



NCC RADIO TEST REPORT

Equipment : VUSION 4.5
Brand Name : SES-imagotag
Model Name : EDG2-0450-A
Applicant : 龍亨新技股份有限公司
74144 南部科學工業園區台南市新市區創業路 28 號 4 樓
Manufacturer : SES-imagotag
55 Place Nelson Mandela, 92024 Nanterre, France.
Standard : NCC LP0002 Section 3.10.2

The product was received on Sep. 07, 2018, and testing was started from Sep. 12, 2018 and completed on Sep. 13, 2018. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013, NCC LP0002 (Jan. 10, 2018) and shown compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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TEL : 886-3-656-9065
FAX : 886-3-656-9085
Report Template No.: CB-A11_1 Ver1.2



Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
-	2.3	AC Power Line Conducted Emissions	N/A	Note
2.1	3.10.2.2	Field Strength of Fundamental Emissions	PASS	-
2.2	-	20dB Spectrum Bandwidth	PASS	-
2.3	3.10.2.2	Radiated Emissions	PASS	-
2.4	3.10.2.2	Band Edge Emissions	PASS	-
2.5	2.2	Antenna Requirements	PASS	-
Note: It was supplied power by Internal Lithium Battery*3 (3Vdc) for EUT; it's not necessary to apply to AC Power Line Conducted Emissions test.				

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen

Report Producer: Cindy Peng

1. General Information

1.1. Product Details

Items	Description
Power Type	From Internal Lithium Battery*3 (3Vdc)
Modulation	MSK
Frequency Range	2400 ~ 2483.5MHz
Operation Frequency Range	2404 ~ 2479.25MHz
Channel Number	11
Channel Bandwidth (99%)	1.153 MHz
Max. Field Strength	57.07 dBuV/m at 3m (Average)
Carrier Frequencies	Please refer to section 1.4

1.2. Accessories

Power	Brand	Model
Internal Lithium Battery*3	Omnergy	CR2450

1.3. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	SES-imagotag	R26N02	Printed on PCB Antenna	N/A	-9.17

1.4. Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency
2400 ~ 2483.5MHz	0	2404.00 MHz
	1	2409.95 MHz
	2	2421.85 MHz
	3	2424.65 MHz
	4	2441.80 MHz
	5	2449.15 MHz
	6	2461.75 MHz
	7	2469.45 MHz
	8	2474.35 MHz
	9	2476.80 MHz
	10	2479.25 MHz

1.5. Table for Test Modes

The following table is a list of the test modes shown in this test report.

Test Items	Mode	Channel	Antenna
Field Strength of Fundamental Emissions 20dB Spectrum Bandwidth	CTX	0/4/10	1
Radiated Emissions 30MHz ~ 1GHz	Intentional – CTX	-	1
	Unintentional – CRX	-	1
Radiated Emissions 1GHz~5 th Harmonic	CRX	-	1
Radiated Emissions 1GHz~10 th Harmonic	CTX	0/4/10	1
Band Edge Emissions	CTX	0/4/10	1

Note: CTX=continuously transmitting, CRX=continuously receiving

Radiated Emissions 30MHz~1GHz		
Operating Mode	Intentional – CTX	
Test Mode	1	EUT X axis
	2	EUT Y axis
	3	EUT Z axis
Mode 3 is the worst case, so it was selected to record in this test report.		
Operating Mode	Unintentional – CRX	
Test Mode	1	EUT X axis
	2	EUT Y axis
	3	EUT Z axis
Mode 3 is the worst case, so it was selected to record in this test report.		

Radiated Emissions Unintentional 1GHz~5 th Harmonic		
Operating Mode	Unintentional – CRX	
The EUT was performed at X axis, Y axis and Z axis position for Radiated emission test. Z axis generated the worst test result for Radiated emission unintentional below 1GHz test, thus the measurement for Radiated emission unintentional 1GHz~5 th Harmonic test will follow this same test configuration.		
Test Mode	1	EUT Z axis

Radiated Emissions Intentional 1GHz~10 th Harmonic		
Operating Mode	Intentional – CTX	
The EUT was performed at X axis, Y axis and Z axis position for Radiated emission test, and the worst case was found at Z axis. So the measurement will follow this same test configuration.		
Test Mode	1	EUT Z axis

1.6. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ ANSI C63.10-2013
- ♦ NCC LP0002 (Jan. 10, 2018)

The following reference test guidance is not within the scope of accreditation of TAF.

- ♦ FCC KDB 414788 D01 v01r01

1.7. Table for Testing Locations

Test Site Location					
Address:	No.8, Lane 724, Bo-ai St., Jhubei City, Hsinchu County 302, Taiwan, R.O.C.				
TEL:	886-3-656-9065				
FAX:	886-3-656-9085				
Test Site No.	Site Category	Location	FCC Designation No.	IC File No.	VCCI Reg. No
03CH01-CB	SAC	Hsin Chu	TW0006	IC 4086D	-

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC); Fully Anechoic Chamber (FAC).

1.8. Table for Slight Change

This product is an extension of original one reported under Sporton project number: TR872501-05.

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
Changing the equipment name to "VUSION 4.5" from "VUSION 4.5 BWR".	The test results of this report reference the results of the original Sporton Report No.: TR872501-05. The modifications of this time do not affect the RF characteristic. Therefore, the content of the original test report is kept.

Note: All test results are based on original test report.

1.9. Table for Supporting Units

N/A

**1.10. Duty Cycle**

Duty Cycle (%)	Correction Duty Factor (dB)
1.03	-39.74

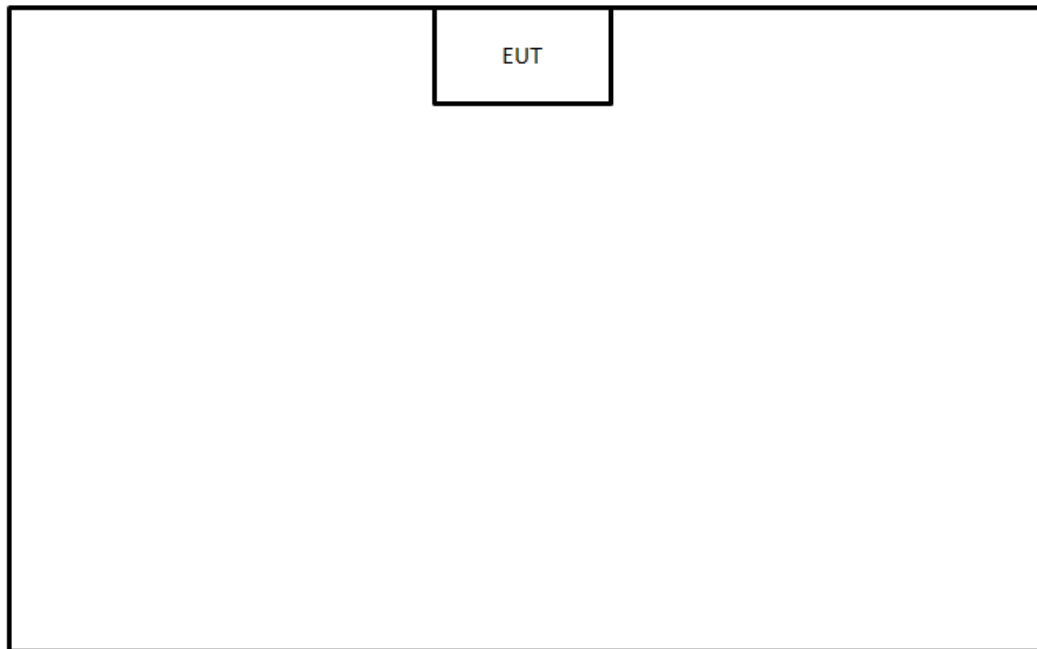
Note: Correction Duty Factor (dB) = $20 \log (1.03/100) = -39.74$



