

TEST REPORT

Applicant: Fibocom Wireless Inc
Address: 1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China
Equipment Type: LTE Module
Model Name: MG661-LA
Brand Name: Fibocom
FCC ID: ZMOMG661LA
Test Standard: 47 CFR Part 15 Subpart B
ANSI C63.4-2014
Sample Arrival Date: Jun. 16, 2023
Test Date: Jul. 03, 2023
Date of Issue: Jul. 31, 2023

ISSUED BY:

Shenzhen BALUN Technology Co., Ltd.

Tested by: Zhang Guoxi

Checked by: Xia Long

Approved by: Liao Jianming
(Technical Director)

Zhang Guoxi

Xia Long

Liao Jianming

Revision History		
Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Jul. 31, 2023</u>	<u>Initial Issue</u>

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1 GENERAL INFORMATION

1.1 Test Laboratory

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

1.2 Test Location

Name	Shenzhen BALUN Technology Co., Ltd.
Location	<input checked="" type="checkbox"/> Block B, 1/F, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
	<input type="checkbox"/> 1/F, Building B, Ganghongji High-tech Intelligent Industrial Park, No. 1008, Songbai Road, Yangguang Community, Xili Sub-district, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Fibocom Wireless Inc
Address	1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China

2.2 Manufacturer Information

Manufacturer	Fibocom Wireless Inc
Address	1101, Tower A, Building 6, Shenzhen International Innovation Valley, Dashi 1st Rd, Nanshan, Shenzhen, China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Name	LTE Module
Model Name Under Test	MG661-LA
Series Model Name	N/A
Description of Model name differentiation	N/A
Hardware Version	V1.2
Software Version	16009.1000.00.01.86.01
Dimensions (Approx.)	N/A
Weight (Approx.)	N/A

2.5 Ancillary Equipment

Note: Not applicable.

2.6 Technical Information

Network and Wireless connectivity	4G Network LTE FDD Band 2/4/5/7/66
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The requirement for the following technical information of the EUT was tested in this report:

The Highest Speed of Processor	2690MHz
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3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15 Subpart B	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)	3.22 dB
Radiated emissions (30 MHz-1 GHz)-10m	4.80 dB
Radiated emissions (30 MHz-1 GHz)-3m	4.76 dB
Radiated emissions (1 GHz-18 GHz)-3m	4.88 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments, Test Date and Test Engineer

Test items	Voltage	Temperature	Relative Humidity	Ambient Pressure	Test Date	Test Engineer
Radiated Emission	AC 240V	23.6°C	49%	101kPa	Jul. 03, 2023	Gu Shuaizhen
Conducted Emission	AC 240V	24.0°C	59%	101kPa	Jul. 03, 2023	Yuan Zhishen

4.2 Test Equipment List

Radiated Emission Test For Frequency Below 1 GHz (3m)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	Agilent	N9038A	MY55330120	2022.09.09	2023.09.08	<input checked="" type="checkbox"/>
Amplifier (30-1GHz)	COM-MV	ZT30-1000M	B2017119081	2022.09.09	2023.09.08	<input checked="" type="checkbox"/>
Test Antenna- Bi-Log	SCHWARZBECK	VULB 9168	9168-00867	2022.04.12	2025.04.11	<input checked="" type="checkbox"/>
Anechoic Chamber	YiHeng	9m*6m*6m	966#2	2021.08.19	2024.08.18	<input checked="" type="checkbox"/>
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		<input checked="" type="checkbox"/>

Radiated Emission Test For Frequency Above 1 GHz (3m)						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	Agilent	N9038A	MY55330120	2022.09.09	2023.09.08	<input checked="" type="checkbox"/>
Amplifier (1-12GHz)	Advanced Microwave	WLA652A	1740103	2022.09.09	2023.09.08	<input checked="" type="checkbox"/>
Amplifier (0.8-21GHz)	Mini-Circuits	ZVA-213-S+	225321316	2022.09.09	2023.09.08	<input checked="" type="checkbox"/>
Amplifier (18-40GHz)	COM-MV	KA_LNA18-4 0G-01	18050001	2022.09.09	2023.09.08	<input type="checkbox"/>
Test Antenna- Horn	SCHWARZBECK	BBHA 9120D	1917	2022.06.09	2025.06.08	<input checked="" type="checkbox"/>
Anechoic Chamber	YiHeng	9m*6m*6m	966#2	2021.08.19	2024.08.18	<input checked="" type="checkbox"/>
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		<input checked="" type="checkbox"/>

