



TEST REPORT

Applicant Name : Shenzhen VanTop Technology & Innovation Co., Ltd.
Address : 502, 5th Flr. BLDG 4, MinQi Technology Park, No. 65 Lishan Road, Taoyuan Street, Nanshan District, Shenzhen, China
Report Number : SZNS220331-11809E-RF
FCC ID: 2AQ3A-HMA001

Test Standard (s)

FCC PART 15.231

Sample Description

Product Type: Base Station
Model No.: Assure B1
Multiple Model(s) No.: Assure B2, Assure B3, Mate A1, PROTECT D1, HM612, D1, PROTECT B2, HM206 (Please refer to DOS for Model difference)
Trade Mark: N/A
Date Received: 2022/03/31
Report Date: 2022/06/02

Test Result:	Pass*
--------------	-------


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

Prepared and Checked By:



Black Ding
EMC Engineer

Approved By:



Robert Li
EMC Engineer

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

Shenzhen Accurate Technology Co., Ltd. is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk "★". Customer model name, addresses, names, trademarks etc. are not considered data.

This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

Shenzhen Accurate Technology Co., Ltd.

1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China
Tel: +86 755-26503290 Fax: +86 755-26503396 Web: www.atc-lab.com

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	6
SUMMARY OF TEST RESULTS	7
TEST EQUIPMENT LIST AND DETAILS	8
FCC §15.203 - ANTENNA REQUIREMENT.....	9
APPLICABLE STANDARD	9
ANTENNA CONNECTOR CONSTRUCTION	9
FCC §15.207 (A) – AC LINE CONDUCTED EMISSIONS	10
APPLICABLE STANDARD	10
EUT SETUP	10
EMI TEST RECEIVER SETUP.....	10
TEST PROCEDURE	10
TEST DATA	11
FCC §15.205, §15.209, §15.231 (B) - RADIATED EMISSIONS	14
APPLICABLE STANDARD	14
EUT SETUP	14
EMI TEST RECEIVER SETUP.....	15
TEST PROCEDURE	15
CORRECTED AMPLITUDE & MARGIN CALCULATION	16
TEST DATA	16
FCC §15.231(A) (1) - DEACTIVATION TESTING.....	21
APPLICABLE STANDARD	21
TEST PROCEDURE	21
TEST DATA	21
FCC §15.231(C) – 20 DB EMISSION BANDWIDTH TESTING	22
APPLICABLE STANDARD	22
TEST PROCEDURE	22
TEST DATA	22

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Frequency Range	433.95MHz
Modulation Technique	FSK
E-field strength	78.45dBuV/m@3m
Antenna Specification*	2.0dBi (provided by the applicant)
Voltage Range	DC 5.0V from adapter
Sample number	SZNS220331-11809E-RF-S1 (Assigned by ATC)
Sample/EUT Status	Good condition
Adapter information	Model: SA-0502000JPU Input: AC 100-240V, 50/60Hz, 0.35A Max Output: DC 5.0V, 2.0A

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, 15.207, 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
	18GHz - 26.5GHz	5.06dB
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 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISED), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing by manufacturer.