1.11. Test Configurations

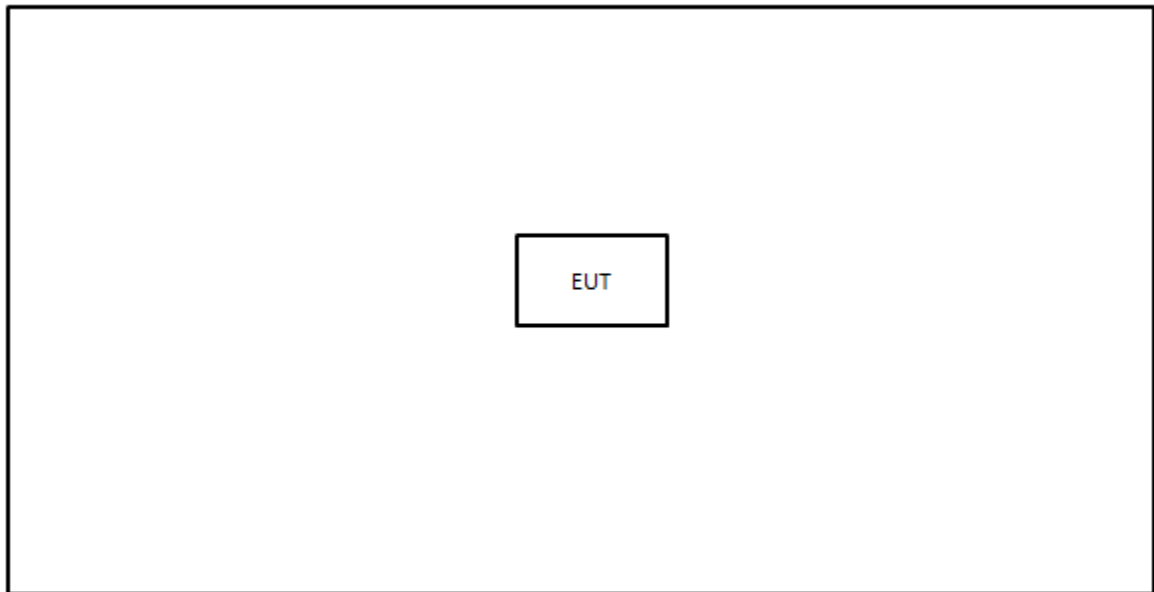
1.11.1. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz and Unintentional 1GHz~5th Harmonic





Test Configuration: Intentional 1GHz~10th Harmonic





2. Test Result

2.1. Field Strength of Fundamental Emissions Measurement

2.1.1. Limit

The field strength of fundamental emissions within these bands specified at a distance of 3 meters (measurement instrumentation employing an average detector) shall comply with the following table.

Frequency Band (MHz)	Fundamental Emissions Limit (dBuV/m) at 3m
2400-2483.5	94 (Average)
	114 (Peak)

2.1.2. Measuring Instruments and Setting

Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer.

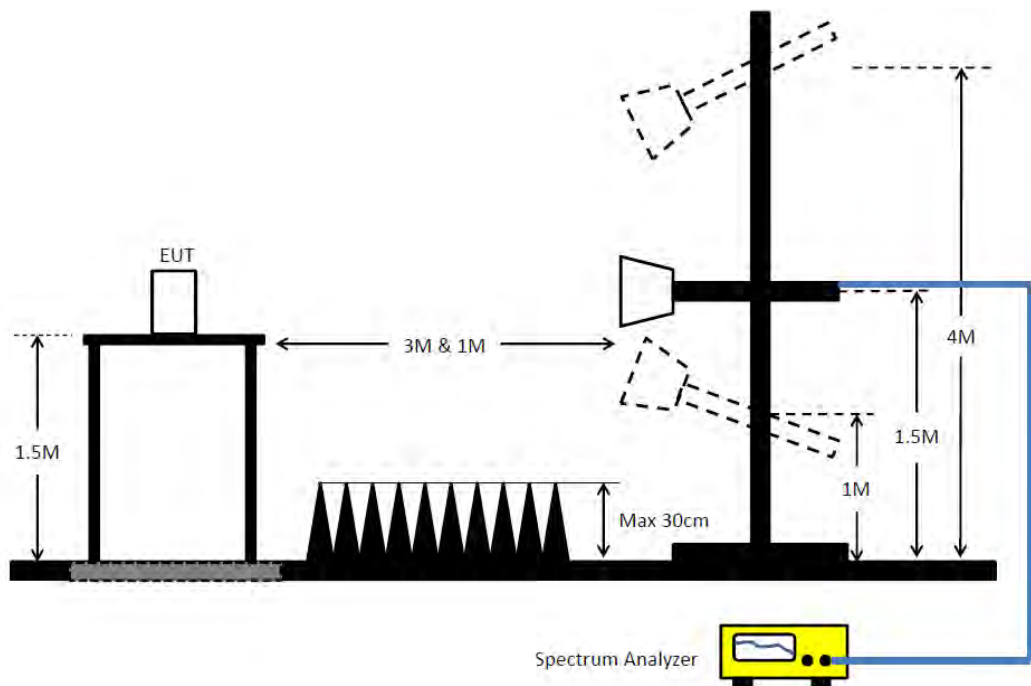
Power Meter Parameter	Setting
RBW	1 MHz Peak / 3MHz Peak
VBW	1 MHz Peak / 1/T Average
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

2.1.3. Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. For Fundamental emissions, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
6. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in

cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

2.1.4. Test Setup Layout



2.1.5. Test Deviation

There is no deviation with the original standard.

2.1.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.1.7. Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.



2.1.8. Test Result of Field Strength of Fundamental Emissions

Temperature	22.5°C	Humidity	47%
Test Engineer	Eason Chen	Configurations	Channel 0, 4, 10
Test Date	Sep. 12, 2018		

Channel 0

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2404.16	57.07	94.00	-36.93	25.53	3.02	28.52	0.00	200	35	Average	HORIZONTAL
2	2404.16	96.81	114.00	-17.19	65.27	3.02	28.52	0.00	200	35	Peak	HORIZONTAL

Channel 4

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2442.12	56.41	94.00	-37.59	24.77	3.04	28.60	0.00	118	23	Average	HORIZONTAL
2	2442.12	96.15	114.00	-17.85	64.51	3.04	28.60	0.00	118	23	Peak	HORIZONTAL

Channel 10

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	2479.41	56.68	94.00	-37.32	24.96	3.06	28.66	0.00	262	283	Average	HORIZONTAL
2	2479.41	96.42	114.00	-17.58	64.70	3.06	28.66	0.00	262	283	Peak	HORIZONTAL

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

2.2. 20dB Spectrum Bandwidth Measurement

2.2.1. Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (2400 ~ 2483.5MHz).

2.2.2. Measuring Instruments and Setting

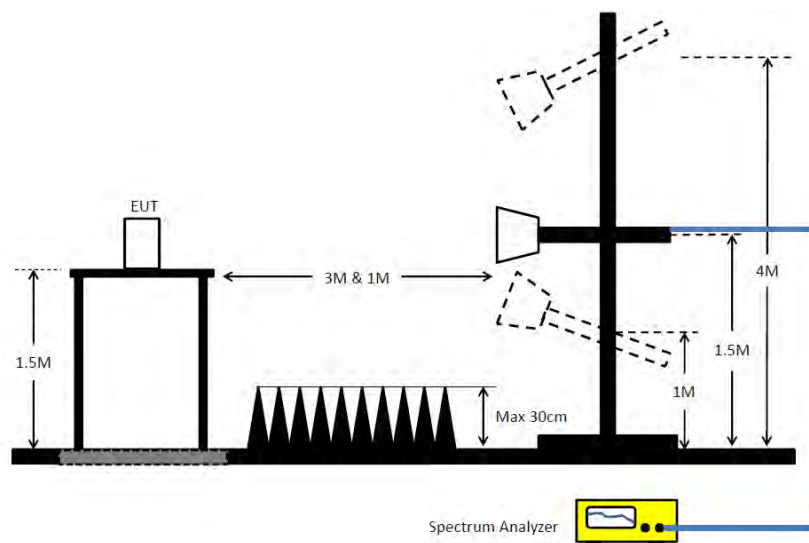
Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 20dB Bandwidth
RBW	100 kHz
VBW	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

2.2.3. Test Procedures

1. The test procedure is the same as section 2.3.3.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.

2.2.4. Test Setup Layout



**2.2.5. Test Deviation**

There is no deviation with the original standard.

