

# FCC Test Report

Product Name	360 CAM(WIFI+Bluetooth)
Model No.	VSF013W
FCC ID.	2AAD3013W

Applicant	ABILITY ENTERPRISE CO., LTD.
Address	No.200, Sec. 3, Zhonghuan Rd., Xinzhuang Dist.,New Taipei City 24242,Taiwan(R.O.C.)

Date of Receipt	Jul. 13, 2018
Issued Date	Dec. 19, 2018
Report No.	1870168R-RFUSP01V00-B
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.

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# Test Report

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Applicant	ABILITY ENTERPRISE CO., LTD.
Address	No.200, Sec. 3, Zhonghuan Rd., Xinzhuang Dist.,New Taipei City 24242,Taiwan(R.O.C.)
Manufacturer	ABILITY ENTERPRISE CO., LTD.
Model No.	VSF013W
FCC ID.	2AAD3013W
EUT Rated Voltage	By Battery
EUT Test Voltage	AC 120V /60 Hz (Adapter); By Battery
Trade Name	ABILITY
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2017 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v05
Test Result	Complied

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Tested By : Jason Tuan  
( Engineer / Jason Tuan )

Approved By : Vincent Lin  
( Director / Vincent Lin )

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## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	360 CAM(WIFI+Bluetooth)
Trade Name	ABILITY
Model No.	VSF013W
FCC ID.	2AAD3013W
Frequency Range	2402 – 2480MHz
Channel Number	V4.0: 40CH
Type of Modulation	V4.0: GFSK(1Mbps)
Antenna Type	PIFA Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
USB Cable	Shielded, 0.8m
USB Cable	Shielded, 0.6m
Power Adapter	MFR: AQUIL STAR PRECISION INDUSTRIAL(SHENZHEN)CO., LTD, M/N: ASSA55E-050200 INPUT: AC 100-240V~50/60Hz 0.45A OUTPUT : DC 5V, 2.0A

#### Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	LYNwave	N/A	PIFA Antenna	-2.5dBi for 2.4 GHz

Note: The antenna of EUT is conforming to FCC 15.203.

## Center Frequency of Each Channel: (For V4.0)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 01:	2404 MHz	Channel 02:	2406 MHz	Channel 03:	2408 MHz
Channel 04:	2410 MHz	Channel 05:	2412 MHz	Channel 06:	2414 MHz	Channel 07:	2416 MHz
Channel 08:	2418 MHz	Channel 09:	2420 MHz	Channel 10:	2422 MHz	Channel 11:	2424 MHz
Channel 12:	2426 MHz	Channel 13:	2428 MHz	Channel 14:	2430 MHz	Channel 15:	2432 MHz
Channel 16:	2434 MHz	Channel 17:	2436 MHz	Channel 18:	2438 MHz	Channel 19:	2440 MHz
Channel 20:	2442 MHz	Channel 21:	2444 MHz	Channel 22:	2446 MHz	Channel 23:	2448 MHz
Channel 24:	2450 MHz	Channel 25:	2452 MHz	Channel 26:	2454 MHz	Channel 27:	2456 MHz
Channel 28:	2458 MHz	Channel 29:	2460 MHz	Channel 30:	2462 MHz	Channel 31:	2464 MHz
Channel 32:	2466 MHz	Channel 33:	2468 MHz	Channel 34:	2470 MHz	Channel 35:	2472 MHz
Channel 36:	2474 MHz	Channel 37:	2476 MHz	Channel 38:	2478 MHz	Channel 39:	2480 MHz

## Note:

1. The EUT is a 360 CAM(WIFI+Bluetooth) with a built-in WLAN 、 Bluetooth V3.0, V2.1+EDR,V4.0 transceiver, this report for Bluetooth V4.0.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit - BLE (GFSK) Mode 2: Charge mode
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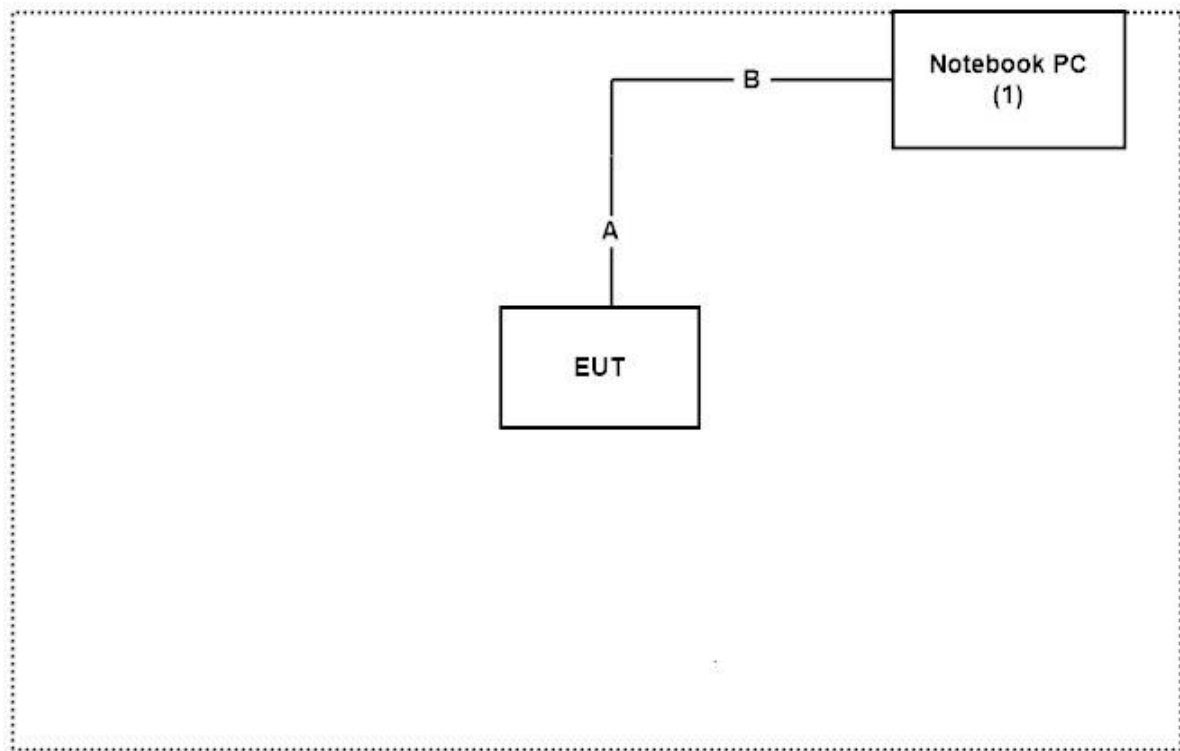
### 1.3. Tested System Details

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

Product	Manufacturer	Model No.	Serial No.	Power Cord
1   Notebook PC	DELL	Latitude E5440	B6TYTZ1	Non-Shielded, 0.8m

Signal Cable Type	Signal cable Description
A   USB Cable	Shielded, 0.8m
B   USB Cable	Shielded, 2m

### 1.4. Configuration of Tested System



### 1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software "Vendor command v.01.08.2018.0828" on the Notebook PC.
3. Configure the test mode, the test channel, and the data rate.
4. Press "OK" to start the continuous Transmit.
5. Verify that the EUT works properly.

## 1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

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Site Description: Accredited by TAF  
Accredited Number: 3023

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FCC Accreditation Number: TW3023

## 1.7. List of Test Equipment

### For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2018/02/12	2019/02/11
X	Spectrum Analyzer	Agilent	N9010A	MY53470892	2018/09/27	2019/09/26
X	Peak Power Analyzer	Keysight	8990B	MY51000410	2018/08/01	2019/07/31
X	Wideband Power Sensor	Keysight	N1923A	MY56080003	2018/07/25	2019/07/24
X	Wideband Power Sensor	Keysight	N1923A	MY56080004	2018/07/25	2019/07/24
X	EMI Test Receiver	R&S	ESCS 30	100369	2018/11/07	2019/11/06
X	LISN	R&S	ESH3-Z5	836679/017	2018/02/09	2019/02/08
X	LISN	R&S	ENV216	100097	2018/02/09	2019/02/08
X	Coaxial Cable	DEKRA	RG 400	LC018-RG	2018/06/21	2019/06/20

### For Radiated measurements /Site3/CB8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2018/03/12	2019/03/11
	Loop Antenna	Teseq	HLA6121	37133	2017/10/13	2019/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2018/06/24	2019/06/23
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2018/06/14	2019/06/13
X	Pre-Amplifier	Jet-Power	JPA-10M1G33	170101000330 010	2018/06/14	2019/06/13
X	Horn Antenna	ETS-Lindgren	3117	00135205	2018/05/03	2019/05/02
X	Horn Antenna	SCHWARZBECK	9120D	576	2018/11/30	2019/11/29
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2018/04/10	2019/04/09
	Horn Antenna	Com-Power	AH-840	101043	2018/01/09	2019/01/08
	Amplifier + Cable	EMCI	EMC184045SE	980370	2018/03/21	2019/03/20
X	Filter	MICRO-TRONICS	BRM50702	G270	2018/08/06	2019/08/05
	Filter	MICRO-TRONICS	BRM50716	G196	2018/08/06	2019/08/05

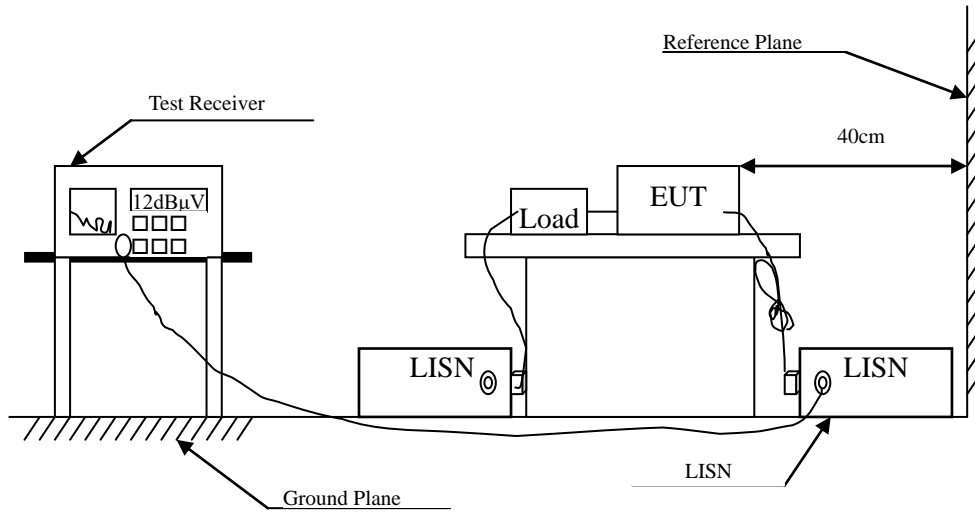
Note:

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 :QuieTek EMI 2.0 V2.1.113.



