



TEST REPORT

Report No.: SHE23090001-02AE

Date: 2023-09-22

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Applicant : Georg Fischer JRG AG
Address of Applicant : Hauptstrasse 130, Sissach, 4450, Switzerland

Product Name : Electrically Operated Water Valve
Brand Name : GF
Model Name : 9910.015, 9910.020, 9910.025, 9920.015, 9920.020
Sample Acquisition Method : Sent by client
Sample No. : E23090001-02#01(Radiation Prototype)
E23090001-02#02(Conduction Prototype)
FCC ID : 2ASE5-99001
ISED Number : 24912-99001

Standards : FCC CFR47 Part 15, Subpart C
RSS-Gen (Issue 5, Amd.2-Feb 2021)
RSS-247 (Issue 3, August 2023)

Date of Receipt : 2023-09-04
Date of Test : 2023-09-04 ~ 2023-09-22
Date of Issue : 2023-09-22

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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(Authorized signatory: Echo Mu)



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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	Georg Fischer JRG AG
Address	Hauptstrasse 130, Sissach, 4450, Switzerland
Contact Person	Philippe Cachot
Telephone	+41 61975 2402
Email	philippe-cachot@georgfischer.com
Manufacturer Company Name	Georg Fischer JRG AG
Address	Hauptstrasse 130, Sissach, 4450, Switzerland

1.3 Details of EUT

Product Name	Electrically Operated Water Valve
Brand Name	GF
Test Model Name	9910.015
Series Model Name	9910.020, 9910.025, 9920.015, 9920.020
Difference Description	All models are same in electrical characteristics. The differences between them are type designation and the appearance. So, all the RF tests were performed on model 9910.015.
FCC ID	2ASE5-99001
ISED Number	24912-99001
HVIN	99001
Mode of Operation	Bluetooth BLE
Frequency Range	2402MHz ~ 2480MHz
Number of Channels	40 (at intervals of 2 MHz)
Modulation Type	BLE <input checked="" type="checkbox"/> GFSK 1Mbps <input checked="" type="checkbox"/> GFSK 2Mbps
Antenna Type	PCB Antenna
Antenna Gain	1.82dBi
Test Voltage	DC 36V
Hardware Version	Index D



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Software Version	V576
RF power setting in TEST SW	Cute Com_Power level setting_p 0 0

Note:

- The above information was declared by the manufacture.
- 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 3, August 2023)	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.



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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	N/A ^{note}

Note(s): The EUT is powered by DC 36V. Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.



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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
Spectrum Analyzer	Keysight	N9020B	MY59260184	2023-07-27	2024-07-26
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2023-06-08	2024-06-07
Signal Generator	Rohde & Schwarz	SMR27	100184	2023-07-27	2024-07-26
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2023-06-08	2024-06-07
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2023-03-22	2025-03-21
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2023-06-13	2025-06-12
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2023-06-18	2025-06-17
Loop Antenna	SCHWARZBECK	FMZB 1513	/	2022-07-02	2024-07-01
Broadband Preamplifier	SCHWARZBECK	BBV 9718	346	2023-06-08	2024-06-07
DC Power Supply	ITECH	IT6512A	N/A	2022-06-07	2024-06-06
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2023-06-09	2026-06-08
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 $y \pm U$, 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 95.45%.

Parameter	Uncertainty
Antenna Port Conducted Emission	< 1GHz ± 1.5 dB
	> 1GHz ± 1.5 dB
Radiated Emission	< 1GHz ± 5.00 dB
	> 1GHz ± 4.88 dB
Conducted Emission on AC Mains	150KHz-30MHz ± 2.68 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 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	SAMSUNG	3430EA	N/A
USB Cable	N/A	N/A	1.00m Unshielded