2.2.6. EUT Operation during Test

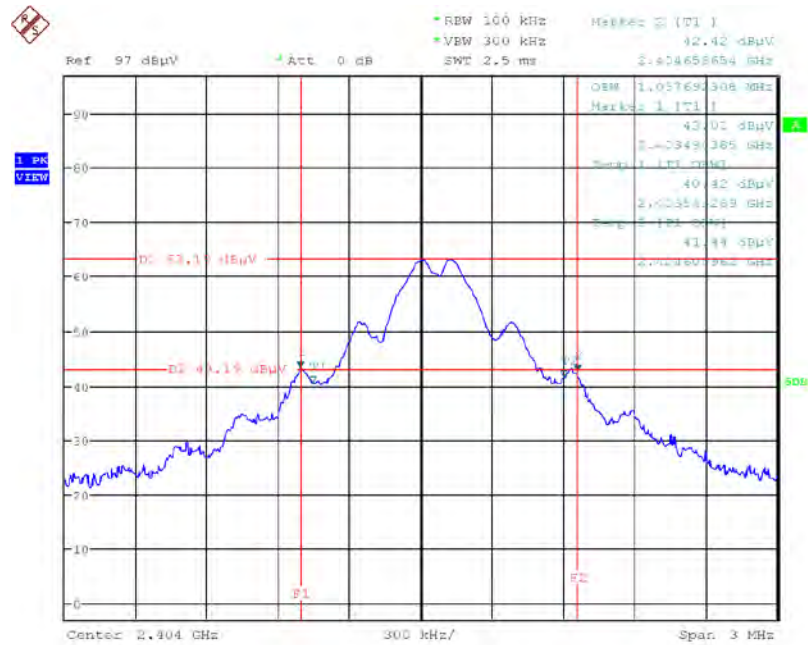
The EUT was programmed to be in continuously transmitting mode.

2.2.7. Test Result of 20dB Spectrum Bandwidth

Temperature	22.5°C	Humidity	47%
Test Engineer	Eason Chen	Configurations	Channel 0/4/10

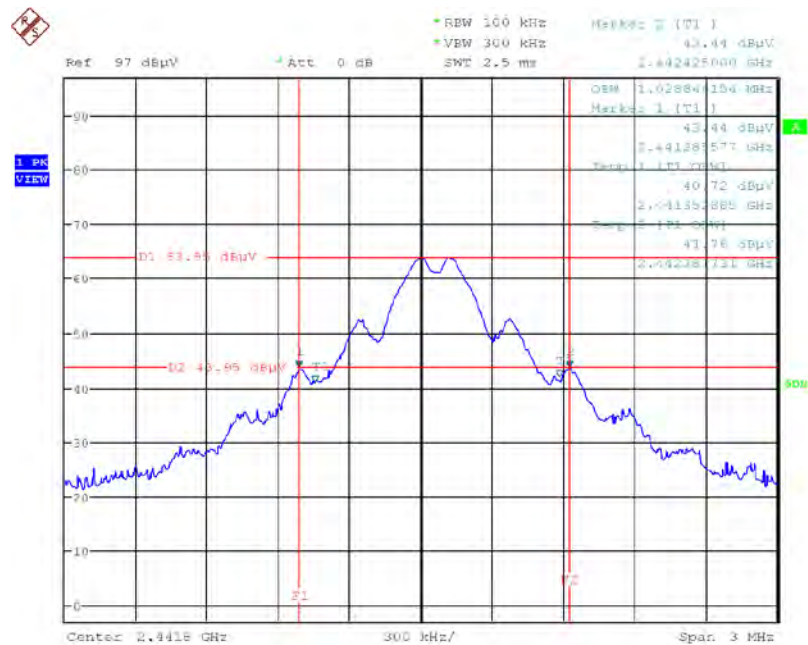
Frequency	20dB BW (MHz)	99% OBW (MHz)	Frequency range (MHz) $f_L > 2400\text{MHz}$	Frequency range (MHz) $f_H < 2483.5\text{MHz}$	Test Result
2404.00 MHz	1.168	1.057	2403.490	-	PASS
2441.80 MHz	1.139	1.028	-	-	PASS
2479.25 MHz	1.226	1.153	-	2479.990	PASS

20 dB and 99% Bandwidth Plot on 2404.00 MHz



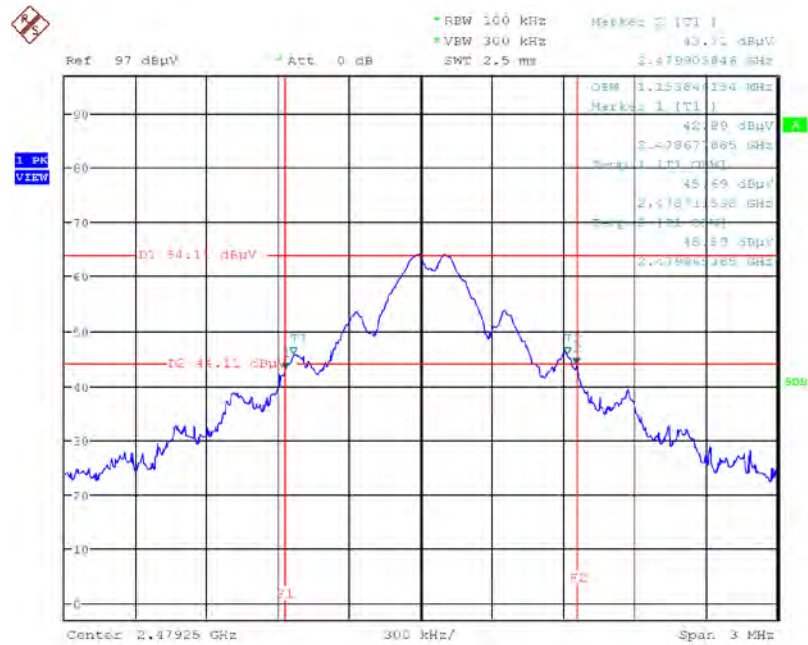
Date: 12.SEP.2018 22:00:30

20 dB and 99% dB Bandwidth Plot on 2441.80 MHz



Date: 12.SEP.2018 22:12:41

20 dB and 99% dB Bandwidth Plot on 2479.25 MHz



Date: 12.SEP.2018 23:20:12

2.3. Radiated Emissions Measurement

2.3.1. Limit

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 2.8 limit in the table below has to be followed.

