

FCC

EMC

TEST REPORT

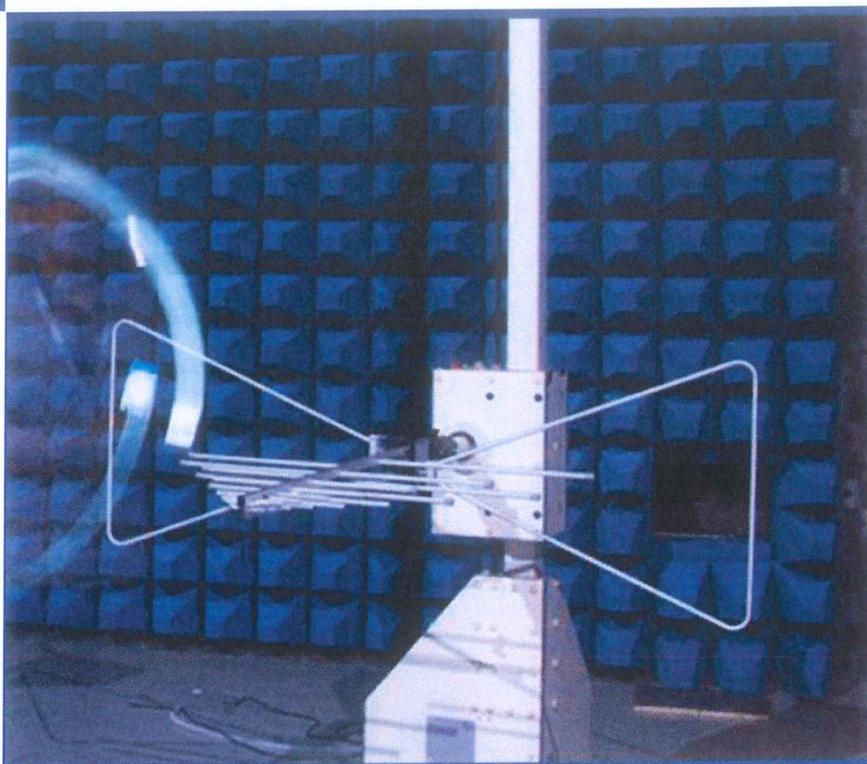
ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



FOR
mAntenna B1

ISSUED TO
Megabyte Limited

Unit 507, 5/F, Building 12W, No. 12 Science Park West Avenue, Hong Kong Science Park, Shatin, New Territories, Hong Kong



Tested by: Xia Long
Xia Long
(Engineer)
Date: May 04, 2017

Approved by: [Signature]
Wei Yanquan
(Chief Engineer)
Date: May 04, 2017



Report No.: BL-SZ1720204-401
EUT Name: mAntenna B1
Model Name: ANT1B-MB
Brand Name: myndar
Test Standard: 47 CFR Part 15 Subpart B

Test Conclusion: Pass
Test Date: Mar. 05, 2017 ~ Mar. 13, 2017
Date of Issue: May 04, 2017

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Revision History

<u>Version</u>	<u>Issue Date</u>	<u>Revisions Content</u>
<u>Rev. 01</u>	<u>May 04, 2017</u>	<u>Initial Issue</u>

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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	<p>The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1.</p> <p>The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 832625.</p> <p>The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.</p>
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20°C~25°C
Ambient Relative Humidity	45% - 55%
Ambient Pressure	100 kPa - 102 kPa

1.4 Announce

- (1) The test report reference to the report template version v6.3.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Megabyte Limited
Address	Unit 507, 5/F, Building 12W, No. 12 Science Park West Avenue, Hong Kong Science Park, Shatin, New Territories, Hong Kong

2.2 Manufacturer Information

Manufacturer	Megabyte Limited
Address	Unit 507, 5/F, Building 12W, No. 12 Science Park West Avenue, Hong Kong Science Park, Shatin, New Territories, Hong Kong

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	mAntenna B1
Model Name Under Test	ANT1B-MB
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	QA3
Software Version	N/A
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A
The Highest Speed of Processor	N/A
Network and Wireless connectivity	Bluetooth

2.5 Ancillary Equipment

Ancillary Equipment 1	Connecting Line	
	Length (Approx.)	15.51 M

2.6 Technical Information

Note: Not applicable.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	FCC 47 CFR Part 15 Subpart B (10-1-15 Edition)	Unintentional Radiators
2	ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low- Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

3.2 Verdict

No.	Description	FCC Rule	Test Verdict	Result
1	Radiated Emission	15.109	Pass	Annex A .1
2	Conducted Emission, AC Ports	15.107	Pass	Annex A .2

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)	3.23 dB
Radiated emissions (30 MHz-1 GHz)	4.30 dB
Radiated emissions (1 GHz-18 GHz)	4.81 dB
Radiated emissions (18 GHz-40 GHz)	5.71 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

Environment Parameter	Selected Values During Tests			
	Temperature	Voltage	Relative Humidity	Ambient Pressure
Normal Temperature, Normal Voltage (NTNV)	23°C~26°C	DC 5 V	50%-55%	100 to 102 kPa

