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NCC RADIO TEST REPORT

Applicant's company	光寶科技股份有限公司
Applicant Address	台北市內湖區瑞光路 392 號 22 樓
Manufacturer's company	LITE-ON TECHNOLOGY (Changzhou) CO., LTD
Manufacturer Address	A9 Building, No. 88 Yanghu Road, Wujin Hi-Tech Industrial Development Zone, Changzhou City, Jiangsu Province 213100 China

Product Name	Bluetooth Module
Brand Name	LITE-ON
Model Name	WB116A
Test Rule	NCC LP0002 Section 3.10.1
Test Freq. Range	2402 ~ 2480MHz
Received Date	Sep. 10, 2015
Final Test Date	Jun. 19, 2017
Submission Type	Slight Change

Statement

Test result included is only for the Bluetooth BR/EDR of the product.

The test result in this report refers exclusively to the presented test model / sample.

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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, DA-00705** and **NCC LP0002 (Aug. 23, 2016)**.

The test equipment used to perform the test is calibrated and traceable to NML/ROC.



Table of Contents

1. VERIFICATION OF COMPLIANCE	1
2. SUMMARY OF THE TEST RESULT	2
3. GENERAL INFORMATION	3
3.1. Product Details.....	3
3.2. Accessories.....	3
3.3. Table for Filed Antenna.....	4
3.4. Table for Carrier Frequencies	5
3.5. Table for Test Modes	5
3.6. Table for Testing Locations.....	6
3.7. Table for Slight Change	6
3.8. Table for Supporting Units	6
3.9. Test Configurations	7
4. TEST RESULT	8
4.1. Radiated Emissions Measurement	8
4.2. Antenna Requirements	17
5. LIST OF MEASURING EQUIPMENTS	18
6. MEASUREMENT UNCERTAINTY.....	19
APPENDIX A. TEST PHOTOS	A1 ~ A3

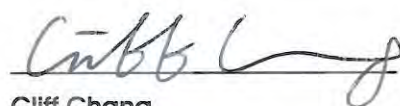
History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
TR590912-03	Rev. 01	Initial issue of report	Aug. 08, 2017

1. VERIFICATION OF COMPLIANCE

Product Name : Bluetooth Module
Brand Name : LITE-ON
Model No. : WB116A
Applicant : 光寶科技股份有限公司
Test Rule Part(s) : NCC LP0002 Section 3.10.1

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Sep. 10, 2015 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.



Cliff Chang

SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: NCC LP0002 (Aug. 23, 2016)			
Part	Rule Section	Description of Test	Result
4.1	3.10.1.5	Radiated Emissions	Complies
4.2	3.10.1.4	Antenna Requirements	Complies

3. GENERAL INFORMATION

3.1. Product Details

Items	Description
Power Type	From host system
Modulation	FHSS (GFSK / $\pi/4$ -DQPSK / 8DPSK)
Data Rate (Mbps)	GFSK: 1 ; $\pi/4$ -DQPSK: 2 ; 8DPSK: 3
Frequency Range	2402 ~ 2480MHz
Channel Number	79
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3
Note 1: Bluetooth BR uses a combination of GFSK (1Mbps).	
Note 2: Bluetooth EDR uses a combination of $\pi/4$ -DQPSK (2Mbps) and 8DPSK (3Mbps).	

