	15	2.1	V	2.85	57.76	74	-16.24
7231.2	46.04	AV	15	2.1	V	2.85	48.89	54	-5.11
8135.1	49.54	PK	182	1.8	H	4.34	53.88	74	-20.12
8135.1	51.32	PK	274	1	V	4.34	55.66	74	-18.34
8135.1	42.43	AV	274	1	V	4.34	46.77	54	-7.23
Lora Band1 High 905.3MHz									
928	38.58	QP	75	2.2	H	1.77	40.35	46	-5.65
928	39.47	QP	197	2.5	V	1.77	41.24	46	-4.76
7242.4	51.55	PK	205	1.5	H	2.92	54.47	74	-19.53
7242.4	42.56	AV	205	1.5	H	2.92	45.48	54	-8.52
7242.4	56.21	PK	66	1.4	V	2.92	59.13	74	-14.87
7242.4	47.39	AV	66	1.4	V	2.92	50.31	54	-3.69
8147.7	51.78	PK	145	1.8	H	4.33	56.11	74	-17.89
8147.7	43.43	AV	145	1.8	H	4.33	47.76	54	-6.24
8147.7	54.04	PK	263	1.5	V	4.33	58.37	74	-15.63
8147.7	45.34	AV	263	1.5	V	4.33	49.67	54	-4.33
Lora Band2 Low 906.9MHz									
902	40.18	QP	301	1.9	H	1.49	41.67	46	-4.33
902	39.16	QP	172	1.6	V	1.49	40.65	46	-5.35
7255.2	51.69	PK	196	1.9	H	3	54.69	74	-19.31
7255.2	42.85	AV	196	1.9	H	3	45.85	54	-8.15
7255.2	55.16	PK	226	1.4	V	3	58.16	74	-15.84
7255.2	46.26	AV	226	1.4	V	3	49.26	54	-4.74
8162.1	50.81	PK	201	2.1	H	4.43	55.24	74	-18.76
8162.1	41.95	AV	201	2.1	H	4.43	46.38	54	-7.62
8162.1	54.16	PK	144	2.1	V	4.43	58.59	74	-15.41
8162.1	45.41	AV	144	2.1	V	4.43	49.84	54	-4.16
Lora Band2 High 908.3MHz									
928	38.53	QP	94	2.3	H	1.77	40.3	46	-5.7
928	40.18	QP	101	2.5	V	1.77	41.95	46	-4.05
7266.4	50.75	PK	188	1.8	H	3.09	53.84	74	-20.16
7266.4	56.05	PK	144	1.4	V	3.09	59.14	74	-14.86
7266.4	47.15	AV	144	1.4	V	3.09	50.24	54	-3.76
8174.7	49.88	PK	20	1.7	H	4.54	54.42	74	-19.58
8174.7	41.21	AV	20	1.7	H	4.54	45.75	54	-8.25
8174.7	53.73	PK	286	2.2	V	4.54	58.27	74	-15.73
8174.7	44.89	AV	286	2.2	V	4.54	49.43	54	-4.57

