

FCC

EMC

TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.

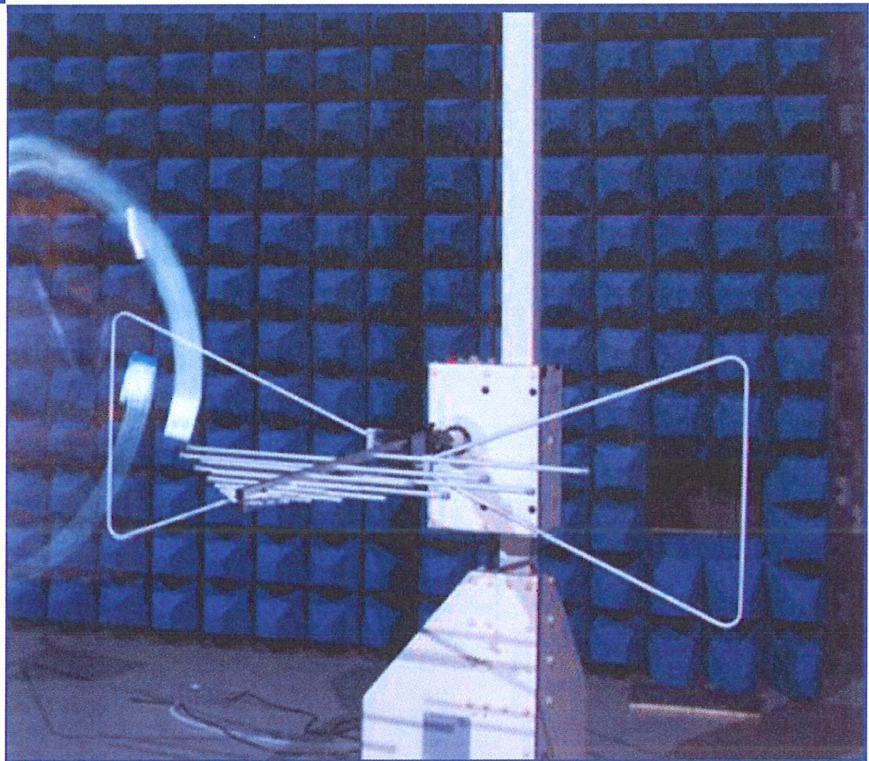


FOR

CS108 Sled Handheld for RFID/2D Barcode

ISSUED TO
Convergence Systems Ltd.

11/F., Tower 1, Tern Centre, 237, Queen's Road, Central, Hong Kong.



Tested by: Xia Long
Xia Long
(Engineer)
Date Jun. 12. 2017

Approved by: Wei Yanquan
Wei Yanquan
(Chief Engineer)
Date Jun. 12. 2017

Report No.: BL-SZ1730414-401
EUT Name: CS108 Sled Handheld for RFID/2D
Barcode
Model Name: CS108-2
Brand Name: CSL
Test Standard: 47 CFR Part 15 Subpart B
FCC ID: UB4CS108C1GEN2

Test Conclusion: Pass
Test Date: Apr. 24, 2017 ~ May 04, 2017
Date of Issue: Jun. 12, 2017

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Revision History

<u>Version</u>	<u>Issue Date</u>	<u>Revisions Content</u>
<u>Rev. 01</u>	<u>Jun. 12, 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 v6.4.
- (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	Convergence Systems Ltd.
Address	11/F., Tower 1, Tern Centre, 237, Queen's Road, Central, Hong Kong.

2.2 Manufacturer Information

Manufacturer	Convergence Systems Ltd.
Address	11/F., Tower 1, Tern Centre, 237, Queen's Road, Central, Hong Kong.

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	CS108 Sled Handheld for RFID/2D Barcode
Model Name Under Test	CS108-2
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	v1.0
Software Version	v1.0
Dimensions (Approx.)	161mm x 90mm x 161mm
Weight (Approx.)	600g
Network and Wireless connectivity	Bluetooth, RFID

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	EEMB
	Model No.	LP605590
	Serial No.	N/A
	Capacitance	3400 mAh
	Rated Voltage	3.7 V
	Limit Charge Voltage	4.2 V
Ancillary Equipment 2	USB Cable	
	Length(Approx.)	85 cm

