

TEST REPORT

Report No.: SHH22020028-01AE

Date: 2022-06-13

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Applicant : Anitoa Biotechnology (Hangzhou) Co.,Ltd.
Address of Applicant : Room 210,2F,Building 2,No.658 binan Road,Changhe Street,Binjiang District,Hangzhou City,Zhejiang Province

Product Name : Real-time Fluorescence Quantitative PCR Instrument
Brand Name : anitoa
Model No. : MQ4164,MQ4041,MQ4042,MQ4043,MQ4044,MQ4081,MQ4082,MQ4083,MQ4084,MQ4161,MQ4162,MQ4163
Sample No. : H22020028-01#01 :
FCC ID : 2A7M7MQ4

Standards : FCC CFR47 Part 15, Subpart C

Date of Receipt : 2022-05-20
Date of Test : 2022-05-21 ~ 2022-06-08
Date of Issue : 2022-06-13

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.

Prepared by:



(Erik Yang)

Reviewed by:



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Approved by:



(Authorized signatory: Guoyou Chi)

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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	Anitoa Biotechnology (Hangzhou) Co.,Ltd.
Address	Room 210,2F,Building 2,No.658 binan Road,Changhe Street,Binjiang District,Hangzhou City,Zhejiang Province
Contact Person	Xu.Bai
Telephone	13616528058
Email	xu.bai@artobio.cn
Manufacturer Company Name	Anitoa Biotechnology (Hangzhou) Co.,Ltd.
Address	Room 210,2F,Building 2,No.658 binan Road,Changhe Street,Binjiang District,Hangzhou City,Zhejiang Province
Factory Company Name	Anitoa Biotechnology (Hangzhou) Co.,Ltd.
Address	Room 210,2F,Building 2,No.658 binan Road,Changhe Street,Binjiang District,Hangzhou City,Zhejiang Province

1.3 Details of EUT

Product Name	Real-time Fluorescence Quantitative PCR Instrument
Brand Name	anitoa
Test Model No.	MQ4164
Series Model No.	MQ4041,MQ4042,MQ4043,MQ4044,MQ4081,MQ4082,MQ4083,MQ4084,MQ4161,MQ4162,MQ4163
Difference Description	All the models are identical with the same schematics, PCB layout, structure, size and components, the difference are only quantities in fluorescence channel and check holes
FCC ID	2A7M7MQ4
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	2dBi
Test Voltage	AC 120V 60Hz by Switching adapter (Model: GST160A15)
Extreme Voltage	Low Voltage: AC 100V by Switching adapter (Model: GST160A15)

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	High Voltage: AC 240V by Switching adapter (Model: GST160A15)
Hardware version	MQ_05_V10.3
Software version	V1.7.2.2
RF power setting in TEST SW	Engineer Mode

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	Result
Antenna Requirement	FCC Part 15.247(b)(4), Part 15.203	PASS
Peak Output Power	FCC Part 15.247(b)(3)	PASS
6dB Bandwidth	FCC Part 15.247(a)(2)	PASS
Power Spectral Density	FCC Part 15.247(e)	PASS
Conducted Spurious Emission & Authorized-band band-edge	FCC Part 15.247(d)	PASS
Radiated Spurious Emission	FCC Part 15.247(d), 15.205, 15.209	PASS
Band Edge (Restricted-band band-edge)	FCC Part 15.247(d), 15.205, 15.209	PASS
Conducted Emission on AC Mains	FCC Part 15.207(a)	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	2021-06-10	2022-06-09
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2021-06-10	2022-06-09
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2021-06-10	2022-06-09
V-network	SCHWARZBECK	NSLK 8127	8127-902	2021-06-10	2022-06-09
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
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2021-06-12	2022-06-11
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2020-11-23	2022-11-22
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

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.

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

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3 Test Set-up and Operation Modes

3.1 Details of Test Mode

Using test software(Engineer Mode) 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.
Switching Adapter	N/A	GST160A15	1.00m Unshielded

3.3 Support Software

Description	Manufacturer	Software Name
Software	N/A	Engineer Mode

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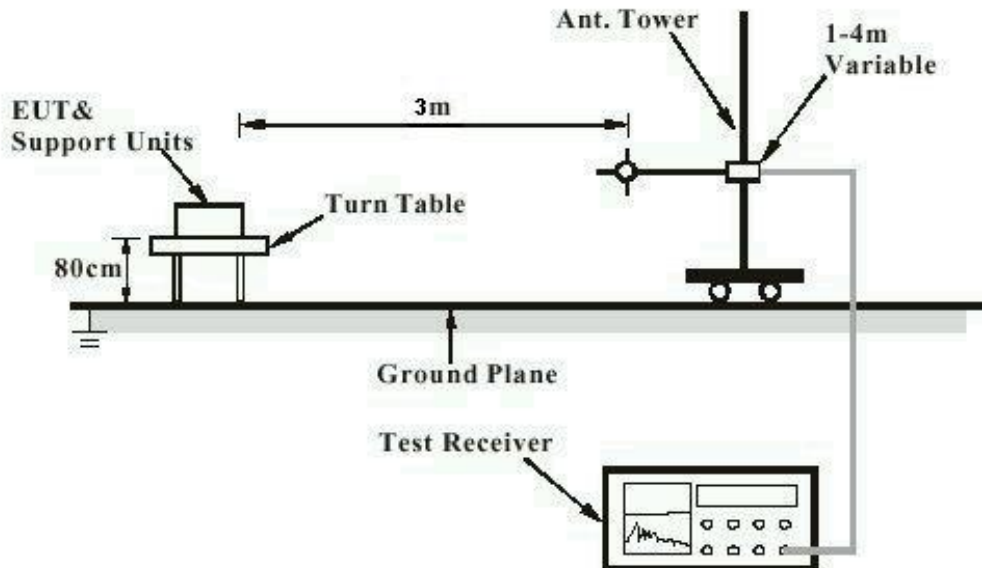
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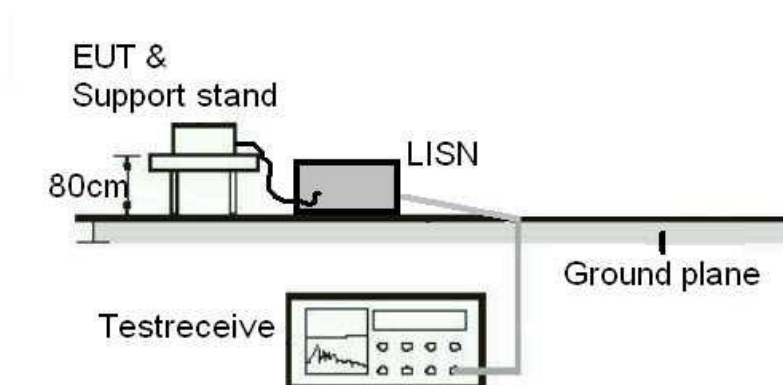
3.4 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Measurement



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 Measurement



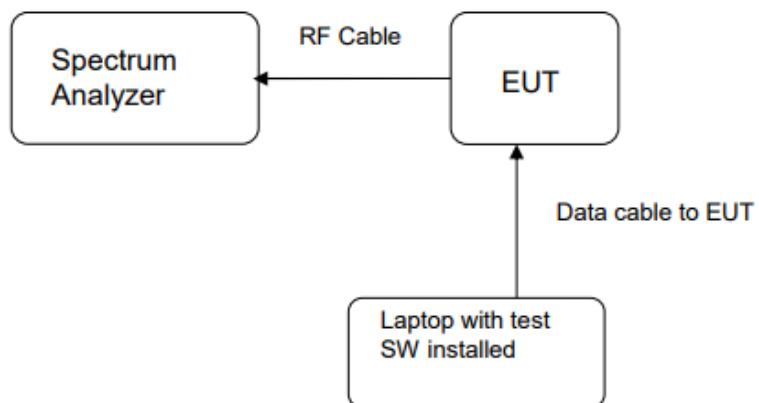
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Diagram of Measurement Configuration for Transmitter Measurement



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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 6dBi

According to the manufacturer declaration, the EUT has an antenna with a directional gain of 2dBi. 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 : 24.8°C

Relative humidity : 52%

Table 1: Peak Output Power

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(mW)	
BLE	2402	5.47	3.52	≤1
	2440	5.36	3.44	
	2480	5.37	3.44	

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Figure 1: Peak Output Power, 2402MHz

