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NCC RADIO TEST REPORT

Applicant's company	龍亭新技股份有限公司
Applicant Address	74144 南部科學工業園區台南市新市區創業路 28 號 4 樓
Manufacturer's company	SES-imagotag
Manufacturer Address	55 Place Nelson Mandela, 92024 Nanterre, France.

Product Name	G1 C 2.6 BW
Brand Name	SES-imagotag
Model Name	B26C02
Test Rule Part(s)	NCC LP0002 Section 3.10.2
Test Freq. Range	2400 ~ 2483.5MHz
Received Date	Feb. 07, 2018
Final Test Date	Mar. 10, 2018
Submission Type	Original Equipment

Statement

The test result in this report refers exclusively to the presented test model / sample.
Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.
The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2013** and **NCC LP0002 (Jan. 10, 2018)**.
The test equipment used to perform the test is calibrated and traceable to NML/ROC.

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
TR6D1412-08	Rev. 01	Initial issue of report	Mar. 15, 2018

1. VERIFICATION OF COMPLIANCE

Product Name	:	G1 C 2.6 BW
Brand Name	:	SES-Imagotag
Model Name	:	B26C02
Applicant	:	龍亨新技股份有限公司
Test Rule Part(s)	:	NCC LP0002 Section 3.10.2

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Feb. 07, 2018 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Reviewed By:
Sam Chen
SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: NCC LP0002 (Jan. 10, 2018)			
Part	Rule Section	Description of Test	Result
-	2.3	AC Power Line Conducted Emissions	Note
4.1	3.10.2.2	Field Strength of Fundamental Emissions	Complies
4.2	-	20dB Spectrum Bandwidth	Complies
4.3	3.10.2.2	Radiated Emissions	Complies
4.4	3.10.2.2	Band Edge Emissions	Complies
4.5	2.2	Antenna Requirements	Complies

Note: It was supplied power by Internal Lithium Battery (3V) for EUT; it's not necessary to apply to AC Power Line Conducted Emissions test.

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Power Type	From Internal Lithium Battery (3V)
Modulation	MSK
Frequency Range	2400 ~ 2483.5MHz
Operation Frequency Range	2404 ~ 2479.25 MHz
Channel Number	11
Channel Bandwidth (99%)	1.120 MHz
Max. Field Strength	58.88 dBuV/m at 3m (Average)
Carrier Frequencies	Please refer to section 3.4

3.2. Accessories

N/A

3.3. Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	imagotag	R16	Printed on PCB Antenna	N/A	-0.15

3.4. 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

3.5. 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~5th Harmonic	Unintentional – CRX	-	1
Radiated Emissions 1GHz~10th Harmonic	CTX	0/4/10	1
Band Edge Emissions	CTX	0/4/10	1

The following test modes were performed for all tests:

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

Radiated Emissions Unintentional 1GHz~5th 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~5th Harmonic test will follow this same test configuration.		
Test Mode	1	CRX: EUT in Z axis

Radiated Emissions Intentional 1GHz~10th Harmonic		
Operating Mode	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	CTX: EUT in Z axis

3.6. 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).

