

TEST REPORT

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Report Number : SZNS1220921-43065E-RF-00A
FCC ID: 2A4G9-006

Test Standard (s)

FCC PART 15.231

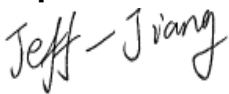
Sample Description

Product Type: Remote control
Model No.: IT104
Trade Mark: 
Date Received: 2022-09-21
Date of Test: 2022-10-08 to 2022-10-18
Report Date: 2022-10-18

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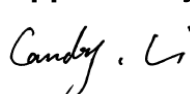
* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:



Jeff Jiang
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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TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT).....	3
OBJECTIVE	3
TEST METHODOLOGY	3
MEASUREMENT UNCERTAINTY	4
SYSTEM TEST CONFIGURATION.....	5
JUSTIFICATION	5
SPECIAL ACCESSORIES	5
EQUIPMENT MODIFICATIONS	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
EXTERNAL I/O CABLE.....	5
BLOCK DIAGRAM OF TEST SETUP	5
SUMMARY OF TEST RESULTS	6
TEST EQUIPMENT LIST AND DETAILS	7
FCC §1.1307 (B) & §2.1093 – RF EXPOSURE.....	8
APPLICABLE STANDARD	8
TEST RESULT:	8
FCC §15.203 - ANTENNA REQUIREMENT.....	9
APPLICABLE STANDARD	9
ANTENNA CONNECTOR CONSTRUCTION	9
FCC §15.205, §15.209, §15.231 (B) - RADIATED EMISSIONS	10
APPLICABLE STANDARD	10
EUT SETUP.....	10
EMI TEST RECEIVER SETUP.....	11
TEST PROCEDURE	11
CORRECTED AMPLITUDE & MARGIN CALCULATION	12
TEST RESULTS SUMMARY	12
TEST DATA	12
FCC §15.231(A) (1) - DEACTIVATION TESTING.....	17
APPLICABLE STANDARD	17
TEST PROCEDURE	17
TEST DATA	17
FCC §15.231(C) – 20 DB EMISSION BANDWIDTH TESTING	18
APPLICABLE STANDARD	18
TEST PROCEDURE	18
TEST DATA	18

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Remote control
Tested Model	IT104
Frequency Range	433.92MHz
E-field strength	70dBuV/m@3m
Modulation Technique	OOK
Antenna Specification*	1.5dBi (It is provided by the applicant)
Voltage Range	DC3V from battery
Sample serial number	SZNS1220921-43065E-RF-S1 (Assigned by ATC)
Sample/EUT Status	Good condition

Objective

All the test measurements were performed according to the measurement procedure described in ANSI C63.10 - 2013.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.209, 15.35(c) and 15.231 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.

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
Occupied Channel Bandwidth		5%
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
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

Justification

The system was configured for testing in Engineering Mode and the power is default, which was provided and declared by manufacturer.

Operating frequency: 433.92MHz

Special Accessories

No special accessories was used

Equipment Modifications

No modification was made to the EUT.

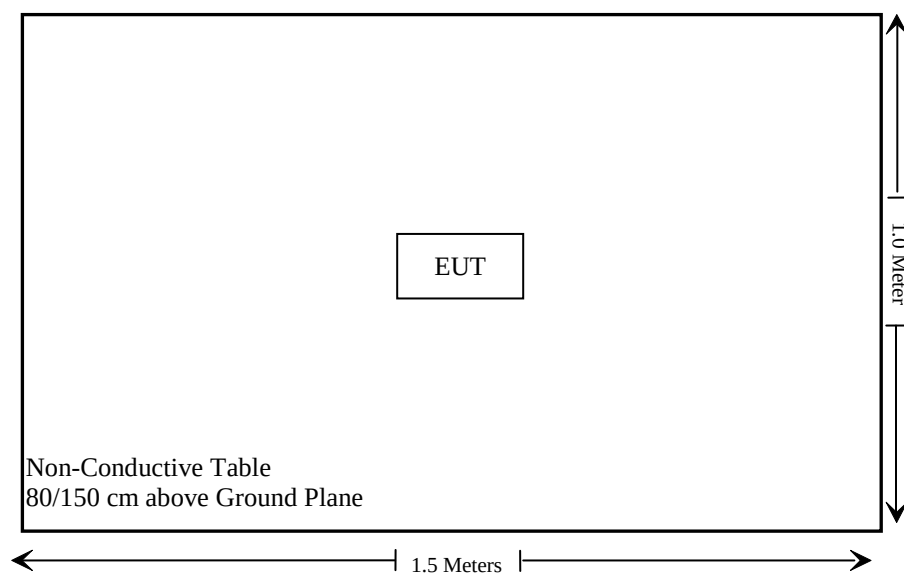
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

