TEST REPORT

Applicant	:	SIMCom Wireless Solutions Limited
Address of Applicant	:	SIMCom Headquarters Building, Building 3, No.289 Linhong Road, Changning District, Shanghai,China
Product Name	:	Wi-Fi & BT Module
Brand Name	:	SIMCom
Model Name	:	W58
Sample Acquisition Method	:	Sent by Client
Sample No.	:	E22110054-01#05 E22110054-01#08
FCC ID	:	2AJYU-8PYA00C
ISED Number	:	23761-8PYA010
Standards	:	FCC CFR47 Part 15, Subpart C RSS-Gen (Issue 5, Amd.2-Feb 2021) RSS-247 (Issue 2, February 2017)
Date of Receipt	:	2023-02-15
Date of Test	:	2023-03-13 ~ 2023-04-17
Date of Issue	:	2023-04-18

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: Erik Yang (Erik Yang) Reviewed by: Jennifer Zhou (Jennifer Zhou) Approved by: Guoyou Chi (Authorized signatory: Guoyou Chi)

Contents

1 General Information

1.1 Testing Laboratory

ISED CAB identifier #	CN0081
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	SIMCom Wireless Solutions Limited
Address	SIMCom Headquarters Building, Building 3, No.289 Linhong Road, Changning District, Shanghai,China
Contact Person	Yongsheng Li
Telephone	+86 21 3252 3134
Email	yongsheng.li@simcom.com
Manufacturer Company Name	SIMCom Wireless Solutions Limited
Address	SIMCom Headquarters Building, Building 3, No.289 Linhong Road, Changning District, Shanghai,China
Factory Company Name	SIMCom Wireless Solutions Limited
Address	SIMCom Headquarters Building, Building 3, No.289 Linhong Road, Changning District, Shanghai,China

1.3 Details of EUT

Product Name	Wi-Fi & BT Module
Brand Name	SIMCom
Test Model Name	W58
FCC ID	2AJYU-8PYA00C
ISED Number	23761-8PYA010
Mode of Operation	Bluetooth BLE Version 4.0
Frequency Range	2402MHz ~ 2480MHz
Number of Channels	40 (at intervals of 1 MHz)
Modulation Type	GFSK
Antenna Type	External Antenna
Antenna Gain	2.97dBi
Extreme Temperature Range	-40℃~ +85℃
Test Voltage	DC 3.3V
Hardware Version	W58_V2.02_PCB

Software Version	LE20B01V04SIM7600G22_MIFI2
Test SW Version	BL410_R; BL410_E
RF power setting in TEST SW	QRCT_Power level setting_Default

Note:

1. *The above information was declared by the manufacture.*
2. *For more details, please refer to the User's manual of the EUT.*

Channel List

Channel	Frequency	Channel	Frequency	Channel	Frequency
0	2.402GHz	14	2.430GHz	28	2.458GHz
1	2.404GHz	15	2.432GHz	29	2.460GHz
2	2.406GHz	16	2.434GHz	30	2.462GHz
3	2.408GHz	17	2.436GHz	31	2.464GHz
4	2.410GHz	18	2.438GHz	32	2.466GHz
5	2.412GHz	19	2.440GHz	33	2.468GHz
6	2.414GHz	20	2.442GHz	34	2.470GHz
7	2.416GHz	21	2.444GHz	35	2.472GHz
8	2.418GHz	22	2.446GHz	36	2.474GHz
9	2.420GHz	23	2.448GHz	37	2.476GHz
10	2.422GHz	24	2.450GHz	38	2.478GHz
11	2.424GHz	25	2.452GHz	39	2.480GHz
12	2.426GHz	26	2.454GHz		
13	2.428GHz	27	2.456GHz		

1.4 Test Methodology

47 CFR Part 15, Subpart C	Telecommunication-Radio Frequency Devices-Intentional Radiators
KDB Publication 558074 D01 v05r02	15.247 Meas Guidance.
RSS-Gen (Issue 5, Amd.2-Feb 2021)	General Requirements for Compliance of Radio Apparatus
RSS-247 (Issue 2, February 2017)	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
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	ISED Rules	Result
Antenna Requirement	FCC Part 15.247(b)(4), Part 15.203	RSS-247 5.4(f) RSS-GEN 6.8	PASS
Maximum peak conducted output power and E.I.R.P	FCC Part 15.247(b)(3)	RSS-247 5.4(d)	PASS
6dB Bandwidth and 99% Bandwidth	FCC Part 15.247(a)(2)	RSS-247 5.2(a) RSS-Gen 6.7	PASS
Maximum conducted output power spectral density	FCC Part 15.247(e)	RSS-247 5.2(b)	PASS
Conducted Spurious Emission & Authorized-band band-edge	FCC Part 15.247(d)	RSS-247 5.5	PASS
Radiated Emission	FCC Part 15.247(d), 15.205, 15.209	RSS-GEN 8.9	PASS
Band Edge (Restricted-band band-edge)	FCC Part 15.247(d), 15.205, 15.209	RSS-GEN 8.10	PASS
Conducted Emission on AC Mains	FCC Part 15.207(a)	RSS-Gen 8.8	PASS

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
Spectrum Analyzer	Keysight	N9020B	MY59260184	2022-08-02	2023-08-01
Spectrum Analyzer	Keysight	N9020A	MY54101709	2022-08-02	2023-08-01
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2022-06-10	2023-06-09
Signal Generator	Rohde & Schwarz	SMR27	100184	2022-08-02	2023-08-01
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2022-06-10	2023-06-09
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2022-06-10	2023-06-09
V-network	SCHWARZBECK	NSLK8127	8127-902	2022-06-10	2023-06-09
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08	2023-06-07
Horn Antenna	SCHWARZBECK	BBHA9120D	9120D-1775	2021-06-08	2023-06-07
Loop Antenna	SCHWARZBECK	FMZB 1513	/	2022-06-10	2023-06-09
Broadband Preamplifier	SCHWARZBECK	BBV 9718	346	2022-06-10	2023-06-09
EMC chamber 9*6*6（L*W*H)	CHANGNING	966	N/A	2022-06-10	2023-06-09
Shielded Enclosure 8*5*4（L*W*H)	CHANGNING	854	N/A	2022-06-10	2023-06-09
Test Software	BL	BL410_E	Version:1.0.0.117	N/A	N/A
Test Software	BL	BL410_R	Version:2.1.1.409	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. The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95.45%.

Parameter		Uncertainty
Antenna Port Conducted Emission	< 1GHz	± 1.5 dB
	> 1GHz	± 1.5 dB
Radiated Emission	9KHz – 30MHz	± 3.42 dB
	30 MHz – 1GHz	± 5.00 dB
	> 1GHz	± 4.88 dB
Conducted Emission on AC Mains	150kHz-30MHz	± 2.68 dB
Occupied Channel Bandwidth		±5 %

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

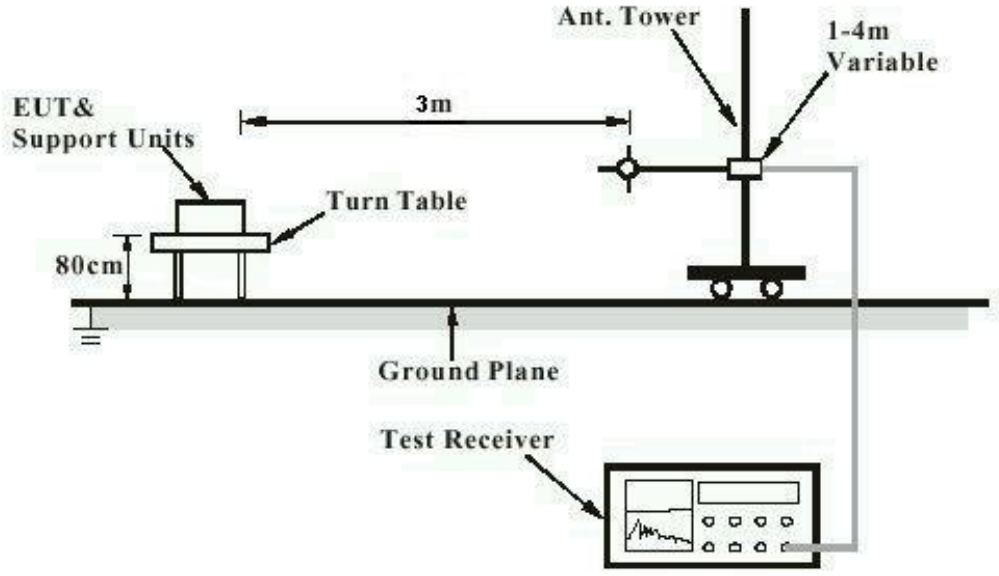
Description	Manufacturer	Model Name	Serial No.
Laptop	Lenovo	TP00083A	PF-0PRDGN 17/03
Adapter	Something High Electric(Xiamen) Company Inc.	P-050B-050200EU	N/A
EVB Debug Board	SIMCom	8PYA00-SIMCOM-EVB_V1.02	N/A
USB Cable	SIMCom	N/A	1.00m Unshielded

3.3 Support Software

Description	Manufacturer	Software Name
Software	Qualcomm	QRCT Version 4.0.00166.0

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

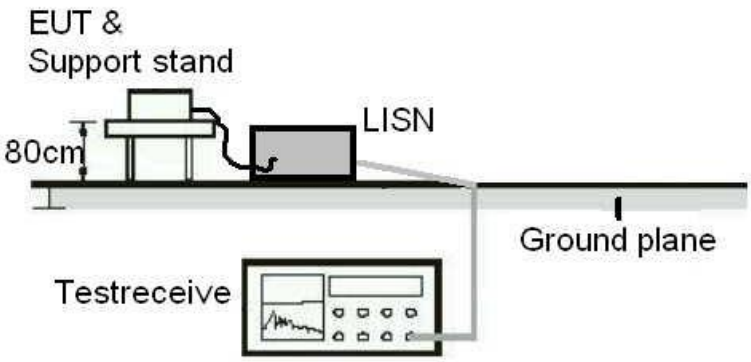
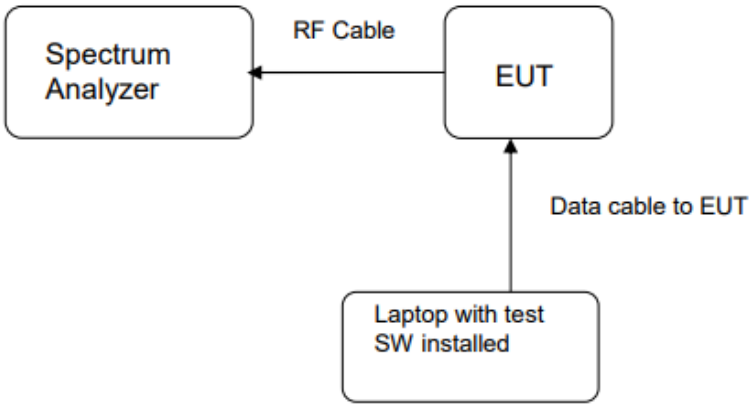


Diagram of Measurement Configuration for Transmitter Test



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 RSS-247 5.4(f), RSS-GEN 6.8
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 2.97dBi. The antenna is external 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.

4.1.2 Maximum peak conducted output power and E.I.R.P

RESULT: **PASS**

Test standard : FCC Part 15.247(b)(3), RSS-247 5.4(d)
Requirement : ANSI C63.10-2013 clause 11.9.1.1,
KDB 558074 clause 8.3.1.1
Kind of test site : Shielded room

Test setup

Test Channel : Low/Middle/High
Operation Mode : A.1.a
Ambient temperature : 20.8°C
Relative humidity : 51%

Table 1: Maximum peak conducted output power

Test Mode	Test Channel (MHz)	Maximum peak conducted output power		Limit (W)
		(dBm)	(mW)	
BLE	2402	-1.417	0.722	< 1
	2440	0.722	1.181	
	2480	-0.358	0.921	

Table 2: E.I.R.P

Test Mode	Test Channel (MHz)	E.I.R.P		Limit (W)
		(dBm)	(mW)	
BLE	2402	1.553	1.430	< 4
	2440	3.692	2.340	
	2480	2.612	1.825	