3.2. Accessories

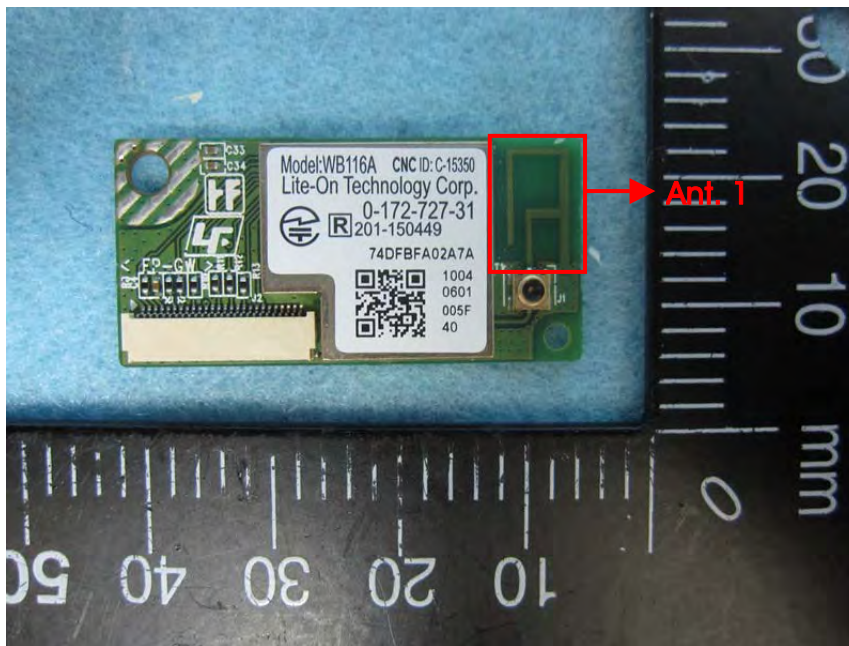
N/A

3.3. Table for Filed Antenna

Ant.	Brand Holder	Model Name	Antenna Type	Connector	Gain (dBi)
1	SONY Corporation	WB116A	Printed Antenna	N/A	0.24

Note: The EUT has one antenna.

Only Ant. 1 can be used as transmitting/receiving antenna.



3.4. Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400~2483.5MHz	0	2402 MHz	39	2441 MHz
	1	2403 MHz	40	2442 MHz
	:	:	:	:
	37	2439 MHz	77	2479 MHz
	38	2440 MHz	78	2480 MHz

3.5. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel	Antenna
Radiated Emissions Below 1GHz	Unintentional-Normal Link / Intentional-CTX	-	-	-

The following test modes were performed for all tests:

For Radiated Emission test (Below 1GHz):

Intentional-CTX

Mode 1. Intentional-CTX_EUT in X axis_EUT (18 Pin)

Mode 2. Intentional-CTX_EUT in Y axis_EUT (18 Pin)

Mode 3. Intentional-CTX_EUT in Z axis_EUT (18 Pin)

Mode 2 is the worst case, so it was selected to record in this test report

Unintentional Normal Link

Mode 1. Unintentional-Normal Link_EUT in X axis_EUT (18 Pin)

Mode 2. Unintentional-Normal Link_EUT in Y axis_EUT (18 Pin)

Mode 3. Unintentional-Normal Link_EUT in Z axis_EUT (18 Pin)

Mode 2 is the worst case, so it was selected to record in this test report

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	-
CO01-CB	Conduction	Hsin Chu	TW0006	IC 4086D	-

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

3.7. Table for Slight Change

This product is an extension of original report under Sporton project number: TR590912

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

Modifications	Performance Checking
1. Adding GPIO on EUT 2	Radiated Emissions (Below 1 GHz)
2. Updating Chip P/N to "AB1520" from "AB1520H"	
3. Updating Standard to "NCC LP0002 (Aug. 23, 2016)." from "NCC LP0002 (Jun. 28, 2011)."	Do not effect the test result.