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

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§ 1.1307 (b) & §2.1093	RF EXPOSURE	Compliant
§15.203	Antenna Requirement	Compliant
§15.207	AC Line Conducted Emission	Not Applicable
§15.205, §15.209, §15.231(b)	Radiated Emissions	Compliant
§15.231 (c)	20dB Emission Bandwidth	Compliant
§15.231 (a) (1)	Deactivation	Compliant

Not Applicable--The device is powered by battery only.

Note: the EUT have 8 keys, pre-scan all keys, the worst case 2ON key was tested and recorded in the report.

TEST EQUIPMENT LIST AND DETAILS

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12
SONOMA INSTRUMENT	Amplifier	310 N	186131	2021/11/09	2022/11/08
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2021/11/09	2022/11/08
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2020/01/05	2023/01/04
CD	High Pass Filter	HPM-1.2/18G-60	110	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.10	N050	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.11	N1000	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13
Radiated Emission Test Software: e3 19821b (V9)					

*** 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) & §2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D04 Interim General RF Exposure Guidance v01, clause 2.1.2 – 1-mW test Exemption:

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

Test Result:

For worst case:

Mode	Frequency	Maximum Tune-up Power		1-mW test Exemption
	(MHz)	(dBm)	(mW)	
SRD	433.92	-27	0.002	Yes

Note 1: $E(\text{dBuV/m}) = \text{EIRP}(\text{dBm}) - 95.2$ for distance 3m
so the $\text{EIRP} = 70\text{dBuV/m} - 95.2 = -25.2\text{dBm}$

Note 2: $\text{EIRP}(\text{dBm}) = \text{ERP} + 2.15\text{dBi}$
so the $\text{ERP} = -25.2\text{dBm} - 2.15\text{dBi} = -27.35\text{dBm}$

Note3: The tune-up power was declared by the applicant.

Result: Compliant.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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.

Antenna Connector Construction

The EUT has one internal on board PCB antenna arrangement which was permanently attached. And the antenna gain is 1.5dBi; fulfill the requirement of this section. Please refer to EUT photos.

Result: Compliant.

FCC §15.205, §15.209, §15.231 (b) - RADIATED EMISSIONS

Applicable Standard

FCC §15.205, §15.209, §15.231 (b)

According to FCC §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

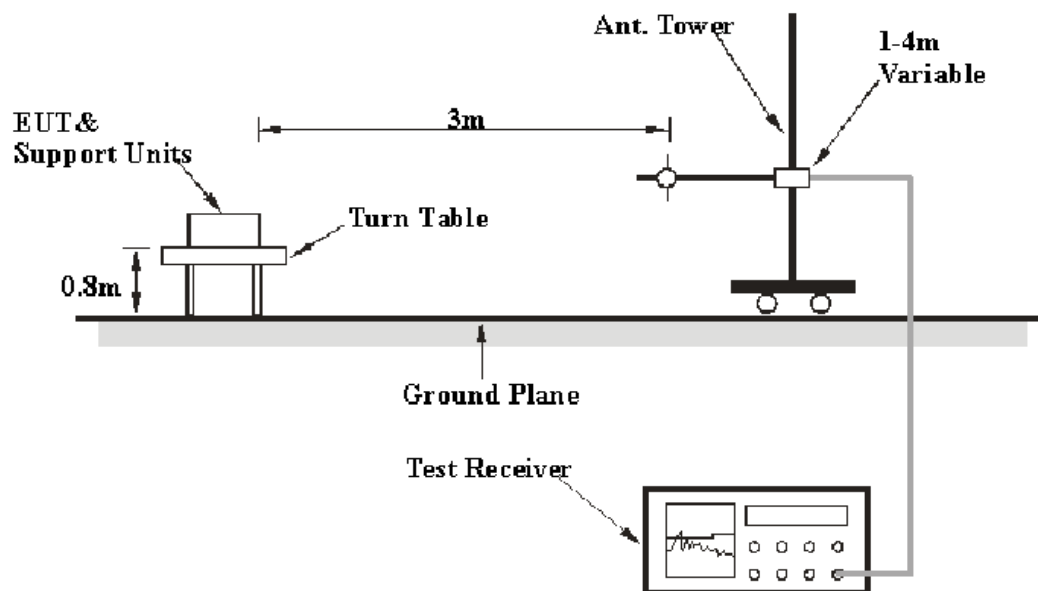
Fundamental frequency (MHz)	Field Strength of Fundamental (Microvolts /meter)	Field Strength of spurious emissions ((Microvolts /meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750**	125 to 375**
174-260	3750	375
260-470	3750 to 12500**	375 to 1250**
Above 470	12500	1250

