

FCC Test Report

Report No.: RFBWEY-WTW-P20120668

FCC ID: U9K-MS3001

Test Model: SSMS3

Received Date: Dec. 29, 2020

Test Date: Dec. 30, 2020 ~ Jan. 07, 2021

Issued Date: Jan. 25, 2021

Applicant: SIMPLISAFE, INC.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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**FCC Registration /
Designation Number:** 788550 / TW0003



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Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty	5
2.2 Modification Record	5
3 General Information	6
3.1 General Description of EUT	6
3.2 Description of Test Modes	6
3.2.1 Test Mode Applicability and Tested Channel Deta	7
3.3 Description of Support Units	8
3.3.1 Configuration of System under Test	8
3.4 General Description of Applied Standards	8
4 Test Types and Results	9
4.1 Radiated Emission Measurement	9
4.1.1 Limits of Radiated Emission Measurement	9
4.1.2 Test Instruments	10
4.1.3 Test Procedures	11
4.1.4 Deviation from Test Standard	11
4.1.5 Test Set Up	12
4.1.6 EUT Operating Conditions	13
4.1.7 Test Results	14
4.2 20dB Bandwidth Measurement	20
4.2.1 Limits of 20dB Bandwidth Measurement	20
4.2.2 Test Setup	20
4.2.3 Test Instruments	20
4.2.4 Test Procedures	20
4.2.5 Deviation from Test Standard	20
4.2.6 EUT Operating Conditions	20
4.2.7 Test Results	21
4.3 Deactivation Time Measurement	22
4.3.1 Limits of Deactivation Time Measurement	22
4.3.2 Test Setup	22
4.3.3 Test Instruments	22
4.3.4 Test Procedures	22
4.3.5 Deviation from Test Standard	22
4.3.6 EUT Operating Conditions	22
4.3.7 Test Results	23
5 Pictures of Test Arrangements	24
Appendix – Information of the Testing Laboratories	25

Release Control Record

Issue No.	Description	Date Issued
RFBWEY-WTW-P20120668	Original release	Jan. 25, 2021

1 Certificate of Conformity

Product: Motion Sensor

Brand: SimpliSafe

Test Model: SSMS3

Sample Status: Engineering sample

Applicant: SIMPLISAFE, INC.

Test Date: Dec. 30, 2020 ~ Jan. 07, 2021

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.231)
ANSI C63.10: 2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Celine Chou , **Date:** Jan. 25, 2021
Celine Chou / Senior Specialist

Approved by : Bruce Chen , **Date:** Jan. 25, 2021
Bruce Chen / Senior Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.231)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	NA	Power supply is from DC battery.
15.209 15.231(b)	Radiated Emission Test	Pass	Meet the requirement of limit. Minimum passing margin is -1.10dB at 433.92MHz.
15.231(c)	Emission Bandwidth Measurement	Pass	Meet the requirement of limit.
15.231(a)	De-activation	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

N/A: Not Applicable

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (\pm)
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.04 dB
	30MHz ~ 200MHz	2.93 dB
	200MHz ~ 1000MHz	2.95 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.26 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Motion Sensor
Brand	SimpliSafe
Test Model	SSMS3
Sample Status	Engineering sample
Power Supply Rating	3Vdc
Modulation Type	FSK
Operating Frequency	433.92MHz
Field Strength	79.72dBuV/m
Antenna Type	PCB antenna with 0dBi gain (The Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.)
Antenna Connector	NA
Accessory Device	NA
Cable Supplied	NA

3.2 Description of Test Modes

1 channel is provided to this EUT

Channel	Freq. (MHz)
1	433.92

3.2.1 Test Mode Applicability and Tested Channel Data

EUT Configure Mode	Applicable to					Description
	RE ≥ 1G	RE < 1G	PLC	EB	DT	
-	√	√	Note 1	√	√	-

Where RE≥1G: Radiated Emission above 1GHz RE<1G: Radiated Emission below 1GHz
 PLC: Power Line Conducted Emission EB: 20dB Bandwidth measurement
 DT: Deactivation Time measurement

Note:

- Without AC power port of the EUT
- The antenna had been pre-tested on the positioned of each 3 axis. The worst cases were found when positioned on **Z-plane**.

Radiated Emission Test (Above 1GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	1	1	FSK

Radiated Emission Test (Below 1GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	1	1	FSK

Emission Bandwidth Measurement:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	1	1	FSK

Deactivation Time Measurement:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Available Channel	Tested Channel	Modulation Type
-	1	1	FSK

Test Condition:

Applicable to	Environmental Conditions	Input Power	Tested by
RE≥1G	22 deg. C, 68% RH	3Vdc	Tim Chen
RE<1G	22 deg. C, 68% RH	3Vdc	Tim Chen
EB/DT	22 deg. C, 68% RH	3Vdc	Tim Chen

3.3 Description of Support Units

The EUT has been tested as an independent unit.