4.2 Test Equipment List

Radiated Emission Test For Frequency Below 1 GHz						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2016.07.05	2017.07.04	<input checked="" type="checkbox"/>
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-977	2016.07.19	2018.07.18	<input checked="" type="checkbox"/>
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	9120D-1148	2015.07.22	2017.07.21	<input type="checkbox"/>
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	N/A	2016.08.09	2018.08.08	<input checked="" type="checkbox"/>

Radiated Emission Test For Frequency Above 1 GHz						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9038A	MY53220118	2016.09.09	2017.09.08	<input checked="" type="checkbox"/>
Test Antenna-Bi-Log	SCHWARZBECK	VULB 9163	9163-624	2015.07.22	2017.07.21	<input type="checkbox"/>
Test Antenna-Horn	SCHWARZBECK	BBHA 9120D	9120D-1148	2015.07.22	2017.07.21	<input checked="" type="checkbox"/>
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2017.02.21	2019.02.20	<input checked="" type="checkbox"/>

Conducted disturbance Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2016.07.05	2017.07.04	<input checked="" type="checkbox"/>
LISN	SCHWARZBECK	NSLK 8127	8127-687	2016.07.05	2017.07.04	<input checked="" type="checkbox"/>
Shielded Enclosure	ChangNing	CN-130701	130703	N/A	N/A	<input checked="" type="checkbox"/>

4.3 Test Enclosure list

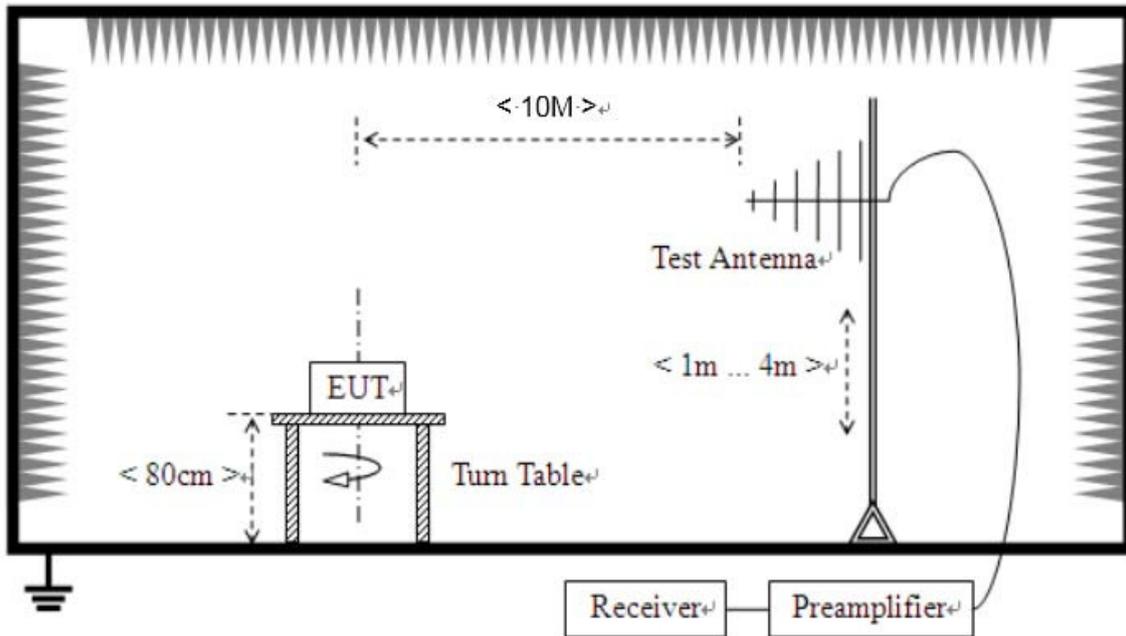
Description	Manufacturer	Model	Serial No.	Length	Description	Use
PC	N/A	N/A	N/A	N/A	Special Handled	<input type="checkbox"/>
Laptop	Apple	A1465	N/A	N/A	N/A	<input type="checkbox"/>
Laptop	Lenovo	E31	R3026PU9	N/A	N/A	<input checked="" type="checkbox"/>
Printer	HP	DESKJET 1000	N/A	N/A	N/A	<input type="checkbox"/>
Keyboard	Logitech	Y-BP62a	N/A	N/A	N/A	<input type="checkbox"/>
Mouse	Logitech	M100	N/A	N/A	N/A	<input type="checkbox"/>
USB disk	Kingston	N/A	N/A	N/A	N/A	<input type="checkbox"/>
TF Card	Kingston	N/A	N/A	N/A	N/A	<input type="checkbox"/>
VGA Cable	N/A	N/A	N/A	1.5 m	Shielded with core	<input type="checkbox"/>
HDMI Cable	N/A	N/A	N/A	1.5 m	Shielded with core	<input type="checkbox"/>
DVI Cable	N/A	N/A	N/A	1.5 m	Shielded with core	<input type="checkbox"/>
Coaxial video cable	N/A	N/A	N/A	2.0 m	Shielded with core	<input type="checkbox"/>
iPhone	Apple	A1586	N/A	N/A	N/A	<input type="checkbox"/>
Bluetooth Earphone	SAMSUNG	Gear Circle	N/A	N/A	N/A	<input type="checkbox"/>
GPS/GLONASS Vector signal generator	R&S	N5172B EXG	N/A	N/A	N/A	<input type="checkbox"/>
WIFI Router	TP-LINK	TL-WDR7500	N/A	N/A	N/A	<input type="checkbox"/>
Earphone	N/A	OPPO	N/A	1.1 m	N/A	<input type="checkbox"/>
Car Battery	Camel	55530	N/A	N/A	12 V/55 Ah	<input type="checkbox"/>
Artificial load	N/A	N/A	N/A	N/A	2.5 Ω/100 W	<input type="checkbox"/>
Artificial load	N/A	N/A	N/A	N/A	5 Ω/100 W	<input type="checkbox"/>
Electronic Load	ITECH	IT8511	N/A	N/A	N/A	<input type="checkbox"/>
USB Cable	N/A	N/A	N/A	1.5 m	Shielded with core	<input type="checkbox"/>
DC Power Supply	ITECH	IT6863A	60001401068 7210006	N/A	N/A	<input type="checkbox"/>
LCD Monitor	SAMSUNG	UA32C4000P	N/A	N/A	N/A	<input type="checkbox"/>
RJ45 Cable	N/A	N/A	N/A	1.5 m	Shielded with core	<input type="checkbox"/>
Temperature And Humidity Recorder	myndar	PZ1D-MB	N/A	N/A	N/A	<input checked="" type="checkbox"/>