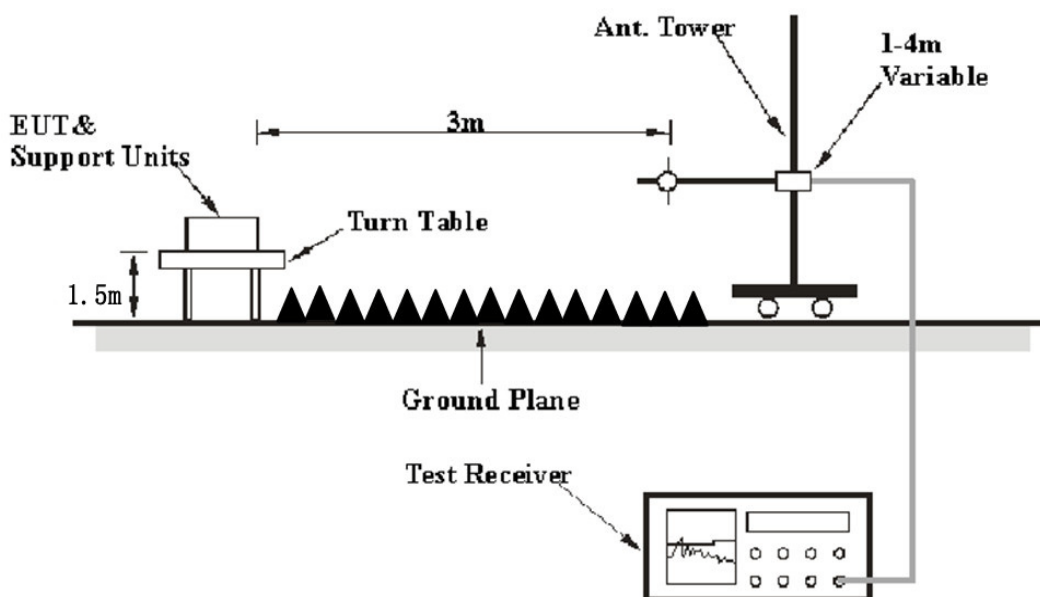
**linear interpolations

The above field strength limits are specified at a distance of 3-meters the tighter limits apply at the band edges.

EUT Setup

Below 1 GHz:



Above 1 GHz:

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 § 15.209, 15.205 and 15.231.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 5 GHz.

During the radiated emission test, the test receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	PK
Above 1 GHz	1 MHz	3 MHz	/	PK

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 the Quasi-peak detection mode from 30MHz to 1GHz, Peak and average detection mode above 1 GHz.

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

Corrected Amplitude & 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 Results Summary

According to the data in the following table, the EUT complied with the FCC §15.205, §15.209, §15.231 (b).

