

TEST REPORT

Report No.: SHE19090021-01GE

Date: 2019-12-11

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Applicant : Shanghai ZoomSmart Technology Co.,Ltd.
Address of Applicant : Room 802 Hengxi Road No.809 Pujiang Town Minhang district, Shanghai, China

Product Name : Rugged Phone
Model No. : LT600
Sample No. : E19090021-01#03
E19090021-01#05
FCC ID : 2AUFL-LT600

Standards : FCC CFR47 Part 15, Subpart C

Date of Receipt : 2019-09-16
Date of Test : 2019-09-23 ~ 2019-11-27
Date of Issue : 2019-12-11

Remark:

This report details the results of the testing carried out on one sample, the results contained in this report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

Prepared by: Jennifer Zhou Reviewed by: Adrian Shi Approved by: Guoyou Shi

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(Jennifer Zhou)

(Adrian Shi)

(Authorized signatory: Guoyou Chi)

Revision Record			
Version	Date	Revisions	Revised By
1.0	2019-12-11	Original	--

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1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Services (Shanghai) Co., Ltd.
Address	155 Pingbei Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Company Name	Shanghai ZoomSmart Technology Co.,Ltd.
Address	Room 802 Hengxi Road No.809 Pujiang Town Minhang district, Shanghai, China
Contact Person	yc.qiao
Telephone	15800844215
Email	yc.qiao@zoomsmart.com.cn

1.3 Details of EUT

Product Name	Rugged Phone
Brand Name	ZOOMSMART
Model No.	LT600
FCC ID	2AUFL-LT600
Mode of Operation	Bluetooth BLE
Frequency Range	2400MHz ~ 2483.5MHz
Number of Channels	40 (at intervals of 2 MHz)
Modulation Type	GFSK
Antenna Type	Internal Antenna
Antenna Gain	2.03 dBi
Extreme Temperature Range	0℃~ +40℃
Test Voltage	DC 3.85V

1.4 Test Methodology

47 CFR Part 15, Subpart C	Miscellaneous Wireless Communications Services
KDB Publication 558074 D01 v05r02	DTS Meas Guidance.
ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Note(s):

All test items were verified and recorded according to the standards and without any addition/deviation/exclusion during the test.

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1.5 Test Verdict

No.	FCC Part No.	ISED Part No.	Description	Test Result	Verdict
1	15.203	RSS-247, 5.4(6)	Antenna Requirement	Clause 4.1.1	PASS
2	15.247(b)	RSS-247, 5.4(4)	Peak Output Power	Clause 4.1.2	PASS
3	15.247(a)	RSS-Gen, 6.6; RSS-247, 5.2(1)	6dB Bandwidth and 99% Bandwidth	Clause 4.1.3	PASS
4	15.247(e)	RSS-247, 5.2(2)	Power Spectral Density	Clause 4.1.4	PASS
5	15.247(d)	RSS-247, 5.5	Conducted Spurious Emission & Authorized-band band-edge	Clause 4.1.5	PASS
6	15.247(d), 15.205, 15.209	RSS-247, 5.5	Spurious Emission	Clause 4.1.6	PASS
7	15.247(d), 15.205, 15.209	RSS-247, 5.5	Band Edge (Restricted-band band-edge)	Clause 4.1.7	PASS
8	15.207(a)	RSS-Gen 8.8	Conducted Emission	Clause 4.2.1	PASS

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2 Test Condition

2.1 Environmental conditions

Temperature (°C)	18-25
Humidity (%RH)	40-65
Barometric Pressure (mbar)	960-1060

2.2 Equipment List

Name of Equipment	Manufacturer	Model	Serial No.	Cal. Due Date
Spectrum Analyzer	Keysight	N9020B	MY59260184	2020-07-28
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2020-06-24
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2020-06-19
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2020-06-19
V-network	SCHWARZBECK	NSLK 8127	8127-902	2020-02-20
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2020-08-22
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2020-06-06
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2020-06-06
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2021-03-19
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2020-07-26
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2020-06-26
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2020-08-28
Test Software	BL	BL410_E	N/A	N/A

2.3 Measurement Uncertainty

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	30 MHz – 1 GHz	± 3 dB
	> 1GHz	± 3 dB

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3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software was control EUT work in continuous transmitter and receiver mode. Select test channel as below:

Channel	Frequency
The lowest channel(CH0)	2402MHz
The middle channel(CH19)	2440MHz
The Highest channel(CH39)	2480MHz

The basic operation modes are:

- A. On
 - 1. BLE mode
 - a. Transmitting
 - i. Low Channel
 - ii. Middle Channel
 - iii. High Channel
 - b. Receiving
 - 2. Normal working with Bluetooth on
- B. Standby
- C. Off

3.2 Special Accessories and Auxiliary Equipment

Description	Manufacturer	Model No.	Serial No.
Laptop	Lenovo	TP00083A	N/A

3.3 Support Software

Description	Manufacturer	Software Name
Software	Qualcomm	QRCT3

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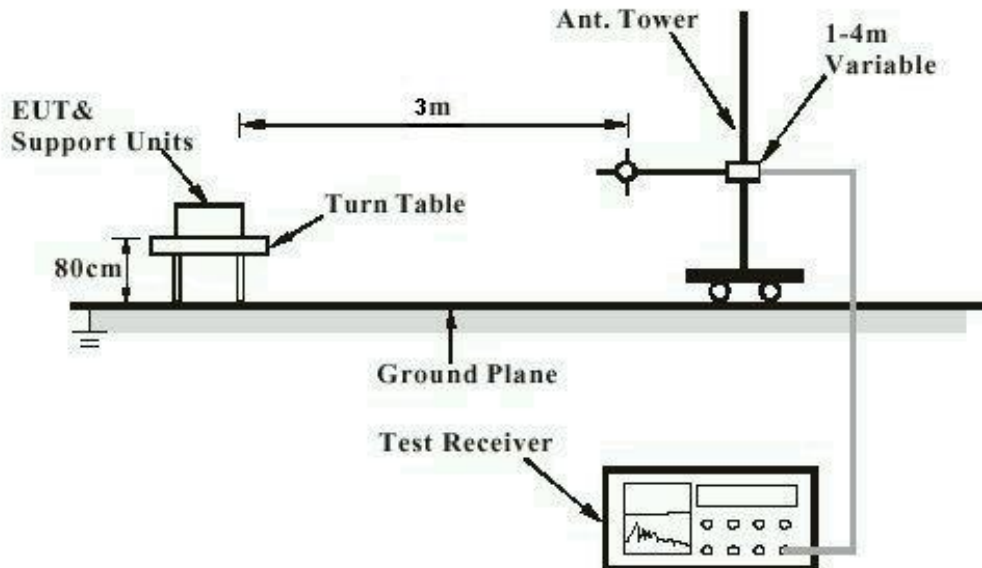
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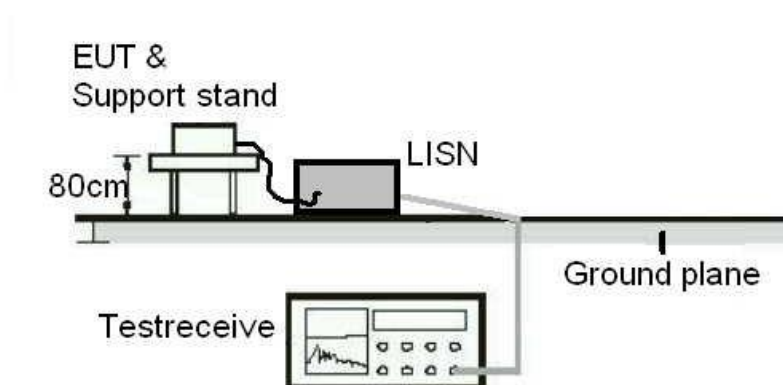
3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test