3.3 Support Software

Description	Manufacturer	Software Name
Software	N/A	Cute Com



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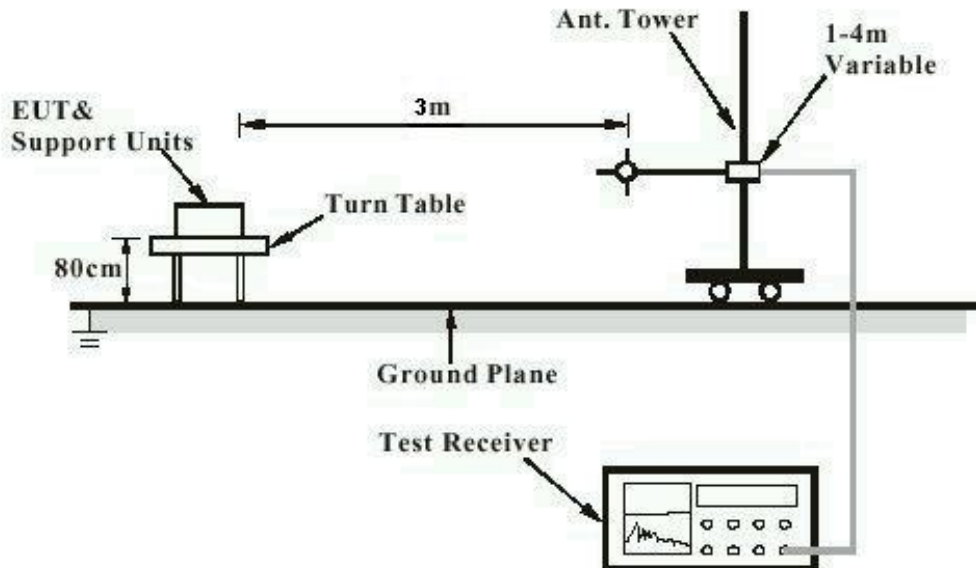
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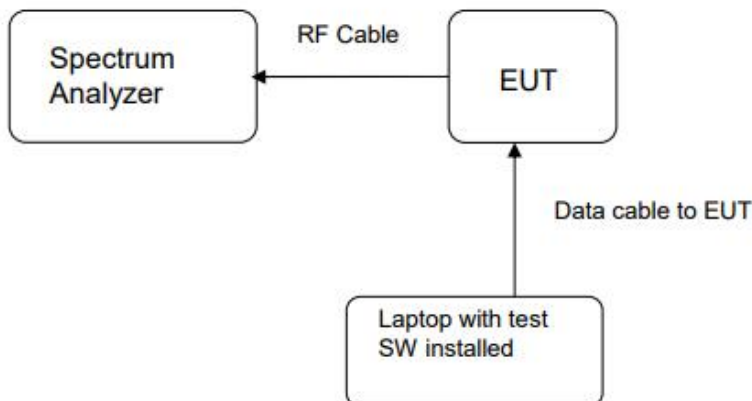
3.4 Test Setup Diagram

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 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
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 1.82dBi. The antenna is a 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 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 : 24.5°C
Relative humidity : 52%

Table 1: Maximum peak conducted output power

Test Mode	Test Channel (MHz)	Maximum peak conducted output power		Limit (W)
		(dBm)	(mW)	
BLE-1Mbps	2402	-0.52	0.89	< 1
	2440	-1.18	0.76	
	2480	-1.73	0.67	
BLE-2Mbps	2402	-0.45	0.90	
	2440	-1.13	0.77	
	2480	-1.70	0.68	

Table 2: E.I.R.P

Test Mode	Test Channel (MHz)	E.I.R.P		Limit (W)
		(dBm)	(mW)	
BLE-1Mbps	2402	1.30	1.35	< 4
	2440	0.64	1.16	
	2480	0.09	1.02	
BLE-2Mbps	2402	1.37	1.37	
	2440	0.69	1.17	
	2480	0.12	1.03	

Note: The antenna gain is 1.82dBi

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



Figure 2: The plots of Peak Conducted Output Power, BLE-1Mbps, 2440MHz



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Figure 3: The plots of Peak Conducted Output Power, BLE-1Mbps, 2480MHz



Figure 4: The plots of Peak Conducted Output Power, BLE-2Mbps, 2402MHz



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Figure 5: The plots of Peak Conducted Output Power, BLE-2Mbps, 2440MHz



Figure 6: The plots of Peak Conducted Output Power, BLE-2Mbps, 2480MHz





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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 : 24.5°C
Relative humidity : 52%

Table 3: 6dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth Limit
BLE-1Mbps	2402	0.5593	1.1190	>0.5 MHz
	2440	0.5570	1.0547	
	2480	0.5405	0.9632	
BLE-2Mbps	2402	0.7583	1.6194	
	2440	0.7983	1.6248	
	2480	0.7849	1.7870	



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Figure 7: The plots of 6dB Bandwidth, BLE-1Mbps, 2402MHz

