

TEST REPORT

Report No.: SHE22060090-02CE

Date: 2022-07-28

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Applicant : Home Tech Innovation, Inc
Address of Applicant : 1035 Cambridge St, Suite 11A, Cambridge, MA 02141

Product Name : Suvie Kitchen Robot
Brand Name : Suvie
Model No. : SV301
Sample No. : E22060090-01#01
E22060090-02#01

FCC ID : 2AT2K-SV301

Standard : FCC CFR47 Part 15, Subpart C

Date of Receipt : 2022-07-11
Date of Test : 2022-07-11 ~ 2022-07-27
Date of Issue : 2022-07-28

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.

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1 General Information

1.1 Testing Laboratory

Company Name	ICAS Testing Technology Service (Shanghai) Co., Ltd.
Address	No.1298 Pingan Rd, Minhang District, Shanghai, China
Telephone	0086 21-51682999
Fax	0086 21-54711112
Homepage	www.icasiso.com

1.2 Details of Application

Applicant Company Name	Home Tech Innovation, Inc
Address	1035 Cambridge St, Suite 11A, Cambridge, MA 02141
Contact Person	Kevin Incorvia
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Email	kincorvia@suvie.com
Manufacturer Company Name	Home Tech Innovation, Inc
Address	1035 Cambridge St, Suite 11A, Cambridge, MA 02141

1.3 Details of EUT

Product Name	Suvie Kitchen Robot
Brand Name	Suvie
Test Model No.	SV301
FCC ID	2AT2K-SV301
Mode of Operation	Bluetooth BLE
Frequency Range	2400MHz ~ 2483.5MHz
Number of Channels	40 (at intervals of 2 MHz)
Modulation Type	GFSK
Antenna Type	PCB Antenna
Antenna Gain	3.42dBi
Test Voltage	AC 120V 60Hz 1400W
Hardware version	SV301_1.0.2
Software version	fw
Test SW Version	BL410_R; BL410_E
RF power setting in TEST_SW	EspRFTestTool_v2.8

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1.4 Test Methodology

47 CFR Part 15, Subpart C	Telecommunication-Radio Frequency Devices-Intentional Radiators
KDB Publication 558074 D01 v05r02	Part 15.247 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.

1.5 Test Summary

Test Item	FCC Rules	Requirement	Result
Antenna Requirement	FCC Part 15.247(b)(4), Part 15.203	FCC Part 15.247(b)(4), Part 15.203	PASS
Peak Output Power	FCC Part 15.247(b)(3)	ANSI C63.10-2013, Clause 11.9.1.1 KDB 558074 D01 v05r02, Clause 8.3.1	PASS
6dB Bandwidth	FCC Part 15.247(a)(2)	ANSI C63.10-2013, Clause 11.8.1 KDB 558074 D01 v05r02, Clause 8.2	PASS
Power Spectral Density	FCC Part 15.247(e)	ANSI C63.10-2013, Clause 11.10.2 KDB 558074 D01 v05r02, Clause 8.4	PASS
Conducted Spurious Emission & Authorized-band band-edge	FCC Part 15.247(d)	ANSI C63.10-2013, Clause 11.11.1(a) KDB 558074 D01 v05r02, Clause 8.5	PASS
Radiated Spurious Emission	FCC Part 15.247(d), 15.205, 15.209	ANSI C63.10-2013, Clause 11.12 KDB 558074 D01 v05r02, Clause 8.6	PASS
Band Edge (Restricted-band band-edge)	FCC Part 15.247(d), 15.205, 15.209	ANSI C63.10-2013, Clause 11.13 KDB 558074 D01 v05r02, Clause 8.7	PASS
Conducted Emission on AC Mains	FCC Part 15.207(a)	ANSI C63.10-2013, Clause 6.2	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. Date	Cal. Due Date
Spectrum Analyzer	Keysight	N9020B	MY59260184	2021-08-17	2022-08-16
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2022-06-09	2023-06-08
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2022-06-09	2023-06-08
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2022-06-09	2023-06-08
V-network	SCHWARZBECK	NSLK 8127	8127-902	2022-06-09	2023-06-08
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2021-08-13	2022-08-12
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08	2023-06-07
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2021-06-08	2023-06-07
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2020-11-23	2022-11-22
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2021-06-12	2023-06-11
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2020-06-09	2023-06-08
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2020-06-09	2023-06-08
Test Software	BL	BL410_E	N/A	N/A	N/A
Test Software	BL	BL410_R	N/A	N/A	N/A

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2.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the “Guide to the Expression of Uncertainty in measurement” (GUM) published by CISPR and ANSI. The reported uncertainty of measurement $y \pm U$, where expanded uncertainty U is based on a standard uncertainty multiplied by a coverage factor of $k=2$, providing a level of confidence of approximately 95%.

Parameter	Frequency	Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	30 MHz – 1 GHz	± 3.42 dB
	> 1GHz	± 4.20 dB
Conducted Emission on AC Mains	9 kHz to 30 MHz	± 1.71 dB
Occupied Channel Bandwidth		± 5 %

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3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software (EspRFTestTool_v2.8) 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.
PC	HP	HP ZHAN 66 Pro G1	N/A
USB Cable	N/A	N/A	1.00m Unshielded

3.3 Support Software

Description	Manufacturer	Software Name
Software	N/A	EspRFTestTool_v2.8

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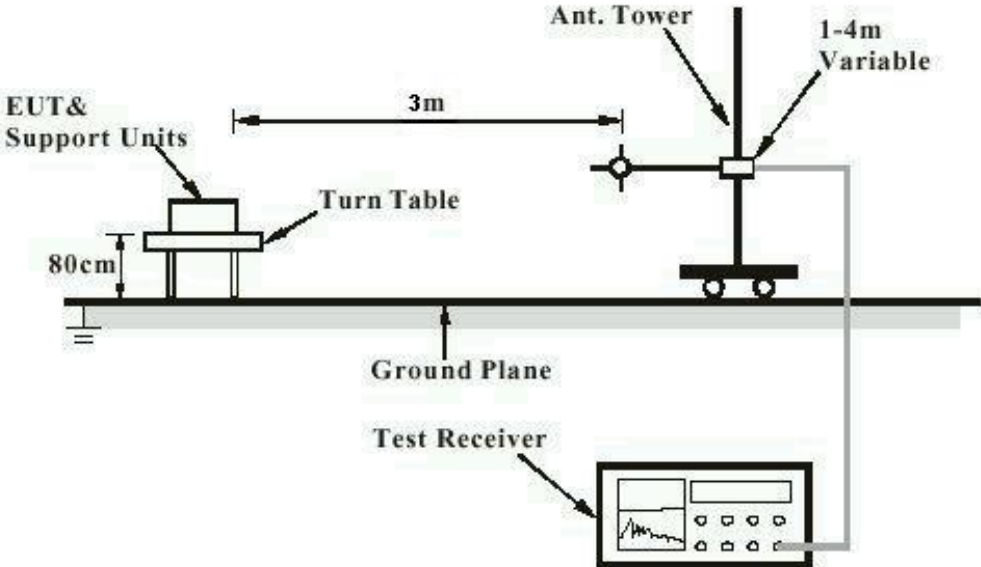
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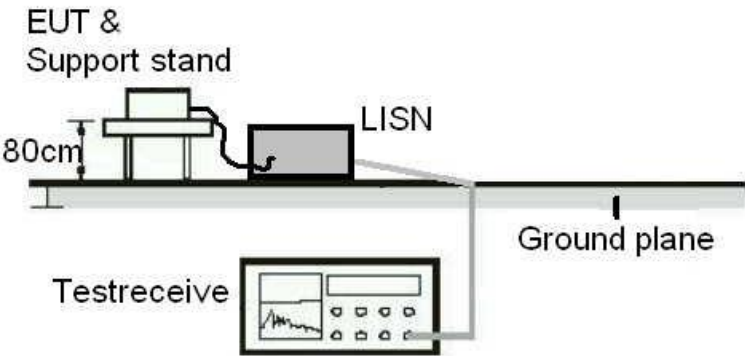
3.4 Test Setup Diagram

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 Configuration for Conduction Test



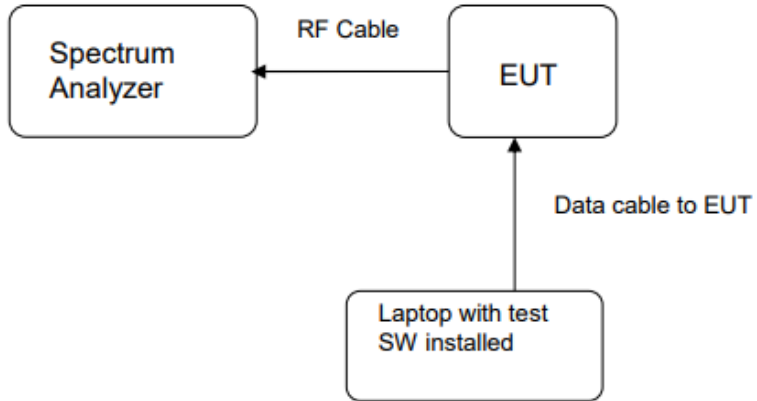
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Diagram of Measurement Configuration for Transmitter Test



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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 6dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 3.42dBi. The antenna is PCB 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, Clause 11.9.1.1
 KDB 558074 D01 v05r02, Clause 8.3.1
 Kind of test site : Shielded room