## 2. Conducted Emission

### 2.1. Test Setup



## 2.2. Limits

<b>FCC Part 15 Subpart C Paragraph 15.207 (dB<math>\mu</math>V) Limit</b>		
Frequency MHz	Limits	
	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.

The EUT was setup to ANSI C63.4, 2014; tested to DTS test procedure of FCC KDB-558074 for compliance to FCC 47CFR Subpart C requirements.

## 2.4. Uncertainty

$\pm 2.26$  dB

## 2.5. Test Result of Conducted Emission

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Conducted Emission Test  
 Power Line : Line 1  
 Test date : 2018/10/20  
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V	Margin dB	Limit dB $\mu$ V
<b>LINE 1</b>					
<b>Quasi-Peak</b>					
0.173	9.742	32.660	42.402	-22.941	65.343
0.248	9.740	24.540	34.280	-28.920	63.200
0.412	9.746	20.440	30.186	-28.328	58.514
0.494	9.750	23.160	32.910	-23.261	56.171
2.646	9.850	29.400	39.250	-16.750	56.000
10.537	10.081	22.080	32.161	-27.839	60.000
<b>Average</b>					
0.173	9.742	17.300	27.042	-28.301	55.343
0.248	9.740	15.590	25.330	-27.870	53.200
0.412	9.746	14.180	23.926	-24.588	48.514
0.494	9.750	17.050	26.800	-19.371	46.171
2.646	9.850	23.880	33.730	-12.270	46.000
10.537	10.081	16.320	26.401	-23.599	50.000

### Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Conducted Emission Test  
 Power Line : Line 2  
 Test date : 2018/10/20  
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V	Margin dB	Limit dB $\mu$ V
<b>LINE 2</b>					
<b>Quasi-Peak</b>					
0.162	9.736	32.400	42.136	-23.521	65.657
0.193	9.738	26.600	36.338	-28.433	64.771
0.482	9.739	21.280	31.019	-25.495	56.514
0.572	9.743	19.000	28.743	-27.257	56.000
2.732	9.842	25.900	35.742	-20.258	56.000
10.658	10.114	15.480	25.594	-34.406	60.000
<b>Average</b>					
0.162	9.736	16.850	26.586	-29.071	55.657
0.193	9.738	12.240	21.978	-32.793	54.771
0.482	9.739	14.110	23.849	-22.665	46.514
0.572	9.743	12.330	22.073	-23.927	46.000
2.732	9.842	19.010	28.852	-17.148	46.000
10.658	10.114	7.880	17.994	-32.006	50.000

## Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Conducted Emission Test  
 Power Line : Line 1  
 Test date : 2018/10/17  
 Test Mode : Mode 2: Charge mode

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V	Margin dB	Limit dB $\mu$ V
<b>LINE 1</b>					
<b>Quasi-Peak</b>					
0.185	9.738	33.780	43.518	-21.482	65.000
0.259	9.740	25.000	34.740	-28.146	62.886
0.498	9.750	31.680	41.430	-14.627	56.057
1.439	9.799	24.380	34.179	-21.821	56.000
3.310	9.865	30.020	39.885	-16.115	56.000
9.408	10.055	24.580	34.635	-25.365	60.000
<b>Average</b>					
0.185	9.738	14.040	23.778	-31.222	55.000
0.259	9.740	10.460	20.200	-32.686	52.886
0.498	9.750	21.120	30.870	-15.187	46.057
1.439	9.799	16.480	26.279	-19.721	46.000
3.310	9.865	18.770	28.635	-17.365	46.000
9.408	10.055	18.850	28.905	-21.095	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Conducted Emission Test  
 Power Line : Line 2  
 Test date : 2018/10/17  
 Test Mode : Mode 2: Charge mode

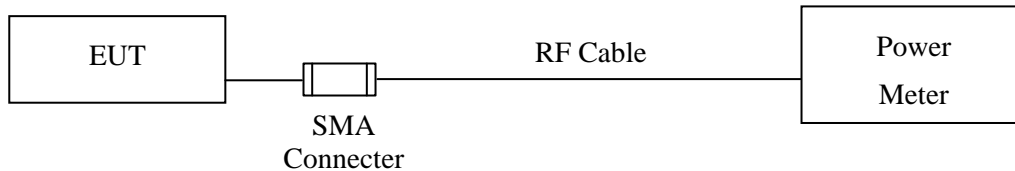
Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V	Margin dB	Limit dB $\mu$ V
<b>LINE 2</b>					
<b>Quasi-Peak</b>					
0.181	9.737	36.100	45.837	-19.277	65.114
0.212	9.738	31.440	41.178	-23.051	64.229
0.509	9.740	33.140	42.880	-13.120	56.000
1.056	9.773	20.160	29.933	-26.067	56.000
3.420	9.868	27.560	37.428	-18.572	56.000
9.166	10.066	17.840	27.906	-32.094	60.000
<b>Average</b>					
0.181	9.737	17.950	27.687	-27.427	55.114
0.212	9.738	15.410	25.148	-29.081	54.229
0.509	9.740	25.340	35.080	-10.920	46.000
1.056	9.773	11.370	21.143	-24.857	46.000
3.420	9.868	16.380	26.248	-19.752	46.000
9.166	10.066	10.670	20.736	-29.264	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "█" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

### 3. Peak Power Output

#### 3.1. Test Setup



#### 3.2. Limit

The maximum peak power shall be less 1Watt.

#### 3.3. Test Procedure

Tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 9.1.3 PKPM1 Peak power meter method.

#### 3.4. Uncertainty

$\pm 1.19$  dB

### 3.5. Test Result of Peak Power Output

Product : 360 CAM(WIFI+Bluetooth)  
Test Item : Peak Power Output  
Test Site : No.3 OATS  
Test date : 2018/10/18  
Test Mode : Mode 1: Transmit - BLE (GFSK)

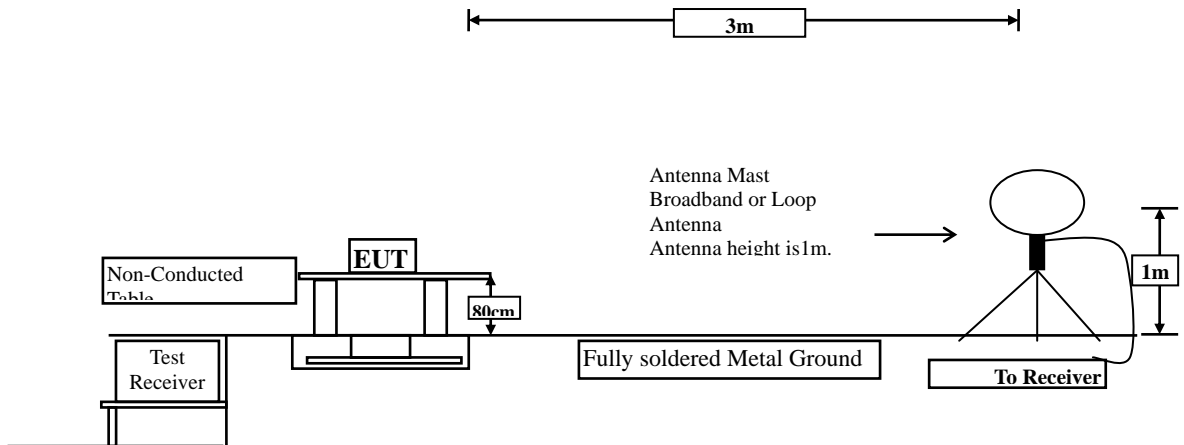
Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	6.22	1 Watt= 30 dBm	Pass
Channel 19	2440.00	6.56	1 Watt= 30 dBm	Pass
Channel 39	2480.00	6.08	1 Watt= 30 dBm	Pass