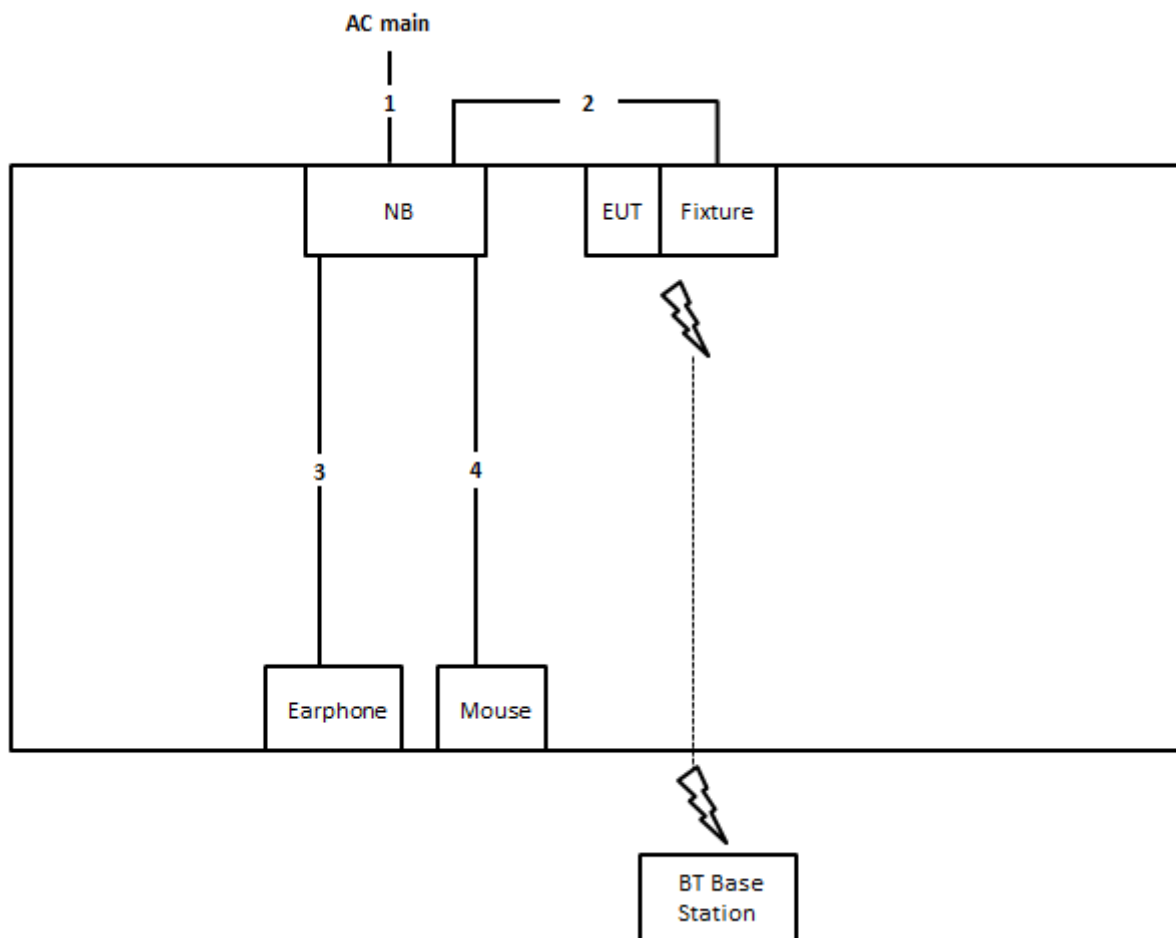
3.8. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
NB	DELL	E4300	DoC
Mouse	Logitech	M-U0026	DoC
Earphone	e-Power	S90W	N/A
Test fixture	LITE-ON	E198681	N/A
BT base station	Anritsu	MT8852B	N/A

3.9. Test Configurations

3.9.1. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz



Item	Connection	Shielded	Length
1	Power cable	No	2.6m
2	USB cable	Yes	1m
3	USB cable	Yes	1.8m
4	Audio cable	No	1.4m

4. TEST RESULT

4.1. Radiated Emissions Measurement

4.1.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 2.7, then the 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