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

2.3.2. Measuring Instruments and Setting

Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	100kHz/300kHz for Peak

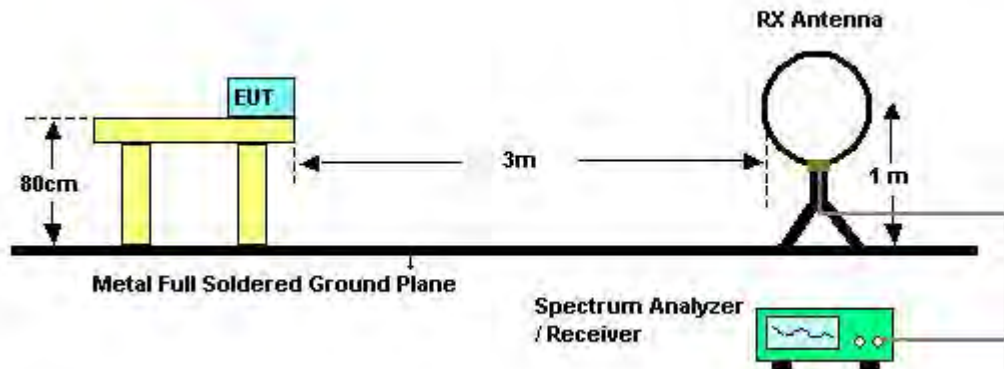
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

2.3.3. Test Procedures

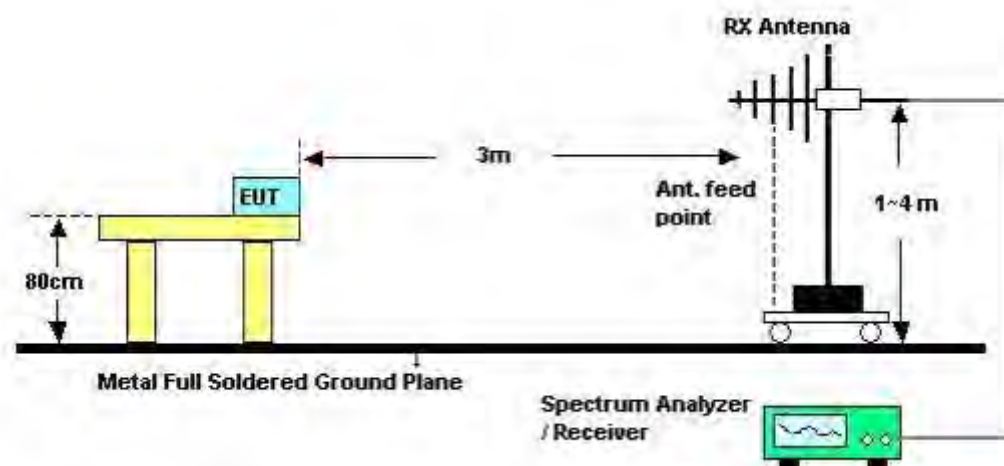
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

2.3.4. Test Setup Layout

For Radiated Emissions: 9kHz ~30MHz

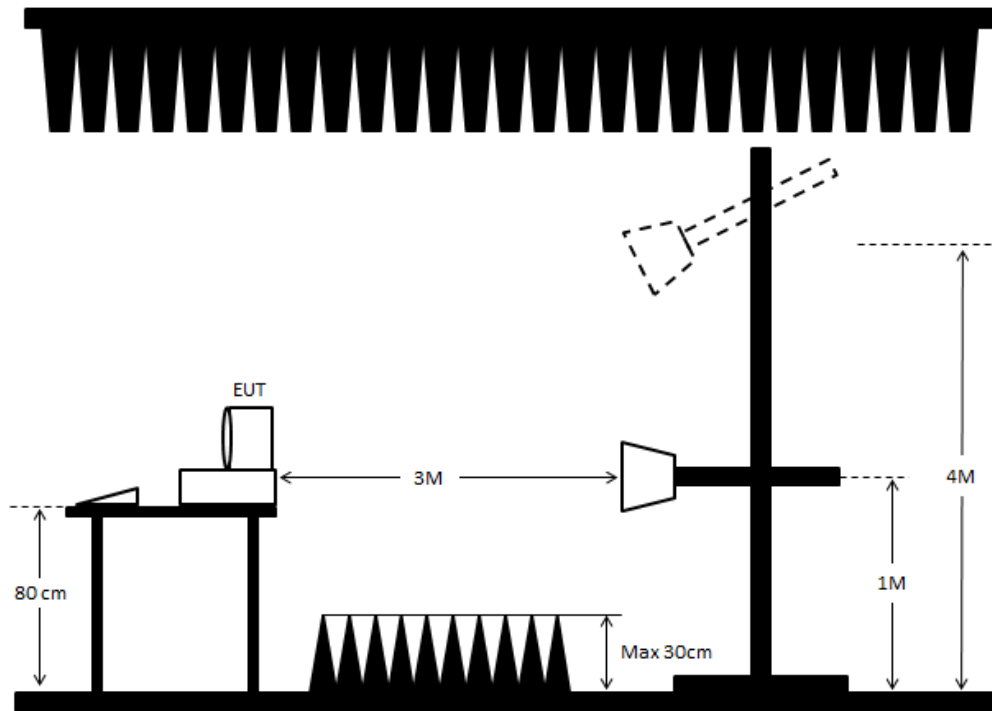


For Radiated Emissions: 30MHz~1GHz

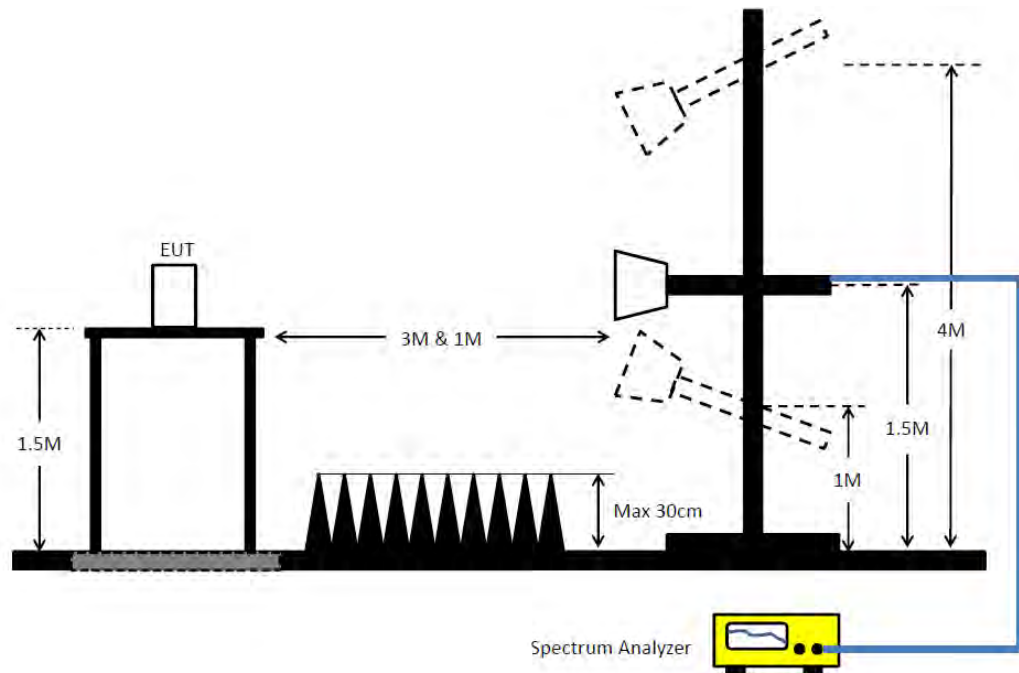


For Radiated Emissions: Above 1GHz

Unintentional 1GHz~5th Harmonic / 1,000~13,000 MHz



Intentional 1GHz~10th Harmonic





2.3.5. Test Deviation

There is no deviation with the original standard.