3.7. Table for Supporting Units

N/A

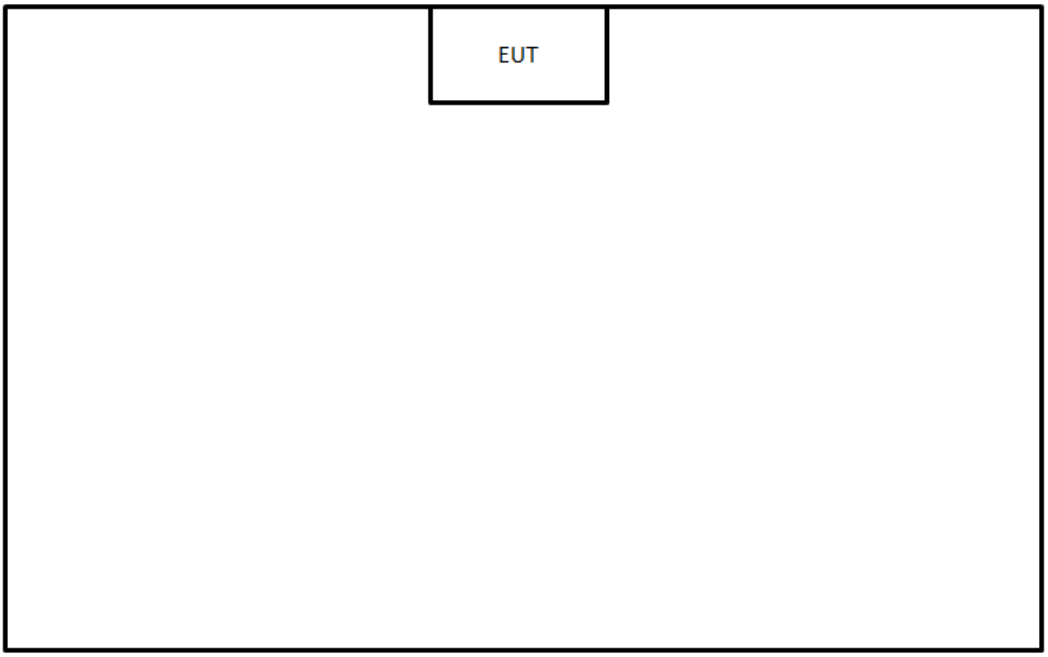
3.8. Duty Cycle

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

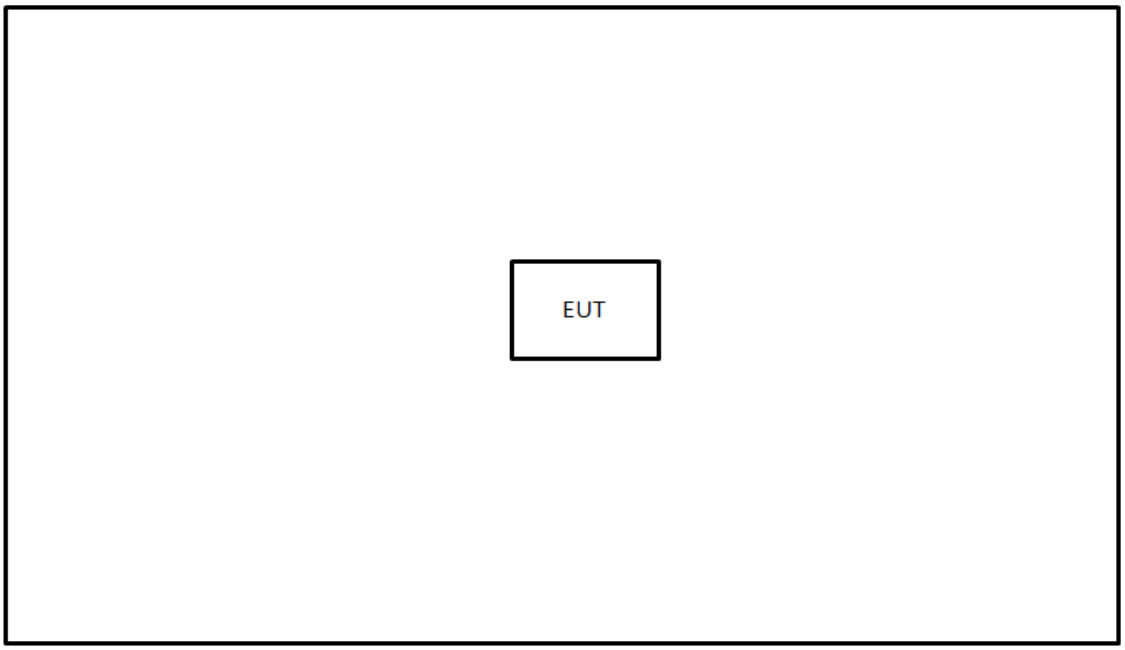
3.9. Test Configurations

3.9.1. Radiation Emissions Test Configuration

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



Test Configuration: Intentional 1GHz~10th Harmonic



4. TEST RESULT

4.1. Field Strength of Fundamental Emissions Measurement

4.1.1. 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)

4.1.2. Measuring Instruments and Setting

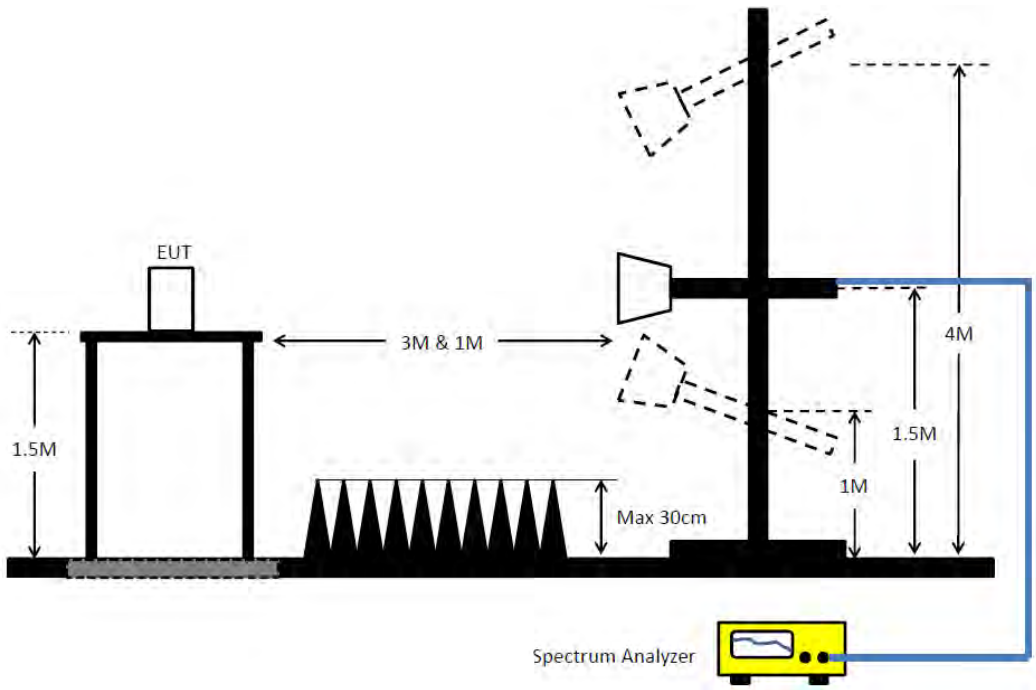
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.1.3. 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.

4.1.4. Test Setup Layout



4.1.5. Test Deviation

There is no deviation with the original standard.

4.1.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.1.7. Test Result of Field Strength of Fundamental Emissions

Temperature	20°C	Humidity	55%
Test Engineer	Jay Lu, Cola Fan	Configurations	Channel 0, 4, 10
Test Date	Feb. 27, 2018 ~ Mar. 10, 2018		

Channel 0

	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	2404.20	58.88	94.00	-35.12	26.68	3.97	28.23	0.00	104	198	Average	HORIZONTAL
2	2404.20	98.62	114.00	-15.38	66.42	3.97	28.23	0.00	104	198	Peak	HORIZONTAL

Channel 4

	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	2441.80	57.59	94.00	-36.41	25.28	4.01	28.30	0.00	101	211	Average	HORIZONTAL
2	2441.80	97.33	114.00	-16.67	65.02	4.01	28.30	0.00	101	211	Peak	HORIZONTAL

Channel 10

	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	2479.25	56.07	94.00	-37.93	23.66	4.04	28.37	0.00	113	37	Average	HORIZONTAL
2	2479.25	95.81	114.00	-18.19	63.40	4.04	28.37	0.00	113	37	Peak	HORIZONTAL

Note:

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

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

4.2. 20dB Spectrum Bandwidth Measurement

4.2.1. Limit

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

4.2.2. Measuring Instruments and Setting

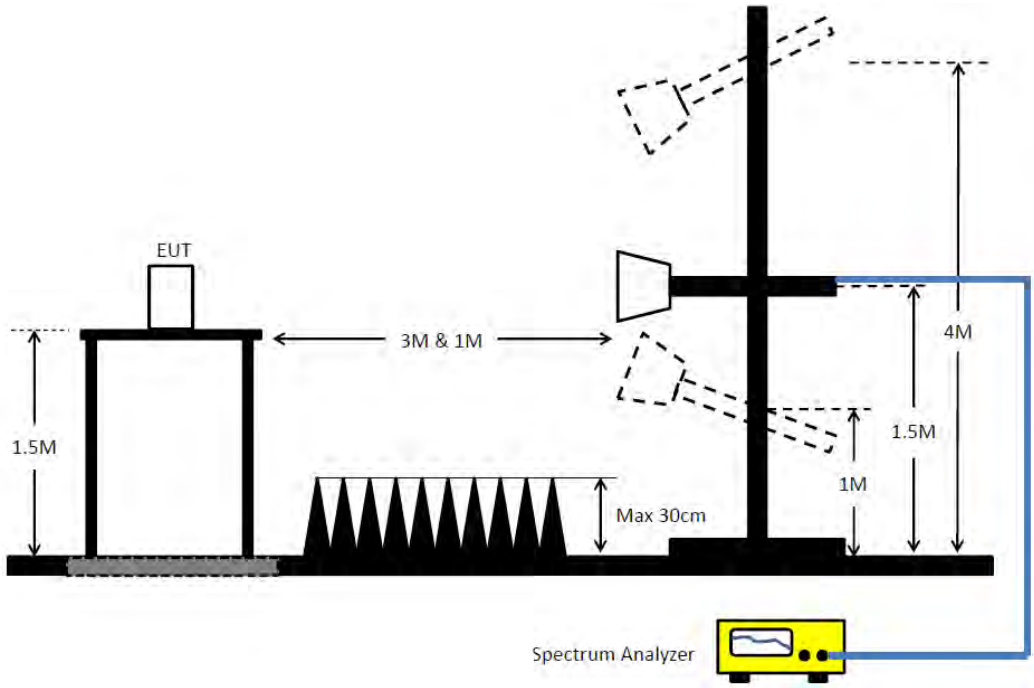
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.2.3. Test Procedures

1. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
2. Measured the spectrum width with power higher than 6dB below carrier.

