

# FCC Test Report

Product Name	Motion Sensor
Model No.	CA001
FCC ID.	U9K-CA0010

Applicant	SimpliSafe, Inc.
Address	294 Washington St 9th Floor, Boston 02108, Massachusetts, United States

Date of Receipt	Jan. 10, 2022
Issued Date	Apr. 14, 2022
Report No.	2210262R-RFUSOTHV04-A
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

# Test Report

Issued Date: Apr. 14, 2022

Report No.: 2210262R-RFUSOTHV04-A



Product Name	Motion Sensor
Applicant	SimpliSafe, Inc.
Address	294 Washington St 9th Floor, Boston 02108, Massachusetts, United States
Manufacturer	SimpliSafe, Inc.
Model No.	CA001
FCC ID.	U9K-CA0010
EUT Rated Voltage	DC 3V (Power by Battery)
EUT Test Voltage	DC 3V (Power by Battery)
Trade Name	SimpliSafe
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By

:

Jinn Chen

( Supervisor / Jinn Chen )

Tested By

:

Bill Lin

( Senior Engineer / Bill Lin )

Approved By

:

Jack Hsu

( Senior Engineer / Jack Hsu )

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## Revision History

Report No.	Version	Description	Issued Date
2210262R-RFUSOTHV04-A	V1.0	Initial issue of report.	Apr. 14, 2022

## 1. General Information

### 1.1. EUT Description

Product Name	Motion Sensor
Trade Name	SimpliSafe
Model No.	CA001
FCC ID	U9K-CA0010
Frequency Range	433.92MHz
Number of Channels	1
Type of Modulation	FSK
Antenna Type	Monopole Antenna

#### Parameters of test software setting

Frequency	433.92 MHz
01	N/A

## Note:

1. The EUT is a Motion Sensor with a built-in 433.92MHz transmitter.
2. The antenna of EUT is conform to FCC 15.203
3. These tests are conducted on a sample for the purpose of demonstrating compliance of transmitter with Part 15 Subpart C Paragraph 15.231.
4. The radiation measurements are performed in X, Y, Z axis positioning. The mode 1 is the worst case. the details of test modes as below:

Test Mode	Mode 1: Transmit mode	
	Description: Automatic FSK message every 1 second	
	Radio PA Setting	1dB
	Data Rate	4.8kbps
	Frequency Deviation	26 kHz
	Modulation	FSK
	Maximum Packet Length (ms):	65
	Mode 2: Normal mode	
	Description: Representative of Production FW	
	Radio PA Setting	1dB
	Data Rate	4.8kbps
	Frequency Deviation	26 kHz
	Modulation	FSK
	Maximum Packet Length (ms):	65

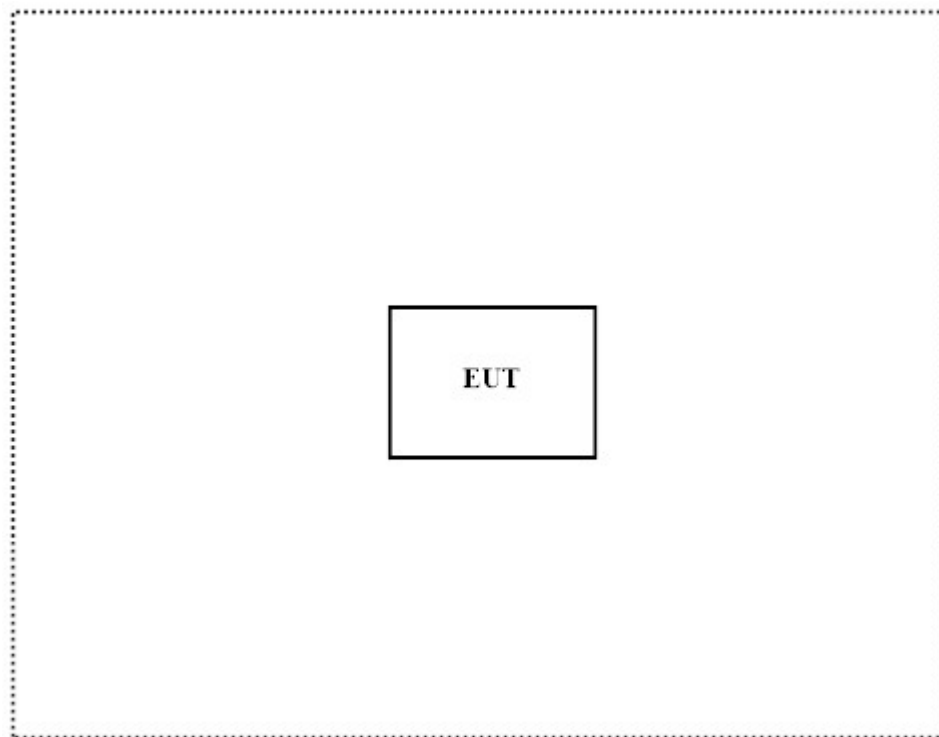
## 1.2. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
N/A					

Signal Cable Type	Signal cable Description
N/A	

## 1.3. Configuration of tested System



## 1.4. EUT Exercise Software

1	Setup the EUT as shown in section 1.3.
2	Push the button of EUT.
3	Equipment operates continuously.
4	Verify that the EUT works properly.