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 from Laptop or DC 3.7 V from Battery	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&SCHWA RZ	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-1600	2016.07.12	2018.07.11	<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 Emission Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	ROHDE&SCHWA RZ	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"/>
LISN	SCHWARZBECK	NNLK 8129	8129-462	2016.09.14	2017.09.13	<input type="checkbox"/>
AMN	SCHWARZBECK	NNBM8124	8124-509	2016.07.05	2017.07.04	<input type="checkbox"/>
AMN	SCHWARZBECK	NNBM8124	8124-510	2016.07.05	2017.07.04	<input type="checkbox"/>
ISN	TESEQ	ISN T800	34449	2016.07.05	2017.07.04	<input type="checkbox"/>
Shielded Enclosure	ChangNing	CN-130701	130703	N/A	N/A	<input checked="" type="checkbox"/>

4.3 Test Enclosure list

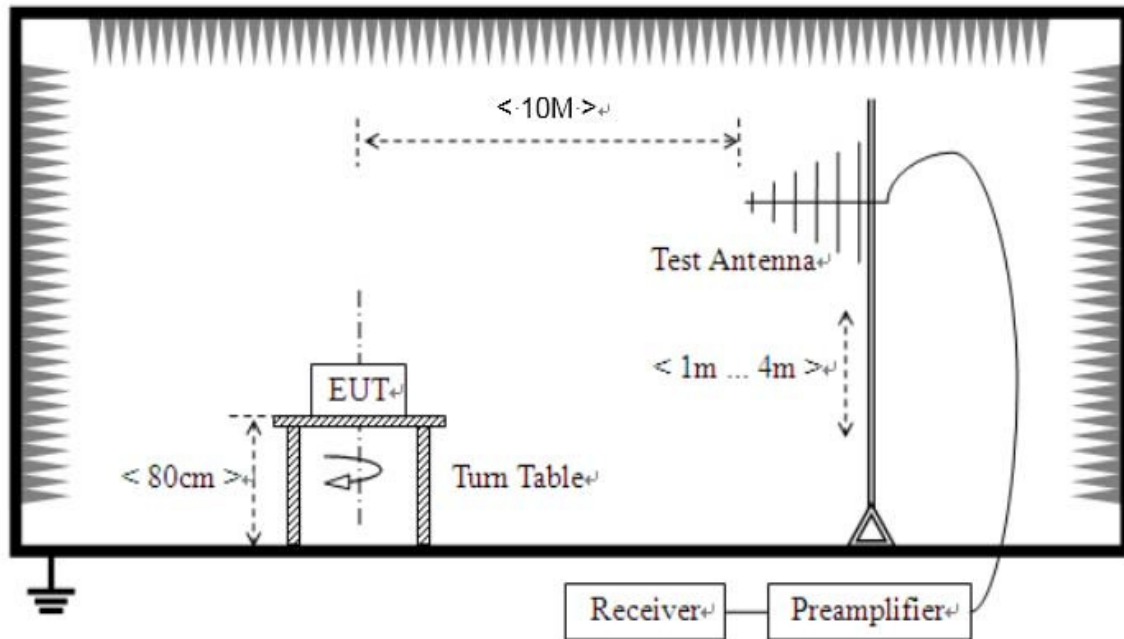
Description	Manufacturer	Model	Serial No.	Length	Description	Use
PC	Dell	015K3N	N/A	N/A	Special Handled	<input type="checkbox"/>
Laptop	Apple	A1465	N/A	N/A	N/A	<input checked="" type="checkbox"/>
Printer	HP	DESKJET 1000	N/A	N/A	N/A	<input type="checkbox"/>
Keyboard	Logitech	Y-BP62a	N/A	N/A	N/A	<input 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"/>
Phone	OPPO	R7sf	N/A	N/A	N/A	<input checked="" 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"/>
LCD Monitor	Dell	U241HB	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"/>

4.4 Test Configurations

Test Configurations (TC) No.	Description
TC01	<u>The Working Test Mode</u> EUT + Battery + USB Cable + Laptop + BT Link + RFID ON