Note: The antenna gain is 2.97dBi

Figure 1: The plots of Peak Conducted Output Power, 2402MHz, BLE

Figure 2: The plots of Peak Conducted Output Power, 2440MHz, BLE

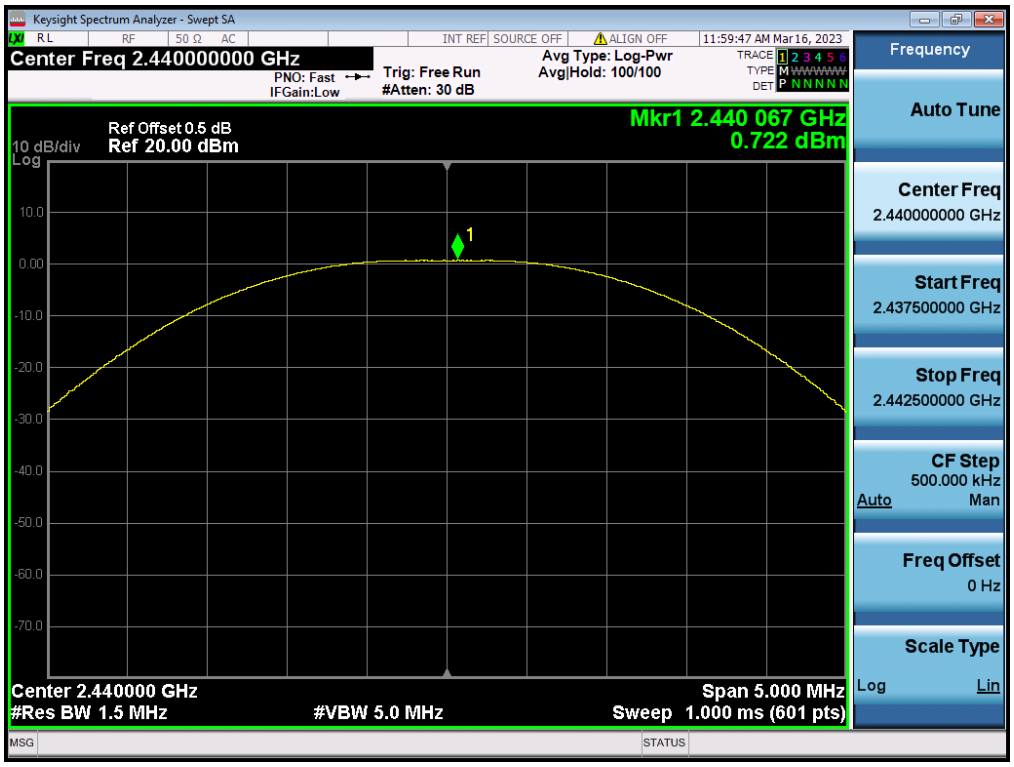
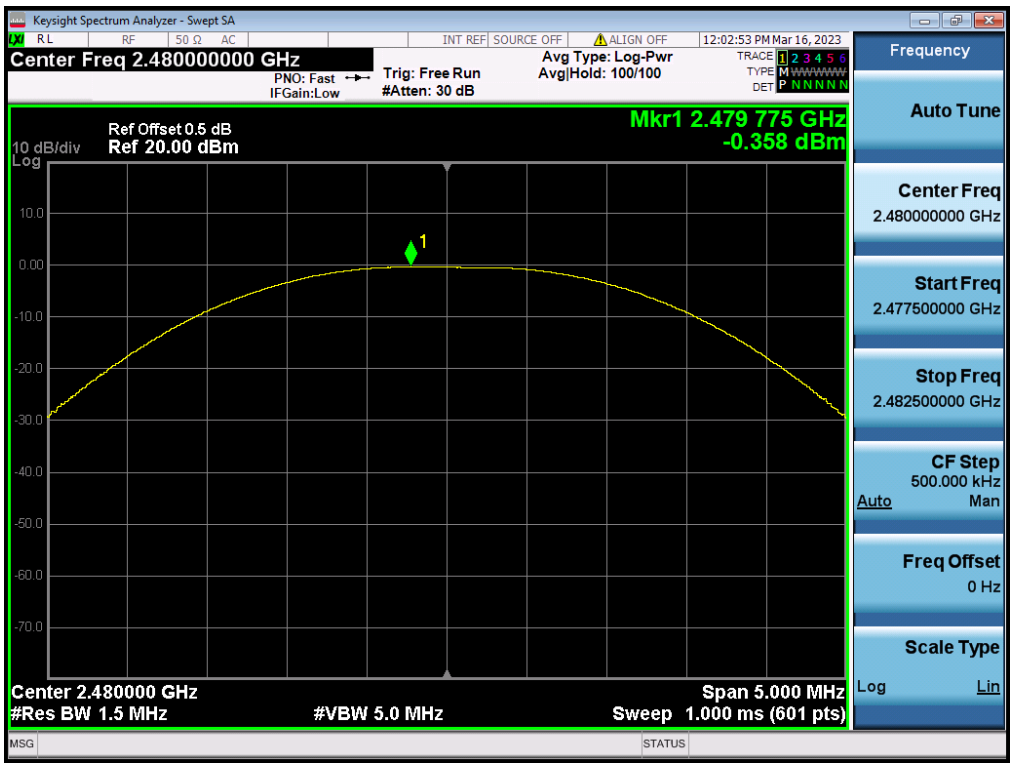


Figure 3: The plots of Peak Conducted Output Power, 2480MHz, BLE



4.1.3 6dB Bandwidth and 99% Bandwidth

RESULT: **PASS**

Test standard	:	FCC Part 15.247(a)(2), RSS-247 5.2(a) RSS-Gen 6.7
Requirement	:	ANSI C63.10-2013 clause 11.8.1, KDB 558074 clause 8.2
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/Middle/High
Operation Mode	:	A.1.a
Ambient temperature	:	20.8°C
Relative humidity	:	51%

Table 3: 6dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth Limit
BLE	2402	0.6462	1.0584	>0.5 MHz
	2440	0.6430	1.0655	
	2480	0.6515	1.0652	