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standard:

FCC Part 15, Subpart C (15.231)

ANSI C63.10- 2013

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission Measurement

4.1.1 Limits of Radiated Emission Measurement

Fundamental Frequency (MHz)	Field Strength of Fundamental	Field Strength of Spurious
	uV/meter	uV/meter
40.66 ~ 40.70	2250	225
70 ~ 130	1250	125
130 ~ 174	1250 ~ 3750	125 ~ 375
174 ~ 260	3750	375
260 ~ 470	3750 ~ 12500	375 ~ 1250
Above 470	12500	1250

Note:

- Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, $\mu\text{V/m}$ at 3 meters = $56.81818(F)-6136.3636$; for the band 260-470 MHz, $\mu\text{V/m}$ at 3 meters = $41.6667(F)-7083.3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.
- The above field strength limits are specified at a distance of 3meters. The tighter limits apply at the band edges.

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	$2400/F(\text{kHz})$	300
0.490 ~ 1.705	$24000/F(\text{kHz})$	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

Note:

- The lower limit shall apply at the transition frequencies.
- Emission level (dBuV/m) = $20 \log$ Emission level ($\mu\text{V/m}$).
- For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver Agilent	N9038A	MY51210203	Mar. 18, 2020	Mar. 17, 2021
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 07, 2020	Dec. 06, 2021
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Apr. 16, 2020	Apr. 15, 2021
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-969	Nov. 22, 2020	Nov. 21, 2021
BILOG Antenna SCHWARZBECK	VULB 9168	9168-472	Nov. 06, 2020	Nov. 05, 2021
Fixed Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Loop Antenna	EM-6879	269	Sep. 17, 2020	Sep. 16, 2021
Preamplifier EMCI	EMC001340	980201	Oct. 21, 2020	Oct. 20, 2021
Bluetooth Tester	CBT	100946	Aug. 06, 2020	Aug. 05, 2022
Preamplifier EMCI	EMC 012645	980115	Oct. 07, 2020	Oct. 06, 2021
Preamplifier EMCI	EMC 330H	980112	Oct. 07, 2020	Oct. 06, 2021
Power Meter Anritsu	ML2495A	1012010	Sep. 01, 2020	Aug. 31, 2021
Power Sensor Anritsu	MA2411B	1315050	Sep. 01, 2020	Aug. 31, 2021
RF Coaxial Cable EMCI	EMC104-SM-SM-8 000	171005	Oct. 07, 2020	Oct. 06, 2021
RF Coaxial Cable HUBER+SUHNNER	SUCOFLEX 104	EMC104-SM-SM-1000(1 40807)	Oct. 07, 2020	Oct. 06, 2021
RF Coaxial Cable WOKEN	8D-FB	Cable-Ch10-01	Oct. 07, 2020	Oct. 06, 2021
Boresight Antenna Fixture	FBA-01	FBA-SIP01	NA	NA
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10.

4.1.3 Test Procedures

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

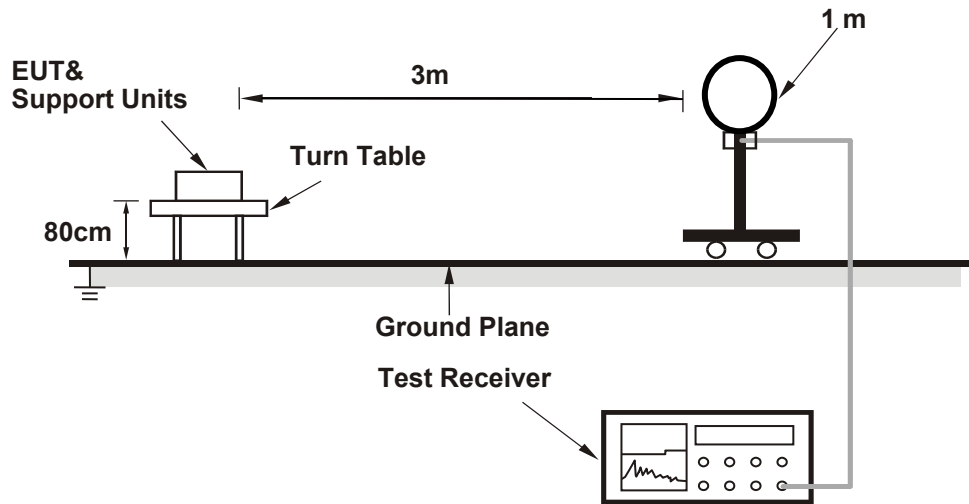
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) or Average detection (AV) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 Deviation from Test Standard