2.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.3.7. Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

2.3.8. Results of Radiated Emissions (9kHz~30MHz)

Temperature	22.5℃	Humidity	47%
Test Engineer	Eason Chen	Configurations	Intentional - CTX
Test Mode	Mode 3	Test Date	Sep. 12, 2018~ Sep. 13, 2018

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

Temperature	22.5℃	Humidity	47%
Test Engineer	Eason Chen	Configurations	Unintentional - CRX
Test Mode	Mode 3	Test Date	Sep. 12, 2018~ Sep. 13, 2018

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

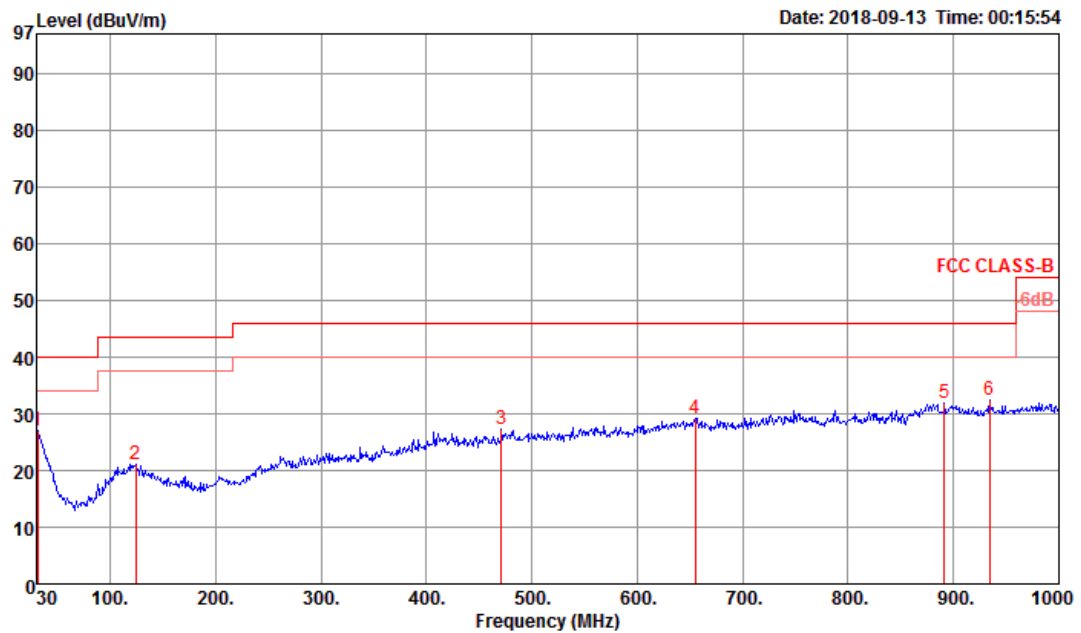
Limit line = specific limits (dBuV) + distance extrapolation factor.



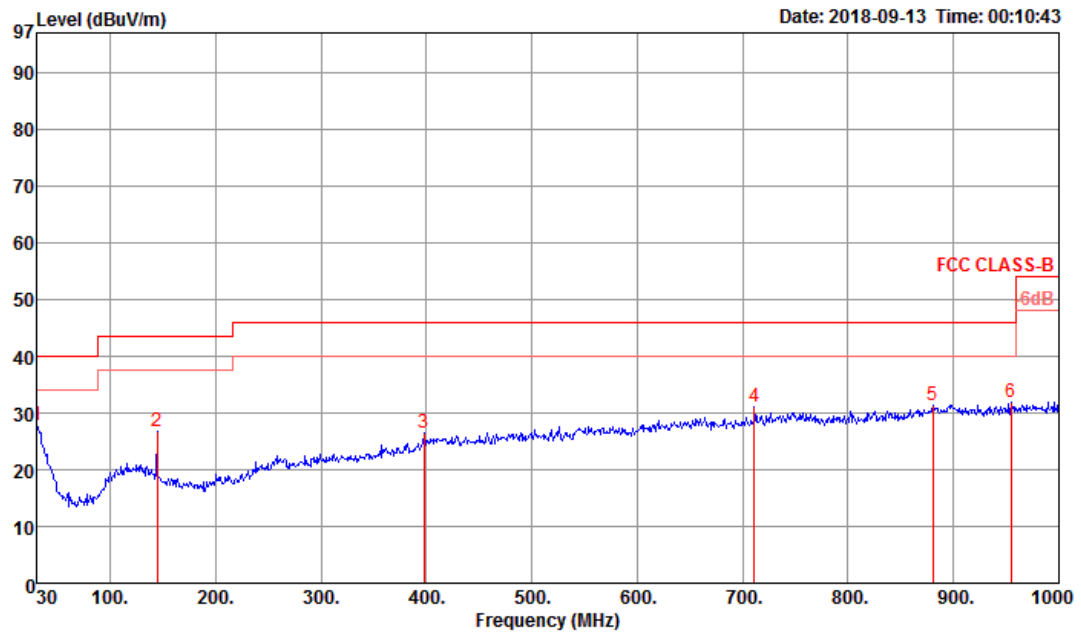
2.3.9. Results of Radiated Emissions (30MHz~1GHz)

Temperature	22.5℃	Humidity	47%
Test Engineer	Eason Chen	Configurations	Intentional - CTX
Test Mode	Mode 3		

Horizontal



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	30.97	26.92	40.00	-13.08	31.86	0.98	25.40	31.32	100	0 Peak	HORIZONTAL
2	124.09	21.06	43.50	-22.44	32.73	1.15	18.90	31.72	100	0 Peak	HORIZONTAL
3	471.35	27.19	46.00	-18.81	33.16	2.83	23.23	32.03	100	0 Peak	HORIZONTAL
4	654.68	29.12	46.00	-16.88	32.29	3.57	25.50	32.24	100	0 Peak	HORIZONTAL
5	891.36	31.82	46.00	-14.18	32.54	4.33	27.10	32.15	100	0 Peak	HORIZONTAL
6	934.04	32.52	46.00	-13.48	33.18	4.22	27.30	32.18	100	0 Peak	HORIZONTAL

**Vertical**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	30.00	27.88	40.00	-12.12	32.20	0.97	26.00	31.29	300	360 Peak	VERTICAL
2	144.46	26.69	43.50	-16.81	39.86	1.13	17.45	31.75	300	360 Peak	VERTICAL
3	397.63	26.47	46.00	-19.53	33.37	2.90	22.15	31.95	300	360 Peak	VERTICAL
4	710.94	30.99	46.00	-15.01	34.22	3.40	25.65	32.28	300	360 Peak	VERTICAL
5	880.69	31.48	46.00	-14.52	32.55	3.89	27.20	32.16	300	360 Peak	VERTICAL
6	954.41	31.86	46.00	-14.14	32.48	3.97	27.60	32.19	300	360 Peak	VERTICAL

Note:

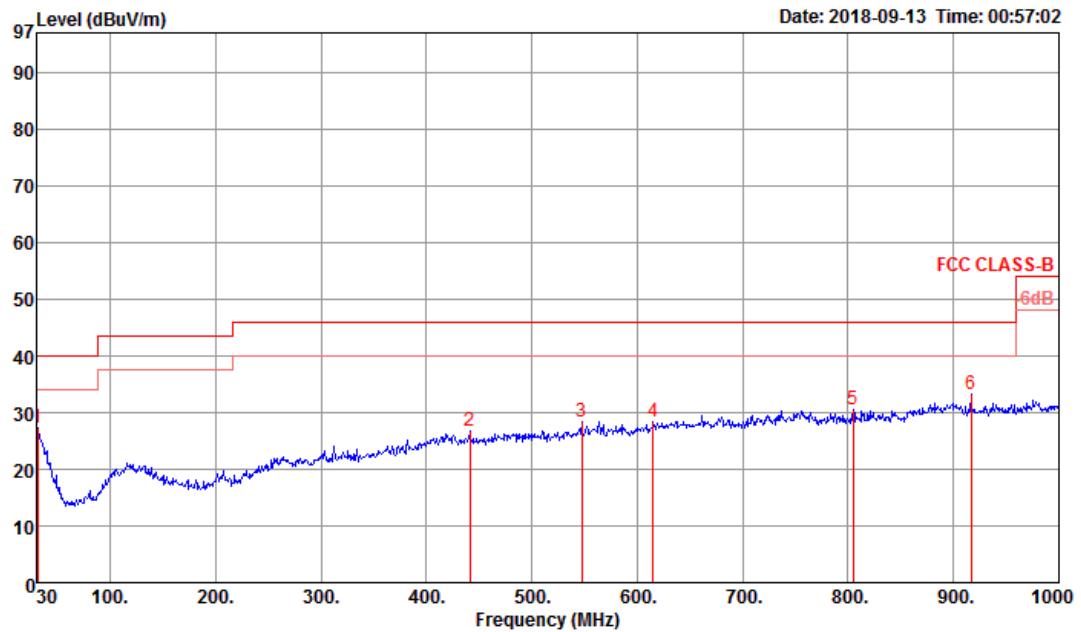
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).