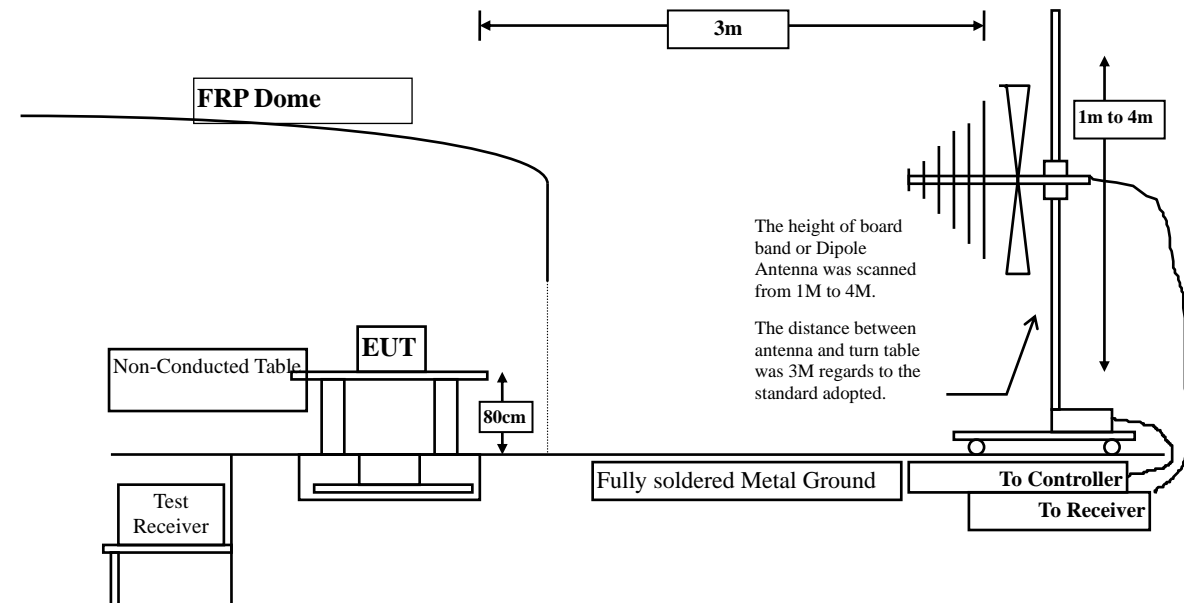
#### 4. Radiated Emission

##### 4.1. Test Setup

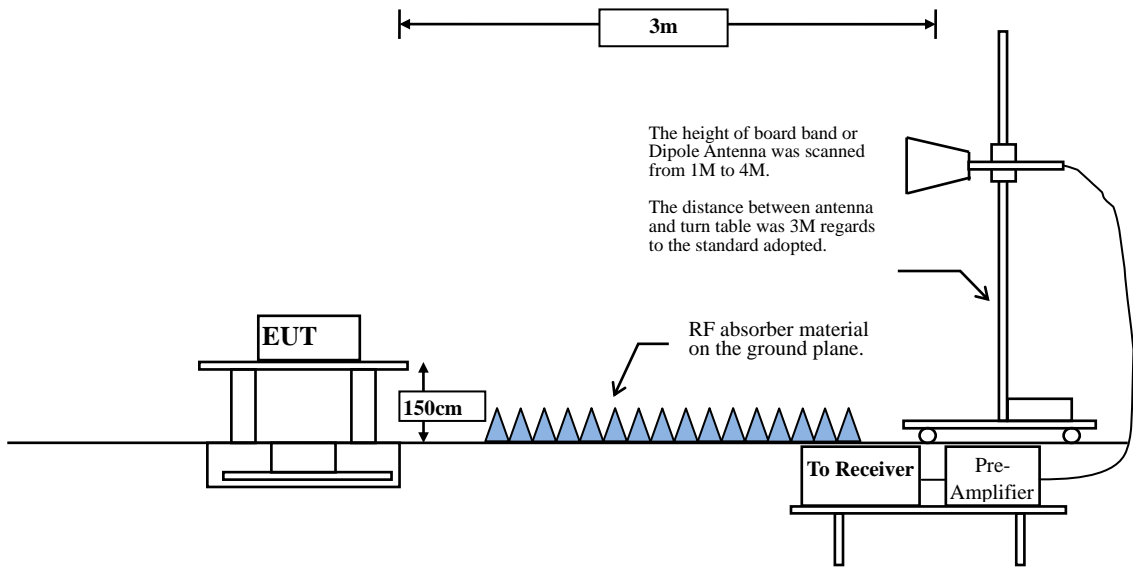
Under 30MHz



Below 1GHz



Above 1GHz



## 4.2. Limits

### ➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

<b>FCC Part 15 Subpart C Paragraph 15.209 Limits</b>		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

- Remarks:
1. RF Voltage (dB $\mu$ V) = 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.

### 4.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

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

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

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were 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 worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

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

### RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

$VBW \geq 3 \times RBW$ .

**Table 1 —RBW as a function of frequency**

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle  $\geq 98\%$

$VBW \geq 1/T$ , when duty cycle  $< 98\%$

( T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE	62.50	0.3913	2556	3000

Note: Duty Cycle Refer to Section 9

## 4.4. Uncertainty

$\pm 4.08$  dB above 1GHz

$\pm 4.22$  dB below 1GHz

#### 4.5. Test Result of Radiated Emission

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Harmonic Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2018/10/16  
 Test Mode : Mode 1: Transmit - BLE (GFSK)(2402MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4804.000	2.511	38.863	41.373	-32.627	74.000
7206.000	9.511	37.008	46.519	-27.481	74.000
9608.000	10.394	37.072	47.466	-26.534	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4804.000	2.923	40.217	43.139	-30.861	74.000
7206.000	9.988	37.085	47.074	-26.926	74.000
9608.000	10.847	37.557	48.404	-25.596	74.000
<b>Average Detector:</b>					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report..

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Harmonic Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2018/10/16  
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4880.000	2.038	39.742	41.780	-32.220	74.000
7320.000	9.699	36.715	46.414	-27.586	74.000
9760.000	9.665	37.428	47.093	-26.907	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4880.000	2.499	40.123	42.622	-31.378	74.000
7320.000	10.303	36.570	46.873	-27.127	74.000
9760.000	10.299	37.511	47.811	-26.189	74.000
<b>Average Detector:</b>					
--					

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Harmonic Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2018/10/16  
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4960.000	2.582	39.755	42.337	-31.663	74.000
7440.000	10.555	35.517	46.072	-27.928	74.000
9920.000	10.206	37.929	48.135	-25.865	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4960.000	3.398	41.170	44.569	-29.431	74.000
7440.000	11.214	37.019	48.233	-25.767	74.000
9920.000	11.245	37.830	49.075	-24.925	74.000
<b>Average Detector:</b>					
--					

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The average measurement was not performed when the peak measured data under the limit of average detection.
5. The emission levels of other frequencies are very lower than the limit and not show in test report.



Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : General Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2018/12/19  
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
175.500	-13.715	44.603	30.888	-12.612	43.500
362.710	-5.999	43.513	37.514	-8.486	46.000
494.630	-2.876	38.628	35.752	-10.248	46.000
597.450	-0.471	29.415	28.944	-17.056	46.000
719.670	1.425	31.336	32.761	-13.239	46.000
833.160	3.681	28.643	32.324	-13.676	46.000
<b>Vertical</b>					
177.440	-13.704	49.050	35.346	-8.154	43.500
380.170	-5.345	35.285	29.940	-16.060	46.000
499.480	-2.758	30.791	28.033	-17.967	46.000
599.390	-0.417	28.312	27.895	-18.105	46.000
719.670	1.425	28.642	30.067	-15.933	46.000
832.190	3.665	28.886	32.551	-13.449	46.000

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : General Radiated Emission  
 Test Site : No.3 OATS  
 Test date : 2018/12/19  
 Test Mode : Mode 2: Charge mode

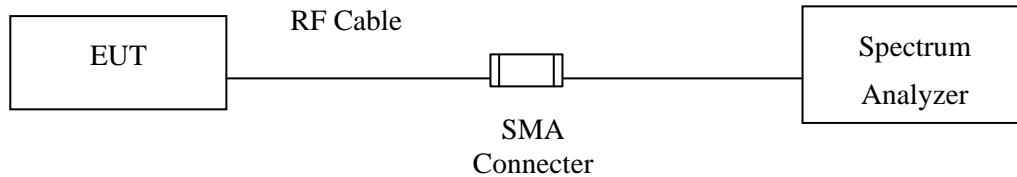
Frequency MHz	Correct Factor dB	Reading Level dB $\mu$ V	Measurement Level dB $\mu$ V/m	Margin dB	Limit dB $\mu$ V/m
<b>Horizontal</b>					
137.670	-11.980	39.374	27.394	-16.106	43.500
239.520	-10.448	44.030	33.582	-12.418	46.000
348.160	-6.535	42.733	36.198	-9.802	46.000
530.520	-2.013	33.952	31.939	-14.061	46.000
647.890	0.433	25.759	26.192	-19.808	46.000
815.700	3.241	27.316	30.557	-15.443	46.000
<b>Vertical</b>					
136.700	-11.932	40.454	28.522	-14.978	43.500
211.390	-12.234	45.420	33.186	-10.314	43.500
348.160	-6.535	45.743	39.208	-6.792	46.000
547.980	-1.578	28.256	26.678	-19.322	46.000
702.210	1.001	24.182	25.183	-20.817	46.000
860.320	4.221	22.771	26.992	-19.008	46.000

## Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

## 5. RF Antenna Conducted Test

### 5.1. Test Setup



### 5.2. Limits

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### 5.3. Test Procedure

The EUT was tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

### 5.4. Uncertainty

$\pm 1.20\text{dB}$

### 5.5. Test Result of RF Antenna Conducted Test

Product : 360 CAM(WIFI+Bluetooth)  
Test Item : RF Antenna Conducted Test  
Test Site : No.3 OATS  
Test date : 2018/09/14  
Test Mode : Mode 1: Transmit - BLE (GFSK)

Figure Channel 00:

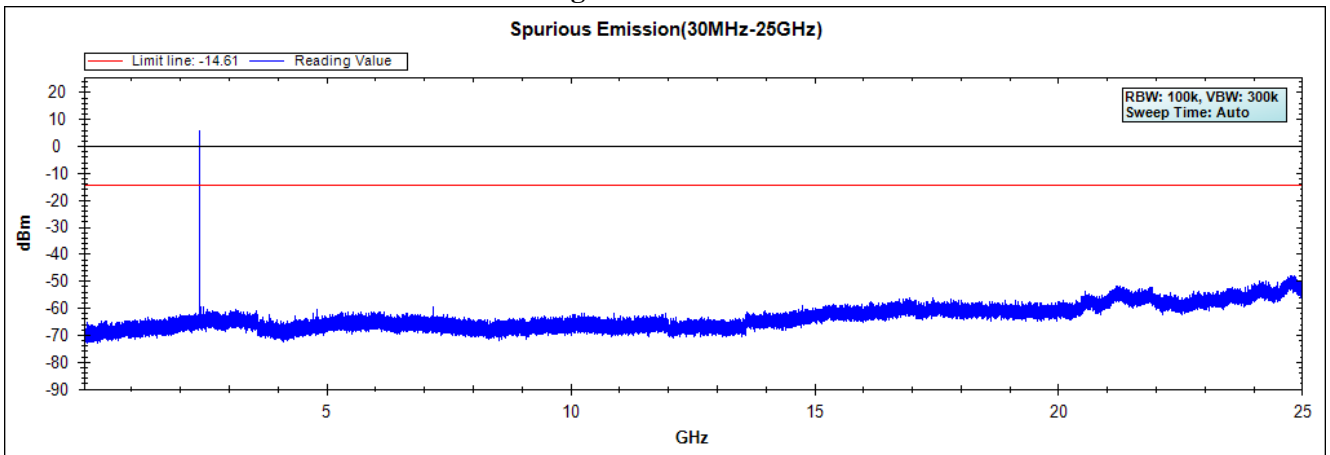


Figure Channel 19:

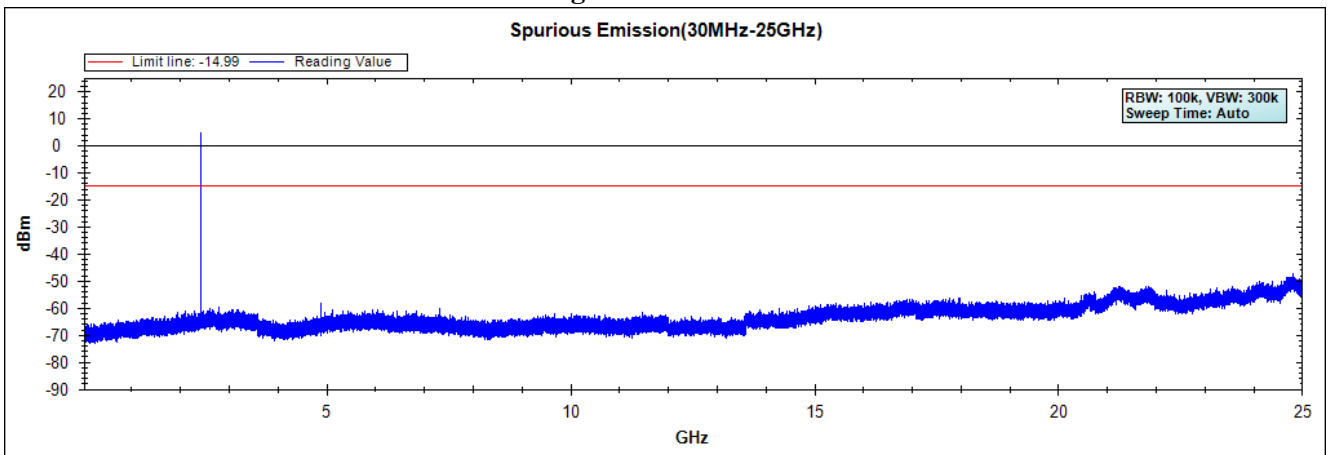
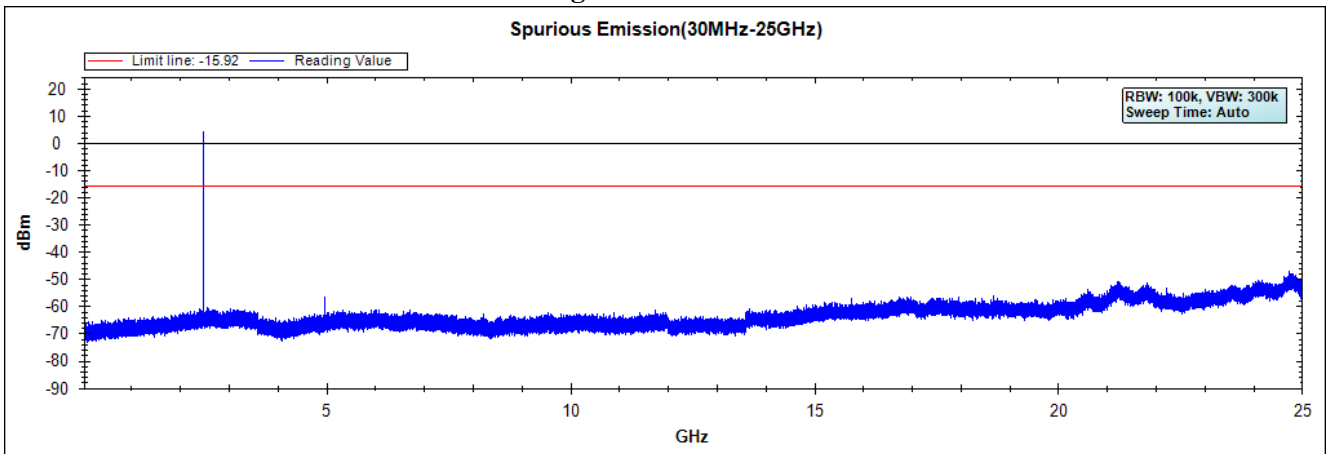


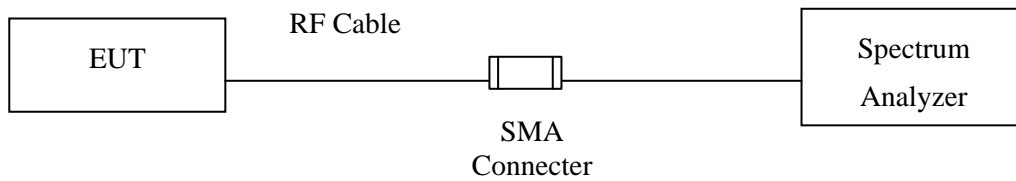
Figure Channel 39:



## 6. Band Edge

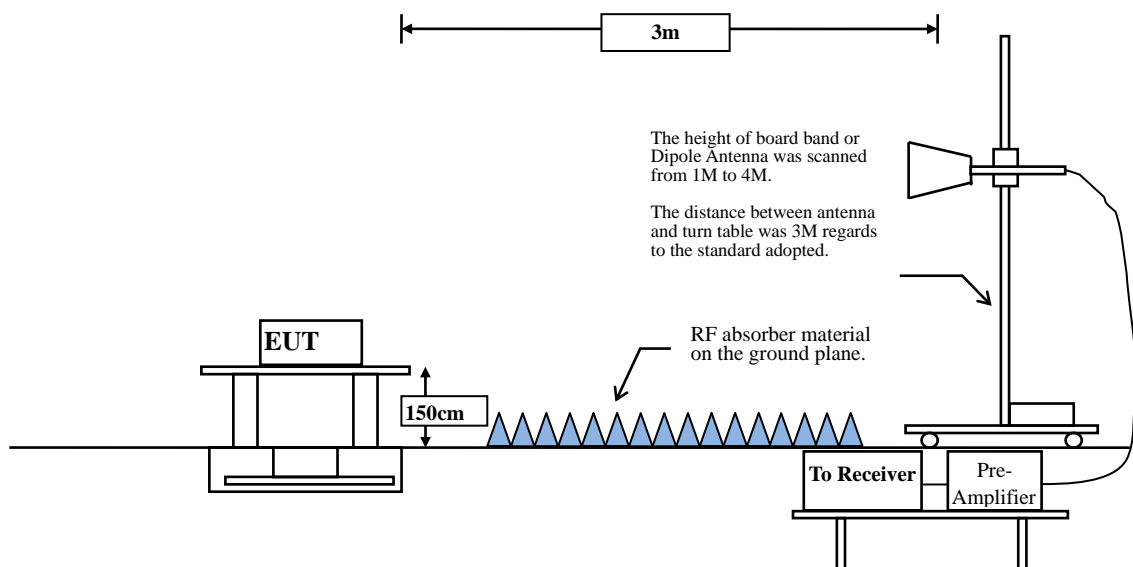
### 6.1. Test Setup

#### RF Conducted Measurement



#### RF Radiated Measurement:

Above 1GHz



## 6.2. Limit

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

## 6.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.

### RBW and VBW Parameter setting:

According to KDB 558074 section 12.2.4. Peak power measurement procedure

RBW = as specified in Table 1.

$VBW \geq 3 \times RBW$ .

**Table 1 —RBW as a function of frequency**

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

According to KDB 558074 section 12.2.5. Average power measurement procedure

RBW = 1MHz.

VBW = 10Hz, when duty cycle  $\geq 98\%$

$VBW \geq 1/T$ , when duty cycle  $< 98\%$

( T refers to the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.)