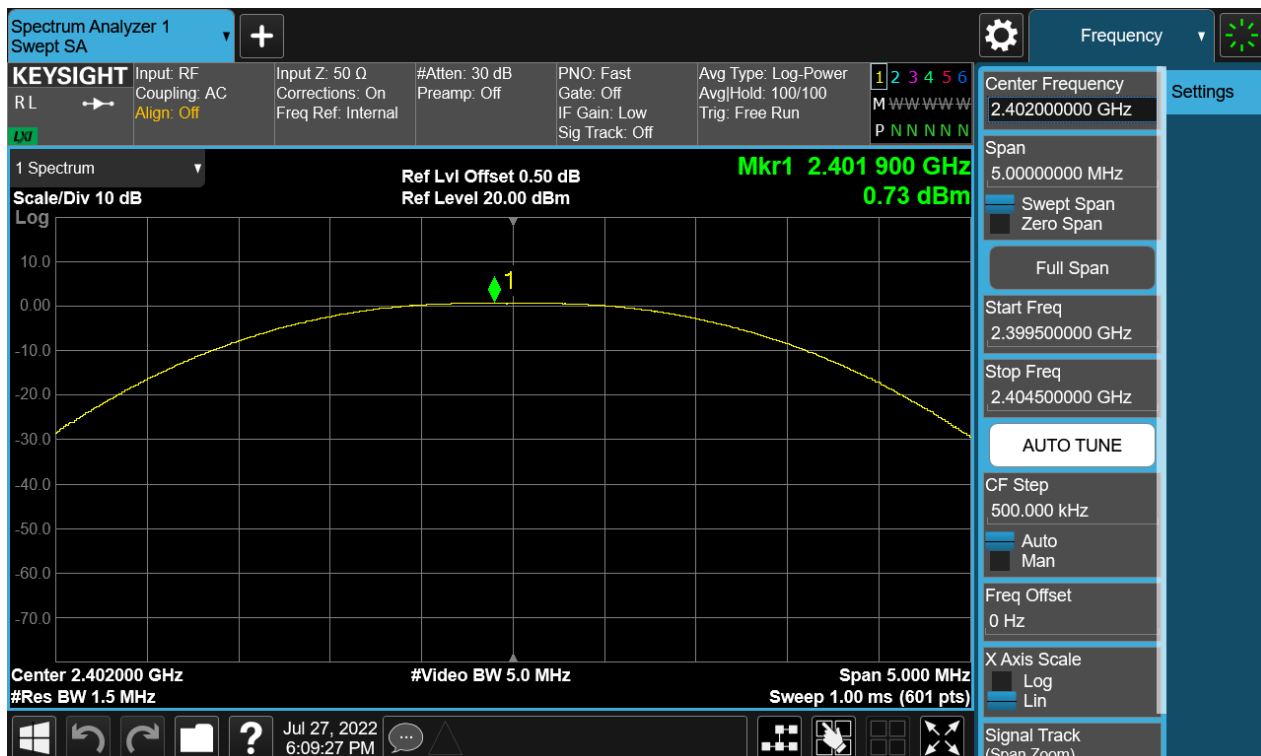
Test setup

Test Channel : Low/Middle/High
 Operation Mode : A.1.a
 Ambient temperature : 24.9°C
 Relative humidity : 51%

Table 1: Peak Output Power

Test Mode	Test Channel (MHz)	Peak Output Power		Limit (W)
		(dBm)	(mW)	
BLE	2402	0.73	1.18	≤1
	2440	1.15	1.30	
	2480	0.59	1.15	

Figure 1: Peak Output Power, 2402MHz



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Figure 2: Peak Output Power, 2440MHz

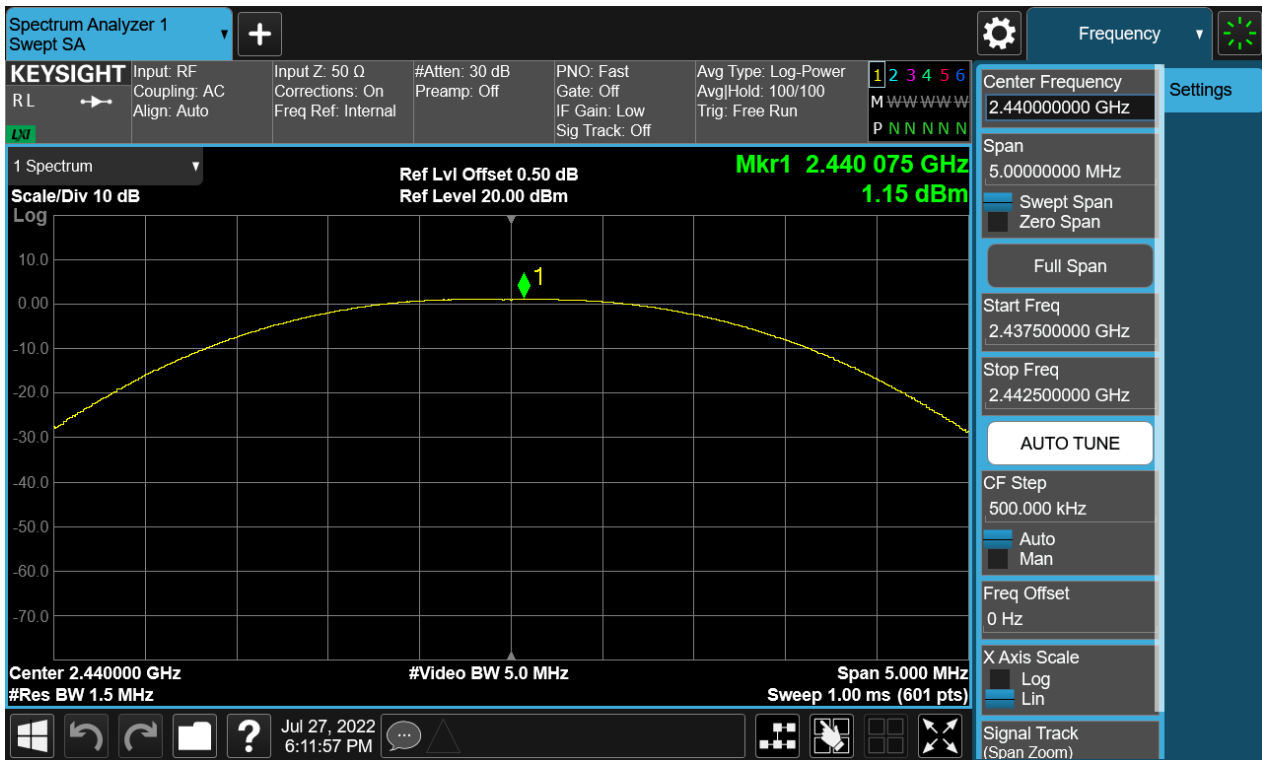
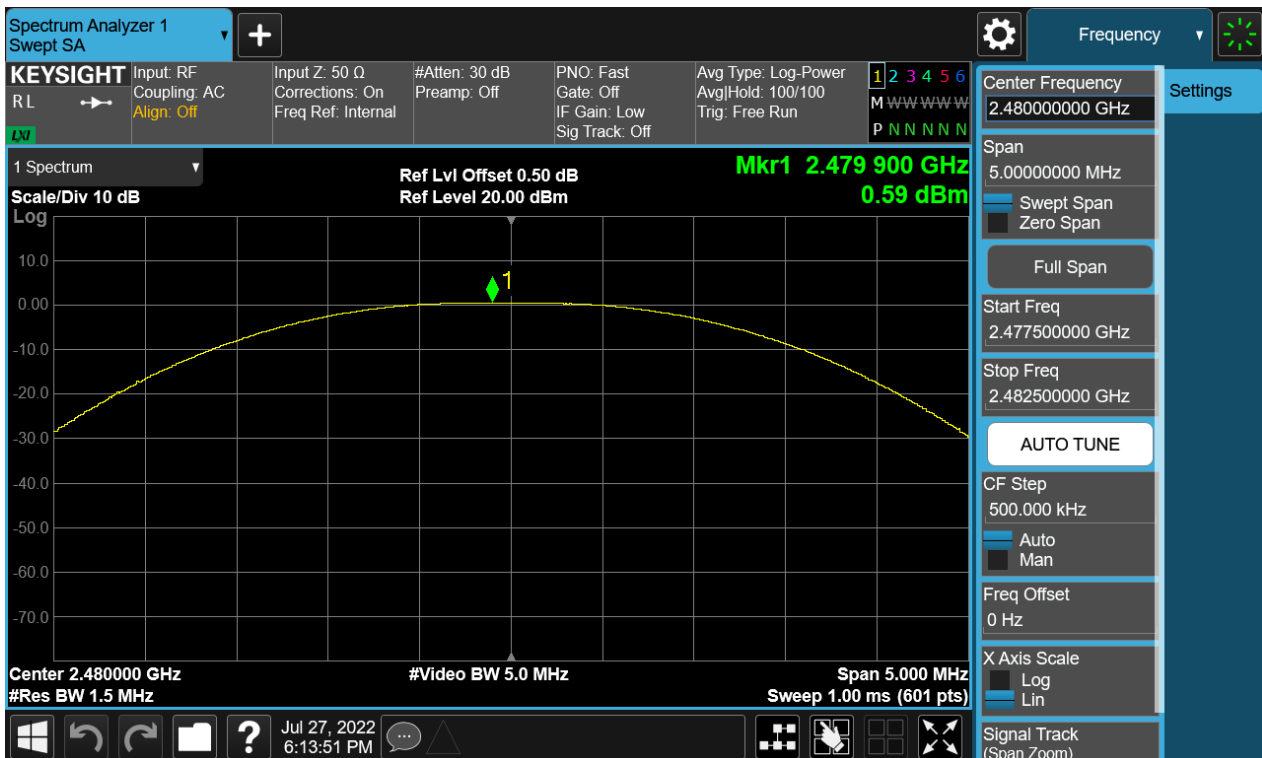


Figure 3: Peak Output Power, 2480MHz



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4.1.3 6dB Bandwidth

RESULT:

PASS

Test standard : FCC Part 15.247(a)(2)
 Requirement : ANSI C63.10-2013, Clause 11.8.1
 KDB 558074 D01 v05r02, Clause 8.2
 Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
 Operation Mode : A.1.a
 Ambient temperature : 24.9°C
 Relative humidity : 51%

Table 2: 6dB Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	Limit
BLE	2402	0.6490	≥0.5 MHz
	2440	0.6439	
	2480	0.6330	

Figure 4: 6dB Bandwidth, 2402MHz



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Figure 5: 6dB Bandwidth, 2440MHz