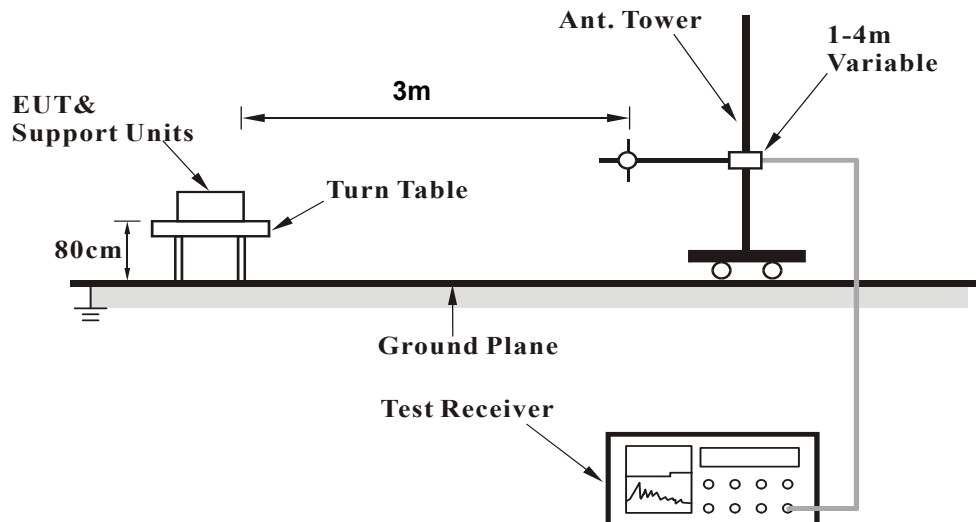
No deviation.

4.1.5 Test Set Up

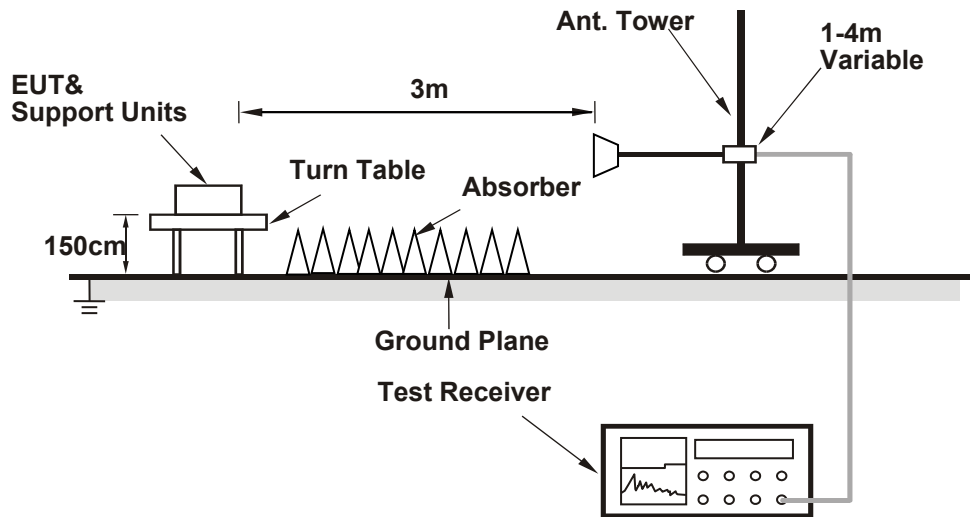
Radiated emission below 30MHz



Radiated emission 30MHz to 1GHz



Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

- a. Set the EUT under transmission condition continuously at specific channel frequency.

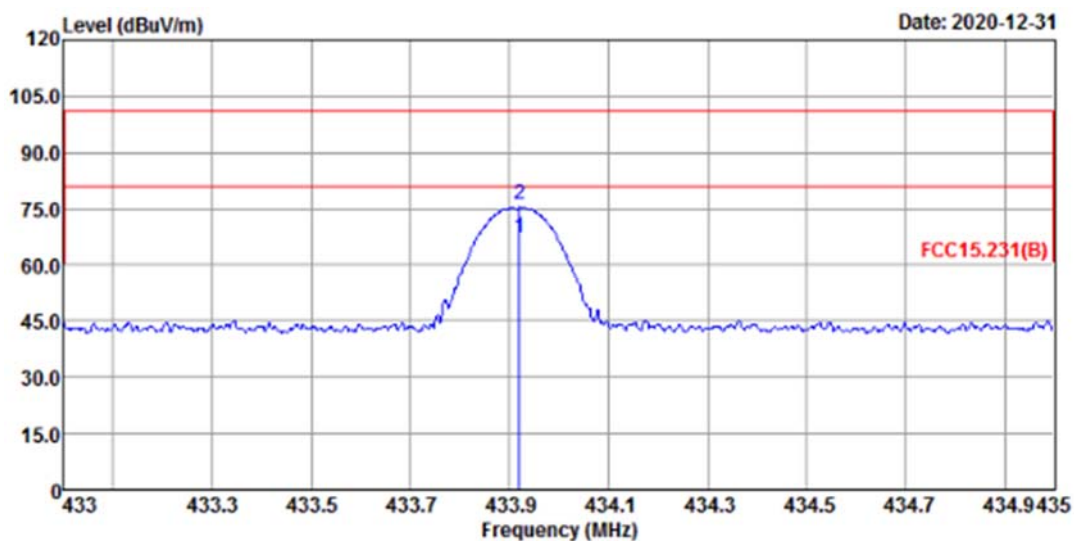
4.1.7 Test Results

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	433.92MHz
Input Power	3Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	22 deg. C, 68% RH	Tested By	Tim Chen