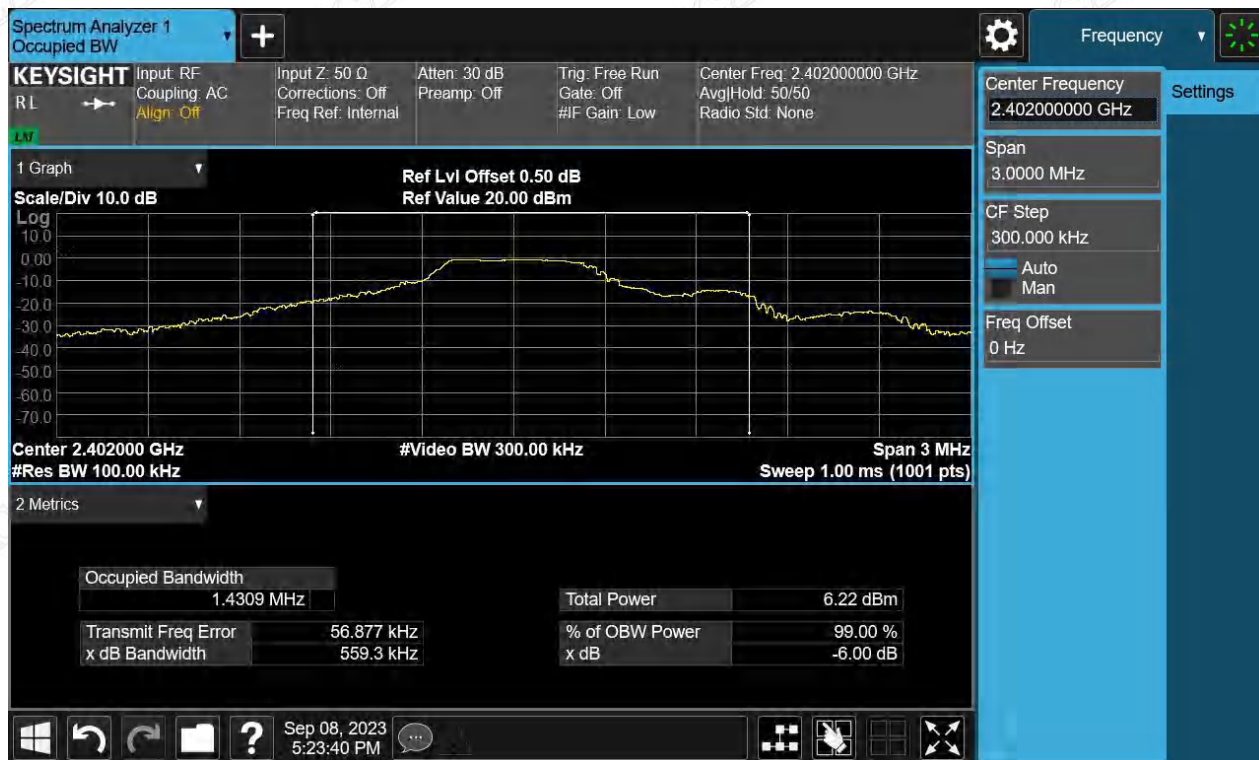


Figure 8: The plots of 99% Bandwidth, BLE-1Mbps, 2402MHz



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Figure 9: The plots of 6dB Bandwidth, BLE-1Mbps, 2440MHz



Figure 10: The plots of 99% Bandwidth, BLE-1Mbps, 2440MHz



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Figure 11: The plots of 6dB Bandwidth, BLE-1Mbps, 2480MHz



Figure 12: The plots of 99% Bandwidth, BLE-1Mbps, 2480MHz



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Figure 13: The plots of 6dB Bandwidth, BLE-2Mbps, 2402MHz