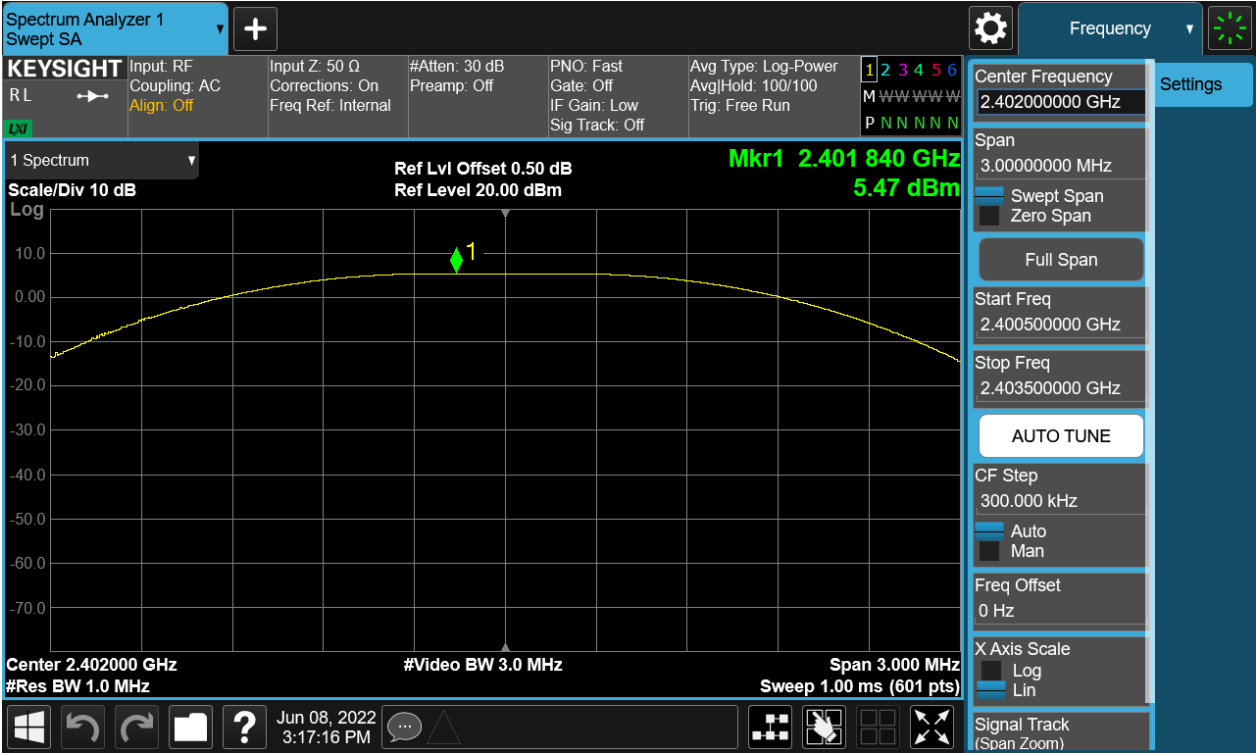
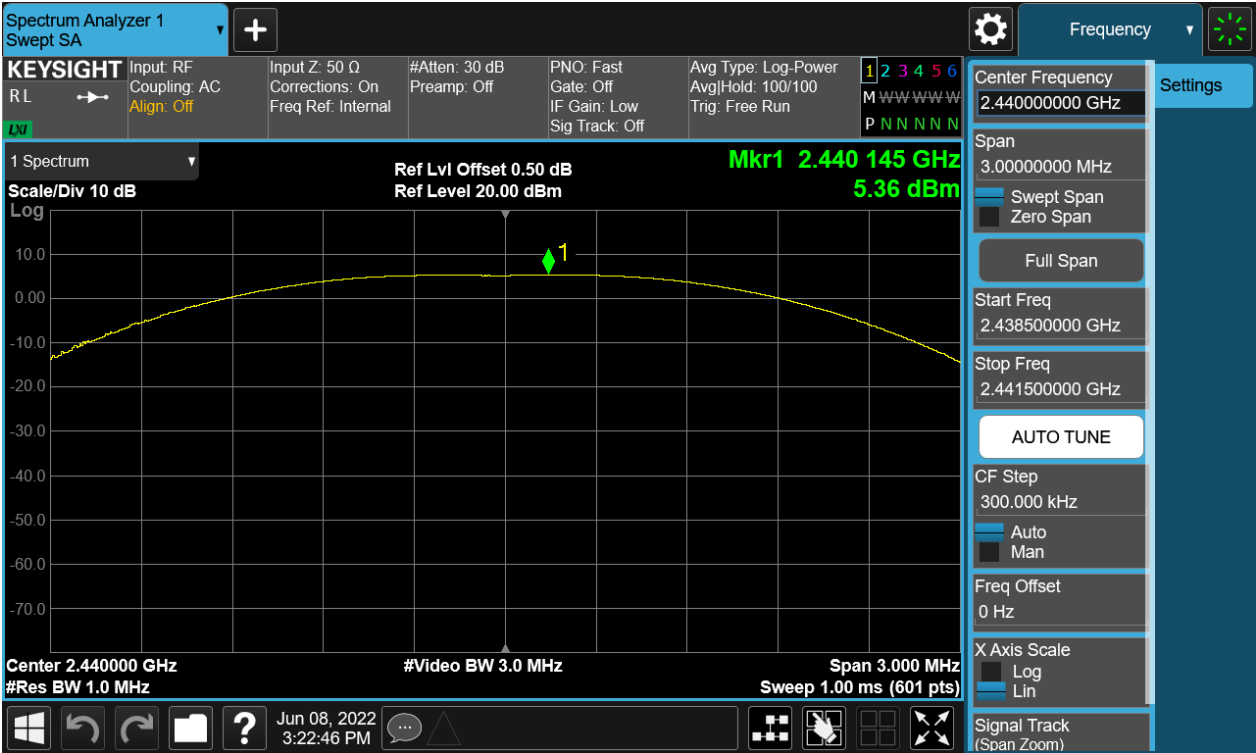


Figure 2: Peak Output Power, 2440MHz



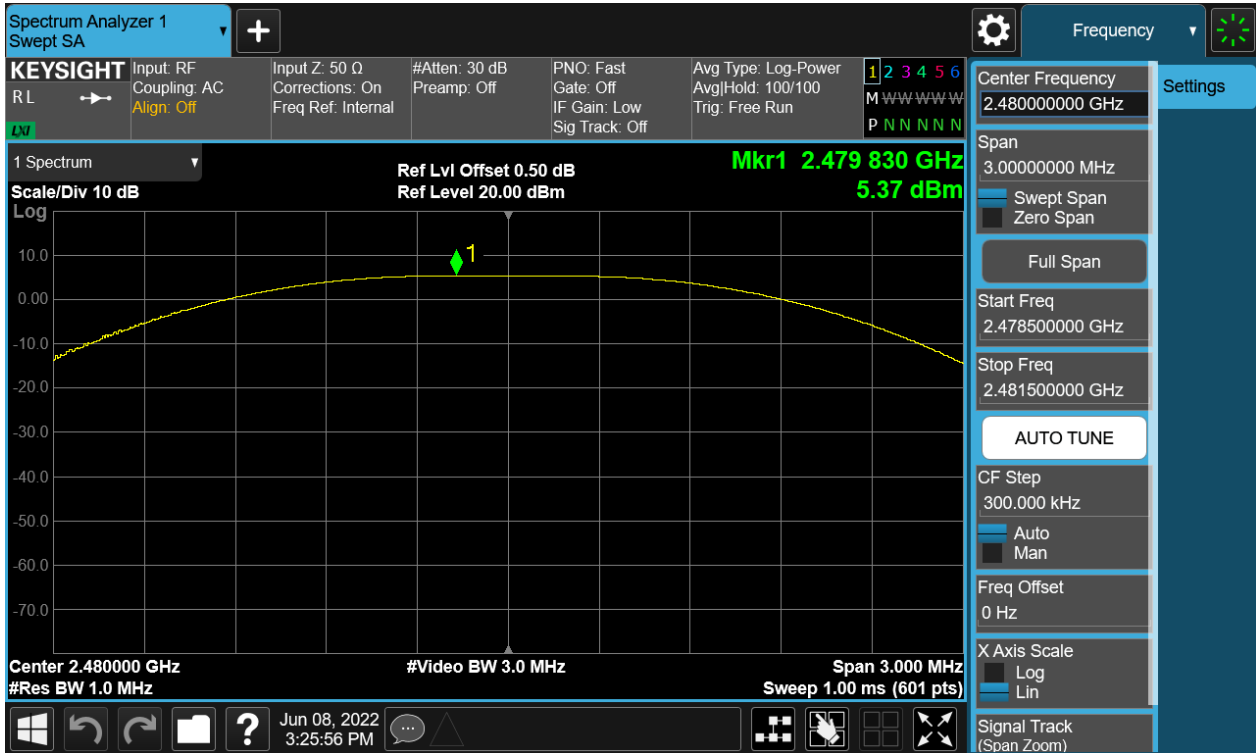
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Figure 3: Peak Output Power, 2480MHz



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4.1.3 6dB Bandwidth

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 : 24.8°C
Relative humidity : 52%

Table 2: 6dB Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Limit
BLE	2402	0.7005	≥ 0.5 MHz
	2440	0.6419	
	2480	0.7008	

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Figure 4: 6dB Bandwidth, 2402MHz



Figure 5: 6dB Bandwidth, 2440MHz



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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, KDB 558074
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 24.8°C
Relative humidity : 52%