Note: Measurements above 1GHz are done with a table height of 1.5m. In addition, there is RF absorbing material on the floor of the test site for above 1GHz measurement.

Diagram of Measurement Equipment Configuration for Conduction Measurement



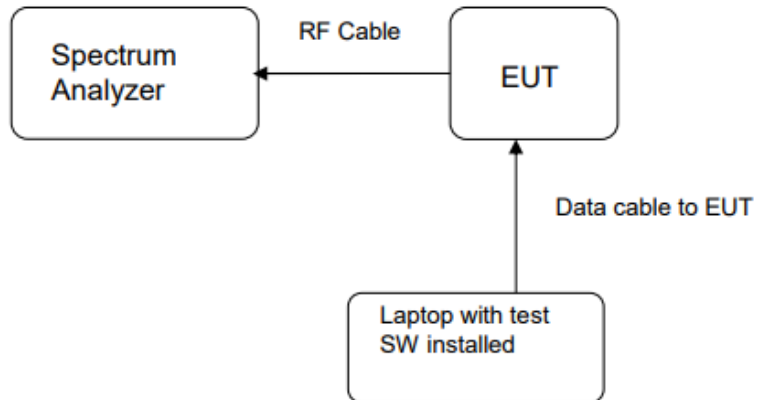
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Diagram of Measurement Equipment Configuration for Transmitter Measurement



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4 Test Results

4.1 Transmitter Requirement & Test Suites

4.1.1 Antenna Requirement

RESULT:

PASS

Test standard : FCC Part 15.247(b)(4), Part 15.203

Requirement : The use of approved antennas only with directional gains that do not exceed 6 dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 2.03 dBi. The antenna is an internal antenna with no possibility of replacement with a non-approved antenna by the end-user.

Therefore, the EUT is considered to comply with this provision.

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4.1.2 Peak Output Power

RESULT:

PASS

Test standard : FCC Part 15.247(b)(3)

Requirement : ANSI C63.10-2013, KDB 558074

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1.a

Ambient temperature : 25°C

Relative humidity : 52%

Table 1: Peak Output Power

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(mW)	
BLE	2402	-0.49	0.89	< 1
	2440	-0.01	1.00	
	2480	-2.04	0.63	

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Figure 1: Peak Output Power, 2402MHz

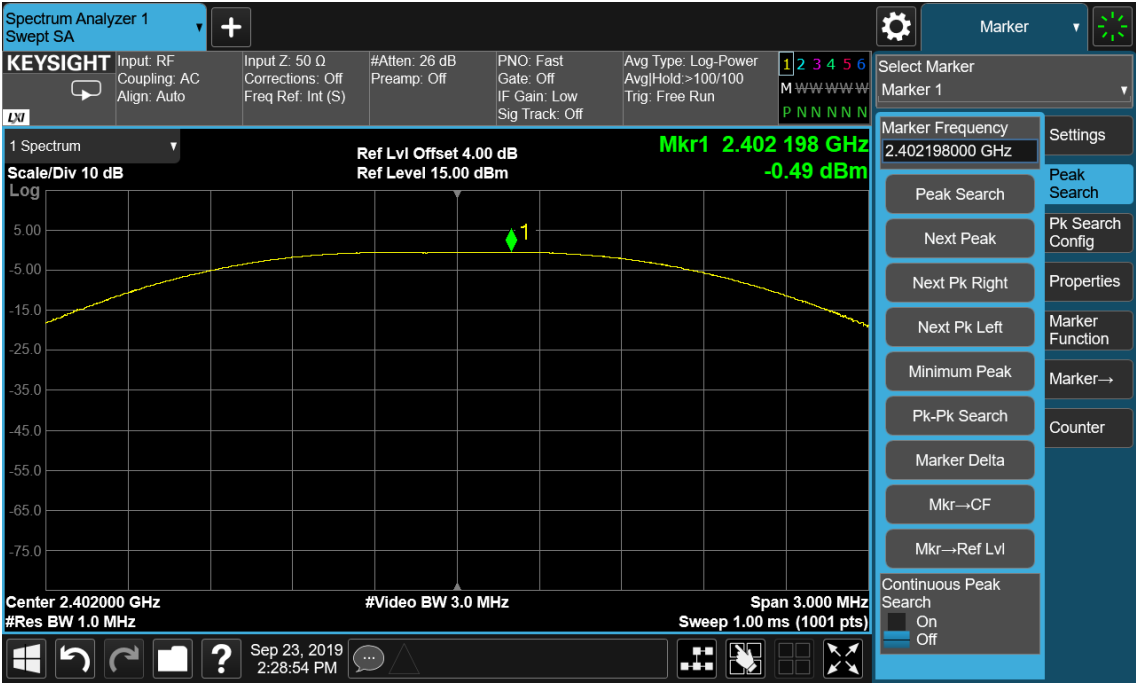


Figure 2: Peak Output Power, 2440MHz



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Figure 3: Peak Output Power, 2480MHz



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4.1.3 6dB Bandwidth and 99% Bandwidth

RESULT:

PASS

Test standard : FCC Part 15.247(a)(2)

Requirement : ANSI C63.10-2013, KDB 558074

Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1.a

Ambient temperature : 25°C

Relative humidity : 52%

Table 2: 6dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth Limit
BLE	2402	0.670	1.081	0.5 MHz
	2440	0.670	1.081	
	2480	0.677	1.081	