Operating frequency: 433.95MHz

Special Accessories

No special accessories was used

Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

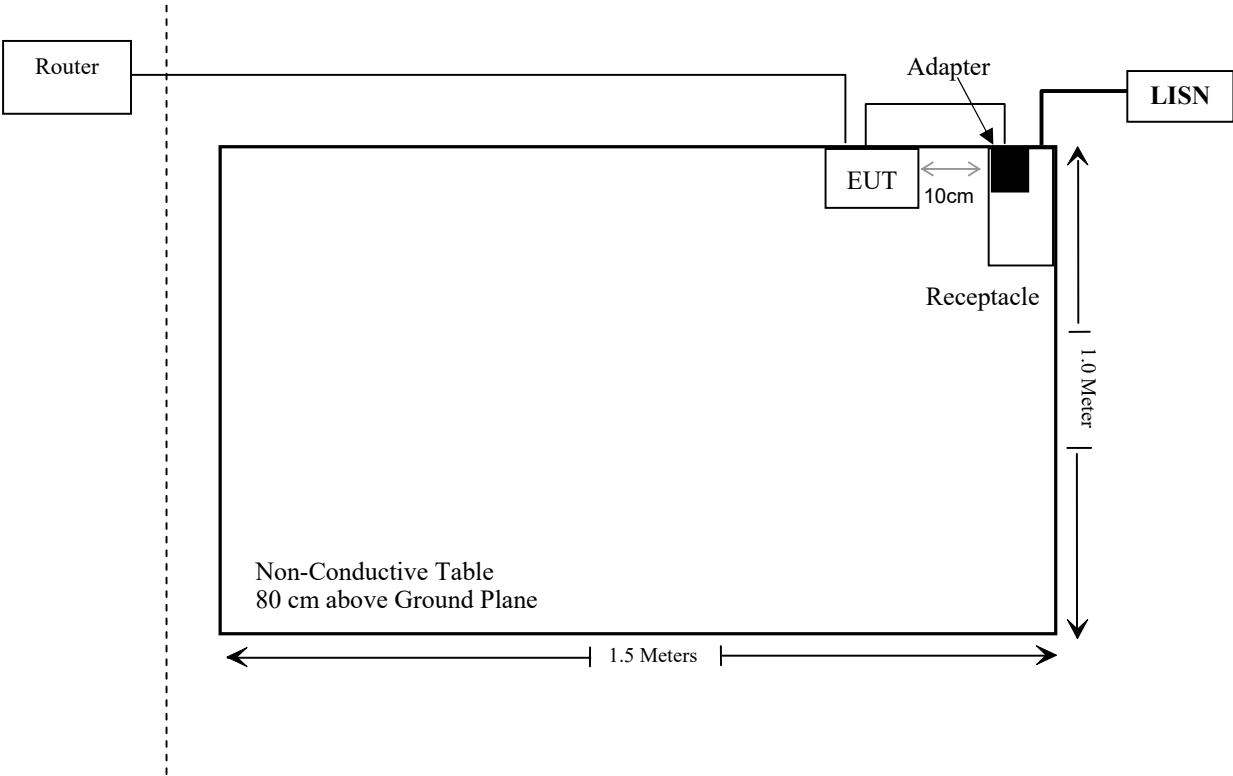
Manufacturer	Description	Model	Serial Number
HUAWEI	Router	WS5100	Unknown

External I/O Cable

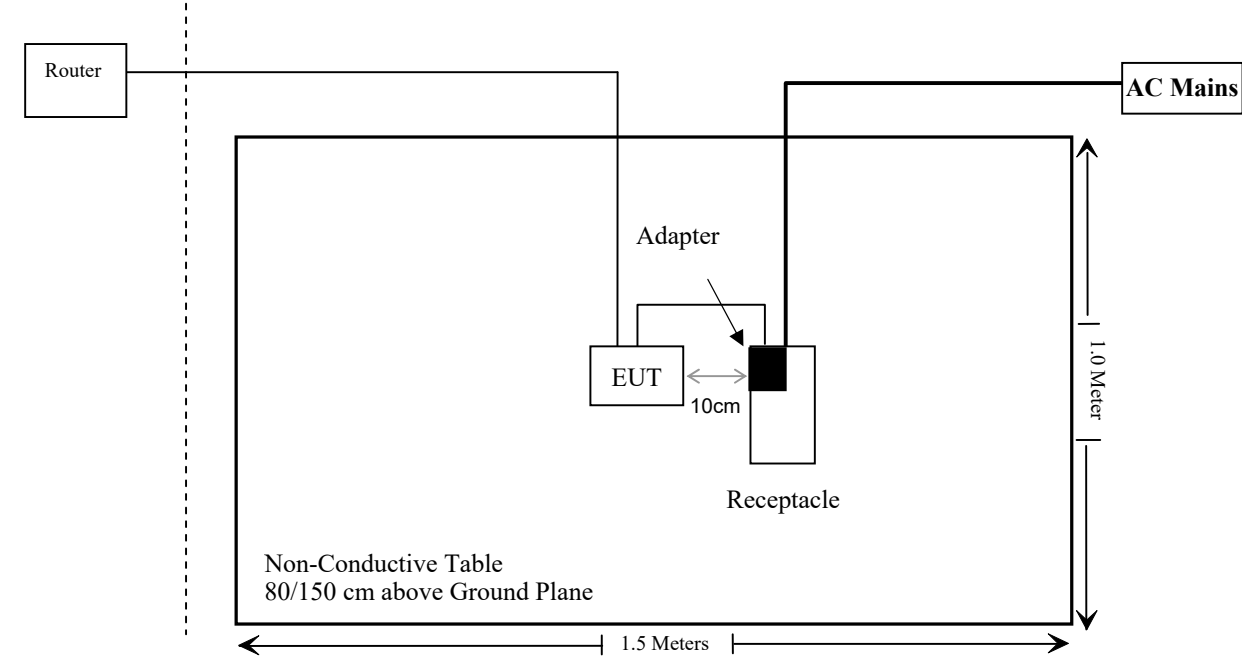
Cable Description	Length (m)	From Port	To
Un-shielded Detachable RJ45 Cable	10	EUT	Router
Un-shielded Detachable USB Cable	1.0	Adapter	EUT

Block Diagram of Test Setup

For conducted emission



For radiated emission



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emissions	Compliant
§15.205, §15.209, §15.231(b)	Radiated Emissions	Compliant
§15.231 (c)	20dB Emission Bandwidth	Compliant
§15.231 (a) (1)	Deactivation	Compliant