Conducted disturbance Test						
Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due	Use
EMI Receiver	KEYSIGHT	N9010B	MY57110309	2022.09.09	2023.09.08	<input checked="" type="checkbox"/>
LISN	SCHWARZBECK	NSLK 8127	8127-687	2023.05.16	2024.05.15	<input checked="" type="checkbox"/>
ISN	TESEQ	ISN T800	34449	2022.11.11	2023.11.10	<input type="checkbox"/>
ISN	TESEQ	ISN T8-Cat6	53561	2023.04.23	2024.04.22	<input type="checkbox"/>
Shielded Room	YiHeng Electronic Co., Ltd	3.5m*3.1m*2. 8m	112	2022.02.19	2025.02.18	<input checked="" type="checkbox"/>
Description	Manufacturer	Name		Version		Use
Test Software	BALUN	BL410-E		V22.930		<input checked="" type="checkbox"/>

4.3 Test Enclosure list

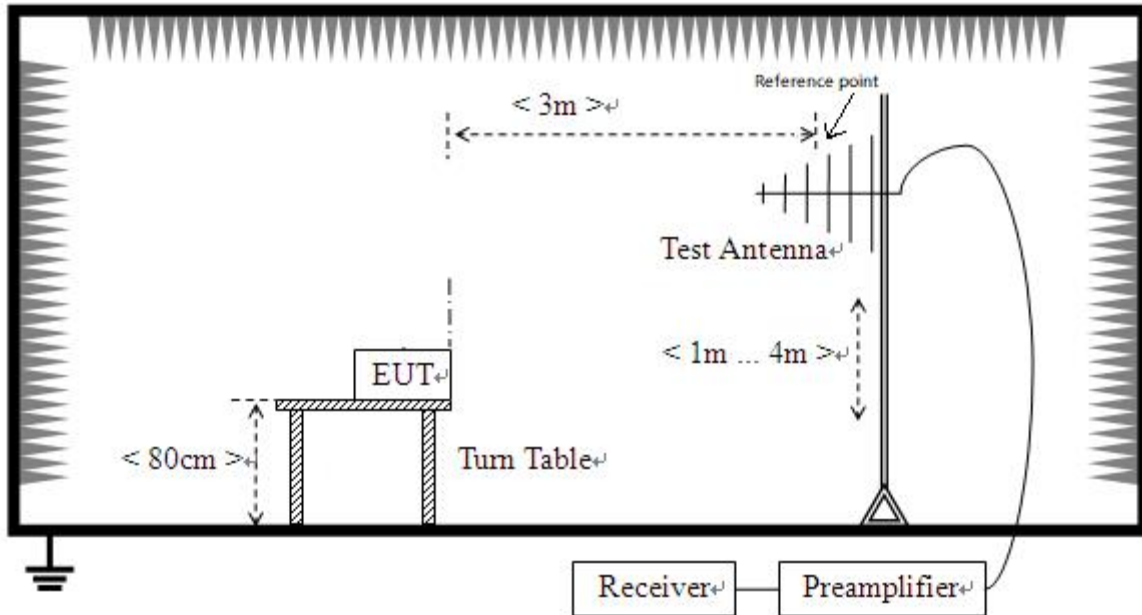
Description	Manufacturer	Model	Serial No.	Length	Description	Use
Adapter	N/A	N/A	N/A	N/A	N/A	<input checked="" type="checkbox"/>
USB Cable	N/A	N/A	N/A	N/A	N/A	<input checked="" type="checkbox"/>

4.4 Test Configurations

Test Configurations (TC) No.	Description
TC01	<u>The LTE Band 5 RX Test Mode</u> LTE Band 5 RX + EUT + Adapter + USB Cable

