FCC Part 15.231

TEST REPORT

For

Vital Home Systems LLC

4870 Palmetto Woods Dr Naples, FL 34119 United States

FCC ID: 2AD4D-AWSAMCP

Report Type	**Original Report**
Product Name:	**Control Panel**
Model Name:	**AWSAM-CP**
Report Number :	**RLK210218005**
Report Date :	**2021/10/01**
Reviewed By:	**Ethan Shao** Ethan Shao
Prepared By:	**Bay Area Compliance Laboratories Corp. (Linkou Lab)** **No. 6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.)** **Tel: +886 (3)3961072; Fax: +886 (3) 3961027** **www.bacl.com.tw**

Revision History

Revision	Report Number	Issue Date	Description
1.0	RLK210218005	2021/10/01	Original Report

TABLE OF CONTENTS

1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	**Vital Home Systems LLC** 4870 Palmetto Woods Dr Naples, FL 34119 United States
Manufacturer	**Nutek Corporation** No. 167, Lane 235, Bauchiau Rd., Xindian District, New Taipei City 23145, Taiwan
Brand(Trade) Name	Vital Home Systems
Product (Equipment)	Control Panel
Model Name	AWSAM-CP
Frequency Range	433.92MHz
Modulation Type	ASK
Received Date	Mar. 11, 2021
Date of Test	Mar. 15, 2021 ~ Sep. 07, 2021

**All measurement and test data in this report was gathered from production sample serial number: 210218005 (Assigned by BACL, Taiwan).*

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☒ AC 120V/60Hz ☒ Adapter Brand Name: Xing Yuan Electronics Co., Ltd Model: XY12J-0502000Q-UW I/P: 100-240VAC,0.5A Max 50/60Hz O/P: 5Vdc, 2.0A. ☐ By Power Core
	☐ DC Type ☐ DC Power Supply ☐ Battery ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System

1.3 Objective

The Objective of this Test Report was to document the compliance of the Vital Home Systems LLC. Appliance (Model: AWSAM-CP) to the requirements of the following Standards:

- Part 2, Subpart J, Part 15, Subparts A and C, section 15.231 of the Federal Communication Commission's rules.

- ANSI C63.10-2013 of t American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.4 Measurement Uncertainty

Parameter	Expanded Measurement uncertainty
RF output power	± 1.488 dB
Occupied Channel Bandwidth	± 453.927 Hz
RF Conducted Emission test	± 2.77 dB
AC Power Line Conducted Emission	± 2.66 dB
Radiated Below 1G	± 3.57 dB
Radiated Above 1G	± 5.32 dB

1.5 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.

1.6 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Linkou Lab) to collect test data is located on No.6, Wende 2Rd., Guishan Dist., Taoyuan City 33382, Taiwan (R.O.C.)

Bay Area Compliance Laboratories Corp.(Linkou Lab) Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 3546) and the FCC designation No.TW3546 under the Mutual Recognition Agreement (MRA) in FCC Test. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.10.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 974454. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

2 System Test Configuration

2.1 Description of Test Configuration

The system was configured for testing in an engineering mode, which was provided by manufacturer. The engineering mode was configured the system transmitting with maximum power. For SRD mode, only 1 channel (433.92MHz) was used.

2.2 Equipment Modifications

No modification was made to the EUT.