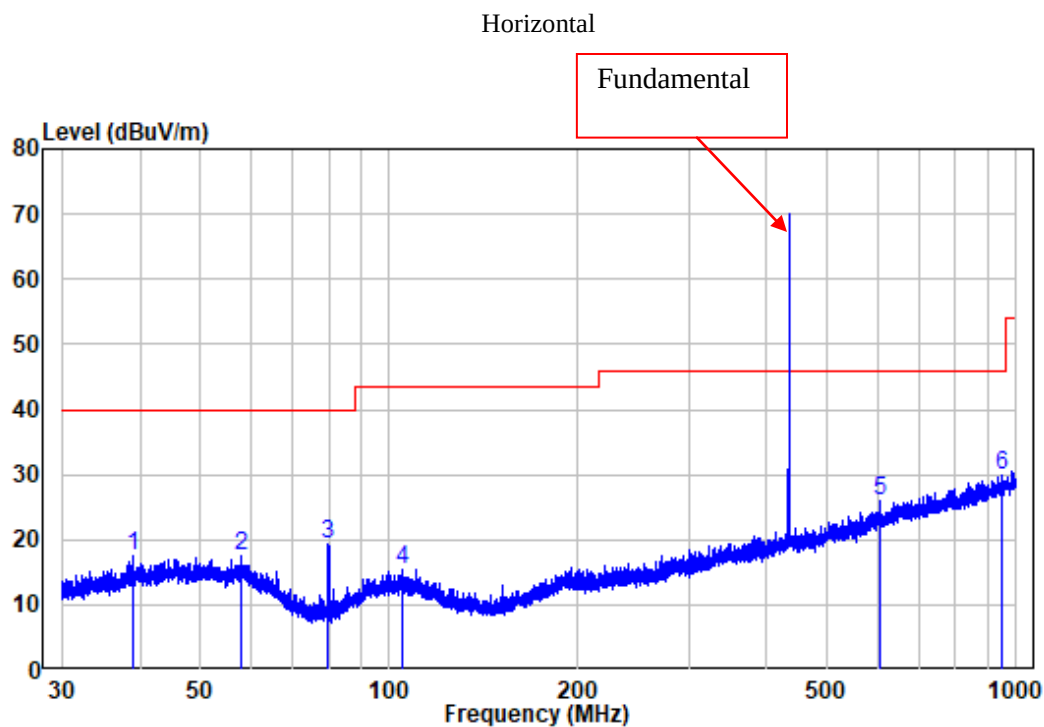
Test Data

Environmental Conditions

Temperature:	24°C
Relative Humidity:	57 %
ATM Pressure:	101.5 kPa

The testing was performed by Level Li on 2022-10-08.

Test mode: Transmitting (Pre-scan in the X, Y and Z axes of orientation, the worst case as setup photos was recorded)

30MHz – 1 GHz:

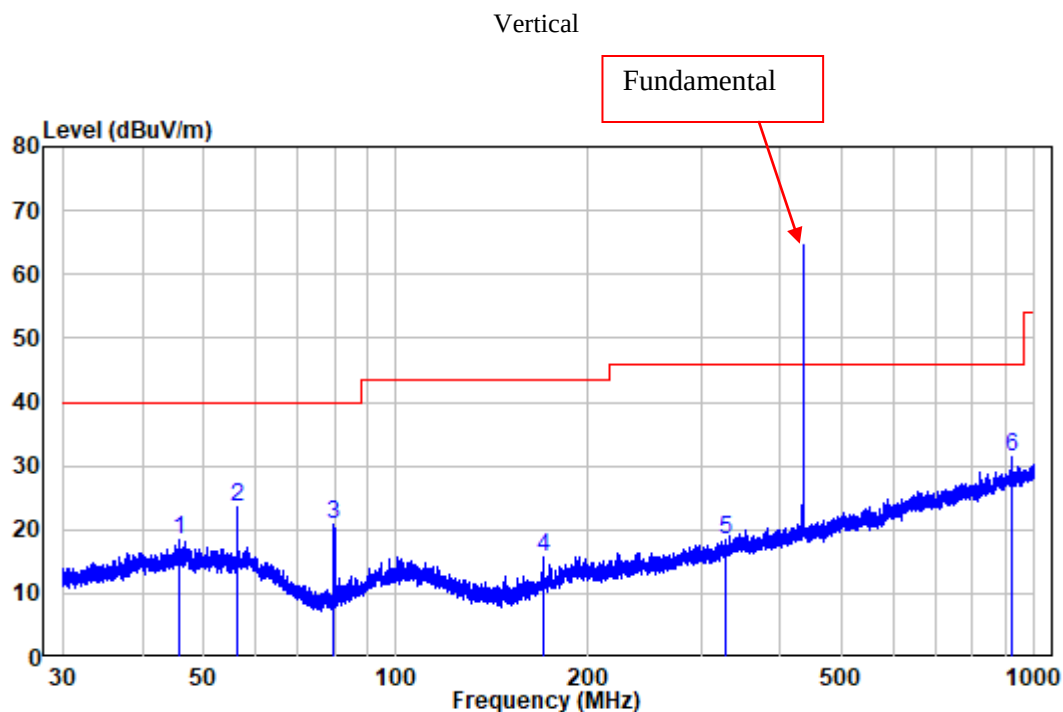
Site : chamber

Condition: 3m HORIZONTAL

Job No. : SZNS1220921-43065E-RF

Test Mode: Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	38.973	-10.59	28.02	17.43	40.00	-22.57	Peak
2	58.127	-9.95	27.42	17.47	40.00	-22.53	Peak
3	79.975	-16.79	36.08	19.29	40.00	-20.71	Peak
4	104.720	-11.80	27.20	15.40	43.50	-28.10	Peak
5	606.456	-2.32	28.36	26.04	46.00	-19.96	Peak
6	948.345	1.99	27.85	29.84	46.00	-16.16	Peak