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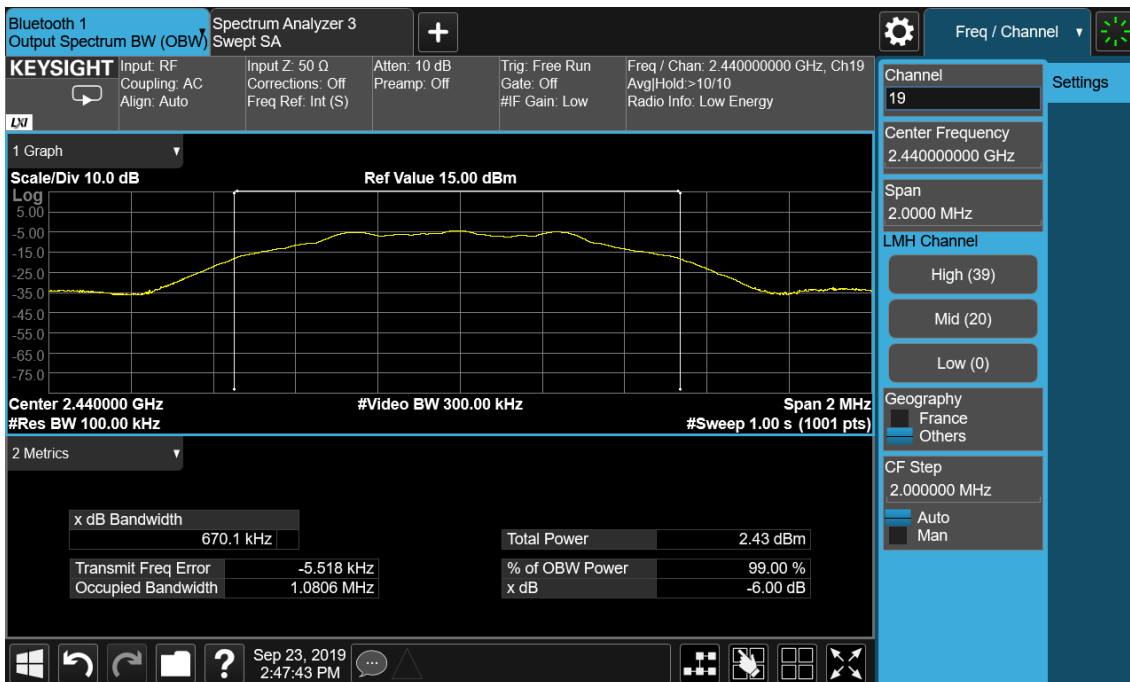
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Figure 4: 6dB Bandwidth and 99% Bandwidth, 2402MHz



Figure 5: 6dB Bandwidth and 99% Bandwidth, 2440MHz



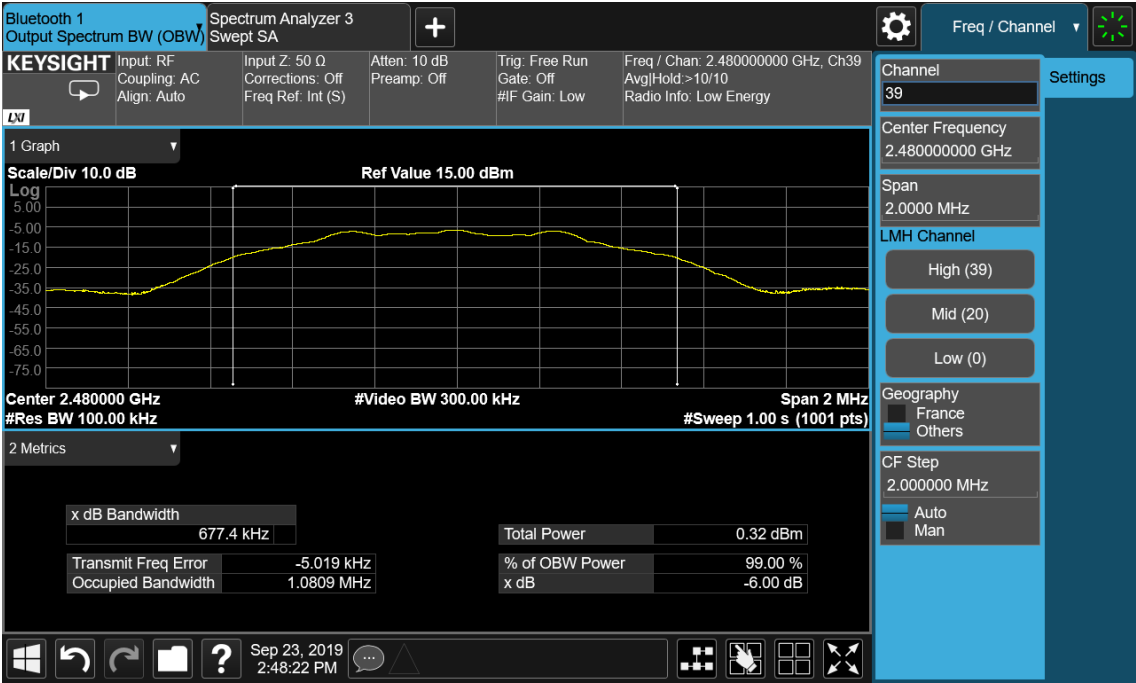
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Figure 6: 6dB Bandwidth and 99% Bandwidth, 2480MHz



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4.1.4 Power Spectral Density

RESULT:

PASS

Test standard : FCC Part 15.247(e)
Requirement : ANSI C63.10-2013, KDB 558074
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 25°C
Relative humidity : 52%

Table 3: Power Spectral Density

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE	2402	-15.91	8
	2441	-15.19	
	2480	-17.13	

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Figure 7: Power Spectral Density, 2402MHz