2.3 EUT Exercise Software

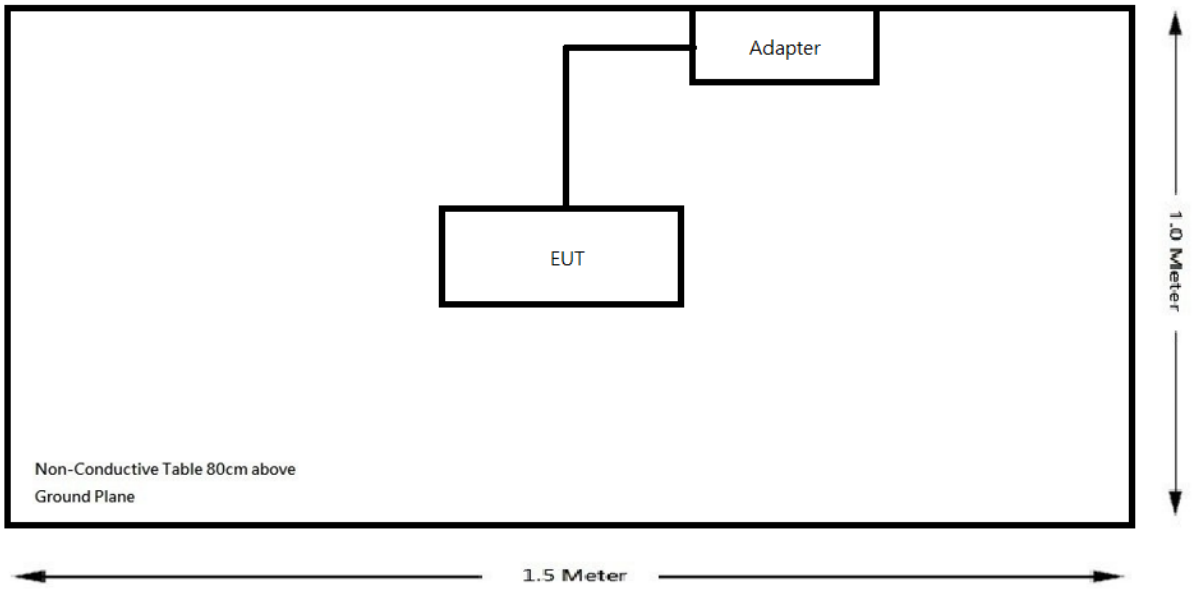
No test software was used.

2.4 Block Diagram of Test Setup

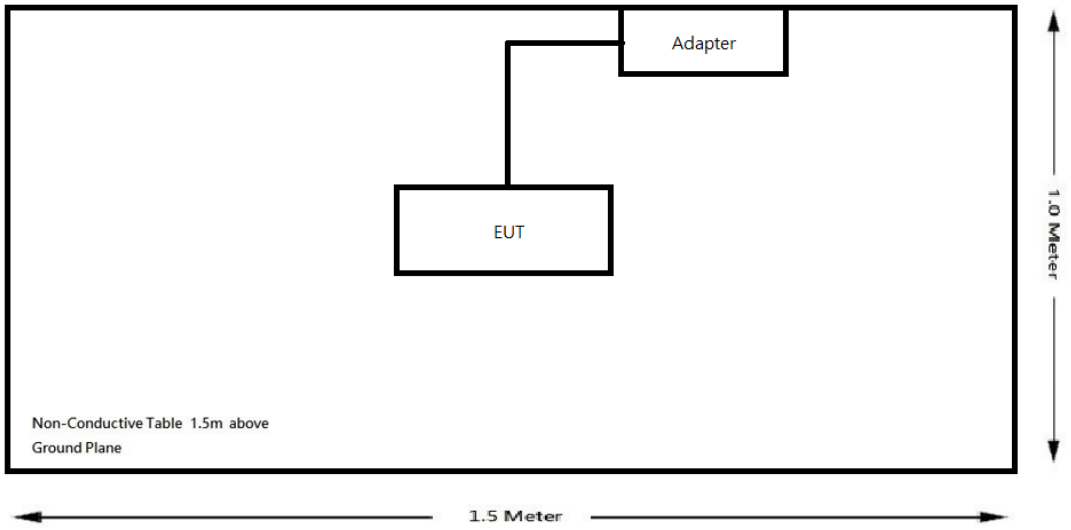
See test photographs attached in setup photos for the actual connections between EUT and support equipment.

Radiation:

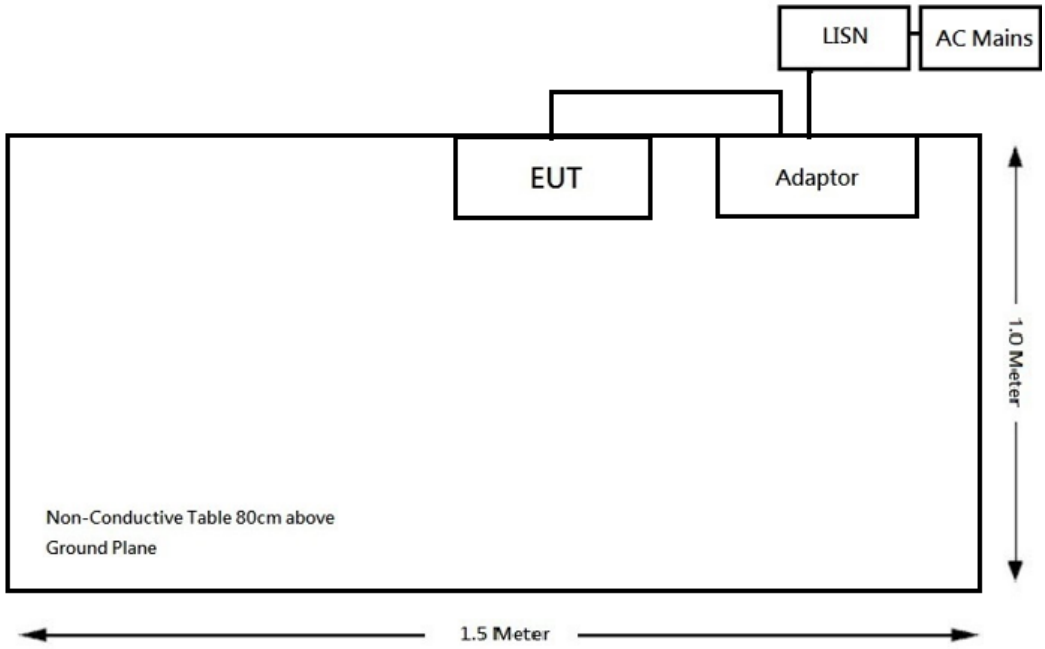
Below 1GHz:



Above 1GHz:



Conduction:



2.5 Environmental Conditions and Test Date

Test Site	Test Date	Temperature (°C)	Relative Humidity (% RH)	Test Engineer
Radiated (966B)	Sep. 03, 2021	23.5	60	Blake Wang
Conducted (TH-02)	Sep. 06-07, 2021	25.4-26.2	48-53	Rui Zhan
Conduction (Con-01)	Mar. 15, 2021	25.5	55	Brian Chang

3 Summary of Test Results

FCC Rules	Description of Test	Results
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.231 (a)	Radiated Emissions	Compliance
§15.231 (c)	20dB Bandwidth	Compliance
§15.231 (a)	Deactivation Testing	Compliance

4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Radiation 3M Room (966B)					
Active Loop	ETS-LINDREN	6502	1050	2020/12/25	2021/12/24
Bilog Antenna/6 dB Attenuator	SUNOL SCIENCES & EMCI	JB3 & N-6-06	A071318 & AT-N0670	2020/10/26	2021/10/25
Signal and Spectrum Analyzer	Rohde & Schwarz	FSV40	101456	2021/06/03	2022/06/02
Horn Antenna	ETS-Lindgren	3115	00085775	2020/09/17	2021/09/17
Horn Antenna	ETS-Lindgren	3160-09	00123853	2020/09/17	2021/09/16
Preamplifier	A.H. Systems	PAM-0118P	479	2020/09/09	2021/09/08
Microflex Cable (1m)	EMCI	EMC102-KM-KM-1000	180524	2021/08/06	2022/08/05
Microflex Cable (2m)	EMCI	EMC106-SM-SM-2000	180516	2021/08/06	2022/08/05
Microflex Cable (8m)	UTIFLEX	UFA210A-1-3149-300300	MFR 64639 232490-002	2021/08/06	2022/08/05
Turn Table	Chaintek	T-200-S-1	003502	N.C.R	N.C.R
Antenna Tower	Chaintek	MBD-400-1	003505	N.C.R	N.C.R
Controller	Chaintek	3000-1	003508	N.C.R	N.C.R
Software	Audix	e3 v9	E3LK-02	N.C.R	N.C.R

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

For intentional device, 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.

5.2 Antenna Information

Manufacturer	Type	Antenna Gain	antenna port
SIYU	Dipole	3 dBi	SMA(M)

Note: This device must be professionally installed, and the installer shall be responsible for verifying that the correct antenna is employed with this device.

Result: Compliance.

