



Shenzhen CTA Testing Technology Co., Ltd.

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.....: CTA25081501101

FCC ID.....: 2AUZX-WWD3LWU

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Date of issue.....: Dec. 19, 2025

Testing Laboratory Name: Shenzhen CTA Testing Technology Co., Ltd.

Address: Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

Applicant's name: UBITECH LIMITED

Address: 14F, Wing Hong Centre, 18 Wing Hong Street Chueng Sha Wan, Kowloon, Hong Kong

Test specification

Standard: FCC Part 15.247

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Test item description: Wireless Water Detector

Trade Mark: N/A

Manufacturer: UBITECH LIMITED

Model/Type reference.....: WWD3LWU

Listed Models: N/A

Frequency.....: From 902.3MHz to 914.9MHz

Rating: DC 3.0V From battery

Result.....: PASS

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TEST REPORT

Equipment under Test : Wireless Water Detector

Model /Type : WWD3LWU

Applicant : **UBITECH LIMITED**

Address : 14F, Wing Hong Centre, 18 Wing Hong Street Chueng Sha Wan,
Kowloon, Hong Kong

Manufacturer : **UBITECH LIMITED**

Address : 14F, Wing Hong Centre, 18 Wing Hong Street Chueng Sha Wan,
Kowloon, Hong Kong

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.247](#): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

[ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024](#): American National Standard for Testing Unlicensed Wireless Devices

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Aug. 15, 2025
Testing commenced on	:	Aug. 15, 2025
Testing concluded on	:	Dec. 19, 2025

2.2 Product Description

Product Description:	Wireless Water Detector
Model/Type reference:	WWD3LWU
Power supply:	DC 3.0V From battery
Hardware version:	LoRa_SOC_Rev:0.1
Software version:	WWD3_V0.1
Testing sample ID:	CTA250815011-1# (Engineer sample), CTA250815011-2# (Normal sample)
Lora FHSS	
Modulation Technology:	Lora
Operation frequency:	902.3MHz-914.9MHz
Channel number:	64
Antenna type:	Ceramic Antenna
Antenna gain:	1.75 dBi

2.3 Equipment Under Test

Power supply system utilised

Power supply voltage	:	☐ 230V / 50 Hz	☐ 120V / 60Hz
		☐ 12 V DC	☐ 24 V DC
		☒ Other (specified in blank below)	

DC 3.0V From battery

2.4 Short description of the Equipment under Test (EUT)

This is a Wireless Water Detector.

For more details, refer to the user's manual of the EUT.

2.5 EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

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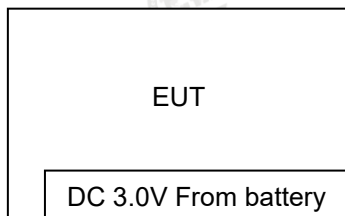
2.6 EUT operation mode

The Applicant provides communication tools software(ModuleReaderManager) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 50 channels provided to the EUT and Channel 01/32/64 were selected to test.

Operation Frequency:

Channel	Frequency (MHz)
01	902.3
02	902.5
⋮	⋮
31	908.3
32	908.5
33	908.7
⋮	⋮
63	914.7
64	914.9

2.7 Block Diagram of Test Setup



2.8 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for the device filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.9 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen CTA Testing Technology Co., Ltd.

Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

3.2 Test Facility

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

FCC-Registration No.: 517856 Designation Number: CN1318

Shenzhen CTA Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6534.01

Shenzhen CTA Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3 Environmental conditions

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

Radiated Emission:

Temperature:	24 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

AC Power Conducted Emission:

Temperature:	25 ° C
Humidity:	46 %
Atmospheric pressure:	950-1050mbar

Conducted testing:

Temperature:	25 ° C
Humidity:	44 %
Atmospheric pressure:	950-1050mbar

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3.4 Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Test result
§15.247(a)(1)	Carrier Frequency separation	LORA	☒ Lowest ☒ Middle ☒ Highest	LORA	☒ Middle	Compliant
§15.247(a)(1)	Number of Hopping channels	LORA	☒ Full	LORA	☒ Full	Compliant
§15.247(a)(1)	Time of Occupancy (dwell time)	LORA	☒ Lowest ☒ Middle ☒ Highest	LORA	☒ Middle	Compliant
§15.247(a)(1)	Spectrum bandwidth of a FHSS system 20dB bandwidth	LORA	☒ Lowest ☒ Middle ☒ Highest	LORA	☒ Lowest ☒ Middle ☒ Highest	Compliant
§15.247(b)(1)	Maximum output peak power	LORA	☒ Lowest ☒ Middle ☒ Highest	LORA	☒ Lowest ☒ Middle ☒ Highest	Compliant
§15.247(d)	Band edge compliance conducted	LORA	☒ Lowest ☒ Highest	LORA	☒ Lowest ☒ Highest	Compliant
§15.205	Band edge compliance radiated	LORA	☒ Lowest ☒ Highest	LORA	☒ Lowest ☒ Highest	Compliant
§15.247(d)	TX spurious emissions conducted	LORA	☒ Lowest ☒ Middle ☒ Highest	LORA	☒ Lowest ☒ Middle ☒ Highest	Compliant
§15.247(d)	TX spurious emissions radiated	LORA	☒ Lowest ☒ Middle ☒ Highest	LORA	☒ Lowest ☒ Middle ☒ Highest	Compliant
§15.209(a)	TX spurious Emissions radiated Below 1GHz	LORA	☒ Lowest ☒ Middle ☒ Highest	LORA	☒ Middle	Compliant
§15.107(a) §15.207	Conducted Emissions 9KHz-30 MHz	LORA	☒ Lowest ☒ Middle ☒ Highest	LORA	☒ Middle	N/A

Remark: The measurement uncertainty is not included in the test result.

3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the Shenzhen CTA Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen CTA Testing Technology Co., Ltd. :

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	9KHz~30MHz	3.02 dB	(1)
Radiated Emission	30~1000MHz	4.06 dB	(1)
Radiated Emission	1~18GHz	5.14 dB	(1)
Radiated Emission	18-40GHz	5.38 dB	(1)
Conducted Disturbance	0.15~30MHz	2.14 dB	(1)
Output Peak power	30MHz~18GHz	0.55 dB	(1)
Power spectral density	/	0.57 dB	(1)
Spectrum bandwidth	/	1.1%	(1)

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Radiated spurious emission (30MHz-1GHz)	30~1000MHz	4.10 dB	(1)
Radiated spurious emission (1GHz-18GHz)	1~18GHz	4.32 dB	(1)
Radiated spurious emission (18GHz-40GHz)	18-40GHz	5.54 dB	(1)
Time	/	±2%	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3.6 Equipments Used during the Test

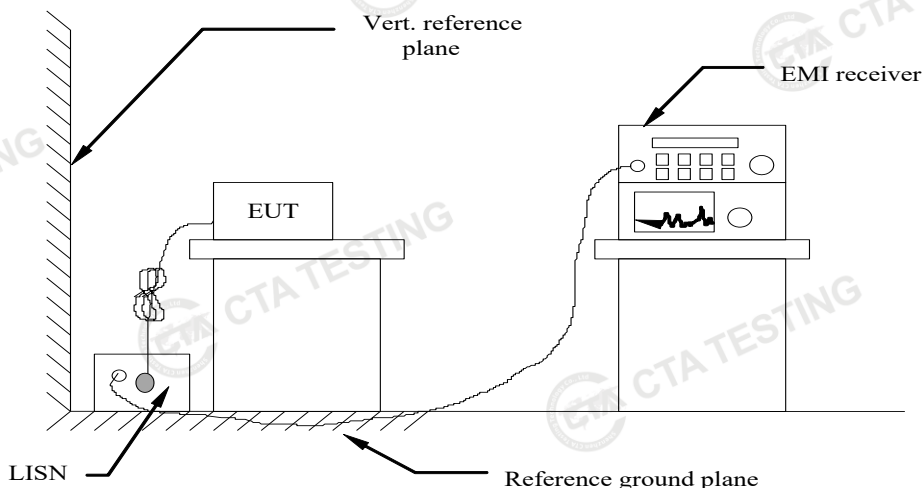
Test Equipment	Manufacturer	Model No.	Equipment No.	Calibration Date	Calibration Due Date
LISN	R&S	ENV216	CTA-308	2025/08/04	2026/08/03
LISN	R&S	ENV216	CTA-314	2025/07/30	2026/07/29
EMI Test Receiver	R&S	ESPI	CTA-307	2025/07/30	2026/07/29
EMI Test Receiver	R&S	ESCI	CTA-306	2025/07/30	2026/07/29
Spectrum Analyzer	Agilent	N9020A	CTA-301	2025/05/17	2026/05/16
Spectrum Analyzer	Agilent	N9020A	CTA-301	2025/07/30	2026/07/29
Vector Signal generator	Agilent	N5182A	CTA-305	2025/07/30	2026/07/29
Analog Signal Generator	R&S	E4421B	CTA-304	2025/07/30	2026/07/29
WIDEBAND RADIO COMMUNICATION TESTER	R&S	CMW500	CTA-302	2025/07/30	2026/07/29
Temperature and humidity meter	Chigo	ZG-7020	CTA-326	2025/07/31	2026/07/30
Ultra-Broadband Antenna	Schwarzbeck	VULB9163	CTA-310	2023/10/17	2026/10/16
Horn Antenna	Schwarzbeck	BBHA 9120D	CTA-309	2023/10/13	2026/10/12
Loop Antenna	Zhinan	ZN30900C	CTA-311	2023/10/17	2026/10/16
Horn Antenna	Schwarzbeck	BBHA 9170	CTA-346	2025/05/18	2028/05/17
Amplifier	Schwarzbeck	BBV9745	CTA-312	2025/07/30	2026/07/29
Amplifier	Tonscend	TAP-011840	CTA-313	2025/07/30	2026/07/29
High-Pass Filter	XingBo	XBLBQ-GTA18	CTA-402	2025/07/30	2026/07/29
High-Pass Filter	XingBo	XBLBQ-GTA27	CTA-403	2025/07/30	2026/07/29
Automatic control unit	Tonscend	JS0806-2	CTA-351	2025/07/30	2026/07/29
Amplifier	SKET	LNPA 1840G-50	CTA-345	2025/05/17	2026/05/16
Spectrum analyzer	R&S	FSV40-N	CTA-344	2025/05/17	2026/05/16
Attenuator	XINQY	10dB	N/A	N/A	N/A
Programmable Constant Temperature And Humidity Test Chamber	DONGGUAN JINGYU	HT-H-408	CTA-053	2025/07/30	2026/07/29
EMI Test Software	Tonscend	TS@JS32-RE	5.0.0.2	N/A	N/A
EMI Test Software	Tonscend	TS@JS32-CE	5.0.0.1	N/A	N/A
RF Test Software	Tonscend	TS@JS1120-3	3.1.65	N/A	N/A
RF Test Software	Tonscend	TS@JS1120	3.1.46	N/A	N/A

Note: The automatic control unit integrated Power sensor

4 TEST CONDITIONS AND RESULTS

4.1 AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2020+Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024
- 4 The EUT received power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST RESULTS

The EUT is powered by the Battery, so this test item is not applicable for the EUT.