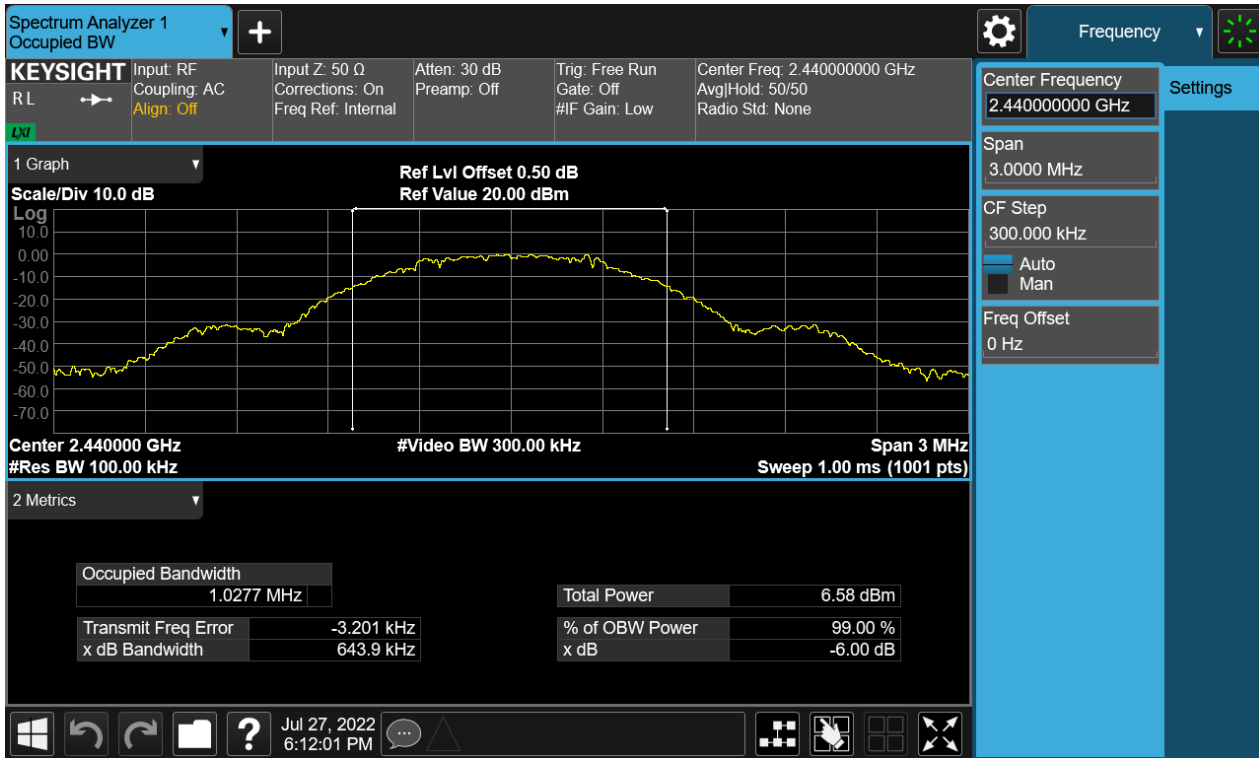


Figure 6: 6dB Bandwidth, 2480MHz



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4.1.4 Power Spectral Density

RESULT:

PASS

Test standard : FCC Part 15.247(e)
 Requirement : ANSI C63.10-2013, Clause 11.10.2
 KDB 558074 D01 v05r02, Clause 8.4
 Kind of test site : Shielded room

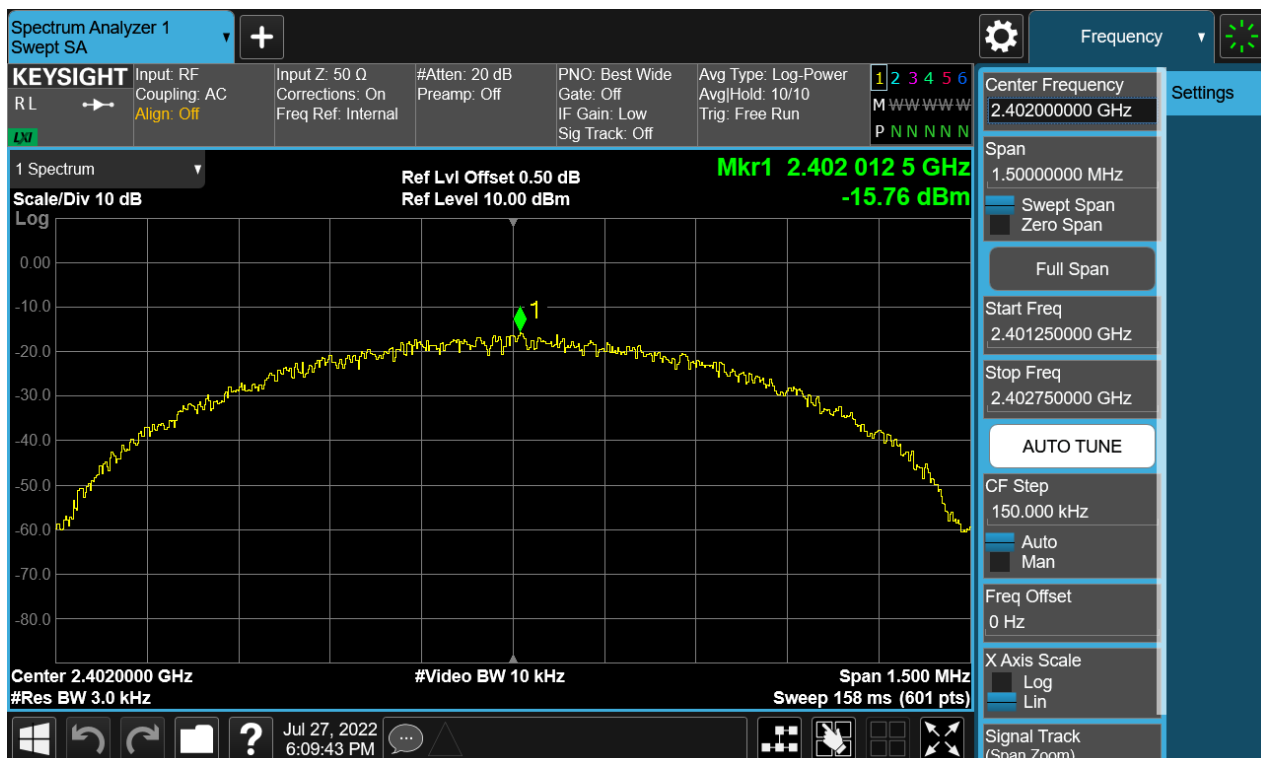
Test setup

Test Channel : Low/Middle/High
 Operation Mode : A.1.a
 Ambient temperature : 24.9°C
 Relative humidity : 51%

Table 3: Power Spectral Density

Test Mode	Test Channel (MHz)	Power Spectral Density Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE	2402	-15.76	≤8
	2440	-15.46	
	2480	-15.89	

Figure 7: Power Spectral Density, 2402MHz



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Figure 8: Power Spectral Density, 2440MHz

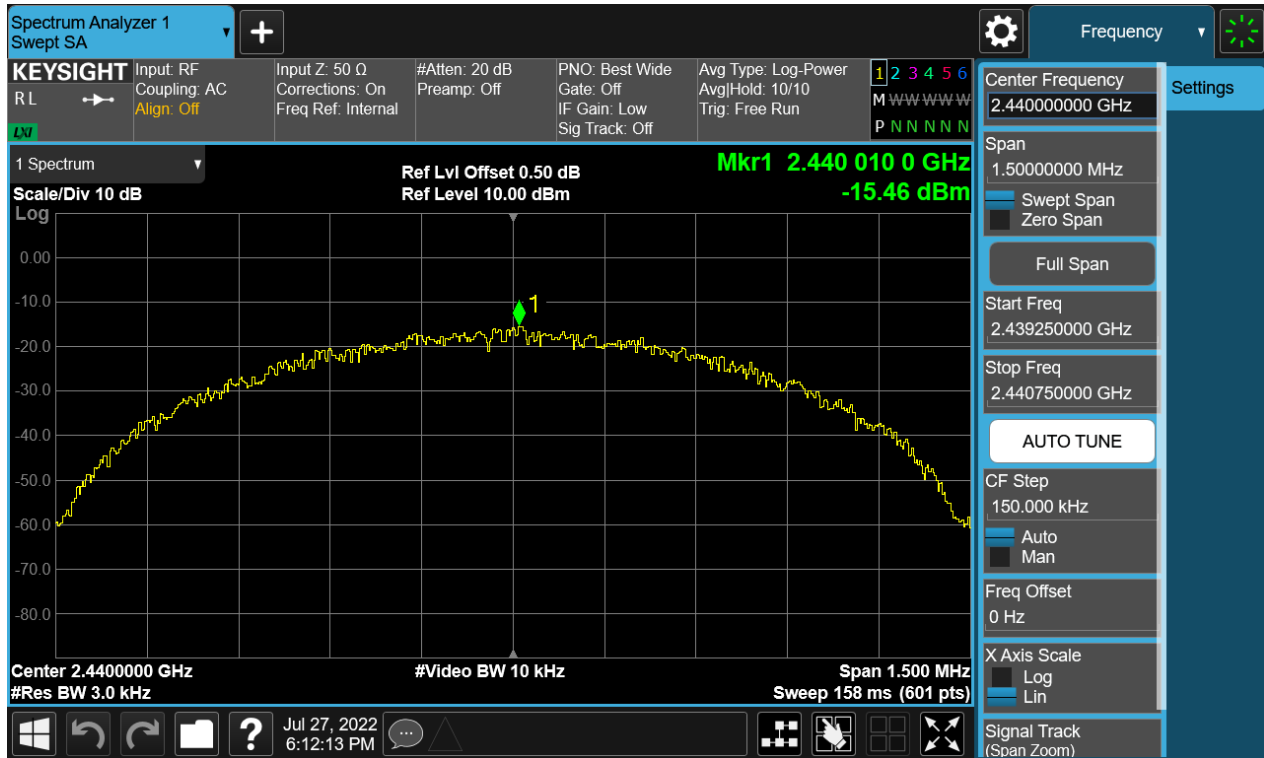
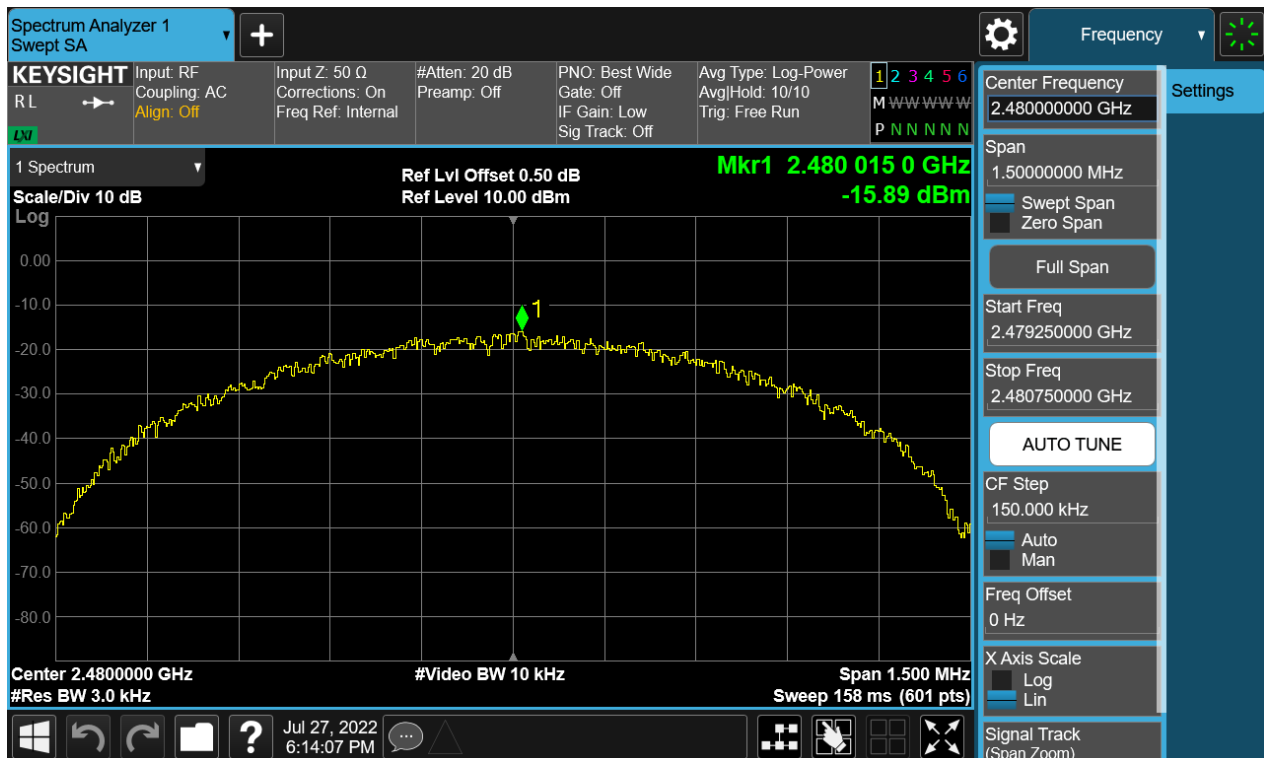