4.2.4. Test Setup Layout



4.2.5. Test Deviation

There is no deviation with the original standard.

4.2.6. EUT Operation during Test

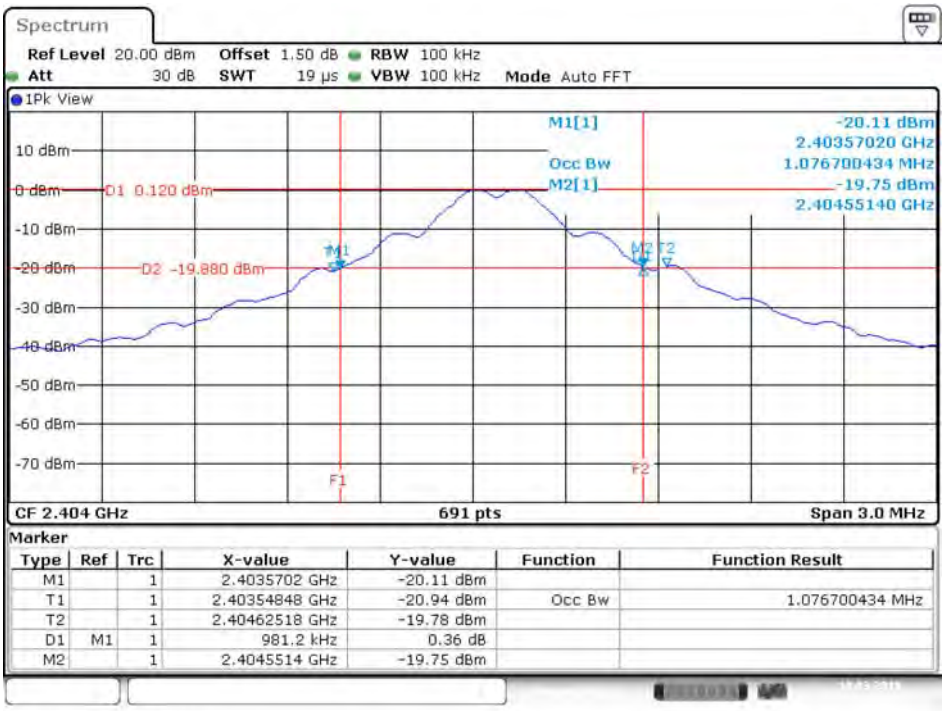
The EUT was programmed to be in continuously transmitting mode.

4.2.7. Test Result of 20dB Spectrum Bandwidth

Temperature	20°C	Humidity	55%
Test Engineer	Jay Luo, Cola Fan	Configurations	Channel 0/4/10

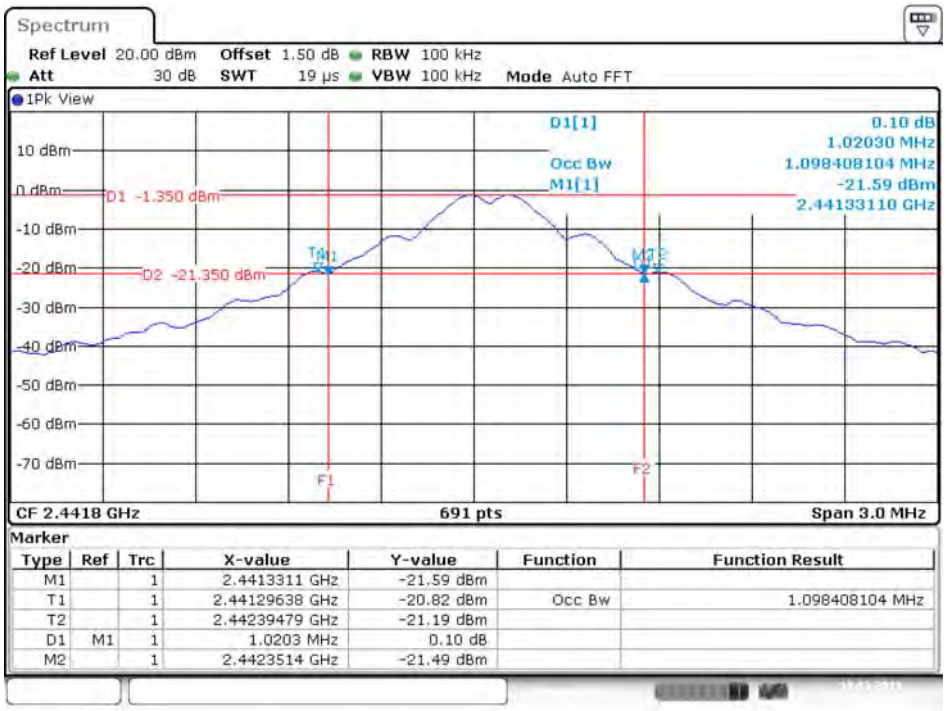
Frequency	20dB BW (MHz)	99% OBW (MHz)	Frequency range (MHz) f_L > 2400MHz	Frequency range (MHz) f_H < 2483.5MHz	Test Result
2404.00 MHz	0.98	1.077	2403.5702	-	Complies
2441.80 MHz	1.02	1.098	-	-	Complies
2479.25 MHz	1.03	1.120	-	2479.8101	Complies