4.4 Test Configurations

Test Configurations (TC) No.	Description
TC01	<u>The normal work Test Mode</u> EUT + Connecting Line + Laptop + BT Link + Temperature And Humidity Recorder

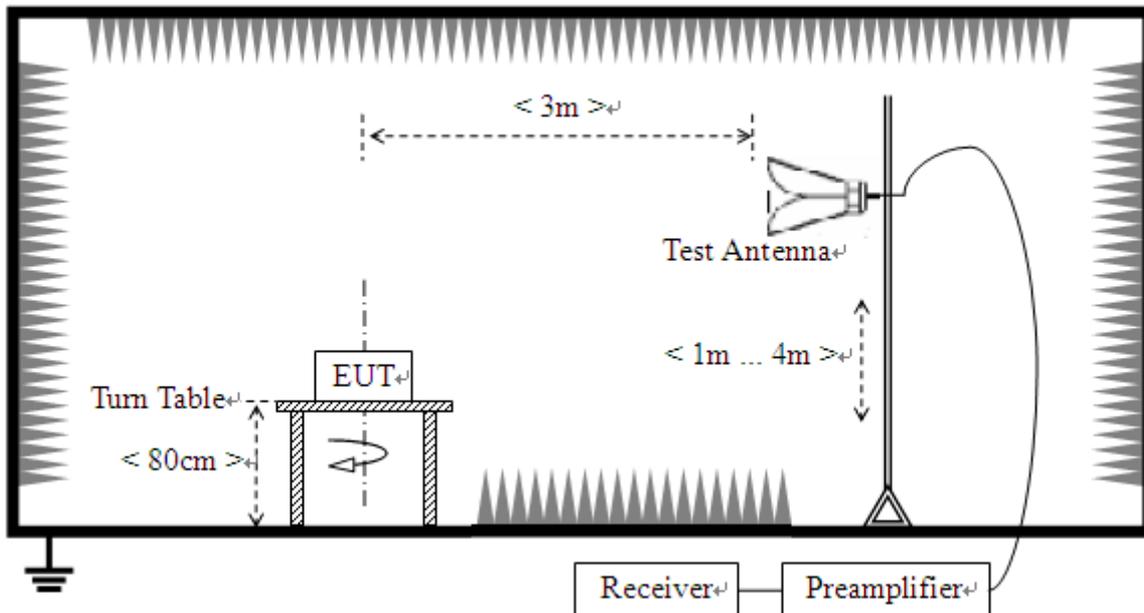
4.5 Test Setups

Test Setup 1



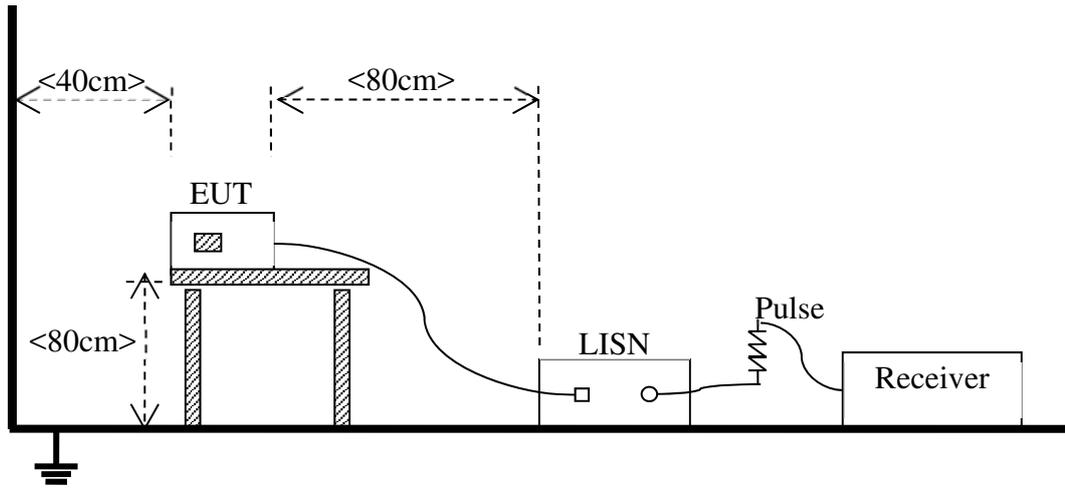
(For Radiated Emission Test (30 MHz-1 GHz))

Test Setup 2



(For Radiated Emission Test (above 1 GHz))

Test Setup 3



(For Conducted Emission, AC Ports Test)

4.6 Test Conditions

Test Case	Test Conditions	
Radiated Emission	Test Env.	NTNV
	Test Setup	Test Setup 1&2
	Test Configuration	TC01 ^{Note}
Conducted Emission, AC Ports	Test Env.	NTNV
	Test Setup	Test Setup 3
	Test Configuration	TC01 ^{Note}

Note: Based on client request, all normal using modes of the normal function were tested but only the worst test data of the worst mode is reported by this report. The normal work Test Mode is the worst mode in this report.

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency range (MHz)	Class B (at 3 m)		Class A (at 10 m)	
	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)
30 - 88	100	40	90	39
88 - 216	150	43.5	150	43.5
216 - 960	200	46	210	46.4
Above 960	500	54	300	49.5

NOTE:

- 1) Field Strength ($\text{dB}\mu\text{V/m}$) = $20 \cdot \log$ [Field Strength ($\mu\text{V/m}$)].