4.1.2. Measuring Instruments and Setting

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

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

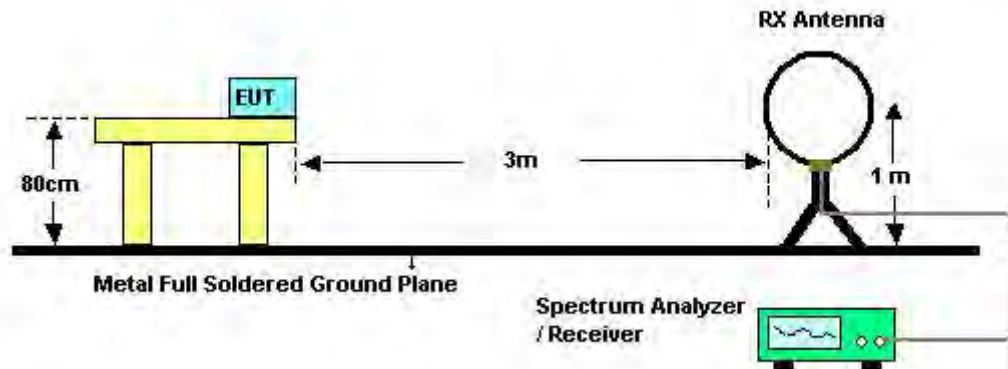
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz, RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz, RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz, RBW 120kHz for QP

4.1.3. Test Procedures

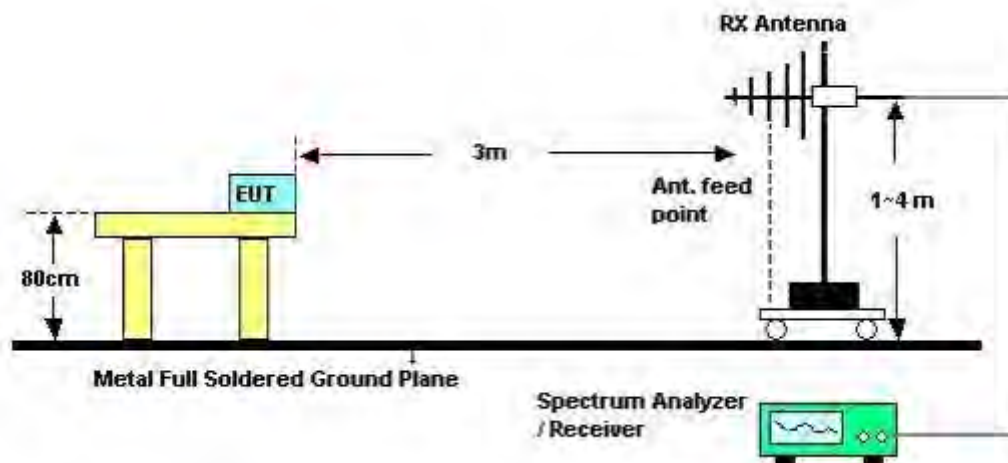
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 1m & 3m far away from the turntable.
2. Power on the EUT and all the supporting 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.

4.1.4. Test Setup Layout

For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



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

Temperature	24°C	Humidity	54%
Test Engineer	Eason Chen & Mason Chen	Test Date	Jun. 19, 2017
Configurations	Intentional-CTX	Test Mode	Mode 2

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

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

Temperature	24°C	Humidity	54%
Test Engineer	Eason Chen	Test Date	Jun. 12, 2017
Configurations	Unintentional-Normal Link	Test Mode	Mode 2

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.