20 dB / 99% Bandwidth Plot on 2404.00 MHz



Date: 10.MAR.2018 13:09:37

20 dB / 99% Bandwidth Plot on 2441.80 MHz

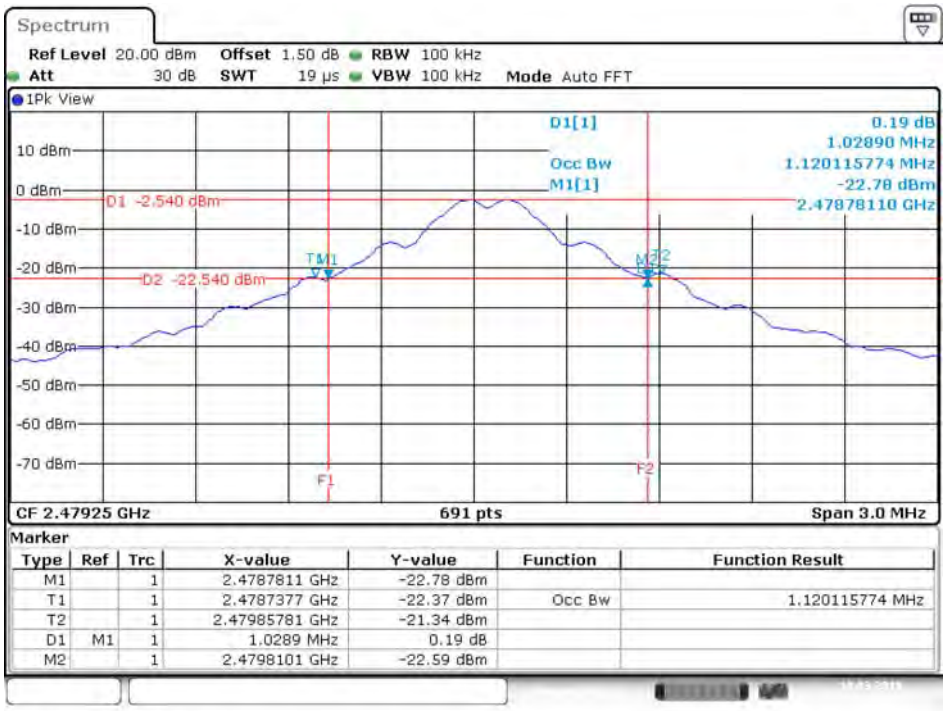


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4413311 GHz	-21.59 dBm		
T1		1	2.44129638 GHz	-20.82 dBm	Occ Bw	1.098408104 MHz
T2		1	2.44239479 GHz	-21.19 dBm		
D1	M1	1	1.0203 MHz	0.10 dB		
M2		1	2.4423514 GHz	-21.49 dBm		

Date: 10.MAR.2018 13:38:58

20 dB / 99% Bandwidth Plot on 2479.25 MHz



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4.3. Radiated Emissions Measurement

4.3.1. 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

4.3.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this 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

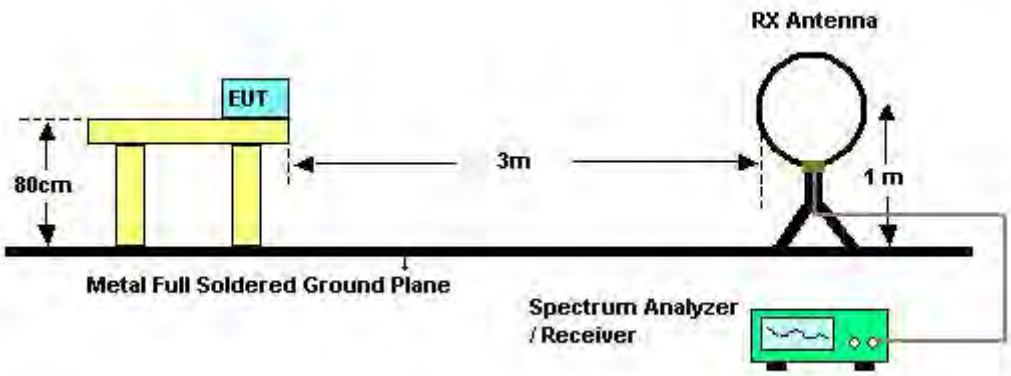
4.3.3. Test Procedures

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.