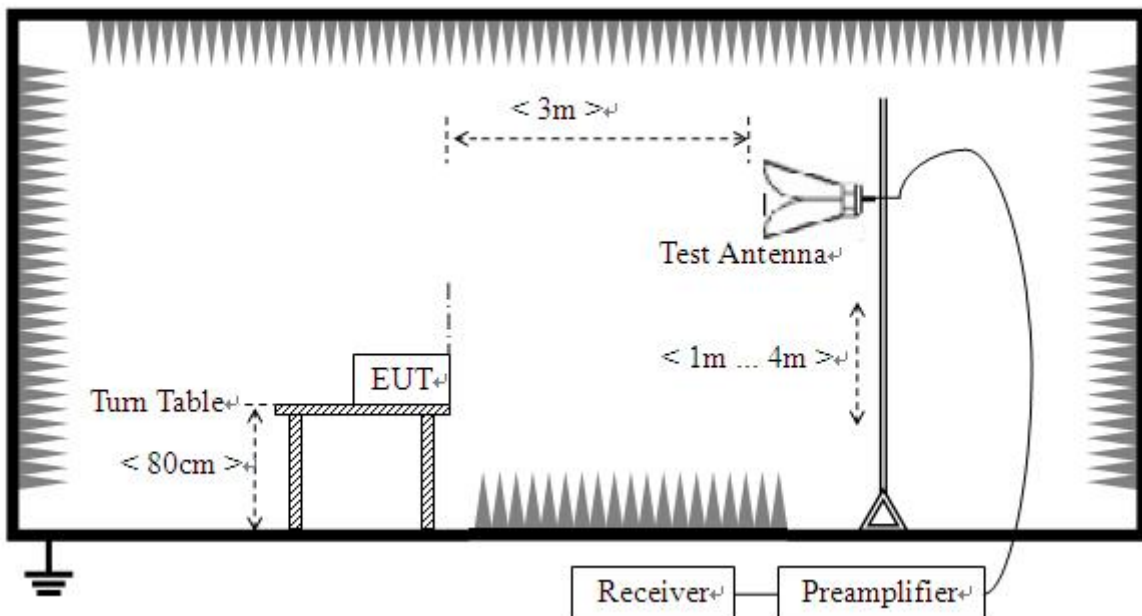
4.5 Test Setups

Test Setup 1



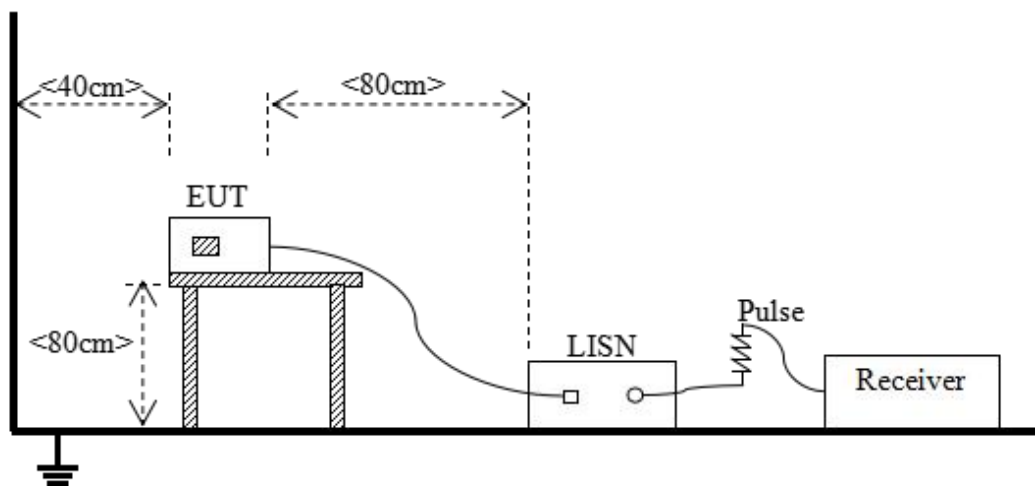
(For Radiated Emission Test (30 MHz-1 GHz))

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 Setup	Test Setup 1&2
	Test Configuration	TC01 ^{Note}
Conducted Emission, AC Ports	Test Setup	Test Setup 3
	Test Configuration	TC01 ^{Note}

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 B (at 10 m)	Class A (at 10 m)	
	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)	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	30	90	39
88 - 216	150	43.5	33.5	150	43.5
216 - 960	200	46	36	210	46.4
Above 960	500	54	44	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 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.

The measurement frequency range is from 30 MHz to the 5th harmonic of the maximum frequency of the EUT internal source. The Turn Table is actuated to turn from 0° to 360° , and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW \geq RBW

Sweep = auto

Detector function = peak for $f < 1$ GHz, peak & RMS Average for $f \geq 1$ GHz

Trace = max hold

5.1.1.4 Test Result

Please refer to ANNEX A.1.