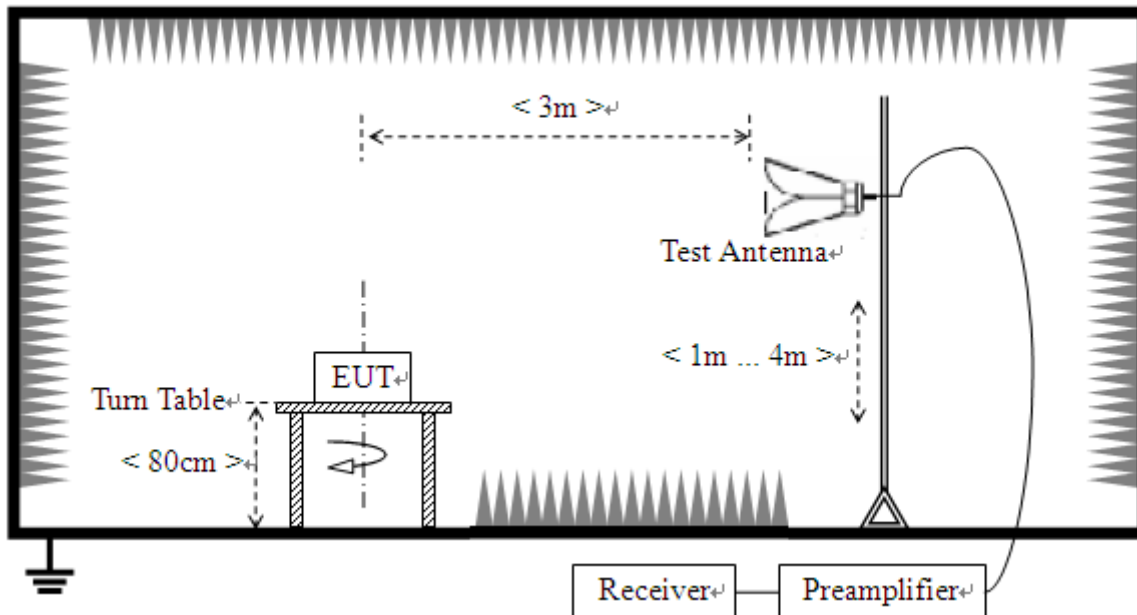
4.5 Test Setups

Test Setup 1



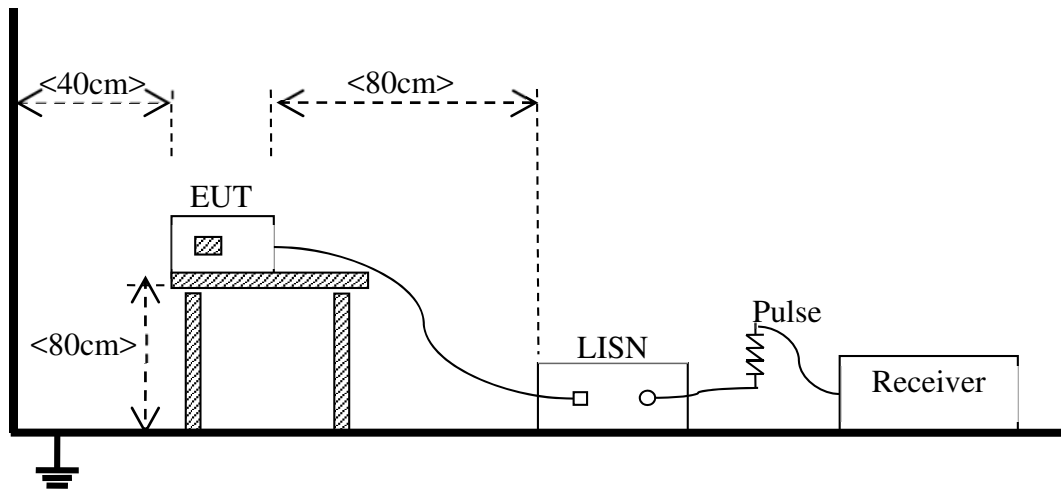
(For Radiated Emission Test (30 MHz-1 GHz))

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 Working 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 10 m)		Class A (at 10 m)	
	Field Strength ($\mu\text{V/m}$)	Field Strength (dB $\mu\text{V/m}$)	Field Strength ($\mu\text{V/m}$)	Field Strength (dB $\mu\text{V/m}$)
30 - 88	100	30	90	39
88 - 216	150	33.5	150	43.5
216 - 960	200	36	210	46.4
Above 960	500	44	300	49.5

NOTE:

- 1) Field Strength (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 setup 1 to test setup 2) 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.