4.3.4. Test Setup Layout

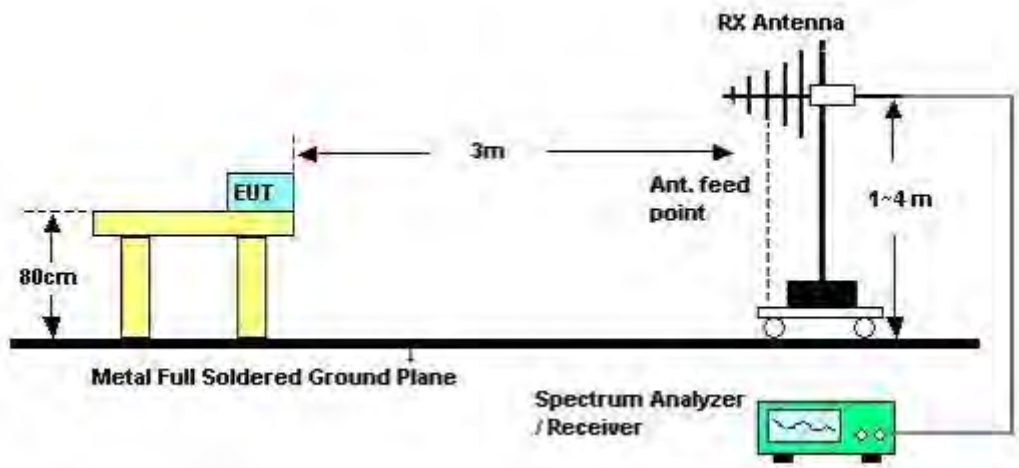
For Radiated Emissions: 9kHz ~30MHz

Intentional – CTX and Unintentional – CRX



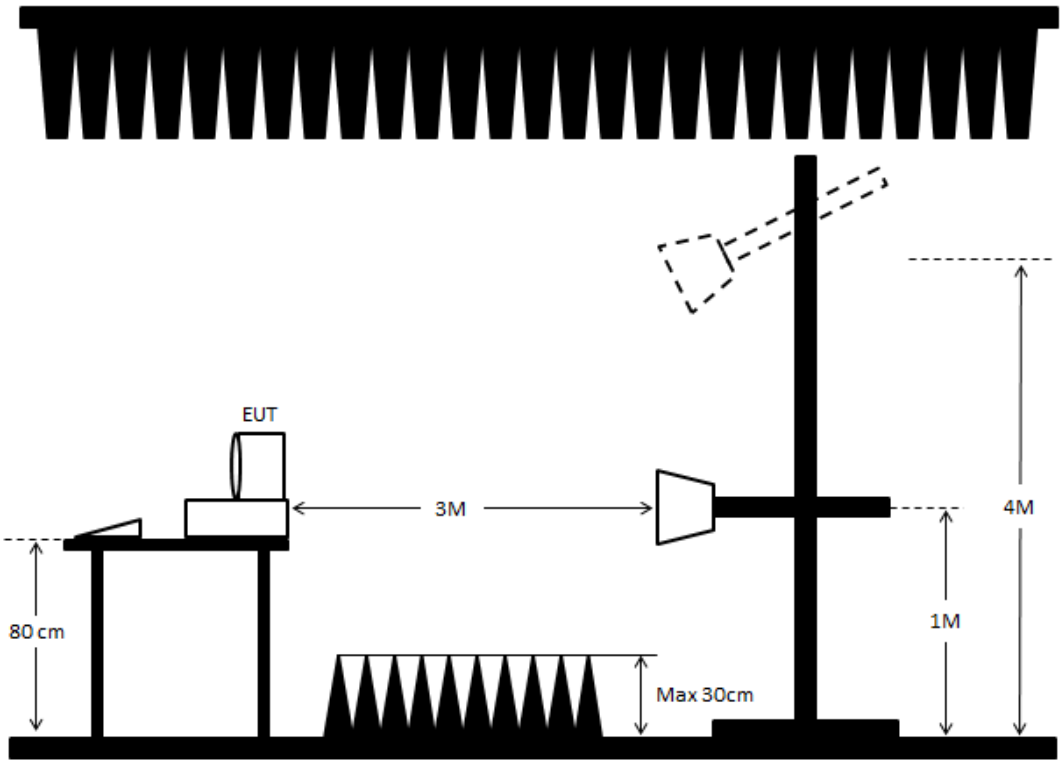
For Radiated Emissions: 30MHz~1GHz

Intentional – CTX and Unintentional – CRX

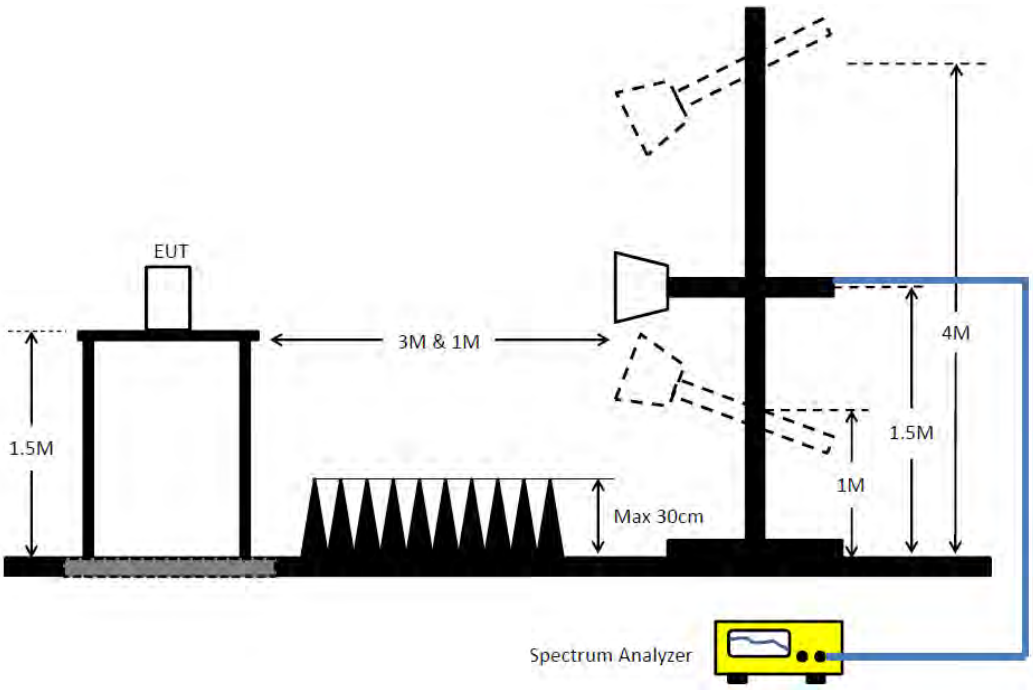


For Radiated Emissions: Above 1GHz

Unintentional 1GHz~5th Harmonic_CRX



Intentional 1GHz~10th Harmonic_CTX



4.3.5. Test Deviation

There is no deviation with the original standard.

4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

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

Temperature	20°C	Humidity	55%
Test Engineer	Jay Luo, Cola Fan	Configurations	Intentional – CTX
Test Mode	Mode 3	Test Date	Feb. 27, 2018 ~ Mar. 10, 2018

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

Note:

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

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

Temperature	20℃	Humidity	55%
Test Engineer	Jay Luo, Cola Fan	Configurations	Unintentional – CRX
Test Mode	Mode 3	Test Date	Feb. 27, 2018 ~ Mar. 10, 2018

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

Note:

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

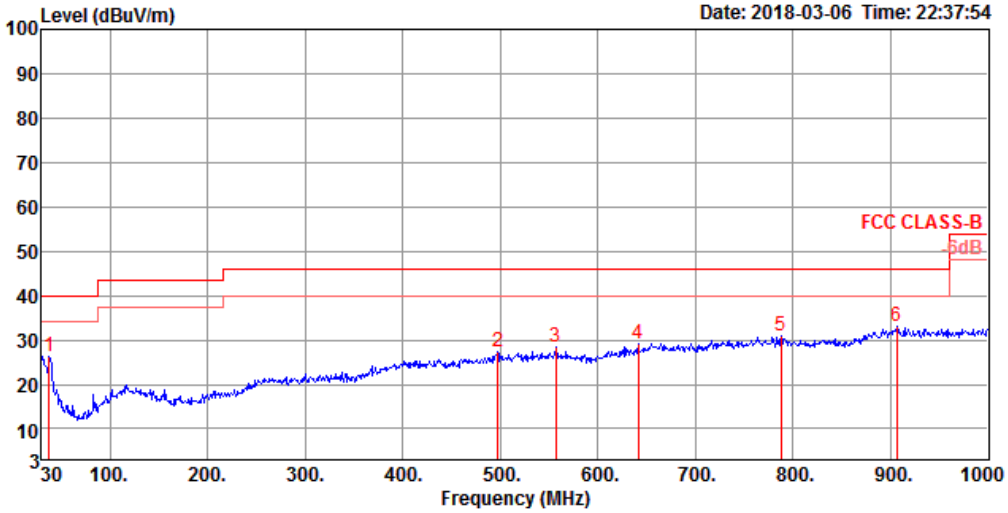
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

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

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

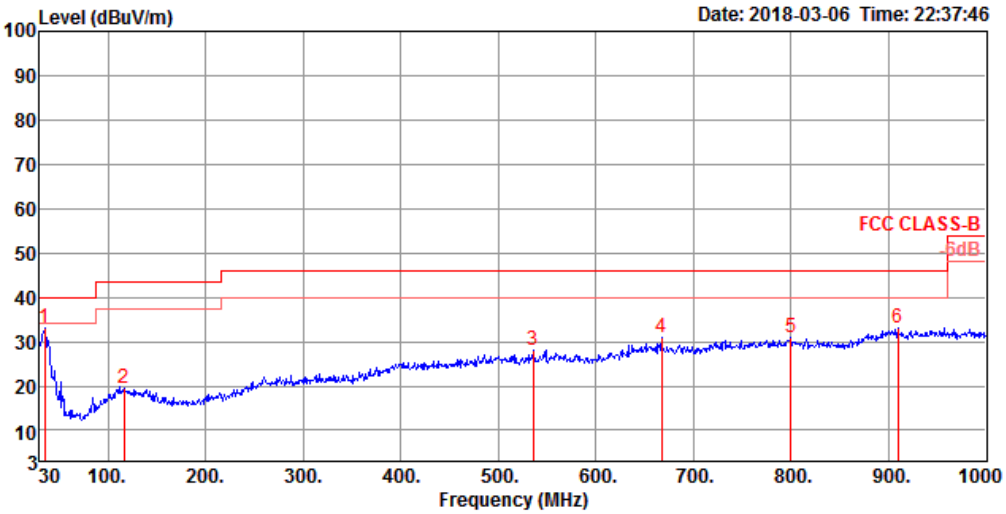
Temperature	20°C	Humidity	55%
Test Engineer	Jay Luo, Cola Fan	Configurations	Intentional – CTX
Test Mode	Mode 3		