Antenna Polarity & Test Distance: Horizontal at 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)
1	*433.92	67.16 AV	42.35	24.81	80.82	-13.66	106	188
2	*433.92	76.11 PK	51.30	24.81	100.82	-24.71	106	188

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 Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ * “ : Fundamental frequency
6. Above limits have been translated by the formula

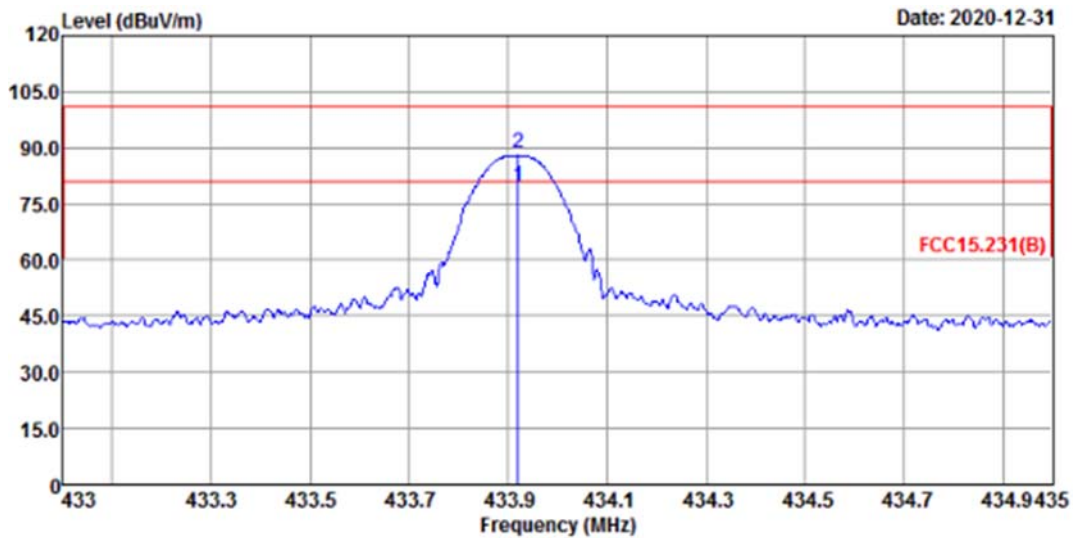


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	433.92MHz
Input Power	3Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	22 deg. C, 68% RH	Tested By	Tim Chen

Antenna Polarity & Test Distance: Vertical at 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)
1	*433.92	79.72 AV	54.91	24.81	80.82	-1.10	122	115
2	*433.92	88.69 PK	63.88	24.81	100.82	-12.13	122	115

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 Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “ * “ : Fundamental frequency
6. Above limits have been translated by the formula

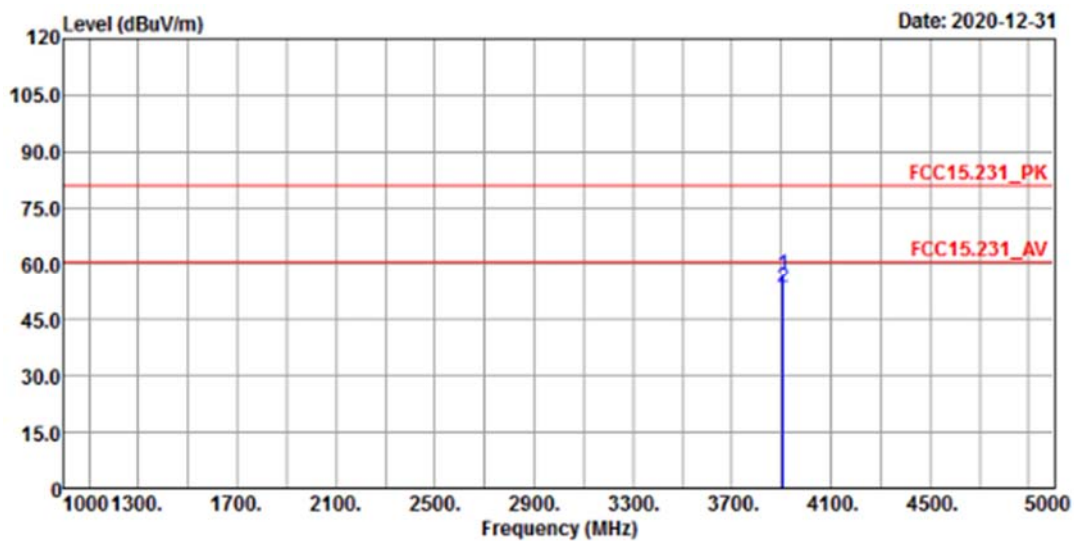


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1GHz ~ 5GHz
Input Power	3Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	22 deg. C, 68% RH	Tested By	Tim Chen