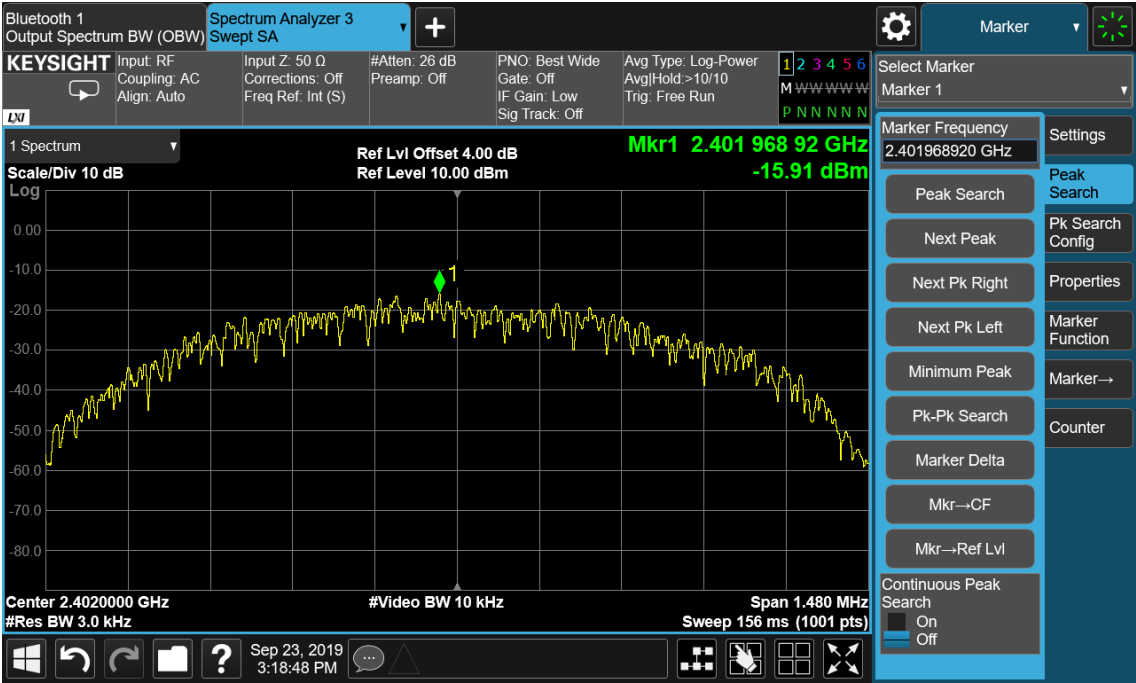
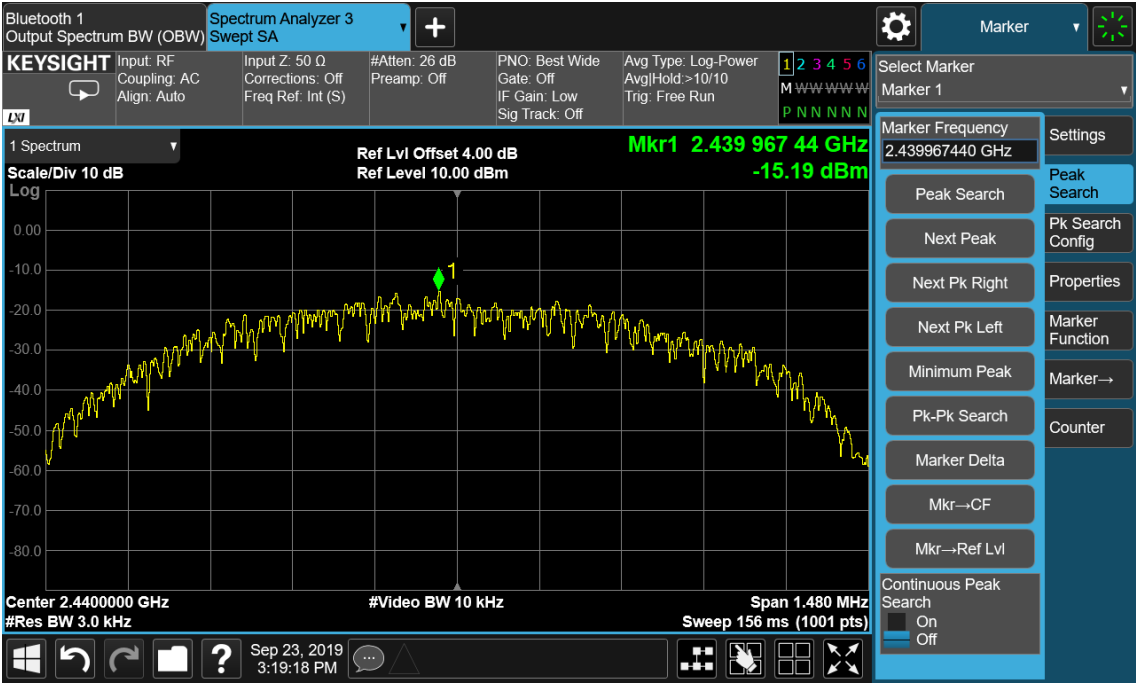


Figure 8: Power Spectral Density, 2440MHz



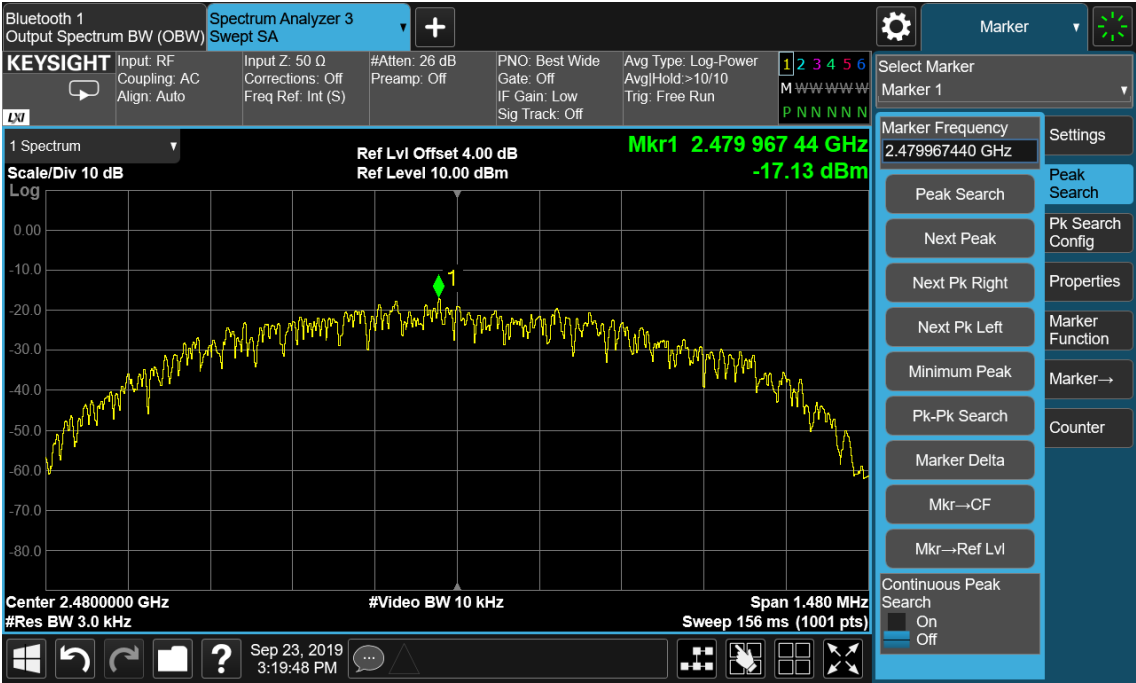
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Figure 9: Power Spectral Density, 2480MHz