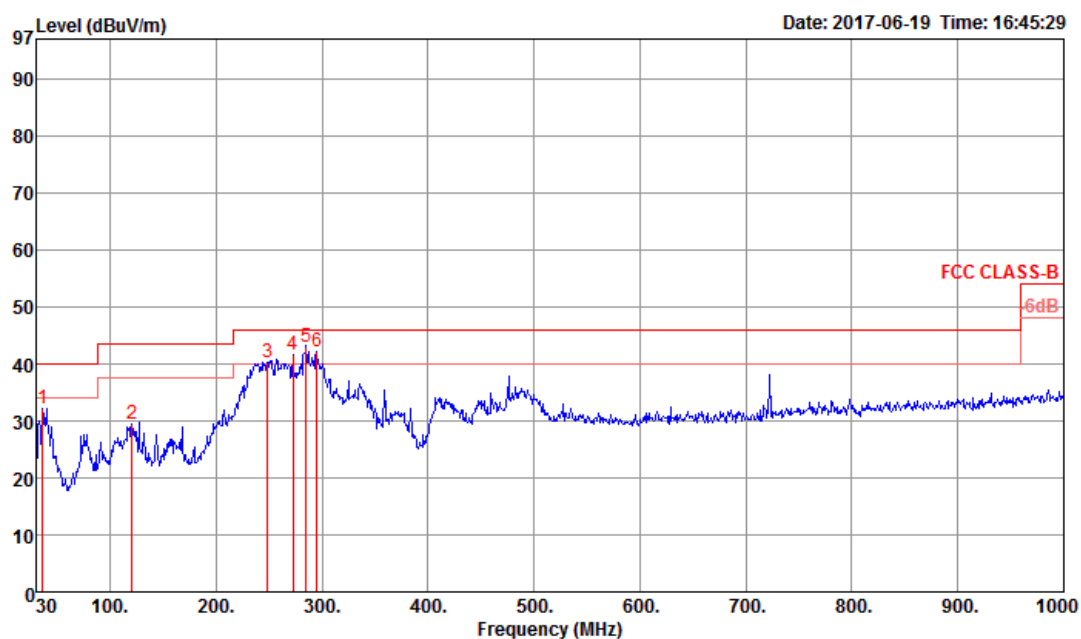
Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB);

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

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

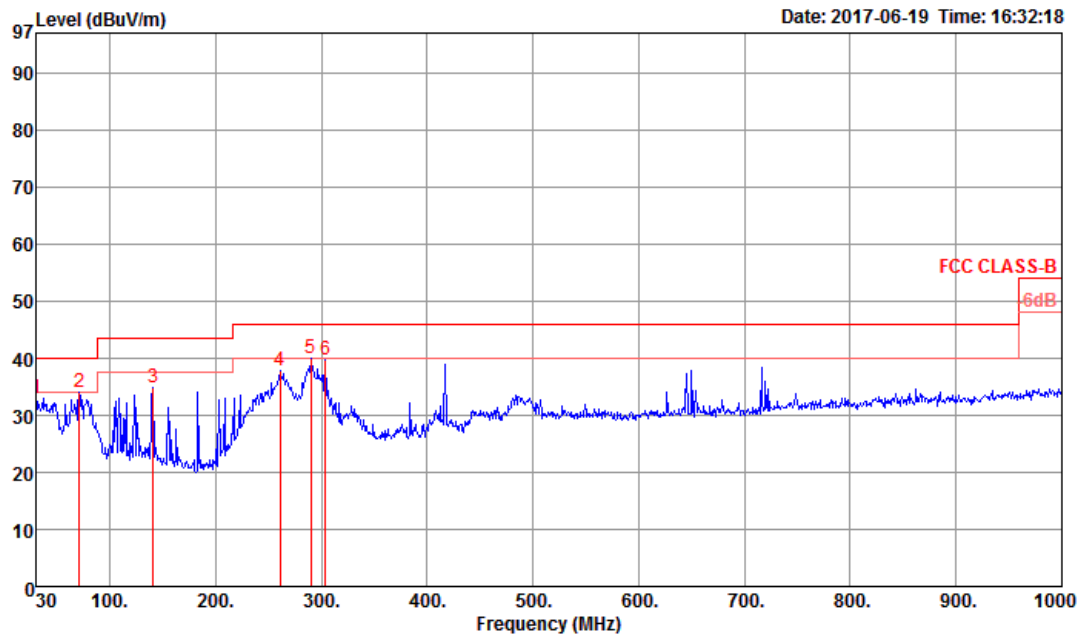
Temperature	24°C	Humidity	54%
Test Engineer	Eason Chen & Mason Chen	Configurations	Intentional-CTX
Test Mode	Mode 2		