## 1.5. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Radiated Emission	Temperature (°C)	15~35 °C	23.5 °C
	Humidity (%RH)	20~75 %	55.1 %
Conductive	Temperature (°C)	15~35 °C	23.5 °C
	Humidity (%RH)	20~75 %	58 %

**USA** : **FCC Registration Number: TW0033**

**Canada** : **IC Registration Number: 26930**

Site Description : Accredited by TAF  
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd  
Address : No. 5-22, Ruishukeng Linkou District, New Taipei City,  
24451, Taiwan

Performed Location : No. 26, Huaya 1st Rd., Guishan Dist., Taoyuan City  
333411, Taiwan, R.O.C.

Phone number : +886-3-275-7255  
Fax number : +866-3-327-8031  
Email address : [info.tw@dekra.com](mailto:info.tw@dekra.com)  
Website : <http://www.dekra.com.tw>



## 1.6. List of Test Equipment

### For Conducted measurements /SH2

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due. Date
X	Spectrum Analyzer	R&S	FSV30	103466	2021.12.27	2022.12.26
	Peak Power Analyzer	KEYSIGHT	8900B	MY51000539	2021.06.07	2022.06.06
	Power Sensor	KEYSIGHT	N1923A	MY59240002	2021.05.17	2022.05.16
	Power Sensor	KEYSIGHT	N1923A	MY59240003	2021.05.17	2022.05.16

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.

### For Radiated measurements /966-3

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due. Date
X	Loop Antenna	AMETEK	HLA6121	56736	2021.04.14	2022.04.13
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-675	2021.08.10	2022.08.10
X	Horn Antenna	ETS-Lindgren	3117	00227700	2021.11.09	2022.11.08
	Horn Antenna	Com-Power	AH-840	101087	2021.06.16	2022.06.15
X	Pre-Amplifier	EMCI	EMC001330	980302	2021.07.26	2022.07.25
X	Pre-Amplifier	EMCI	EMC051835SE	980313	2021.11.24	2022.11.23
	Pre-Amplifier	EMCI	EMC05820SE	980310	2021.07.07	2022.07.06
	Pre-Amplifier	EMCI	EMC184045SE	980369		
	Coaxial Cable	EMCI	EMC102-KM-KM-600	1160314	2021.04.27	2022.04.26
	Coaxial Cable	EMCI	EMC102-KM-KM-7000	170242		
	Filter	MICRO	BRM50702	G251	2021.09.16	2022.09.15
	Filter	MICRO	BRM50716	G188	2021.09.16	2022.09.15
X	EMI Test Receiver	R&S	ESR	102793	2021.12.15	2022.12.14
X	Spectrum Analyzer	R&S	FSV3044	101113	2022.01.25	2023.02.24
X	Coaxial Cable	SGH	HA800	GD20110222-3		
	Coaxial Cable	SGH	SGH18	20110223-1	2022.01.05	2023.01.04
	Coaxial Cable	SGH	SGH18	2021005-3		
	Coaxial Cable	SGH	SGH18	2021001-18		

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with “X” are used to measure the final test results.
3. Test Software version : AUDIX e3 V9.

## 1.7. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document.

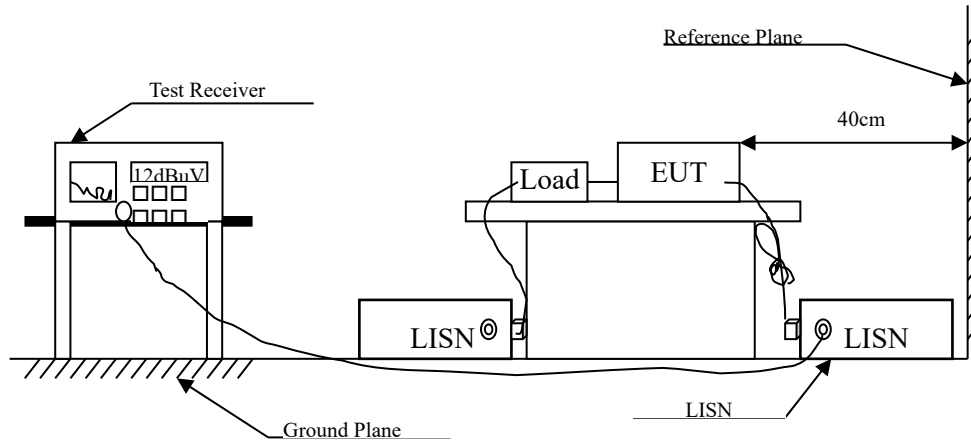
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test item	Uncertainty	
Conducted Emission	$\pm 3.42$ dB	
Radiated Emission	Under 1GHz $\pm 4.06$ dB	Above 1GHz $\pm 3.73$ dB
Transmit time	$\pm 2.31$ ms	
Occupied Bandwidth	$\pm 682.83$ Hz	
Duty Cycle	$\pm 2.31$ ms	

## 2. Conducted Emission

### 2.1. Test Setup



### 2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 Limits (dBuV)		
Frequency MHz	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks : In the above table, the tighter limit applies at the band edges.