TEST EQUIPMENT LIST AND DETAILS

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde& Schwarz	EMI Test Receiver	ESCI	100784	2021/12/13	2022/12/12
Rohde & Schwarz	L.I.S.N.	ENV216	101314	2021/12/13	2022/12/12
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2021/12/13	2022/12/12
Unknown	RF Coaxial Cable	No.17	N0350	2021/12/14	2022/12/13
Conducted Emission Test Software: e3 19821b (V9)					
Radiated Emissions Test					
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
Radiated Emission Test Software: e3 19821b (V9)					
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

* **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 §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 antenna arrangement which was permanently attached. And the antenna gain is 2dBi; fulfill the requirement of this section. Please refer to EUT photos.

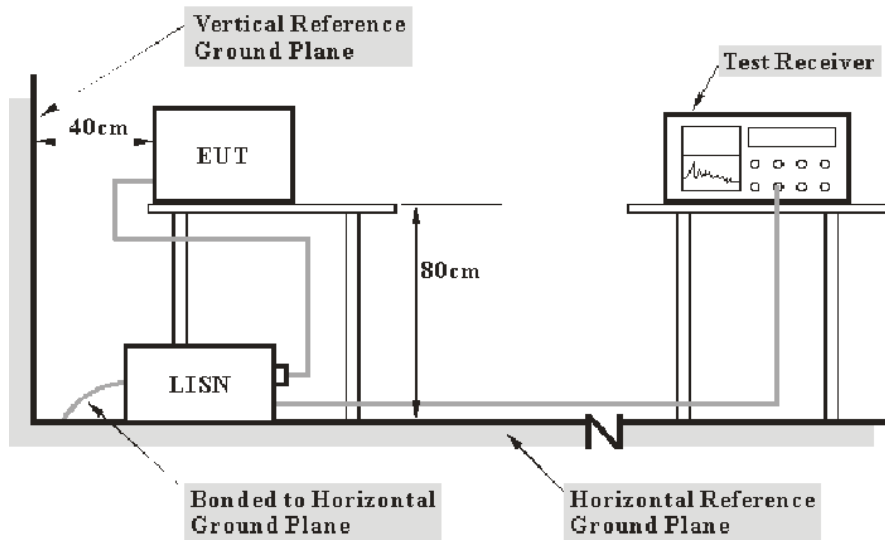
Result: Compliant.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

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

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Transd Factor & Margin Calculation

The Transd factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Transd Factor} = \text{LISN VDF} + \text{Cable Loss}$$

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

$$\text{Over limit} = \text{Result} - \text{Limit}$$

$$\text{Result} = \text{Reading} + \text{Factor}$$

Test Data

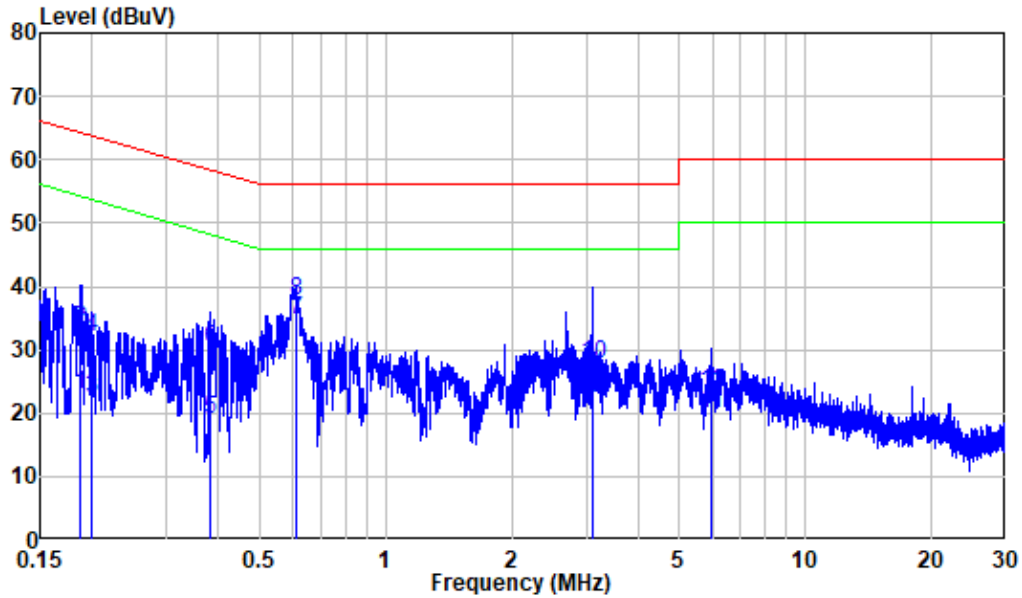
Environmental Conditions

Temperature:	23 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Jason Liu on 2022-05-10.