Antenna Polarity & Test Distance: Horizontal at 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)
1	3905.28	56.98 AV	74.99	-18.01	60.82	-3.84	371	37
2	3905.28	53.72 PK	71.73	-18.01	80.82	-27.10	371	37

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 Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

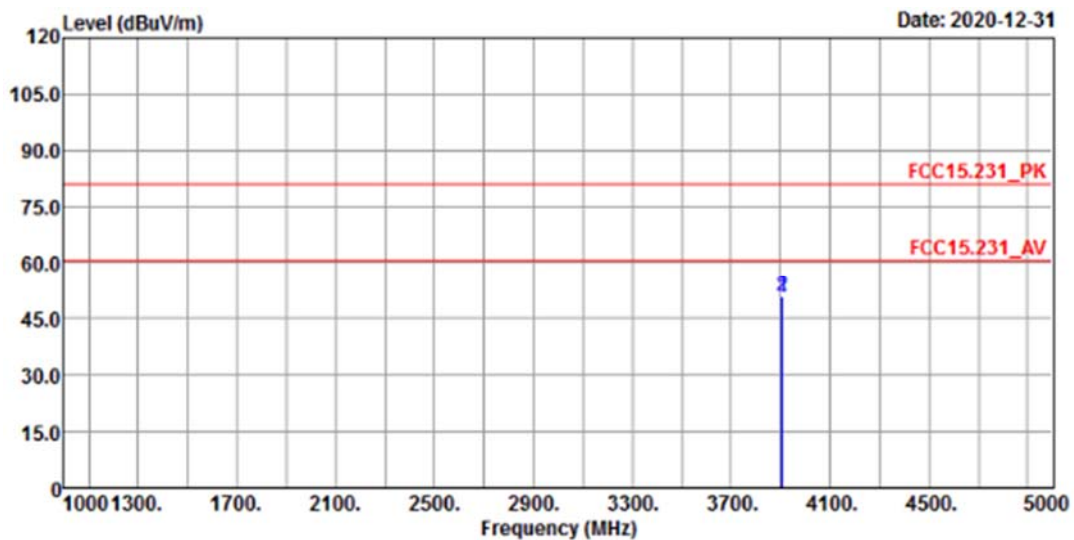


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1GHz ~ 5GHz
Input Power	3Vdc	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	22 deg. C, 68% RH	Tested By	Tim Chen

Antenna Polarity & Test Distance: Vertical at 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)
1	3905.28	50.64 AV	68.65	-18.01	60.82	-10.18	100	150
2	3905.28	50.86 PK	68.87	-18.01	80.82	-29.96	100	150

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 Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

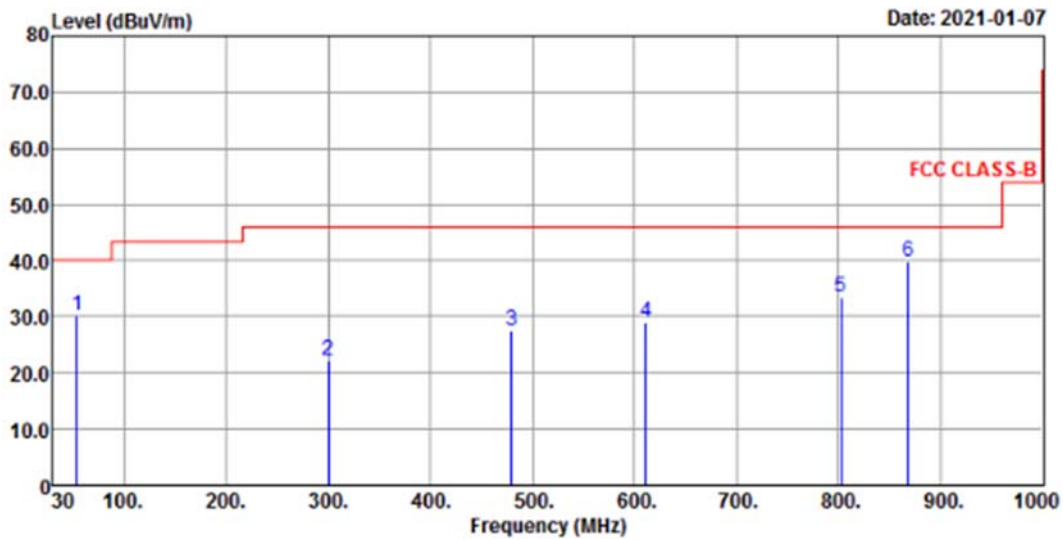


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 1000MHz
Input Power	3Vdc	Detector Function	Quasi-Peak
Environmental Conditions	22 deg. C, 68% RH	Tested By	Tim Chen