Site : chamber

Condition: 3m VERTICAL

Job No. : SZNS1220921-43065E-RF

Test Mode: Transmitting

	Freq	Factor	Read Level	Limit Level	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	
1	45.775	-9.98	28.36	18.38	40.00	-21.62 Peak
2	56.222	-10.16	33.61	23.45	40.00	-16.55 Peak
3	79.975	-16.79	37.47	20.68	40.00	-19.32 Peak
4	169.748	-13.61	29.23	15.62	43.50	-27.88 Peak
5	327.600	-8.12	26.64	18.52	46.00	-27.48 Peak
6	920.496	1.57	29.93	31.50	46.00	-14.50 Peak

Fundamental:

Frequency (MHz)	Receiver		Turn-Table	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15.231(b)	
	Reading (dBμV)	PK/QP/Ave.	Angle Degree	Height (m)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
433.92MHz									
433.92	75.72	PK	302	1.5	H	-5.72	70.00	80.83	-10.83
433.92	66.20	PK	271	2.0	V	-5.72	60.48	80.83	-20.35

1MHz - 5 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBµV/m)	FCC Part 15.231(b)	
	Reading (dBµV)	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBµV/m)	Margin (dB)
433.92MHz									
1301.76	50.91	PK	195	2.0	H	-10.20	40.71	54.00	-13.29
1301.76	48.2	PK	207	2.2	V	-10.20	38.00	54.00	-16.00
2169.60	53.11	PK	92	1.6	H	-7.22	45.89	60.83	-14.94
2169.60	50.78	PK	141	1.3	V	-7.22	43.56	60.83	-17.27
2603.52	52.09	PK	40	1.3	H	-6.85	45.24	60.83	-15.59
2603.52	51.81	PK	9	1.1	V	-6.85	44.96	60.83	-15.87
3037.44	54.24	PK	114	1.2	H	-5.84	48.40	60.83	-12.43
3037.44	52.60	PK	279	1.9	V	-5.84	46.76	60.83	-14.07
3471.36	48.59	PK	1	1.3	H	-6.00	42.59	60.83	-18.24
3471.36	50.60	PK	58	2.0	V	-6.00	44.60	60.83	-16.23

Note:

The peak value can meet the limit of the average value.

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

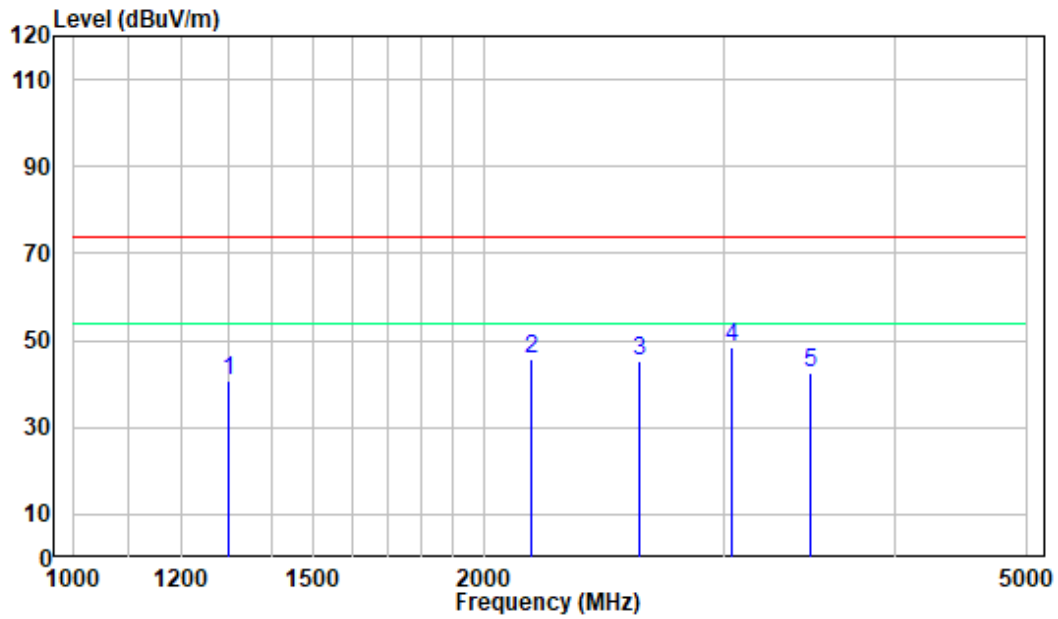
Absolute Level (Corrected Amplitude) = Factor + Reading