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4.1.5 Conducted Spurious Emission & Authorized-band band-edge

RESULT:

PASS

Test standard	: FCC Part 15.247(d)
Requirement	: ANSI C63.10-2013, KDB 558074
Kind of test site	: Shielded room

Test setup

Test Channel	: Low/Middle/High for spurious, Low/High for Band Edge
Operation Mode	: A.1.a
Ambient temperature	: 25°C
Relative humidity	: 52%

For details refer to following test plot.

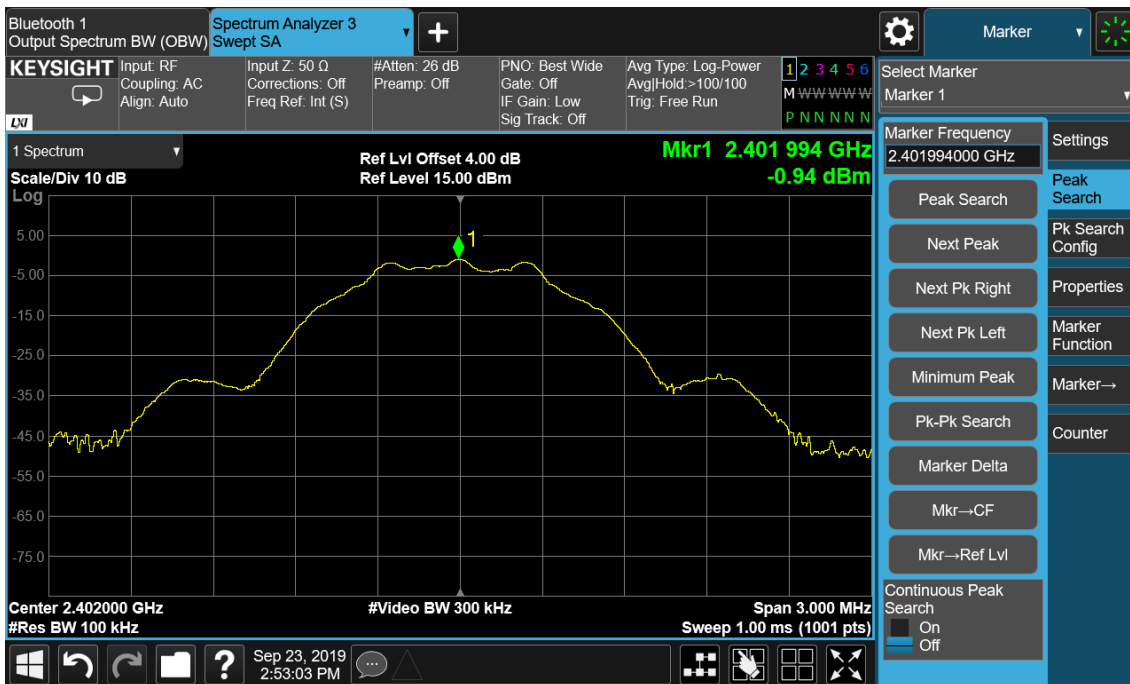
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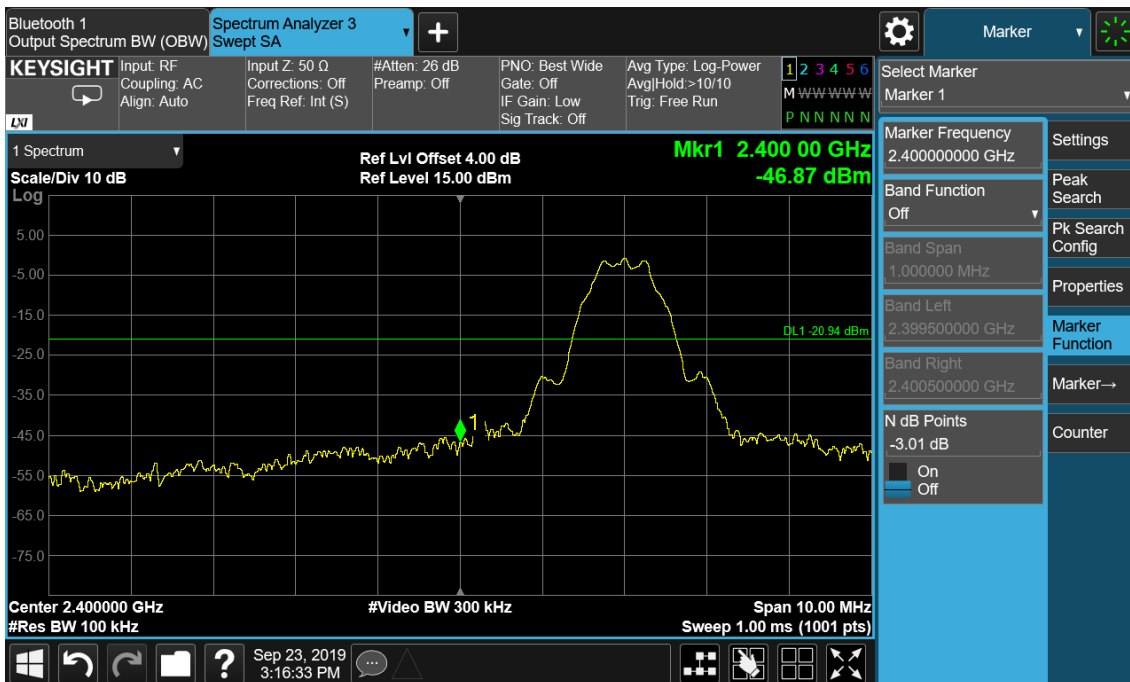
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Figure 10: Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE Carrier Level