NOTE:

1. Results (dB μ V/m) = Reading (dB μ V/m) + Factor (dB/m)

The reading level is calculated by software which is not shown in the sheet

2. Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB) – Amplifier Gain (dB)

3. Over limit = Results – Limit.

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.

Use the following spectrum analyzer settings:

RBW = 9 kHz

VBW \geq RBW

Sweep = 10ms

Detector function =peak & Average

Trace = max hold

5.1.2.4 Test Result

Please refer to ANNEX A.2.

NOTE:

1. Results (dB μ V) = Reading (dB μ V) + Factor (dB)

The reading level is calculated by software which is not shown in the sheet

2. Factor = Insertion loss + Cable loss

3. Over limit = Results – Limit.

ANNEX A TEST RESULTS

A.1 Radiated Emission

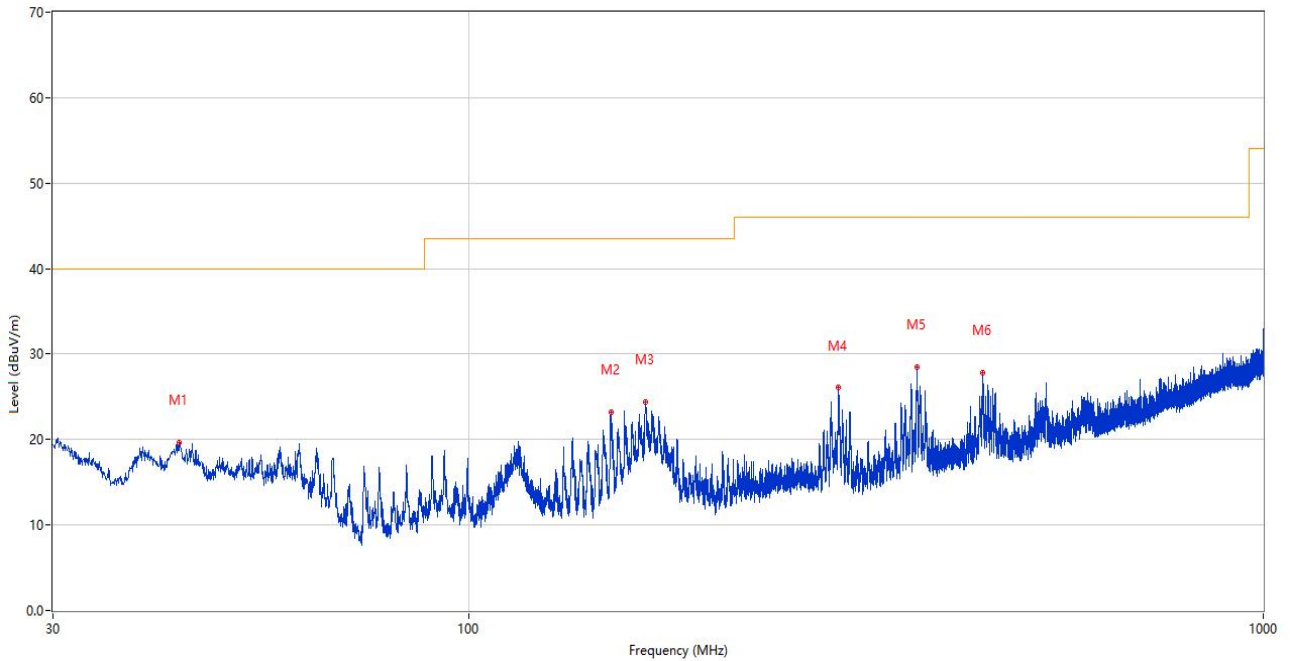
Note 1: The symbol of "--" in the table which means not application.

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.