- 2) In the emission tables above, the tighter limit applies at the band edges.

5.1.1.2 Test Setup

Refer to 4.5 section (test setups1 to test setups2) for radiated emission test, the photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

5.1.1.4 Test Result

Please refer to ANNEX A.1.

5.1.2 Conducted Emission

5.1.2.1 Test Limit

Frequency range (MHz)	Class A	
	Quasi-peak (dB μ V)	Average (dB μ V)
0.15 - 0.50	79	66
0.50 - 30	73	60

Frequency range (MHz)	Class B	
	Quasi-peak (dB μ V)	Average (dB μ V)
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- 1) The lower limit shall apply at the band edges.
- 2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.2.2 Test Setup

Refer to 4.5 section test (test setup 3) for conducted emission, the photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω /50 μ H of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.1.2.4 Test Result

Please refer to ANNEX A.2.

ANNEX A TEST RESULTS

A.1 Radiated Emission

Note 1: The symbol of "--" in the table which means not application.

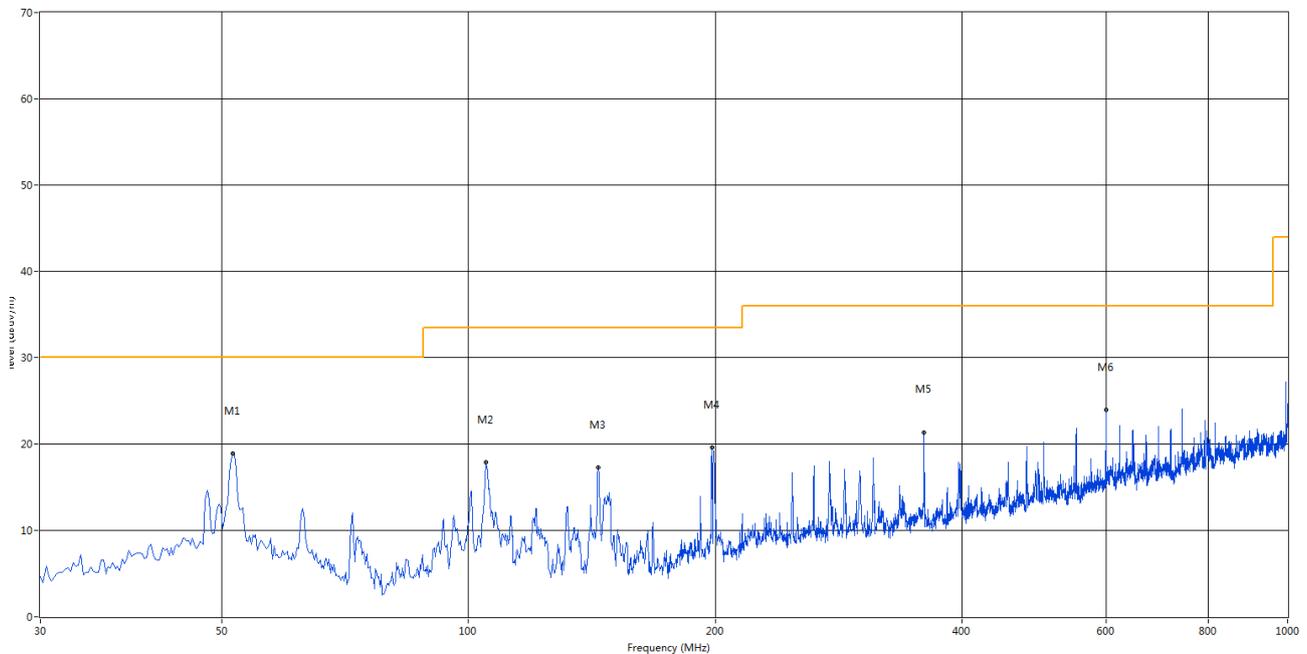
Note 2: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note 3: The marked spikes near 2400 MHz with circle should be ignored because they are Bluetooth carrier frequency.