Figure 9: Power Spectral Density, 2480MHz



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4.1.5 Conducted Spurious Emission & Authorized-band band-edge

RESULT:

PASS

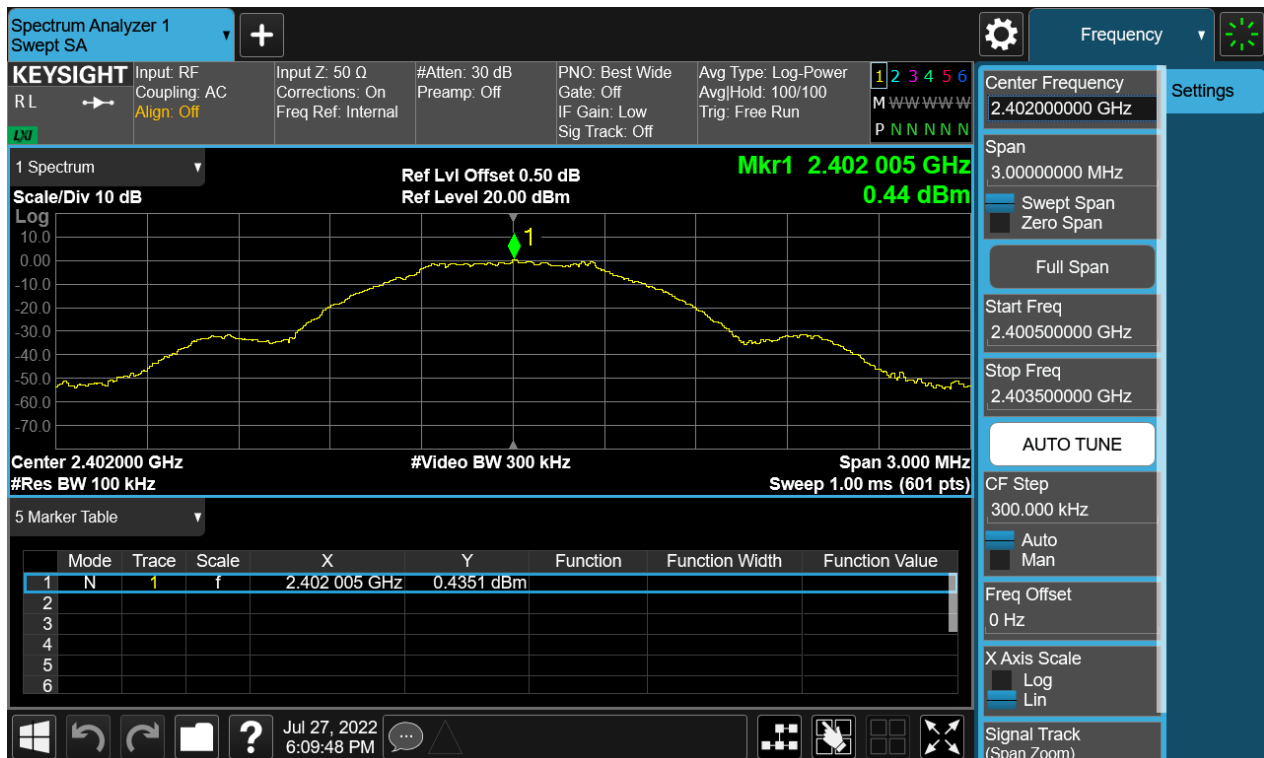
Test standard : FCC Part 15.247(d)
 Requirement : ANSI C63.10-2013, Clause 11.11.1(a)
 KDB 558074 D01 v05r02, Clause 8.5
 Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High for spurious, Low/High for Band Edge
 Operation Mode : A.1.a
 Ambient temperature : 24.9°C
 Relative humidity : 51%

For details refer to following test plot.

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



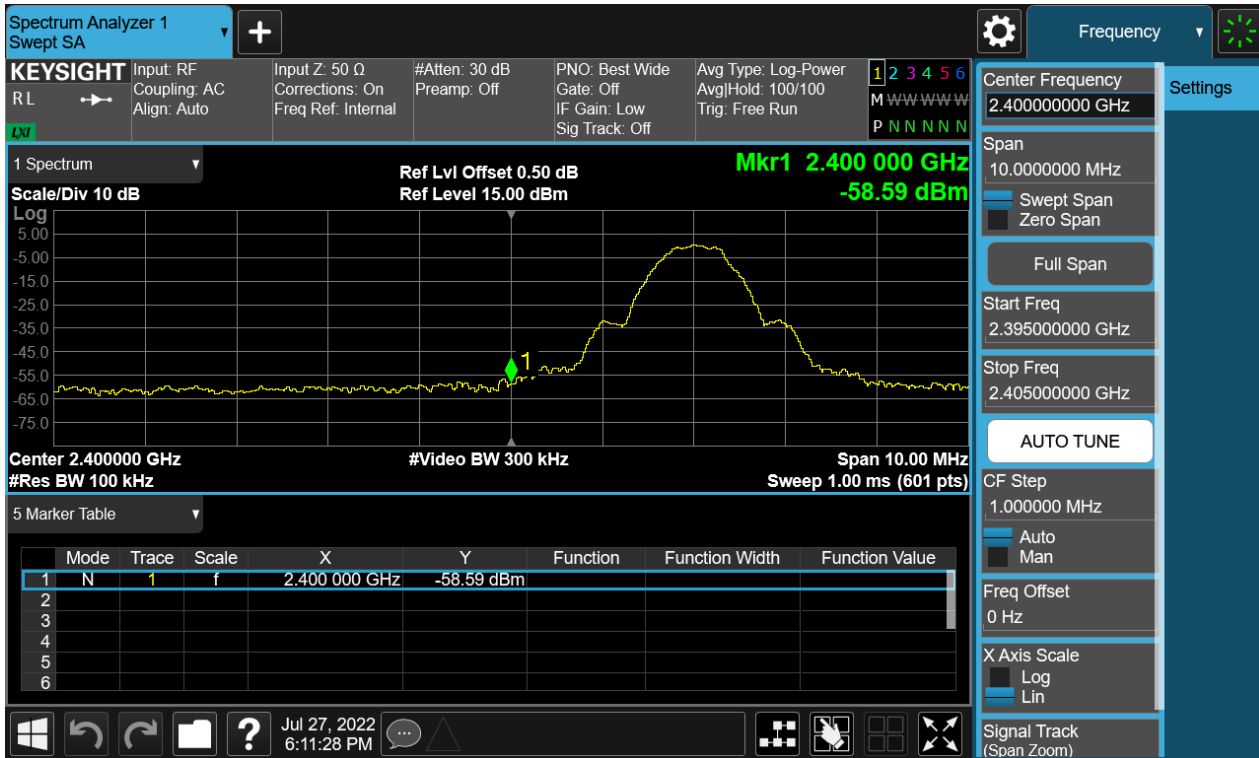
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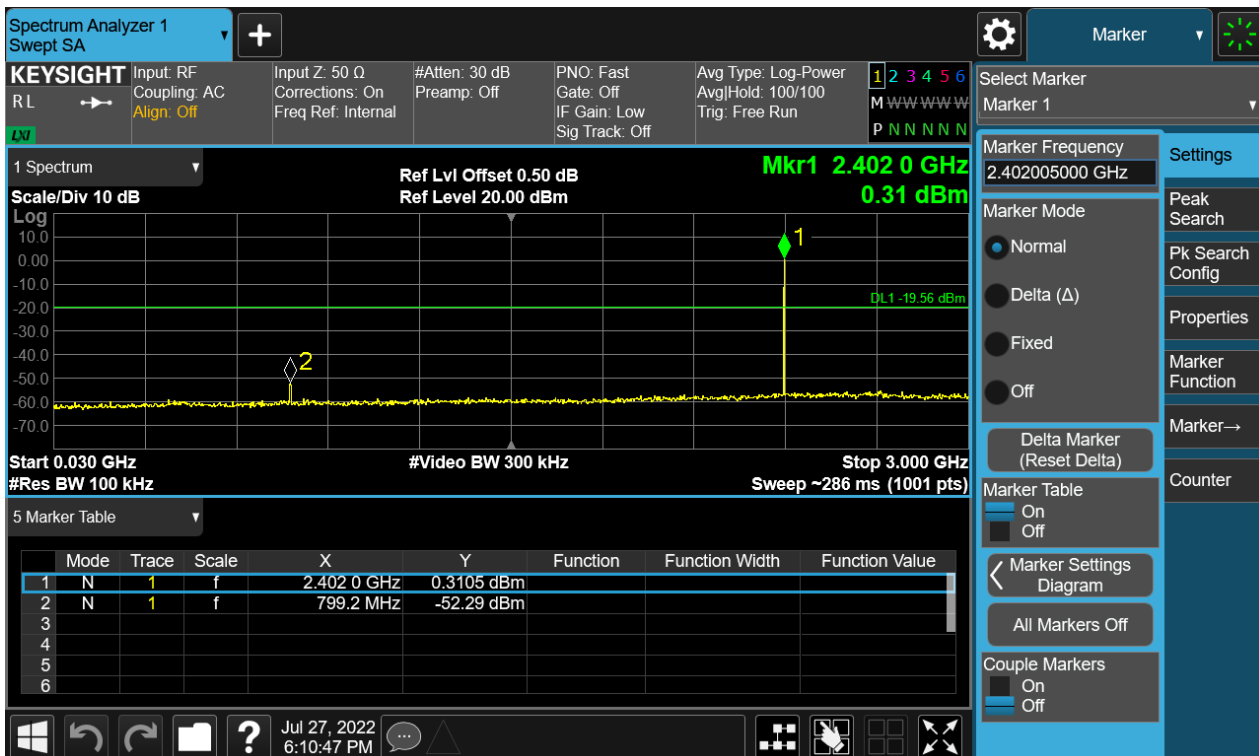
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Band Edge