Test Data and Plots

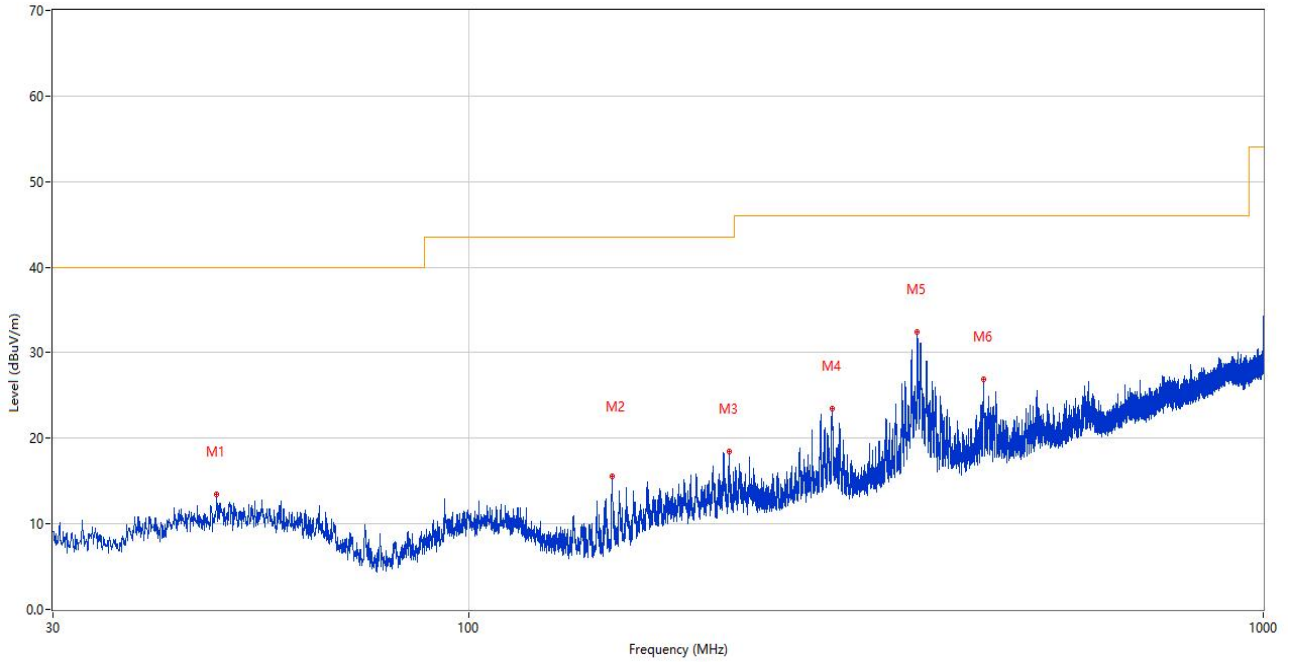
The LTE Band 5 RX Test Mode

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 (Degree)	Height (cm)	Antenna	Verdict
1	43.289	19.64	-25.76	40.0	20.36	Peak	295.00	100	Vertical	Pass
2	151.056	23.20	-30.10	43.5	20.30	Peak	345.00	100	Vertical	Pass
3	167.012	24.36	-29.21	43.5	19.14	Peak	248.00	100	Vertical	Pass
4	291.900	26.05	-23.82	46.0	19.95	Peak	88.00	100	Vertical	Pass
5	366.736	28.52	-21.90	46.0	17.48	Peak	180.00	200	Vertical	Pass
6	444.044	27.82	-20.04	46.0	18.18	Peak	119.00	200	Vertical	Pass