Test Data and Plots

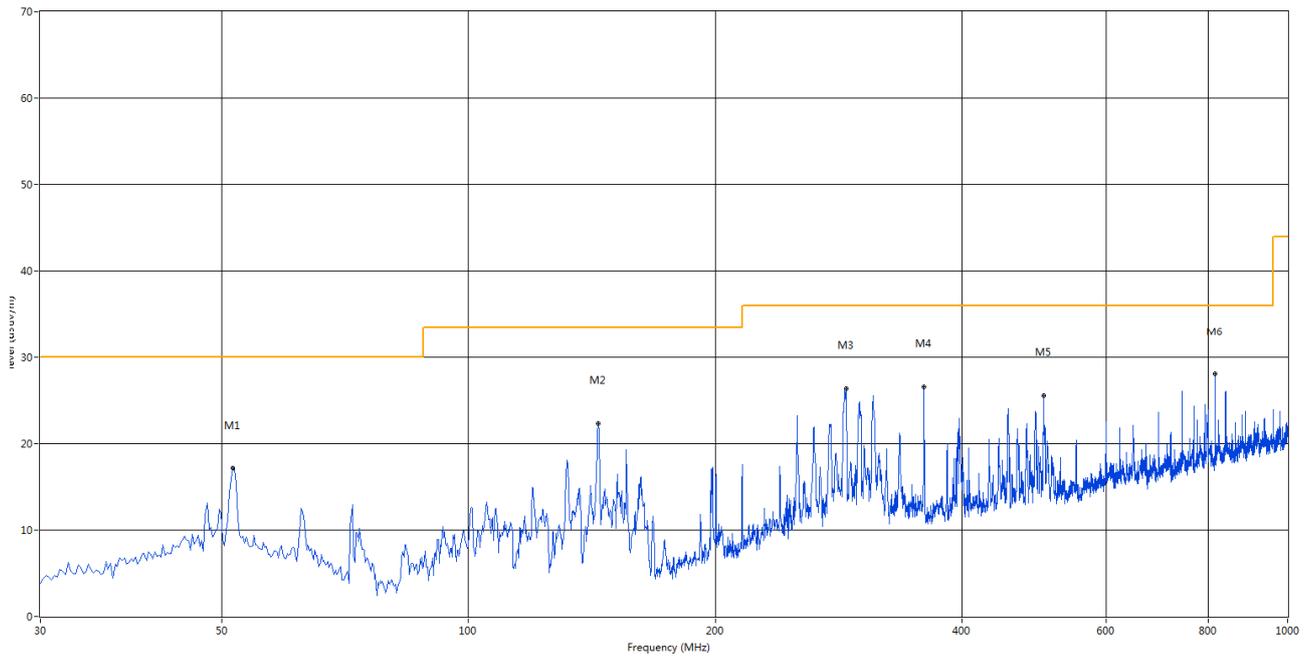
The normal work Test Mode

A.1.1 Test Antenna Vertical, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	51.577	18.81	-13.83	30.0	11.19	Peak	91.00	300	Vertical	Pass
2	104.914	17.84	-15.66	33.5	15.66	Peak	149.00	100	Vertical	Pass
3	143.947	17.24	-19.60	33.5	16.26	Peak	91.00	100	Vertical	Pass
4	198.253	19.52	-16.11	33.5	13.98	Peak	187.00	100	Vertical	Pass
5	359.960	21.30	-11.69	36.0	14.70	Peak	342.00	100	Vertical	Pass
6	599.975	23.89	-6.86	36.0	12.11	Peak	14.00	300	Vertical	Pass