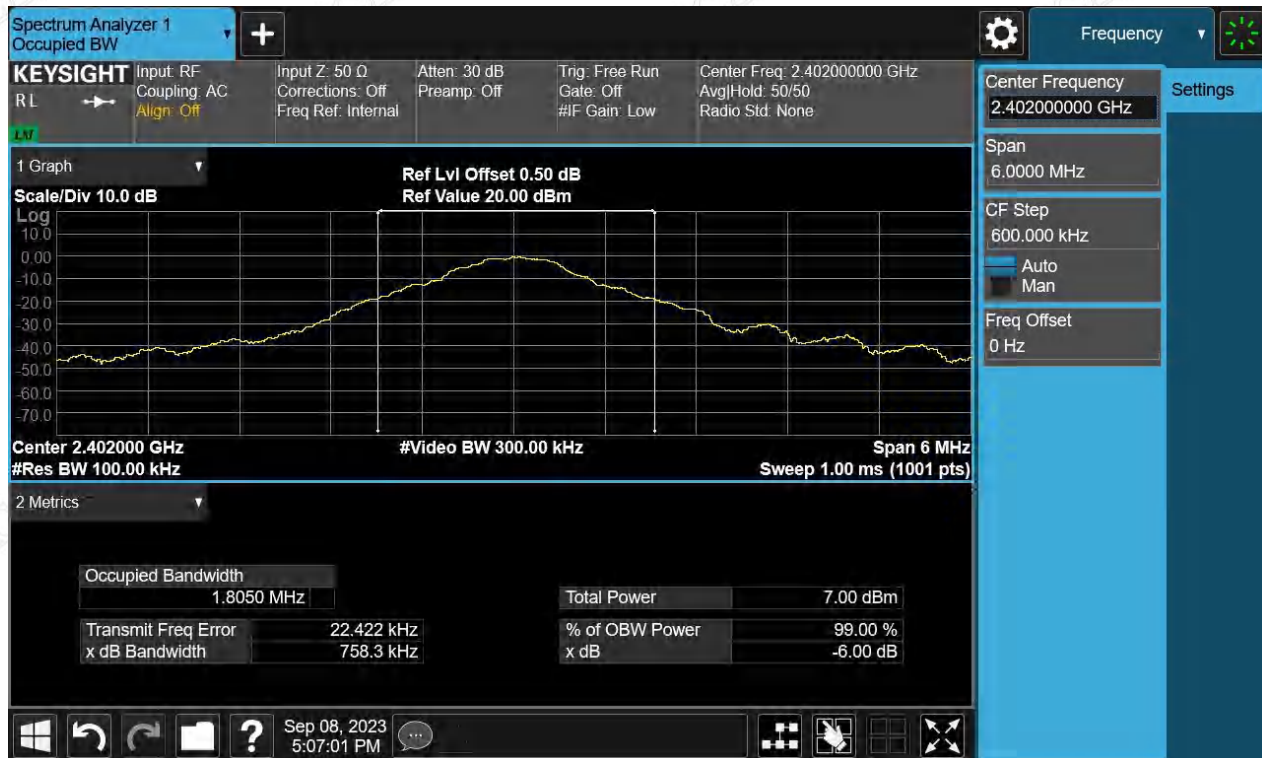
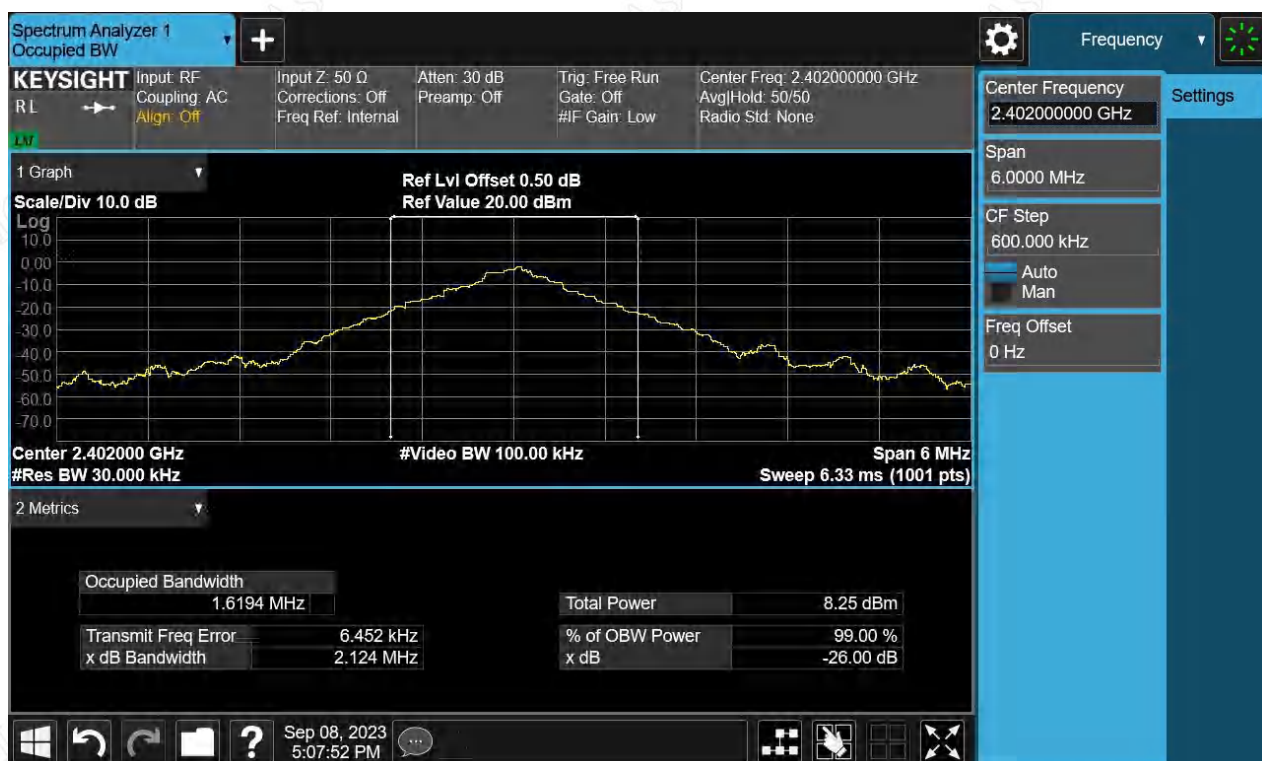