### 2.3. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

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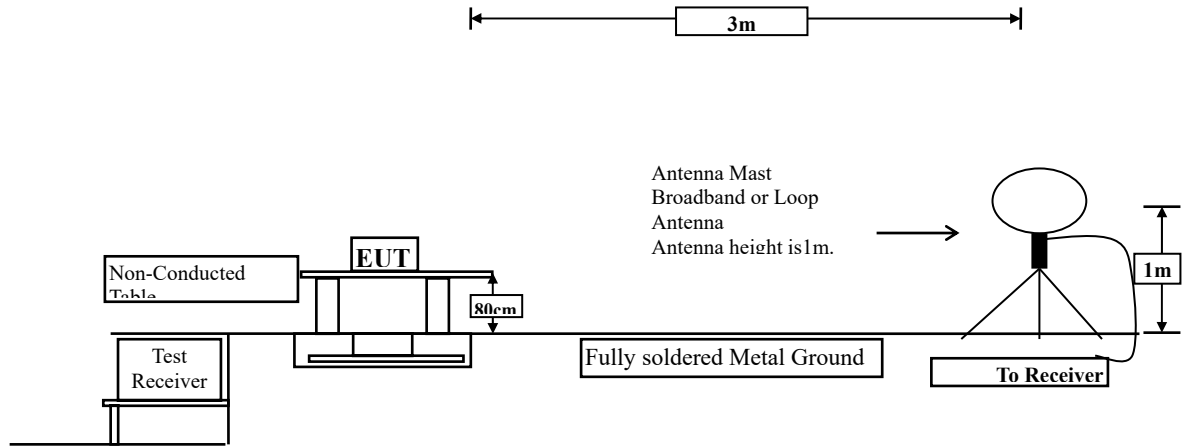
#### **2.4. Test Result of Conducted Emission**

Owing to the Battery operation of EUT, this test item is not performed.