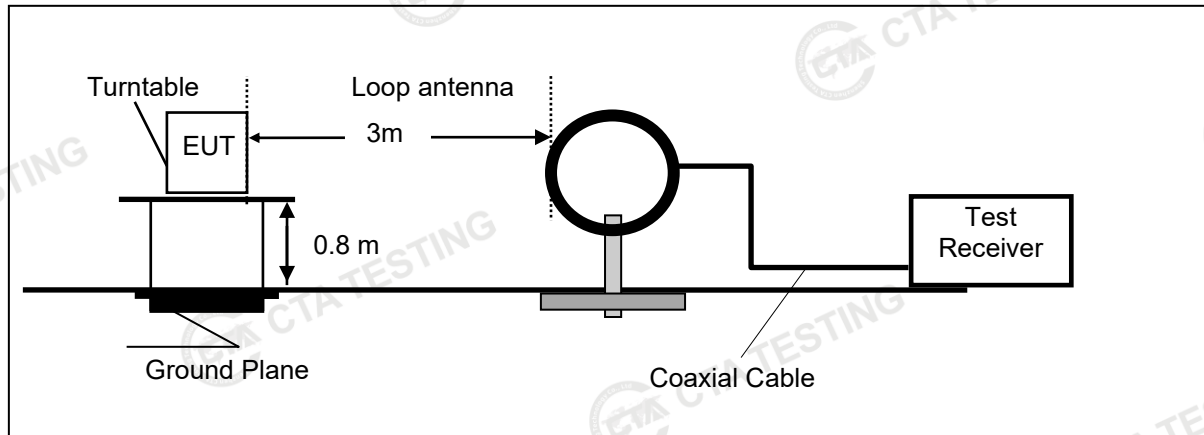
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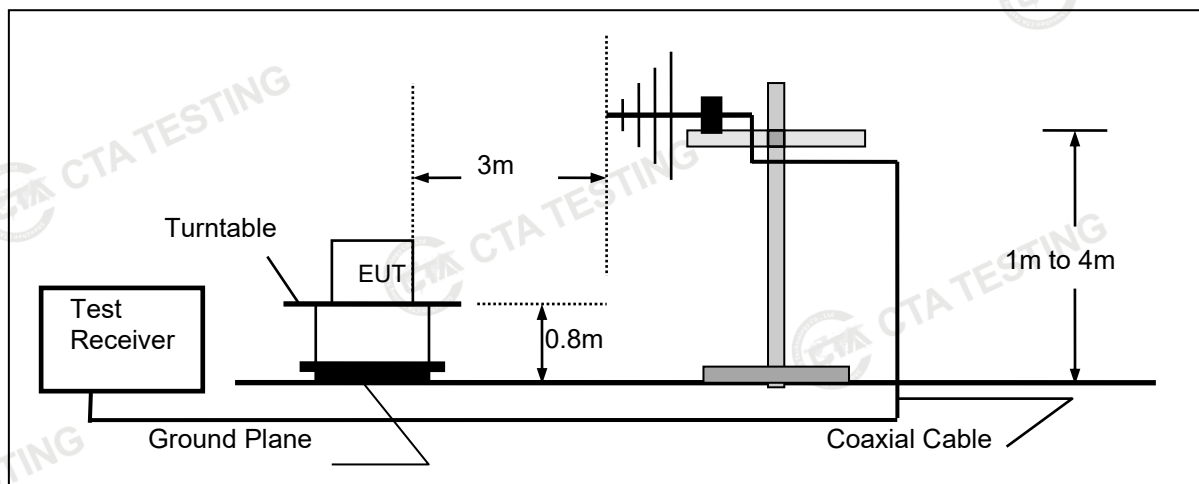
4.2 Radiated Emission

TEST CONFIGURATION

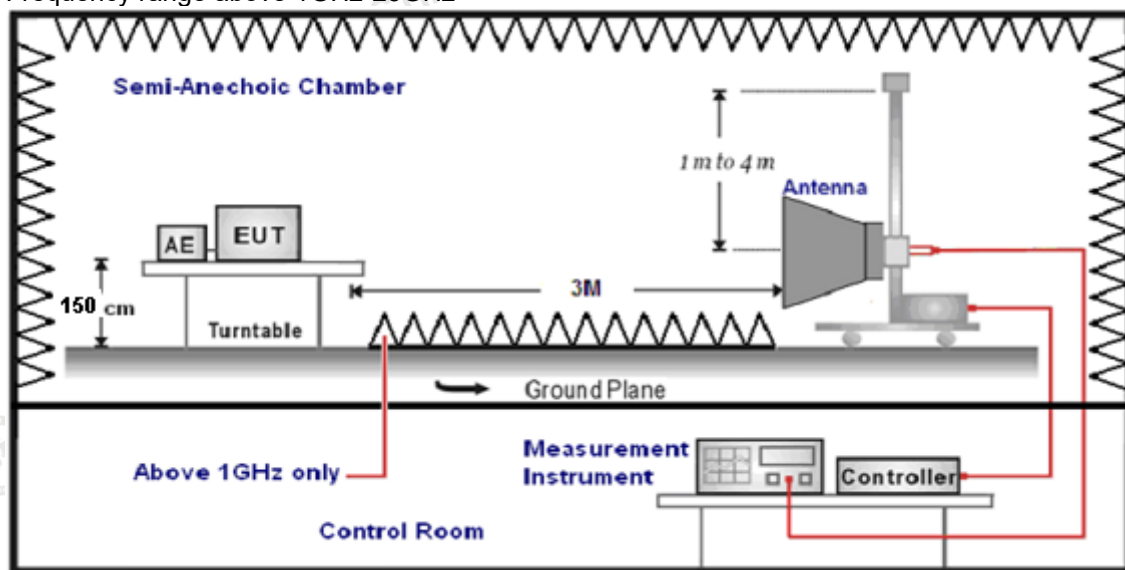
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. Radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz, Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz, Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz, Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

$$\text{Transd} = AF + CL - AG$$

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz})) + 40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz})) + 40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30) + 40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

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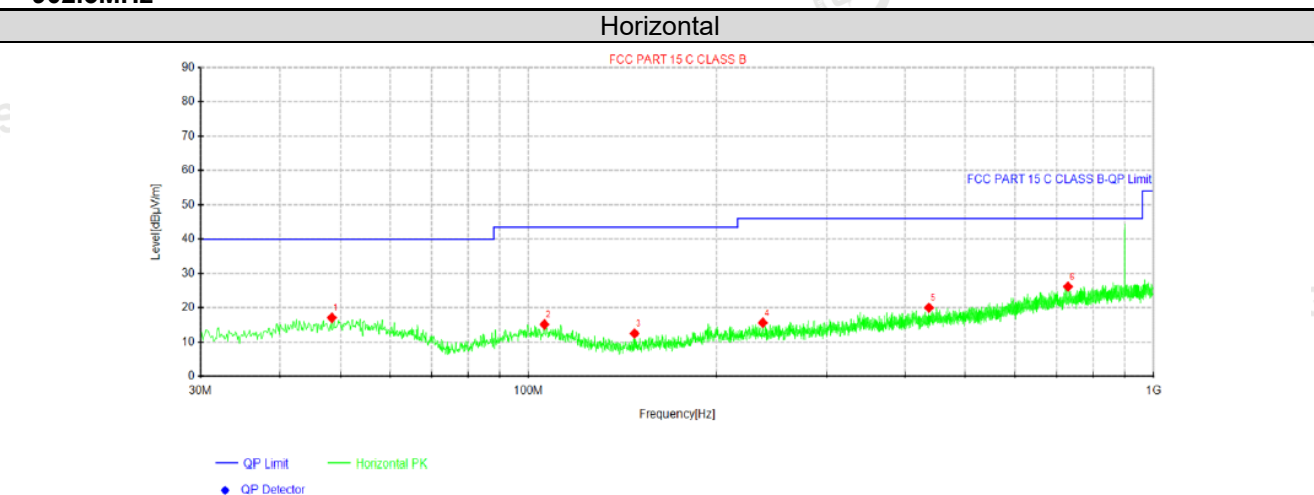
TEST RESULTS

Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. For below 1GHz testing recorded worst at FHSS Low channel.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

For 30MHz-1GHz

902.3MHz



Suspected Data List

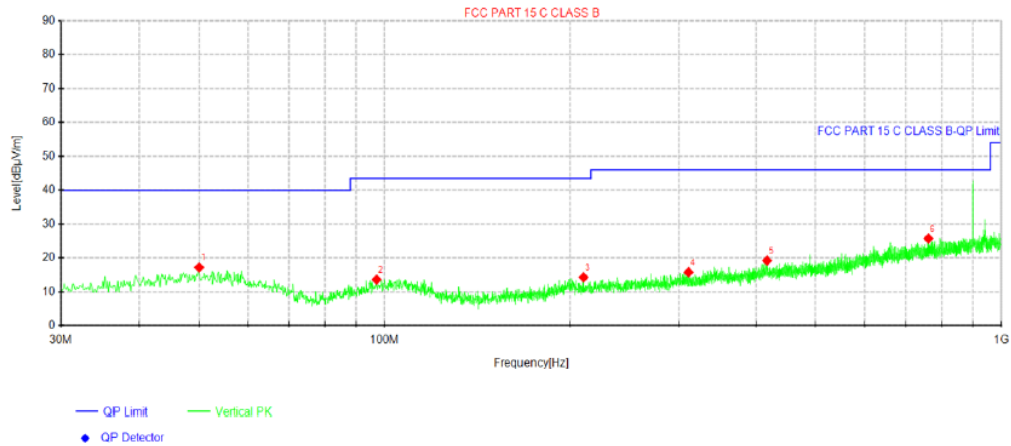
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	48.43	27.63	17.09	-10.54	40.00	22.91	Horizontal
2	106.0238	27.81	15.17	-12.64	43.50	28.33	Horizontal
3	147.7337	29.34	12.52	-16.82	43.50	30.98	Horizontal
4	237.095	28.83	15.63	-13.20	46.00	30.37	Horizontal
5	437.2788	29.46	20.00	-9.46	46.00	26.00	Horizontal
6	729.9763	30.17	26.17	-4.00	46.00	19.83	Horizontal