Conducted spurious emissions 30MHz-25GHz



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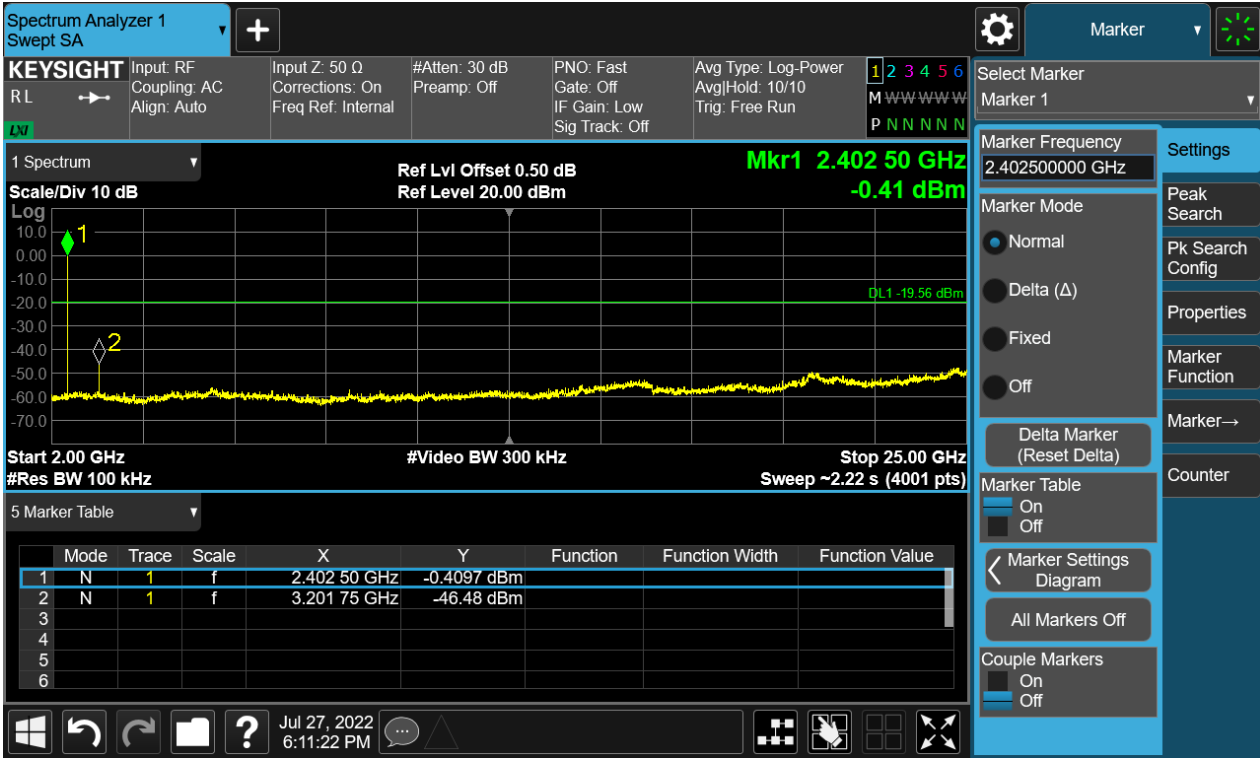
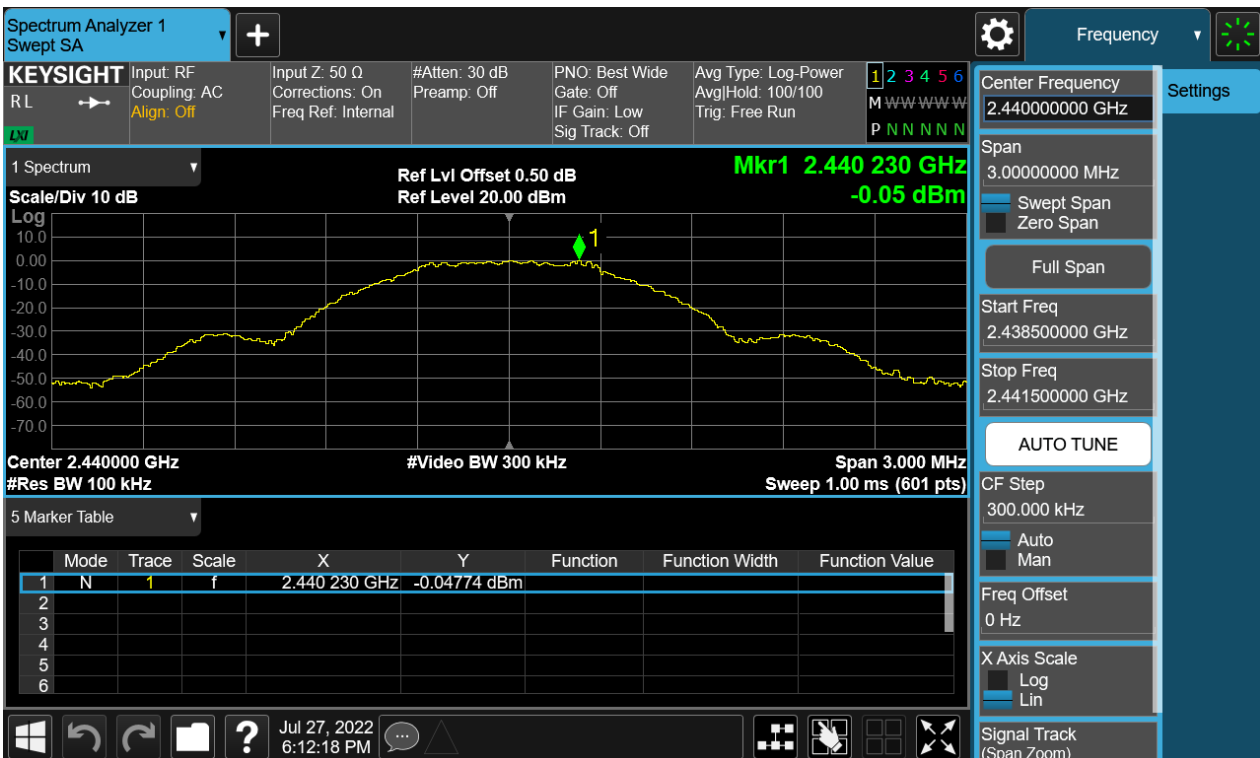


Figure 11: Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE Carrier Level



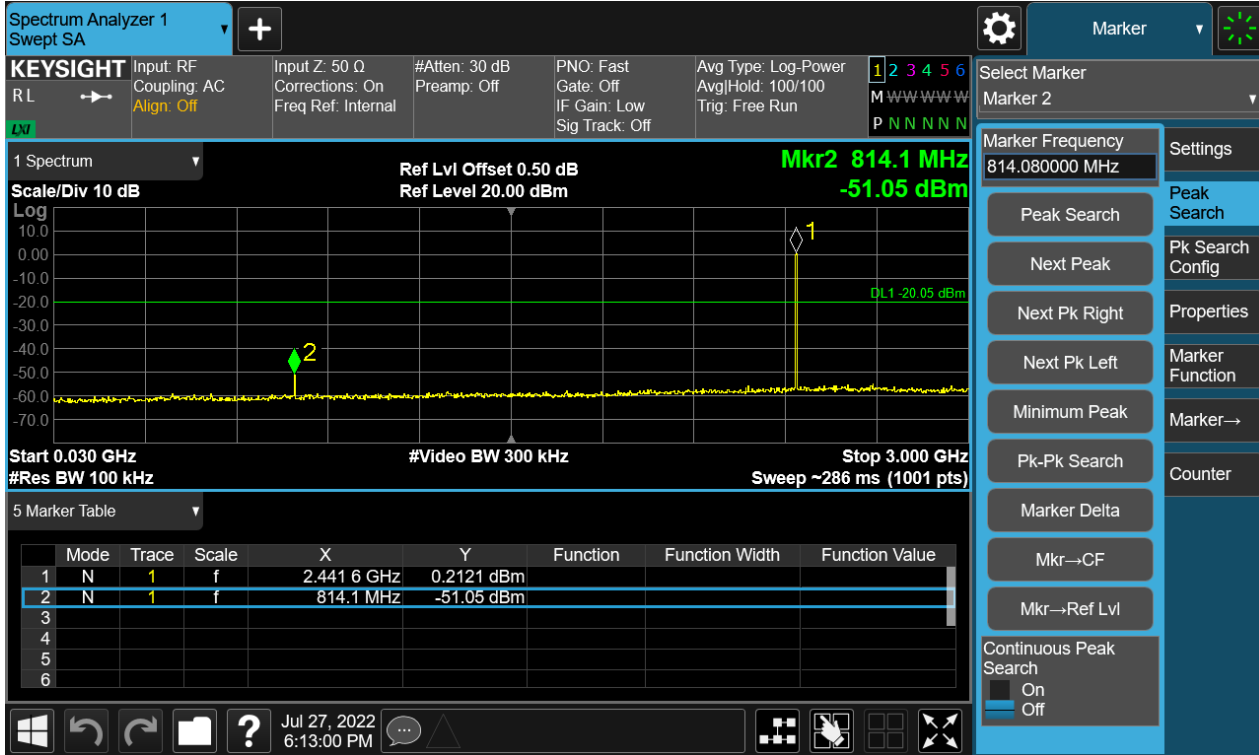
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Conducted spurious emissions 30MHz-25GHz