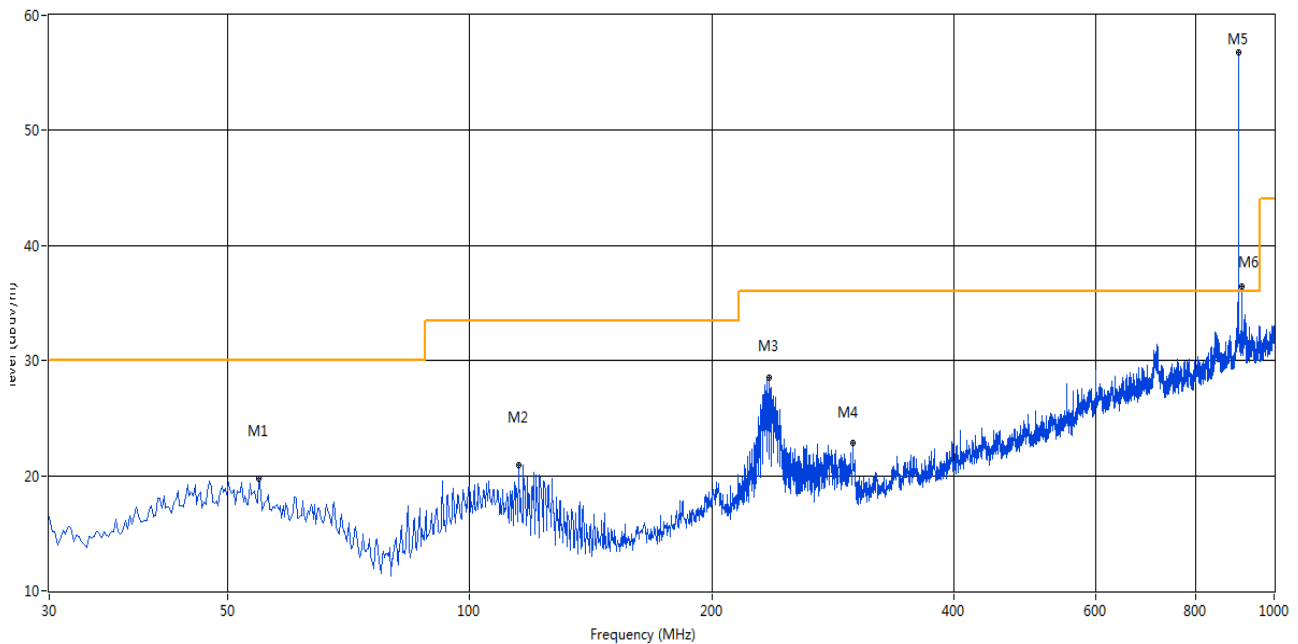
Note 2: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note 3: This frequency which near 900 MHz with circle should be ignored because they are RFID carrier frequency, the marked spikes near 2400 MHz with circle should be ignored because they are Bluetooth carrier frequency.