Note: 1). Level (dBμV/m) = Reading (dBμV) + Factor (dB/m)

2). Factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin (dB) = Limit (dBμV/m) - Level (dBμV/m)

Vertical



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	50.0062	27.84	17.20	-10.64	40.00	22.80	Vertical
2	97.0512	26.72	13.62	-13.10	43.50	29.88	Vertical
3	210.1775	28.01	14.32	-13.69	43.50	29.18	Vertical
4	311.0575	27.56	15.78	-11.78	46.00	30.22	Vertical
5	416.9088	28.88	19.22	-9.66	46.00	26.78	Vertical
6	761.865	29.34	25.73	-3.61	46.00	20.27	Vertical

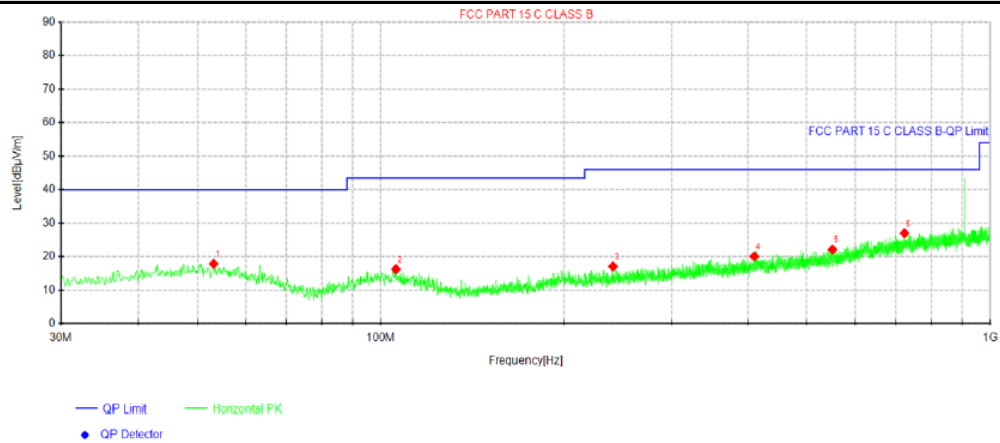
Note:1). Level (dBμV/m) = Reading (dBμV) + Factor (dB/m)

2). Factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin (dB) = Limit (dBμV/m) - Level (dBμV/m)

908.5MHz

Horizontal



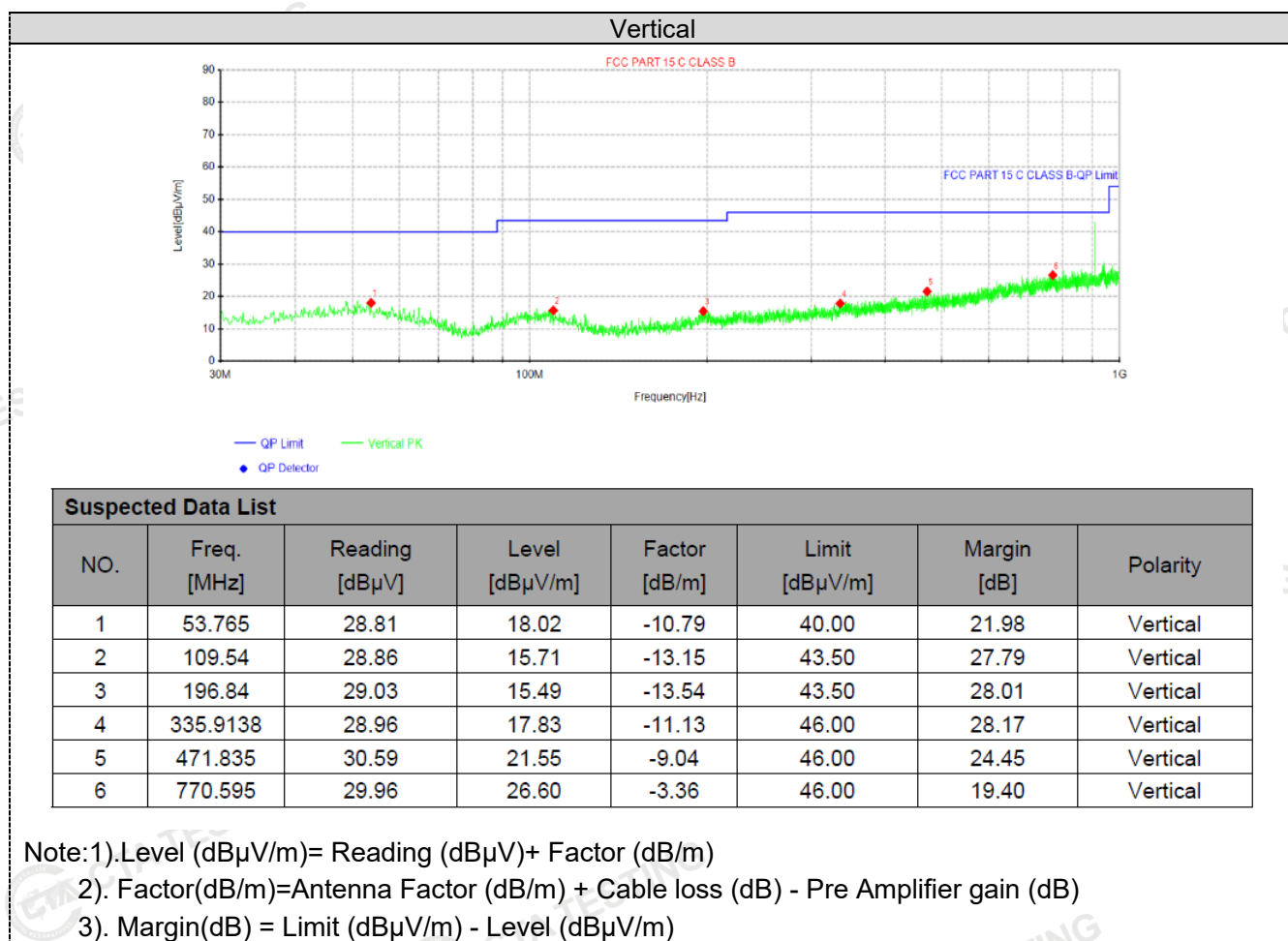
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	53.1588	28.59	17.85	-10.74	40.00	22.15	Horizontal
2	105.9025	28.89	16.27	-12.62	43.50	27.23	Horizontal
3	240.3688	30.29	17.09	-13.20	46.00	28.91	Horizontal
4	410.1188	30.02	20.07	-9.95	46.00	25.93	Horizontal
5	551.0112	30.14	22.13	-8.01	46.00	23.87	Horizontal
6	723.3075	31.12	26.99	-4.13	46.00	19.01	Horizontal

Note:1). Level (dBμV/m) = Reading (dBμV) + Factor (dB/m)

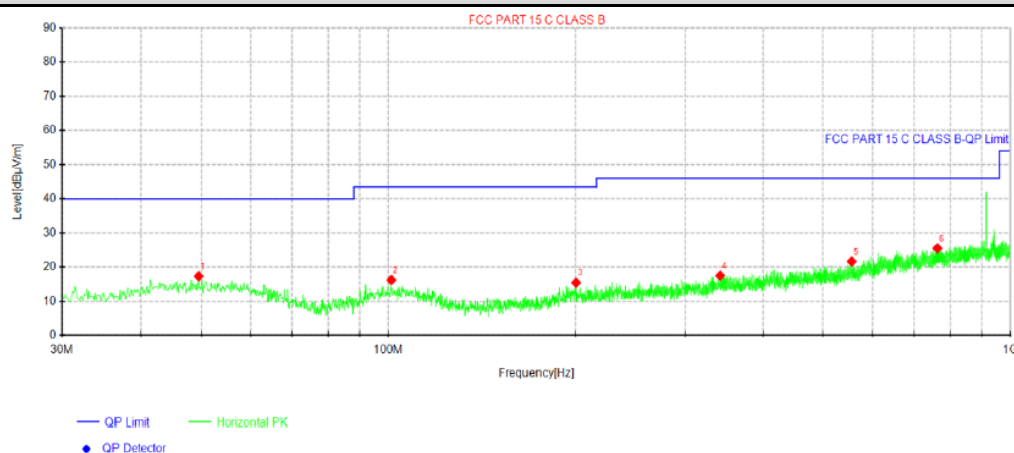
2). Factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin (dB) = Limit (dBμV/m) - Level (dBμV/m)