Figure 4: The plots of 6dB Bandwidth, 2402MHz, BLE

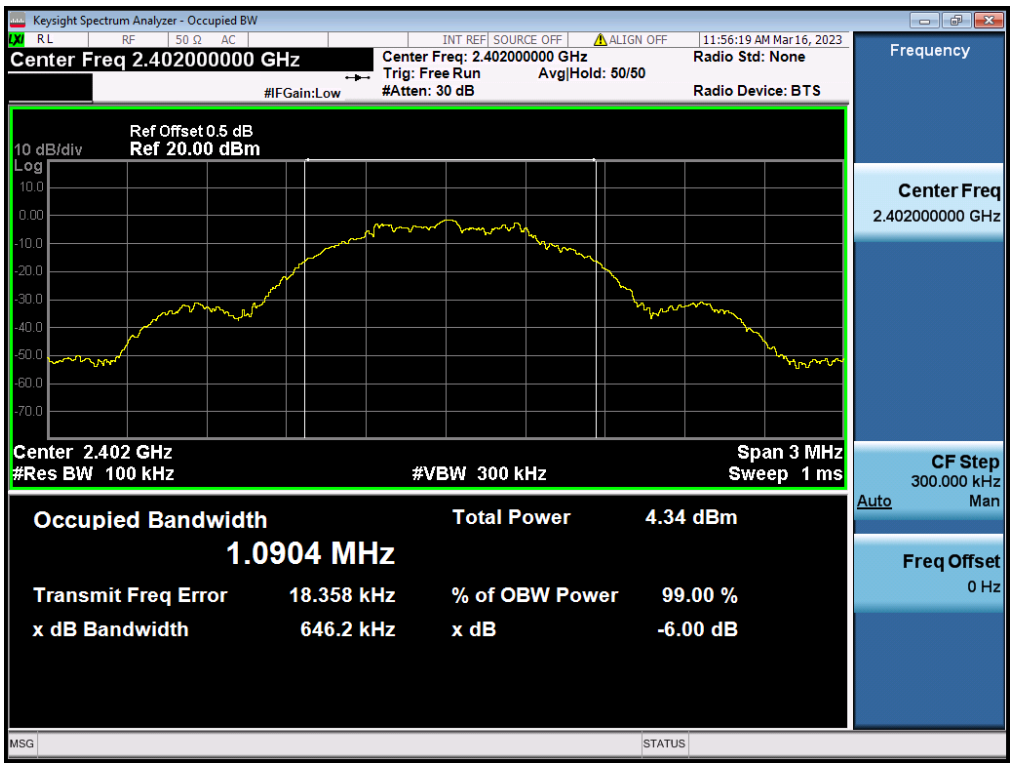


Figure 5: The plots of 99% Bandwidth, 2402MHz, BLE

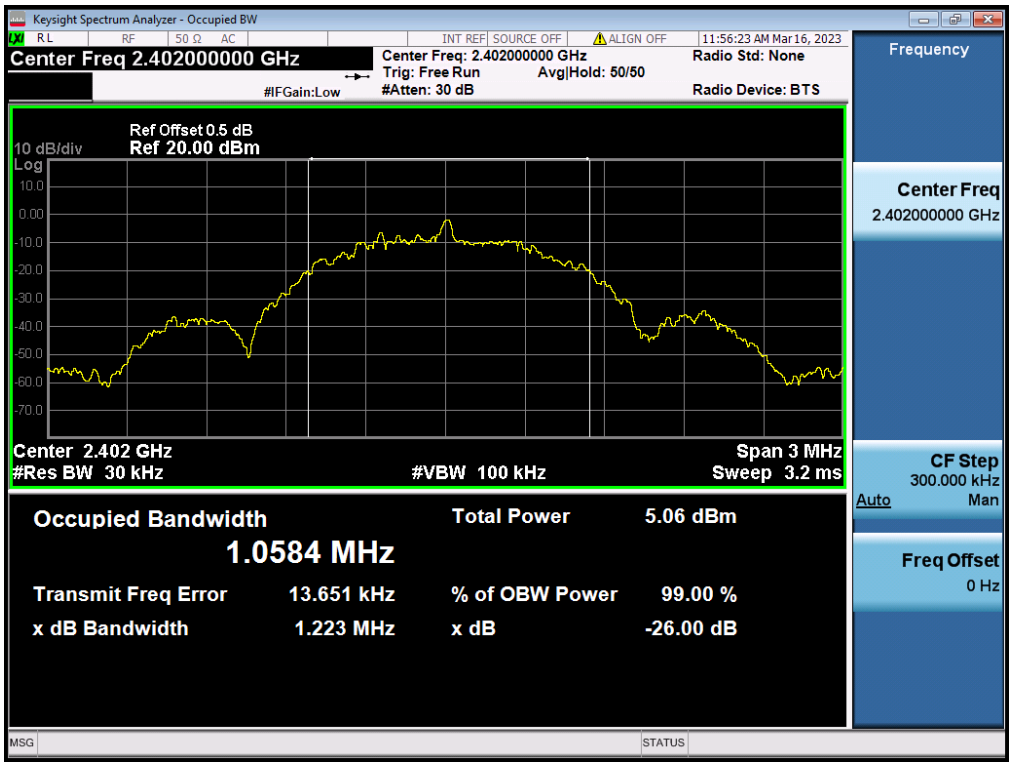


Figure 6: The plots of 6dB Bandwidth, 2440MHz, BLE

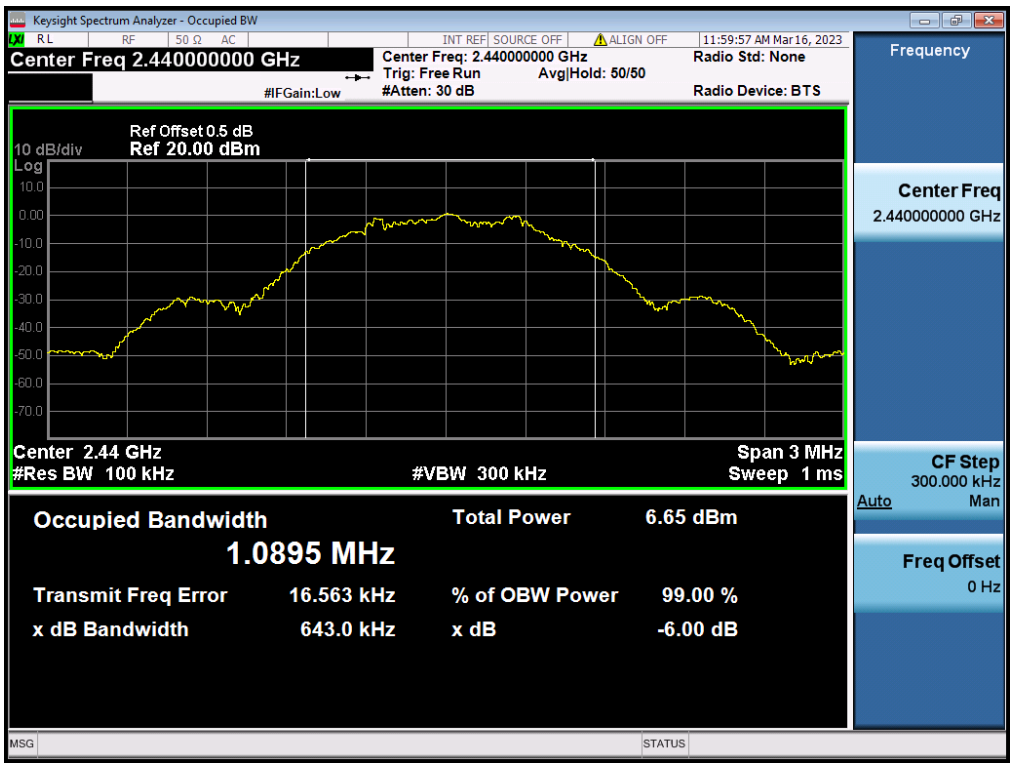


Figure 7: The plots of 99% Bandwidth, 2440MHz, BLE

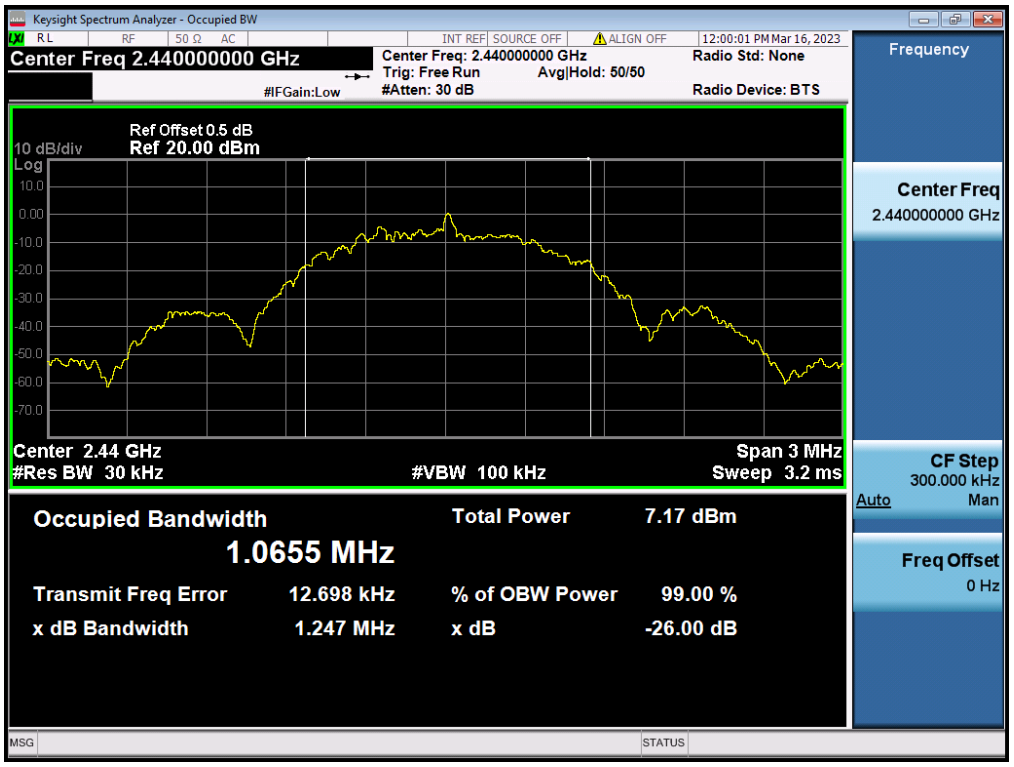


Figure 8: The plots of 6dB Bandwidth, 2480MHz, BLE

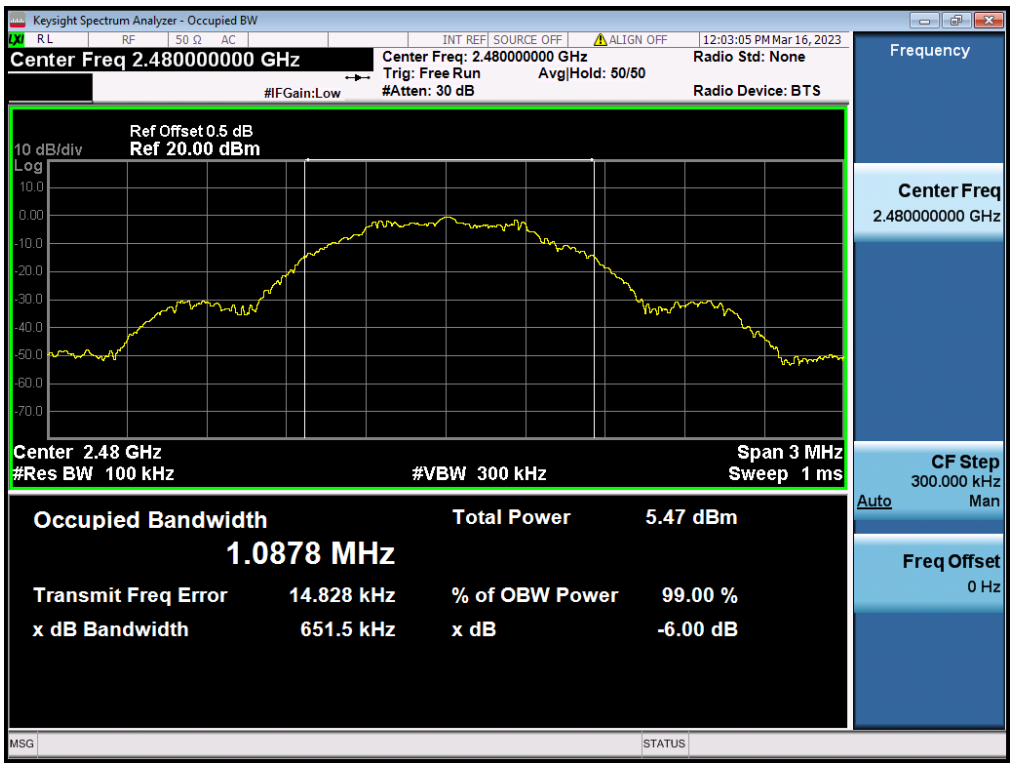
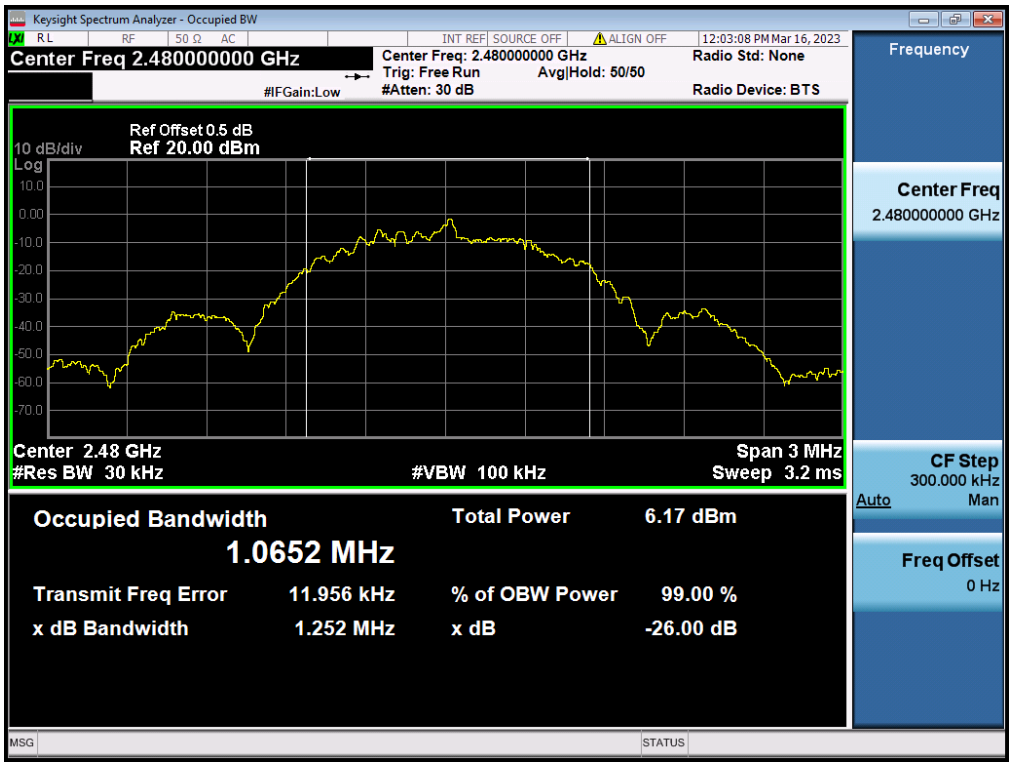


Figure 9: The plots of 99% Bandwidth, 2480MHz, BLE



4.1.4 Maximum conducted output power spectral density

RESULT: **PASS**

Test standard	:	FCC Part 15.247(e), RSS-247 5.2(b)
Requirement	:	ANSI C63.10-2013 clause 11.10.2, KDB 558074 clause 8.4
Kind of test site	:	Shielded room

Test setup

Test Channel	:	Low/Middle/High
Operation Mode	:	A.1.a
Ambient temperature	:	20.8°C
Relative humidity	:	51%

Table 4: Maximum conducted output power spectral density

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE	2402	-16.083	8
	2440	-13.904	
	2480	-15.016	

Figure 10: The plots of Power Spectral Density, 2402MHz, BLE

Figure 11: The plots of Power Spectral Density, 2440MHz, BLE

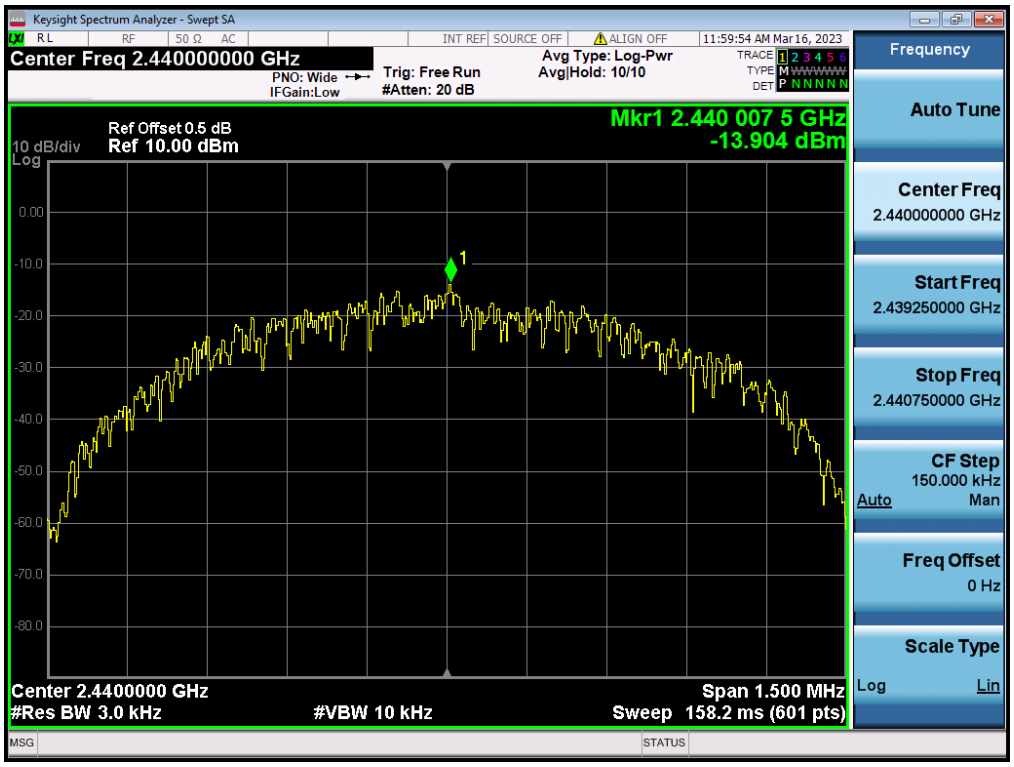
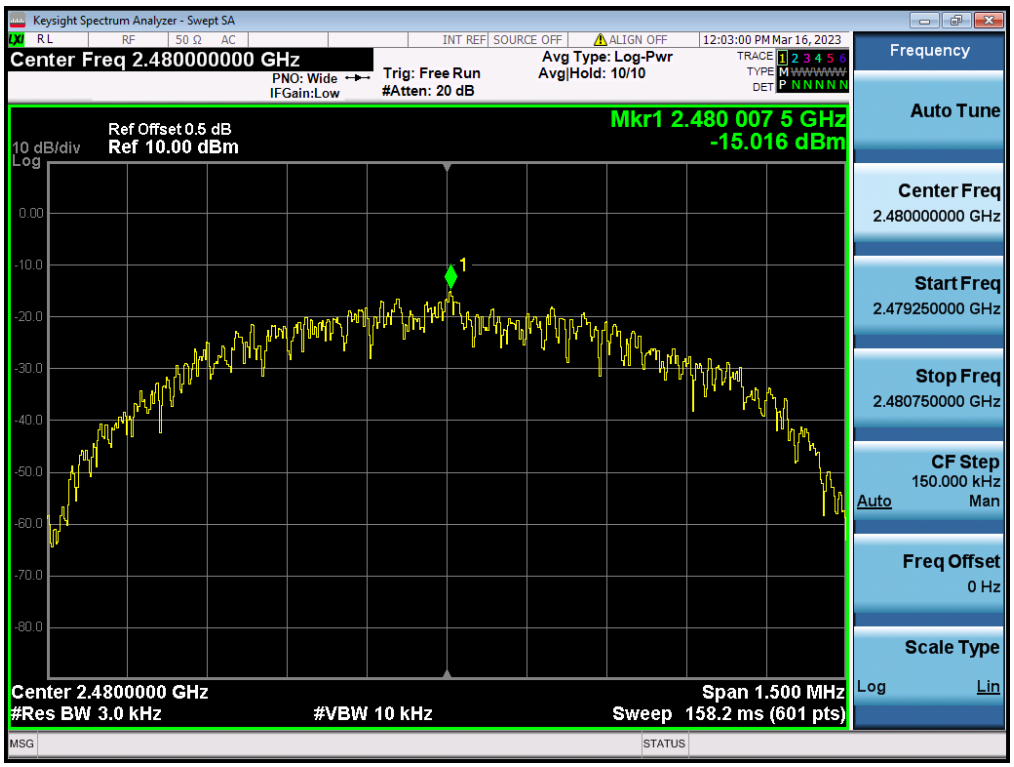


Figure 12: The plots of Power Spectral Density, 2480MHz, BLE



4.1.5 Conducted Spurious Emission & Authorized-band band-edge

RESULT: **PASS**

Test standard	:	FCC Part 15.247(d), RSS-247 5.5
Requirement	:	ANSI C63.10-2013 clause 11.11, KDB 558074 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	:	20.8°C
Relative humidity	:	51%

For details refer to following test plot.