6 FCC §15.207 - AC Line Conducted Emissions

6.1 Applicable Standard

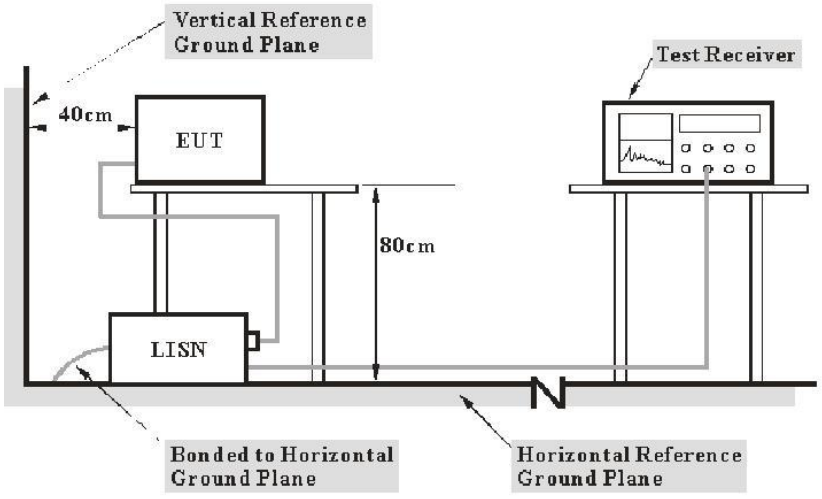
According to FCC §15.207,

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 2
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency. Note 2: A linear average detector is required

6.2 EUT Setup and Test Procedure



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 setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits

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	Receiver RBW
150 kHz - 30 MHz	9 kHz

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

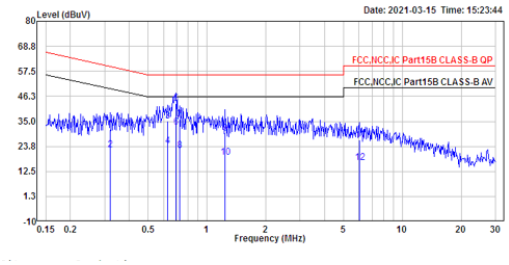
6.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
AC Line Conduction Room (CON-01)					
Two-Line V-Network	Rohde & Schwarz	ENV216	100010	2020/09/14	2021/09/13
Pulse Limiter	SCHWARZBECK	VSTD 9561-F	00432	2020/09/11	2021/09/10
ESR EMI Test Receiver	Rohde & Schwarz	ESR3	102430	2020/05/07	2021/05/06
RF Cable	EMCI	EMCCFD300-BM-BM-8000	180526	2020/08/18	2021/08/17
Software	Audix	e3 v9	E3LK-03	N.C.R	N.C.R

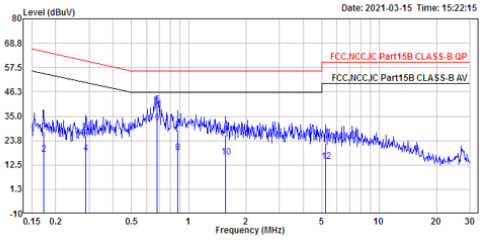
***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

6.4 Test Result

Line	Neutral



	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.320	11.61	31.48	19.87	59.71	-28.23	QP
2	0.320	2.37	22.24	19.87	49.71	-27.47	Average
3	0.629	15.29	35.18	19.89	56.00	-20.82	QP
4	0.629	4.05	23.94	19.89	46.00	-22.06	Average
5	0.693	23.14	43.05	19.91	56.00	-12.95	QP
6	0.693	12.67	32.58	19.91	46.00	-13.42	Average
7	0.726	15.79	35.70	19.91	56.00	-20.30	QP
8	0.726	1.99	21.90	19.91	46.00	-24.10	Average
9	1.239	9.85	29.78	19.93	56.00	-26.22	QP
10	1.239	-1.11	18.82	19.93	46.00	-27.18	Average
11	6.048	6.50	26.62	20.12	60.00	-33.38	QP
12	6.048	-3.80	16.32	20.12	50.00	-33.68	Average