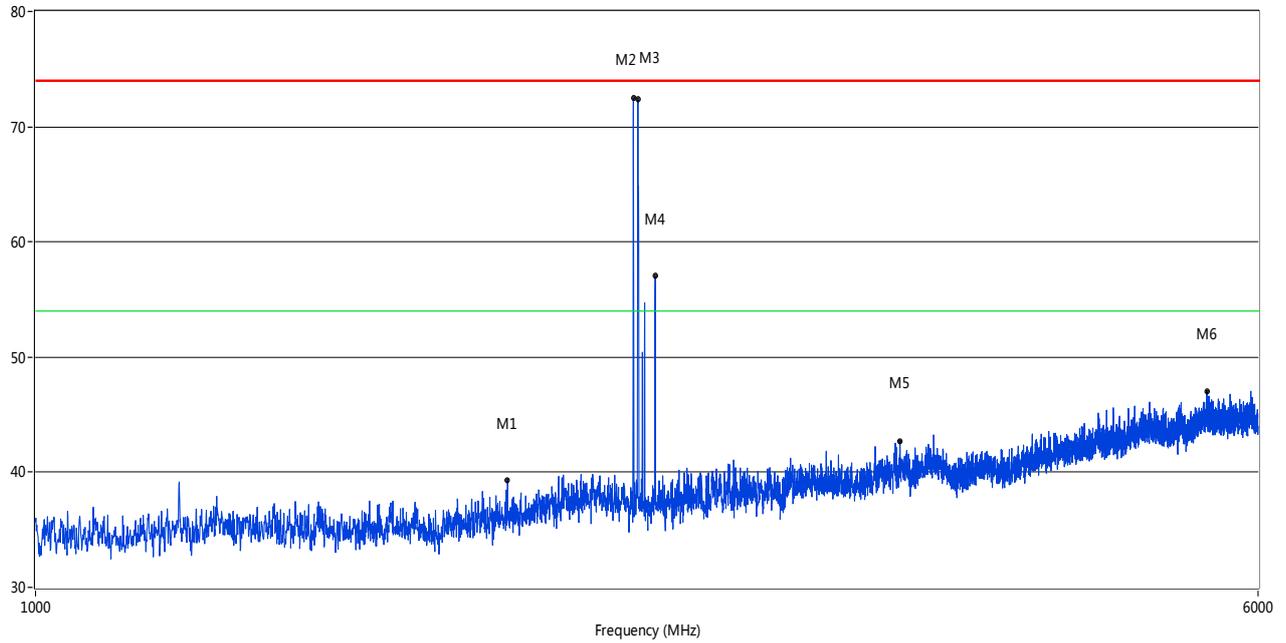
A.1.2 Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	51.577	17.12	-13.83	30.0	12.88	Peak	33.00	400	Horizontal	Pass
2	143.947	22.31	-19.60	33.5	11.19	Peak	359.00	400	Horizontal	Pass
3	288.925	26.36	-13.69	36.0	9.64	Peak	0.00	400	Horizontal	Pass
4	359.960	26.52	-11.69	36.0	9.48	Peak	91.00	200	Horizontal	Pass
5	503.727	25.56	-9.07	36.0	10.44	Peak	153.00	300	Horizontal	Pass
6	815.989	28.01	-4.03	36.0	7.99	Peak	231.00	100	Horizontal	Pass

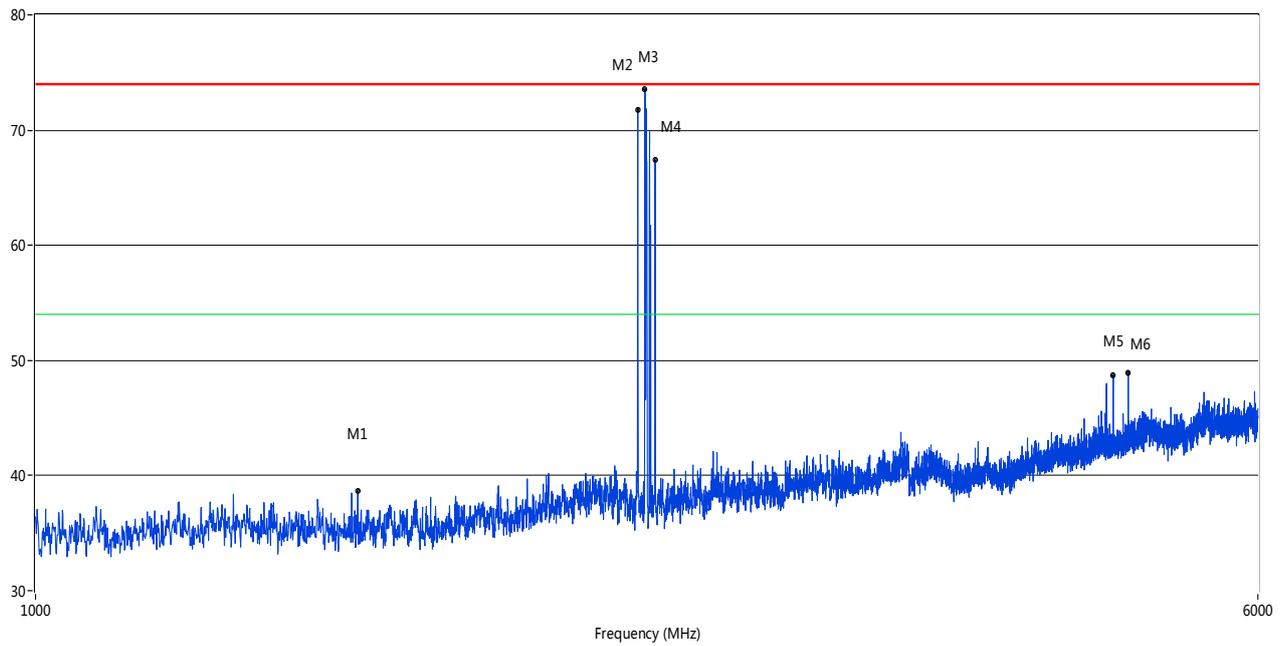
Test Data and Plots (Above 1 GHz)