Table 3: Power Spectral Density

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE	2402	-9.87	≤ 8
	2440	-10.04	
	2480	-10.28	

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Figure 7: Power Spectral Density, 2402MHz

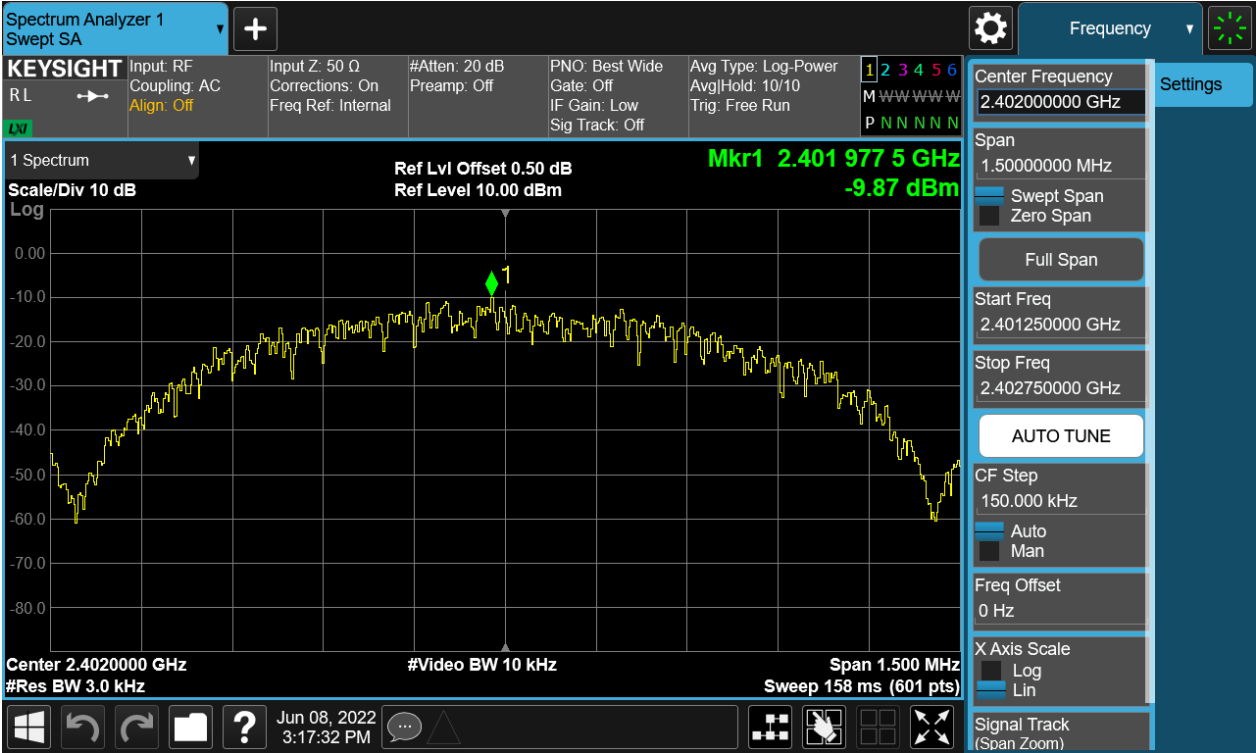
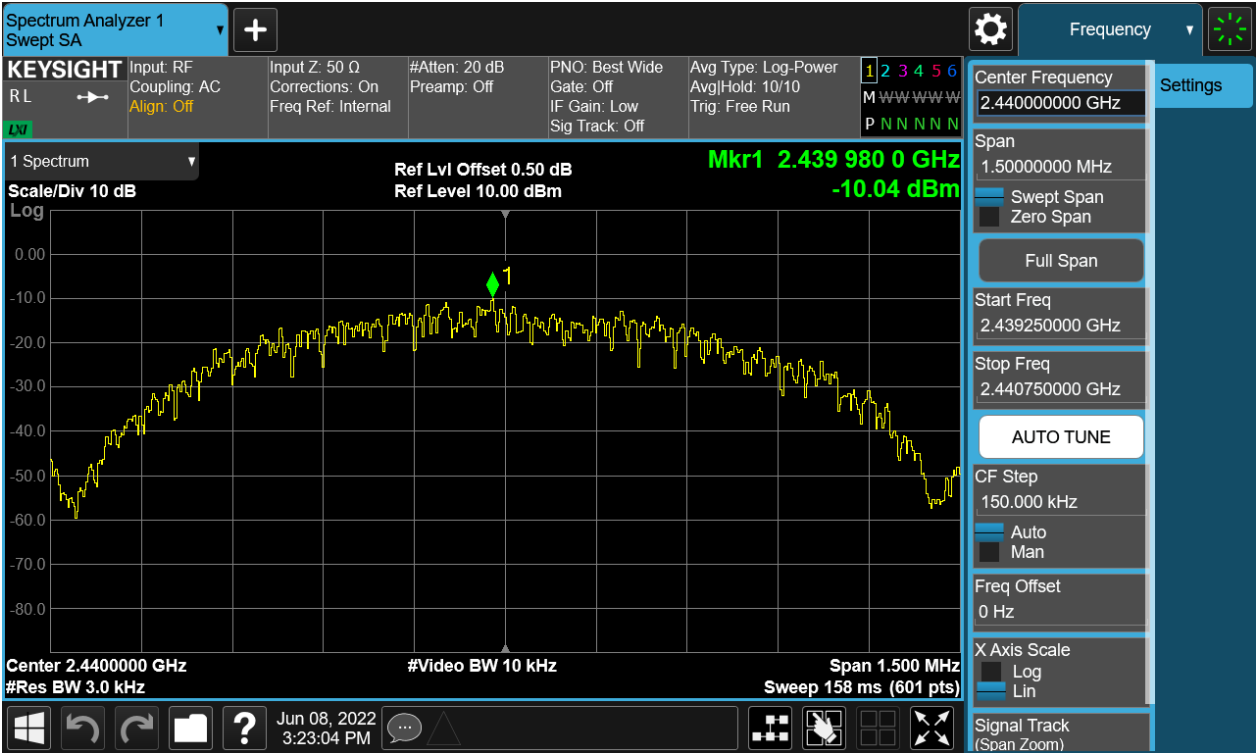


Figure 8: Power Spectral Density, 2440MHz



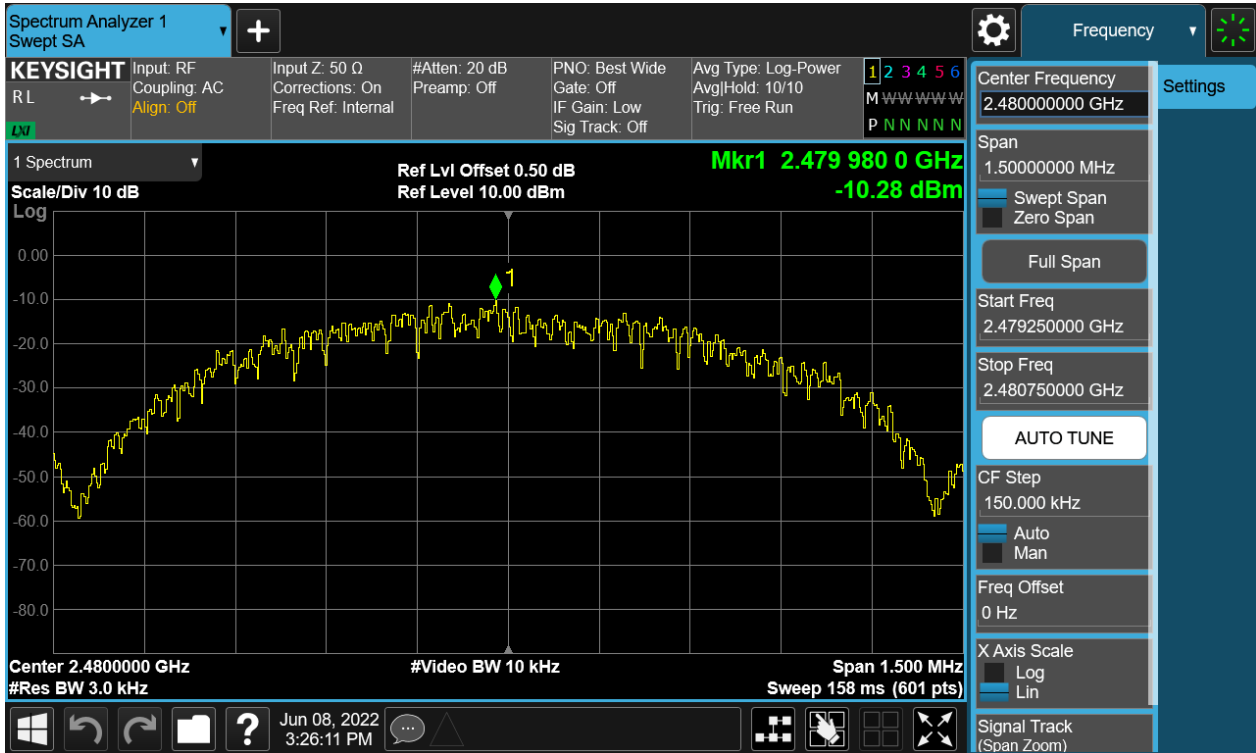
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Figure 9: Power Spectral Density, 2480MHz