Margin = Absolute Level (Corrected Amplitude) – Limit

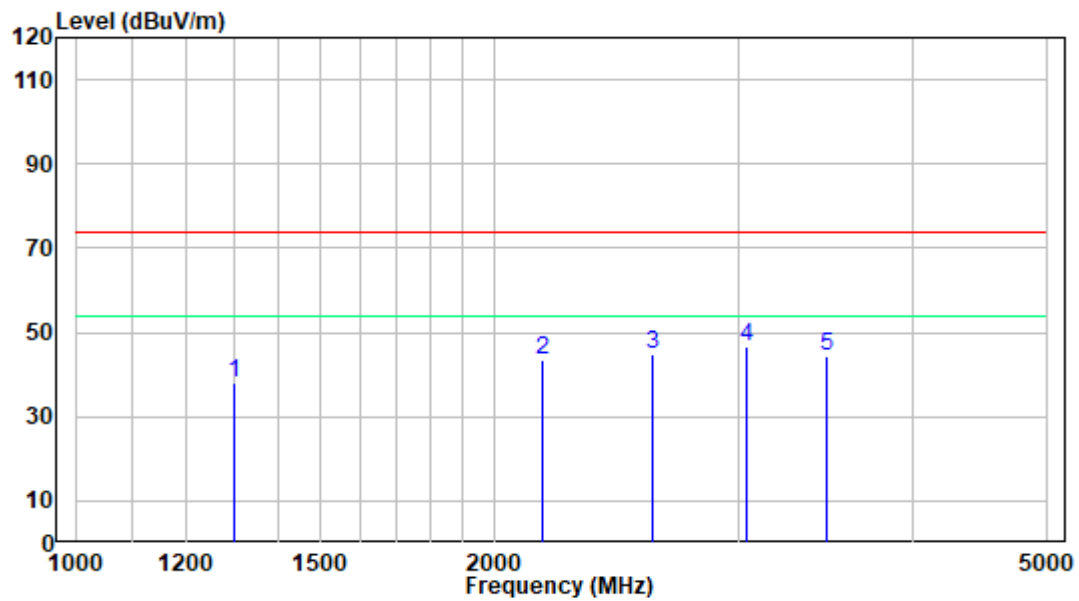
The other spurious emission which is in the noise floor level was not recorded.

Pre-scan plots:

Horizontal



Vertical



FCC §15.231(a) (1) - DEACTIVATION TESTING

Applicable Standard

Per FCC §15.231(a) (1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Test Procedure

1. Set center frequency of spectrum analyzer=operating frequency.
2. Set the spectrum analyzer as RBW=100kHz/ VBW=300kHz/ Span=0Hz.
3. Repeat above procedures until all frequency measured was complete.