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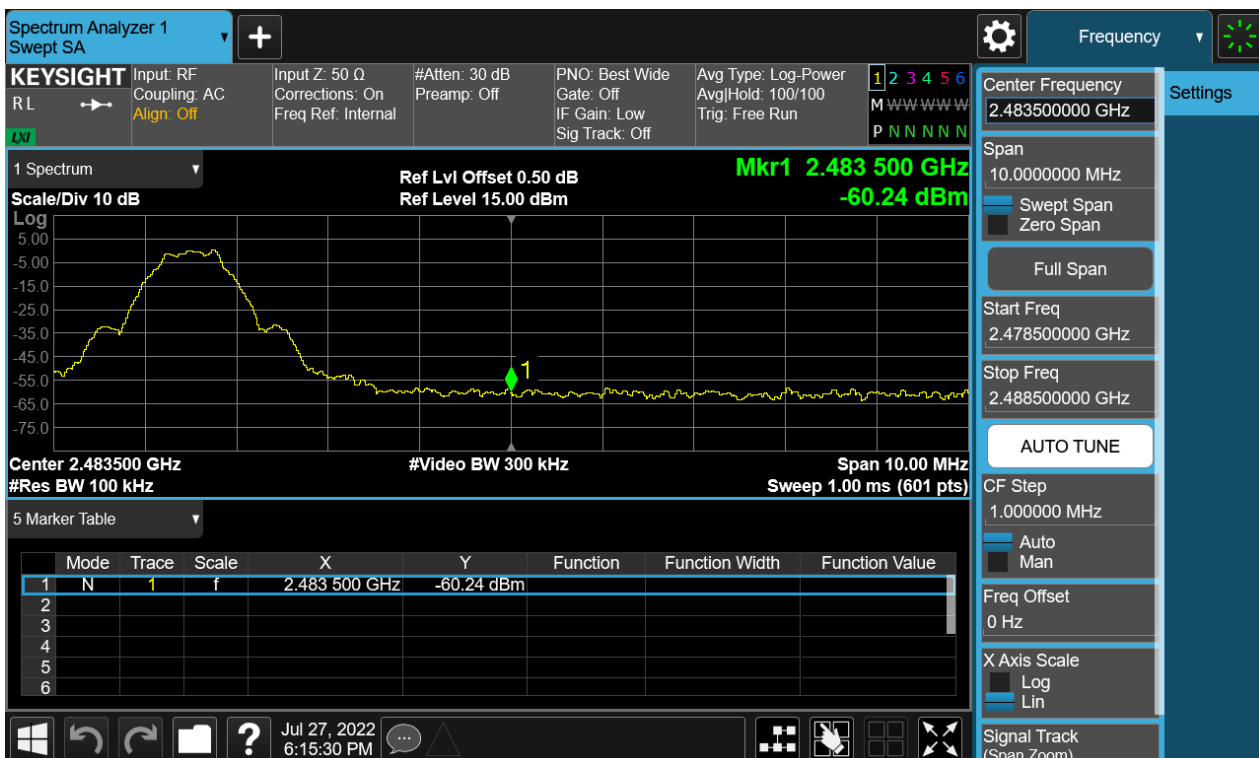
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Figure 12: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE Carrier Level



Band Edge



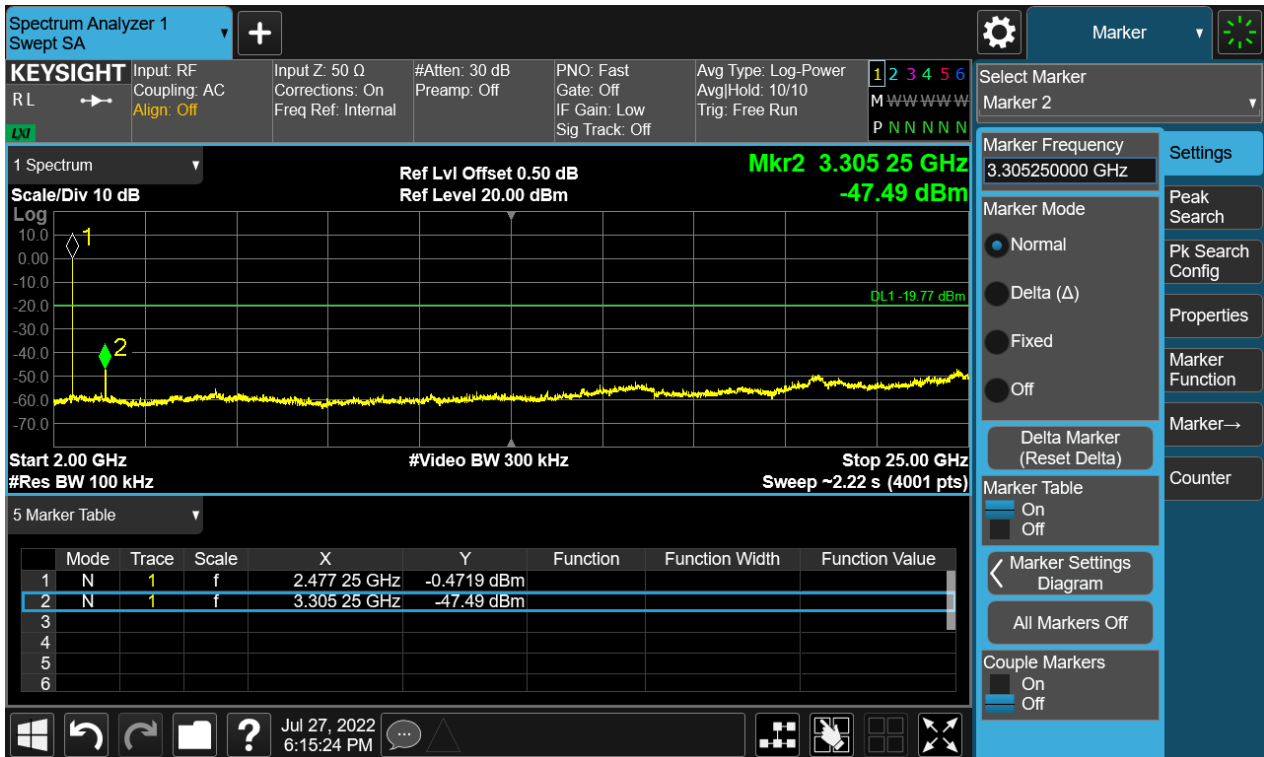
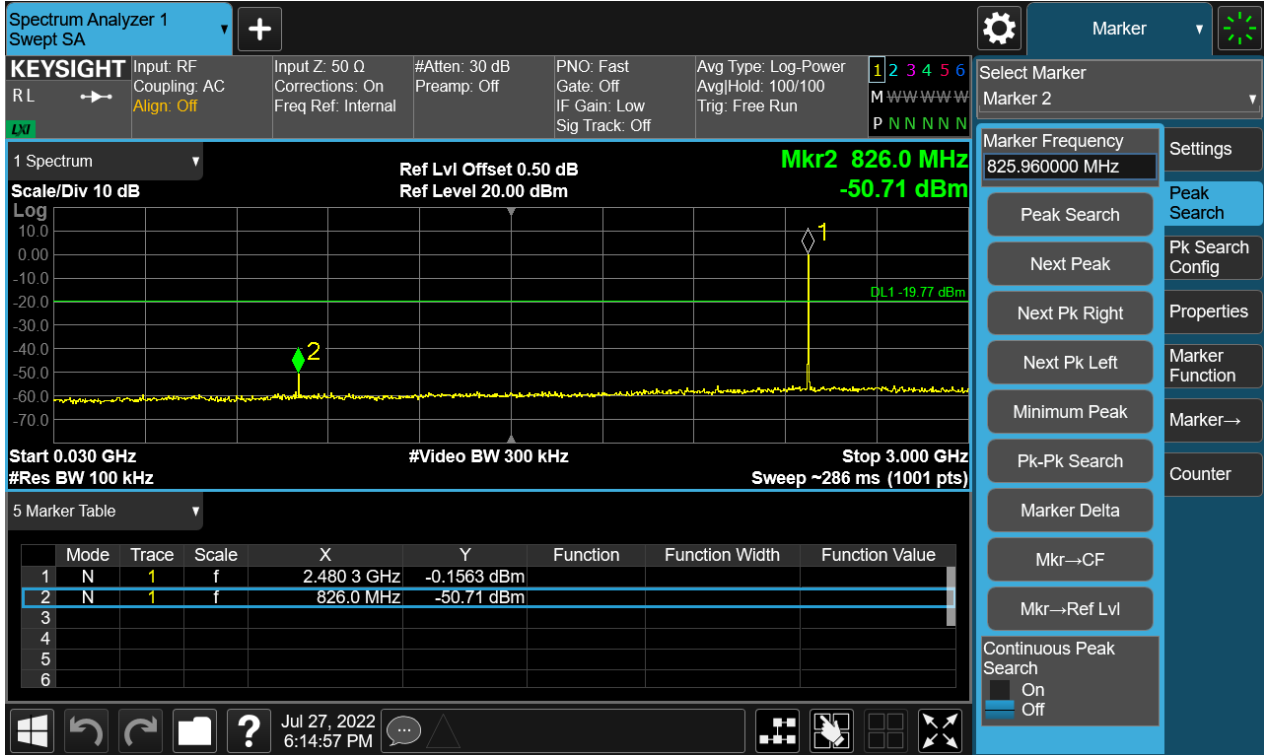
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Conducted spurious emissions 30MHz-25GHz



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4.1.6 Radiated Spurious Emission

RESULT:

PASS

Test standard : FCC Part 15.247(d), 15.205, 15.209
Requirement : ANSI C63.10-2013, Clause 11.12
KDB 558074 D01 v05r02, Clause 8.6
Kind of test site : 3m Semi-Anechoic Chamber

Test setup

Test Channel : Low/Middle/High
Operation Mode : A
Ambient temperature : 22.1°C
Relative humidity : 52%

Notes

Test plots please refer to the annex document "SHE22060090-02CE DATA BLE-TX EXHIBIT A".