A.1.3 Test Antenna Vertical, 1 GHz – 6 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1997.750	39.31	-0.11	74.0	34.69	Peak	2.60	100	Vertical	Pass
2	2402.050	72.47	0.79	74.0	1.53	Peak	311.20	100	Vertical	N/A
3	2418.300	72.35	1.37	74.0	1.65	Peak	0.00	100	Vertical	N/A
4	2480.050	57.02	1.73	74.0	16.98	Peak	183.70	100	Vertical	N/A
5	3550.600	42.72	5.18	74.0	31.28	Peak	82.20	100	Vertical	Pass
6	5567.400	47.00	11.69	74.0	27.00	Peak	22.80	100	Vertical	Pass

A.1.4 Test Antenna Horizontal, 1 GHz – 6 GHz



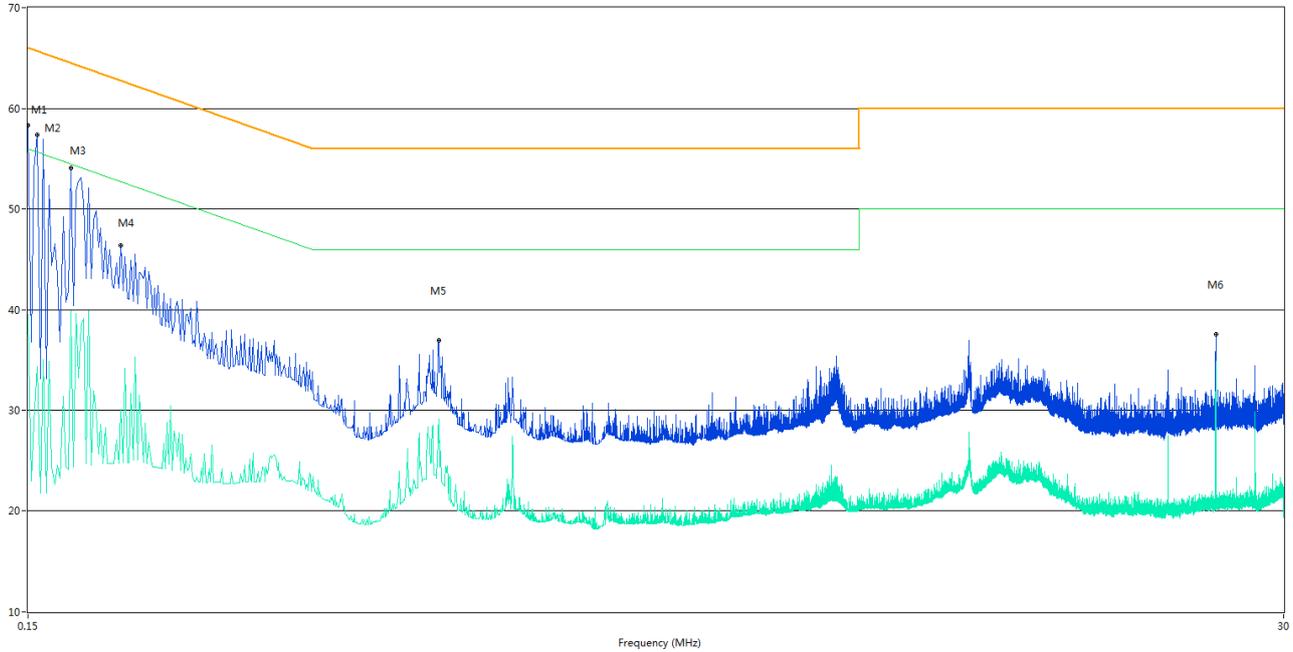
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1603.850	38.64	-2.65	74.0	35.36	Peak	211.10	100	Horizontal	Pass
2	2418.300	71.77	1.37	74.0	2.23	Peak	187.60	100	Horizontal	N/A
3	2443.650	73.53	1.28	74.0	0.47	Peak	41.10	100	Horizontal	N/A
4	2480.050	67.40	1.73	74.0	6.60	Peak	165.90	100	Horizontal	N/A
5	4854.000	48.71	10.78	74.0	25.29	Peak	172.90	100	Horizontal	N/A
6	4962.000	48.96	10.80	74.0	25.04	Peak	303.30	100	Horizontal	N/A