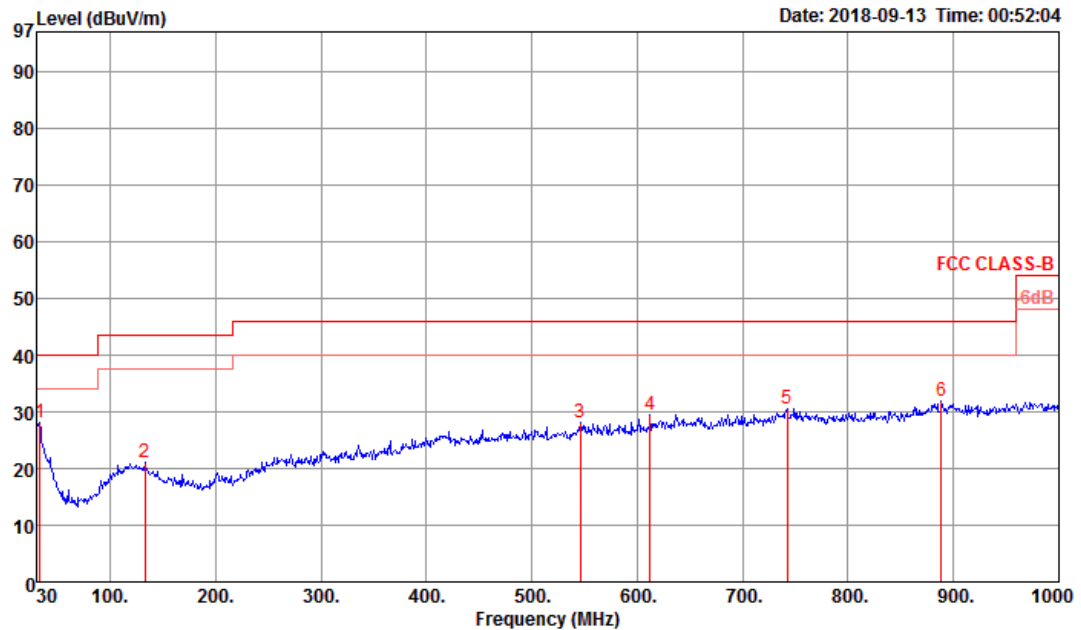
Temperature	22.5°C	Humidity	47%
Test Engineer	Eason Chen	Configurations	Unintentional - CRX
Test Mode	Mode 3		

Horizontal



	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	30.97	27.32	40.00	-12.68	32.26	0.98	25.40	31.32	100	0	Peak	HORIZONTAL
2	441.28	26.64	46.00	-19.36	33.05	2.77	22.80	31.98	100	0	Peak	HORIZONTAL
3	547.01	28.44	46.00	-17.56	33.17	2.75	24.67	32.15	100	0	Peak	HORIZONTAL
4	614.91	28.45	46.00	-17.55	33.09	2.38	25.20	32.22	100	0	Peak	HORIZONTAL
5	805.03	30.58	46.00	-15.42	33.02	3.39	26.40	32.23	100	0	Peak	HORIZONTAL
6	916.58	33.25	46.00	-12.75	33.79	4.52	27.10	32.16	100	0	Peak	HORIZONTAL

Vertical



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	32.91	28.04	40.00	-11.96	34.25	0.99	24.18	31.38	300	360 Peak	VERTICAL
2	132.82	20.98	43.50	-22.52	33.10	1.16	18.45	31.73	300	360 Peak	VERTICAL
3	546.04	28.06	46.00	-17.94	32.86	2.75	24.60	32.15	300	360 Peak	VERTICAL
4	612.00	29.41	46.00	-16.59	34.17	2.31	25.15	32.22	300	360 Peak	VERTICAL
5	741.98	30.54	46.00	-15.46	33.01	3.70	26.05	32.22	300	360 Peak	VERTICAL
6	888.45	31.84	46.00	-14.16	32.56	4.18	27.25	32.15	300	360 Peak	VERTICAL

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

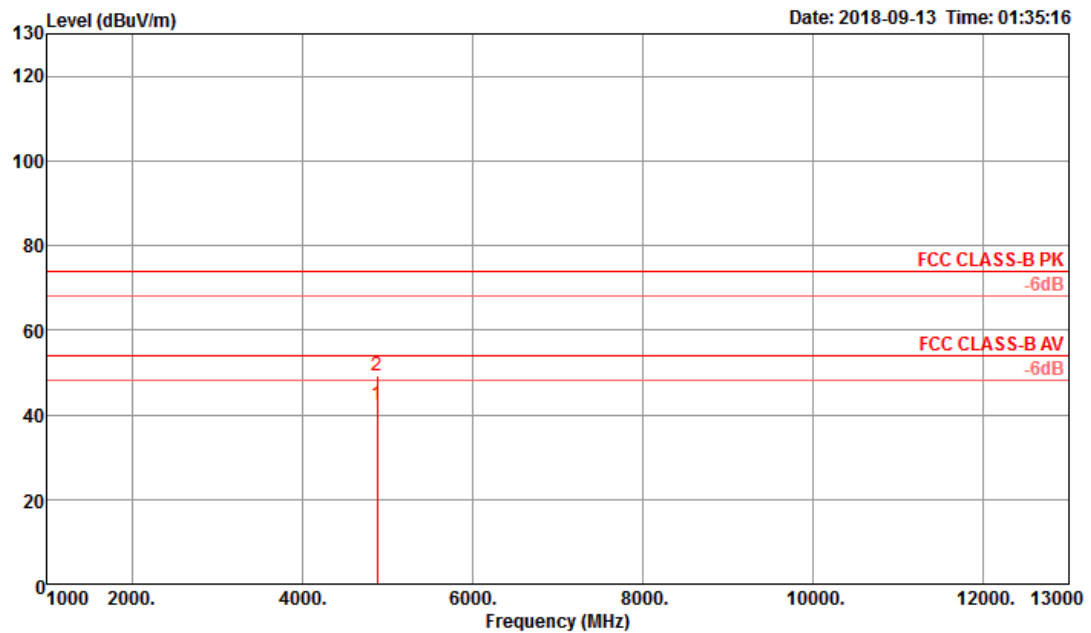
Emission level (dBuV/m) = 20 log Emission level (uV/m).