EUT operation mode: Transmitting

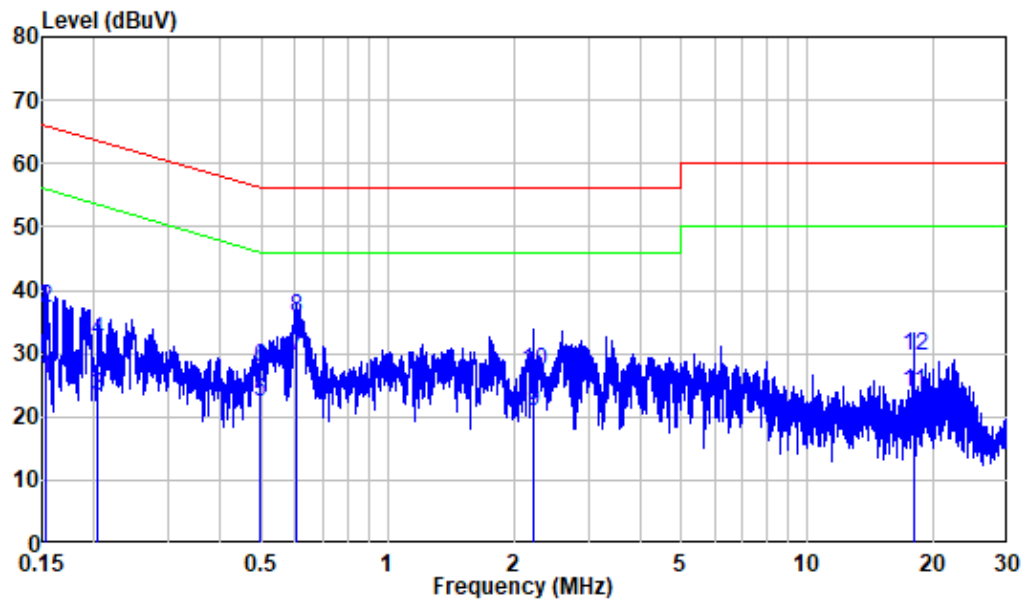
AC 120V/60 Hz, Line



Site : Shielding Room
 Condition: Line
 Job No. : SZNS220331-11809E-RF
 Mode : 433.95MHz
 Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.188	9.80	13.15	22.95	54.13	-31.18	Average
2	0.188	9.80	23.53	33.33	64.13	-30.80	QP
3	0.200	9.80	12.40	22.20	53.62	-31.42	Average
4	0.200	9.80	22.28	32.08	63.62	-31.54	QP
5	0.382	9.80	9.13	18.93	48.24	-29.31	Average
6	0.382	9.80	20.25	30.05	58.24	-28.19	QP
7	0.609	9.81	25.03	34.84	46.00	-11.16	Average
8	0.609	9.81	27.87	37.68	56.00	-18.32	QP
9	3.100	9.83	12.63	22.46	46.00	-23.54	Average
10	3.100	9.83	17.92	27.75	56.00	-28.25	QP
11	5.953	9.86	10.13	19.99	50.00	-30.01	Average
12	5.953	9.86	13.30	23.16	60.00	-36.84	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
 Condition: Neutral
 Job No. : SZNS220331-11809E-RF
 Mode : 433.95MHz
 Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.153	9.80	16.24	26.04	55.86	-29.82	Average
2	0.153	9.80	27.18	36.98	65.86	-28.88	QP
3	0.203	9.80	13.54	23.34	53.48	-30.14	Average
4	0.203	9.80	22.35	32.15	63.48	-31.33	QP
5	0.498	9.80	12.57	22.37	46.03	-23.66	Average
6	0.498	9.80	17.95	27.75	56.03	-28.28	QP
7	0.607	9.81	19.65	29.46	46.00	-16.54	Average
8	0.607	9.81	25.67	35.48	56.00	-20.52	QP
9	2.223	9.82	11.07	20.89	46.00	-25.11	Average
10	2.223	9.82	17.42	27.24	56.00	-28.76	QP
11	17.944	10.08	13.70	23.78	50.00	-26.22	Average
12	17.944	10.08	19.49	29.57	60.00	-30.43	QP

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:

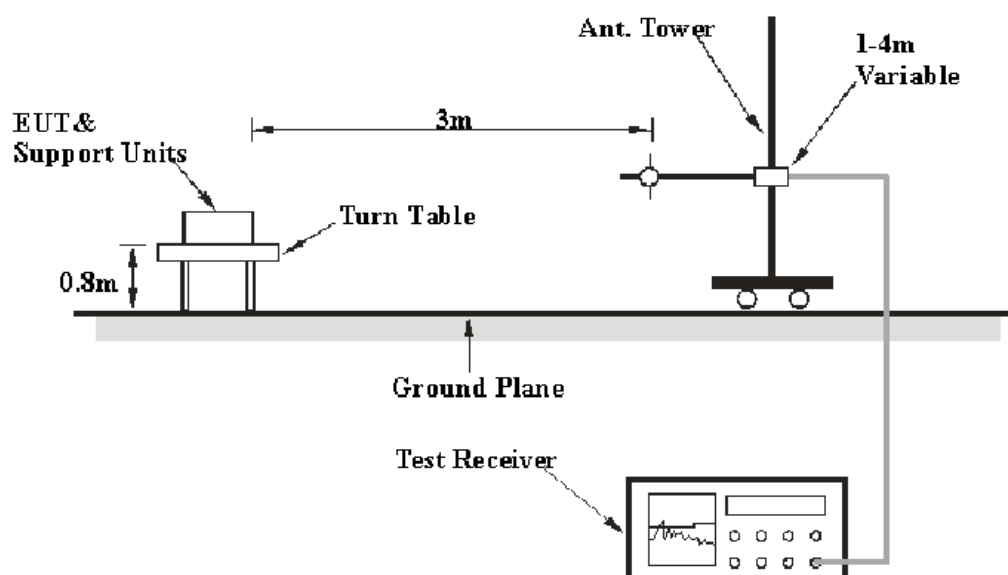
Fundamental frequency (MHz)	Field Strength of Fundamental (Microvolts /meter)	Field Strength of spurious emissions ((Microvolts /meter)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750**	125 to 375**
174-260	3750	375
260-470	3750 to 12500**	375 to 1250**
Above 470	12500	1250

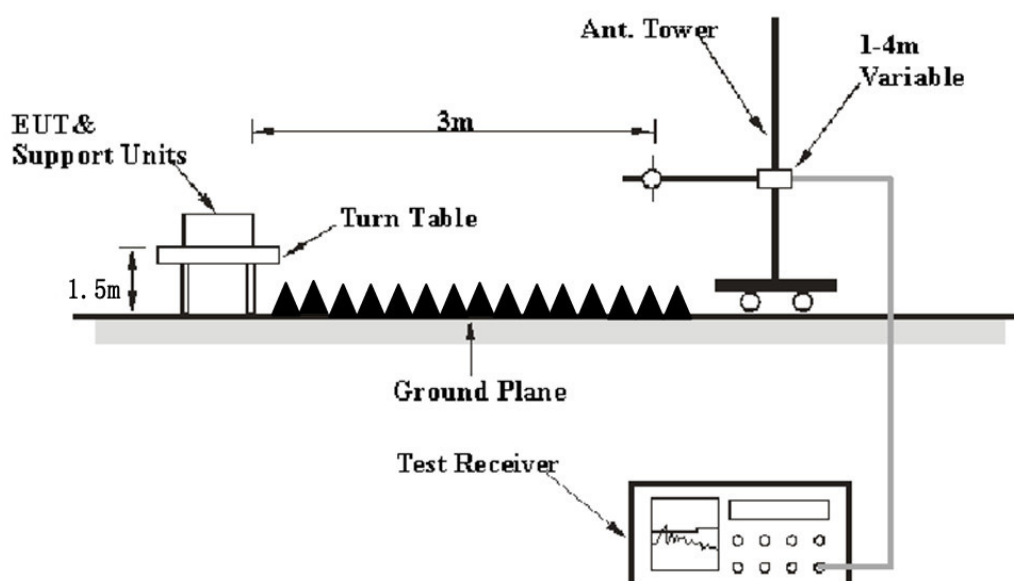
*Linear interpolations.

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.

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 Data

Environmental Conditions

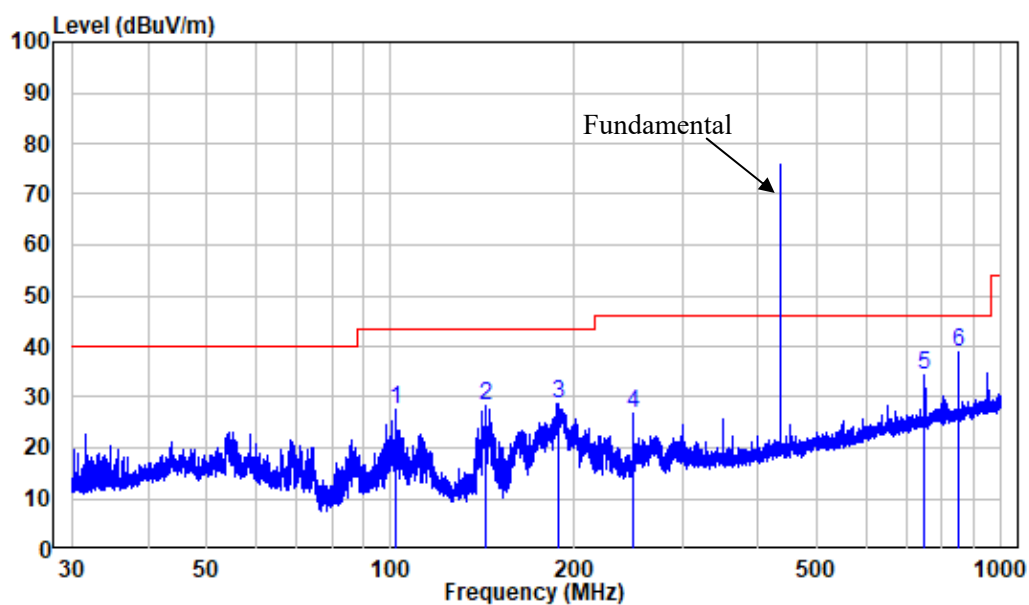
Temperature:	25 °C
Relative Humidity:	58~70 %
ATM Pressure:	101.0 kPa