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	37.76	26.39	40.00	-13.61	36.70	1.10	21.02	32.43	200	353	Peak	HORIZONTAL
2	497.54	27.19	46.00	-18.81	32.81	2.94	23.77	32.33	200	313	Peak	HORIZONTAL
3	556.71	28.48	46.00	-17.52	33.67	2.62	24.55	32.36	100	118	Peak	HORIZONTAL
4	641.10	29.29	46.00	-16.71	33.05	3.30	25.31	32.37	100	289	Peak	HORIZONTAL
5	787.57	30.97	46.00	-15.03	33.06	3.57	26.49	32.15	100	162	Peak	HORIZONTAL
6	905.91	32.89	46.00	-13.11	32.25	4.67	27.55	31.58	200	254	Peak	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	34.85	33.14	40.00	-6.86	41.79	1.01	22.77	32.43	100	327	Peak	VERTICAL
2	116.33	19.32	43.50	-24.18	32.09	1.09	18.51	32.37	200	252	Peak	VERTICAL
3	535.37	27.91	46.00	-18.09	33.17	2.79	24.30	32.35	100	199	Peak	VERTICAL
4	667.29	30.86	46.00	-15.14	34.30	3.48	25.44	32.36	100	18	Peak	VERTICAL
5	800.18	30.99	46.00	-15.01	33.00	3.51	26.60	32.12	100	99	Peak	VERTICAL
6	909.79	33.02	46.00	-12.98	32.32	4.62	27.58	31.50	100	321	Peak	VERTICAL

Note:

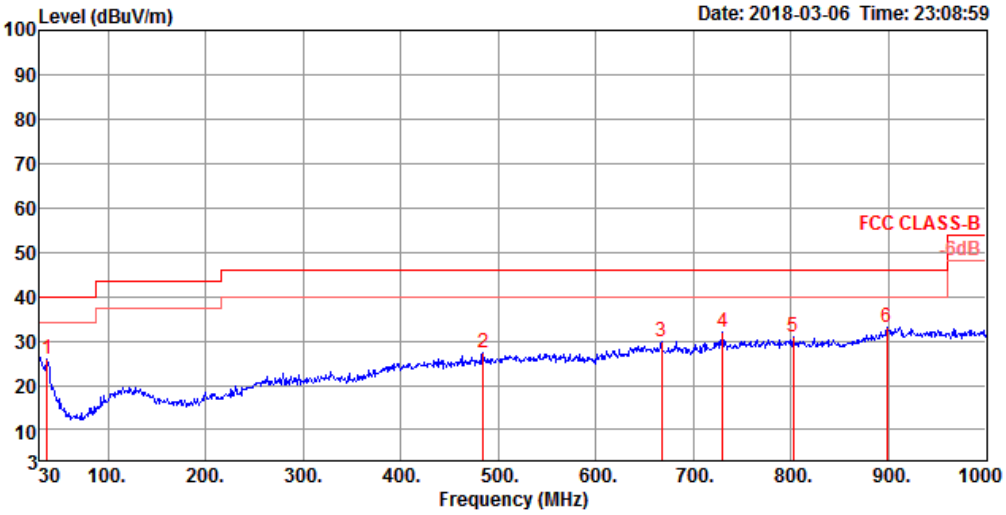
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

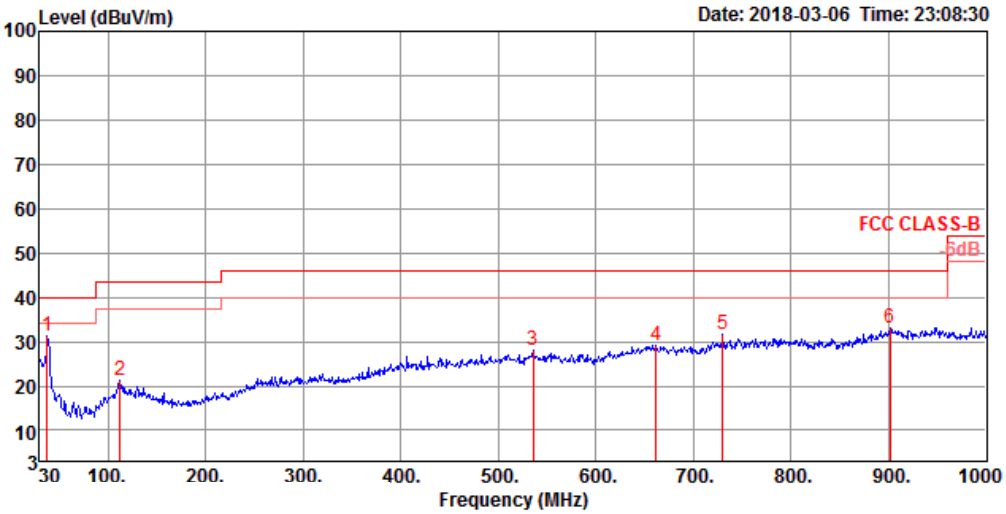
Temperature	20℃	Humidity	55%
Test Engineer	Jay Luo, Cola Fan	Configurations	Unintentional – CRX
Test Mode	Mode 3		

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	37.76	25.84	40.00	-14.16	36.15	1.10	21.02	32.43	200	272	Peak	HORIZONTAL
2	484.93	27.22	46.00	-18.78	33.06	2.89	23.59	32.32	150	202	Peak	HORIZONTAL
3	667.29	29.92	46.00	-16.08	33.36	3.48	25.44	32.36	200	99	Peak	HORIZONTAL
4	730.34	31.82	46.00	-14.18	34.65	3.58	25.86	32.27	200	341	Peak	HORIZONTAL
5	802.12	30.95	46.00	-15.05	32.99	3.45	26.63	32.12	200	18	Peak	HORIZONTAL
6	898.15	33.09	46.00	-12.91	32.61	4.62	27.48	31.62	150	182	Peak	HORIZONTAL

Vertical



	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	37.76	31.44	40.00	-8.56	41.75	1.10	21.02	32.43	200	230	Peak	VERTICAL
2	112.45	21.23	43.50	-22.27	34.24	1.03	18.33	32.37	150	337	Peak	VERTICAL
3	535.37	27.97	46.00	-18.03	33.23	2.79	24.30	32.35	100	167	Peak	VERTICAL
4	661.47	29.14	46.00	-16.86	32.56	3.52	25.42	32.36	150	34	Peak	VERTICAL
5	730.34	31.69	46.00	-14.31	34.52	3.58	25.86	32.27	200	1	Peak	VERTICAL
6	901.06	33.21	46.00	-12.79	32.52	4.77	27.50	31.58	200	34	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).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.3.9. Results of Radiated Emissions (Unintentional 1GHz~5th Harmonic)

Temperature	20℃	Humidity	55%
Test Engineer	Jay Luo, Cola Fan	Configurations	Unintentional – CRX