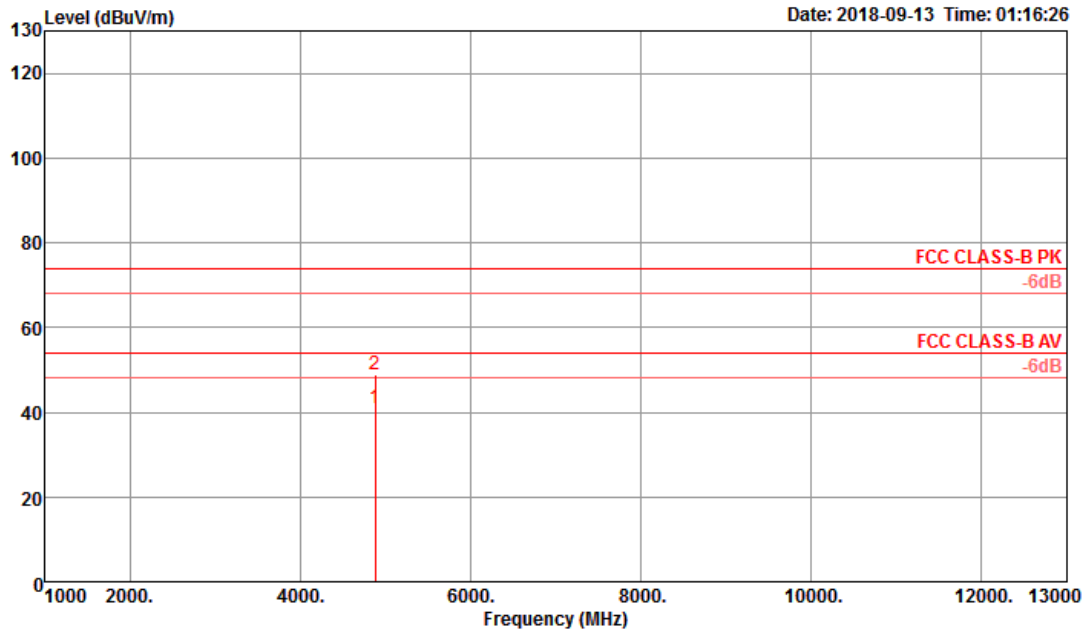
2.3.10. Results for Radiated Emissions (1GHz~5th Harmonic)

Temperature	22.5℃	Humidity	47%
Test Engineer	Eason Chen	Configurations	Unintentional - CRX

Horizontal



	Freq	Level	Limit	Over	Read	Cable	Antenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	4883.22	42.45	54.00	-11.55	38.21	6.01	32.66	34.43	100	84	Average	HORIZONTAL
2	4883.30	49.37	74.00	-24.63	45.13	6.01	32.66	34.43	100	84	Peak	HORIZONTAL

**Vertical**

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	4883.19	41.07	54.00	-12.93	36.83	6.01	32.66	34.43	144	169 Average	VERTICAL
2	4883.24	48.88	74.00	-25.12	44.64	6.01	32.66	34.43	144	169 Peak	VERTICAL

**2.3.11. Results for Radiated Emissions (1GHz~10th Harmonic)**

Temperature	22.5°C	Humidity	47%
Test Engineer	Eason Chen	Configurations	Channel 0
Test Date	Sep. 12, 2018		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	4808.06	13.07	54.00	-40.93	6.72	4.12	33.06	30.83	115	122	Average	HORIZONTAL
2	4808.06	52.81	74.00	-21.19	46.46	4.12	33.06	30.83	115	122	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg		
1	4808.31	10.52	54.00	-43.48	4.17	4.12	33.06	30.83	105	213	Average	VERTICAL
2	4808.31	50.26	74.00	-23.74	43.91	4.12	33.06	30.83	105	213	Peak	VERTICAL



Temperature	22.5°C	Humidity	47%
Test Engineer	Eason Chen	Configurations	Channel 4
Test Date	Sep. 12, 2018		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	4883.54	15.50	54.00	-38.50	8.95	4.15	33.21	30.81	103	54 Average	HORIZONTAL
2	4883.54	55.24	74.00	-18.76	48.69	4.15	33.21	30.81	103	54 Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	4883.82	13.49	54.00	-40.51	6.94	4.15	33.21	30.81	118	207 Average	VERTICAL
2	4883.82	53.23	74.00	-20.77	46.68	4.15	33.21	30.81	118	207 Peak	VERTICAL



Temperature	22.5°C	Humidity	47%
Test Engineer	Eason Chen	Configurations	Channel 10
Test Date	Sep. 12, 2018		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	4958.59	14.60	54.00	-39.40	7.88	4.19	33.33	30.80	102	153 Average	HORIZONTAL
2	4958.59	54.34	74.00	-19.66	47.62	4.19	33.33	30.80	102	153 Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss Factor	Preamp Factor	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	4958.61	13.28	54.00	-40.72	6.56	4.19	33.33	30.80	150	13 Average	VERTICAL
2	4958.61	53.02	74.00	-20.98	46.30	4.19	33.33	30.80	150	13 Peak	VERTICAL

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

2.4. Band Edge Emissions Measurement

2.4.1. Limit

Band edge emissions radiated outside of the specified frequency bands shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 2.8 limit in the table below has to be followed.

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

2.4.2. Measuring Instruments and Setting

Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 1/T for Average
RBW / VBW (Emission in non-restricted band)	100kHz/300kHz for Peak

2.4.3. Test Procedures

The test procedure is the same as section 2.3.3.

2.4.4. Test Setup Layout

This test setup layout is the same as that shown in section 2.3.4.

2.4.5. Test Deviation

There is no deviation with the original standard.

2.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.4.7. Measurement Results Calculation

The measured Level is calculated using:

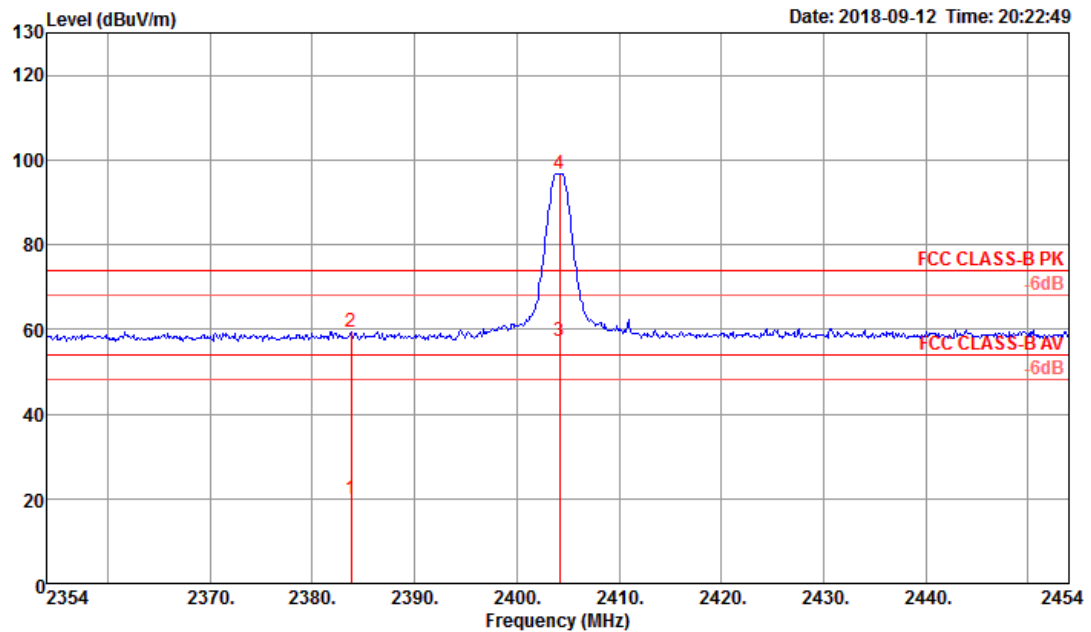
Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.