Test Data and Plots

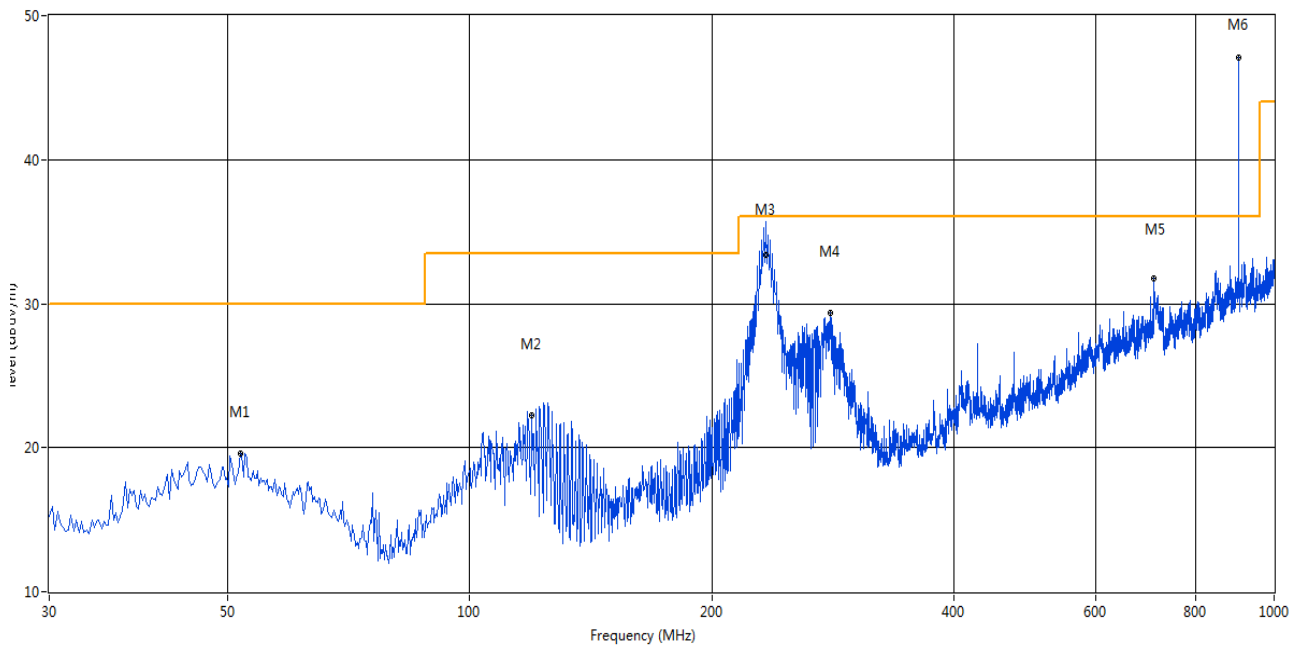
The Working Test Mode

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



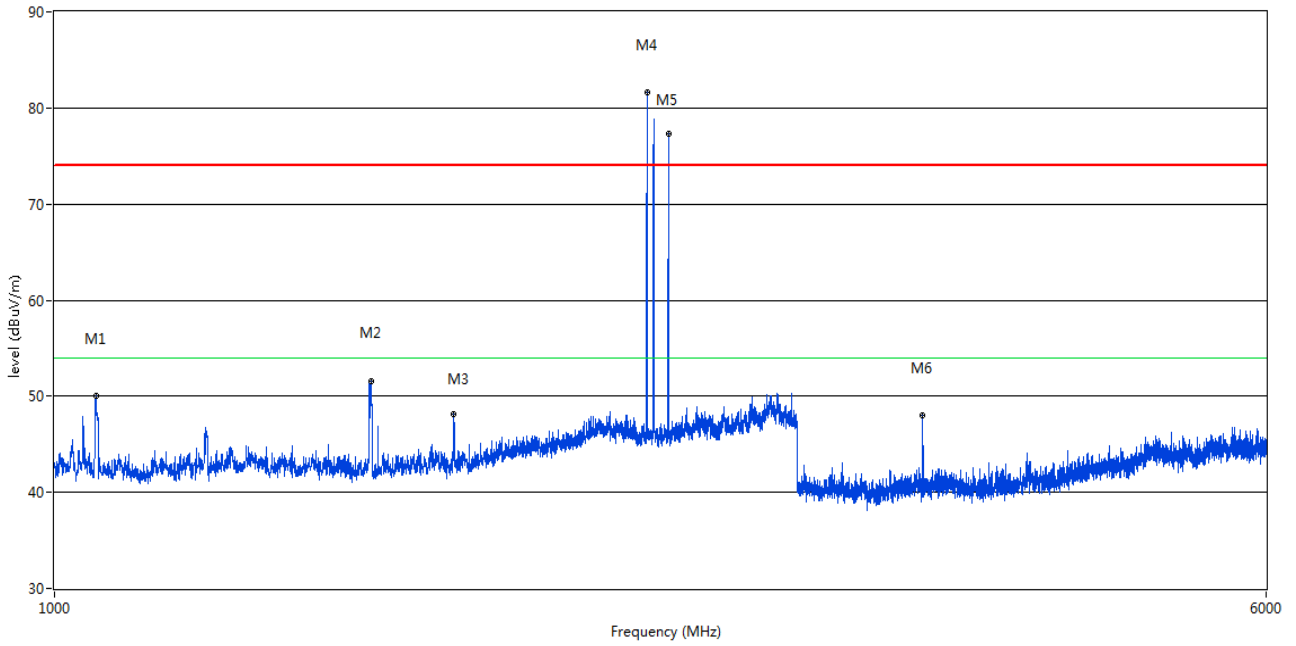
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	54.729	19.73	-13.69	30.0	10.27	Peak	0.00	400	Vertical	Pass
2	115.096	20.96	-16.12	33.5	12.54	Peak	314.00	100	Vertical	Pass
3	235.831	28.52	-13.82	36.0	7.48	Peak	39.00	400	Vertical	Pass
4	299.593	22.84	-12.29	36.0	13.16	Peak	116.00	100	Vertical	Pass
5	902.539	56.75	-0.78	36.0	-20.75	Peak	189.00	200	Vertical	N/A
6	911.995	36.45	-0.99	36.0	-0.45	Peak	203.00	200	Vertical	N/A