A.2 Conducted Emission

Test Data and Plots

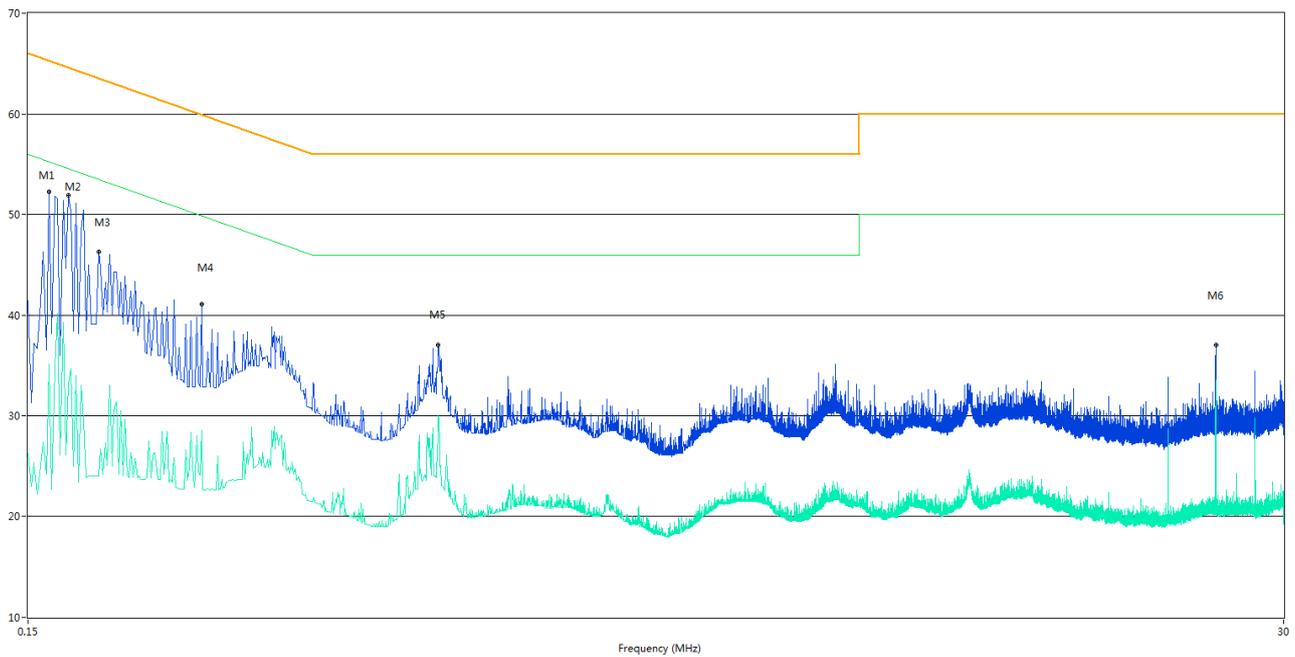
The normal work Test Mode

A.2.1 L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.150	58.3	11.00	66.0	7.70	Peak	L Line	Pass
1**	0.150	39.6	11.00	56.0	16.40	AV	L Line	Pass
2	0.156	57.3	11.00	65.7	8.40	Peak	L Line	Pass
2**	0.156	34.3	11.00	55.7	21.40	AV	L Line	Pass
3	0.180	54.1	11.00	64.5	10.40	Peak	L Line	Pass
3**	0.180	39.9	11.00	54.5	14.60	AV	L Line	Pass
4	0.222	46.4	11.00	62.7	16.30	Peak	L Line	Pass
4**	0.222	30.1	11.00	52.7	22.60	AV	L Line	Pass
5	0.850	36.9	11.00	56.0	19.10	Peak	L Line	Pass
5**	0.850	29.1	11.00	46.0	16.90	AV	L Line	Pass
6	22.526	37.5	11.00	60.0	22.50	Peak	L Line	Pass
6**	22.526	34.8	11.00	50.0	15.20	AV	L Line	Pass

A.2.2 N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.164	52.3	11.00	65.3	13.00	Peak	N Line	Pass
1**	0.164	35.1	11.00	55.3	20.20	AV	N Line	Pass
2	0.178	52.0	11.00	64.6	12.60	Peak	N Line	Pass
2**	0.178	33.1	11.00	54.6	21.50	AV	N Line	Pass
3	0.202	46.3	11.00	63.5	17.20	Peak	N Line	Pass
3**	0.202	22.4	11.00	53.5	31.10	AV	N Line	Pass
4	0.312	41.1	11.00	59.9	18.80	Peak	N Line	Pass
4**	0.312	28.5	11.00	49.9	21.40	AV	N Line	Pass
5	0.848	36.9	11.00	56.0	19.10	Peak	N Line	Pass
5**	0.848	30.1	11.00	46.0	15.90	AV	N Line	Pass
6	22.524	37.0	11.00	60.0	23.00	Peak	N Line	Pass
6**	22.524	32.9	11.00	50.0	17.10	AV	N Line	Pass

ANNEX B TEST SETUP PHOTOS

Please refer the document "BL-SZ1720204-AE.PDF".

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document "BL-SZ1720204-AW.PDF".

ANNEX D EUT INTERNAL PHOTOS

Please refer the document "BL-SZ1720204-AI.PDF".

--END OF REPORT--