914.9MHz

Horizontal



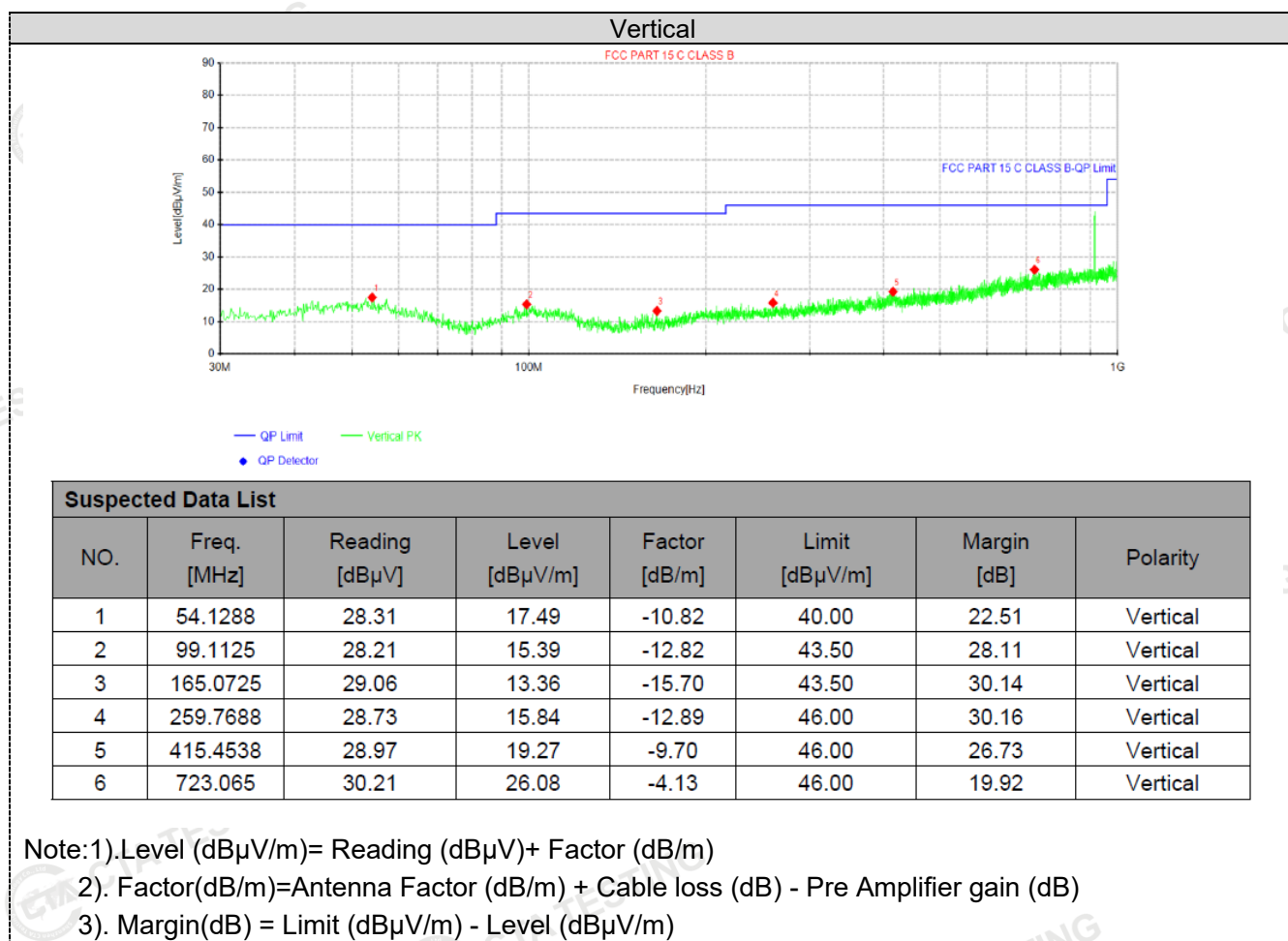
Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	49.5212	27.89	17.34	-10.55	40.00	22.66	Horizontal
2	101.0525	28.96	16.23	-12.73	43.50	27.27	Horizontal
3	200.235	28.57	15.45	-13.12	43.50	28.05	Horizontal
4	341.4912	28.40	17.50	-10.90	46.00	28.50	Horizontal
5	555.74	29.55	21.64	-7.91	46.00	24.36	Horizontal
6	763.1988	29.11	25.53	-3.58	46.00	20.47	Horizontal

Note: 1). Level (dBμV/m) = Reading (dBμV) + Factor (dB/m)

2). Factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

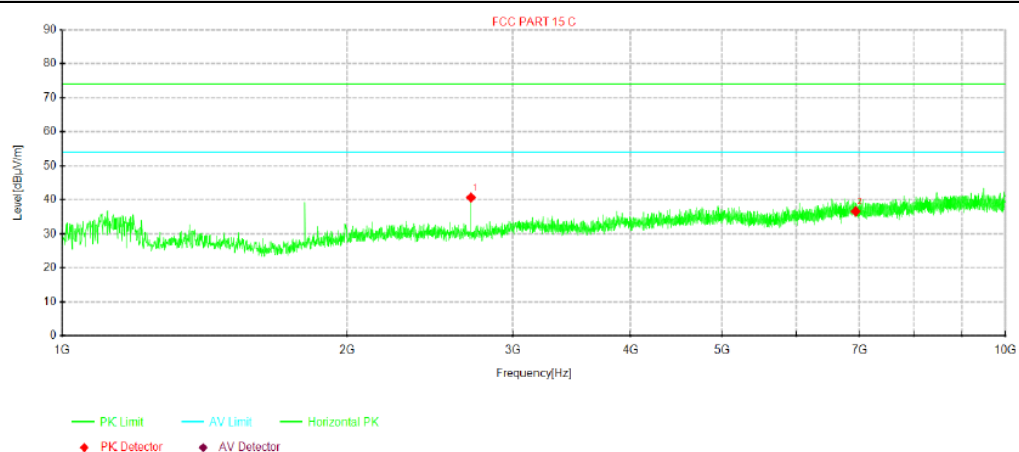
3). Margin (dB) = Limit (dBμV/m) - Level (dBμV/m)



For 1GHz to 10GHz

902.3MHz

Horizontal



Suspected Data List

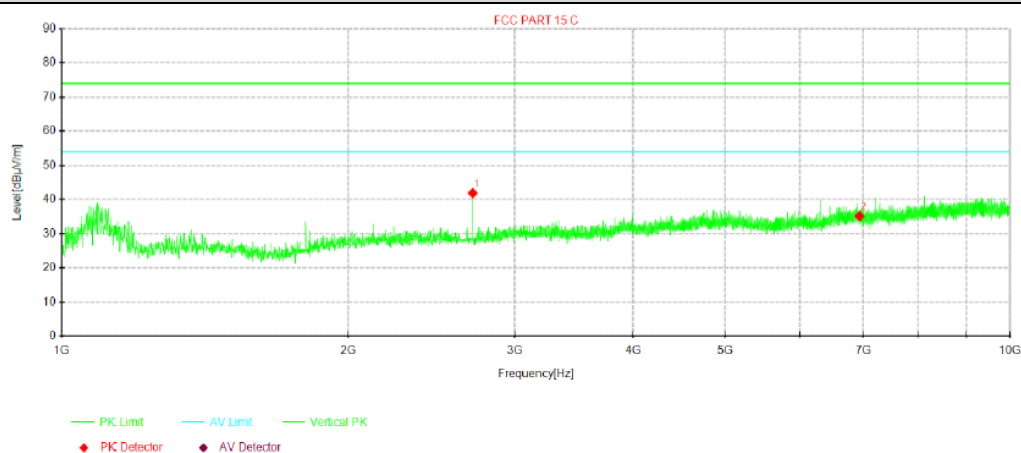
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2707.47	61.03	40.67	-20.36	74.00	33.33	Horizontal
2	6934.82	47.77	36.59	-11.18	74.00	37.41	Horizontal

Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

Vertical



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2707.47	62.23	41.87	-20.36	74.00	32.13	Vertical
2	6934.56	46.38	35.20	-11.18	74.00	38.80	Vertical

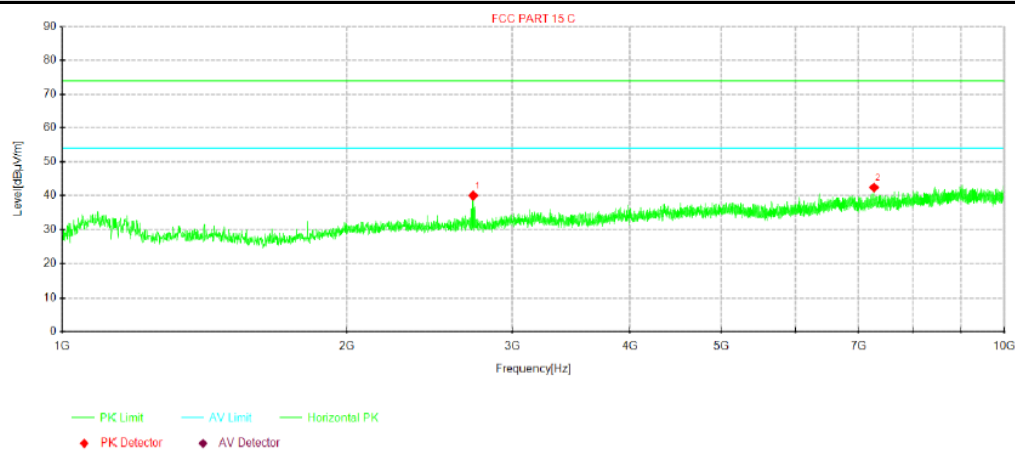
Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

908.5MHz

Horizontal



Suspected Data List

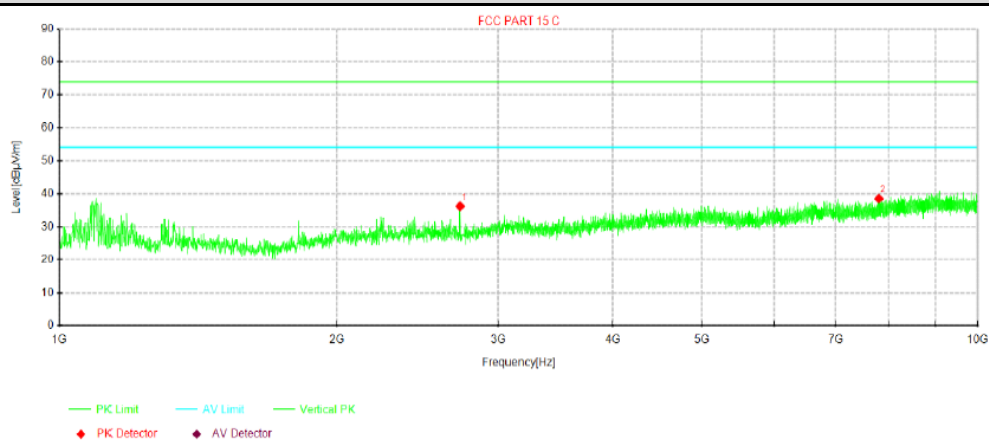
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2725.47	60.30	39.99	-20.31	74.00	34.01	Horizontal
2	7268.22	52.49	42.41	-10.08	74.00	31.59	Horizontal