2.4GHz band	Duty Cycle (%)	T (ms)	1/T (Hz)	VBW (Hz)
BLE	62.50	0.3913	2556	3000

Note: Duty Cycle Refer to Section 9

## 6.4. Uncertainty

$\pm 4.08$  dB above 1GHz

$\pm 4.22$  dB below 1GHz

### 6.5. Test Result of Band Edge

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test date : 2018/10/15  
 Test Mode : Mode 1: Transmit - BLE (GFSK)

#### RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2390.000	6.474	39.624	46.099	74.00	54.00	Pass
00 (Peak)	2400.000	6.528	61.909	68.437	--	--	--
00 (Peak)	2402.174	6.541	86.238	92.779	--	--	--
00 (Average)	2390.000	6.474	20.415	26.890	74.00	54.00	Pass
00 (Average)	2400.000	6.528	43.385	49.913	--	--	--
00 (Average)	2401.884	6.540	85.782	92.322	--	--	--

Figure Channel 00: Horizontal (Peak)

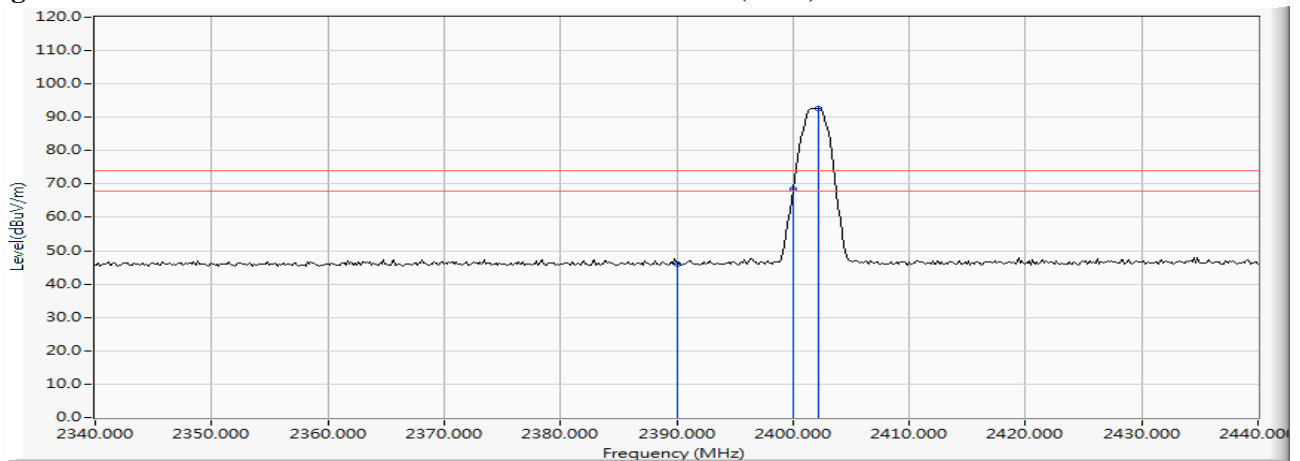
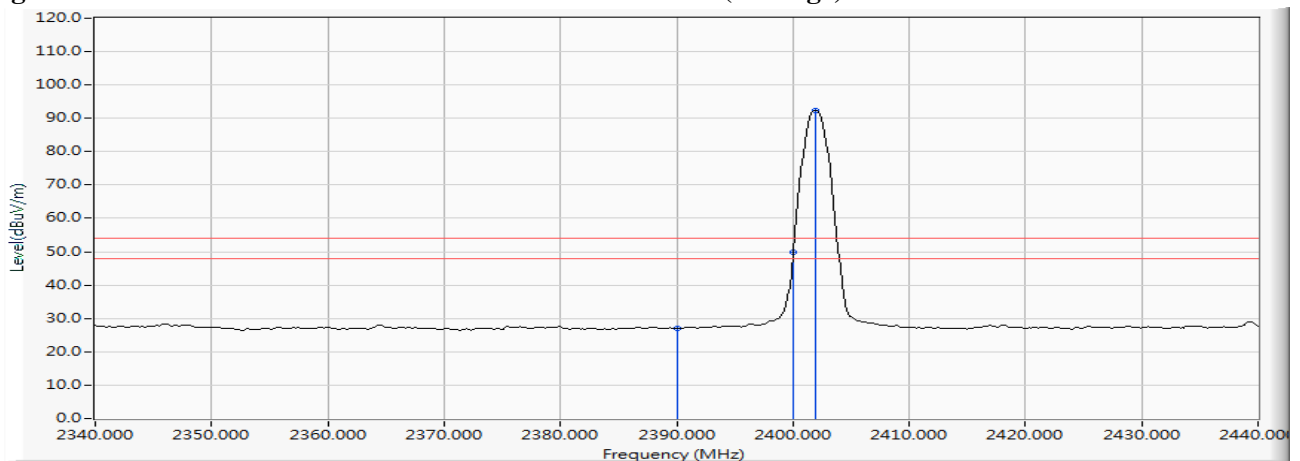


Figure Channel 00: Horizontal (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

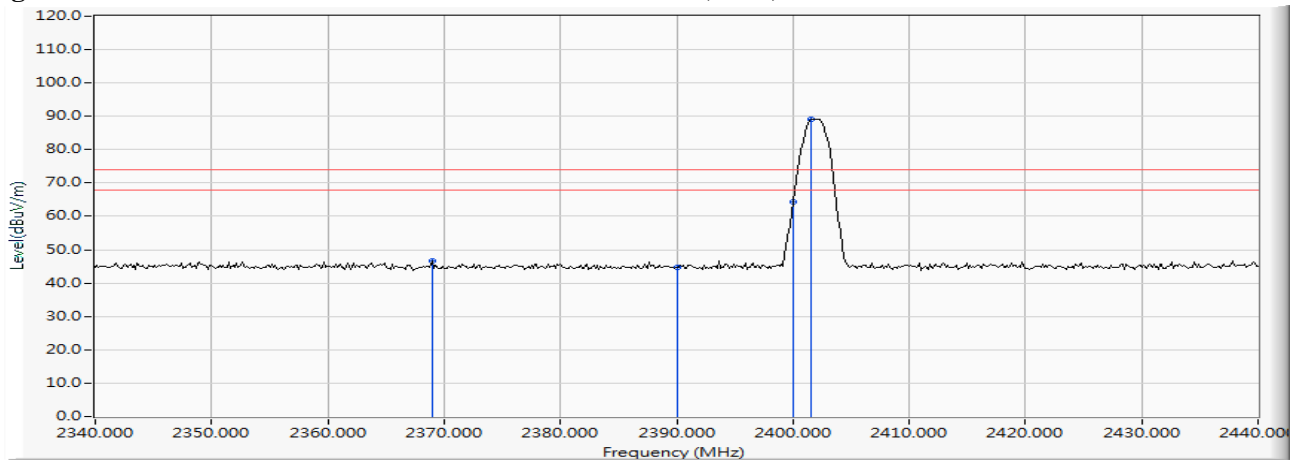


Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test date : 2018/10/15  
 Test Mode : Mode 1: Transmit - BLE (GFSK)

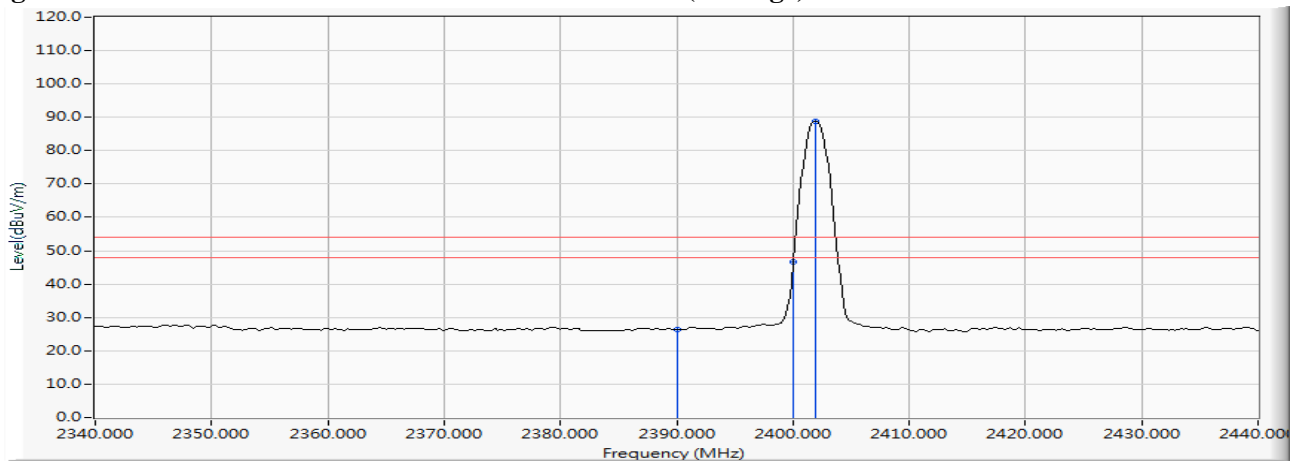
**RF Radiated Measurement (Vertical):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2368.986	5.967	40.656	46.623	74.00	54.00	Pass
00 (Peak)	2390.000	5.880	38.743	44.624	74.00	54.00	Pass
00 (Peak)	2400.000	5.879	58.349	64.228	--	--	--
00 (Peak)	2401.594	5.883	83.254	89.137	--	--	--
00 (Average)	2390.000	5.880	20.629	26.510	74.00	54.00	Pass
00 (Average)	2400.000	5.879	40.711	46.590	--	--	--
00 (Average)	2401.884	5.884	82.957	88.841	--	--	--

**Figure Channel 00: Vertical (Peak)**



**Figure Channel 00: Vertical (Average)**



Note:

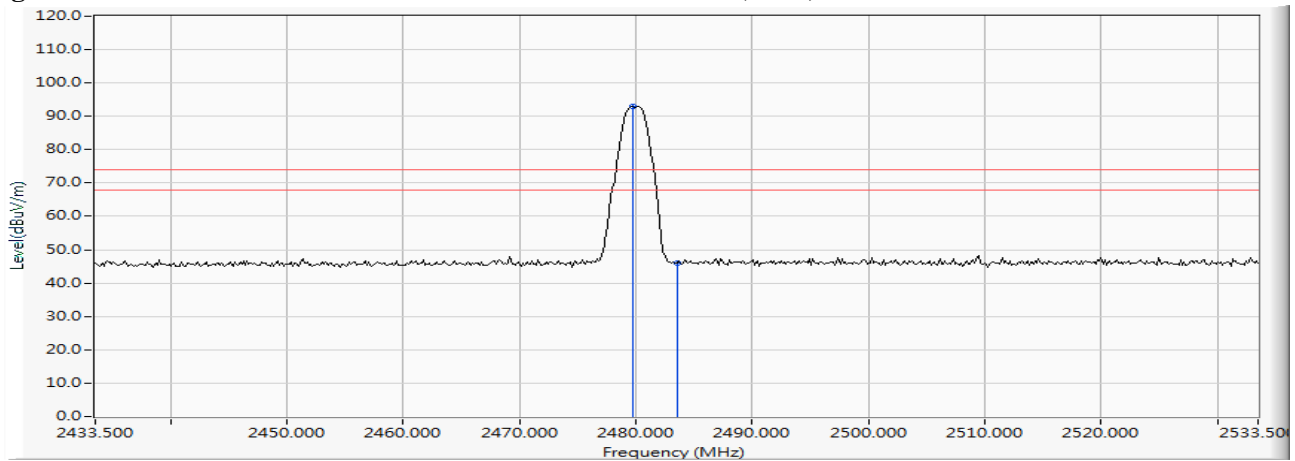
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test date : 2018/10/15  
 Test Mode : Mode 1: Transmit - BLE (GFSK)