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4.1.5 Conducted Spurious Emission & Authorized-band band-edge

RESULT:

PASS

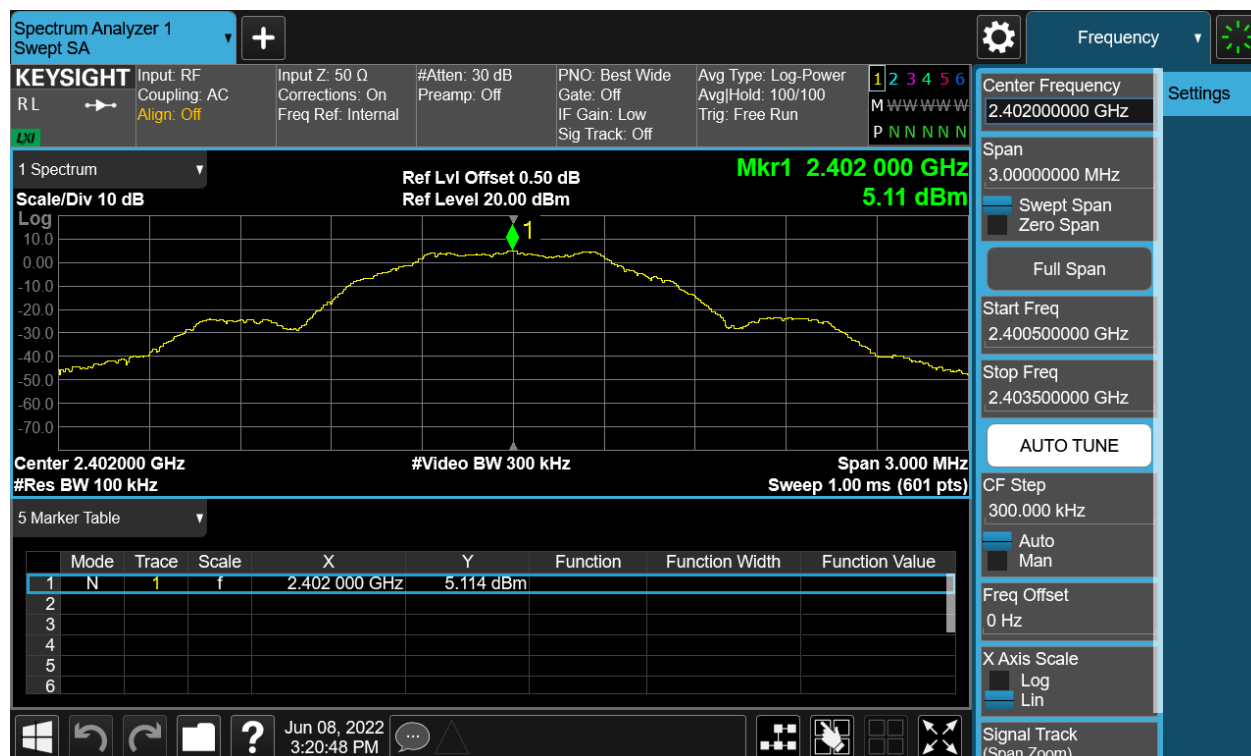
Test standard : FCC Part 15.247(d)
Requirement : ANSI C63.10-2013, KDB 558074
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High for spurious, Low/High for Band Edge
Operation Mode : A.1.a
Ambient temperature : 24.8°C
Relative humidity : 52%

For details refer to following test plot.

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



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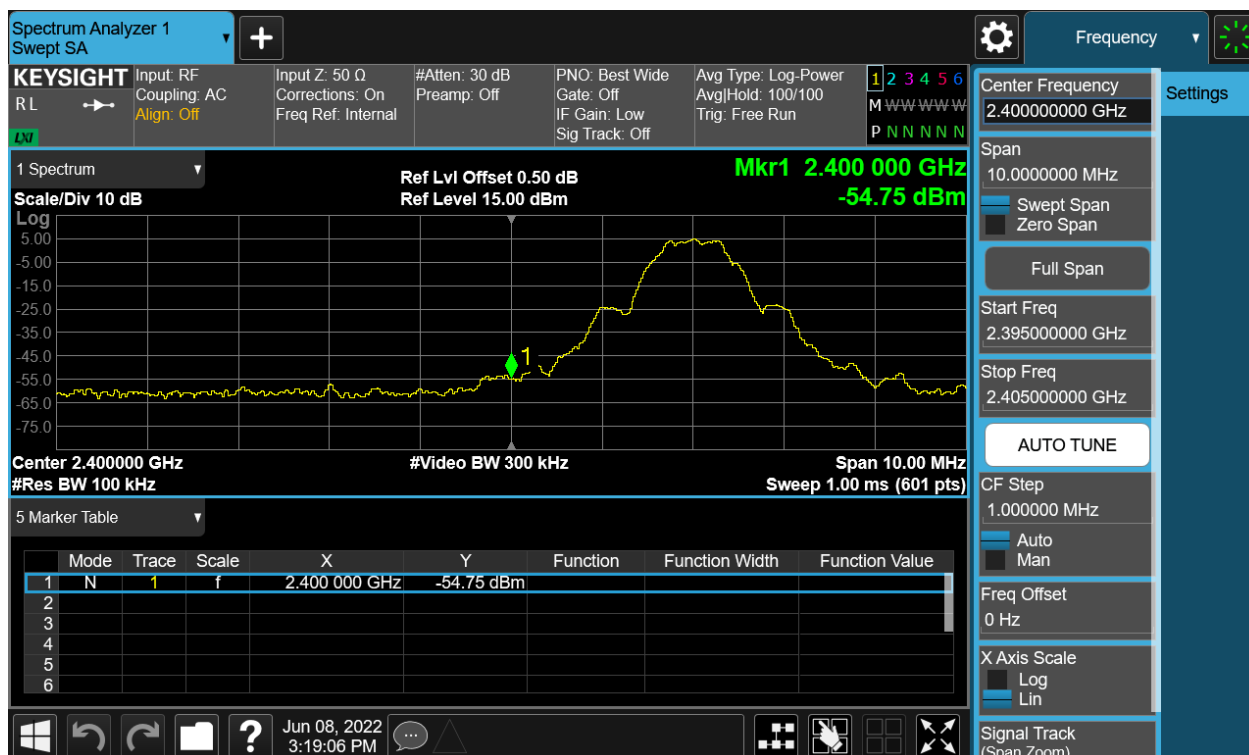
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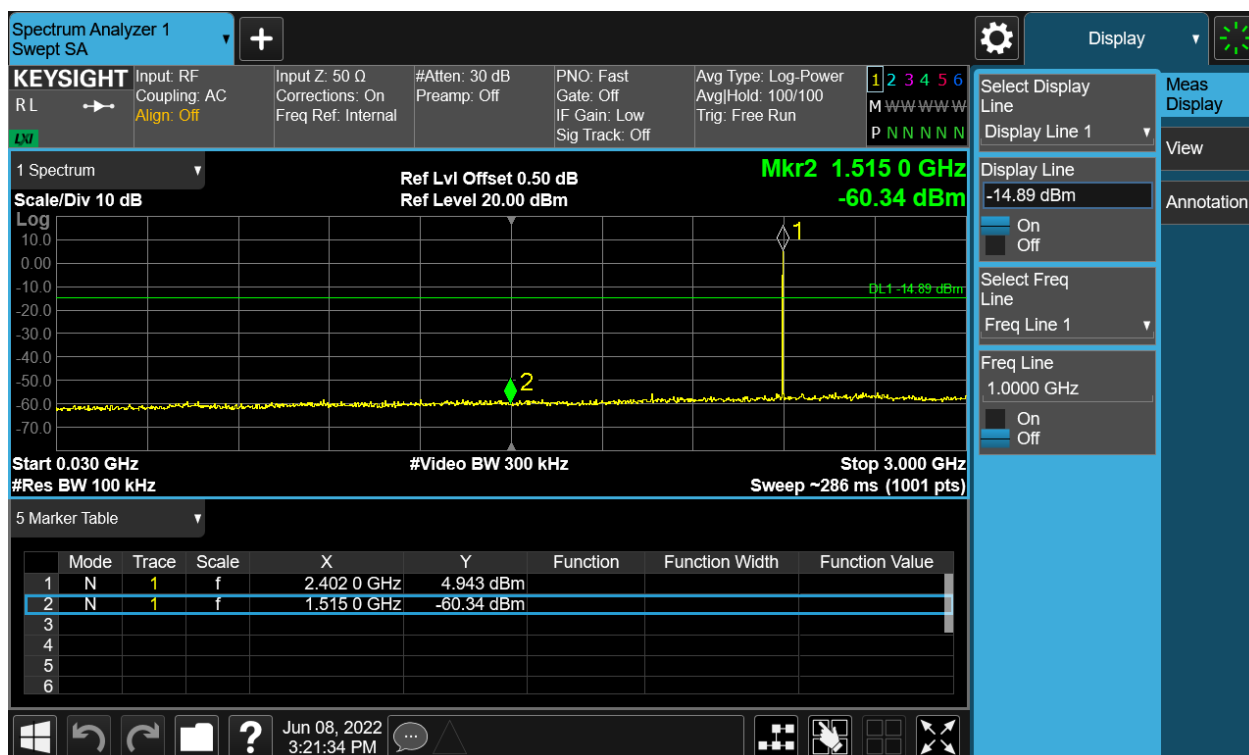
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Band Edge