Test Data

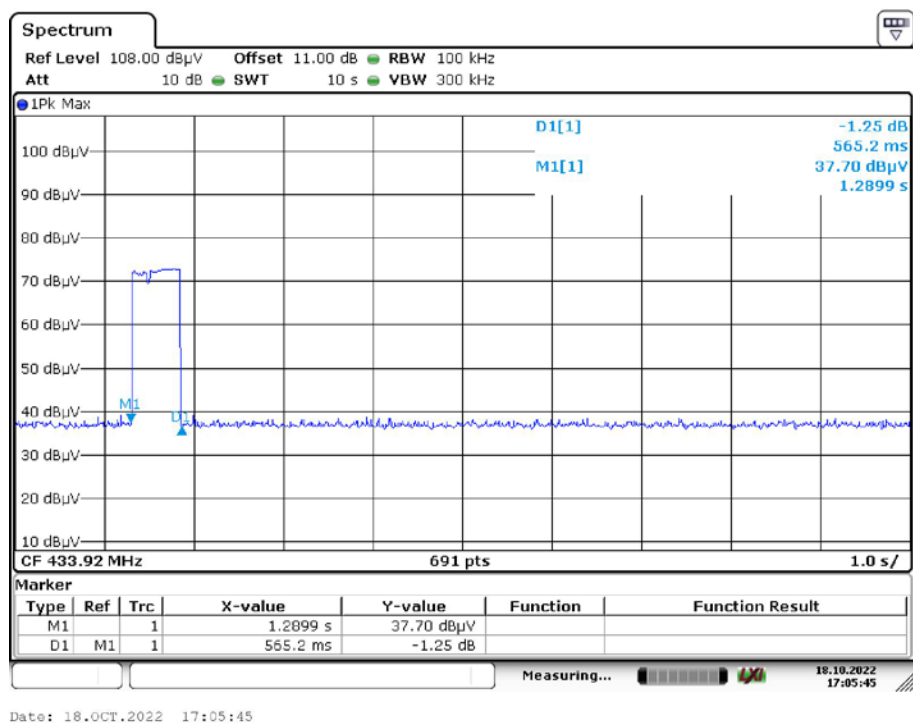
Environmental Conditions

Temperature:	20°C
Relative Humidity:	58-60 %
ATM Pressure:	101.0 kPa

The testing was performed by Jesse.Chen on 2022-10-18.

Test mode: Transmitting

Test Result: Compliant. This product will cease transmission within 5 seconds after activation. Please refer to following plots.



FCC §15.231(c) – 20 dB EMISSION BANDWIDTH TESTING

Applicable Standard

Per 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Test Procedure

The EUT is setting to the transmit mode, the waveform was received by the test antenna which was connected to the spectrum analyzer, plot the 20 dB bandwidth.

Test Data**Environmental Conditions**

Temperature:	20°C
Relative Humidity:	58 %
ATM Pressure:	101.0 kPa

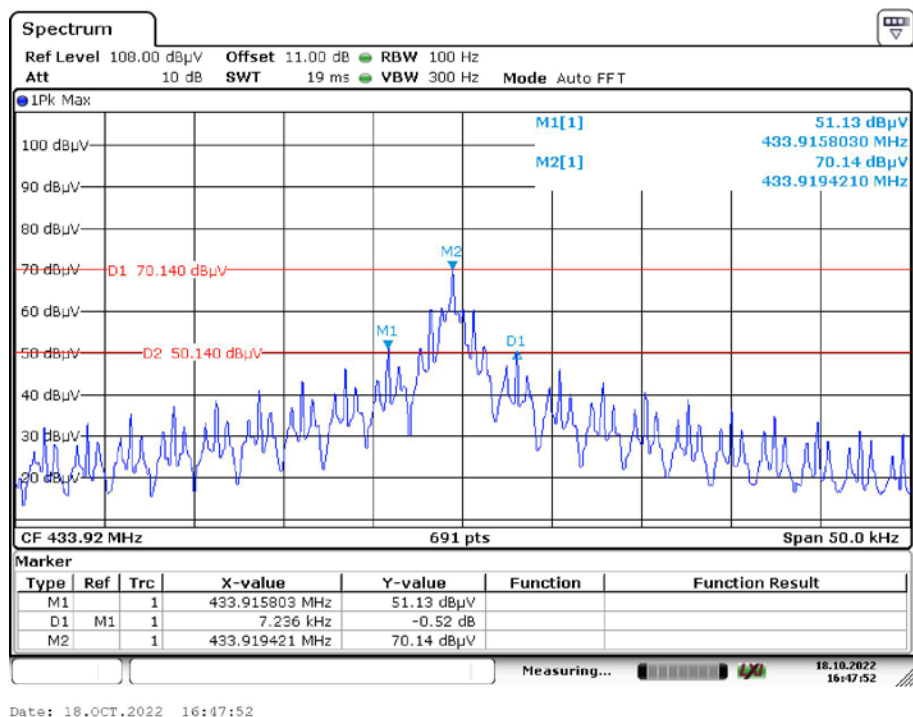
The testing was performed by Jesse.Chen on 2022-10-18.

Test Mode: Transmitting

Please refer to following table and plots.

Channel Frequency (MHz)	20 dB Emission Bandwidth (kHz)	Limit (kHz)	Result
433.92	7.236	<1084.8	Pass

20 dB Emission Bandwidth



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