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	35.82	32.16	40.00	-7.84	36.12	2.15	22.47	28.58	100	360	Peak	HORIZONTAL
2	120.21	29.55	43.50	-13.95	37.59	2.30	17.99	28.33	100	360	Peak	HORIZONTAL
3	248.25	40.35	46.00	-5.65	47.55	2.59	18.14	27.93	100	360	Peak	HORIZONTAL
4	272.50	41.66	46.00	-4.34	47.89	2.68	18.96	27.87	100	360	Peak	HORIZONTAL
5	285.11	42.99	46.00	-3.01	49.39	2.72	18.72	27.84	100	360	QP	HORIZONTAL
6	294.81	42.28	46.00	-3.72	48.41	2.75	18.94	27.82	100	360	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	33.04	40.00	-6.96	35.28	2.10	24.24	28.58	200	0 Peak	VERTICAL
2	70.74	34.07	40.00	-5.93	48.01	2.21	12.34	28.49	200	0 Peak	VERTICAL
3	140.58	34.75	43.50	-8.75	43.67	2.30	17.02	28.24	200	0 Peak	VERTICAL
4	260.86	37.73	46.00	-8.27	43.50	2.63	19.50	27.90	200	0 Peak	VERTICAL
5	289.96	39.98	46.00	-6.02	46.25	2.73	18.83	27.83	200	0 Peak	VERTICAL
6	303.54	39.63	46.00	-6.37	45.56	2.78	19.12	27.83	200	0 Peak	VERTICAL

Note:

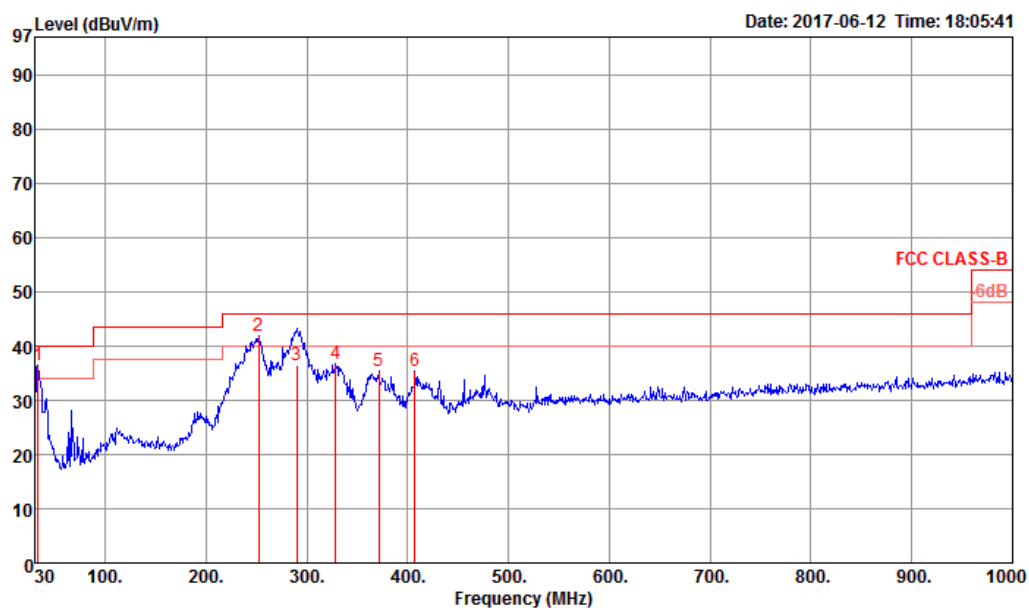
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