The testing was performed by Level Li and Nick Fang on 2022-04-25 and 2022-05-11 for below 1GHz, Nick Fang on 2022-05-31 for above 1GHz.

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

30MHz – 1 GHz:

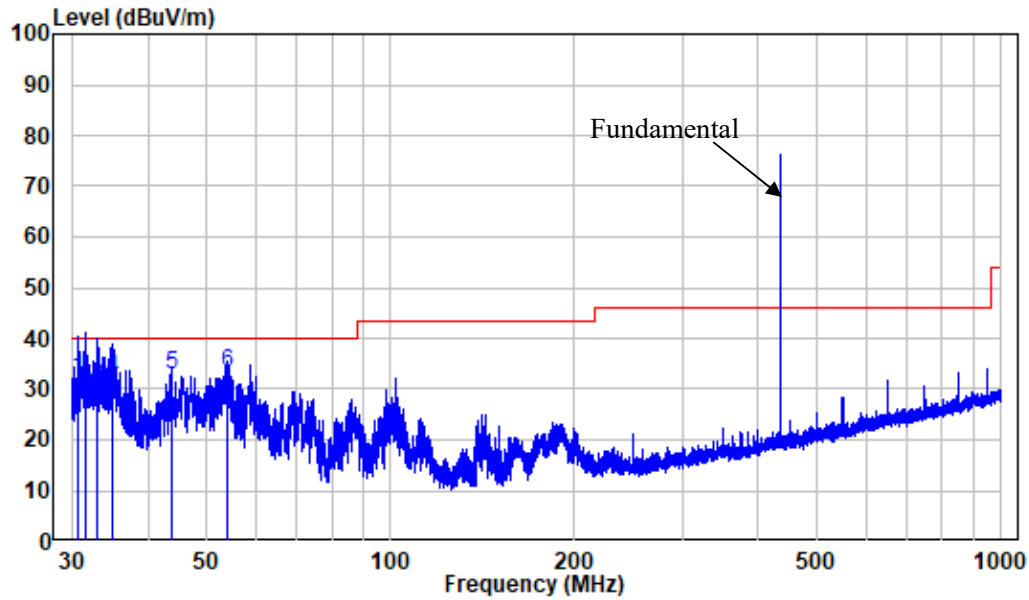
Note: When the test result of peak was less than the limit of QP more than 6dB, just the peak value was recorded.

Horizontal

Site : chamber
Condition: 3m HORIZONTAL
Job No. : SZNS220331-11809E-RF
Test Mode: Transmission

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	101.912	-11.58	39.08	27.50	43.50	-16.00	Peak
2	143.326	-15.52	43.82	28.30	43.50	-15.20	Peak
3	188.413	-11.78	40.52	28.74	43.50	-14.76	Peak
4	250.082	-10.75	37.55	26.80	46.00	-19.20	Peak
5	750.108	-0.87	35.20	34.33	46.00	-11.67	Peak
6	850.290	0.36	38.65	39.01	46.00	-6.99	Peak

Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No. : SZNS220331-11809E-RF
 Test Mode: Transmission

	Freq	Factor	Read Level	Level	Limit	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.826	-12.31	44.50	32.19	40.00	-7.81	QP
2	31.592	-12.22	41.20	28.98	40.00	-11.02	QP
3	33.051	-12.01	42.50	30.49	40.00	-9.51	QP
4	34.928	-11.56	43.50	31.94	40.00	-8.06	QP
5	43.793	-9.91	42.70	32.79	40.00	-7.21	QP
6	54.071	-10.35	43.51	33.16	40.00	-6.84	QP

Fundamental:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/AV		Height (m)	Polar (H/V)				
433.95MHz									
433.95	84.24	PK	251	2.0	H	-5.79	78.45	80.83	-2.38
433.95	82.32	PK	159	1.3	V	-5.79	76.53	80.83	-4.3

Note: the peak value can meet the limit of the QP value.