Conducted spurious emissions 30MHz-25GHz



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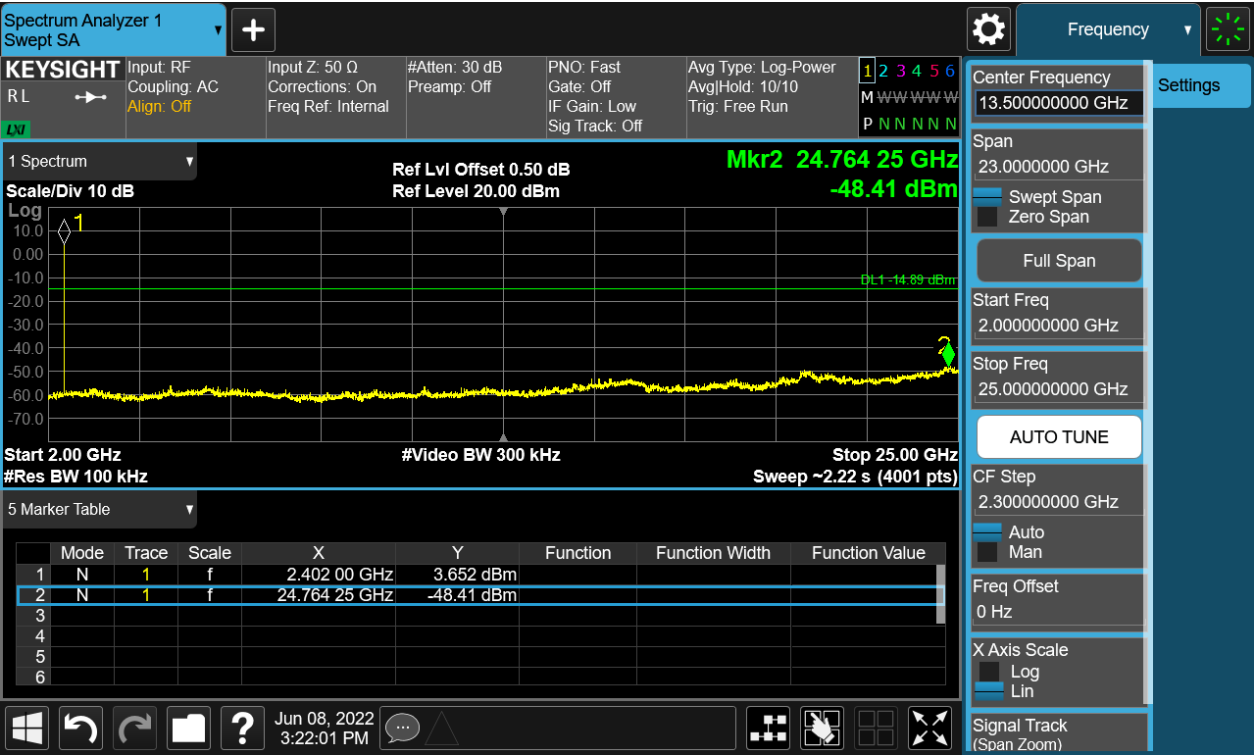


Figure 11: Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE Carrier Level



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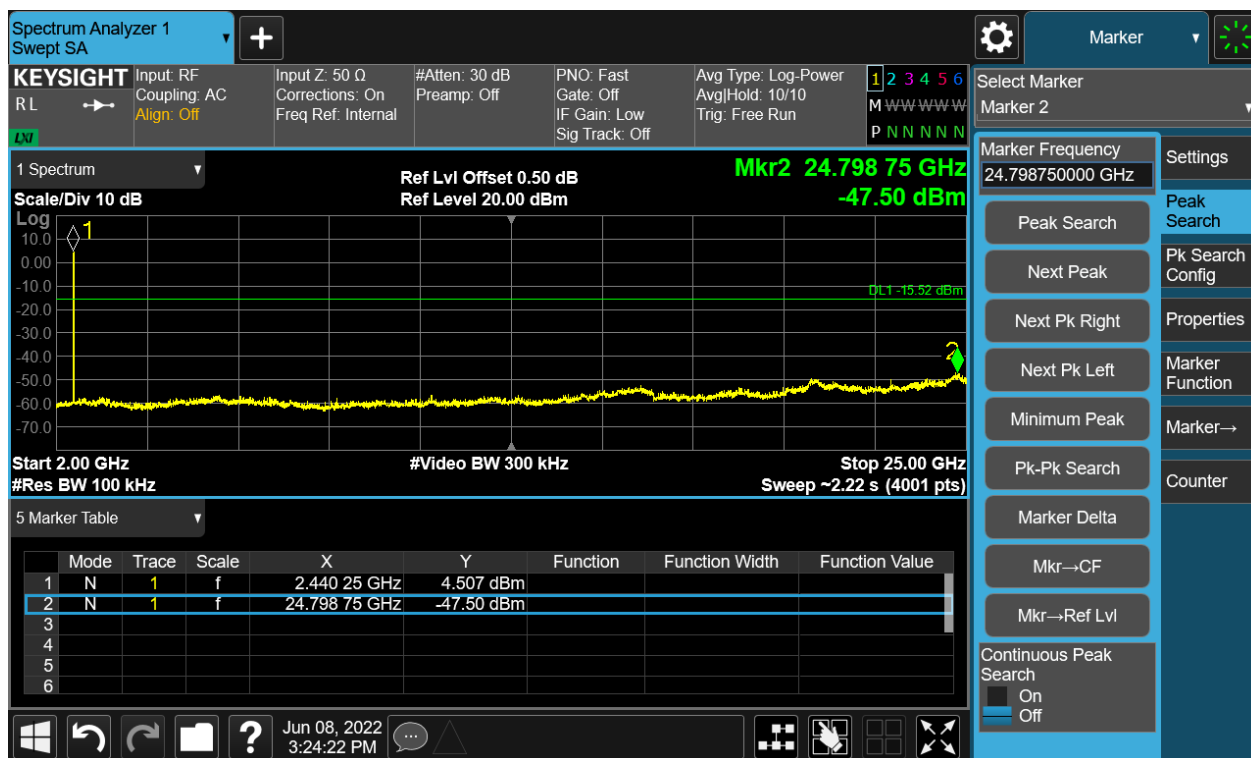
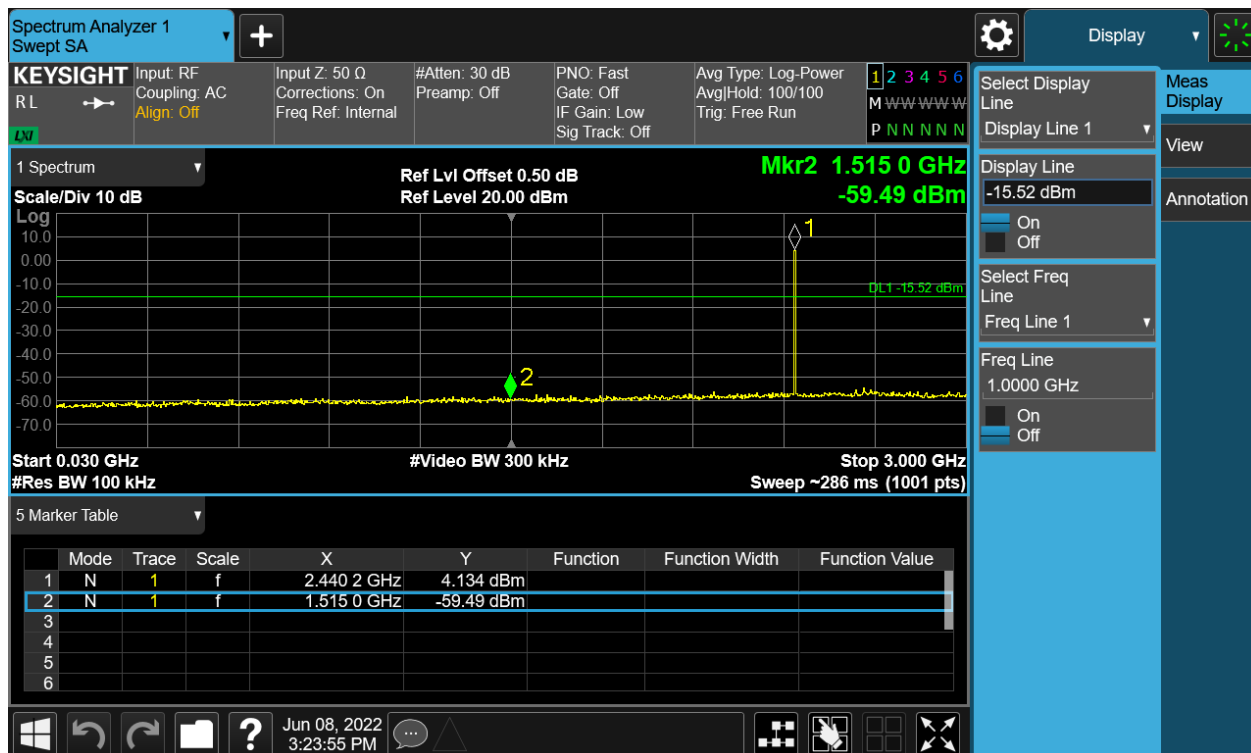
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Conducted spurious emissions 30MHz-25GHz