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)				
FSK Band1 Low 903.9MHz									
902	39.49	QP	73	1.1	H	1.49	40.98	46	-5.02
902	39.05	QP	50	1.7	V	1.49	40.54	46	-5.46
7231.2	52.9	PK	266	2	H	2.85	55.75	74	-18.25
7231.2	44.07	AV	266	2	H	2.85	46.92	54	-7.08
7231.2	54.84	PK	237	1.8	V	2.85	57.69	74	-16.31
7231.2	45.91	AV	237	1.8	V	2.85	48.76	54	-5.24
8135.1	49.16	PK	161	1.2	H	4.34	53.5	74	-20.5
8135.1	50.14	PK	179	1.9	V	4.34	54.48	74	-19.52
8135.1	41.3	AV	179	1.9	V	4.34	45.64	54	-8.36
FSK Band1 High 905.3MHz									
928	38.49	QP	170	2.1	H	1.77	40.26	46	-5.74
928	38.41	QP	318	1.8	V	1.77	40.18	46	-5.82
7242.4	51.55	PK	360	1.7	H	2.92	54.47	74	-19.53
7242.4	42.75	AV	360	1.7	H	2.92	45.67	54	-8.33
7242.4	55.94	PK	53	1.1	V	2.92	58.86	74	-15.14
7242.4	47.01	AV	53	1.1	V	2.92	49.93	54	-4.07
8147.7	51.09	PK	145	1.5	H	4.33	55.42	74	-18.58
8147.7	42.13	AV	145	1.5	H	4.33	46.46	54	-7.54
8147.7	53.31	PK	162	1.2	V	4.33	57.64	74	-16.36
8147.7	44.4	AV	162	1.2	V	4.33	48.73	54	-5.27
FSK Band2 Low 906.9MHz									
902	40.12	QP	275	1.2	H	1.49	41.61	46	-4.39
902	38.63	QP	320	1.8	V	1.49	40.12	46	-5.88
7255.2	52.14	PK	249	1.1	H	3	55.14	74	-18.86
7255.2	43.25	AV	249	1.1	H	3	46.25	54	-7.75
7255.2	55.35	PK	247	2.2	V	3	58.35	74	-15.65
7255.2	46.62	AV	247	2.2	V	3	49.62	54	-4.38
8162.1	50.09	PK	31	1.9	H	4.43	54.52	74	-19.48
8162.1	41.42	AV	31	1.9	H	4.43	45.85	54	-8.15
8162.1	52.55	PK	194	1.7	V	4.43	56.98	74	-17.02
8162.1	43.48	AV	194	1.7	V	4.43	47.91	54	-6.09

Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	Reading (dBuV)	PK/QP/AV		Height (m)	Polar (H/V)				
FSK Band2 High 908.3MHz									
928	39.56	QP	79	2.3	H	1.77	41.33	46	-4.67
928	38.61	QP	125	1.9	V	1.77	40.38	46	-5.62
7266.4	50.56	PK	215	2.2	H	3.09	53.65	74	-20.35
7266.4	41.79	AV	215	2.2	H	3.09	44.88	54	-9.12
7266.4	55.85	PK	294	1.2	V	3.09	58.94	74	-15.06
7266.4	46.84	AV	294	1.2	V	3.09	49.93	54	-4.07
8174.7	49.49	PK	125	2.1	H	4.54	54.03	74	-19.97
8174.7	41.04	AV	125	2.1	H	4.54	45.58	54	-8.42
8174.7	53.34	PK	6	1.2	V	4.54	57.88	74	-16.12
8174.7	44.29	AV	6	1.2	V	4.54	48.83	54	-5.17

Note:

Factor = Antenna factor (RX) + Cable Loss - Amplifier Factor

Absolute Level (Corrected Amplitude) = Factor + Reading

Margin = Absolute Level (Corrected Amplitude) - Limit

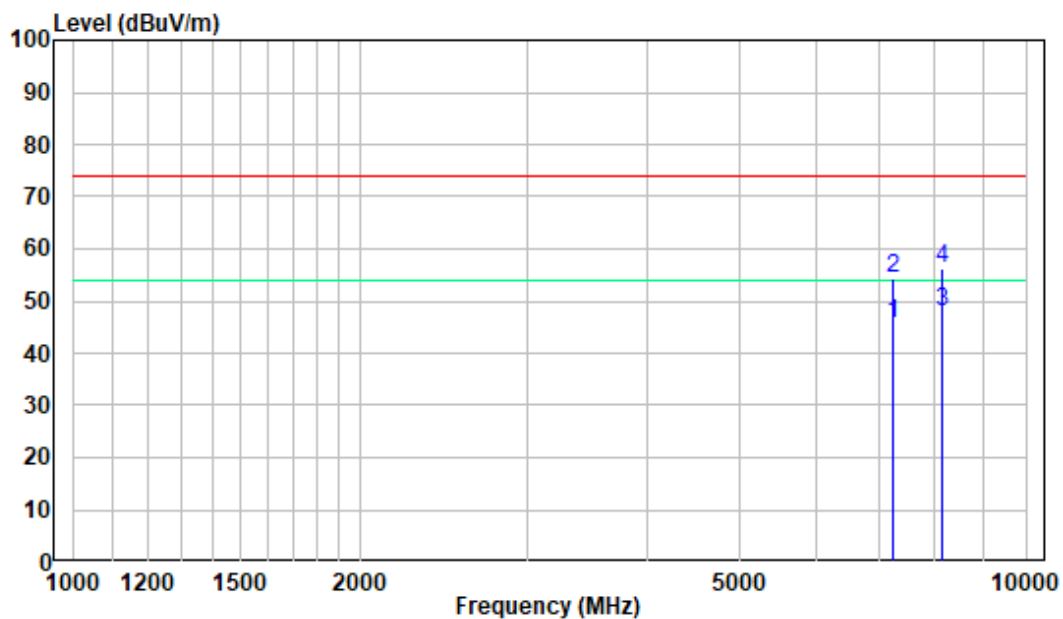
The other spurious emission which is in the noise floor level was not recorded.