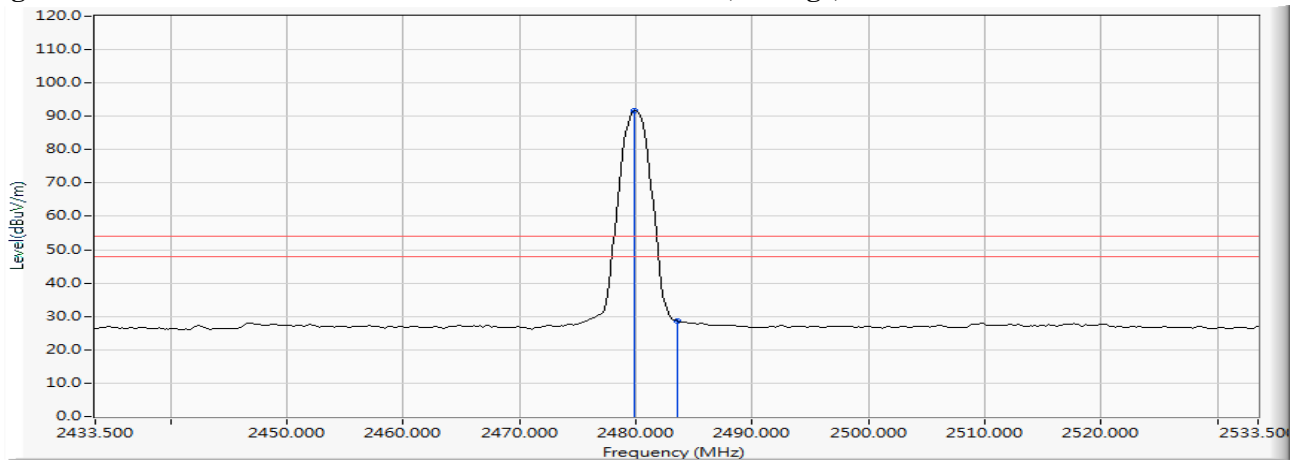
**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
39 (Peak)	2479.732	7.084	85.864	92.947	--	--	--
39 (Peak)	2483.500	7.110	38.906	46.016	74.00	54.00	Pass
39 (Average)	2479.877	7.085	84.549	91.633	--	--	--
39 (Average)	2483.500	7.110	21.477	28.587	74.00	54.00	Pass

**Figure Channel 39: Horizontal (Peak)**



**Figure Channel 39: Horizontal (Average)**



Note:

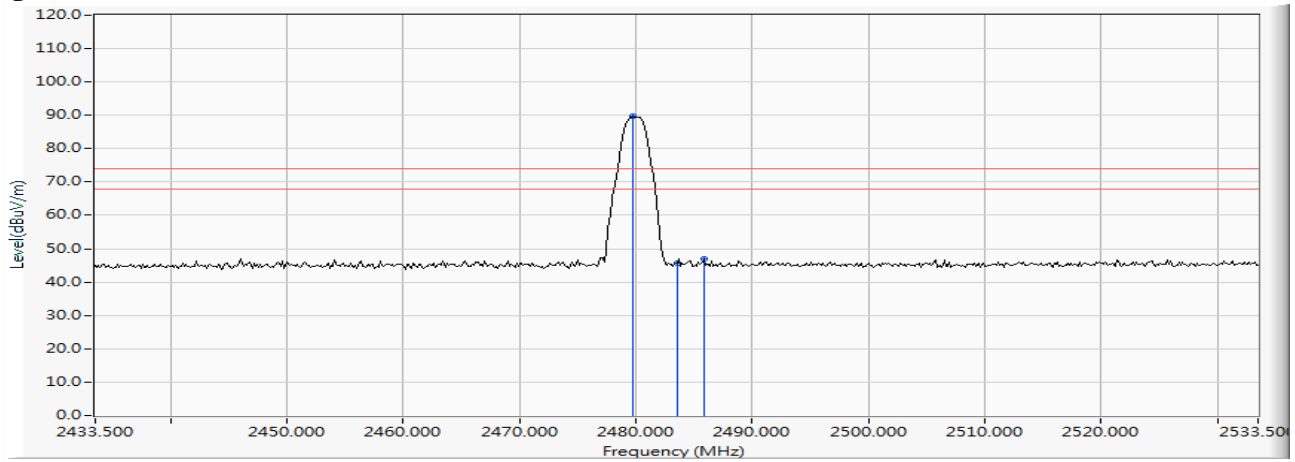
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test date : 2018/10/15  
 Test Mode : Mode 1: Transmit - BLE (GFSK)

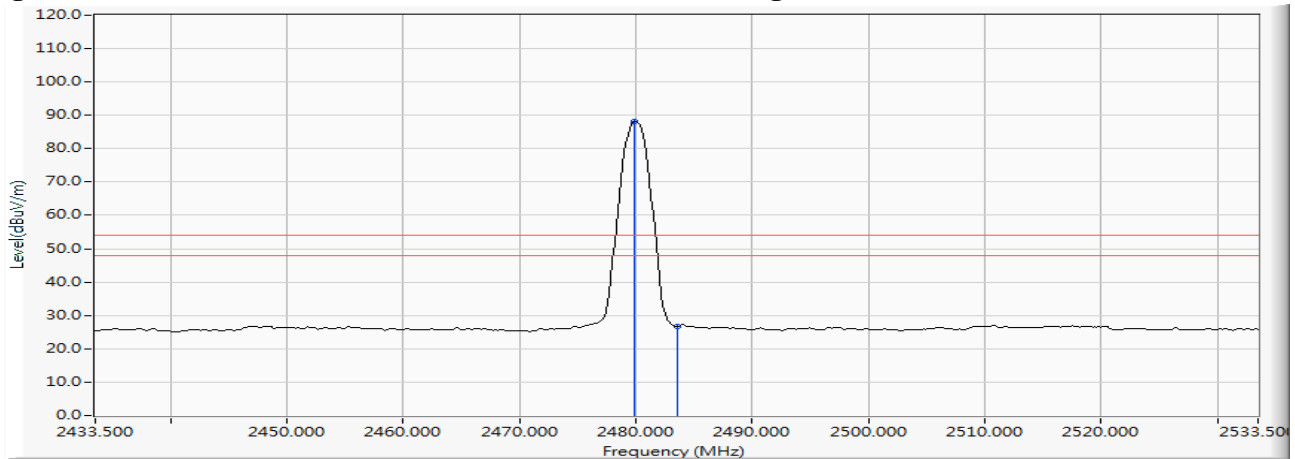
**RF Radiated Measurement (Vertical):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
39 (Peak)	2479.732	6.340	83.258	89.598	--	--	--
39 (Peak)	2483.500	6.363	39.262	45.625	74.00	54.00	Pass
39 (Peak)	2485.819	6.378	40.638	47.016	74.00	54.00	Pass
39 (Average)	2479.877	6.341	81.912	88.253	--	--	--
39 (Average)	2483.500	6.363	20.340	26.703	74.00	54.00	Pass

**Figure Channel 39: Vertical (Peak)**



**Figure Channel 39: Vertical (Average)**

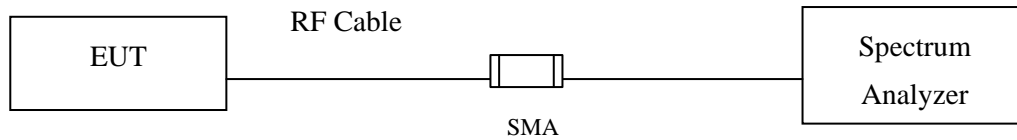


Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. The average measurement was not performed when the peak measured data under the limit of average detection.

## 7. 6dB Bandwidth

### 7.1. Test Setup



### 7.2. Limits

The minimum bandwidth shall be at least 500 kHz.

### 7.3. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 1-5% of the emission bandwidth,  $VBW \geq 3 * RBW$

### 7.4. Uncertainty

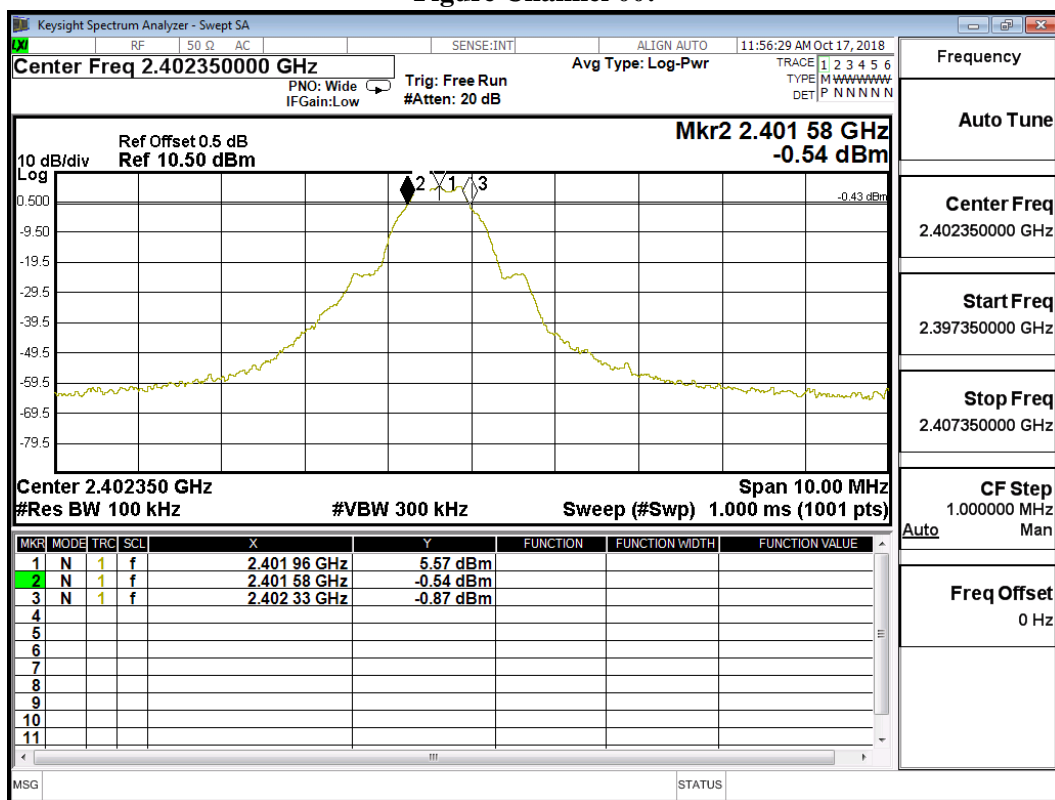
$\pm 283\text{Hz}$

### 7.5. Test Result of 6dB Bandwidth

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : 6dB Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	750	>500	Pass