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

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

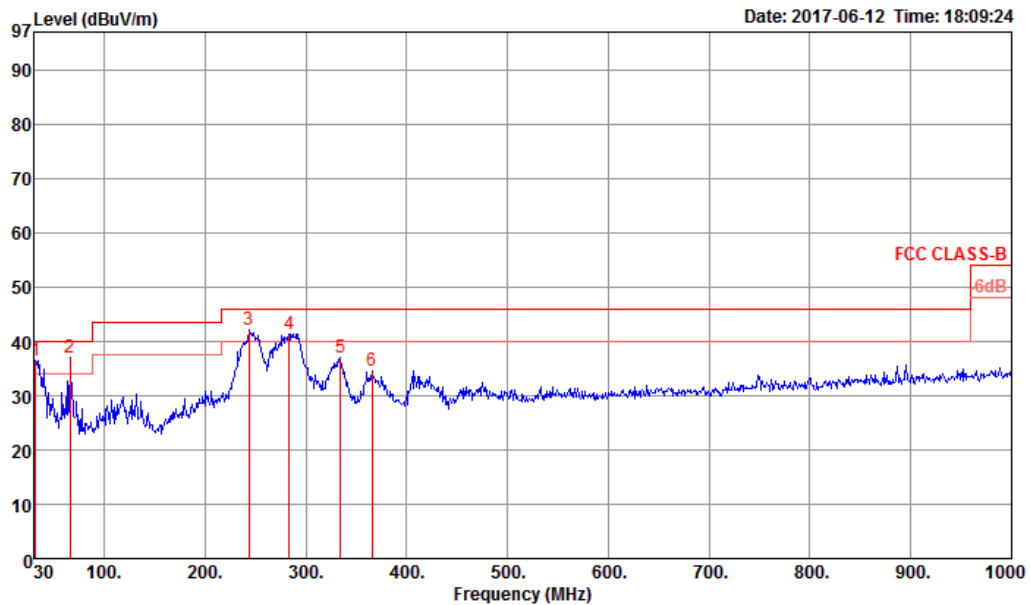
Temperature	24°C	Humidity	54%
Test Engineer	Eason Chen	Configurations	Unintentional-Normal Link
Test Mode	Mode 2		

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	32.91	36.42	40.00	-3.58	39.31	2.14	23.55	28.58	100	0 Peak	HORIZONTAL
2	252.13	41.83	46.00	-4.17	48.58	2.60	18.57	27.92	100	0 Peak	HORIZONTAL
3	289.96	36.43	46.00	-9.57	42.70	2.73	18.83	27.83	167	151 QP	HORIZONTAL
4	328.76	36.88	46.00	-9.12	42.52	2.89	19.57	28.10	100	0 Peak	HORIZONTAL
5	371.44	35.29	46.00	-10.71	40.08	3.03	20.68	28.50	100	0 Peak	HORIZONTAL
6	407.33	35.27	46.00	-10.73	39.04	3.12	21.88	28.77	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	31.94	36.53	40.00	-3.47	39.22	2.12	23.77	28.58	400	0 Peak	VERTICAL
2	65.89	36.96	40.00	-3.04	51.13	2.18	12.16	28.51	400	0 Peak	VERTICAL
3	243.40	42.12	46.00	-3.88	49.98	2.58	17.50	27.94	400	0 Peak	VERTICAL
4	283.17	41.43	46.00	-4.57	47.90	2.71	18.67	27.85	400	0 Peak	VERTICAL
5	334.58	36.91	46.00	-9.09	42.46	2.91	19.68	28.14	400	0 Peak	VERTICAL
6	365.62	34.56	46.00	-11.44	39.39	3.02	20.58	28.43	400	0 Peak	VERTICAL

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB 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.

4.2. Antenna Requirements

4.2.1. 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.