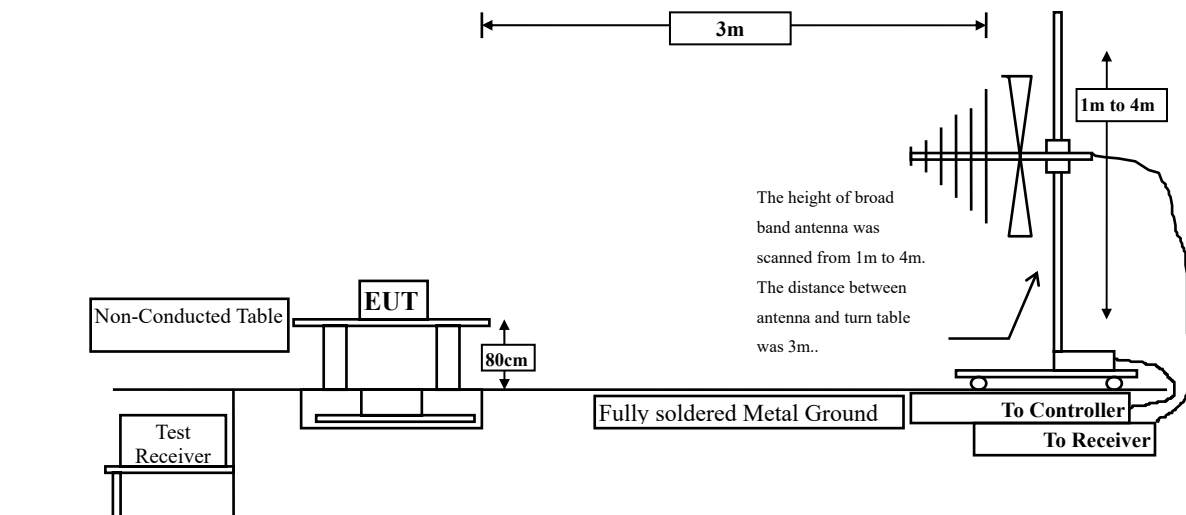
### 3. Radiated Emission

#### 3.1. Test Setup

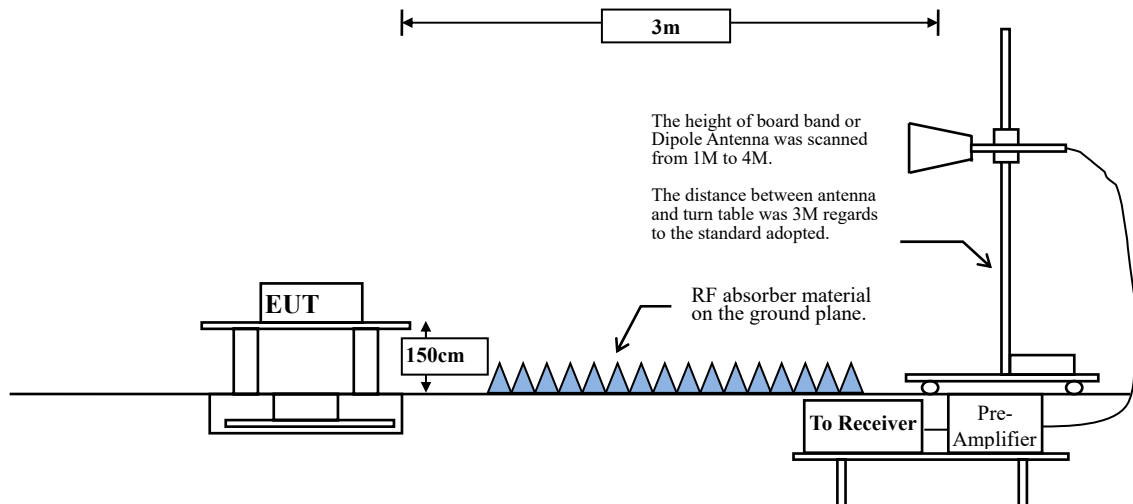
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



### 3.2. Limits

#### ➤ Fundamental and Harmonics Emission Limits

FCC Part 15 Subpart C Paragraph 15.231(b) Limits		
Fundamental Frequency MHz	Field Strength of Fundamental	Field Strength of Spurious Emission
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

- Remarks :
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
  2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
  3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

#### ➤ Spurious electric field strength limits

FCC Part 15 Subpart C Paragraph 15.209 Limits			
Frequency MHz	uV/m	dBuV/m	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	See Remark <sup>1</sup>	300
0.490-1.705	24000/F(kHz)	See Remark <sup>1</sup>	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

- Remarks :
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
  2. In the Above Table, the tighter limit applies at the band edges.
  3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

### 3.3. Test Procedure

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

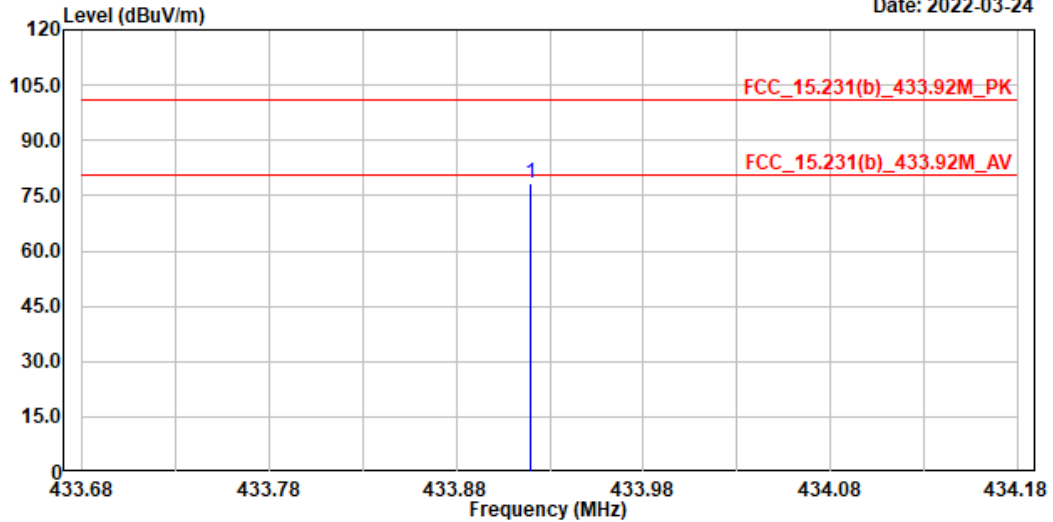
The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

### 3.4. Test Result

Site :966-3  
 Condition :3m ,Horizontal  
 Mode :mode 1\_433.92MHz  
 Test BY :Ashton Chiu

Date: 2022-03-24



No.	Frequency MHz	Level dBuV/m	Limit Line dBuV/m	Over Limit dB	Read Level dBuV	Factor dB	Remark
1	433.920	78.25	100.83	-22.58	97.99	-19.74	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission under 30MHz was not included since the emission levels are very low against the limit.

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
433.92	78.25	-3.713	74.537	-6.293	80.830