1 GHz - 5 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/AV		Height (m)	Polar (H/V)				
433.95MHz									
1301.85	53.65	PK	92	1.7	H	-10.2	43.45	54	-10.55
1301.85	52.77	PK	172	2.5	V	-10.2	42.57	54	-11.43

Note:

Corrected Amplitude = Corrected Factor + Reading

Corrected Factor = Antenna factor (Rx) + cable loss – amplifier factor

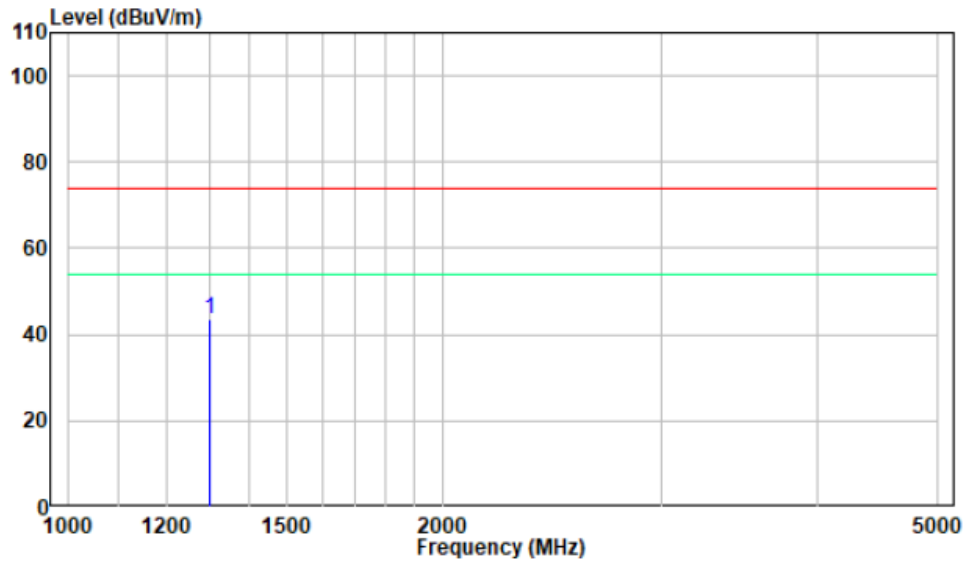
Margin = Corr. Amplitude - Limit

The test result of peak was less than the limit of QP/average, so just peak value was recorded.

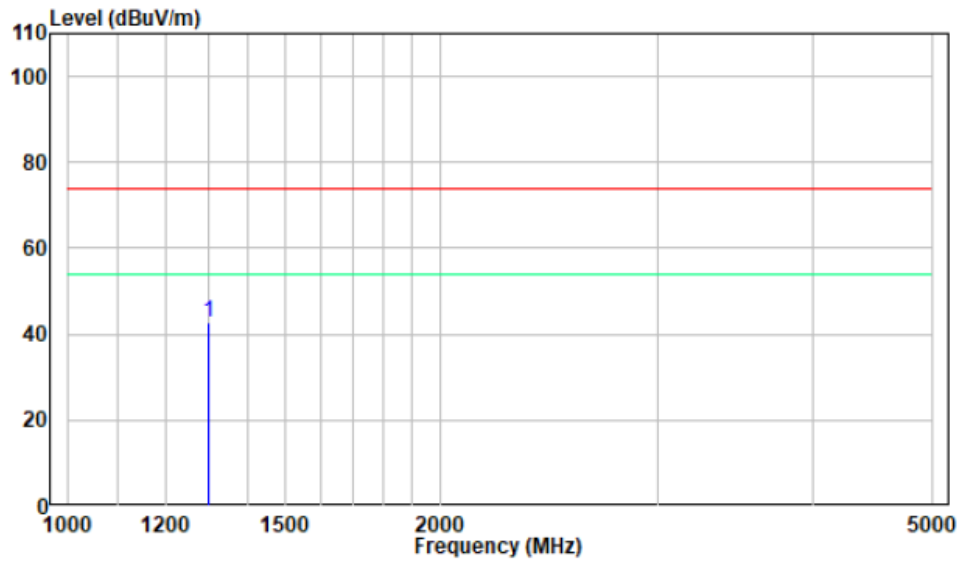
The other spurious emission which is 20dB to the limit was not recorded.

1 GHz - 5 GHz:

Pre-scan-Horizontal



Pre-scan – 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. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set center frequency of spectrum analyzer=operating frequency.
3. Set the spectrum analyzer as RBW=100kHz/ VBW=300kHz/ Span=0Hz.
4. Repeat above procedures until all frequency measured was complete.