4.2.2. 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	Remark
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	May 06, 2015	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Mar. 16, 2016*	Radiation (03CH01-CB)
BILOG ANTENNA with 6dB Attenuator	TESEQ & EMCI	CBL6112D & N-6-06	37880 & AT-N0609	20MHz ~ 2GHz	Aug. 30, 2016	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Feb. 24, 2015	Radiation (03CH01-CB)
Pre-Amplifier	EMCI	EMC330N	980332	20MHz ~ 3GHz	May 02, 2017	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 06, 2014	Radiation (03CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	Nov. 22, 2016	Radiation (03CH01-CB)
EMI Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8.4GHz	Jan. 21, 2015	Radiation (03CH01-CB)
EMI Test	R&S	ESCS	100355	9kHz ~ 2.75GHz	May 06, 2017	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz ~ 1 GHz	Nov. 15, 2014	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-16+17	N/A	30 MHz ~ 1 GHz	Oct. 24, 2016	Radiation (03CH01-CB)
Test Software	Audix	E3	6.2009-10-7	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%

Appendix A. Test Photos

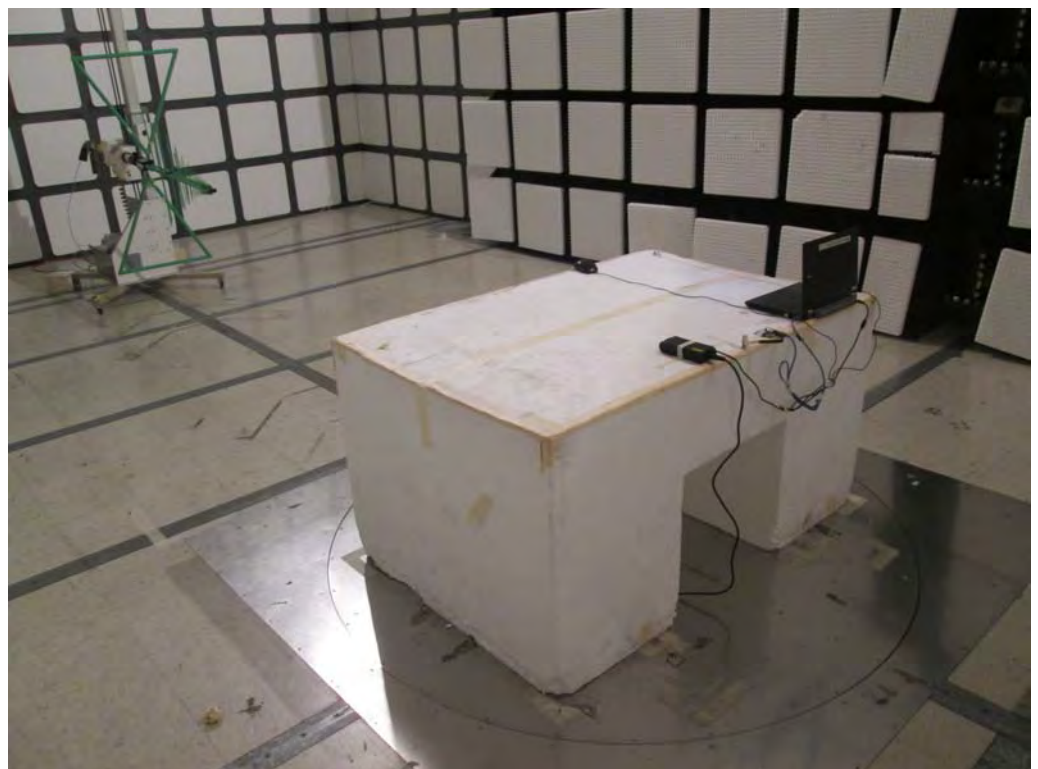
1. Photographs of Radiated Emissions Test Configuration

Test Configuration: 30MHz~1GHz / Test Mode: Mode 2

FRONT VIEW



REAR VIEW



CLOSE-UP VIEW