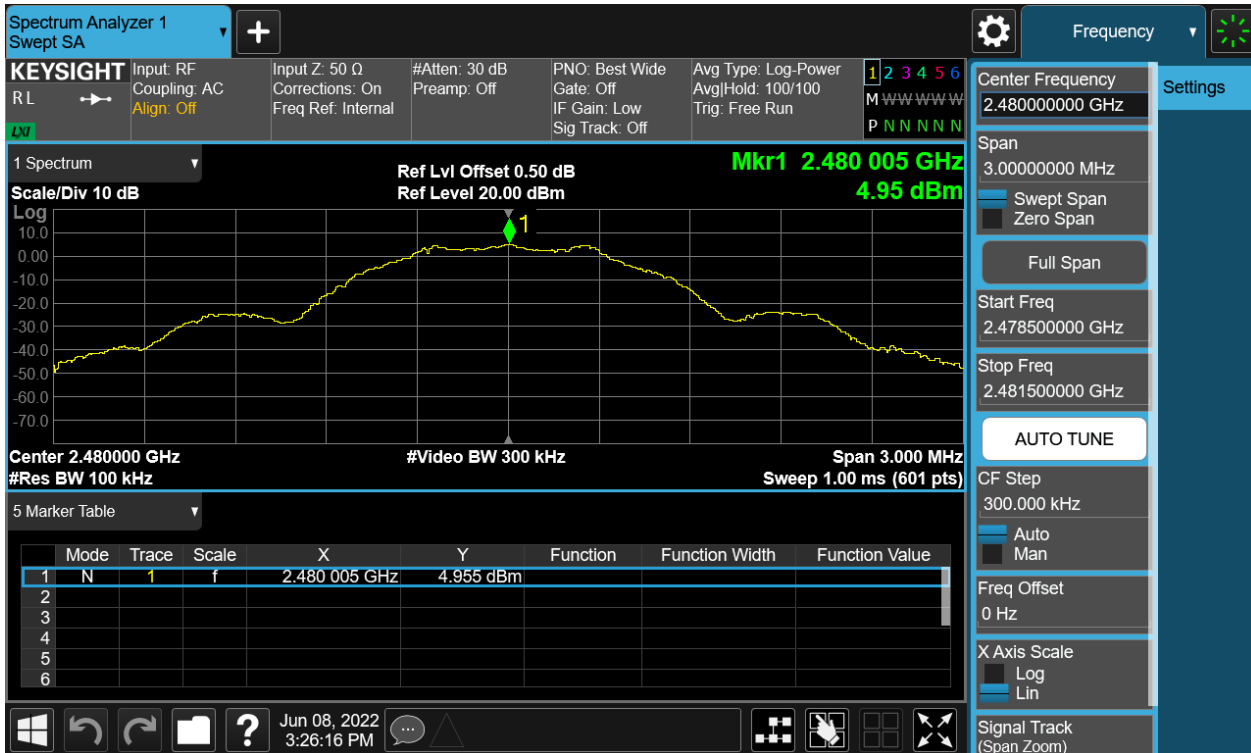
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Figure 12: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE Carrier Level



Band Edge



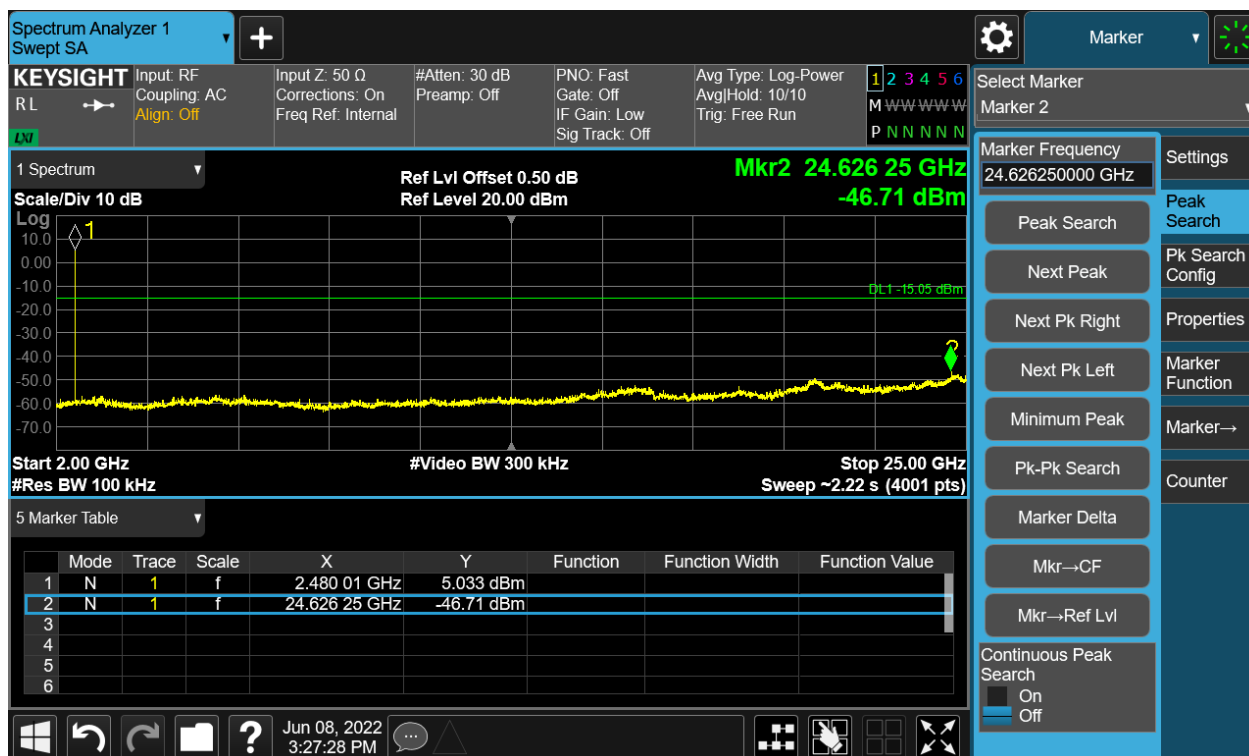
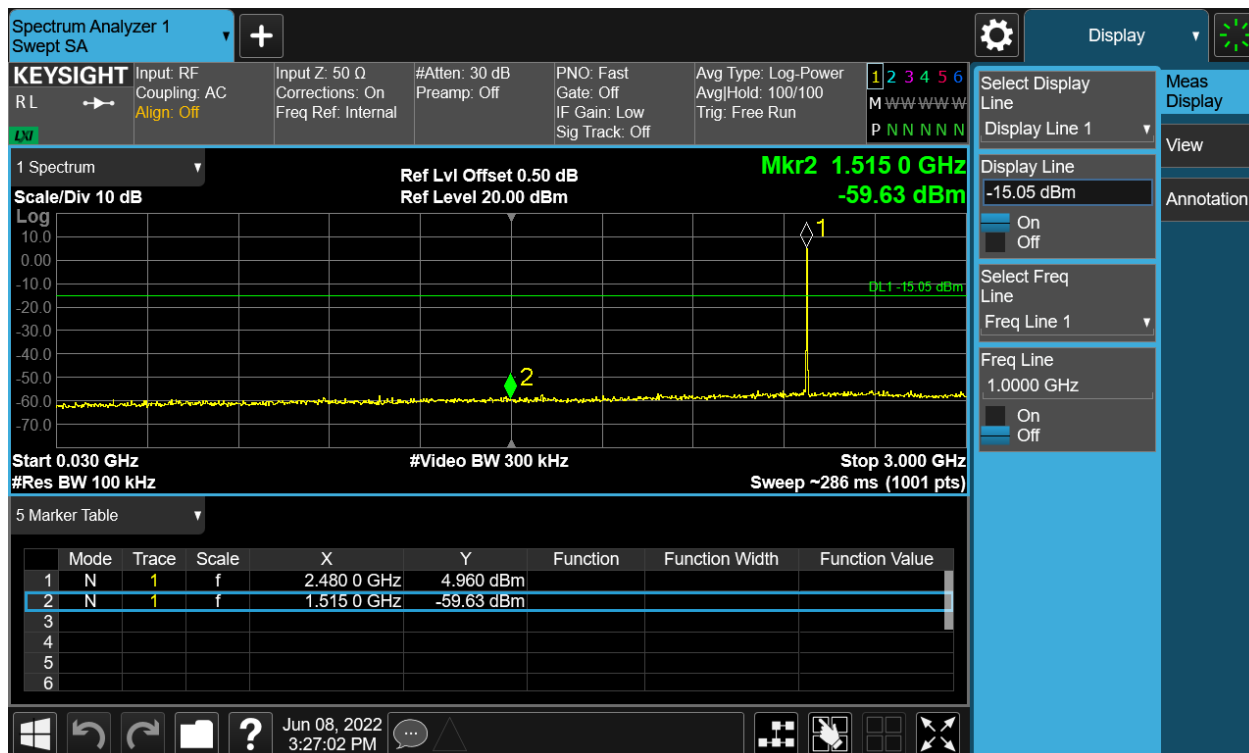
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Conducted spurious emissions 30MHz-25GHz