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



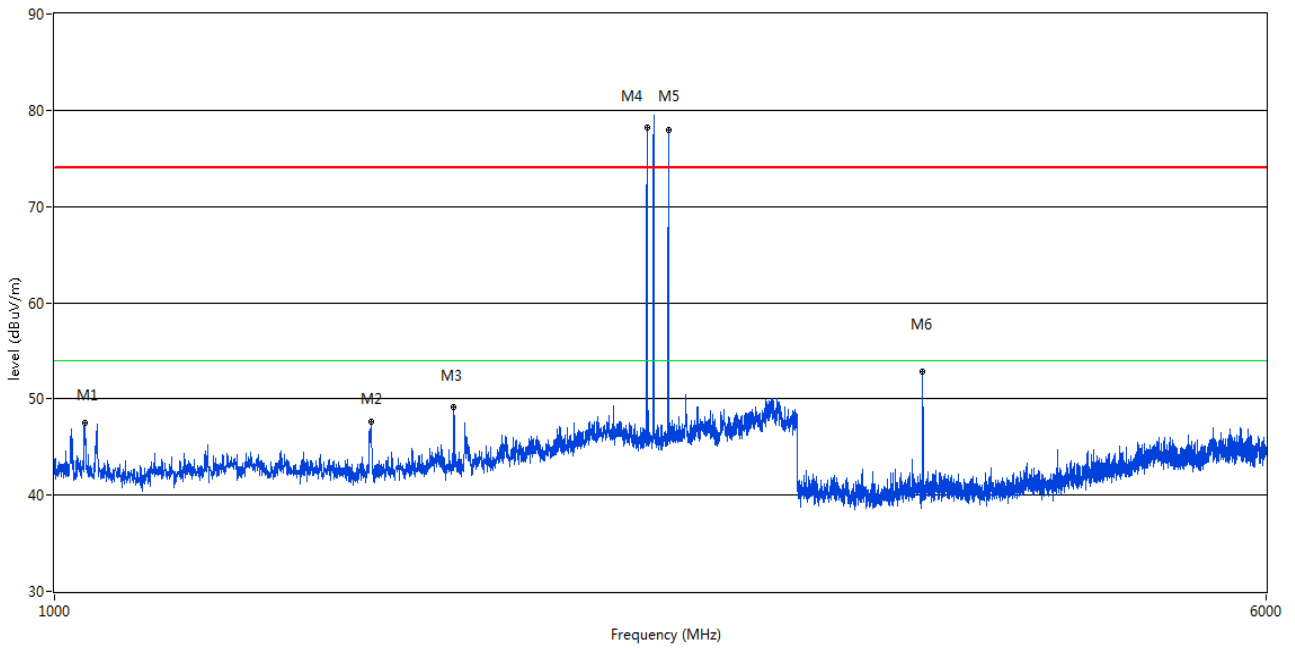
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	51.820	19.63	-13.37	30.0	10.37	Peak	302.00	200	Horizontal	Pass
2	119.460	21.95	-16.95	33.5	11.55	Peak	141.00	400	Horizontal	Pass
3	233.505	35.34	-14.05	36.0	0.66	Peak	347.00	400.00	Horizontal	N/A
3*	233.505	33.36	-14.05	36.0	2.64	QP	347.00	400.00	Horizontal	Pass
4	280.440	29.40	-12.82	36.0	6.60	Peak	102.00	300	Horizontal	Pass
5	709.073	31.79	-4.05	36.0	4.21	Peak	0.00	200	Horizontal	Pass
6	902.539	47.13	-0.78	36.0	-11.13	Peak	145.00	400	Horizontal	N/A

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	1063.000	50.00	-4.72	74.0	24.00	Peak	171.30	100	Vertical	Pass
2	1596.500	51.59	-3.56	74.0	22.41	Peak	238.40	100	Vertical	Pass
3	1805.000	48.11	-2.10	74.0	25.89	Peak	353.10	100	Vertical	N/A
4	2402.000	81.64	0.85	74.0	-7.64	Peak	303.20	100	Vertical	N/A
5	2480.000	77.28	0.68	74.0	-3.28	Peak	292.80	100	Vertical	N/A
6	3610.500	47.97	6.23	74.0	26.03	Peak	312.30	100	Vertical	N/A