Note:1). Level (dBμV/m) = Reading (dBμV) + Factor (dB/m)

2). Factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin (dB) = Limit (dBμV/m) - Level (dBμV/m)

Vertical



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2725.47	56.48	36.17	-20.31	74.00	37.83	Vertical
2	7799.27	47.36	38.58	-8.78	74.00	35.42	Vertical

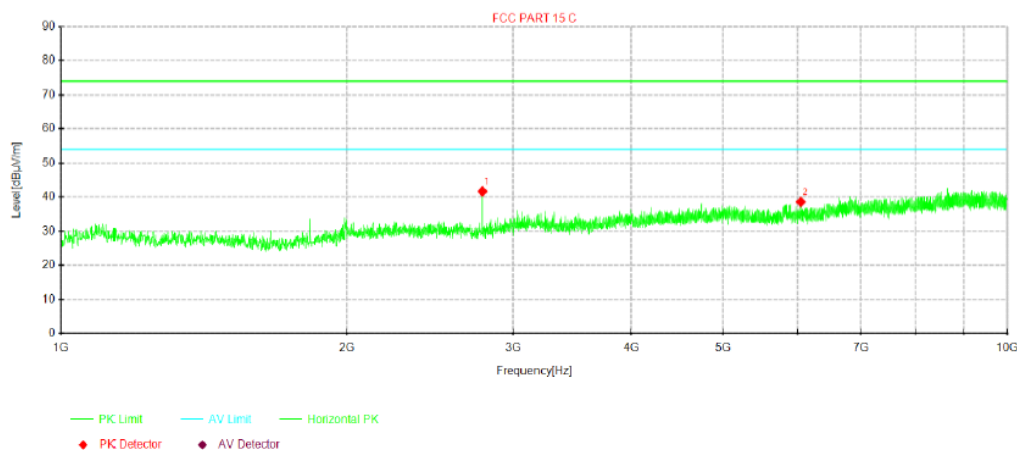
Note:1). Level (dBμV/m) = Reading (dBμV) + Factor (dB/m)

2). Factor (dB/m) = Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin (dB) = Limit (dBμV/m) - Level (dBμV/m)

914.9MHz

Horizontal



Suspected Data List

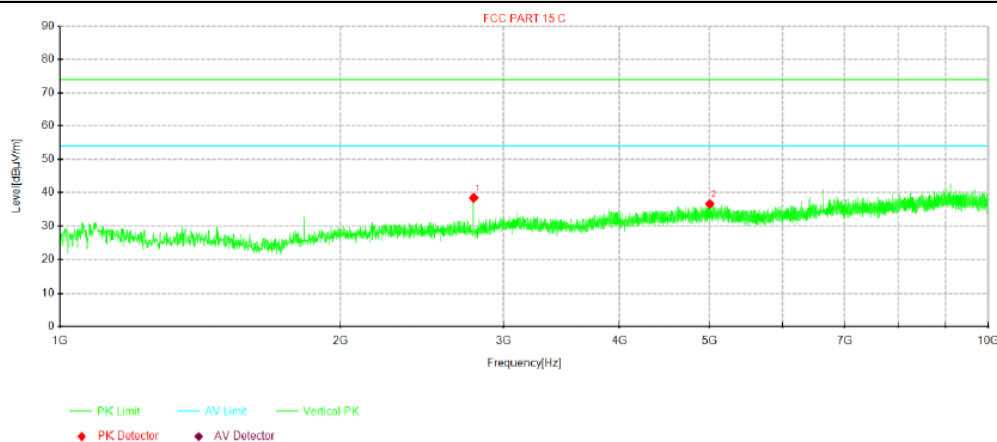
NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2783.07	61.88	41.64	-20.24	74.00	32.36	Horizontal
2	6044.10	52.13	38.60	-13.53	74.00	35.40	Horizontal

Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

Vertical



Suspected Data List

NO.	Freq. [MHz]	Reading [dBμV]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Polarity
1	2784.87	58.66	38.42	-20.24	74.00	35.58	Vertical
2	5007.20	50.93	36.58	-14.35	74.00	37.42	Vertical

Note:1).Level (dBμV/m)= Reading (dBμV)+ Factor (dB/m)

2). Factor(dB/m)=Antenna Factor (dB/m) + Cable loss (dB) - Pre Amplifier gain (dB)

3). Margin(dB) = Limit (dBμV/m) - Level (dBμV/m)

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. The other emission levels were very low against the limit.

4.3 Maximum Peak Output Power

Limit

The Maximum Peak Output Power Measurement is 1W (30dBm).

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the powersensor.

Test Configuration



Test Results

Channel	Output power (dBm)	Limit (dBm)	Result
CH01	7.892	30.0	Pass
CH32	5.293		
CH64	2.792		

Note: 1.The test results including the cable loss.

4.4 20dB Bandwidth

Limit

For frequency hopping systems operating in the 902MHz-928MHz no limit for 20dB bandwidth. The maximum 20 dB bandwidth of the hopping channel shall be 500 kHz.

Test Procedure

The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the EMI receiver or spectrum analyzer shall be between two times and five times the OBW. The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW was 1% to 5% of the OBW and VBW shall be at least three times RBW.

a) Span: shall be between two times and five times the OBW.

b) RBW: 1% to 5% of the OBW.

c) Video bandwidth (VBW) $\geq$ 3RBW

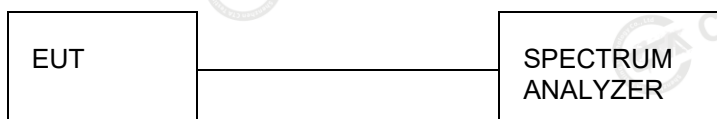
d) Sweep: Auto.

e) Detector function: Peak.

f) Trace: Max-hold.

g) Allow the trace to stabilize

Test Configuration

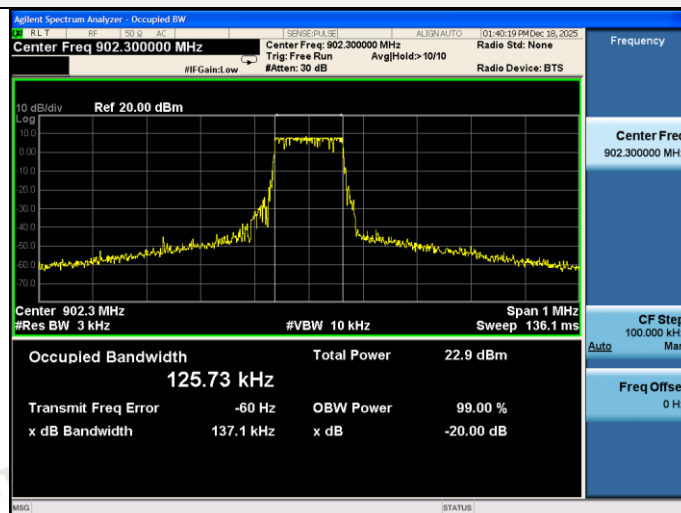


Test Results

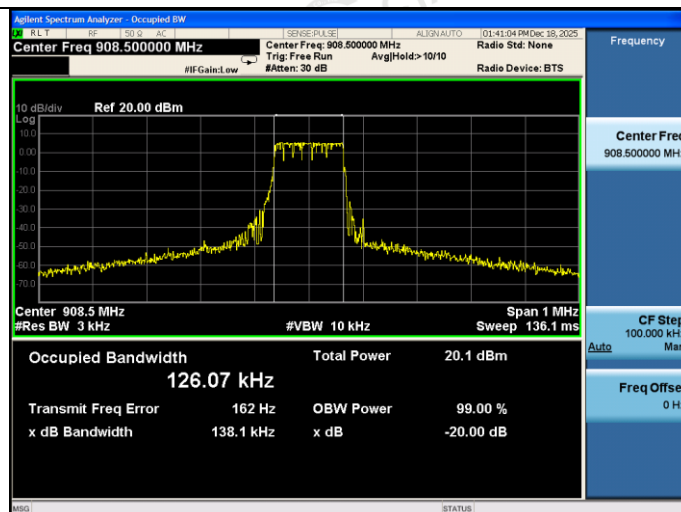
Channel	20dB bandwidth (MHz)	Result
CH01	0.1371	Pass
CH32	0.1381	
CH64	0.1389	

Test plot as follows:

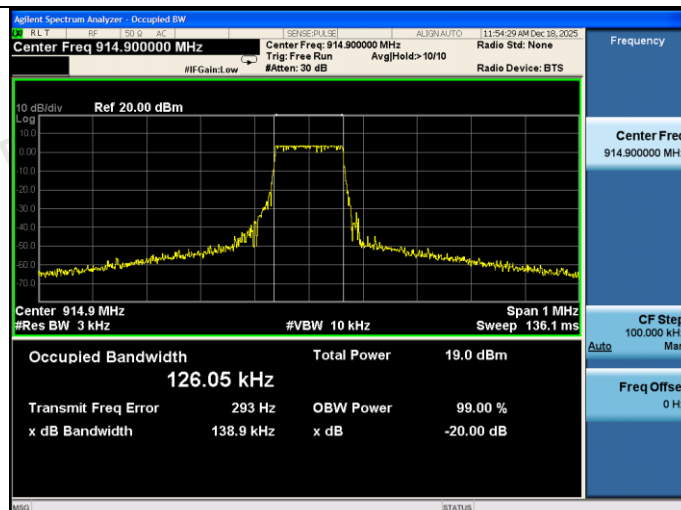
LORA



CH01



CH32



CH64

4.5 Frequency Separation

LIMIT

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the 20dB bandwidth of the hopping channel, whichever is greater.

TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

TEST CONFIGURATION



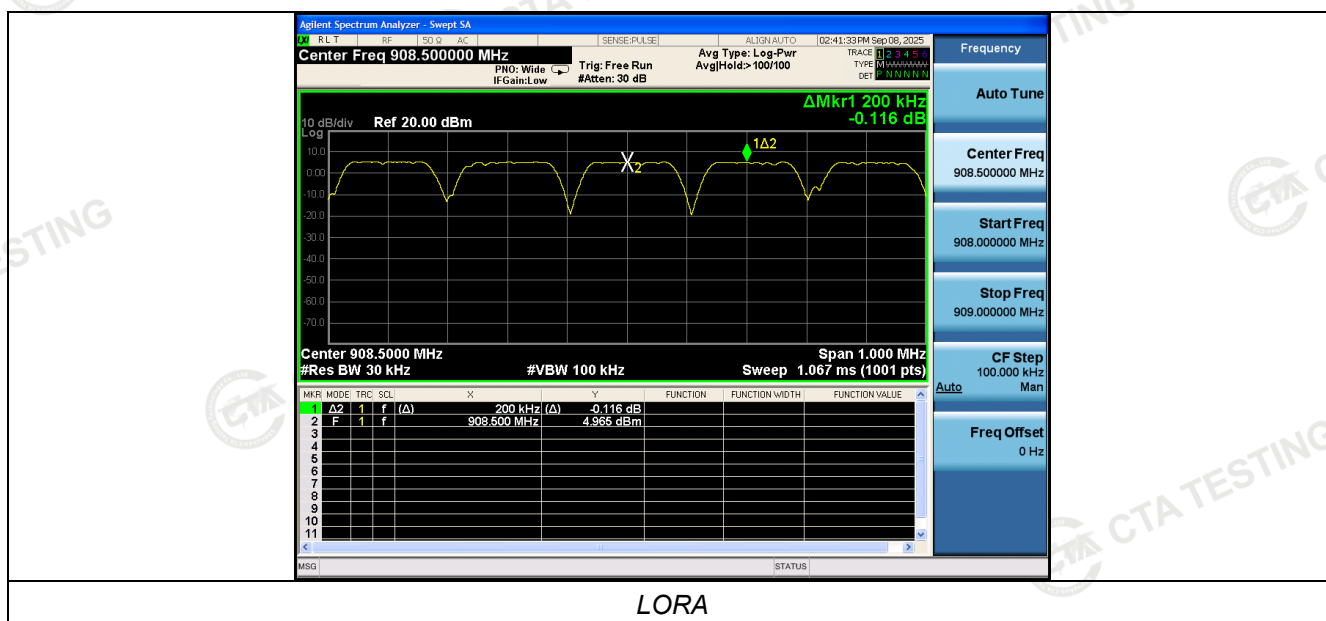
TEST RESULTS

Channel	Channel Separation (MHz)	Limit(MHz)	Result
CH24	0.2	25KHz or 20dB bandwidth	Pass
CH32			

Note:

We have tested all mode at high, middle and low channel, and recorded worst case at middle

Test plot as follows:



4.6 Number of hopping frequency

Limit

≥50 For Frequency hopping systems in the 902–928MHz band

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 903MHz to 906MHz with 100 KHz RBW and 300 KHz VBW.

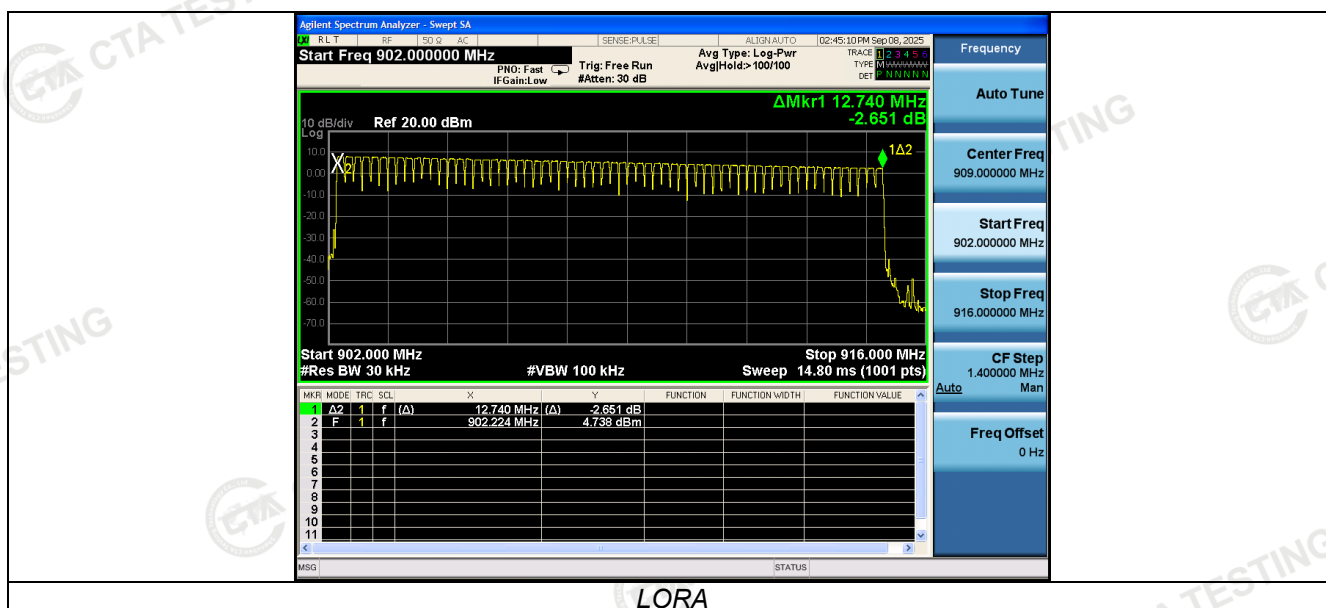
Test Configuration



Test Results

Number of Hopping Channel	Limit	Result
64	≥50	Pass

Test plot as follows:



4.7 Time of Occupancy (Dwell Time)

Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set center frequency of spectrum analyzer=operating frequency with 1MHz RBW and 1MHz VBW, Span 0Hz.

Test Configuration



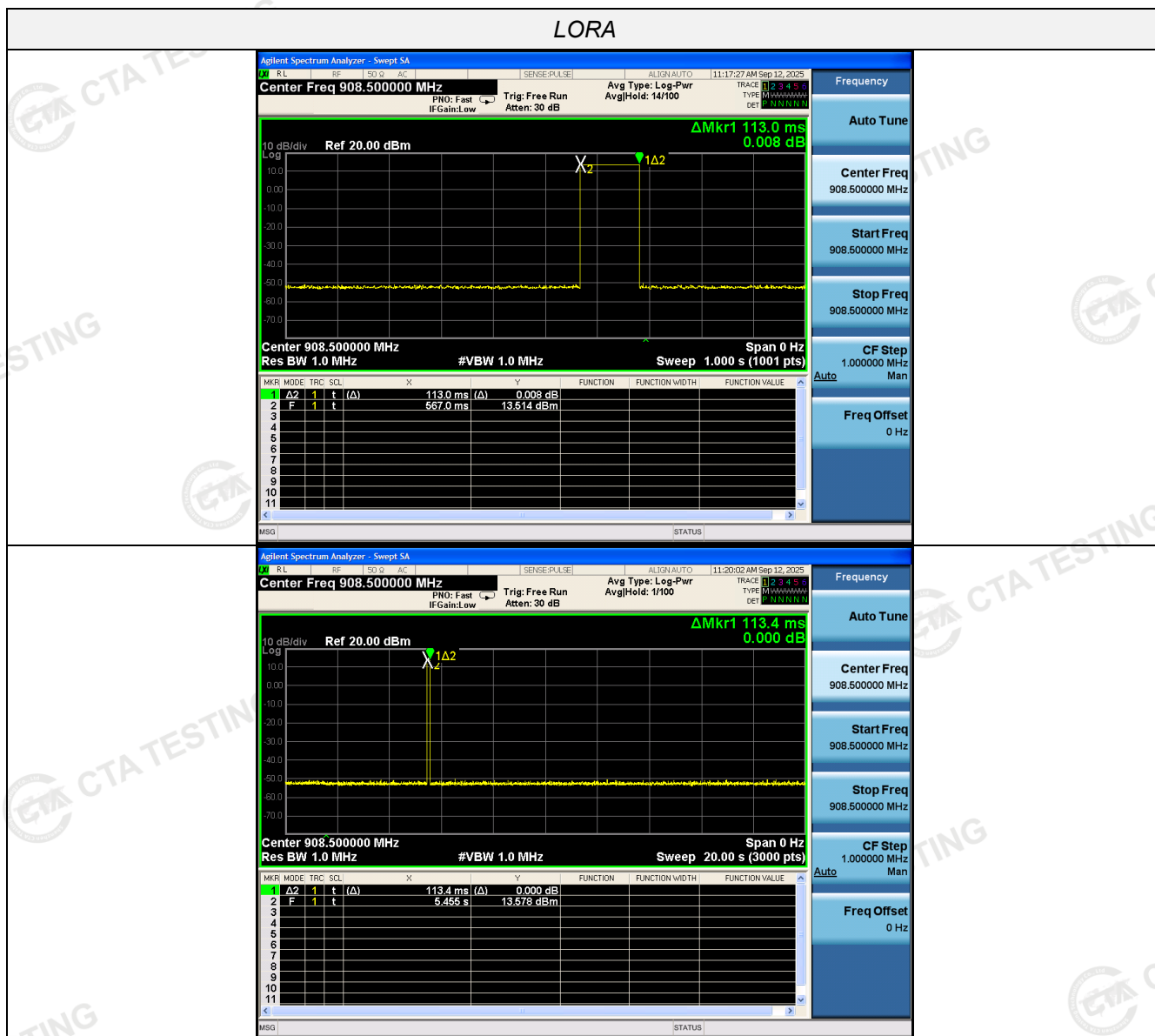
Test Results

CH	Burst time (s)	Dwell time (s)	Limit (s)	Result
25	0.113	0.1134	0.40	Pass

Note: We have tested all mode at high, middle and low channel, and recorded worst case at middle channel.

Test plot as follows:

LORA



4.8 Out-of-band Emissions

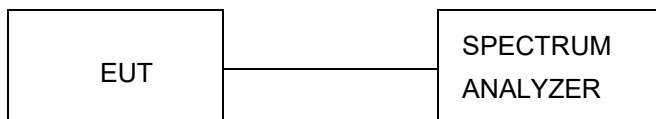
Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector, and max hold. Measurements utilizing these settings are made of the in-band reference level, band edge and out-of-band emissions.