Band Edge

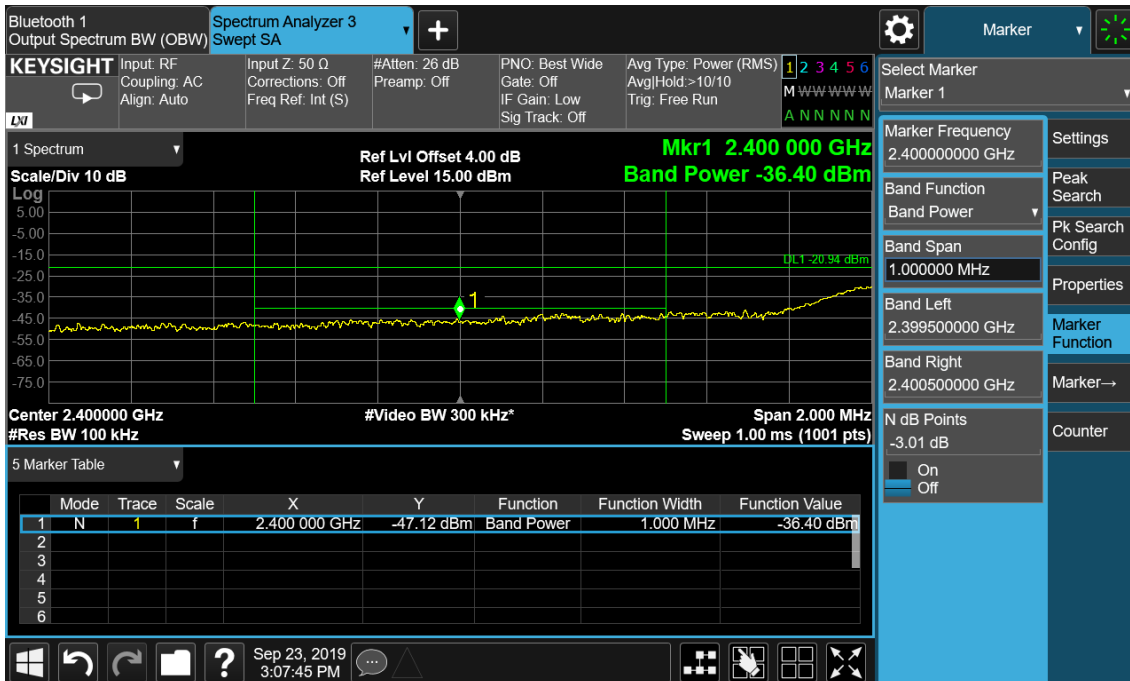


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Conducted spurious emissions 30MHz-25GHz



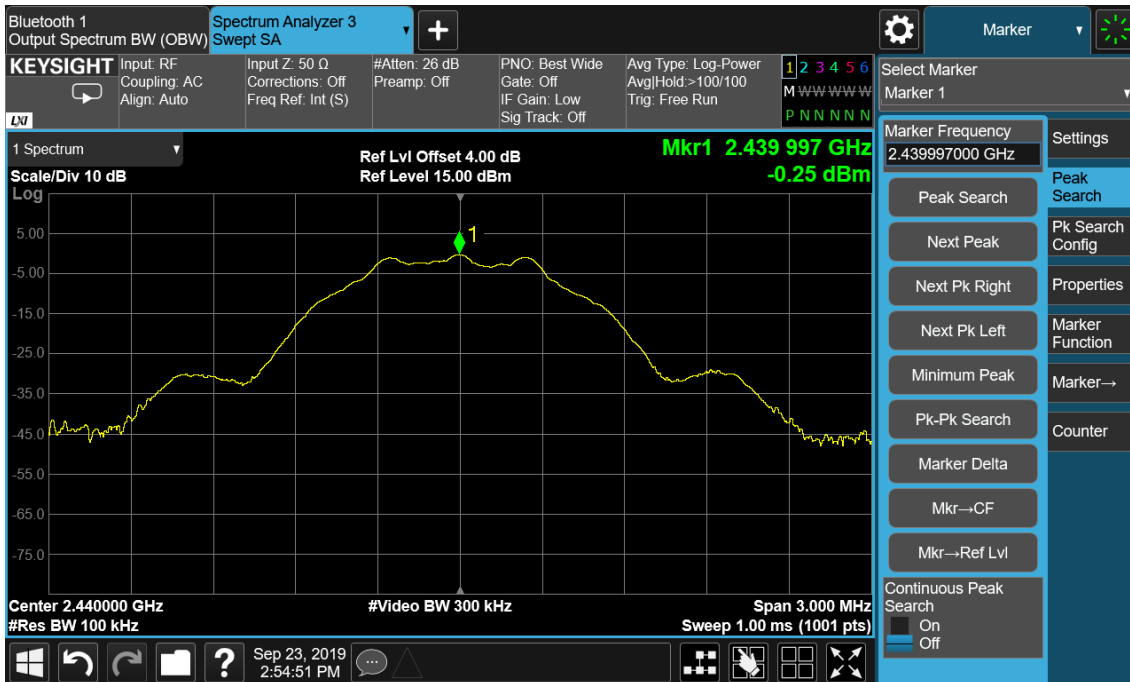
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Figure 11: Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE Carrier Level



Conducted spurious emissions 30MHz-25GHz



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Figure 12: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE Carrier Level