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	1076.06	25.60	54.00	-28.40	34.74	2.65	23.88	35.67	150	11	Average	HORIZONTAL
2	1076.67	35.00	74.00	-39.00	44.11	2.66	23.89	35.66	150	11	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	1076.00	27.80	54.00	-26.20	36.94	2.65	23.88	35.67	147	148	Average	VERTICAL
2	1076.87	35.95	74.00	-38.05	45.06	2.66	23.89	35.66	147	133	Peak	VERTICAL

Note:

The amplitude of spurious emissions that 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).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.3.10. Results for Radiated Emissions (Intentional 1GHz~10th Harmonic)

Temperature	20°C	Humidity	55%
Test Engineer	Jay Luo, Cola Fan	Configurations	Channel 0
Test Date	Feb. 27, 2018 ~ Mar. 10, 2018		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	4808.16	14.47	54.00	-39.53	9.64	6.44	33.34	34.95	101	312	Average	HORIZONTAL
2	4808.16	54.21	74.00	-19.79	49.38	6.44	33.34	34.95	101	312	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	4808.22	12.94	54.00	-41.06	8.11	6.44	33.34	34.95	124	99	Average	VERTICAL
2	4808.22	52.68	74.00	-21.32	47.85	6.44	33.34	34.95	124	99	Peak	VERTICAL

Temperature	20℃	Humidity	55%
Test Engineer	Jay Luo, Cola Fan	Configurations	Channel 4
Test Date	Feb. 27, 2018 ~ Mar. 10, 2018		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	4883.36	13.97	54.00	-40.03	9.05	6.36	33.51	34.95	100	295	Average	HORIZONTAL
2	4883.36	53.71	74.00	-20.29	48.79	6.36	33.51	34.95	100	295	Peak	HORIZONTAL
3	7325.62	20.10	54.00	-33.90	10.47	8.16	36.69	35.22	101	264	Average	HORIZONTAL
4	7325.62	59.84	74.00	-14.16	50.21	8.16	36.69	35.22	101	264	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	4883.66	12.05	54.00	-41.95	7.13	6.36	33.51	34.95	101	138	Average	VERTICAL
2	4883.66	51.79	74.00	-22.21	46.87	6.36	33.51	34.95	101	138	Peak	VERTICAL
3	7325.50	19.55	54.00	-34.45	9.92	8.16	36.69	35.22	282	281	Average	VERTICAL
4	7325.50	59.29	74.00	-14.71	49.66	8.16	36.69	35.22	282	281	Peak	VERTICAL

Temperature	20℃	Humidity	55%
Test Engineer	Jay Luo, Cola Fan	Configurations	Channel 10
Test Date	Feb. 27, 2018 ~ Mar. 10, 2018		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	4958.52	13.55	54.00	-40.45	8.50	6.28	33.72	34.95	101	285	Average	HORIZONTAL
2	4958.52	53.29	74.00	-20.71	48.24	6.28	33.72	34.95	101	285	Peak	HORIZONTAL
3	7437.77	19.75	54.00	-34.25	9.64	8.35	36.98	35.22	101	267	Average	HORIZONTAL
4	7437.77	59.49	74.00	-14.51	49.38	8.35	36.98	35.22	101	267	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	4958.54	12.38	54.00	-41.62	7.33	6.28	33.72	34.95	101	123	Average	VERTICAL
2	4958.54	52.12	74.00	-21.88	47.07	6.28	33.72	34.95	101	123	Peak	VERTICAL
3	7437.87	19.23	54.00	-34.77	9.12	8.35	36.98	35.22	271	281	Average	VERTICAL
4	7437.87	58.97	74.00	-15.03	48.86	8.35	36.98	35.22	271	281	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).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.4. Band Edge Emissions Measurement

4.4.1. 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

4.4.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this 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

4.4.3. Test Procedures

The test procedure is the same as section 4.3.3.

4.4.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.3.4.

4.4.5. Test Deviation

There is no deviation with the original standard.

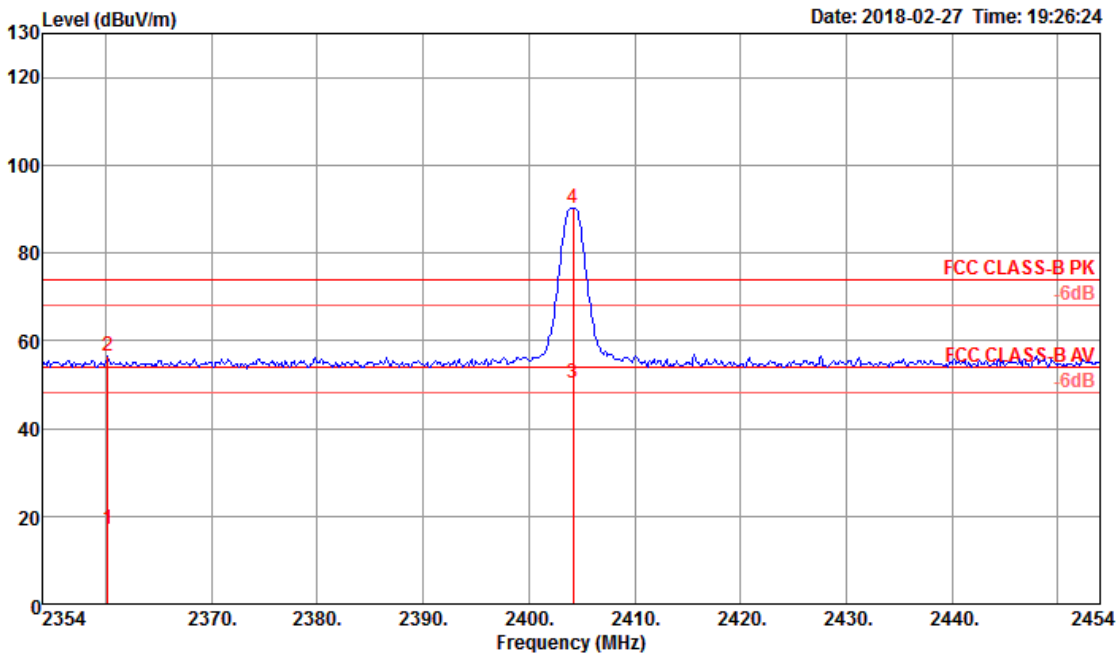
4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.4.7. Test Result of Band Edge and Fundamental Emissions

Temperature	20°C	Humidity	55%
Test Engineer	Jay Luo, Cola Fan	Configurations	Channel 0, 4, 10
Test Date	Feb. 27, 2018 ~ Mar. 10, 2018		