Test Configuration



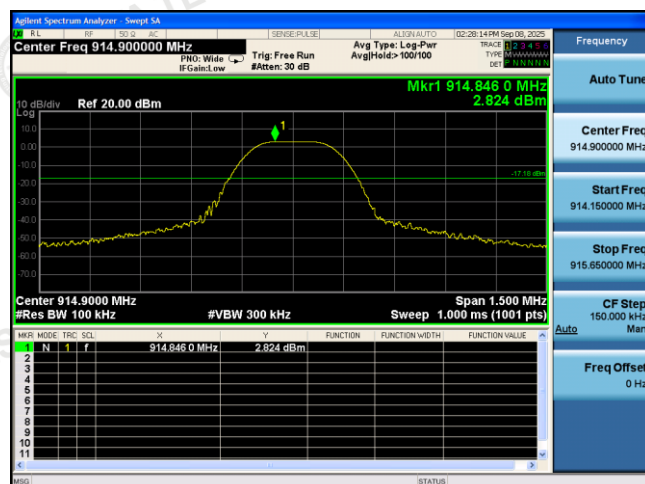
Test Results

Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and band edge measurement data.

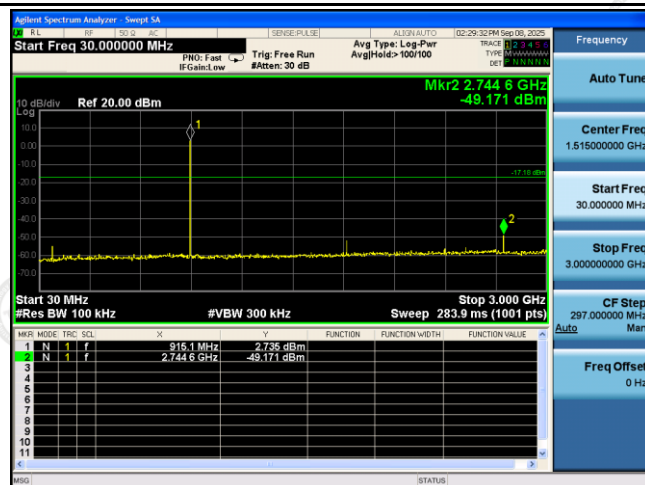
Test plot as follows:



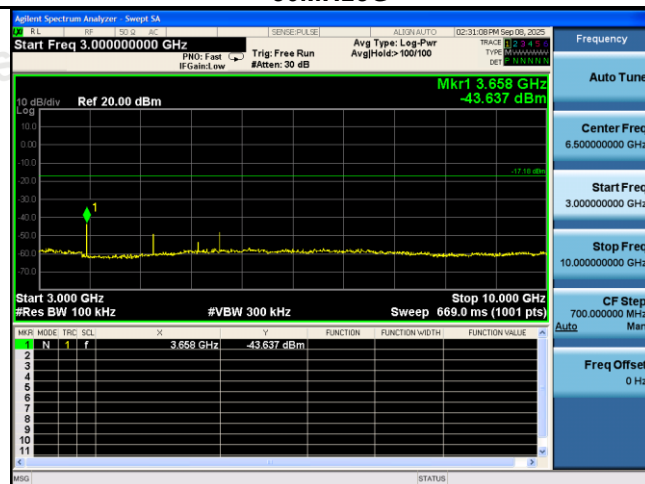
CH64



reference



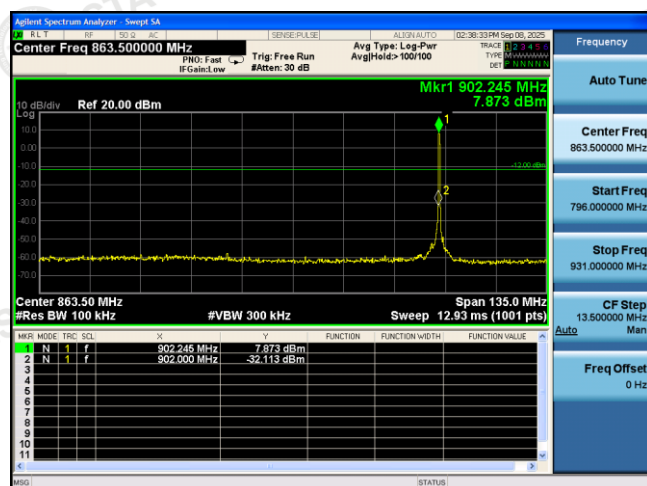
30MHz3G



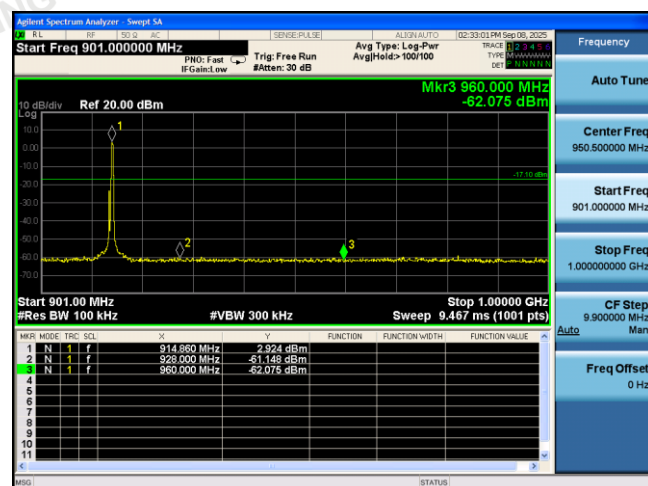
3G-10G

Band-edge Measurements for RF Conducted Emissions:

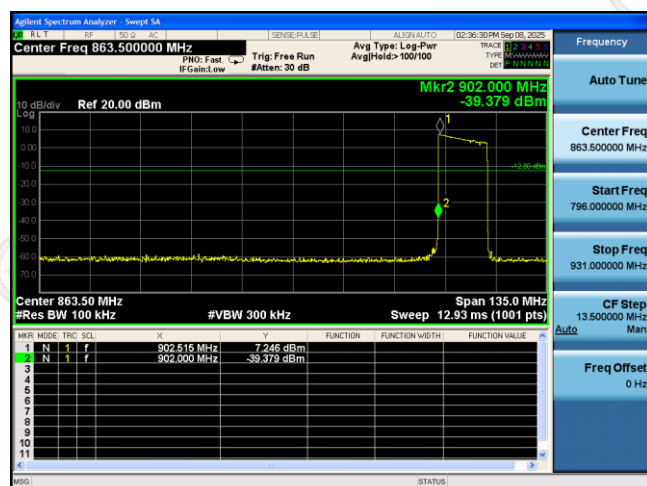
LORA



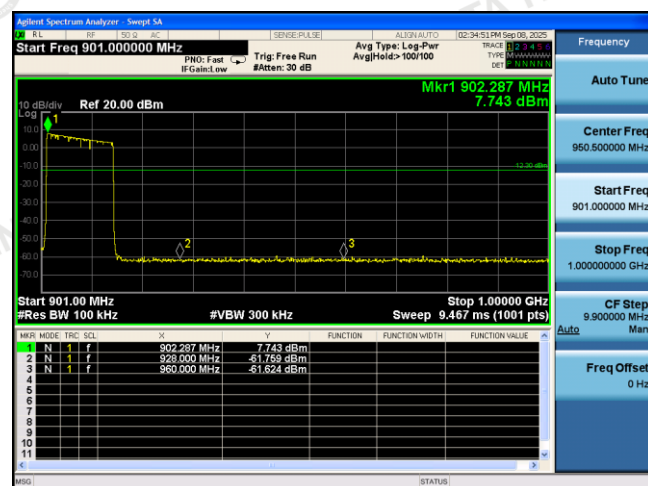
Left Band edge hopping off



Right Band edge hopping off



Left Band edge hopping on



Right Band edge hopping on

4.9 Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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.

And according to FCC 47 CFR Section 15.247 (c), if 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 6dBi.