	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	
1	0.173	8.14	28.01	19.87	64.81	-36.80	QP
2	0.173	-2.19	17.68	19.87	54.81	-37.13	Average
3	0.288	6.20	26.08	19.88	60.57	-34.49	QP
4	0.288	-1.90	17.98	19.88	50.57	-32.59	Average
5	0.682	20.19	40.11	19.92	56.00	-15.89	QP
6	0.682	12.36	32.28	19.92	46.00	-13.72	Average
7	0.873	8.55	28.49	19.94	56.00	-27.51	QP
8	0.873	-1.67	18.27	19.94	46.00	-27.73	Average
9	1.561	6.25	26.21	19.96	56.00	-29.79	QP
10	1.561	-3.87	16.09	19.96	46.00	-29.91	Average
11	5.240	2.31	22.42	20.11	60.00	-37.58	QP
12	5.240	-6.00	14.11	20.11	50.00	-35.89	Average

Note1: Transmit mode

Note2:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

7 FCC §15.205, §15.209 , §15.231 (a) - Radiated Emissions

7.1 Applicable Standard

FCC §15.205, §15.209, §15.231 (a)

(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (millivolts/meter)
40.66-40.70 MHz	2,250	225
70-130 MHz	1,250	125
130-174 MHz	11,250 to 3,750	[1]125 to 375
174-260 MHz	3,750	375
260-470 MHz	13,750 to 12,500	[1]375 to 1,250
Above 470 MHz	12,500	1,250

1Linear interpolations.

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

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

7.2 Measurement Uncertainty

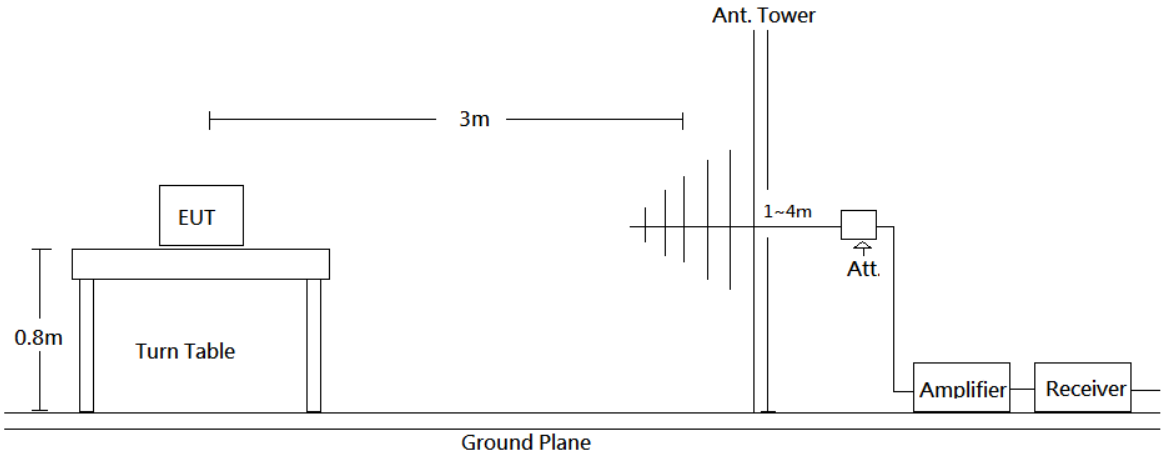
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Taiwan) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report.