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



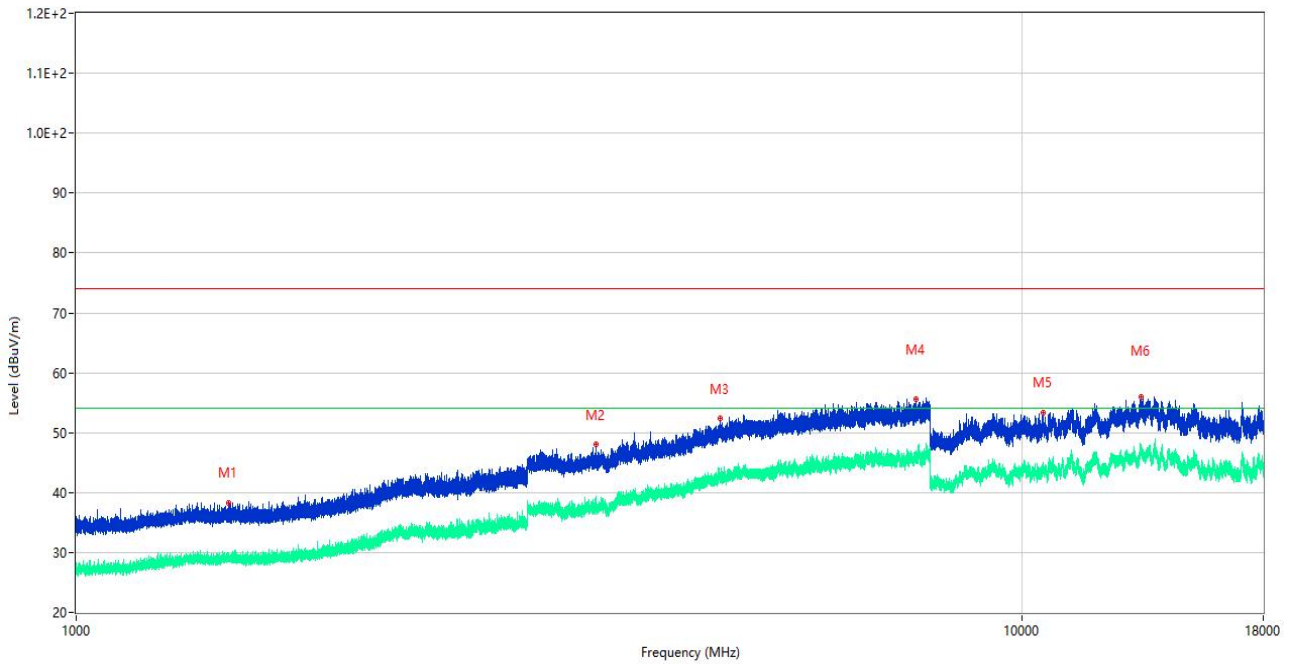
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	48.236	13.48	-25.39	40.0	26.52	Peak	105.00	200	Horizontal	Pass
2	151.686	15.54	-30.09	43.5	27.96	Peak	321.00	200	Horizontal	Pass
3	212.893	18.41	-26.54	43.5	25.09	Peak	106.00	100	Horizontal	Pass
4	286.759	23.48	-23.89	46.0	22.52	Peak	137.00	100	Horizontal	Pass
5	366.784	32.37	-21.90	46.0	13.63	Peak	104.00	100	Horizontal	Pass
6	444.918	26.91	-19.98	46.0	19.09	Peak	181.00	100	Horizontal	Pass

A.1.3 Test Antenna Vertical, 1 GHz – 18 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1412.200	38.90	-16.67	74.0	35.10	Peak	341.00	100	Vertical	Pass
1**	1412.200	28.58	-16.67	54.0	25.42	AV	341.00	100	Vertical	Pass
2	3497.250	47.67	-5.07	74.0	26.33	Peak	199.00	100	Vertical	Pass
2**	3497.250	38.13	-5.07	54.0	15.87	AV	199.00	100	Vertical	Pass
3	4955.500	52.78	0.37	74.0	21.22	Peak	244.00	100	Vertical	Pass
3**	4955.500	42.11	0.37	54.0	11.89	AV	244.00	100	Vertical	Pass
4	6725.500	55.08	1.40	74.0	18.92	Peak	99.00	100	Vertical	Pass
4**	6725.500	44.59	1.40	54.0	9.41	AV	99.00	100	Vertical	Pass
5	8861.500	53.77	1.38	74.0	20.23	Peak	347.00	100	Vertical	Pass
5**	8861.500	43.41	1.38	54.0	10.59	AV	347.00	100	Vertical	Pass
6	13602.000	55.79	4.73	74.0	18.21	Peak	91.00	100	Vertical	Pass
6**	13602.000	46.69	4.73	54.0	7.31	AV	91.00	100	Vertical	Pass