Antenna Polarity & Test Distance: Horizontal At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)
1	53.50	30.10	41.99	-11.89	40.00	-9.90	231	141
2	299.78	22.18	33.37	-11.19	46.00	-23.82	145	132
3	479.32	27.41	33.24	-5.83	46.00	-18.59	121	164
4	611.00	28.96	31.35	-2.39	46.00	-17.04	123	165
5	802.50	33.25	31.52	1.73	46.00	-12.75	187	144
6	867.84	39.95	37.32	2.63	46.00	-6.05	178	231

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 Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.

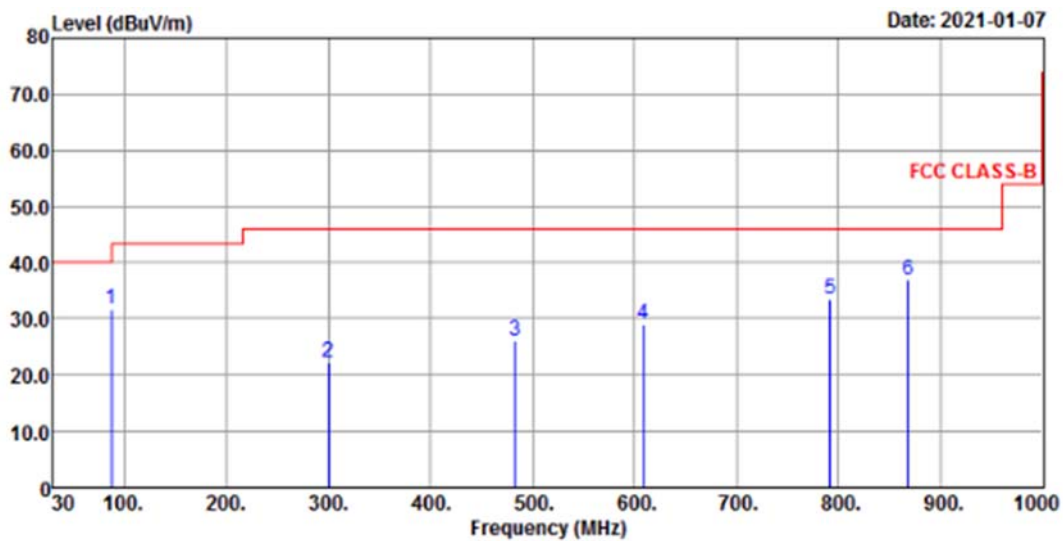


EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	Below 1000MHz
Input Power	3Vdc	Detector Function	Quasi-Peak
Environmental Conditions	22 deg. C, 68% RH	Tested By	Tim Chen

Antenna Polarity & Test Distance: Vertical At 3m								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Raw Value (dBuV)	Correction Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)
1	87.34	31.59	49.12	-17.53	40.00	-8.41	241	164
2	299.78	22.24	33.43	-11.19	46.00	-23.76	189	165
3	482.61	25.90	31.68	-5.78	46.00	-20.10	197	134
4	609.00	28.83	31.30	-2.47	46.00	-17.17	199	175
5	792.00	33.27	31.73	1.54	46.00	-12.73	164	133
6	867.84	36.85	34.22	2.63	46.00	-9.15	121	187

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 Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



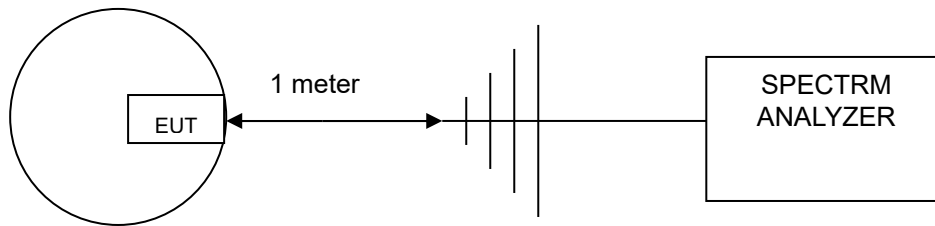
4.2 20dB Bandwidth Measurement

4.2.1 Limits of 20dB Bandwidth Measurement

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for device operating above 70 MHz and below 900 MHz.