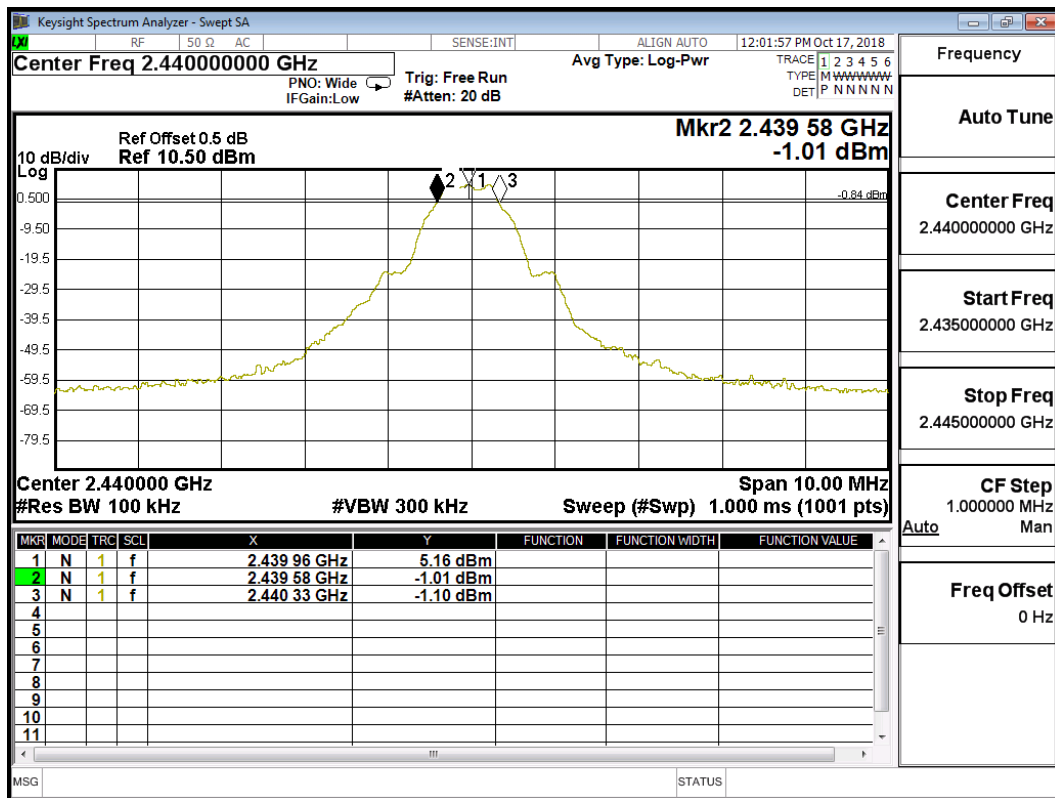
Figure Channel 00:



Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : 6dB Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
19	2440	750	>500	Pass

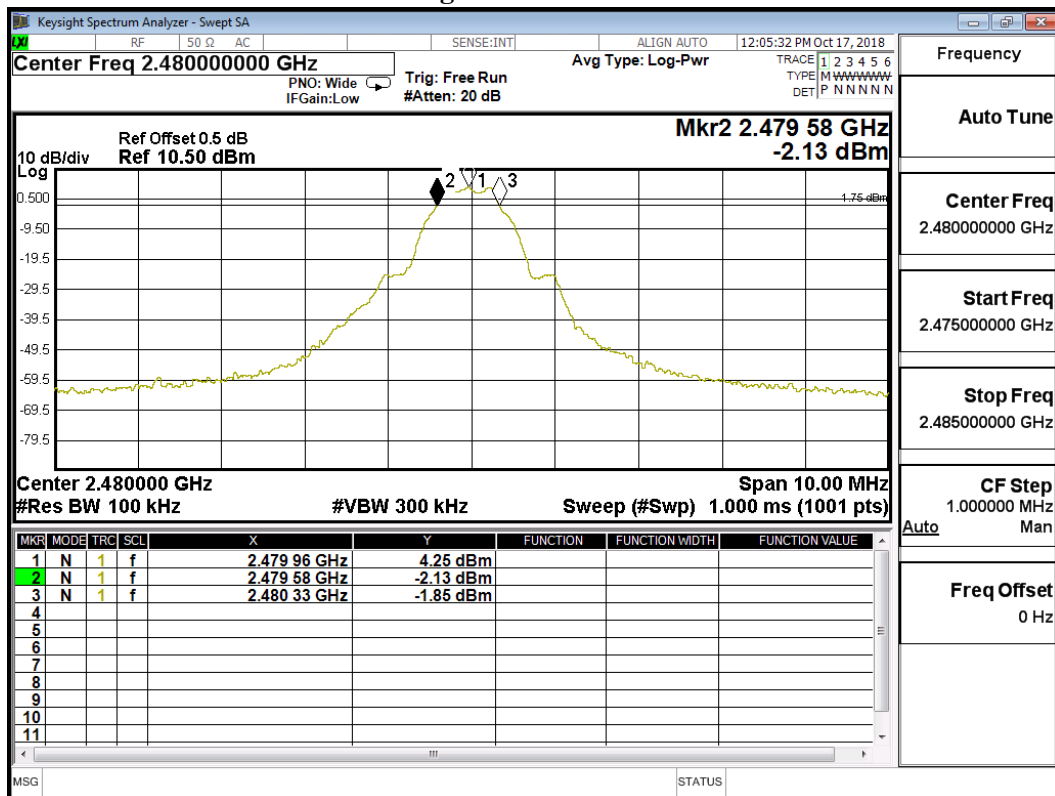
Figure Channel 19:



Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : 6dB Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

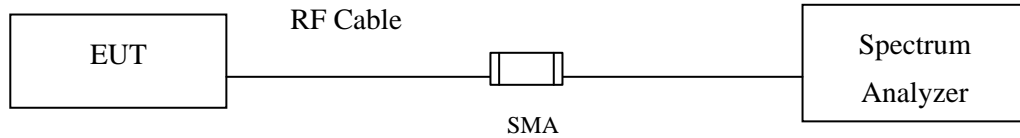
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2480	750	>500	Pass

Figure Channel 39:



## 8. Power Density

### 8.1. Test Setup



### 8.2. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

### 8.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013, the maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

### 8.4. Uncertainty

$\pm 1.20$  dB

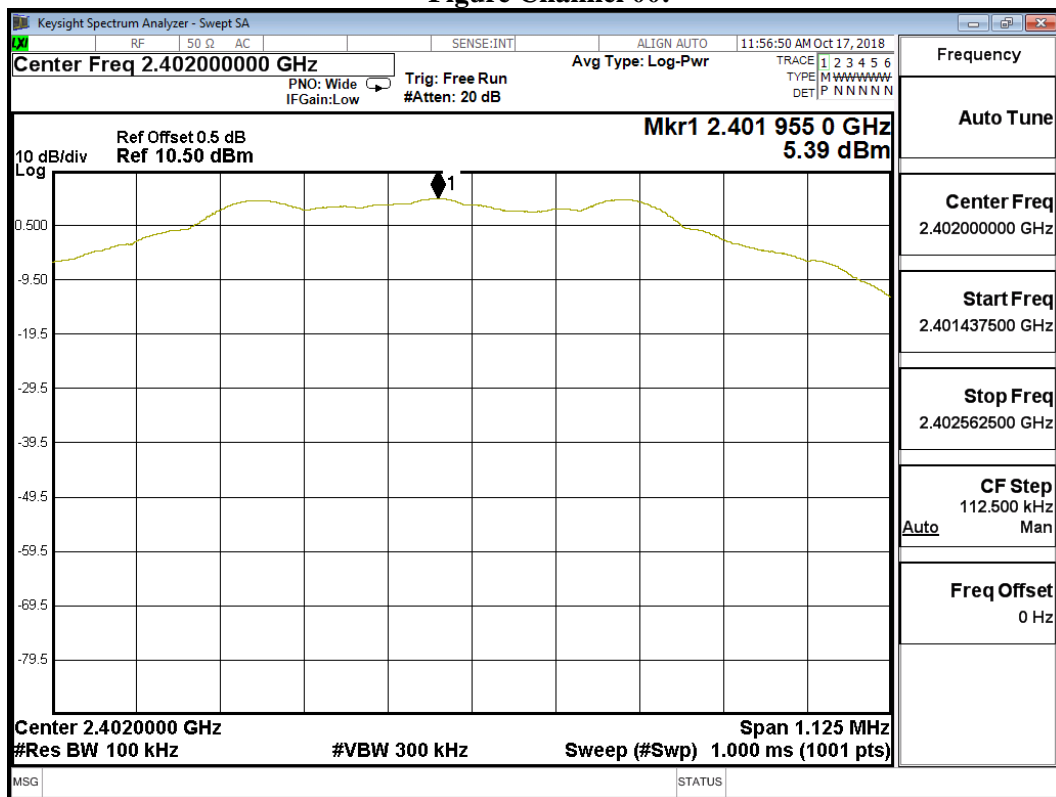


### 8.5. Test Result of Power Density

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Power Density Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	5.39	≤ 8dBm	Pass