Band Edge

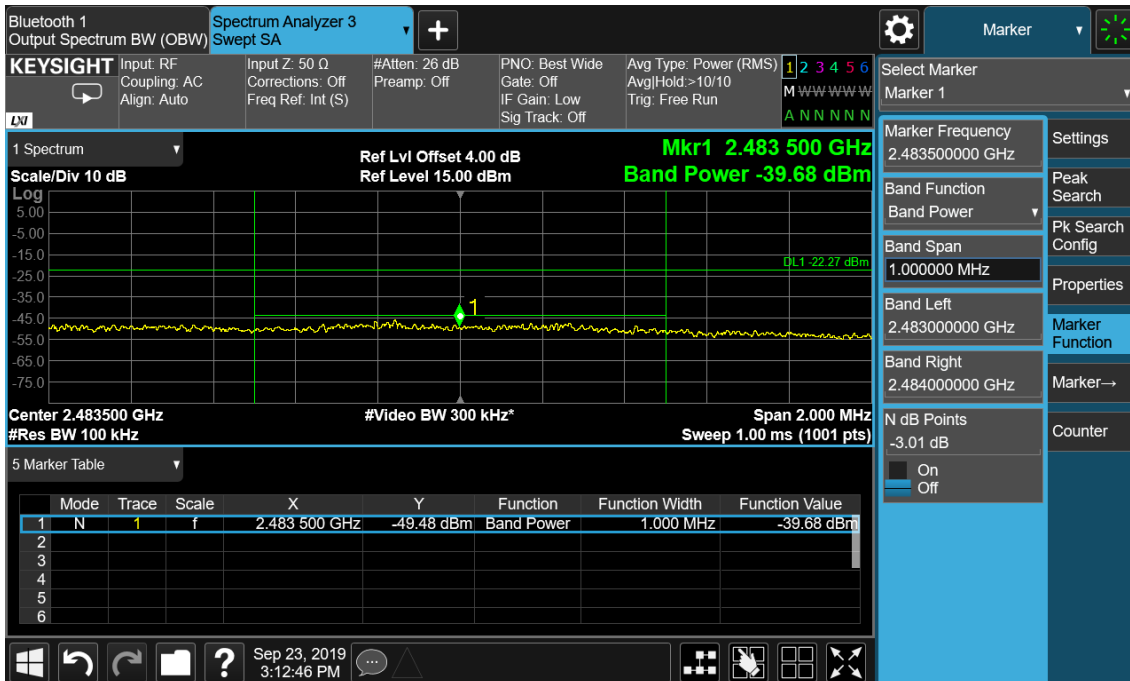


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Conducted spurious emissions 30MHz-25GHz



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4.1.6 Spurious Emission

RESULT:

PASS

Test standard : FCC Part 15.247(d), 15.205, 15.209

Requirement : ANSI C63.10-2013, KDB 558074

Kind of test site : 3m Semi-Anechoic Chamber

Test setup

Test Channel : Low/Middle/High

Operation Mode : A

Ambient temperature : 25°C

Relative humidity : 52%

Notes:

1. Test plots please refer to the annex document "EXHIBIT A of SHE19090021-01GE".
2. For 9 kHz ~ 30 MHz, the amplitude of spurious emissions that are attenuated by more than 20dB below the permissible. The value has no need to be reported.
3. The spurious above 18GHz is noise only and 20dB below the limit. The value has no need to be reported.
4. The EUT is working in the Normal link mode below 1 GHz.

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4.1.7 Band Edge (Restricted-band band-edge)

RESULT:

PASS

Test standard : FCC Part 15.247(d), 15.205, 15.209

Requirement : ANSI C63.10-2013, KDB 558074

Kind of test site : 3m Semi-Anechoic Chamber

Test setup

Test Channel : Low/Middle/High

Operation Mode : A.1

Ambient temperature : 25°C

Relative humidity : 52%

Note:

1. Test plots please refer to the annex document "EXHIBIT A of SHE19090021-01GE".

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4.2 Mains Emissions

4.2.1 Conducted Emission on AC Mains

RESULT:

PASS

Test standard : FCC Part 15.207(a)

Requirement : ANSI C63.10-2013

Kind of test site : Shielded room

Test setup

Input Voltage : AC 120V, 60Hz; AC 240V, 50Hz

Operation Mode : A.2

Earthing : Not Connected

Ambient temperature : 25°C

Relative humidity : 52%

For details refer to following test plot.

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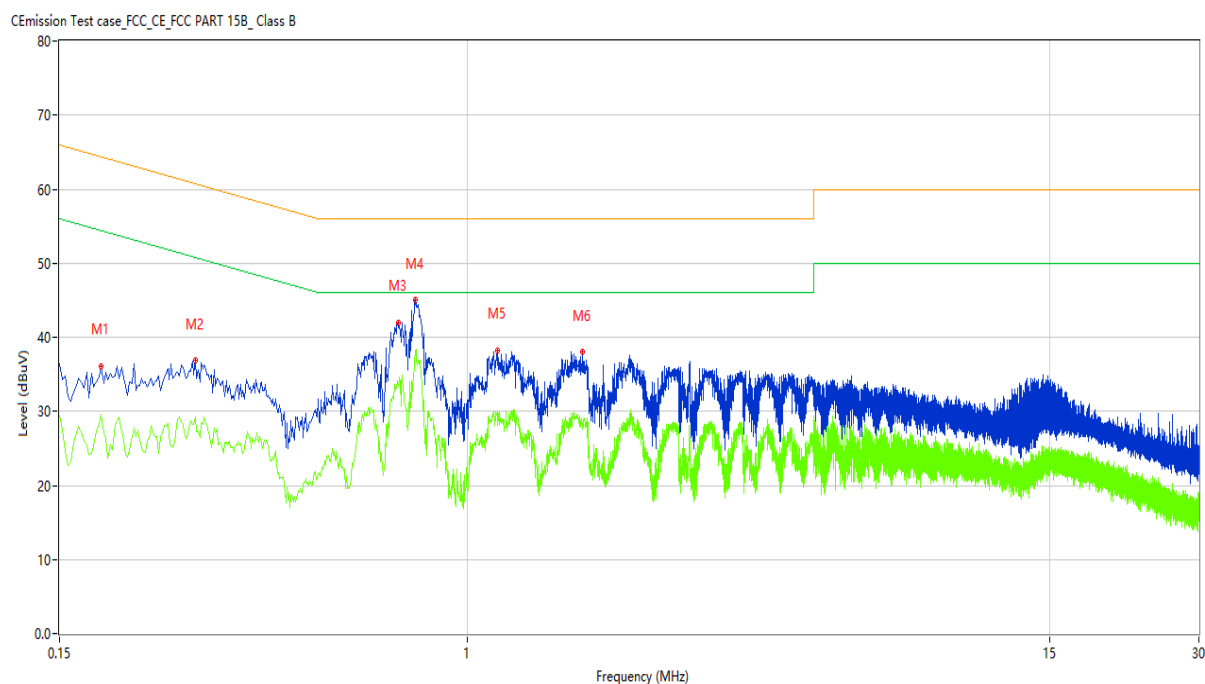
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Note:

The all configurations were tested respectively, but only the worst configuration shown here.