Figure 13: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE, Carrier Level

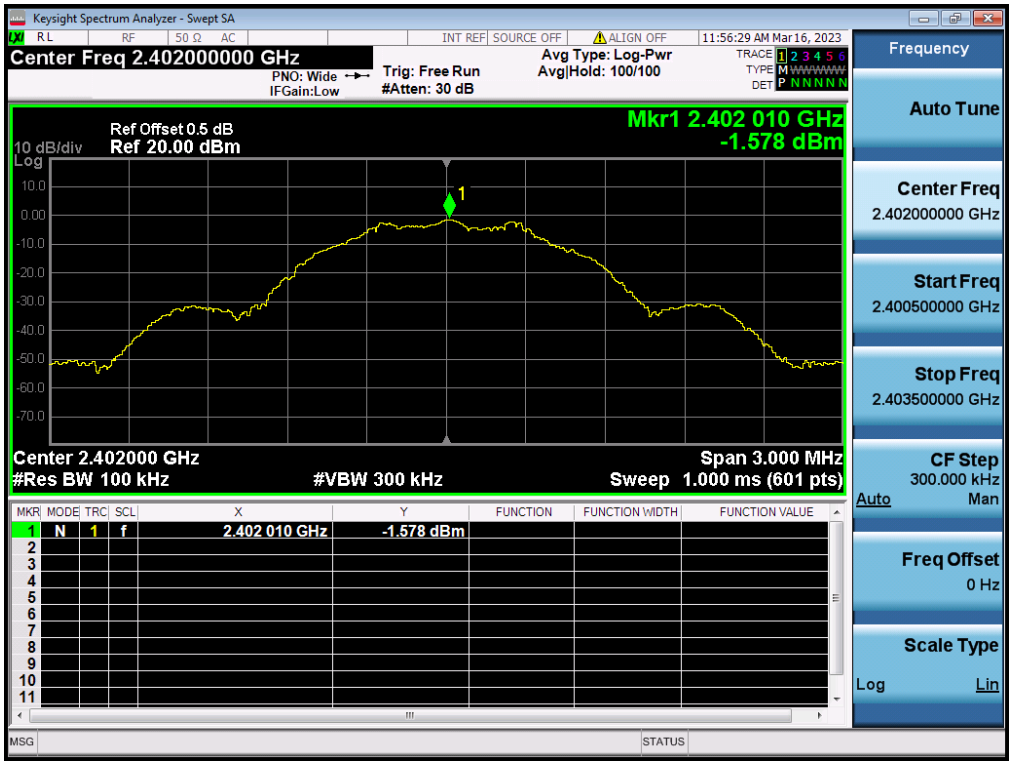


Figure 14: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE, Band Edge

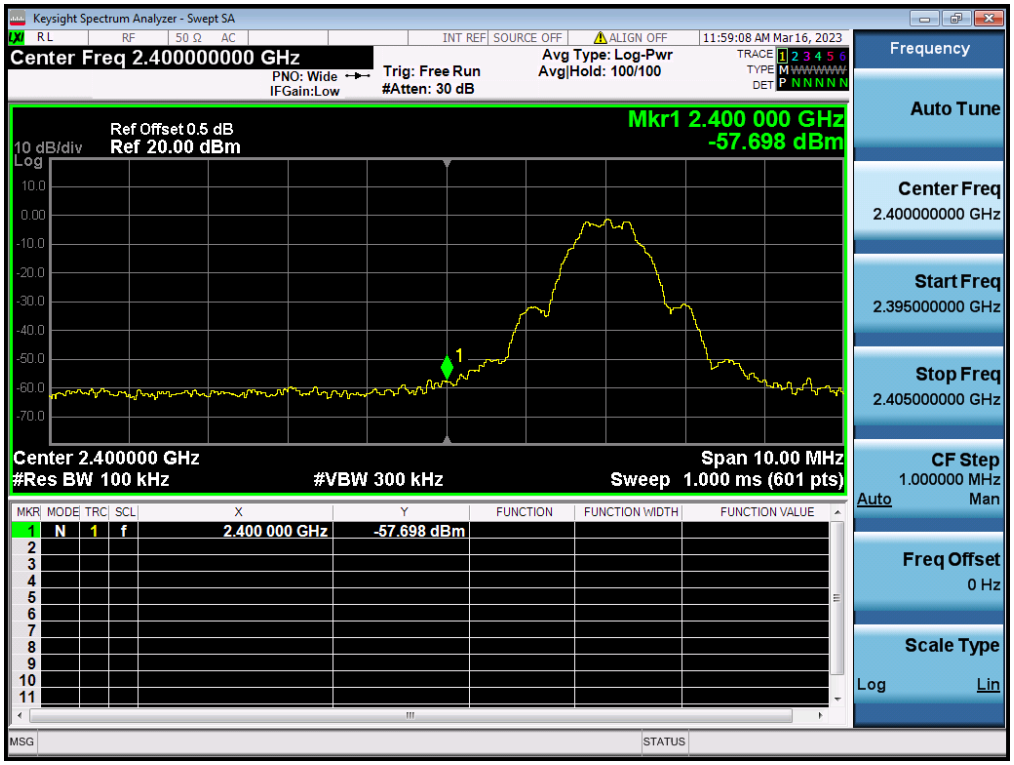


Figure 15: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE, Conducted spurious emissions 30MHz-3GHz

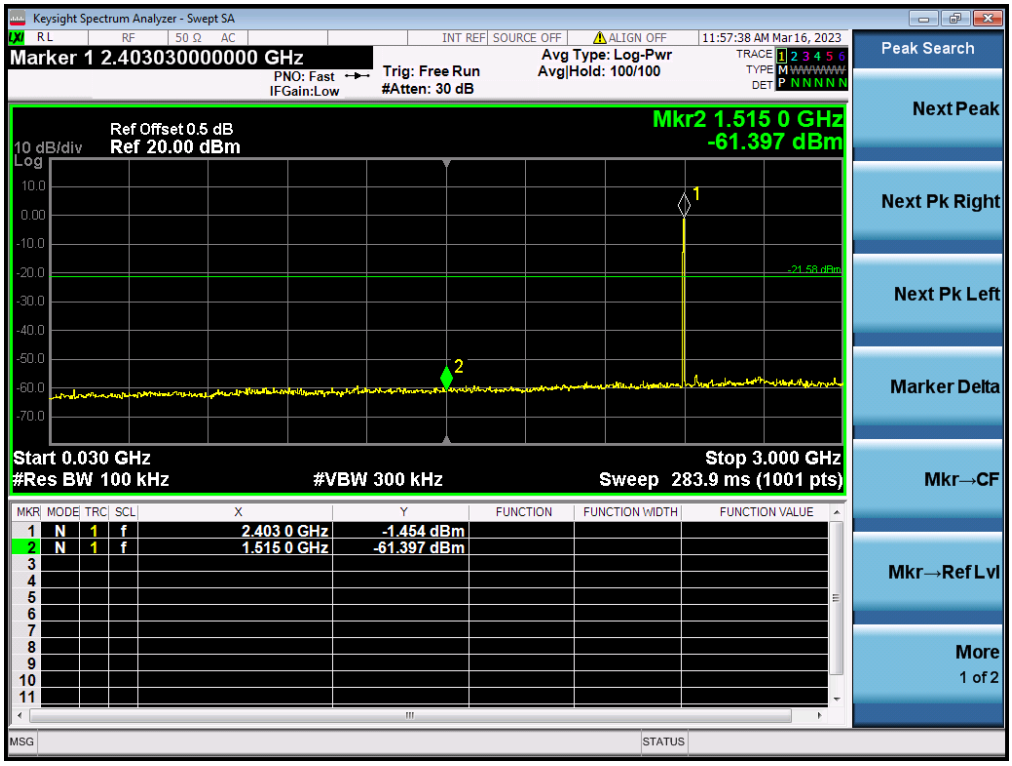


Figure 16: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE, Conducted spurious emissions 2GHz-25GHz

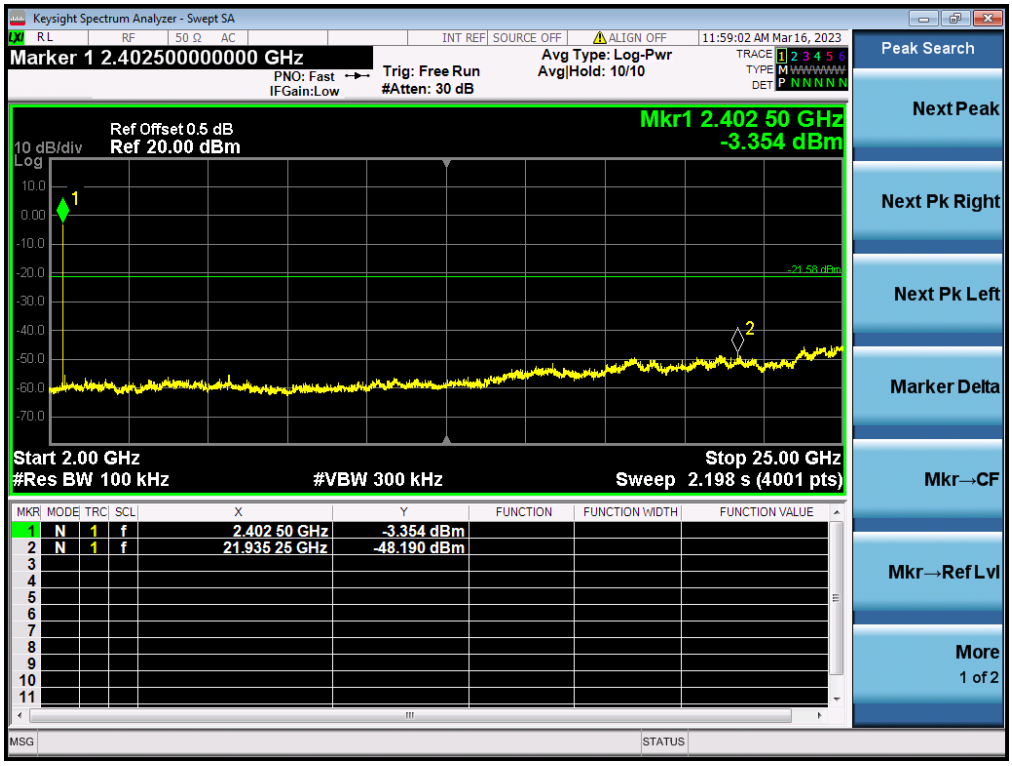


Figure 17: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE, Carrier Level

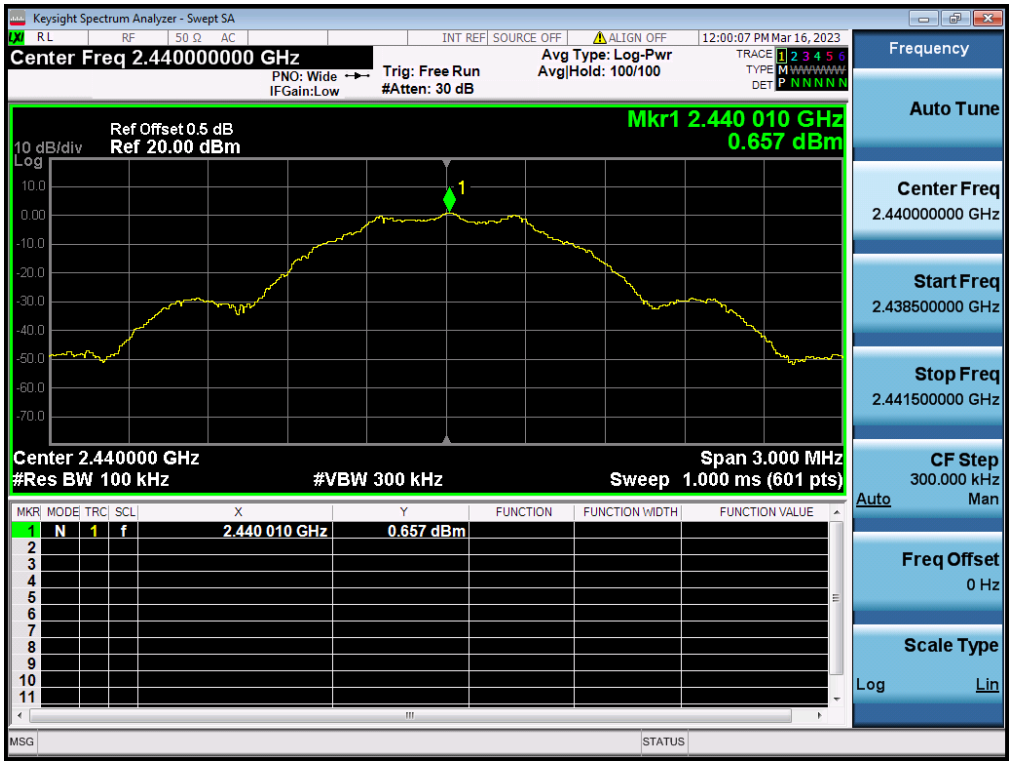


Figure 18: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE, Conducted spurious emissions 30MHz-3GHz