A.1.4 Test Antenna Horizontal, 1 GHz – 18 GHz



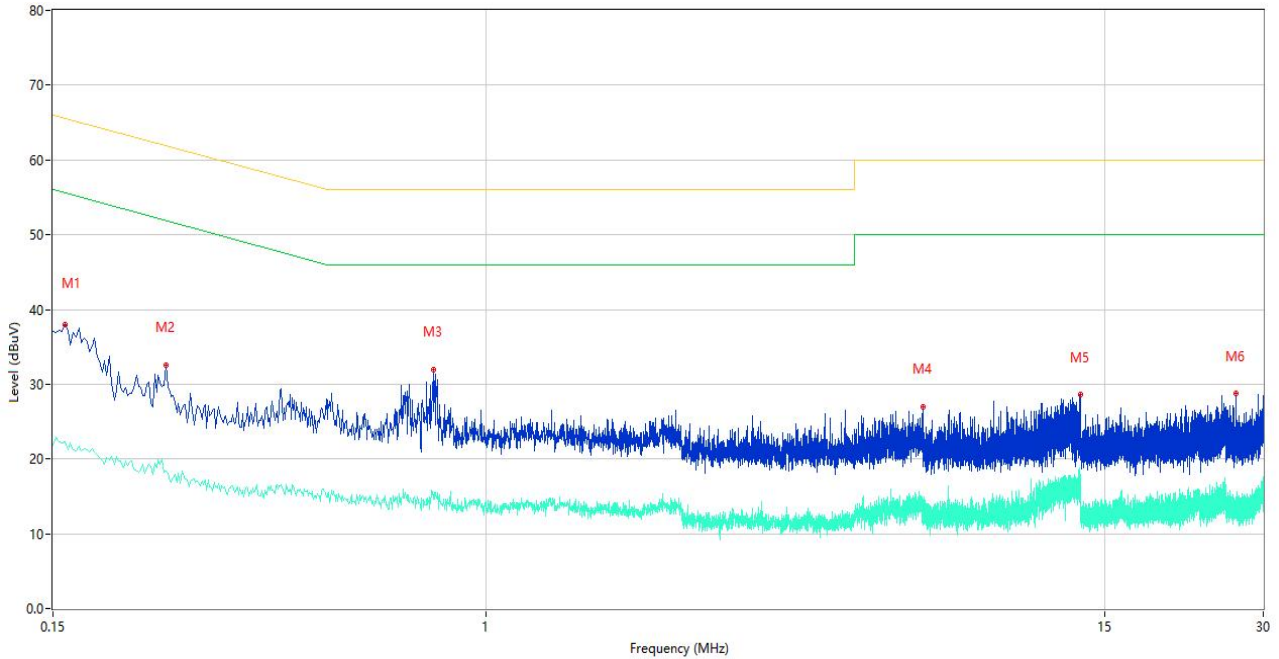
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (Degree)	Height (cm)	Antenna	Verdict
1	1448.500	38.35	-16.48	74.0	35.65	Peak	146.00	100	Horizontal	Pass
1**	1448.500	29.26	-16.48	54.0	24.74	AV	146.00	100	Horizontal	Pass
2	3543.500	48.02	-5.06	74.0	25.98	Peak	239.00	100	Horizontal	Pass
2**	3543.500	37.36	-5.06	54.0	16.64	AV	239.00	100	Horizontal	Pass
3	4801.500	52.36	0.36	74.0	21.64	Peak	34.00	100	Horizontal	Pass
3**	4801.500	41.84	0.36	54.0	12.16	AV	34.00	100	Horizontal	Pass
4	7720.250	55.59	2.19	74.0	18.41	Peak	71.00	100	Horizontal	Pass
4**	7720.250	46.22	2.19	54.0	7.78	AV	71.00	100	Horizontal	Pass
5	10525.000	53.40	1.07	74.0	20.60	Peak	296.00	100	Horizontal	Pass
5**	10525.000	44.97	1.07	54.0	9.03	AV	296.00	100	Horizontal	Pass
6	13371.500	56.00	5.09	74.0	18.00	Peak	123.00	100	Horizontal	Pass
6**	13371.500	46.60	5.09	54.0	7.40	AV	123.00	100	Horizontal	Pass