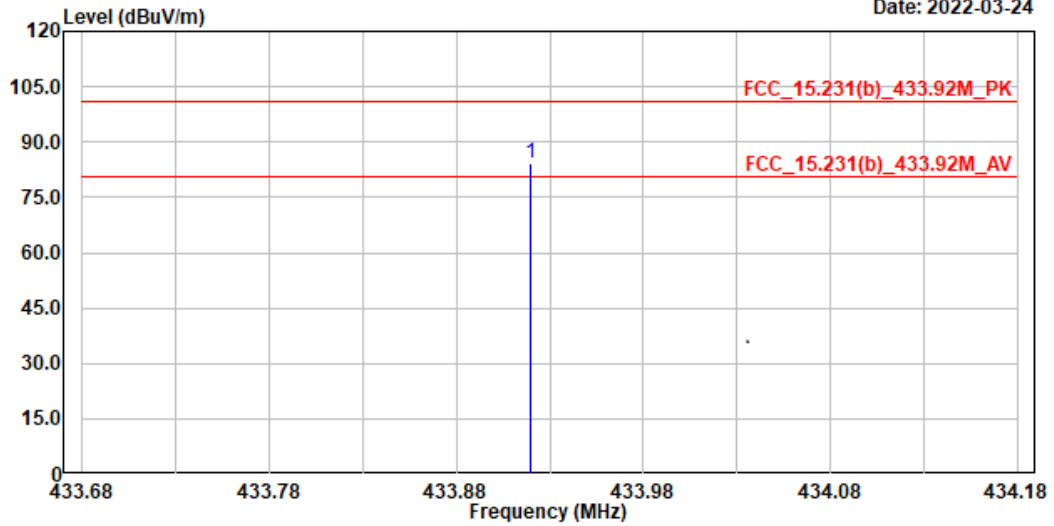
Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 6.



Site :966-3  
 Condition :3m ,Vertical  
 Mode :mode 1\_433.92MHz  
 Test BY :Ashton Chiu

Date: 2022-03-24



No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	433.920	84.32	100.83	-16.51	104.06	-19.74	Peak

Note:

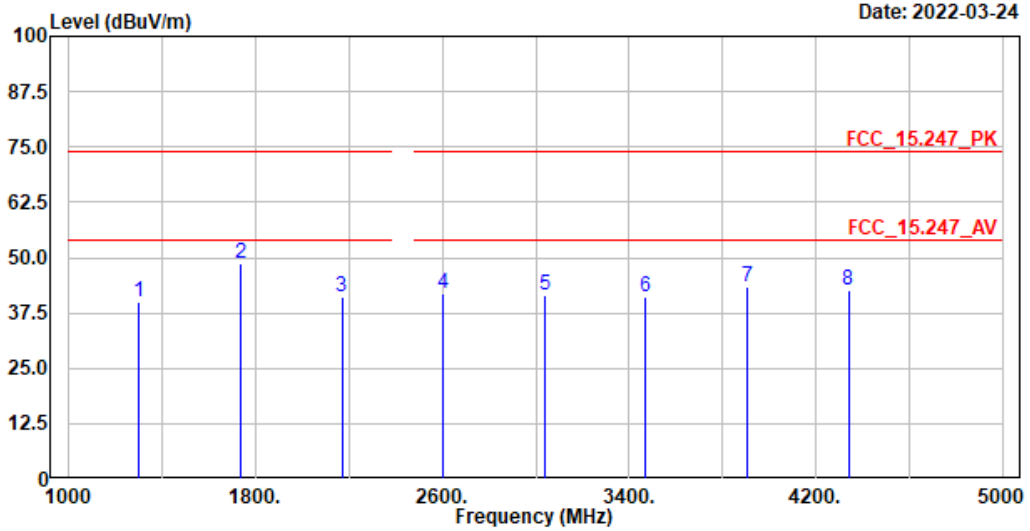
1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission under 30MHz was not included since the emission levels are very low against the limit.

Frequency (MHz)	Peak Measurement (dBμV/m)	Duty Cycle Factor (dB)	Average Measurement (dBμV/m)	Margin (dB)	Average Limit (dBμV/m)
433.92	84.32	-3.713	80.607	-0.223	80.830

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 6.

Site :966-3  
 Condition :3m ,HORIZONTAL  
 Mode :mode 1\_433.92MHz  
 Test BY :Ashton Chiu



Date: 2022-03-24

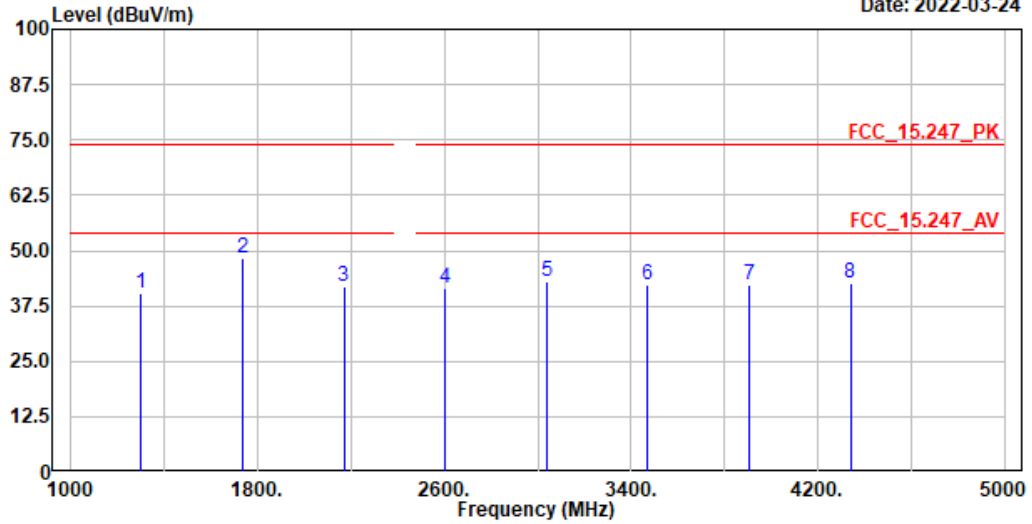
No.	Frequency	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	1301.760	40.19	74.00	-33.81	47.13	-6.94	Peak
2	1735.680	48.63	74.00	-25.37	54.52	-5.89	Peak
3	2169.600	41.15	74.00	-32.85	44.86	-3.71	Peak
4	2603.520	41.96	74.00	-32.04	44.08	-2.12	Peak
5	3037.440	41.47	74.00	-32.53	42.79	-1.32	Peak
6	3471.360	41.30	74.00	-32.70	42.66	-1.36	Peak
7	3905.280	43.28	74.00	-30.72	43.56	-0.28	Peak
8	4339.200	42.71	74.00	-31.29	42.38	0.33	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Site :966-3  
 Condition :3m ,VERTICAL  
 Mode :mode 1\_433.92MHz  
 Test BY :Ashton Chiu