2.4.8. Test Result of Band Edge and Fundamental Emissions

Temperature	22.5°C	Humidity	47%
Test Engineer	Eason Chen	Configurations	Channel 0, 4, 10
Test Date	Sep. 12, 2018		

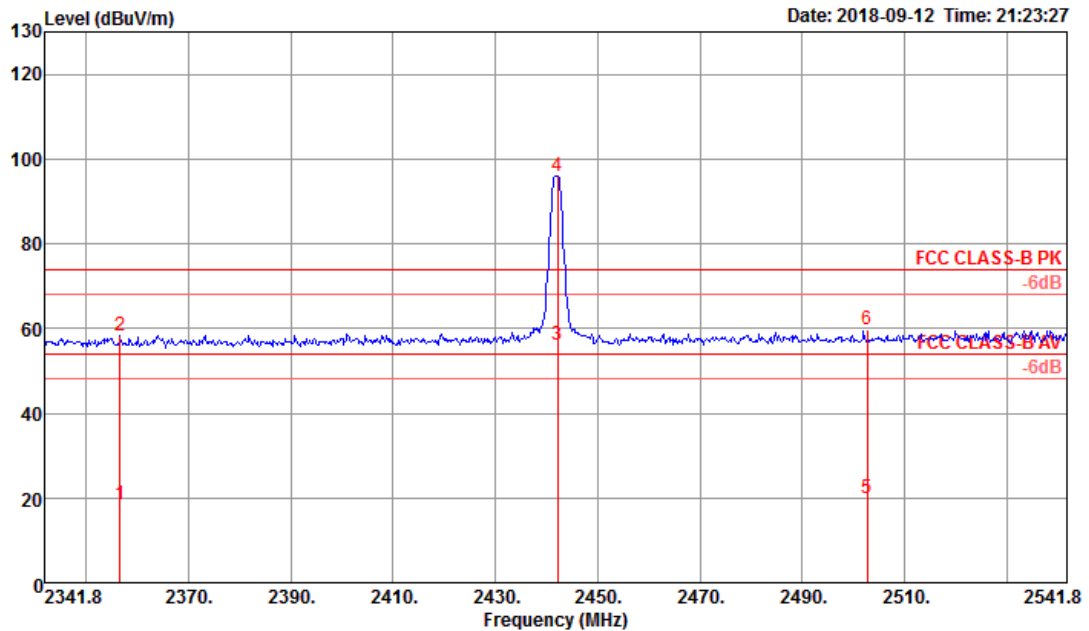
Channel 0



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	2383.81	19.79	54.00	-34.21	-11.70	3.00	28.49	0.00	200	35 Average	HORIZONTAL
2	2383.81	59.53	74.00	-14.47	28.04	3.00	28.49	0.00	200	35 Peak	HORIZONTAL
3 @	2404.16	57.07			25.53	3.02	28.52	0.00	200	35 Average	HORIZONTAL
4 @	2404.16	96.81			65.27	3.02	28.52	0.00	200	35 Peak	HORIZONTAL

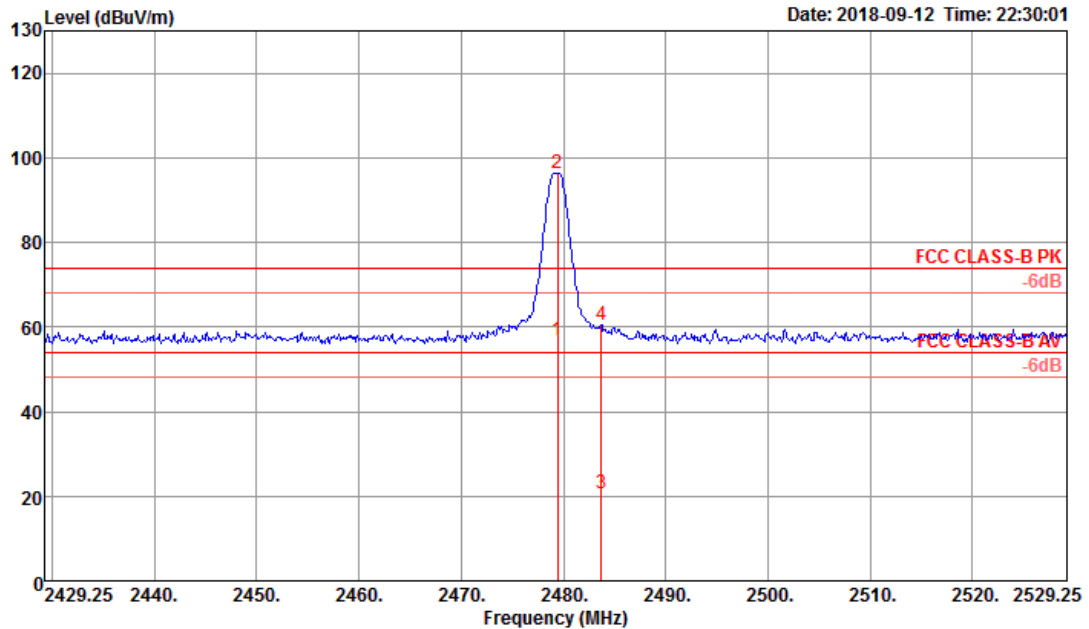
Item 3, 4 are the fundamental frequency at 2404.00 MHz.

Channel 4



	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	2356.54	18.61	54.00	-35.39	-12.82	2.99	28.44	0.00	300	61 Average	VERTICAL
2	2356.54	58.35	74.00	-15.65	26.92	2.99	28.44	0.00	300	61 Peak	VERTICAL
3 @	2442.12	56.26			24.62	3.04	28.60	0.00	300	61 Average	VERTICAL
4 @	2442.12	96.00			64.36	3.04	28.60	0.00	300	61 Peak	VERTICAL
5	2502.70	20.01	54.00	-33.99	-11.76	3.07	28.70	0.00	300	61 Average	VERTICAL
6	2502.70	59.75	74.00	-14.25	27.98	3.07	28.70	0.00	300	61 Peak	VERTICAL

Item 3, 4 are the fundamental frequency at 2441.80 MHz.

Channel 10


	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	A/Pos	T/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1 @	2479.41	56.68			24.96	3.06	28.66	0.00	262	283 Average	HORIZONTAL
2 @	2479.41	96.42			64.70	3.06	28.66	0.00	262	283 Peak	HORIZONTAL
3	2483.74	20.62	54.00	-33.38	-11.11	3.06	28.67	0.00	262	283 Average	HORIZONTAL
4	2483.74	60.36	74.00	-13.64	28.63	3.06	28.67	0.00	262	283 Peak	HORIZONTAL

Item 1, 2 are the fundamental frequency at 2479.25 MHz.

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).



2.5. Antenna Requirements

2.5.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

2.5.2. Antenna Connector Construction

The antenna connector complied with the requirements.

3. List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 27, 2018	Aug. 26, 2019	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2018	Mar. 15, 2019	Radiation (03CH01-CB)
Horn ACenna	EMCO	3115	00075790	750MHz ~ 18GHz	Nov. 20, 2017	Nov. 19, 2018	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jun. 28, 2018	Jun. 27, 2019	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2018	May 01, 2019	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Jan. 09, 2018	Jan. 08, 2019	Radiation (03CH01-CB)
Pre-Amplifier	MITEQ	TTA1840-35-HG	1864479	18GHz ~ 40GHz	Jul. 04, 2018	Jul. 03, 2019	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 23, 2017	Nov. 22, 2018	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100354	9kHz ~ 2.75GHz	Dec. 08, 2017	Dec. 07, 2018	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16	N/A	1 GHz ~ 18 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-16+17	N/A	1 GHz ~ 18 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#1	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Jul. 27, 2018	Jul. 26, 2019	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-I0-7	-	N.C.R.	N.C.R.	Radiation (03CH01-CB)

Note: Calibration Interval of instruments listed above is one year.

N.C.R. means Non-Calibration required.



4. Measurement Uncertainty

Test Items	Uncertainty	Remark
Radiated Emission (30MHz ~ 1,000MHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 18GHz)	3.7 dB	Confidence levels of 95%
Radiated Emission (18GHz ~ 40GHz)	3.5 dB	Confidence levels of 95%