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4.1.6 Radiated 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	: 23°C
Relative humidity	: 54%

Notes

Test plots please refer to the annex document "SHH22020028-01AE 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-test below 1 GHz, Only the worst mode data of transmitting-low channel was 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, KDB 558074
Kind of test site	: 3m Semi-Anechoic Chamber

Test setup

Test Channel	: Low/Middle/High
Operation Mode	: A.1
Ambient temperature	: 23°C
Relative humidity	: 54%

Notes

Test plots please refer to the annex document "SHH22020028-01AE DATA BLE-TX EXHIBIT A".

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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
Operation Mode	: A.2
Earthing	: Not Connected
Ambient temperature	: 23°C
Relative humidity	: 51%

For details refer to following test plot.

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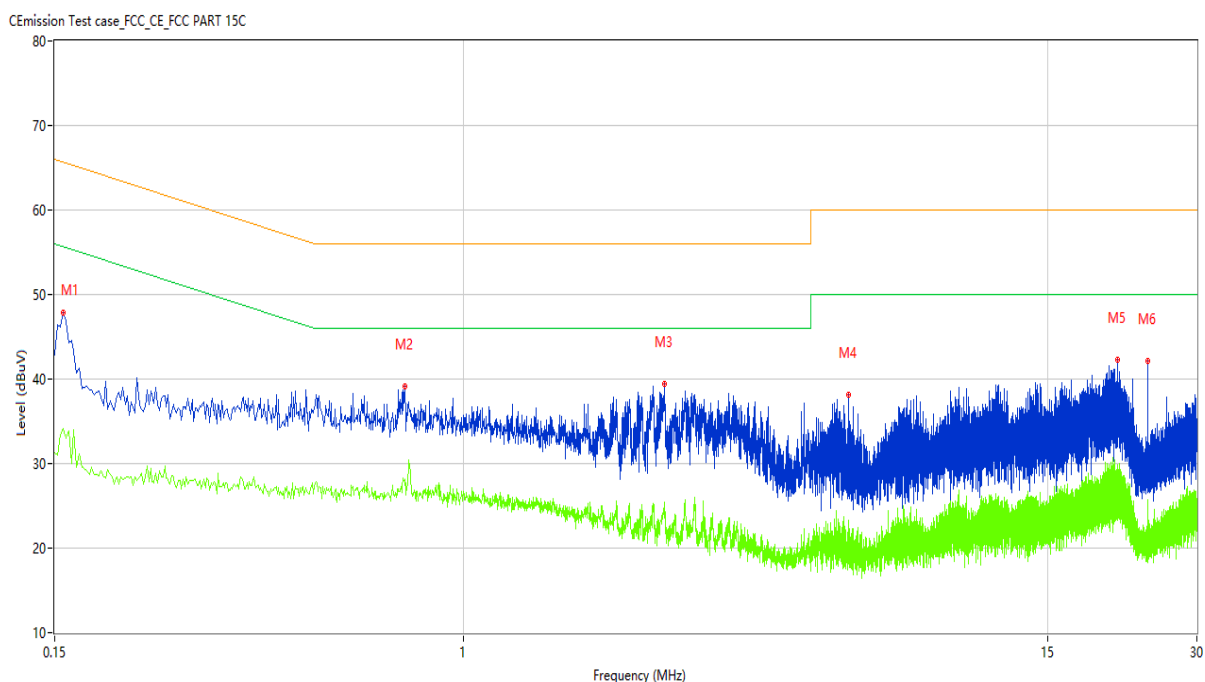
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Note: The all configurations were tested respectively, but only the worst configuration(Transmitting-low channel) shown here.

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	0.150	46.84	10.26	66.00	-19.16	Peak	L	Pass
1*	0.150	40.53	10.26	66.00	-25.47	QP	L	Pass
1**	0.150	31.22	10.26	56.00	-24.78	AV	L	Pass
2	0.760	40.70	10.31	56.00	-15.30	Peak	L	Pass
2*	0.760	32.16	10.31	56.00	-23.84	QP	L	Pass
2**	0.760	28.19	10.31	46.00	-17.81	AV	L	Pass
3	2.542	38.30	10.16	56.00	-17.70	Peak	L	Pass
3*	2.542	34.94	10.16	56.00	-21.06	QP	L	Pass
3**	2.542	24.20	10.16	46.00	-21.80	AV	L	Pass
4	5.956	37.26	10.29	60.00	-22.74	Peak	L	Pass
4*	5.956	29.72	10.29	60.00	-30.28	QP	L	Pass
4**	5.956	23.26	10.29	50.00	-26.74	AV	L	Pass
5	20.810	43.49	10.97	60.00	-16.51	Peak	L	Pass
5*	20.810	32.94	10.97	60.00	-27.06	QP	L	Pass
5**	20.810	28.93	10.97	50.00	-21.07	AV	L	Pass
6	23.890	43.62	11.01	60.00	-16.38	Peak	L	Pass
6*	23.890	26.08	11.01	60.00	-33.92	QP	L	Pass
6**	23.890	25.77	11.01	50.00	-24.23	AV	L	Pass

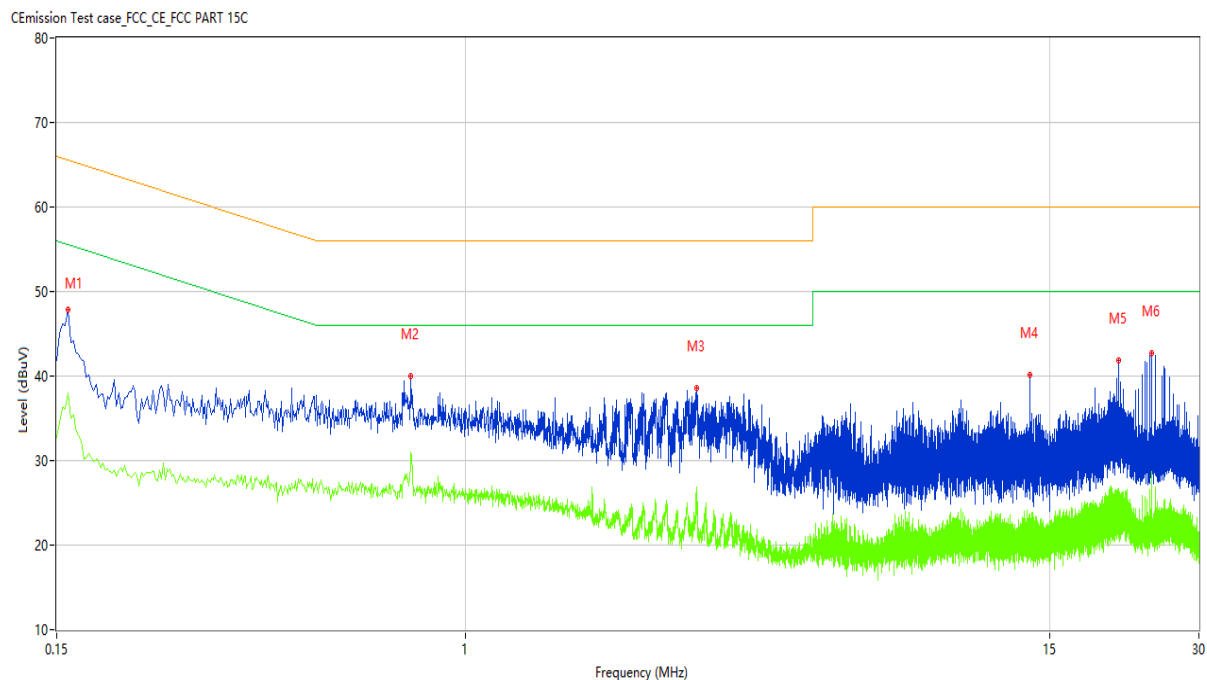
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Figure 14: Conducted Emission on AC Mains, N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.150	46.11	10.26	66.00	-19.89	Peak	N	Pass
1*	0.150	39.99	10.26	66.00	-26.01	QP	N	Pass
1**	0.150	32.75	10.26	56.00	-23.25	AV	N	Pass
2	0.776	41.22	10.31	56.00	-14.78	Peak	N	Pass
2*	0.776	28.23	10.31	56.00	-27.77	QP	N	Pass
2**	0.776	30.96	10.31	46.00	-15.04	AV	N	Pass
3	2.926	38.28	10.16	56.00	-17.72	Peak	N	Pass
3*	2.926	34.77	10.16	56.00	-21.23	QP	N	Pass
3**	2.926	25.83	10.16	46.00	-20.17	AV	N	Pass
4	13.698	42.52	10.43	60.00	-17.48	Peak	N	Pass
4*	13.698	27.81	10.43	60.00	-32.19	QP	N	Pass
4**	13.698	23.29	10.43	50.00	-26.71	AV	N	Pass
5	20.680	43.05	10.97	60.00	-16.95	Peak	N	Pass
5*	20.680	30.76	10.97	60.00	-29.24	QP	N	Pass
5**	20.680	26.09	10.97	50.00	-23.91	AV	N	Pass
6	24.072	46.84	11.01	60.00	-13.16	Peak	N	Pass
6*	24.072	28.92	11.01	60.00	-31.08	QP	N	Pass
6**	24.072	28.66	11.01	50.00	-21.34	AV	N	Pass