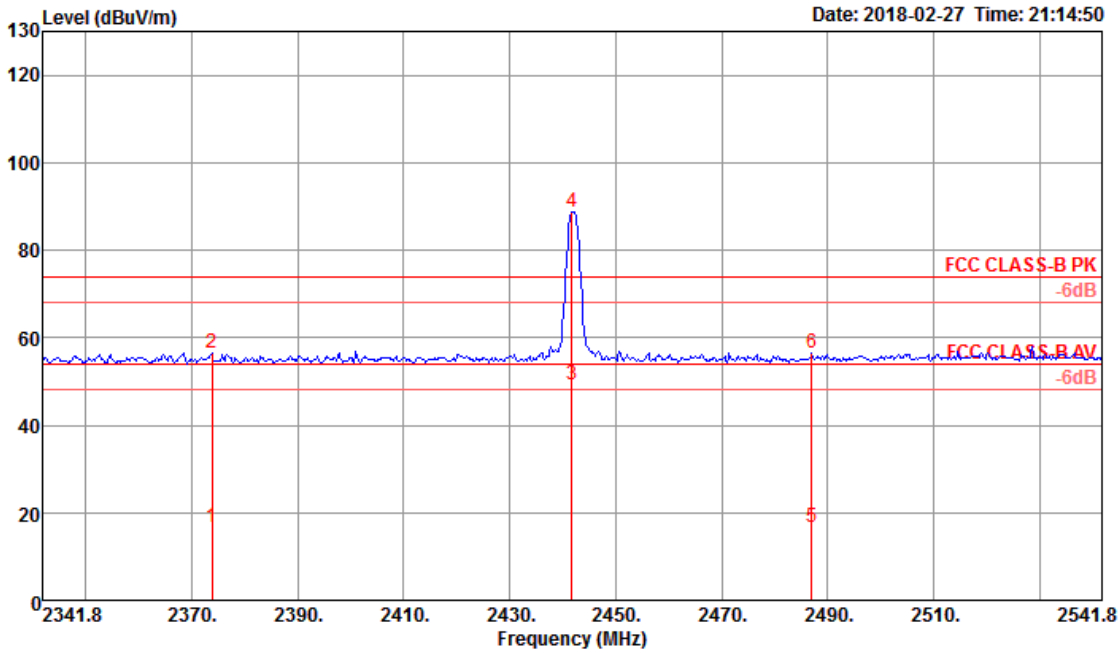
Channel 0



	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	2360.20	16.87	54.00	-37.13	-15.18	3.93	28.12	0.00	284	52	Average	VERTICAL
2	2360.20	56.61	74.00	-17.39	24.56	3.93	28.12	0.00	284	52	Peak	VERTICAL
3	2404.20	50.34			18.14	3.97	28.23	0.00	284	52	Average	VERTICAL
4 @	2404.20	90.08			57.88	3.97	28.23	0.00	284	52	Peak	VERTICAL

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

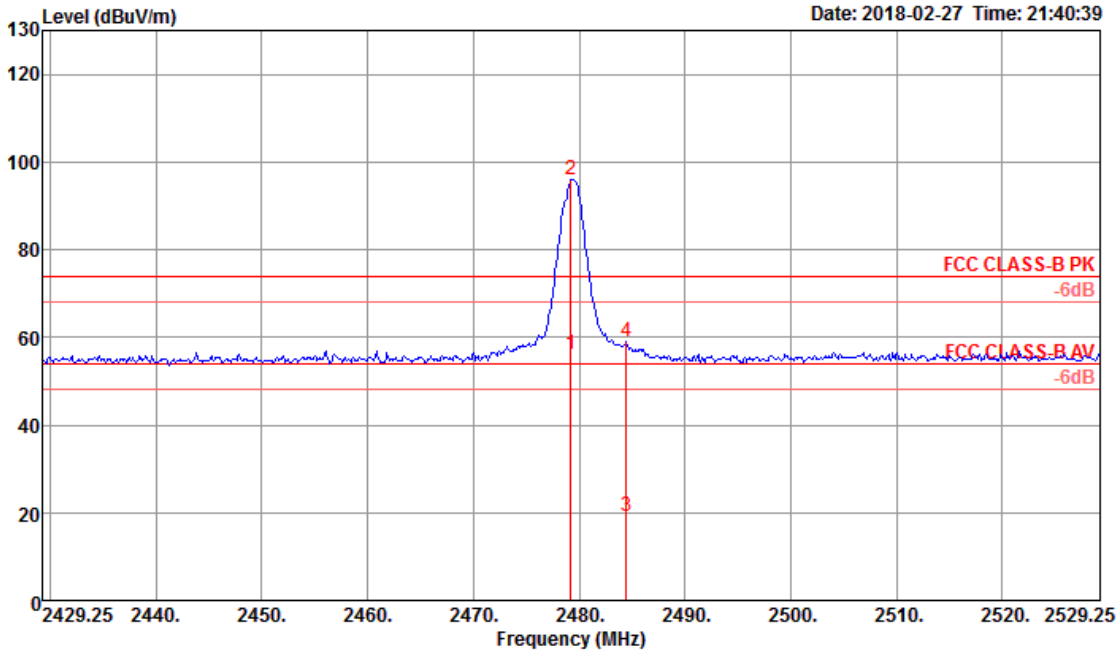
Channel 4



	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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	2373.80	16.79	54.00	-37.21	-15.31	3.94	28.16	0.00	282	35	Average	VERTICAL
2	2373.80	56.53	74.00	-17.47	24.43	3.94	28.16	0.00	282	35	Peak	VERTICAL
3	2441.80	49.08			16.77	4.01	28.30	0.00	282	35	Average	VERTICAL
4 @	2441.80	88.82			56.51	4.01	28.30	0.00	282	35	Peak	VERTICAL
5	2487.00	16.59	54.00	-37.41	-15.83	4.05	28.37	0.00	282	35	Average	VERTICAL
6	2487.00	56.33	74.00	-17.67	23.91	4.05	28.37	0.00	282	35	Peak	VERTICAL

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

Channel 10



	Freq	Level	Limit Line	Over Limit	Read Level	Cable 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 @	2479.25	56.07			23.66	4.04	28.37	0.00	113	37	Average	HORIZONTAL
2 @	2479.25	95.81			63.40	4.04	28.37	0.00	113	37	Peak	HORIZONTAL
3	2484.45	19.30	54.00	-34.70	-13.12	4.05	28.37	0.00	113	37	Average	HORIZONTAL
4	2484.45	59.04	74.00	-14.96	26.62	4.05	28.37	0.00	113	37	Peak	HORIZONTAL

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

Note:

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

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

4.5. Antenna Requirements

4.5.1. 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.

4.5.2. Antenna Connector Construction

Please refer to section 3.3 in this test report, antenna connector complied with the requirements.

5. 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. 30, 2017	Aug. 29, 2018	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	9610-4976	1GHz ~ 18GHz	Apr. 27, 2017	Apr. 26, 2018	Radiation (03CH01-CB)
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Jul. 05, 2017	Jul. 04, 2018	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Mar. 15, 2018*	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2017	May 01, 2018	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. 10, 2017	Jul. 09, 2018	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSU	100015	9kHz~26GHz	Apr. 06, 2017	Apr. 05, 2018	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100355	9kHz ~ 2.75GHz	May 06, 2017	May 05, 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	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-40G#2	N/A	18GHz ~ 40 GHz	Oct. 11, 2017	Oct. 10, 2018	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-I0-7	N/A	N/A	N/A	Radiation (03CH01-CB)

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

"*" Calibration Interval of instruments listed above is two years.

6. 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%