Fundamental Frequency (MHz)	Limit Of Emission Bandwidth (kHz)
433.92	1084.80

4.2.2 Test Setup



4.2.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.2.4 Test Procedures

- The EUT was placed on the turn table.
- The signal was coupled to the spectrum analyzer through an antenna.
- Set the resolution bandwidth to 1kHz and video bandwidth to 3kHz then select Peak function to scan the channel frequency.
- The emission bandwidth was measured and recorded.

4.2.5 Deviation from Test Standard

No deviation.

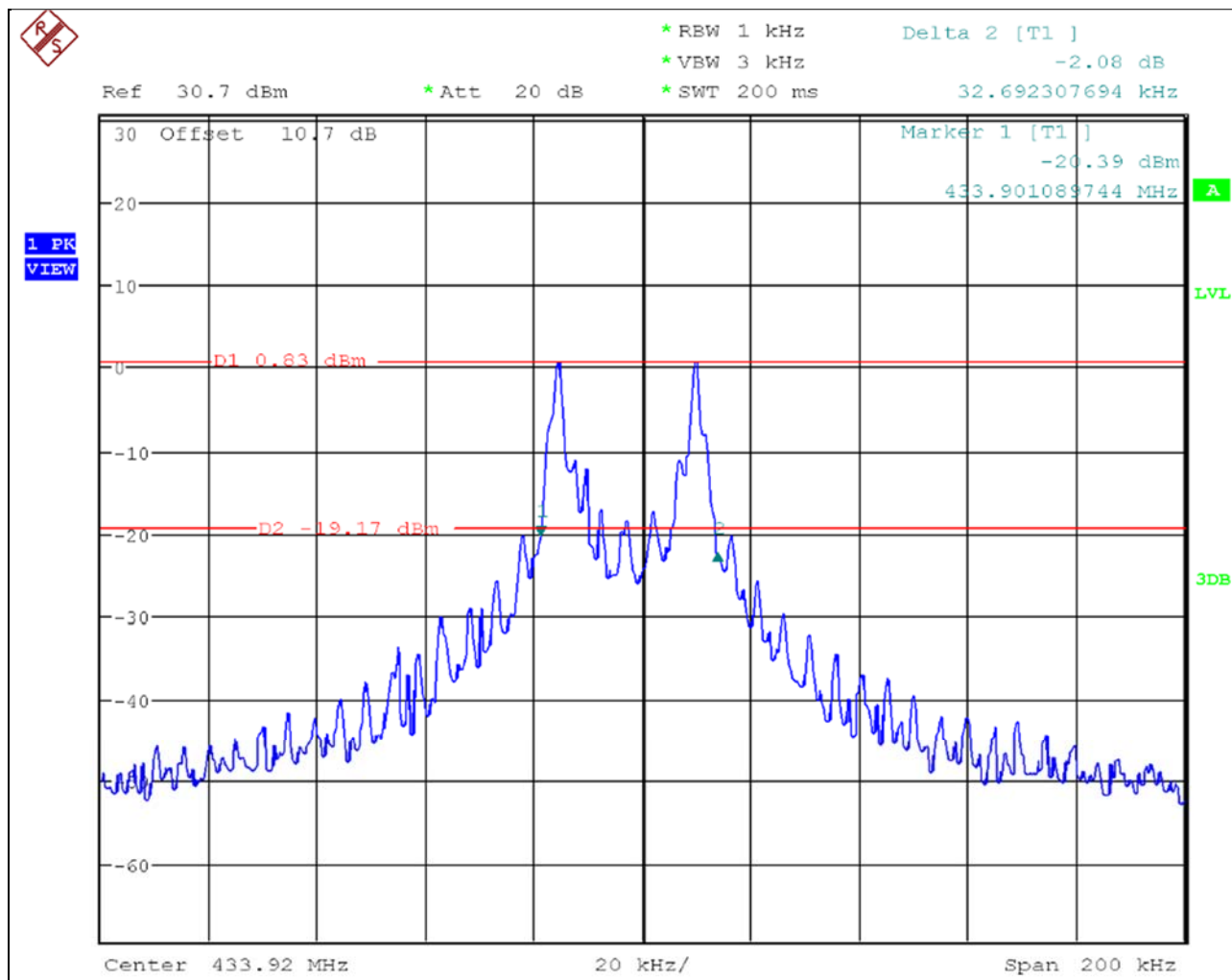
4.2.6 EUT Operating Conditions

Same as Item 4.1.6.