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



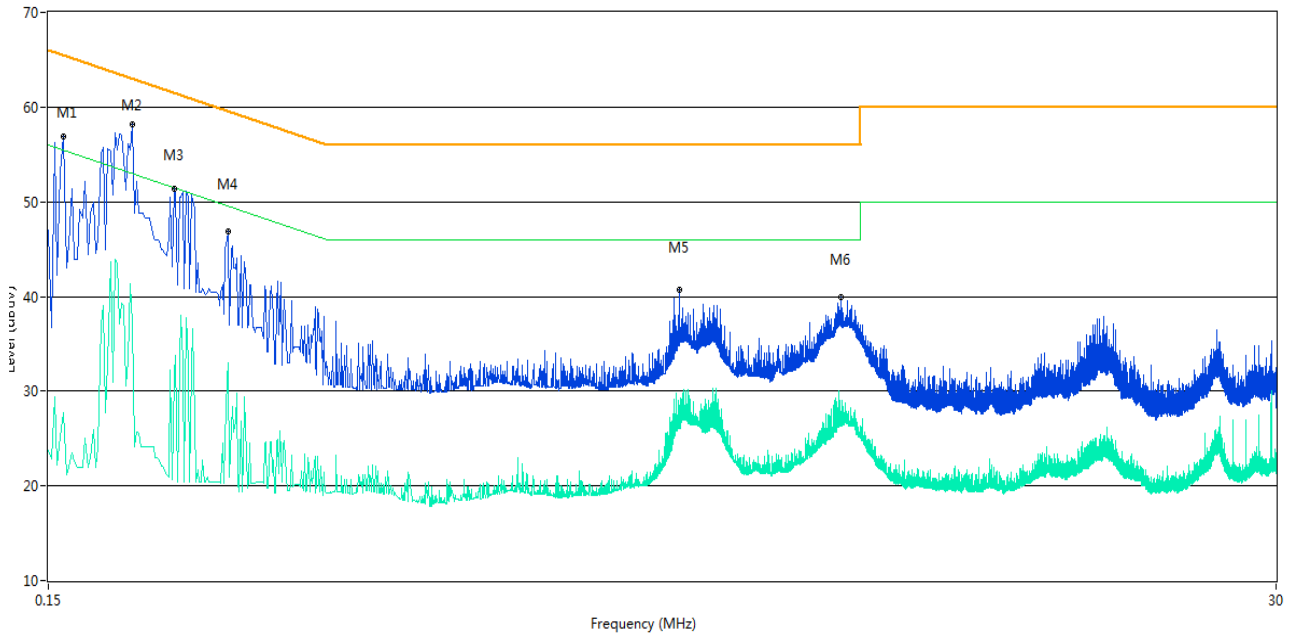
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	1045.500	47.51	-4.49	74.0	26.49	Peak	349.00	100	Horizontal	Pass
2	1597.000	47.62	-3.57	74.0	26.38	Peak	0.50	100	Horizontal	Pass
3	1805.000	49.18	-2.10	74.0	24.82	Peak	2.00	100	Horizontal	N/A
4	2402.000	78.22	0.85	74.0	-4.22	Peak	111.20	100	Horizontal	N/A
5	2479.500	77.99	0.52	74.0	-3.99	Peak	28.90	100	Horizontal	N/A
6	3610.500	52.77	6.23	74.0	21.23	Peak	324.00	100	Horizontal	N/A