TEST REPORT

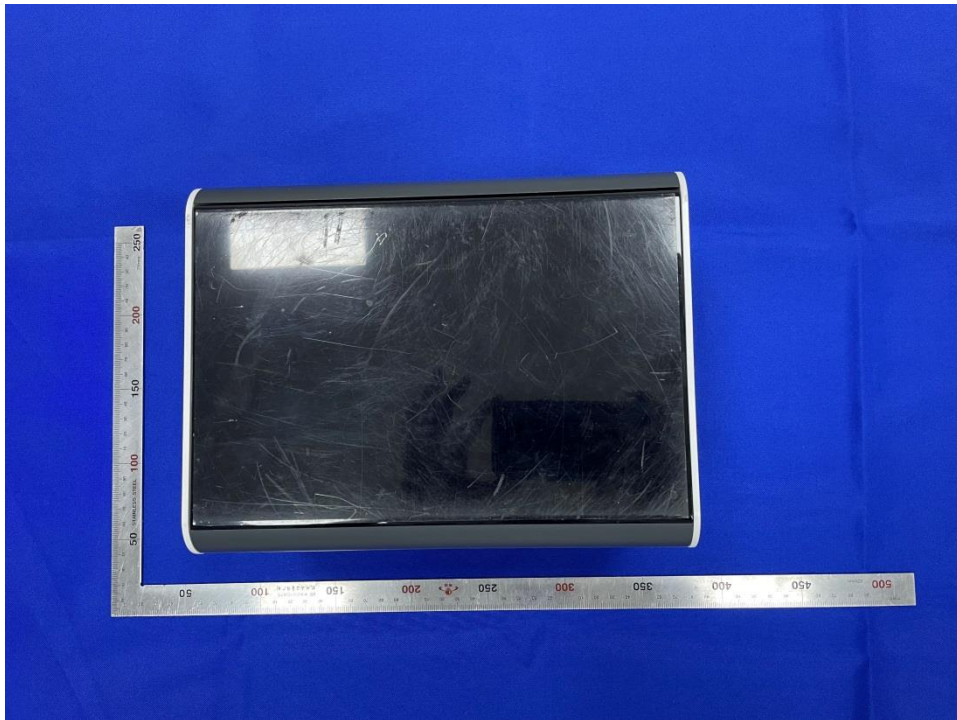
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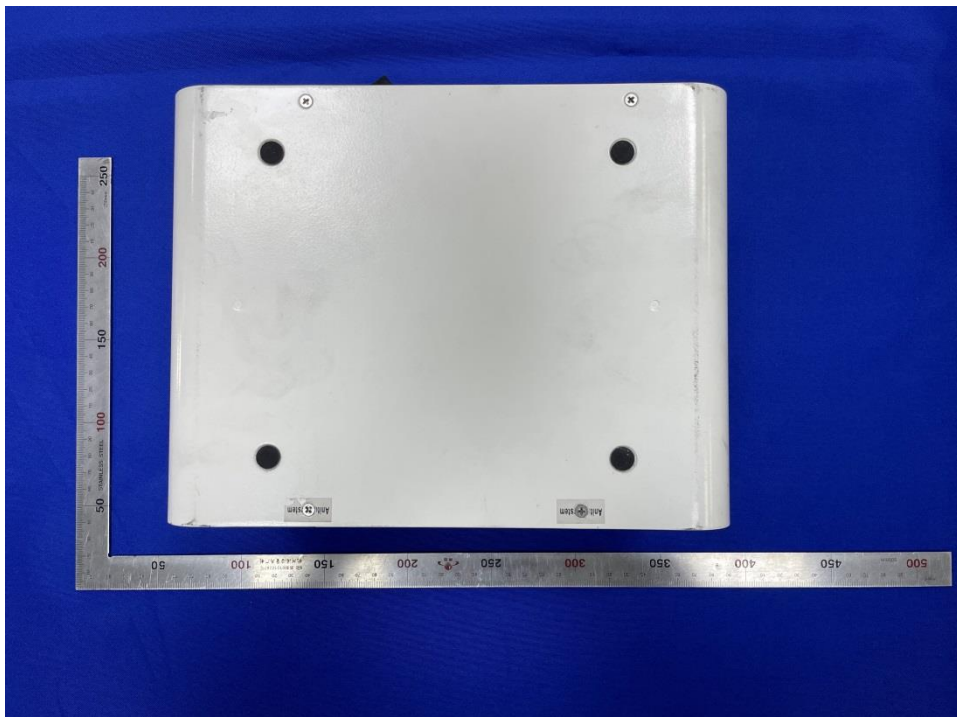
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5 Appendixes

5.1 Photographs of the Sample



Front of the sample



Back of the sample

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5.2 Set-up for Conducted Emission



5.3 Set-up for Conducted RF test at Antenna Port



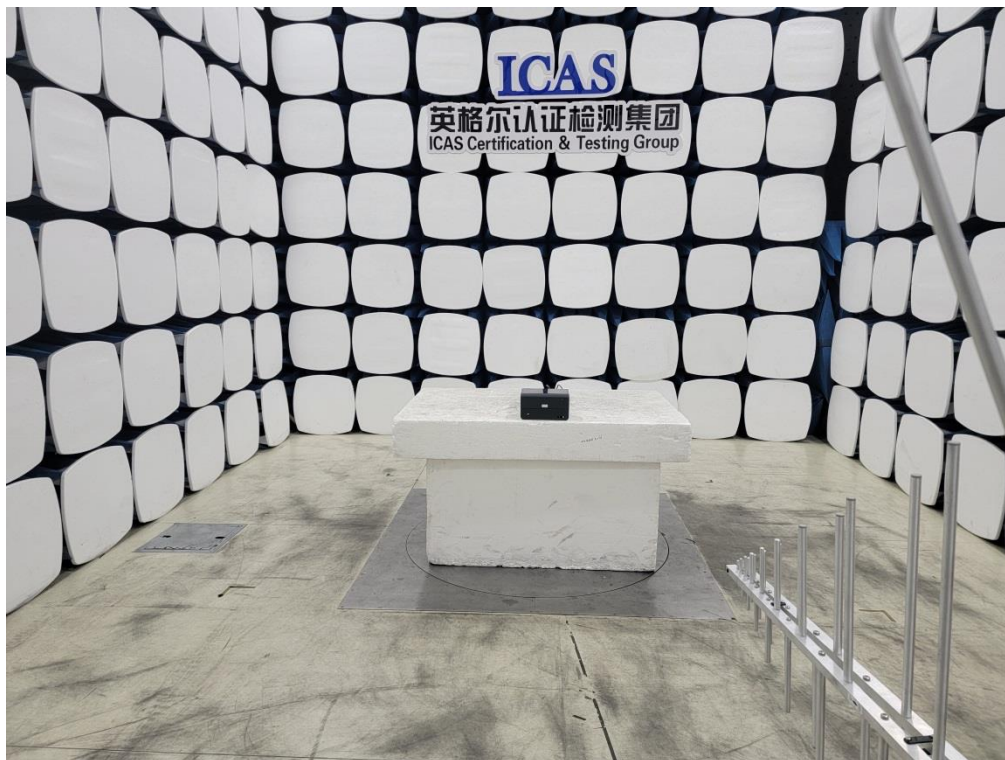
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5.4 Set-up for Spurious Emission below 1GHz



5.5 Set-up for Spurious Emission above 1GHz



End of the report