4.2.7 Test Results

Channel	Frequency (MHz)	20dB Bandwidth (kHz)	Maximum Limit (kHz)	Pass / Fail
1	433.92	32.69	1084.80	Pass

*Limit: 433.92MHz * 0.25% = 1084.80kHz

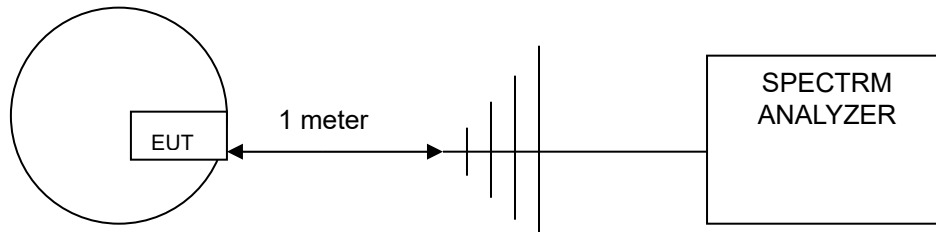


4.3 Deactivation Time Measurement

4.3.1 Limits of Deactivation Time Measurement

A transmitter activated manually shall cease transmission within 5 seconds after activation.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedures

- a. The EUT was placed on the turning table.
- b. The signal was coupled to the spectrum analyzer through an antenna.
- c. Set the resolution bandwidth to 1MHz and video bandwidth to 3MHz. The spectrum analyser was turned to the centre frequency of the transmitter's and the analyser's marker function was used to determine the duration of transmission.
- d. The transmission duration was measured and recorded.

4.3.5 Deviation from Test Standard

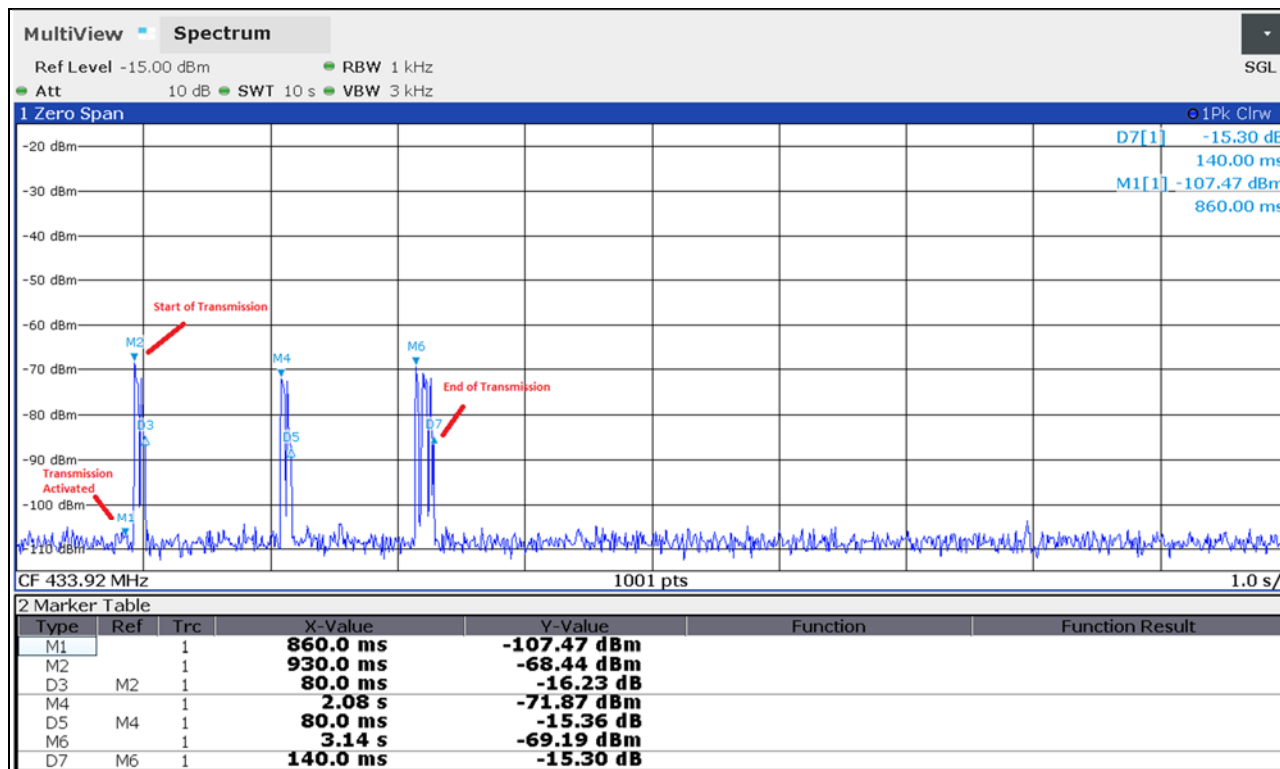
No deviation.

4.3.6 EUT Operating Conditions

Same as Item 4.1.6.

4.3.7 Test Results

Frequency (MHz)	Maximum Limit (Sec)	Pass/Fail
433.92	5	Pass



Note: The total transmission time is (3.14s + 140ms) end of transmission - (930ms) start of transmission = 2.35 seconds.

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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