Date: 2022-03-24



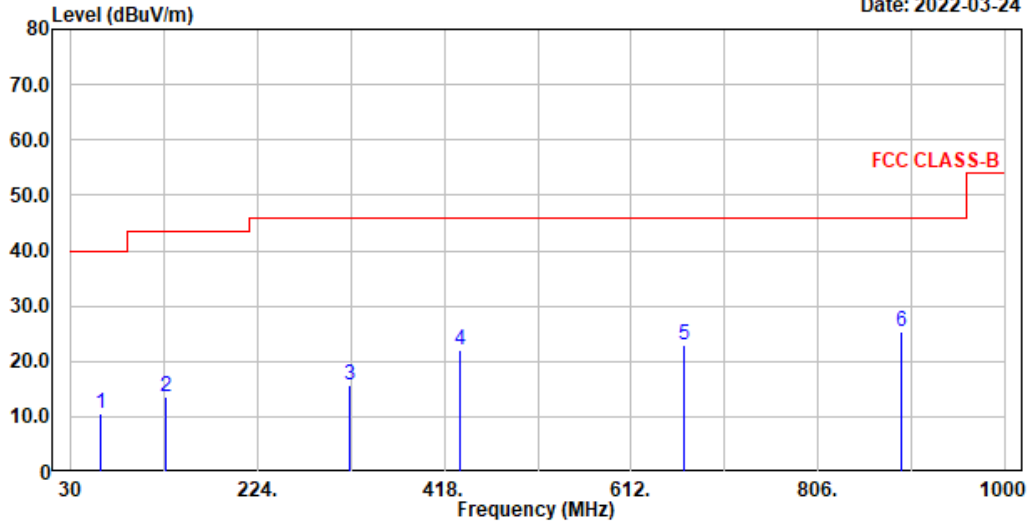
No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	
1	1301.760	40.37	74.00	-33.63	47.30	-6.93	Peak
2	1735.680	48.33	74.00	-25.67	54.22	-5.89	Peak
3	2169.600	41.95	74.00	-32.05	45.66	-3.71	Peak
4	2603.520	41.57	74.00	-32.43	43.69	-2.12	Peak
5	3037.440	42.94	74.00	-31.06	44.26	-1.32	Peak
6	3471.360	42.30	74.00	-31.70	43.66	-1.36	Peak
7	3905.280	42.30	74.00	-31.70	42.58	-0.28	Peak
8	4339.200	42.76	74.00	-31.24	42.43	0.33	Peak

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line

Site :966-3  
 Condition :3m ,Horizontal  
 Mode :mode 1\_433.92MHz  
 Test BY :Ashton Chiu