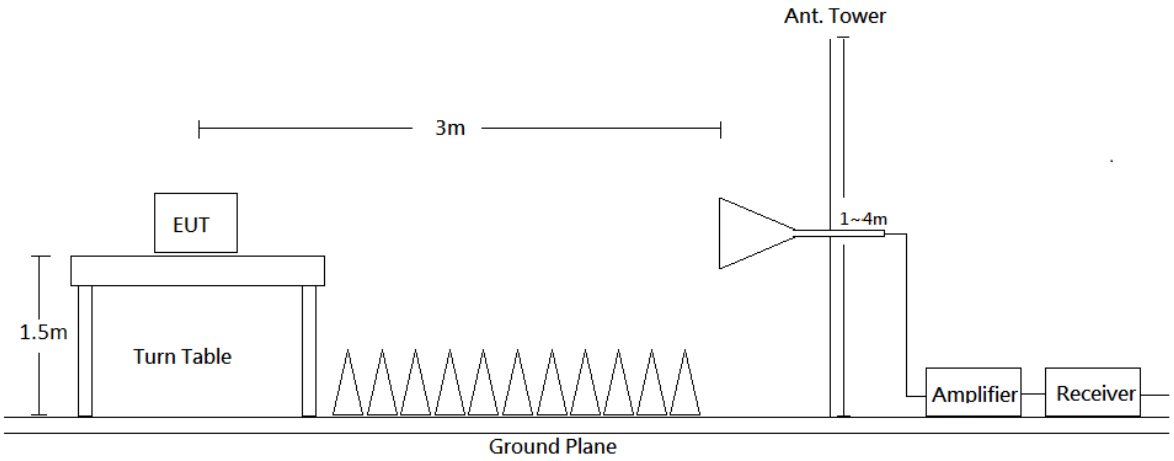
Frequency	Measurement uncertainty
30 MHz~200 MHz	3.75 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	4.21 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	4.83 dB (k=2, 95% level of confidence)
6 GHz~18 GHz	5.18 dB (k=2, 95% level of confidence)
18 GHz~26 GHz	4.55 dB (k=2, 95% level of confidence)
26 GHz~40 GHz	4.67 dB (k=2, 95% level of confidence)

7.3 EUT Setup

Below 1 GHz:



Above 1 GHz:



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, FCC 15.205, and FCC 15.231 limits.

7.4 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	-	QP
Above 1 GHz	1 MHz	3 MHz	-	PK
	1 MHz	1/T	<98%	Ave

7.5 Test Procedure

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

According to §15.231, Intentional radiators operating under the provisions of this Section shall demonstrate compliance with the limits on the field strength of emissions, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector

7.6 Corrected Factor & Margin Calculation

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

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

The “Margin” 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:

Margin = Result – Limit

7.7 Test Results Summary

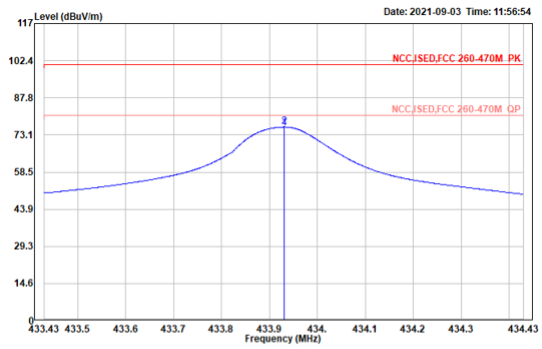
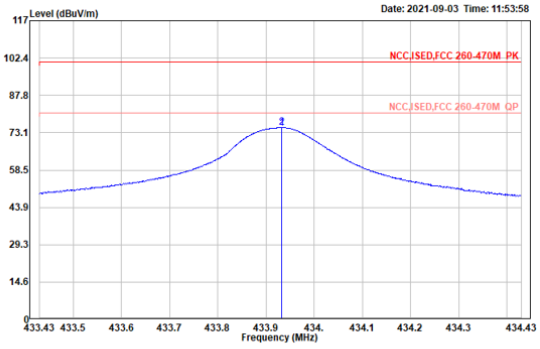
According to the data in the following table, the EUT complied with the FCC §15.231 Limit.

7.8 Test Results

Test Mode: Transmitting

(Pre-scan with three orthogonal axis, and worse case as Y axis.)

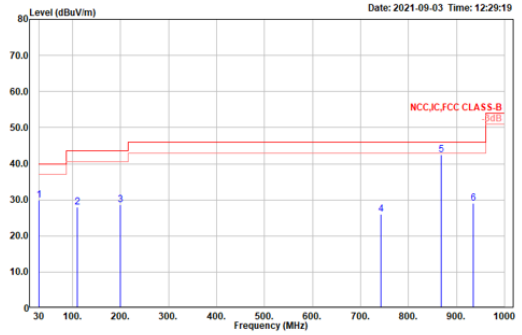
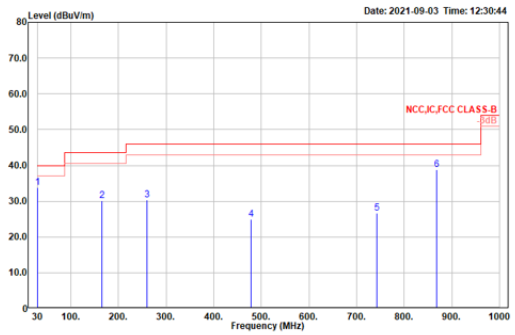
Fundamental