Figure 13: Conducted Emission on AC Mains, L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.182	36.03	10.15	64.39	-28.36	Peak	L	Pass
1**	0.182	29.59	10.15	54.39	-24.80	AV	L	Pass
2	0.282	36.87	10.14	60.76	-23.89	Peak	L	Pass
2**	0.282	29.25	10.14	50.76	-21.51	AV	L	Pass
3	0.724	41.94	10.15	56.00	-14.06	Peak	L	Pass
3**	0.724	33.47	10.15	46.00	-12.53	AV	L	Pass
4	0.784	45.68	10.15	56.00	-10.32	Peak	L	Pass
4*	0.784	42.51	10.15	56.00	-13.49	QP	L	Pass
4**	0.784	37.92	10.15	46.00	-8.08	AV	L	Pass
5	1.150	38.23	10.16	56.00	-17.77	Peak	L	Pass
5**	1.150	30.11	10.16	46.00	-15.89	AV	L	Pass
6	1.710	37.97	10.17	56.00	-18.03	Peak	L	Pass
6**	1.710	27.58	10.17	46.00	-18.42	AV	L	Pass

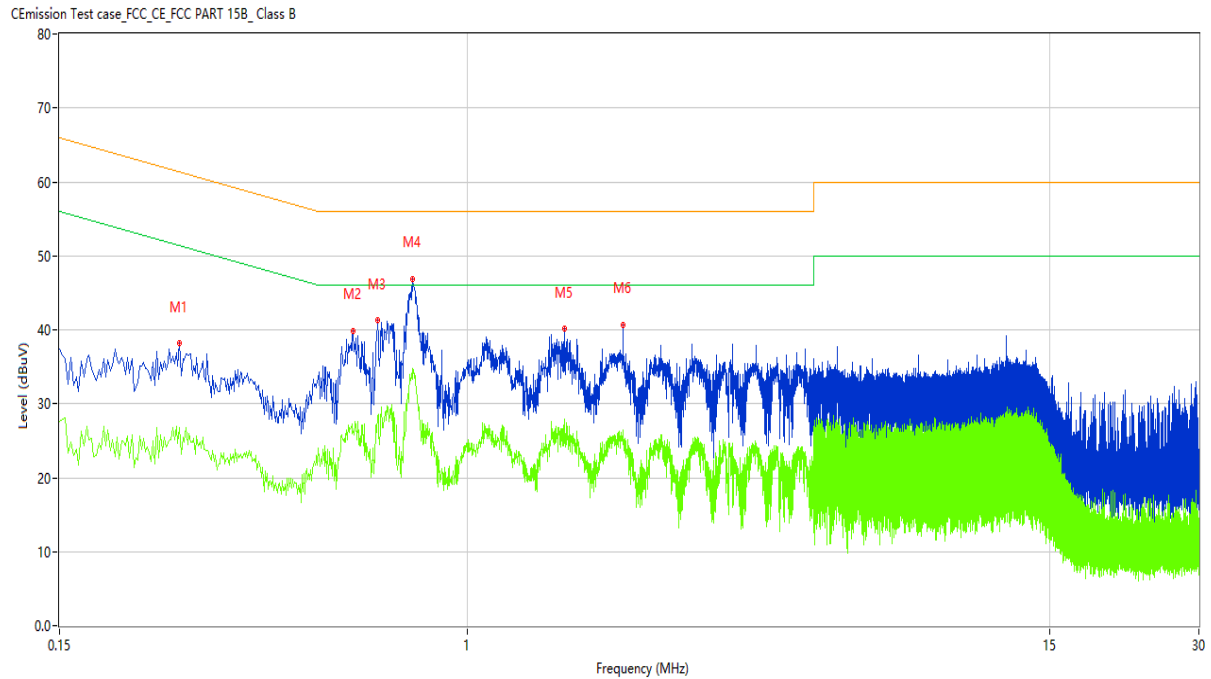
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Figure 14: Conducted Emission on AC Mains, N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.262	38.15	10.14	61.37	-23.22	Peak	N	Pass
1**	0.262	26.79	10.14	51.37	-24.58	AV	N	Pass
2	0.588	39.91	10.15	56.00	-16.09	Peak	N	Pass
2**	0.588	26.35	10.15	46.00	-19.65	AV	N	Pass
3	0.658	41.22	10.15	56.00	-14.78	Peak	N	Pass
3**	0.658	28.33	10.15	46.00	-17.67	AV	N	Pass
4	0.774	47.42	10.15	56.00	-8.58	Peak	N	Pass
4*	0.774	43.63	10.15	56.00	-12.37	QP	N	Pass
4**	0.774	34.85	10.15	46.00	-11.15	AV	N	Pass
5	1.572	40.18	10.17	56.00	-15.82	Peak	N	Pass
5**	1.572	27.89	10.17	46.00	-18.11	AV	N	Pass
6	2.060	40.73	10.18	56.00	-15.27	Peak	N	Pass
6**	2.060	26.43	10.18	46.00	-19.57	AV	N	Pass

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5 Appendixes

5.1 Photographs of the Sample



Front of the sample



Rear of the sample

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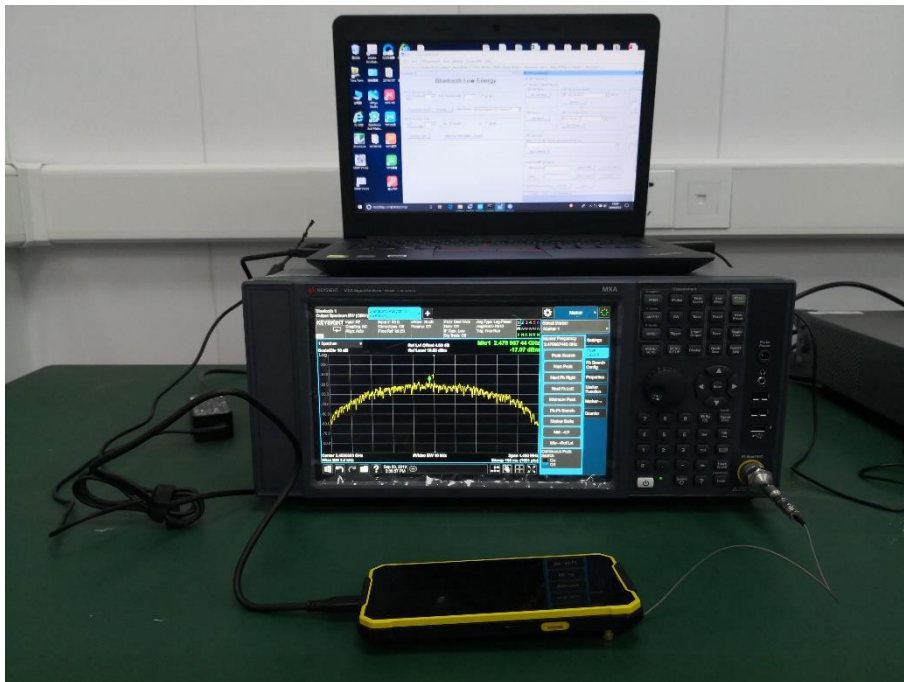
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5.2 Set-up for Conducted Emissions



5.3 Set-up for Conducted RF test at Antenna Port



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5.4 Set-up for Spurious Emissions below 1GHz



5.5 Set-up for Spurious Emissions above 1GHz



End of the report