Date: 2022-03-24

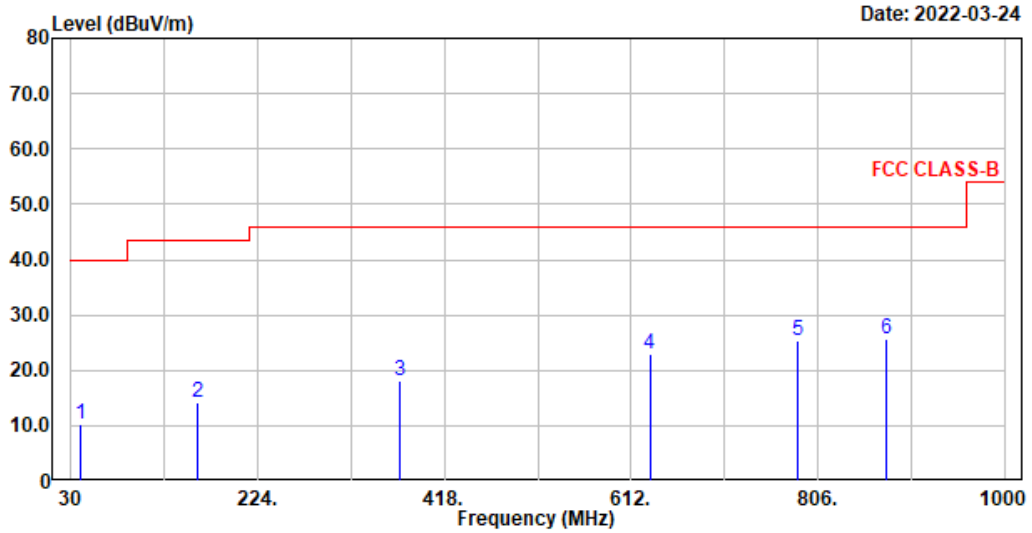


No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	Line	Limit	Level		
			dBuV/m	dB	dBuV	dB	
1	61.040	10.50	40.00	-29.50	35.36	-24.86	QP
2	128.940	13.46	43.50	-30.04	38.71	-25.25	QP
3	320.030	15.73	46.00	-30.27	38.36	-22.63	QP
4	433.520	22.03	46.00	-23.97	41.79	-19.76	QP
5	667.290	22.80	46.00	-23.20	37.97	-15.17	QP
6	892.330	25.38	46.00	-20.62	37.67	-12.29	QP

Note:

1. Level = Read Level + Factor
2. Factor = Antenna Factor + Cable Loss - Preamp Factor
3. Over Limit = Level - Limit Line
4. The emission under 30MHz was not included since the emission levels are very low against the limit.

Site :966-3  
 Condition :3m ,Vertical  
 Mode :mode 1\_433.92MHz  
 Test BY :Ashton Chiu



Date: 2022-03-24

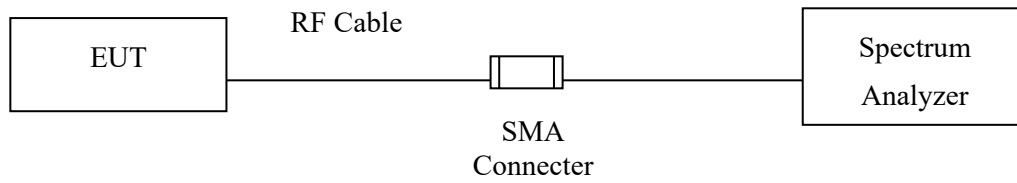
No.	Frequency	Level	Limit	Over	Read	Factor	Remark
	MHz	dBuV/m	Line	Limit	Level		
			dBuV/m	dB	dBuV	dB	
1	39.700	10.26	40.00	-29.74	34.39	-24.13	QP
2	160.950	14.33	43.50	-29.17	38.32	-23.99	QP
3	371.440	18.26	46.00	-27.74	39.75	-21.49	QP
4	631.400	22.81	46.00	-23.19	38.37	-15.56	QP
5	784.660	25.22	46.00	-20.78	38.53	-13.31	QP
6	877.780	25.71	46.00	-20.29	38.27	-12.56	QP

Note:

- Level = Read Level + Factor
- Factor = Antenna Factor + Cable Loss - Preamp Factor
- Over Limit = Level - Limit Line
- The emission under 30MHz was not included since the emission levels are very low against the limit.

## 4. Transmit time

### 4.1. Test Setup



### 4.2. Limits

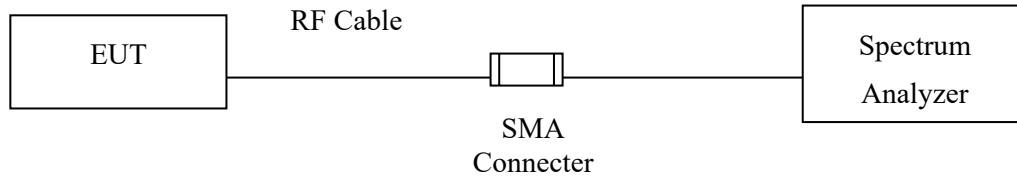
A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