Refer to statement below for compliance

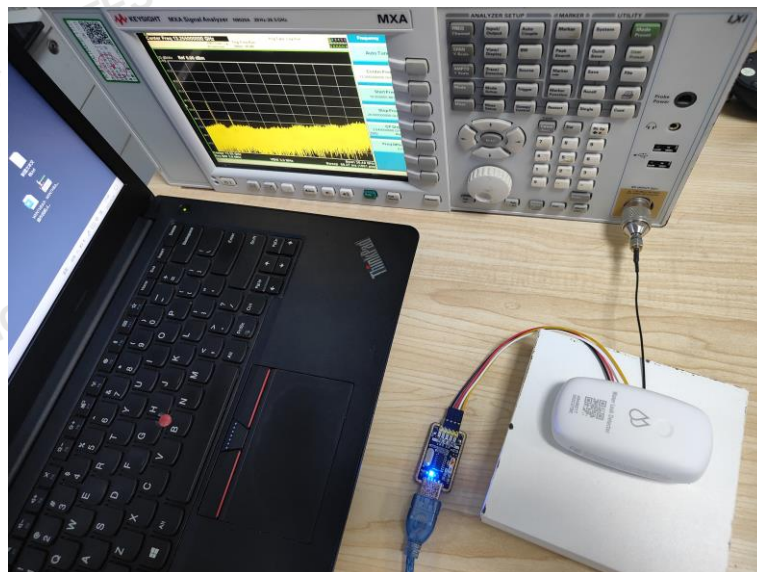
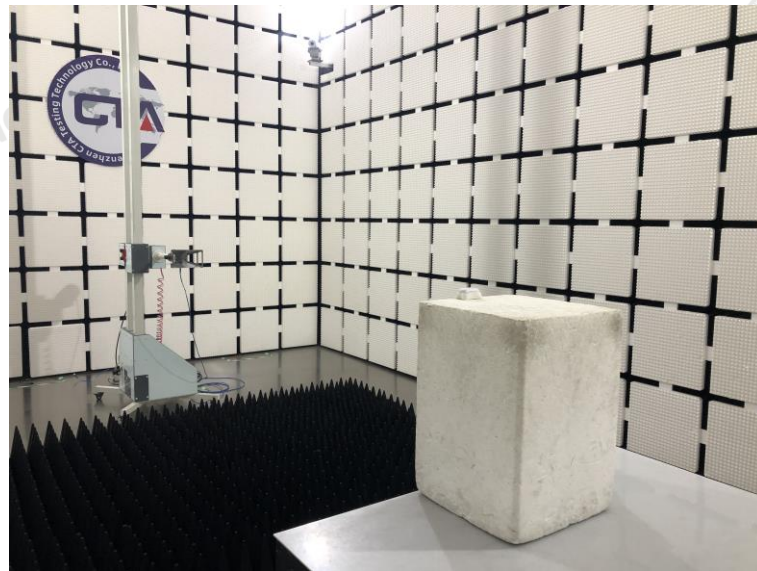
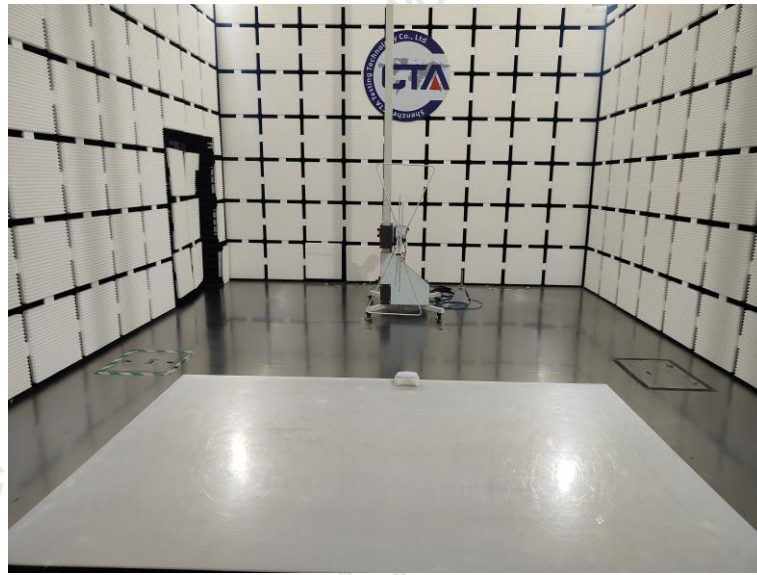
The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

Antenna Connected Construction

The maximum gain of antenna was 1.75 dBi.

Remark: The antenna gain is provided by the customer, if the data provided by the customer is not accurate, Shenzhen CTA Testing Technology Co., Ltd. does not assume any responsibility.

5 Test Setup Photos of the EUT



Shenzhen CTA Testing Technology Co., Ltd.

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Tel: +86-755 2322 5875 E-mail: cta@cta-test.cn Web: <http://www.cta-test.cn>

6 Photos of the EUT

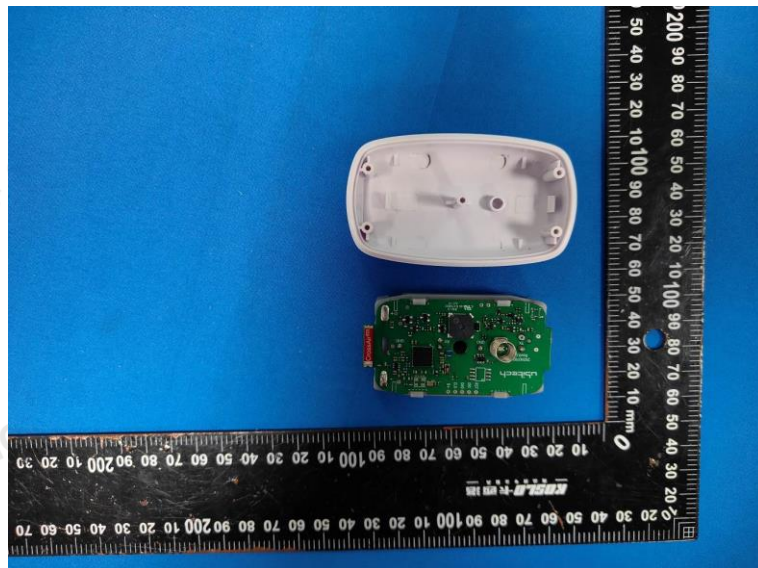


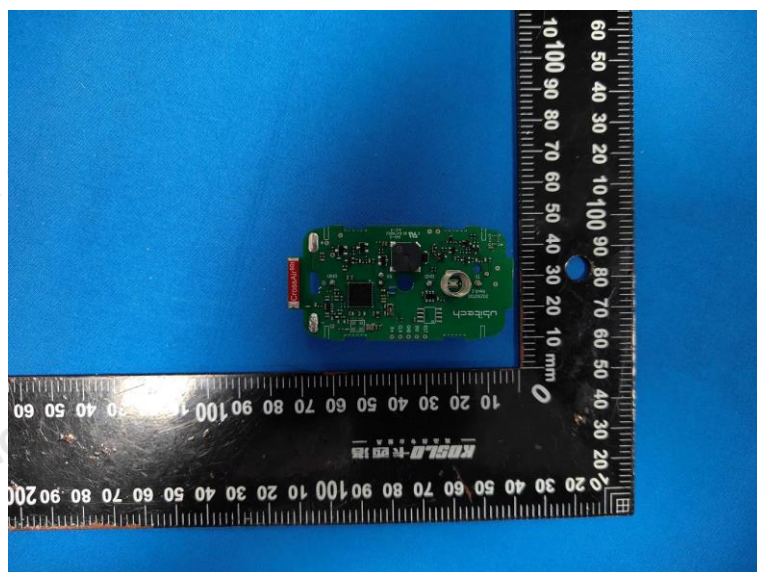
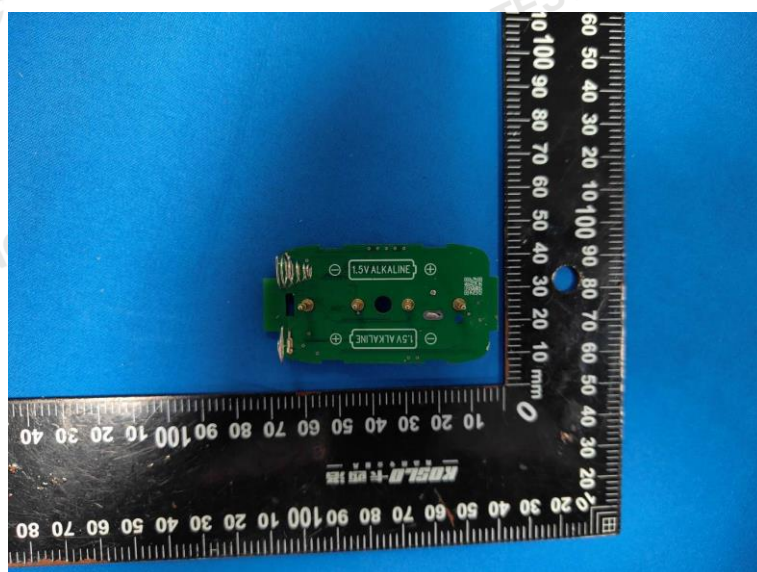
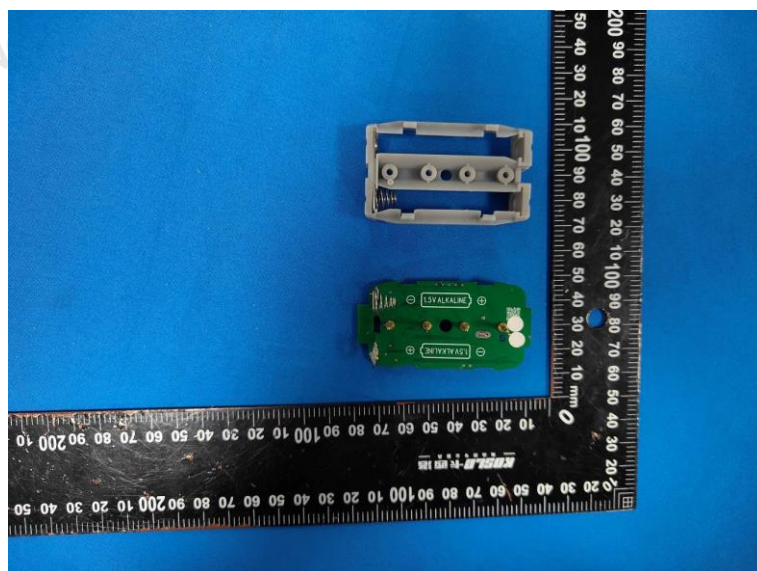
Shenzhen CTA Testing Technology Co., Ltd.

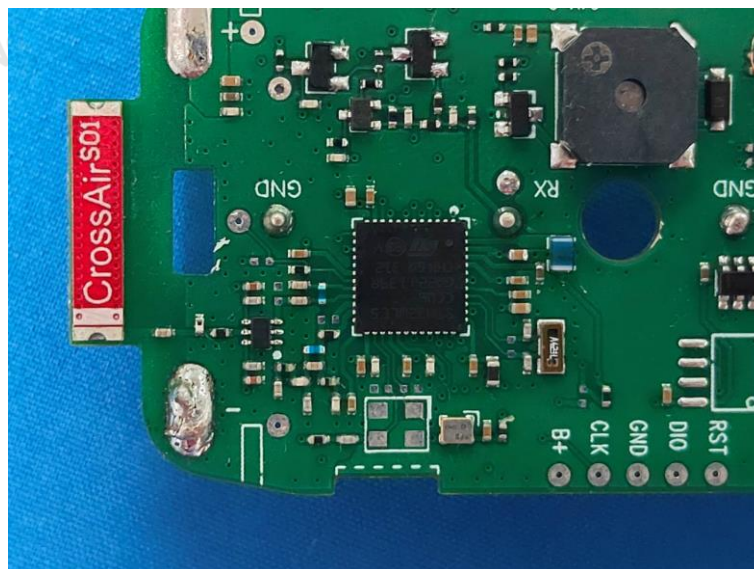
Room 106, Building 1, Yibaolai Industrial Park, Qiaotou Community, Fuhai Street, Bao'an District, Shenzhen, China

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***** End of Report *****