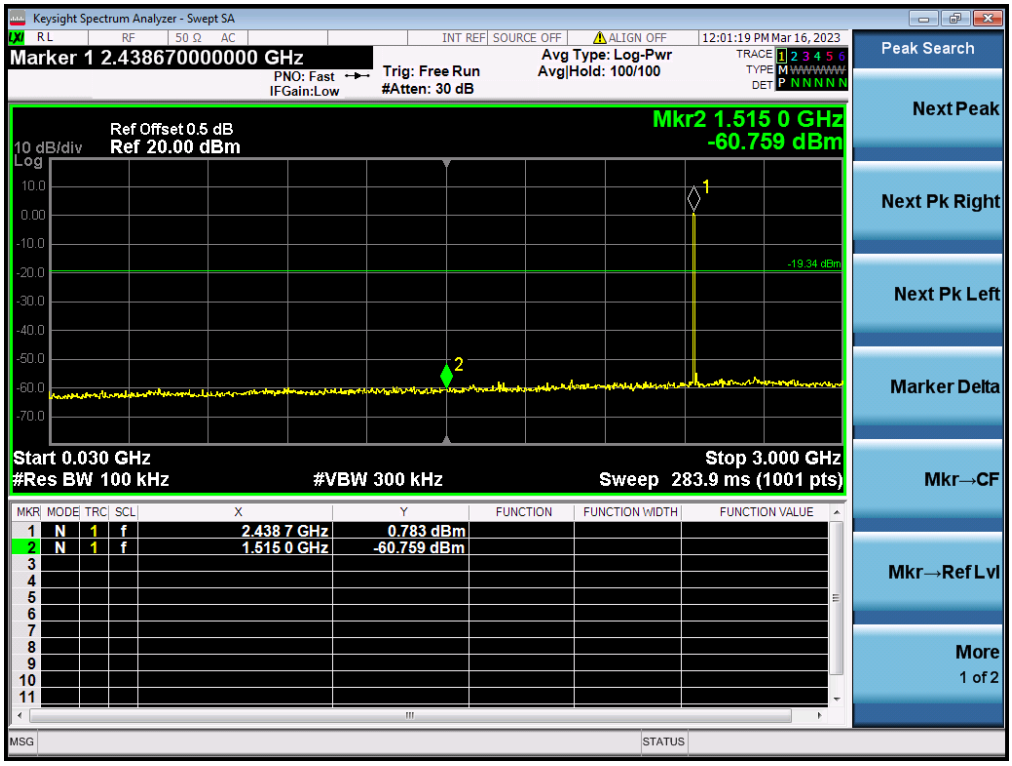


Figure 19: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE, Conducted spurious emissions 2GHz-25GHz

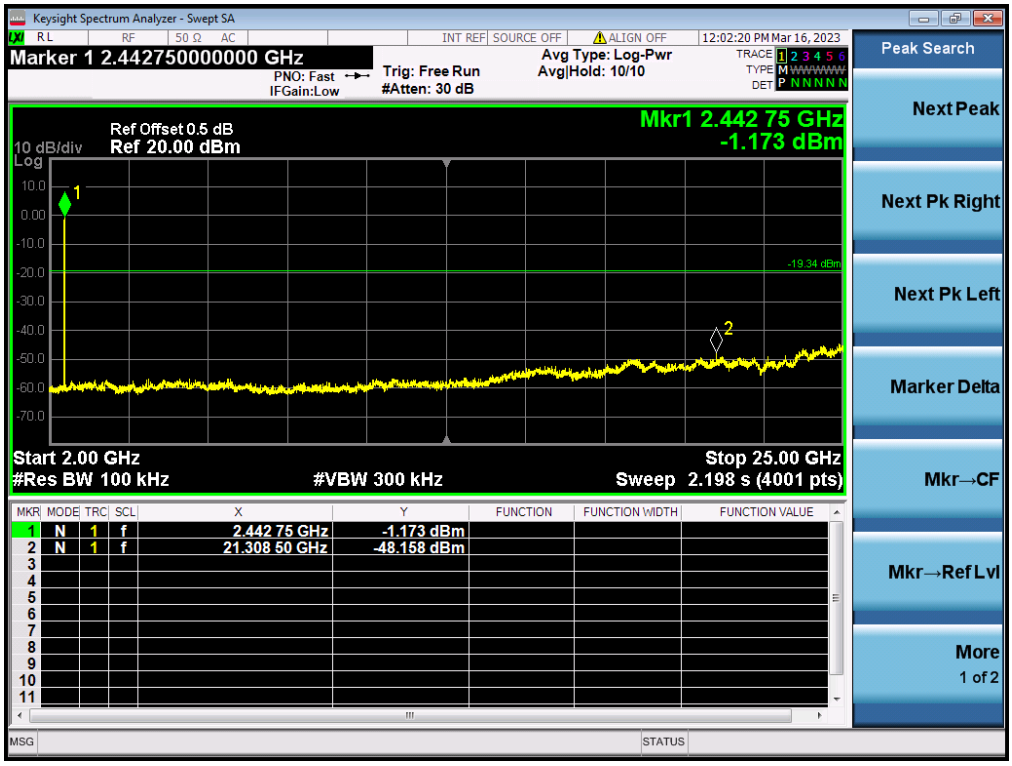


Figure 20: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE, Carrier Level

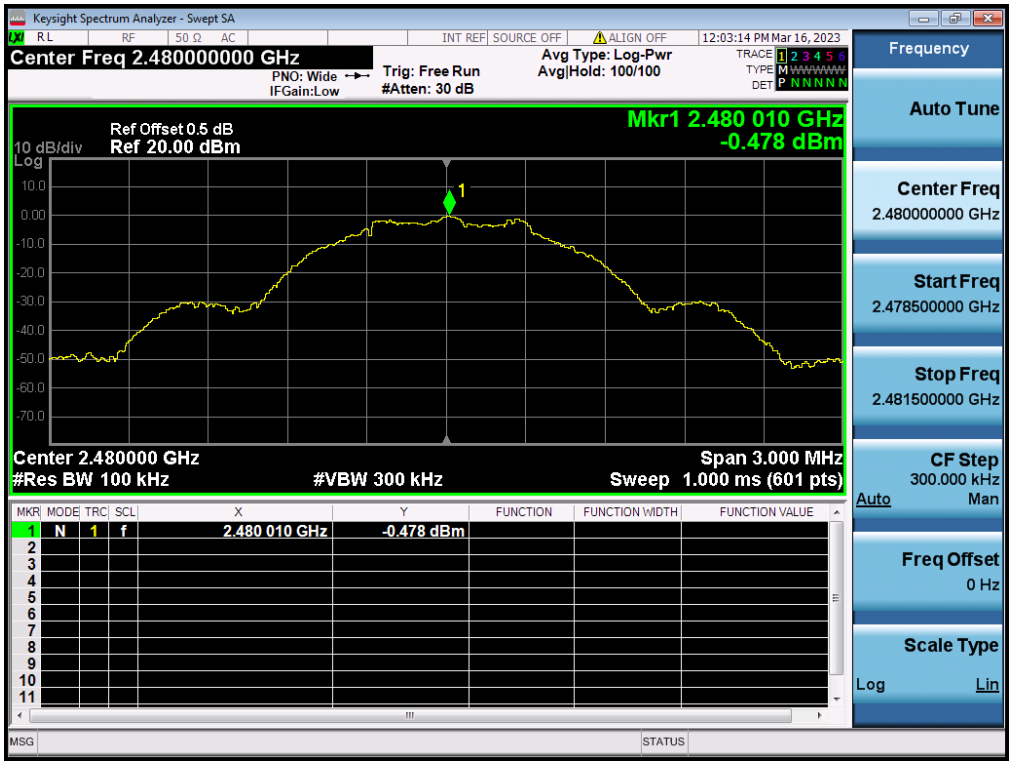


Figure 21: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE, Band Edge

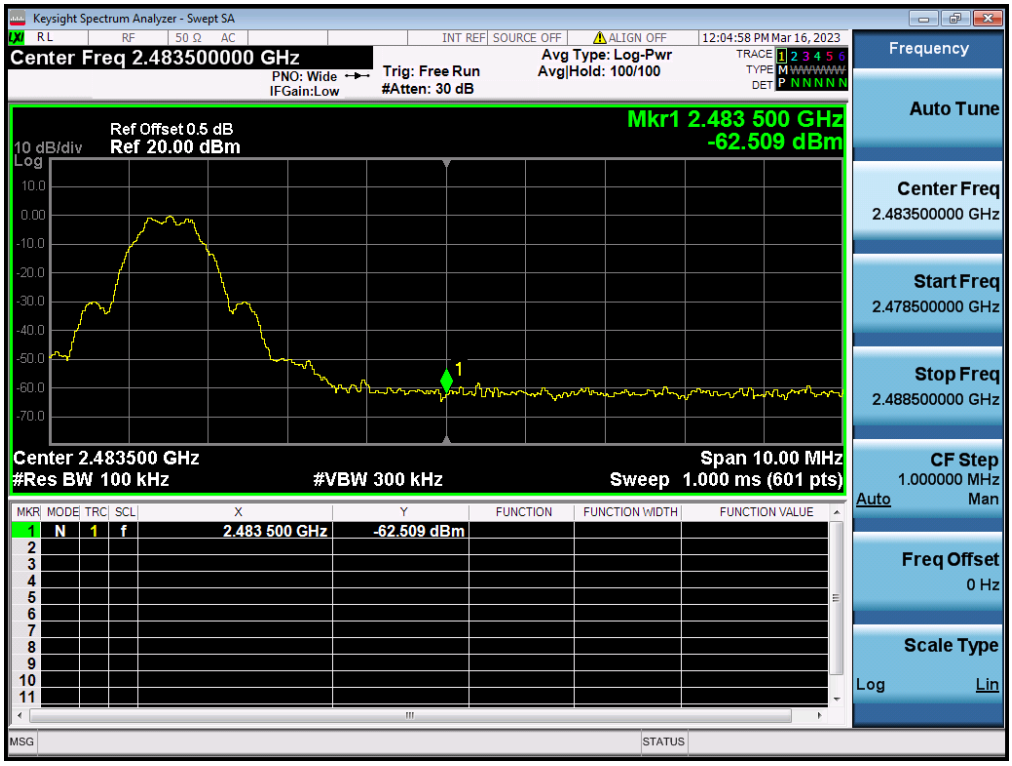


Figure 22: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE, Conducted spurious emissions 30MHz-3GHz

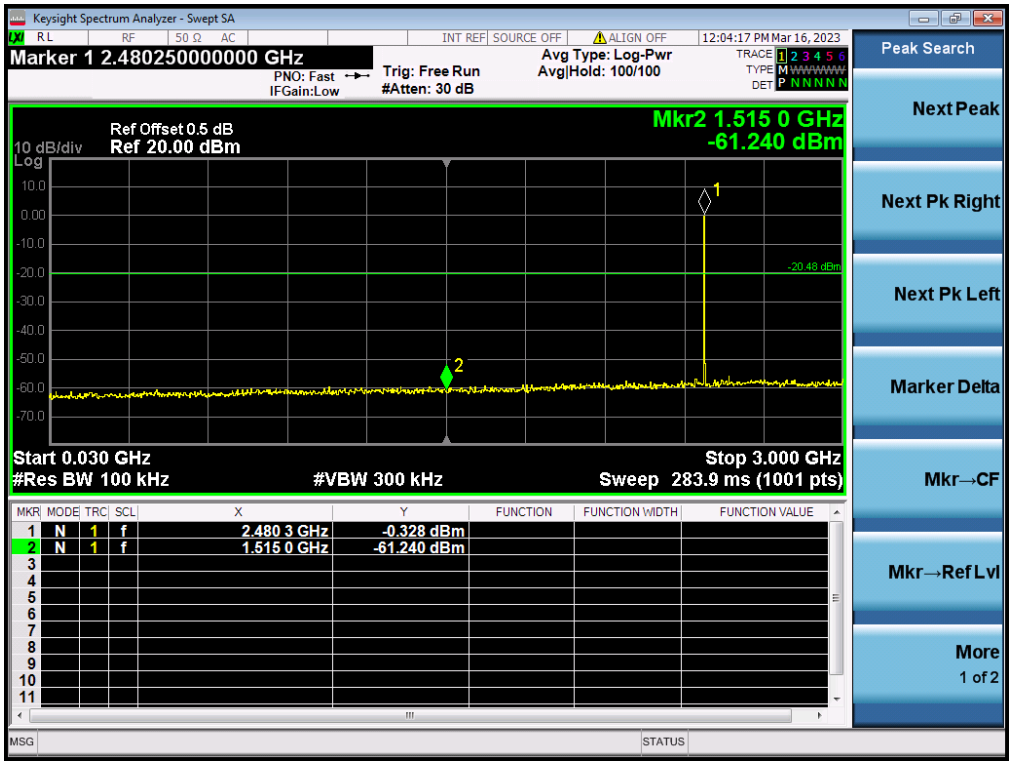
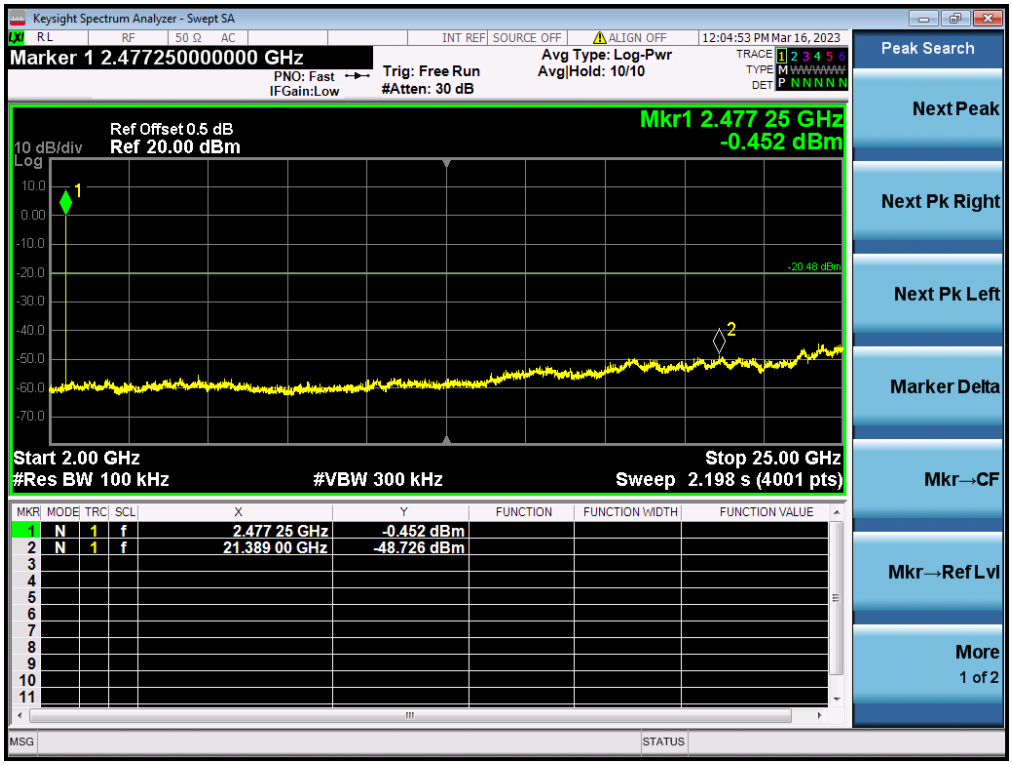