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



## 5. Occupied Bandwidth

### 5.1. Test Setup



### 5.2. Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier



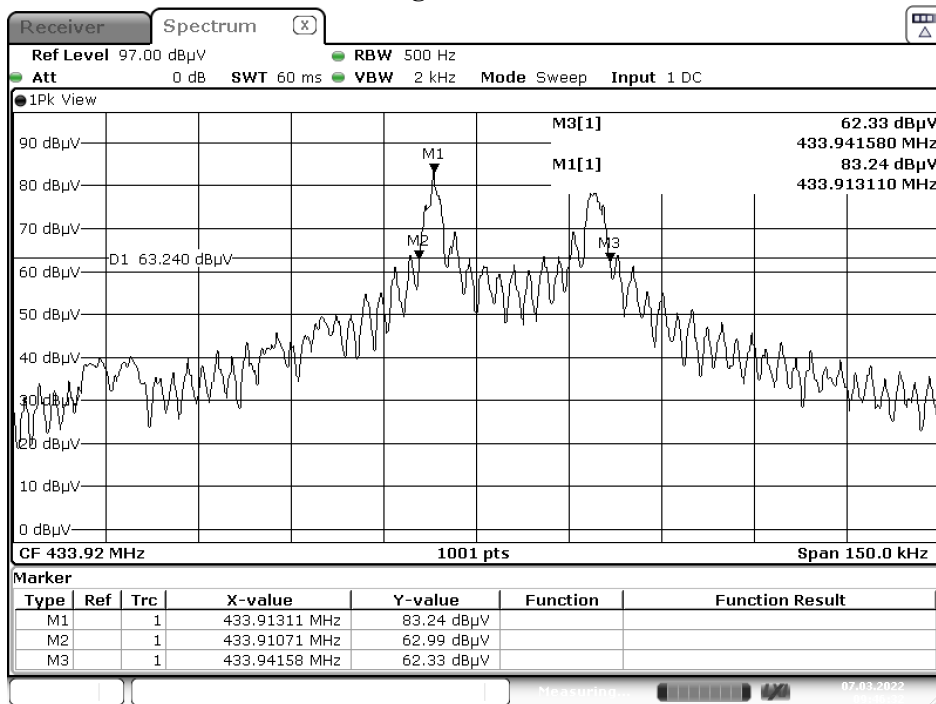
### 5.3. Test Result

Product            Motion Sensor  
 Test Item        Occupied Bandwidth  
 Test Mode        Mode 1: Transmit mode (433.92MHz)

Channel No.	Frequency (MHz)	Measurement Value (MHz)	Limit (MHz)	Result
01	433.92	0.03087	1.0848	Pass

Note: Limit = 433.92MHz \* 0.25%= 1.0848MHz

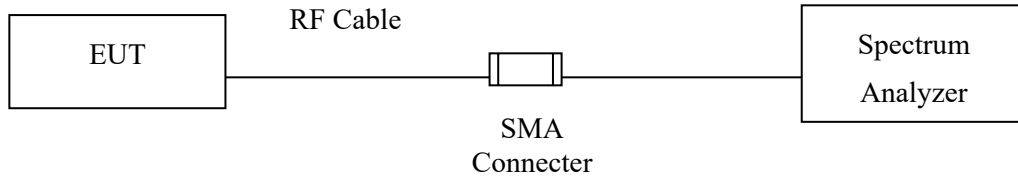
Figure Channel 01:



Date: 7.MAR.2022 09:46:33

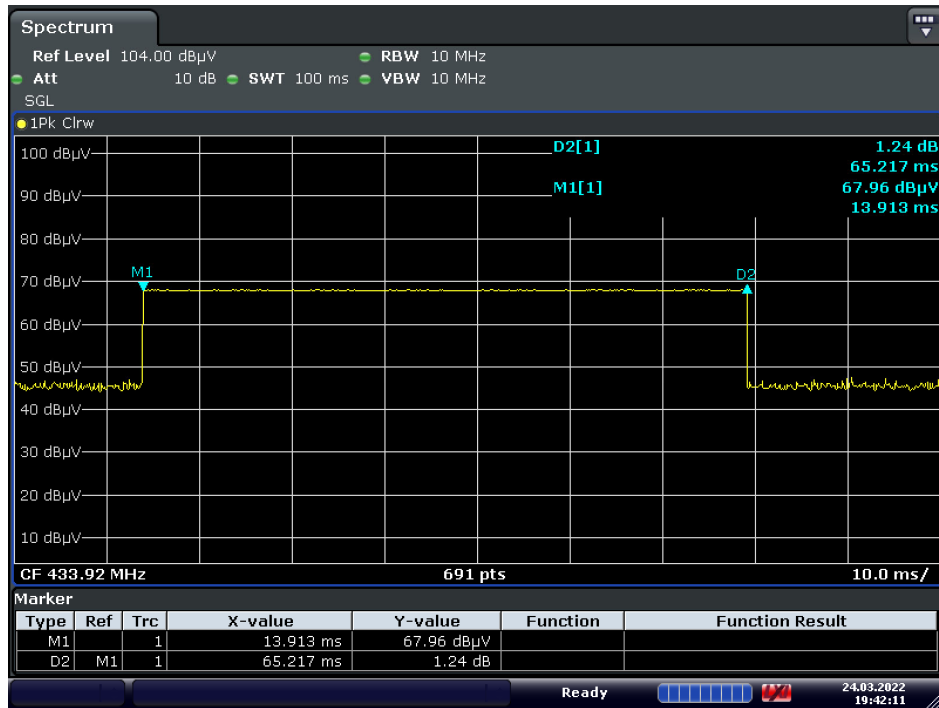
## 6. Duty Cycle

### 6.1. Test Setup



## 6.2. Test Result of Duty Cycle

Product : Motion Sensor  
 Test Item : Duty Cycle Data  
 Test Mode : Mode 1: Transmit mode



Date: 24.MAR.2022 19:42:12

Time on of 100ms= 65.217ms

Duty Cycle= $65.217\text{ms} / 100\text{ms} = 0.65217$

Duty Cycle correction factor= $20 \text{ LOG } 0.65217 = -3.713 \text{ dB}$

Note: Time on of 100ms= (100ms/8001points)\*total transmitter points

<b>Duty Cycle correction factor</b>	<b>-3.713dB</b>
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## 7. **EMI Reduction Method During Compliance Testing**

No modification was made during testing.