A.2 Conducted Emission

Test Data and Plots

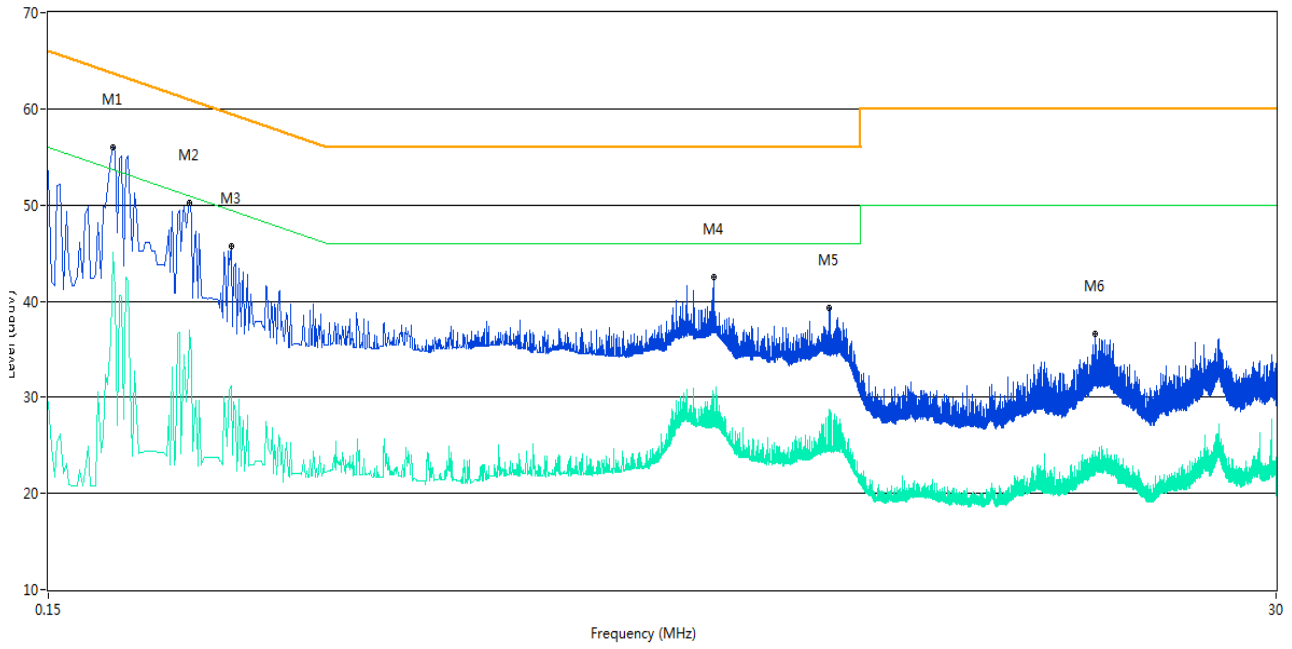
The Working Test Mode

A.2.1 L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.160	56.9	10.29	65.5	8.60	Peak	L Line	Pass
1**	0.160	27.7	10.29	55.5	27.80	AV	L Line	Pass
2	0.216	58.1	10.82	63.0	4.90	Peak	L Line	Pass
2**	0.216	37.2	10.82	53.0	15.80	AV	L Line	Pass
3	0.258	51.4	9.42	61.5	10.10	Peak	L Line	Pass
3**	0.258	31.7	9.42	51.5	19.80	AV	L Line	Pass
4	0.326	46.9	11.16	59.6	12.70	Peak	L Line	Pass
4**	0.326	33.1	11.16	49.6	16.50	AV	L Line	Pass
5	2.288	40.6	10.08	56.0	15.40	Peak	L Line	Pass
5**	2.288	28.5	10.08	46.0	17.50	AV	L Line	Pass
6	4.588	40.0	10.06	56.0	16.00	Peak	L Line	Pass
6**	4.588	26.2	10.06	46.0	19.80	AV	L Line	Pass

A.2.2 N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.198	56.0	9.38	63.7	7.70	Peak	N Line	Pass
1**	0.198	45.1	9.38	53.7	8.60	AV	N Line	Pass
2	0.276	50.3	10.67	60.9	10.60	Peak	N Line	Pass
2**	0.276	37.0	10.67	50.9	13.90	AV	N Line	Pass
3	0.330	45.7	11.05	59.5	13.80	Peak	N Line	Pass
3**	0.330	31.2	11.05	49.5	18.30	AV	N Line	Pass
4	2.652	42.5	10.66	56.0	13.50	Peak	N Line	Pass
4**	2.652	30.3	10.66	46.0	15.70	AV	N Line	Pass
5	4.368	39.3	10.09	56.0	16.70	Peak	N Line	Pass
5**	4.368	28.8	10.09	46.0	17.20	AV	N Line	Pass
6	13.752	36.6	11.18	60.0	23.40	Peak	N Line	Pass
6**	13.752	23.1	11.18	50.0	26.90	AV	N Line	Pass

ANNEX B TEST SETUP PHOTOS

Please refer the document "BL-SZ1730414-AE.PDF".

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document "BL-SZ1730414-AW.PDF".

ANNEX D EUT INTERNAL PHOTOS

Please refer the document "BL-SZ1730414-AI.PDF".

--END OF REPORT--