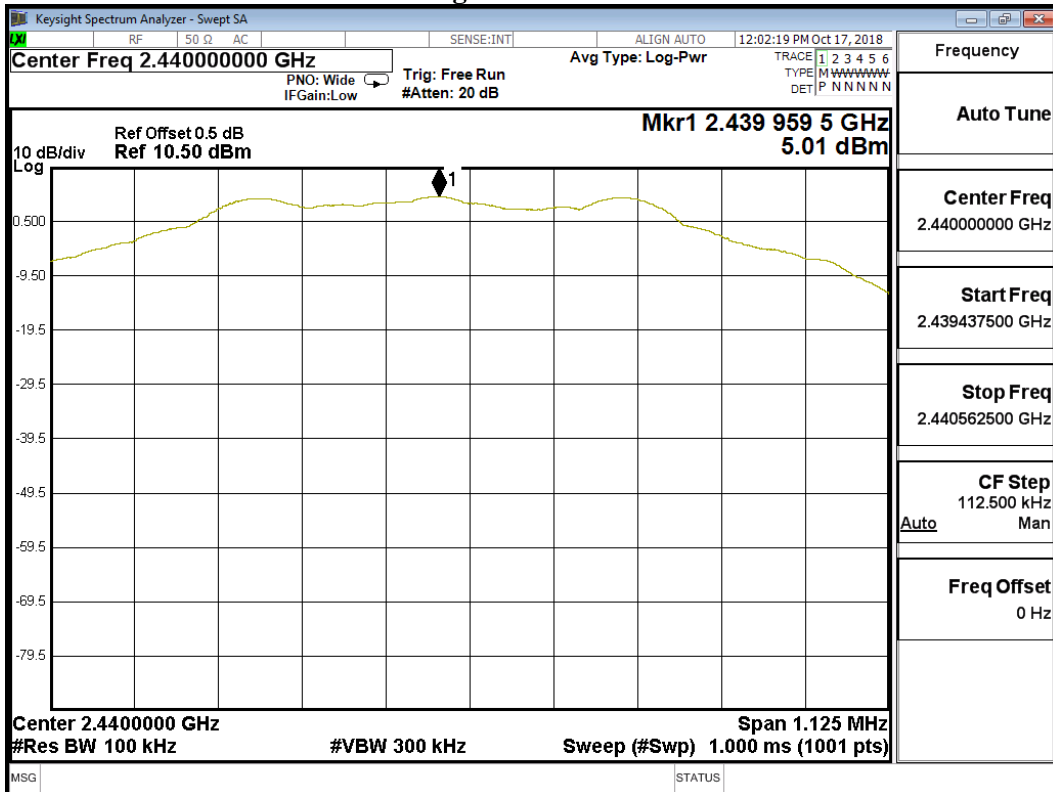
Figure Channel 00:



Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Power Density Data  
 Test Site : No.3OATS  
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
19	2440	5.01	≤ 8dBm	Pass

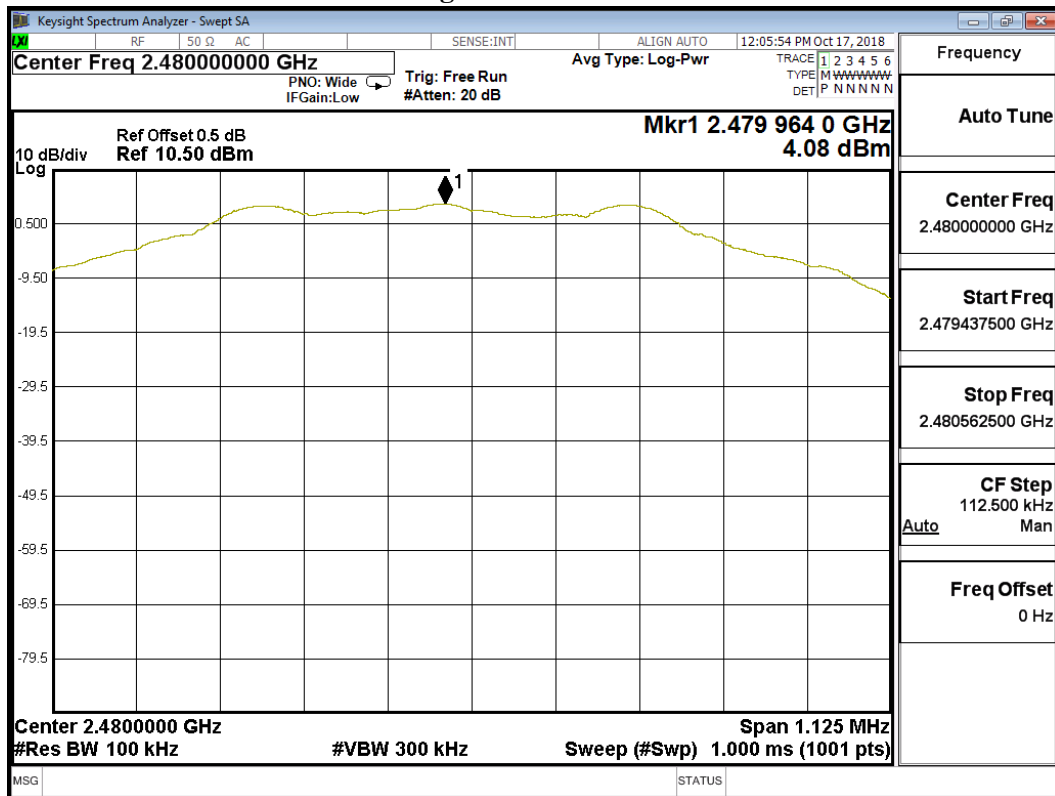
Figure Channel 19:



Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Power Density Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

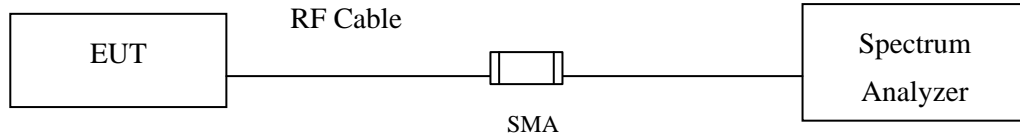
Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2480	4.08	≤ 8dBm	Pass

Figure Channel 39:



## 9. Duty Cycle

### 9.1. Test Setup



### 9.2. Test Procedure

The EUT was setup according to ANSI C63.10 2013; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

### 9.3. Uncertainty

$\pm 2.31\text{msec}$

### 9.4. Test Result of Duty Cycle

Product : 360 CAM(WIFI+Bluetooth)  
 Test Item : Duty Cycle  
 Test Mode : Mode 1: Transmit - BLE (GFSK)

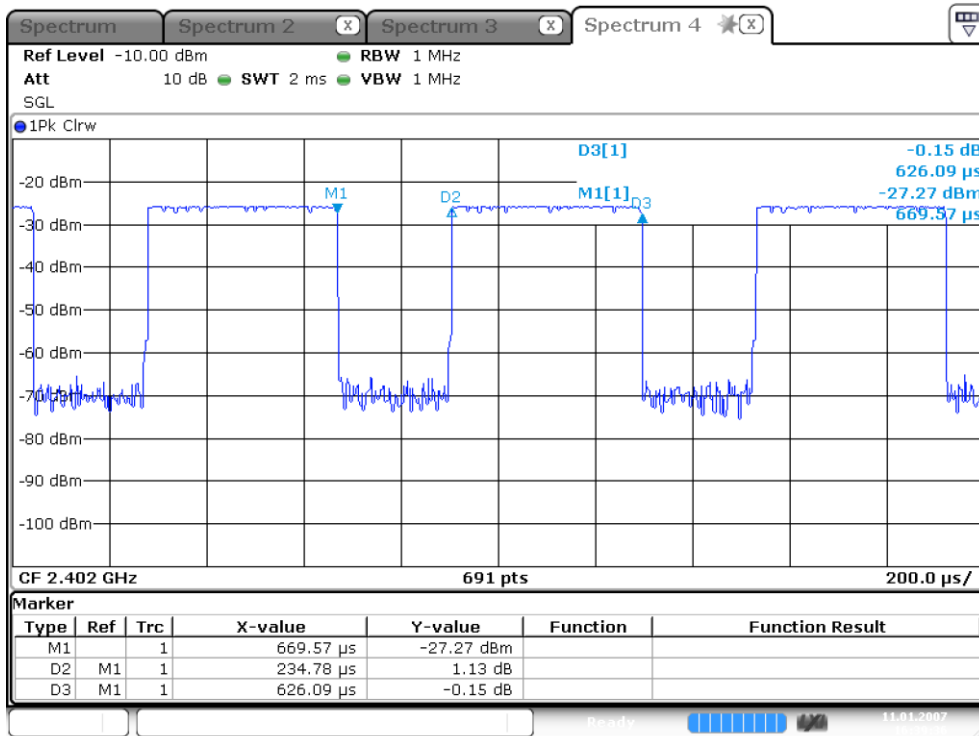
Duty Cycle Formula:

$$\text{Duty Cycle} = \text{Ton} / (\text{Ton} + \text{Toff})$$

$$\text{Duty Factor} = 10 \text{ Log} (1/\text{Duty Cycle})$$

Results:

2.4GHz band	Ton (ms)	Ton + Toff (ms)	Duty Cycle (%)	Duty Factor (dB)
BLE	0.3913	0.6261	62.50	2.04



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**10. EMI Reduction Method During Compliance Testing**

No modification was made during testing.