Test Data

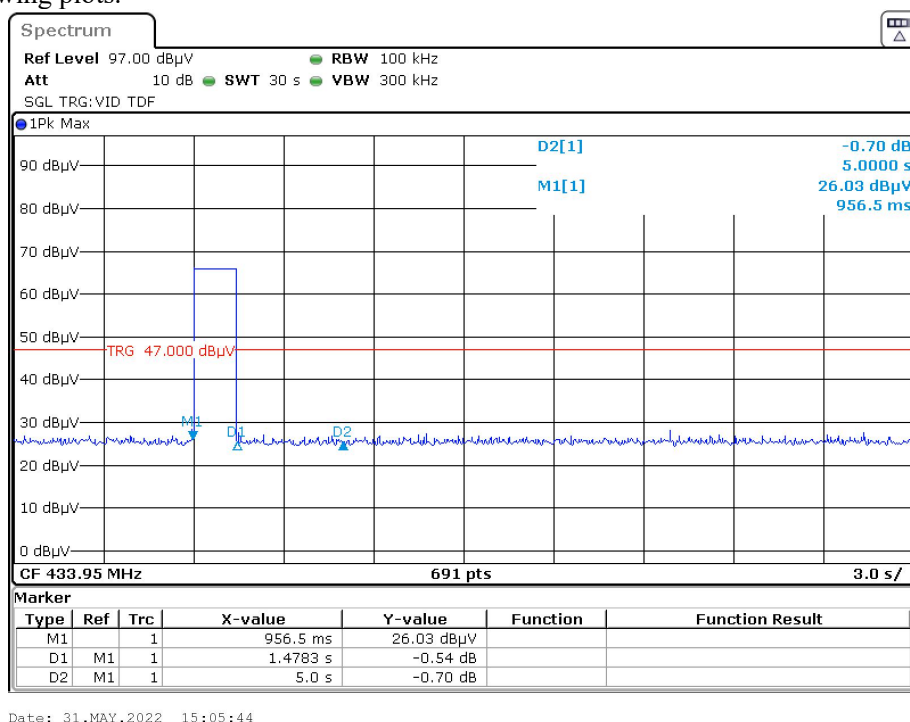
Environmental Conditions

Temperature:	26 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Black Ding on 2022-05-31.

Test mode: Transmitting

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



Date: 31.MAY.2022 15:05:44

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:	26 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

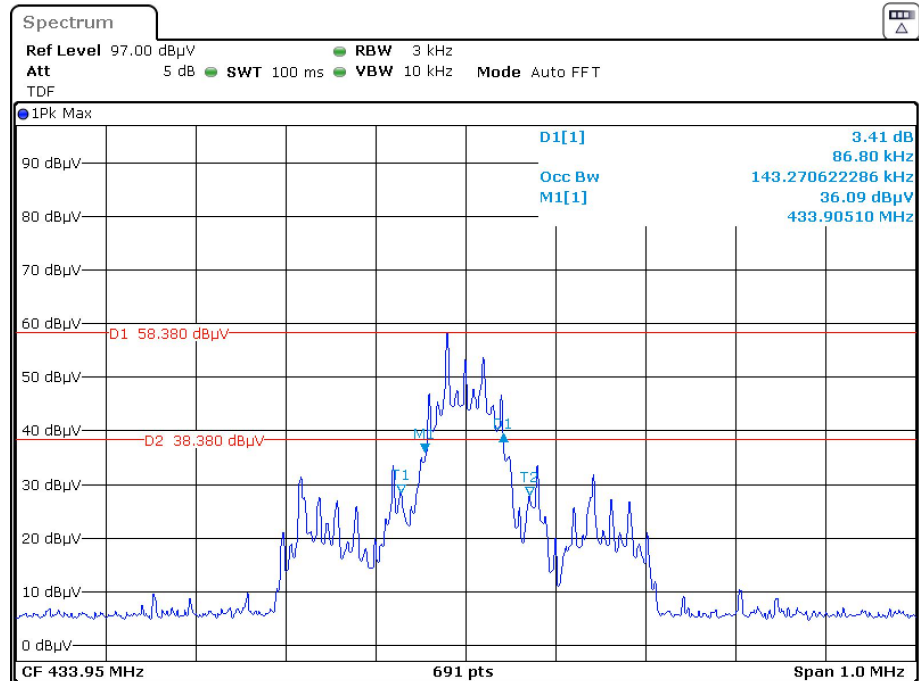
The testing was performed by Black Ding on 2022-05-31.

Test Mode: Transmitting

Please refer to following table and plots.

Channel Frequency (MHz)	20dB Emission Bandwidth (kHz)	Limit (kHz)
433.95	86.80	1084.875

20 dB Emission Bandwidth



Date: 31.MAY.2022 15:27:15

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