Horizontal	Vertical
	

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	433.931	92.83	-16.97	75.86	80.81	-4.95	QP
2	433.931	93.23	-16.97	76.26	100.81	-24.55	Peak

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	433.932	91.64	-16.97	74.67	80.81	-6.14	QP
2	433.932	92.08	-16.97	75.11	100.81	-25.70	Peak

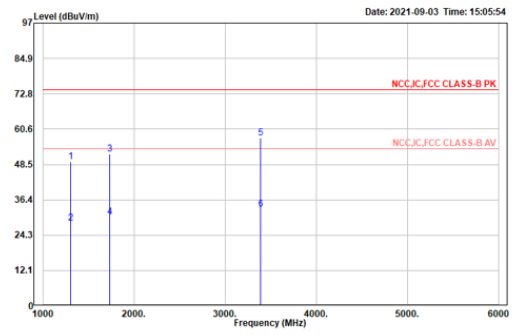
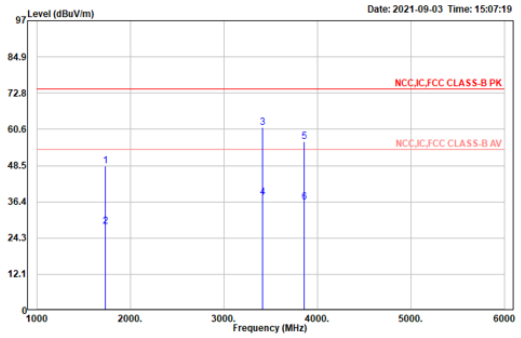
Below 1G (30 MHz-1 GHz) test the output power worst mode:

Horizontal	Vertical
	

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	30.000	38.18	-8.16	30.02	40.00	-9.98	Peak
2	110.510	47.83	-19.83	28.00	43.50	-15.50	Peak
3	199.750	48.75	-20.21	28.54	43.50	-14.96	Peak
4	742.950	37.95	-12.02	25.93	46.00	-20.07	Peak
5	868.080	53.04	-10.50	42.54	46.00	-3.46	QP
6	934.040	38.81	-9.72	29.09	46.00	-16.91	Peak

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	30.000	41.94	-8.06	33.88	40.00	-6.12	Peak
2	165.800	50.84	-20.80	30.04	43.50	-13.46	Peak
3	259.890	51.51	-21.06	30.45	46.00	-15.55	Peak
4	479.110	40.60	-15.74	24.86	46.00	-21.14	Peak
5	742.950	38.38	-11.82	26.56	46.00	-19.44	Peak
6	868.080	48.73	-9.94	38.79	46.00	-7.21	Peak

Above 1G (1 GHz-6 GHz)

Horizontal	Vertical
	

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	1300.000	62.81	-13.32	49.49	74.00	-24.51	Peak
2	1300.000	41.79	-13.32	28.47	54.00	-25.53	Average
3	1735.000	62.92	-10.96	51.96	74.00	-22.04	Peak
4	1735.000	41.35	-10.96	30.39	54.00	-23.61	Average
5 !	3385.000	62.94	-5.43	57.51	74.00	-16.49	Peak
6	3385.000	38.68	-5.43	33.25	54.00	-20.75	Average

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	
1	1735.000	59.40	-10.96	48.44	74.00	-25.56	Peak
2	1735.000	39.06	-10.96	28.10	54.00	-25.90	Average
3 !	3410.000	66.51	-5.31	61.20	74.00	-12.80	Peak
4 !	3410.000	43.05	-5.31	37.74	54.00	-16.26	Average
5 !	3855.000	60.15	-3.53	56.62	74.00	-17.38	Peak
6 !	3855.000	39.79	-3.53	36.26	54.00	-17.74	Average

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

8 FCC §15.231(C) – 20 dB Emission Bandwidth

8.1 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.