Figure 23: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE, Conducted spurious emissions 2GHz-25GHz



4.1.6 Radiated Emission

RESULT: **PASS**

Test standard	:	FCC Part 15.247(d), 15.205, 15.209 RSS-GEN 8.9
Requirement	:	ANSI C63.10-2013 clause 11.12, KDB 558074 clause 8.6
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/Middle/High
Operation Mode	:	A.1.a
Ambient temperature	:	21°C
Relative humidity	:	51%

Notes

Test plots please refer to the annex document "SHE22110054-02CE 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. In addition, During 30MHz to 1GHz test frequency range, only the worst mode data was reported in this report.
2. The spurious above 18GHz is noise only and 20dB below the limit. The value has no need to be reported.
3. 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.

4.1.7 Band Edge (Restricted-band band-edge)

RESULT: **PASS**

Test standard	:	FCC Part 15.247(d), 15.205, 15.209 RSS-GEN 8.10
Requirement	:	ANSI C63.10-2013 clause 11.13, KDB 558074 clause 8.7
Kind of test site	:	3m Semi-Anechoic Chamber

Test setup

Test Channel	:	Low/High
Operation Mode	:	A.1.a
Ambient temperature	:	21°C
Relative humidity	:	51%

Notes

Test plots please refer to the annex document "SHE22110054-02CE DATA BLE-TX EXHIBIT A".

4.2 Mains Emissions

4.2.1 Conducted Emission on AC Mains

RESULT: **PASS**

Test standard	:	FCC Part 15.207(a), RSS-Gen 8.8
Requirement	:	ANSI C63.10-2013 clause 6.2
Kind of test site	:	Shielded room

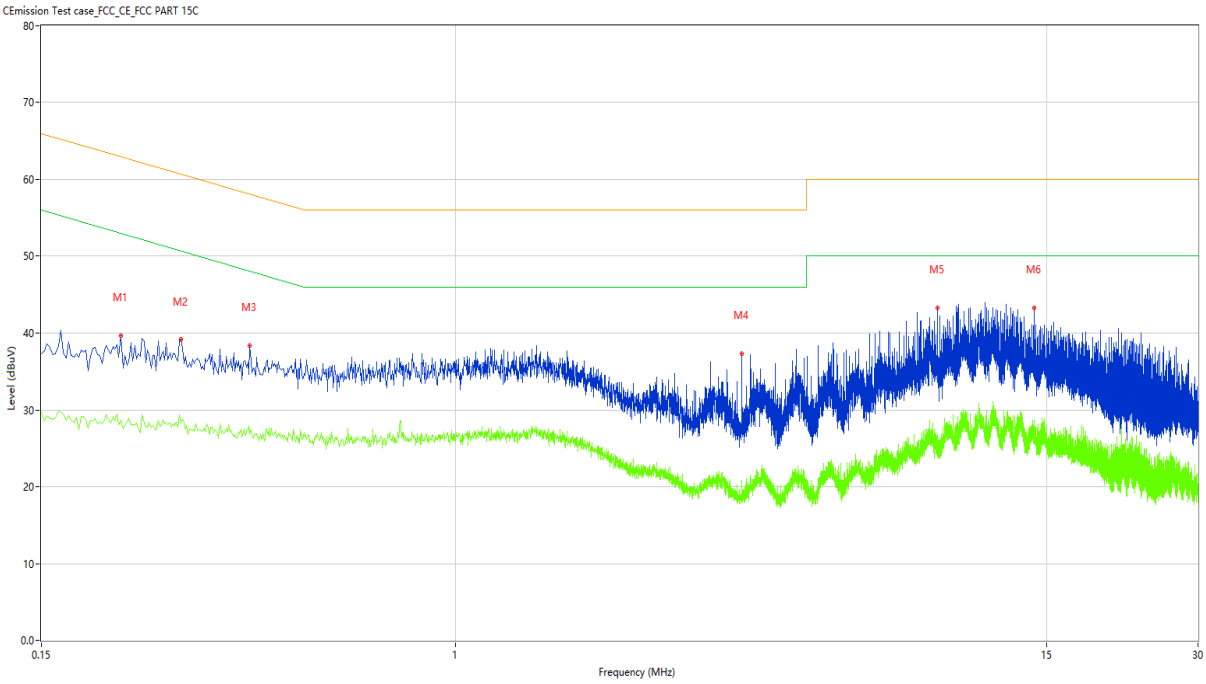
Test setup

Input Voltage	:	which received AC 120V, 60Hz Power
Operation Mode	:	A.1.a
Earthing	:	Not Connected
Ambient temperature	:	23.2°C
Relative humidity	:	52%

For details refer to following test plot.

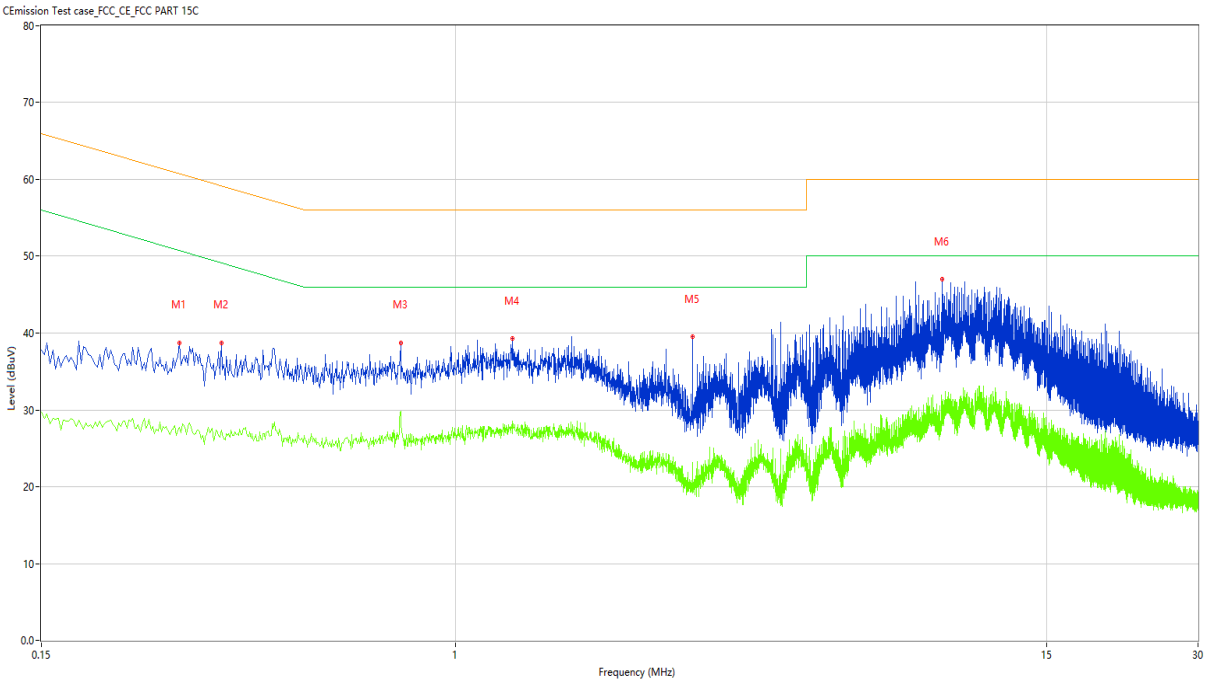
Note：The all configurations were tested respectively, but only the worst configuration(Transmitting-low channel) shown here.

Figure 24: Conducted Emission on AC Mains, L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.216	39.64	10.20	62.97	23.33	Peak	L	Pass
1**	0.216	28.61	10.20	52.97	24.36	AV	L	Pass
2	0.284	39.13	10.23	60.70	21.57	Peak	L	Pass
2**	0.284	28.30	10.23	50.70	22.40	AV	L	Pass
3	0.390	38.39	10.23	58.06	19.67	Peak	L	Pass
3**	0.390	26.89	10.23	48.06	21.17	AV	L	Pass
4	3.708	37.28	10.26	56.00	18.72	Peak	L	Pass
4**	3.708	20.78	10.26	46.00	25.22	AV	L	Pass
5	9.110	43.28	10.48	60.00	16.72	Peak	L	Pass
5**	9.110	26.80	10.48	50.00	23.20	AV	L	Pass
6	14.192	43.26	10.68	60.00	16.74	Peak	L	Pass
6**	14.192	28.67	10.68	50.00	21.33	AV	L	Pass

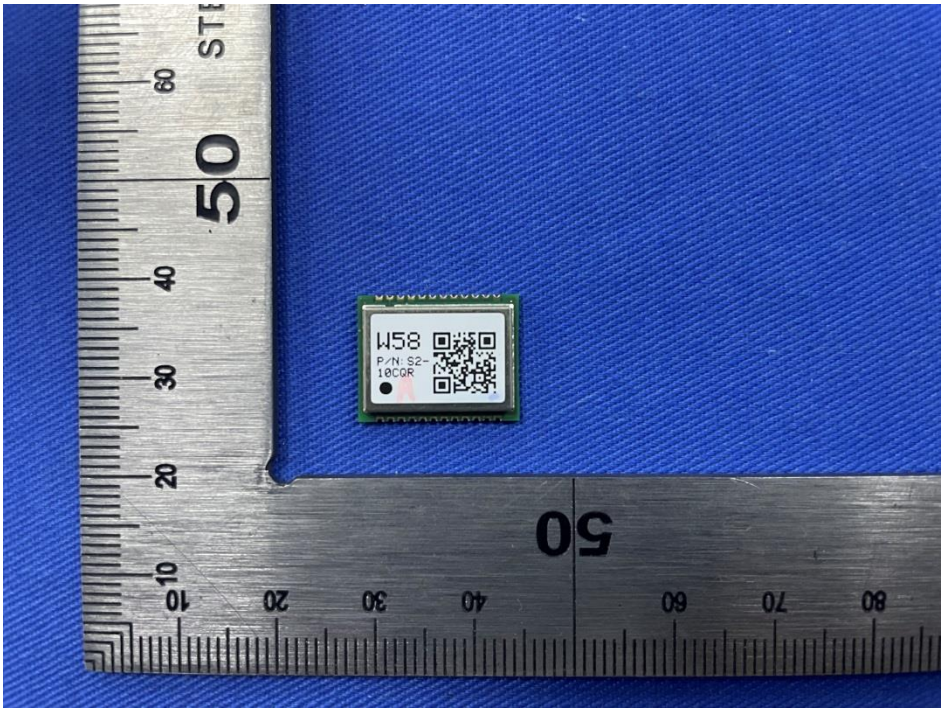
Figure 25: Conducted Emission on AC Mains, N Phase