- 1. 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.*
- 2. The spurious above 18GHz is noise only and 20dB below the limit. The value has no need to be reported.*
- 3. All test modes had been pre-tested, but only middle channel of below 1 GHz is the worst case and recorded in the report.*
- 4. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement -X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.*

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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, Clause 11.13
KDB 558074 D01 v05r02, Clause 8.7
Kind of test site : 3m Semi-Anechoic Chamber

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1
Ambient temperature : 23.1°C
Relative humidity : 52%

Notes

Test plots please refer to the annex document "SHE22060090-02CE DATA BLE-TX EXHIBIT A".

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4.2 Mains Emission

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
Operation Mode : A.2
Earthing : Connected to GND
Ambient temperature : 23.6°C
Relative humidity : 57%

For details refer to following test plot.

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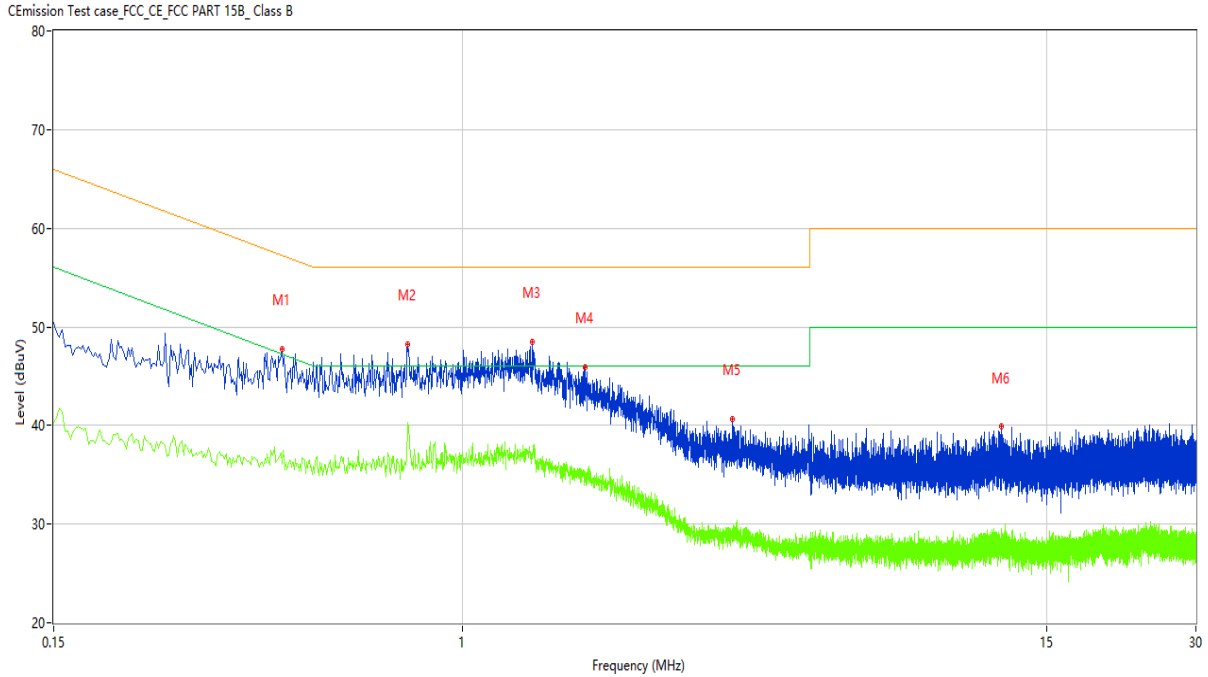
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Note: The all configurations were tested respectively, but only the worst data (at middle channel) shown here.

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	0.432	46.15	10.26	57.21	-11.06	Peak	L	Pass
1*	0.432	40.89	10.26	57.21	-16.32	QP	L	Pass
1**	0.432	36.07	10.26	47.21	-11.14	AV	L	Pass
2	0.776	41.69	10.31	56.00	-14.31	Peak	L	Pass
2*	0.776	31.05	10.31	56.00	-24.95	QP	L	Pass
2**	0.776	40.28	10.31	46.00	-5.72	AV	L	Pass
3	1.382	40.33	10.18	56.00	-15.67	Peak	L	Pass
3*	1.382	26.62	10.18	56.00	-29.38	QP	L	Pass
3**	1.382	36.65	10.18	46.00	-9.35	AV	L	Pass
4	1.766	42.82	10.17	56.00	-13.18	Peak	L	Pass
4*	1.766	29.78	10.17	56.00	-26.22	QP	L	Pass
4**	1.766	34.61	10.17	46.00	-11.39	AV	L	Pass
5	3.500	36.75	10.18	56.00	-19.25	Peak	L	Pass
5*	3.500	25.24	10.18	56.00	-30.76	QP	L	Pass
5**	3.500	28.56	10.18	46.00	-17.44	AV	L	Pass
6	12.194	32.28	10.41	60.00	-27.72	Peak	L	Pass
6*	12.194	27.12	10.41	60.00	-32.88	QP	L	Pass
6**	12.194	28.60	10.41	50.00	-21.40	AV	L	Pass

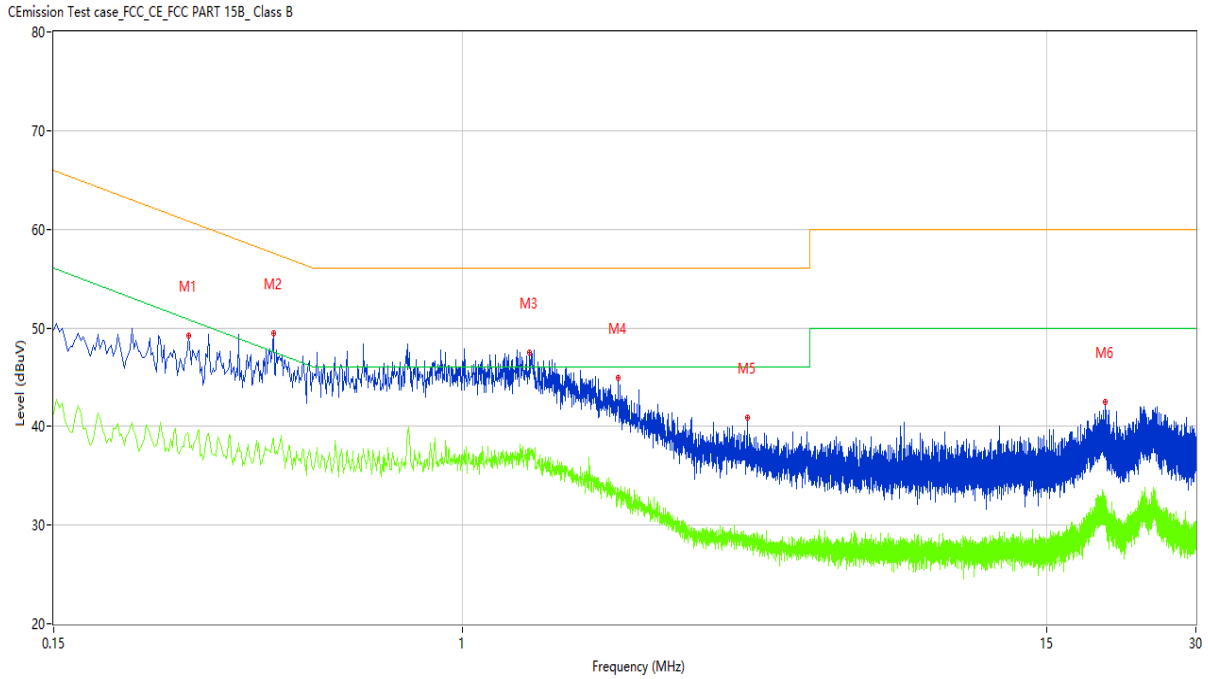
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Figure 14: Conducted Emission on AC Mains, N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.280	39.86	10.22	60.82	-20.96	Peak	N	Pass
1*	0.280	34.73	10.22	60.82	-26.09	QP	N	Pass
1**	0.280	39.16	10.22	50.82	-11.66	AV	N	Pass
2	0.416	45.96	10.25	57.53	-11.57	Peak	N	Pass
2*	0.416	42.49	10.25	57.53	-15.04	QP	N	Pass
2**	0.416	38.87	10.25	47.53	-8.66	AV	N	Pass
3	1.364	35.69	10.19	56.00	-20.31	Peak	N	Pass
3*	1.364	25.36	10.19	56.00	-30.64	QP	N	Pass
3**	1.364	37.64	10.19	46.00	-8.36	AV	N	Pass
4	2.058	33.39	10.16	56.00	-22.61	Peak	N	Pass
4*	2.058	28.63	10.16	56.00	-27.37	QP	N	Pass
4**	2.058	32.46	10.16	46.00	-13.54	AV	N	Pass
5	3.748	28.03	10.19	56.00	-27.97	Peak	N	Pass
5*	3.748	23.06	10.19	56.00	-32.94	QP	N	Pass
5**	3.748	28.48	10.19	46.00	-17.52	AV	N	Pass
6	19.678	36.71	10.91	60.00	-23.29	Peak	N	Pass
6*	19.678	33.36	10.91	60.00	-26.64	QP	N	Pass
6**	19.678	32.71	10.91	50.00	-17.29	AV	N	Pass