8.2 Test Procedure

The waveform was received by the spectrum analyzer/EMI Test Receiver, plot the 20 dB bandwidth.

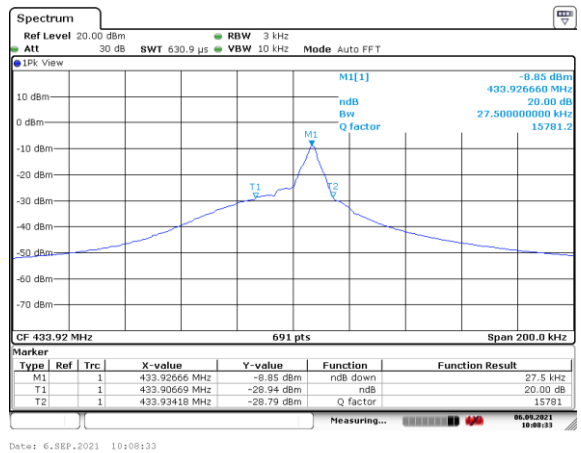
8.3 Test Equipment List and Details

Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101457	2020/09/23	2021/09/22
Cable	MTJ	MT40S	620620-MT40S-100	2021/01/04	2022/01/03

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

8.4 Test Results

Frequency (MHz)	20 dB BW (kHz)	Limit (MHz)	Result
433.92	27.5	1.08	Compliance

	-
	-

9 FCC §15.231(a) –Deactivation Testing

9.1 Applicable Standard

Per 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.

9.2 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 measuring equipment.

(3). Add a correction factor to the display.

9.3 Test Equipment List and Details

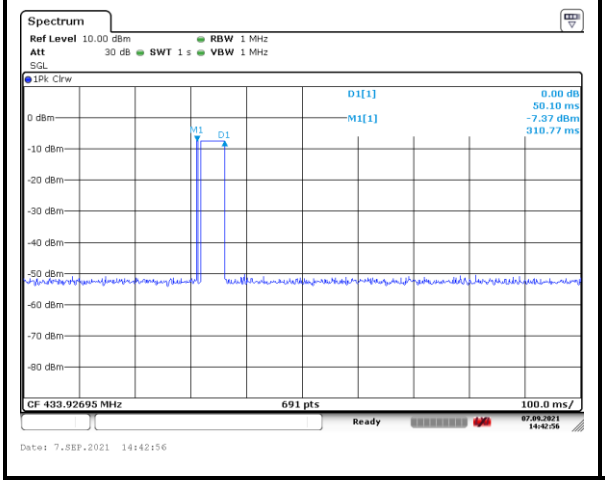
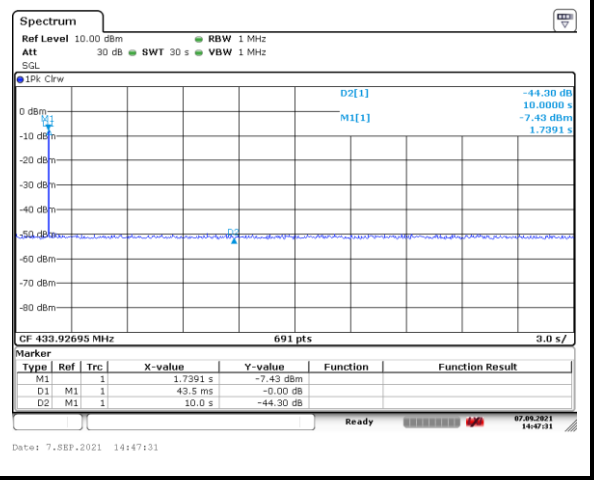
Description	Manufacture	Model	Serial No.	Cal. Date.	Cal. Due.
Conducted Room(TH-02)					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101457	2020/09/23	2021/09/22
Cable	MTJ	MT40S	620620-MT40S-100	2021/01/04	2022/01/03

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratori*

es which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).

9.4 Test Results

Frequency (MHz)	Burst Duration (ms)	Limit (Sec)	Result
433.92	50.10	5	Compliance

Burst time	30 sec
	

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