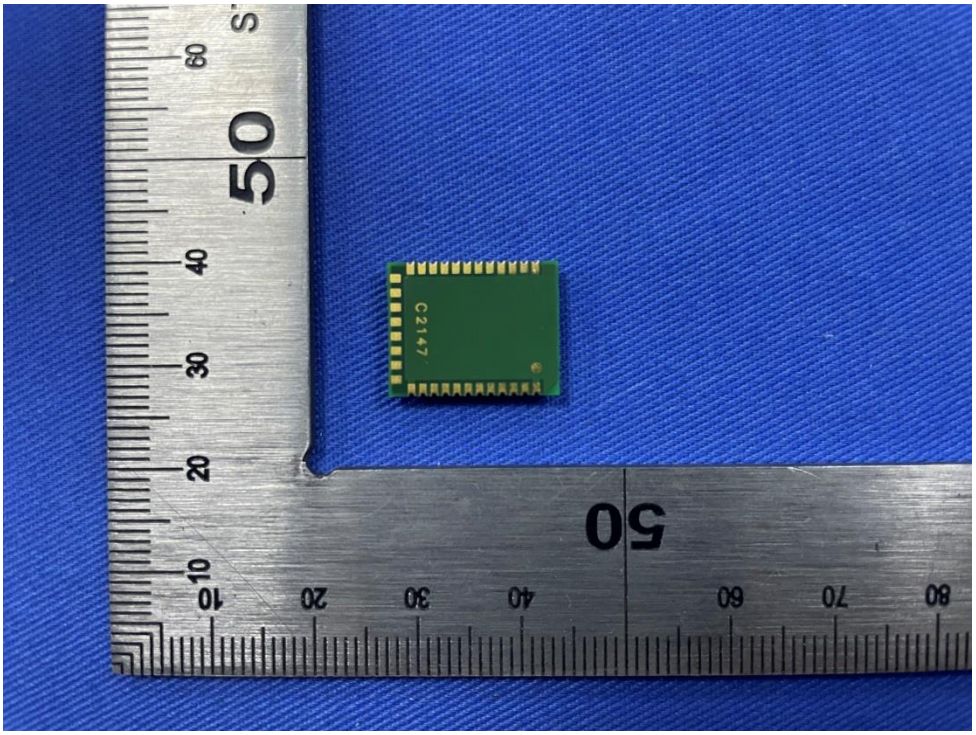
No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.282	38.69	10.25	60.76	22.07	Peak	N	Pass
1**	0.282	27.77	10.25	50.76	22.99	AV	N	Pass
2	0.342	38.70	10.26	59.15	20.45	Peak	N	Pass
2**	0.342	27.39	10.26	49.15	21.76	AV	N	Pass
3	0.778	38.70	10.34	56.00	17.30	Peak	N	Pass
3**	0.778	29.84	10.34	46.00	16.16	AV	N	Pass
4	1.296	39.25	10.22	56.00	16.75	Peak	N	Pass
4**	1.296	28.49	10.22	46.00	17.51	AV	N	Pass
5	2.960	39.49	10.18	56.00	16.51	Peak	N	Pass
5**	2.960	23.11	10.18	46.00	22.89	AV	N	Pass
6	9.290	46.99	10.39	60.00	13.01	Peak	N	Pass
6**	9.290	31.16	10.39	50.00	18.84	AV	N	Pass