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5 Appendixes

5.1 Photographs of the Sample



All of the sample



Front of the sample

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Rear of the sample



Left of the sample

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Right of the sample



Top of the sample

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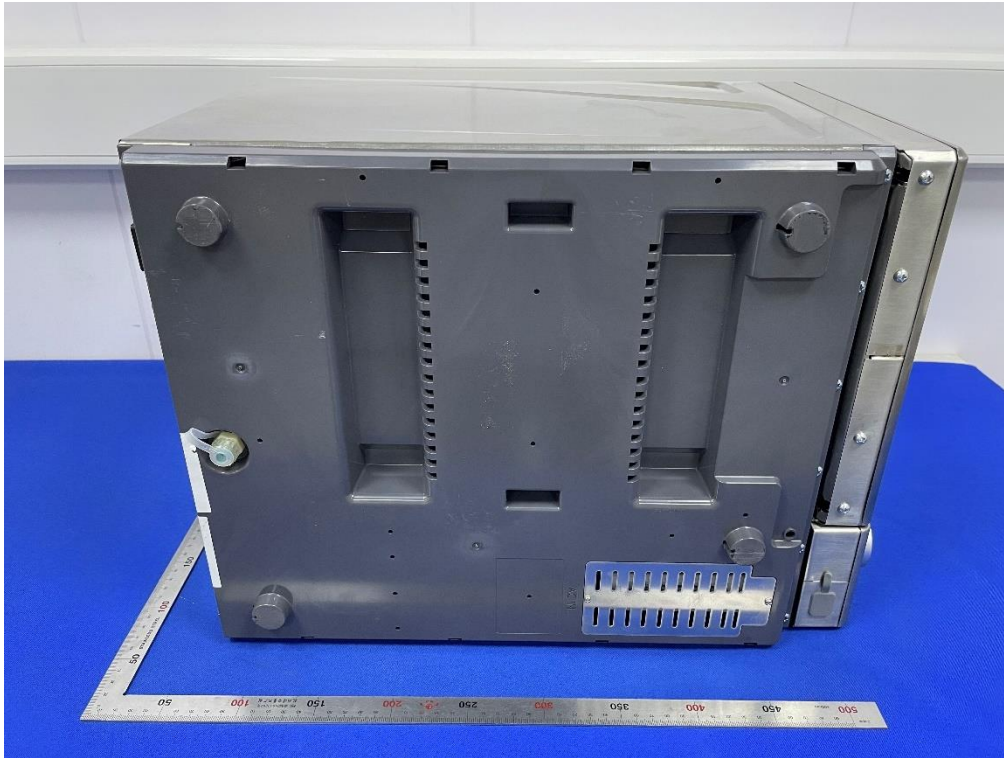
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Bottom of the sample

5.2 Set-up for Conducted Emission on AC Mains



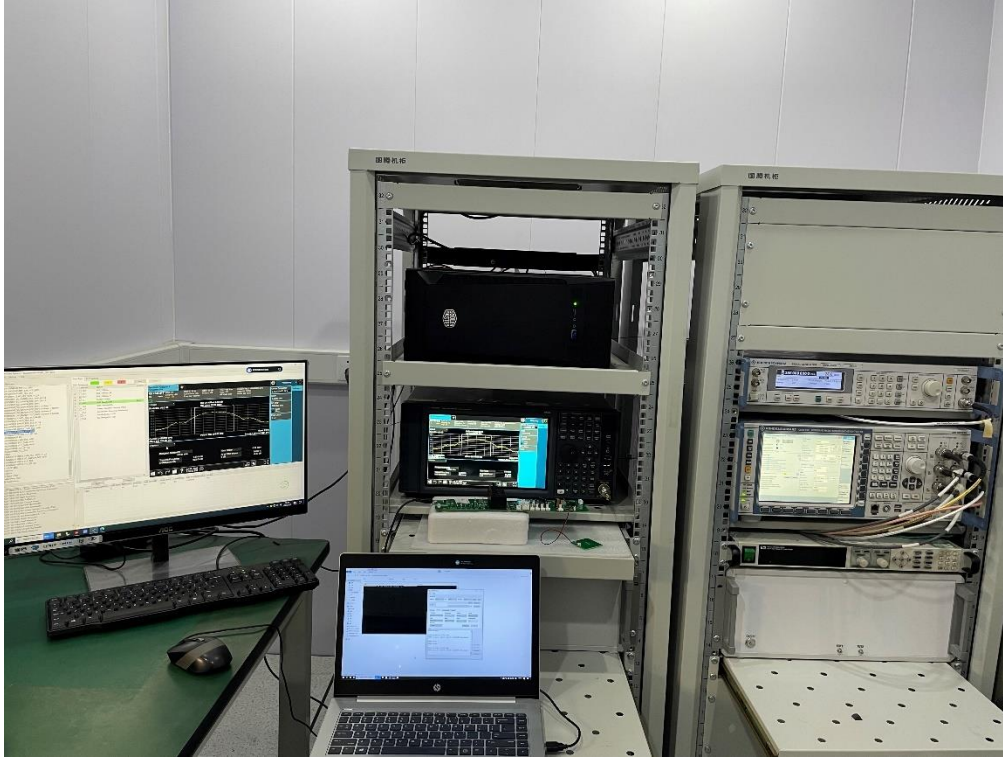
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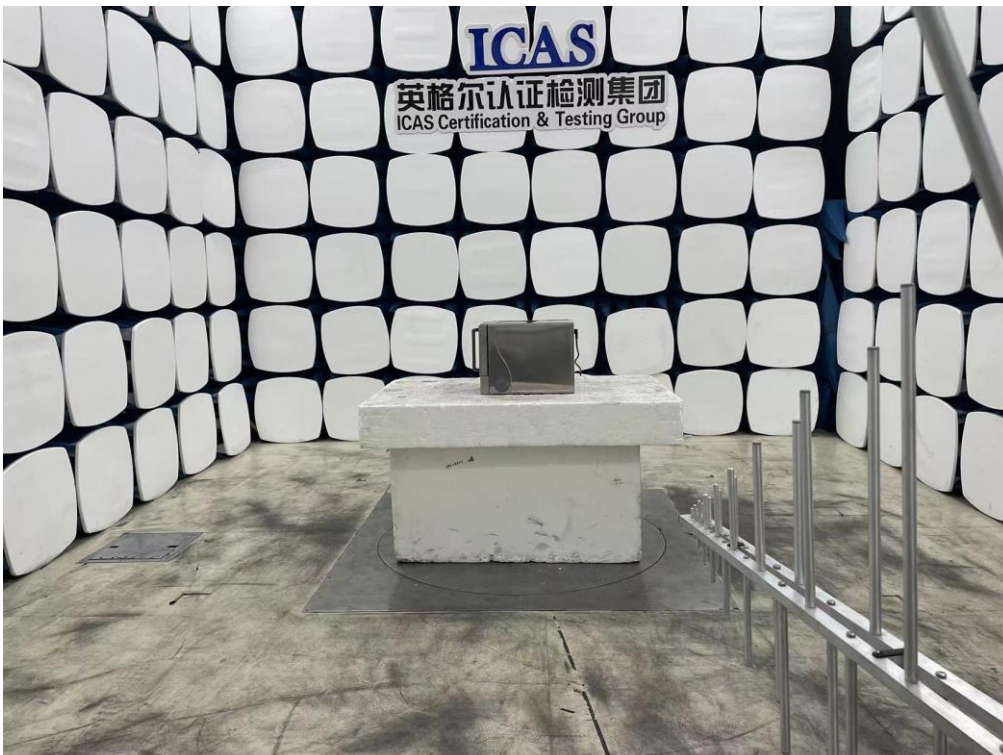
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5.3 Set-up for Conducted RF test at Antenna Port



5.4 Set-up for Radiated Spurious Emission below 1GHz

30MHz-1GHz



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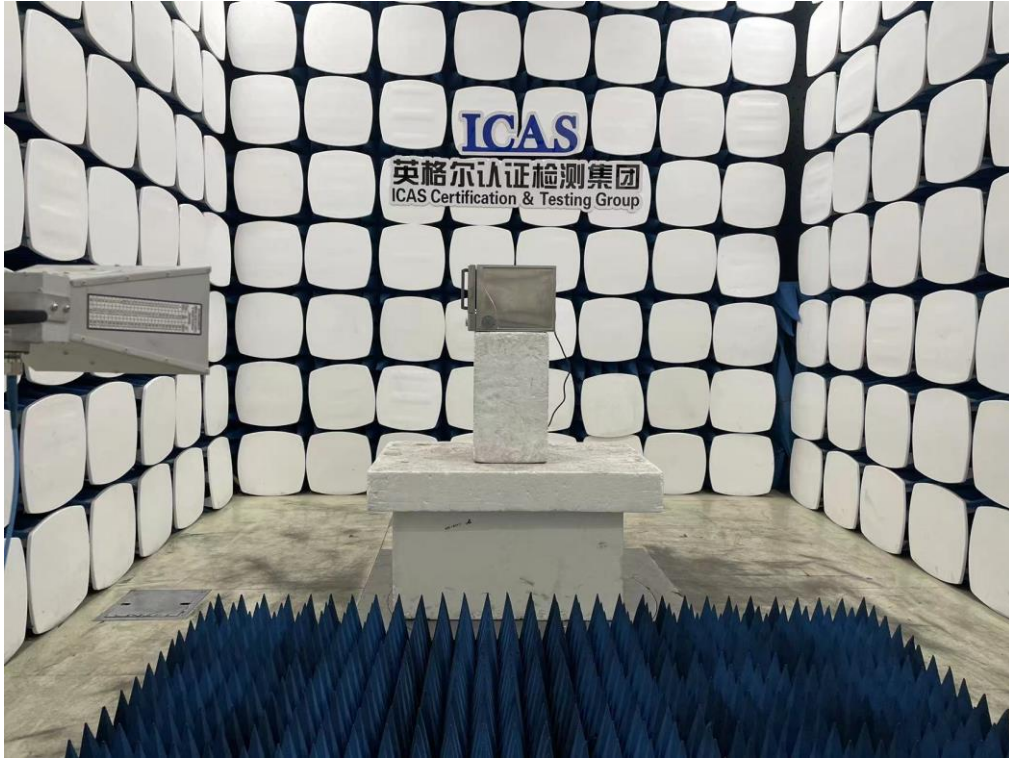
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5.5 Set-up for Radiated Spurious Emission above 1GHz

1GHz-18GHz



End of the report