A.2 Conducted Emission

Test Data and Plots

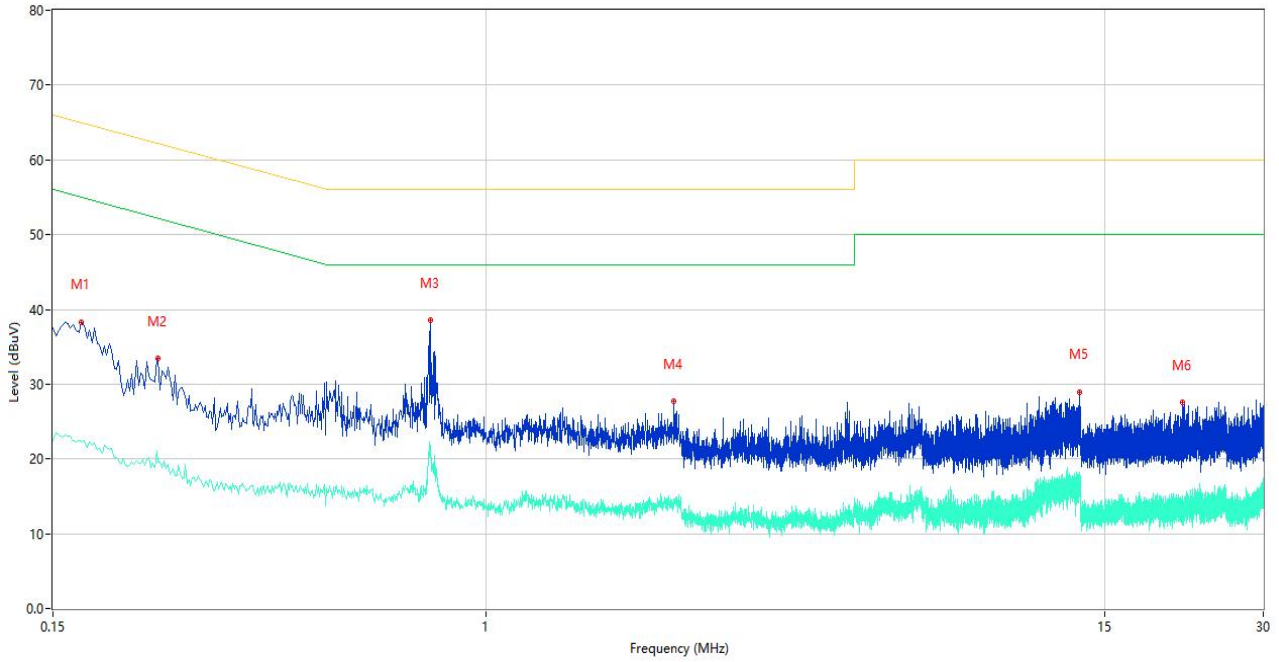
The LTE Band 5 RX Test Mode

A.2.1 L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.158	38.03	9.83	65.57	27.54	Peak	L	Pass
1**	0.158	22.28	9.83	55.57	33.29	AV	L	Pass
2	0.246	32.60	9.79	61.89	29.29	Peak	L	Pass
2**	0.246	18.40	9.79	51.89	33.49	AV	L	Pass
3	0.794	31.99	9.53	56.00	24.01	Peak	L	Pass
3**	0.794	15.15	9.53	46.00	30.85	AV	L	Pass
4	6.772	27.03	10.29	60.00	32.97	Peak	L	Pass
4**	6.772	14.64	10.29	50.00	35.36	AV	L	Pass
5	13.494	28.61	10.20	60.00	31.39	Peak	L	Pass
5**	13.494	15.99	10.20	50.00	34.01	AV	L	Pass
6	26.652	28.77	10.94	60.00	31.23	Peak	L	Pass
6**	26.652	14.08	10.94	50.00	35.92	AV	L	Pass

A.2.2 N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.170	38.33	9.82	64.96	26.63	Peak	N	Pass
1**	0.170	22.35	9.82	54.96	32.61	AV	N	Pass
2	0.238	33.49	9.79	62.17	28.68	Peak	N	Pass
2**	0.238	19.60	9.79	52.17	32.57	AV	N	Pass
3	0.784	38.51	9.58	56.00	17.49	Peak	N	Pass
3**	0.784	21.89	9.58	46.00	24.11	AV	N	Pass
4	2.270	27.74	10.23	56.00	28.26	Peak	N	Pass
4**	2.270	13.90	10.23	46.00	32.10	AV	N	Pass
5	13.416	28.98	10.52	60.00	31.02	Peak	N	Pass
5**	13.416	16.11	10.52	50.00	33.89	AV	N	Pass
6	21.048	27.58	10.80	60.00	32.42	Peak	N	Pass
6**	21.048	14.24	10.80	50.00	35.76	AV	N	Pass

ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ2360790-AE.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ2360790-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ2360790-AI.PDF”.

Statement

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
2. The report without China inspection body and laboratory Mandatory Approval (CMA) mark has no effect of proving to the society.
3. For the report with CNAS mark or A2LA mark, the items marked with "☆" are not within the accredited scope.
4. This report is invalid if it is altered, without the signature of the testing and approval personnel, or without the "inspection and testing dedicated stamp" or test report stamp.
5. The test data and results are only valid for the tested samples provided by the customer.
6. This report shall not be partially reproduced without the written permission of the laboratory.
7. Any objection shall be raised to the laboratory within 30 days after receiving the report.

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