5 Appendixes

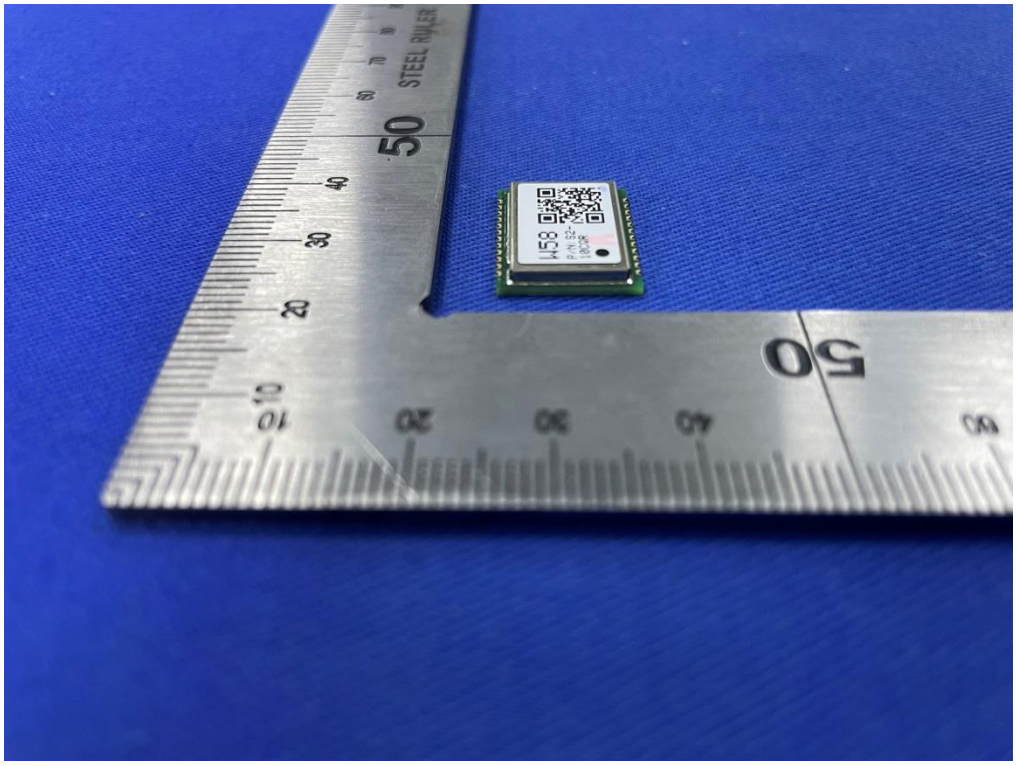
5.1 Photographs of the Sample



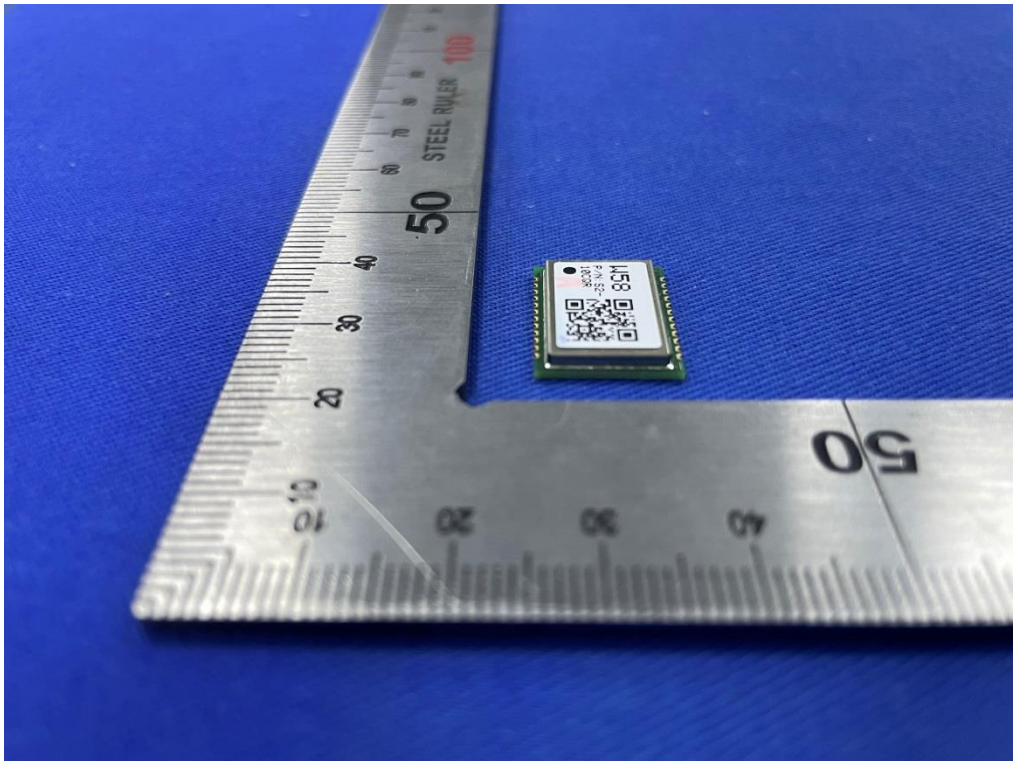
Front of the sample



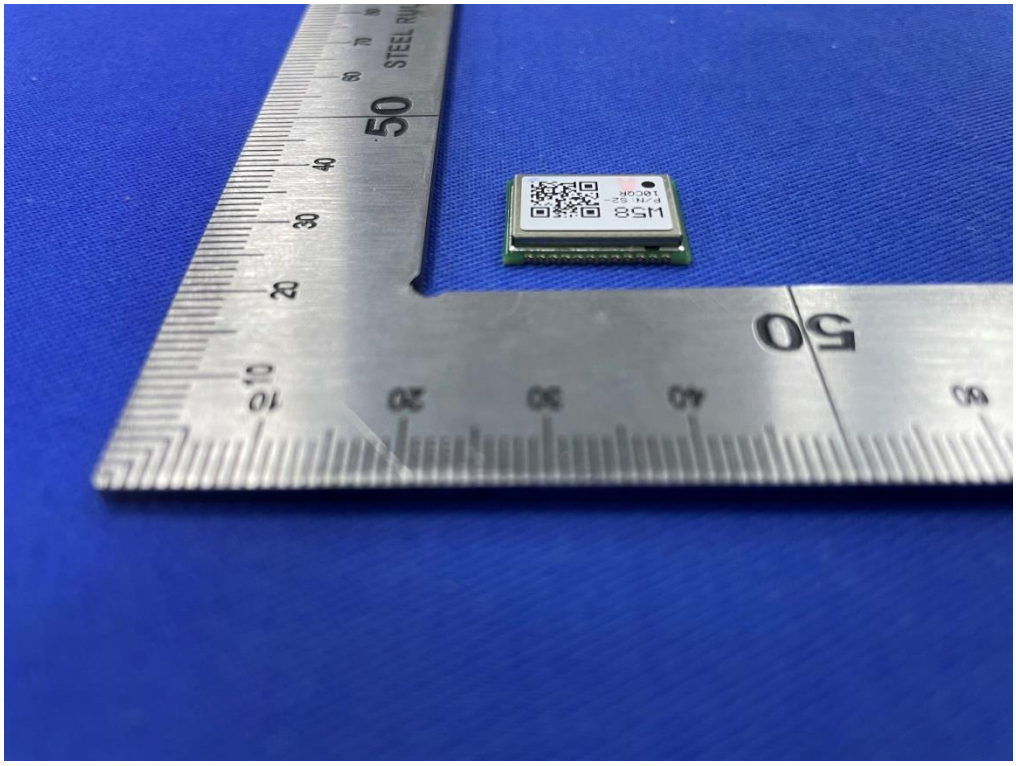
Rear of the sample



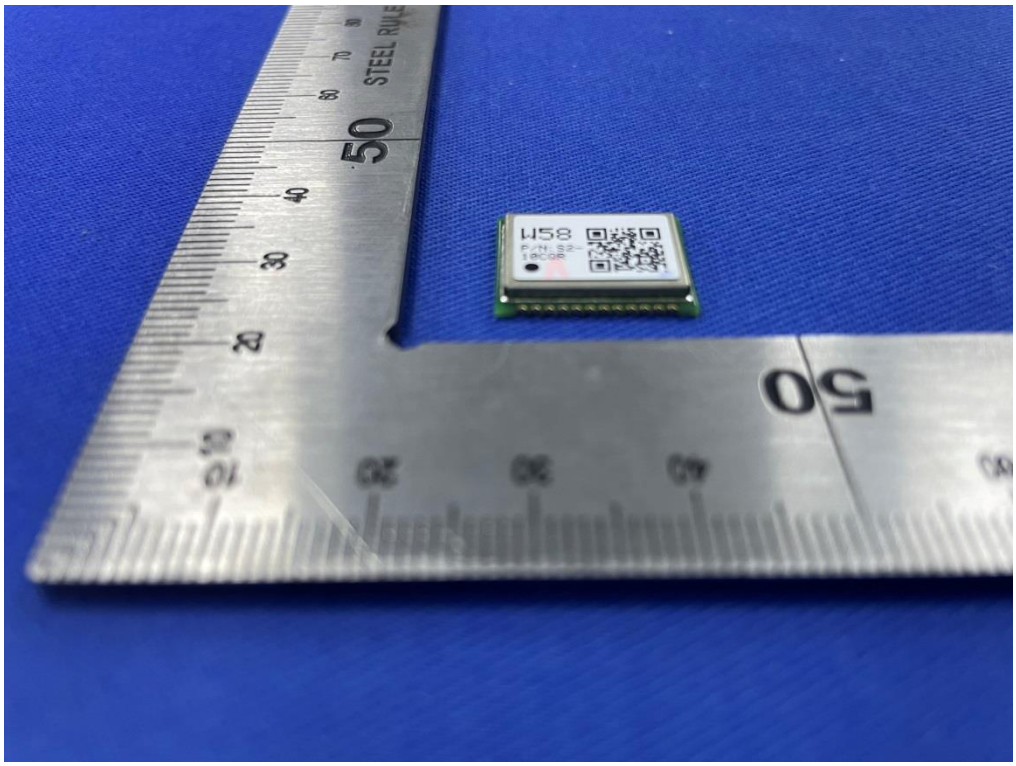
Left of the sample



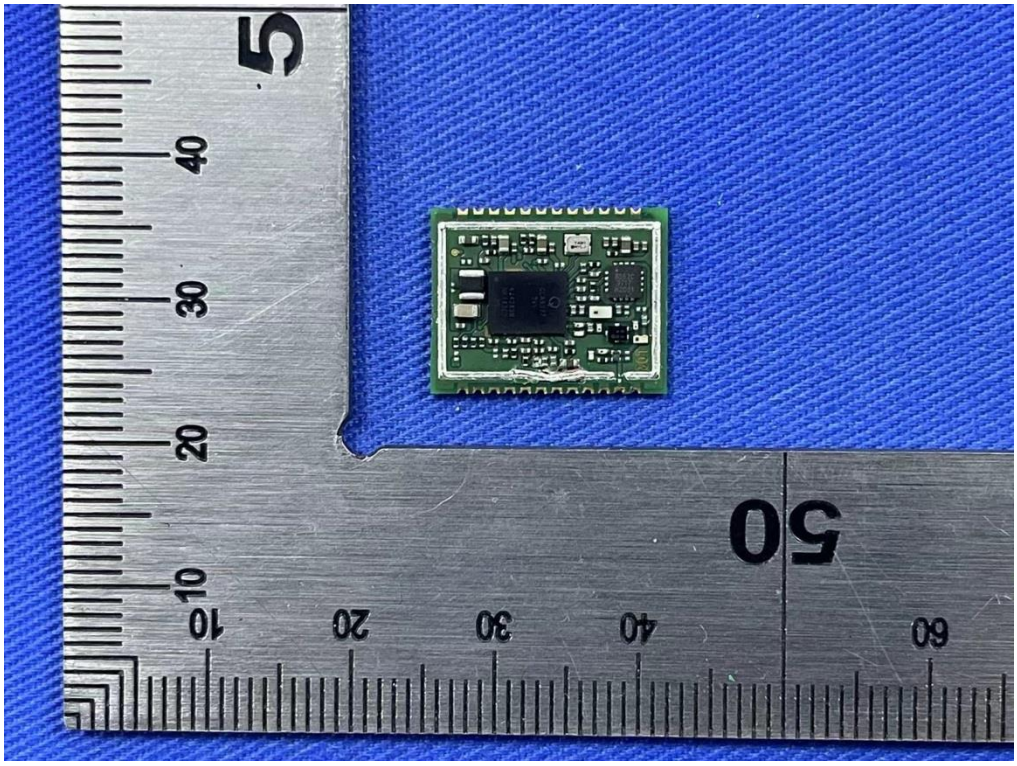
Right of the sample



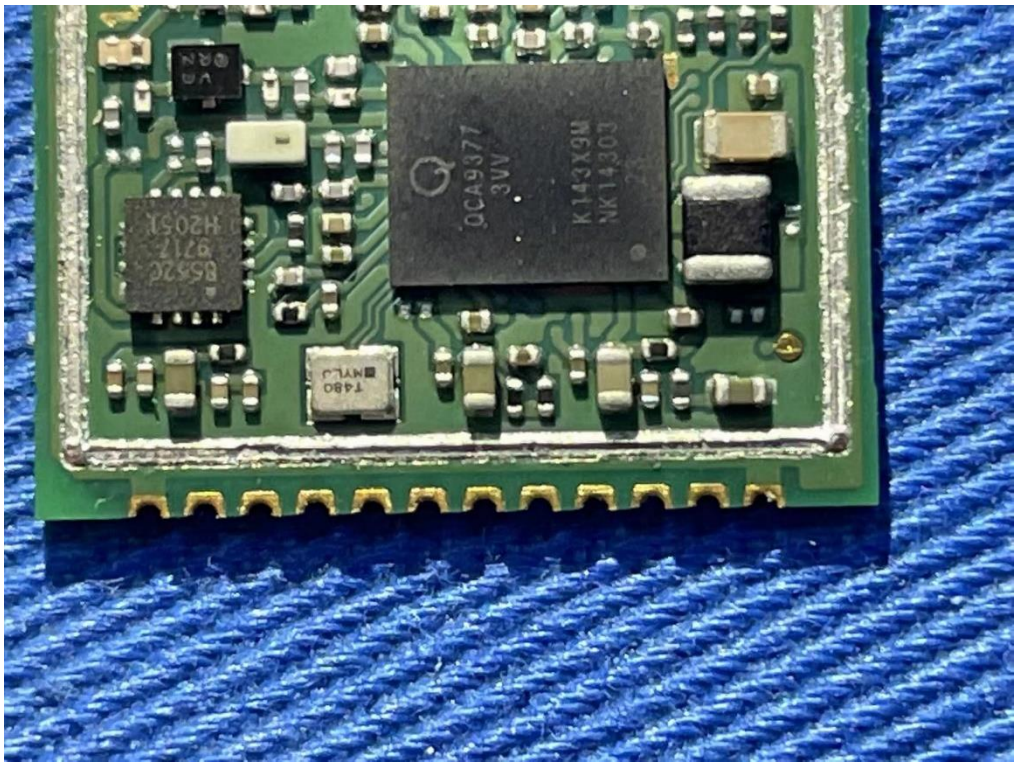
Top of the sample



Bottom of the sample



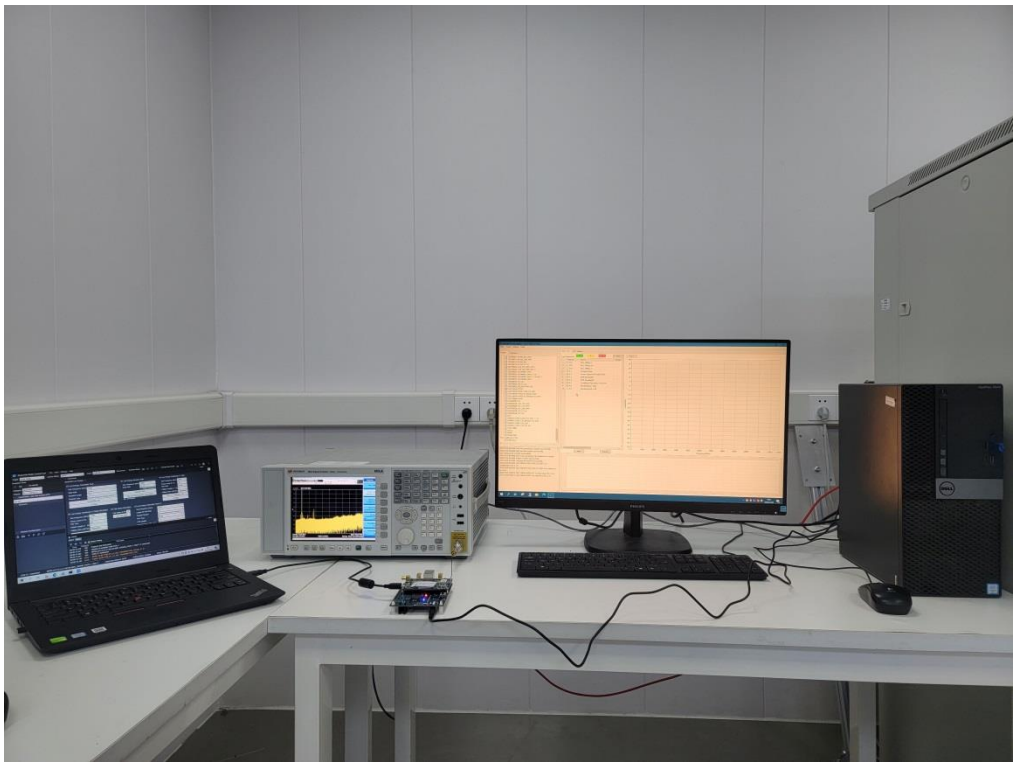
Internal-1 of the sample



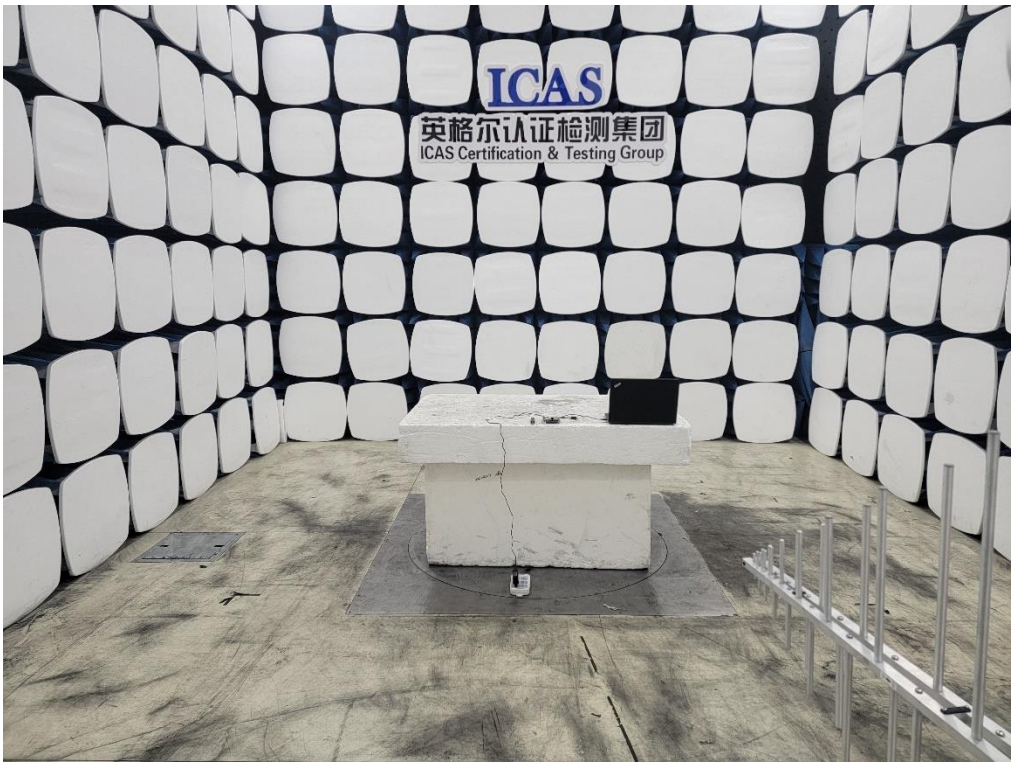
Internal-2 of the sample

5.2 Set-up for Conducted Emissions

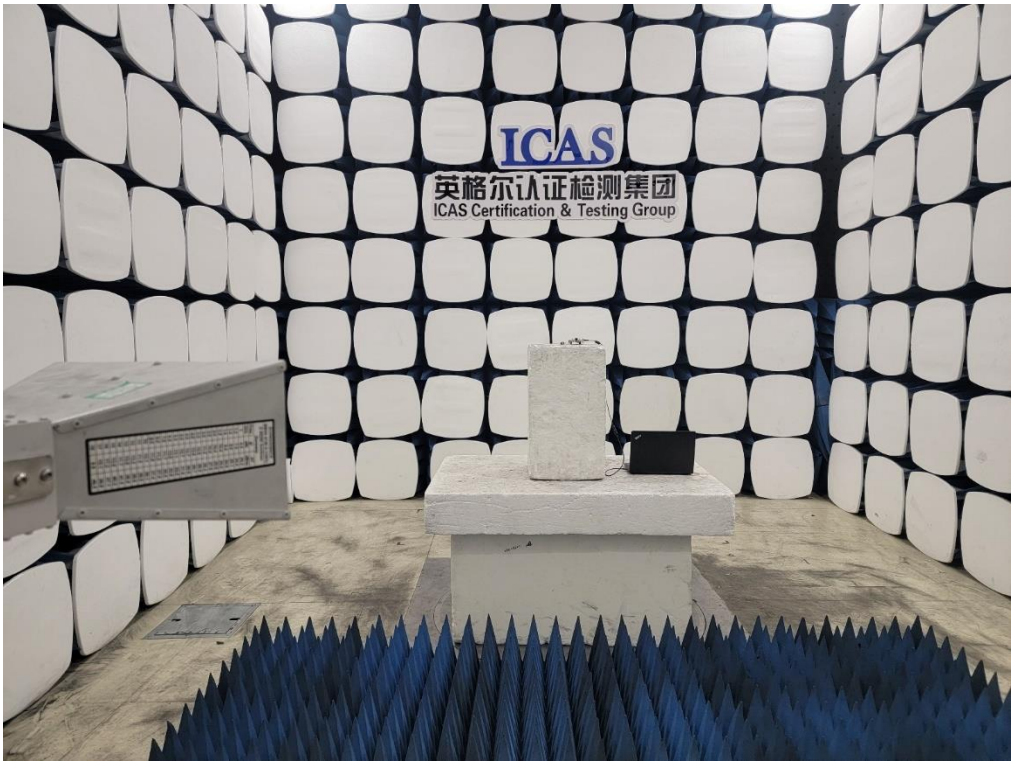
5.3 Set-up for Conducted RF test at Antenna Port



5.4 Set-up for Spurious Emissions below 1GHz



5.5 Set-up for Spurious Emissions above 1GHz



End of the report