For above 1GHz, the test result of peak was 20dB below to the limit of peak, which can be compliant to the average limit, so just peak value was recorded.

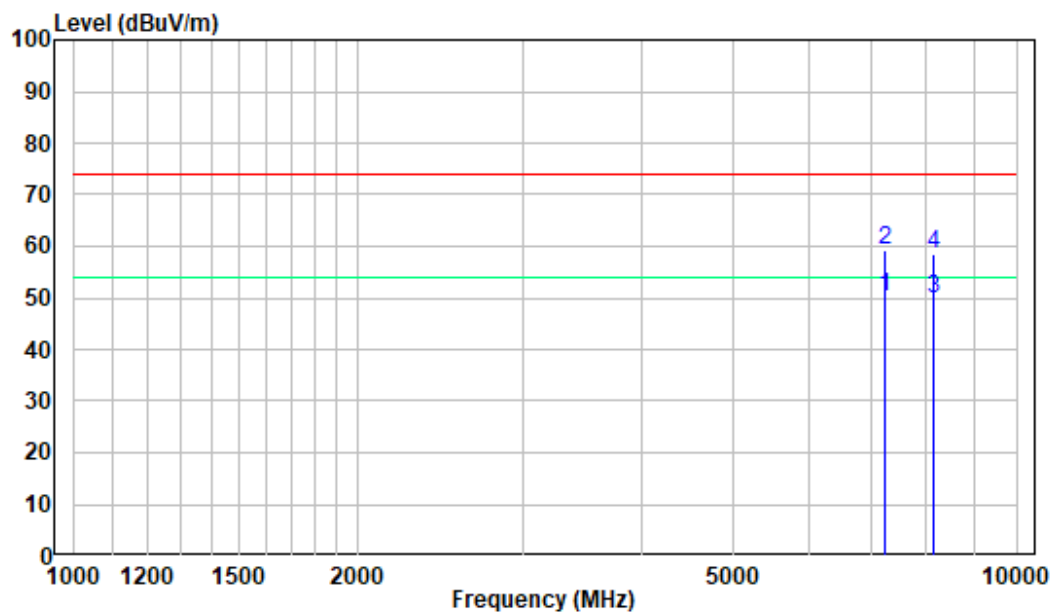
1GHz~10GHz

Lora Band1 High Channel (worst case)

Horizontal



Vertical



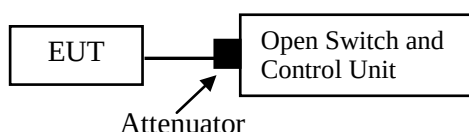
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

Applicable Standard

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Note: The Open Switch and Control Unit has built-in power sensor.

Test Data

Environmental Conditions

Temperature:	24 °C
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

The testing was performed by Gleen Jiang on 2023-01-30.

Test Result: Compliance.

EUT operation mode: Transmitting

Mode	Frequency (MHz)	Conducted Average Output Power	Limit (dBm)
		(dBm)	
LORA-B1	903.9	13.0	30
LORA-B1	905.3	13.1	30
LORA-B2	906.9	13.1	30
LORA-B2	908.3	13.1	30
FSK-B1	903.9	13.1	30
FSK-B1	905.3	13.2	30
FSK-B2	906.9	13.2	30
FSK-B2	908.3	13.1	30

***** END OF REPORT *****