Figure 14: The plots of 99% Bandwidth, BLE-2Mbps, 2402MHz



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Figure 15: The plots of 6dB Bandwidth, BLE-2Mbps, 2440MHz



Figure 16: The plots of 99% Bandwidth, BLE-2Mbps, 2440MHz





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Figure 17: The plots of 6dB Bandwidth, BLE-2Mbps, 2480MHz

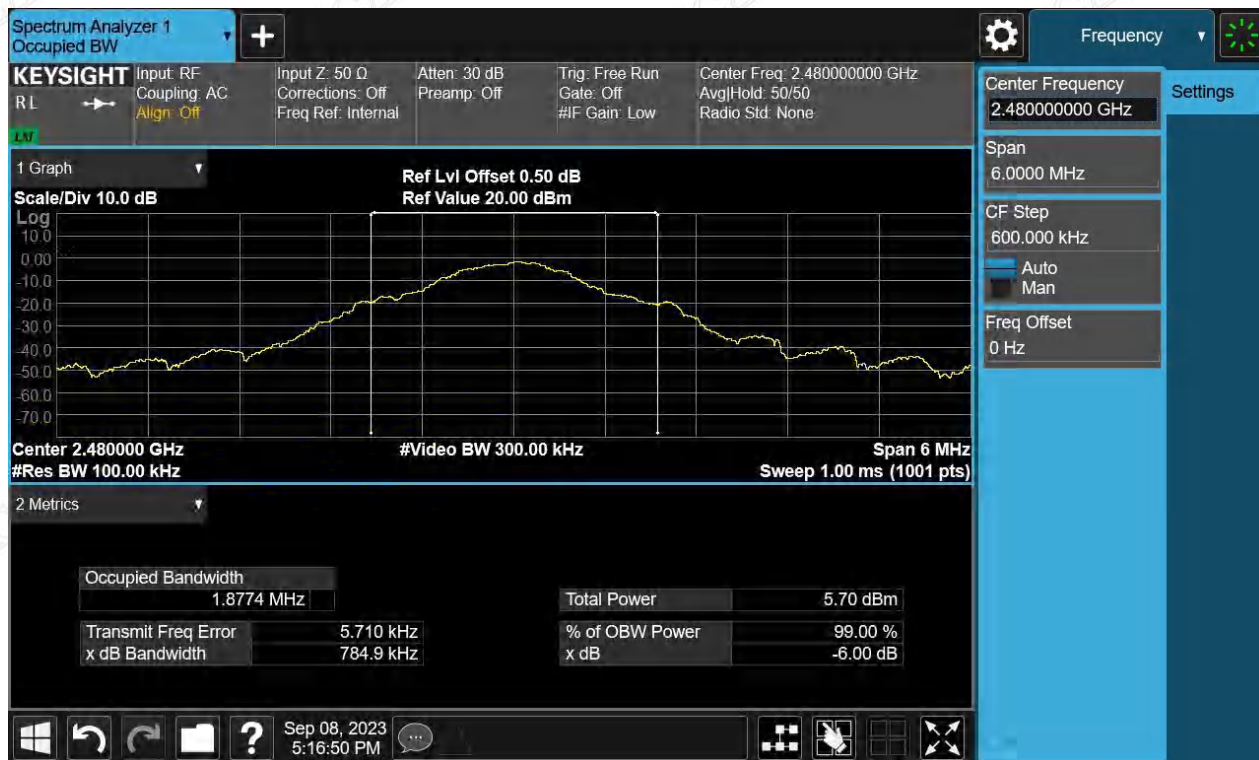


Figure 18: The plots of 99% Bandwidth, BLE-2Mbps, 2480MHz





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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 : 24.5°C
Relative humidity : 52%

Table 4: Maximum conducted output power spectral density

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE-1Mbps	2402	-9.89	8
	2440	-10.13	
	2480	-12.18	
BLE-2Mbps	2402	-13.42	
	2440	-13.90	
	2480	-14.67	

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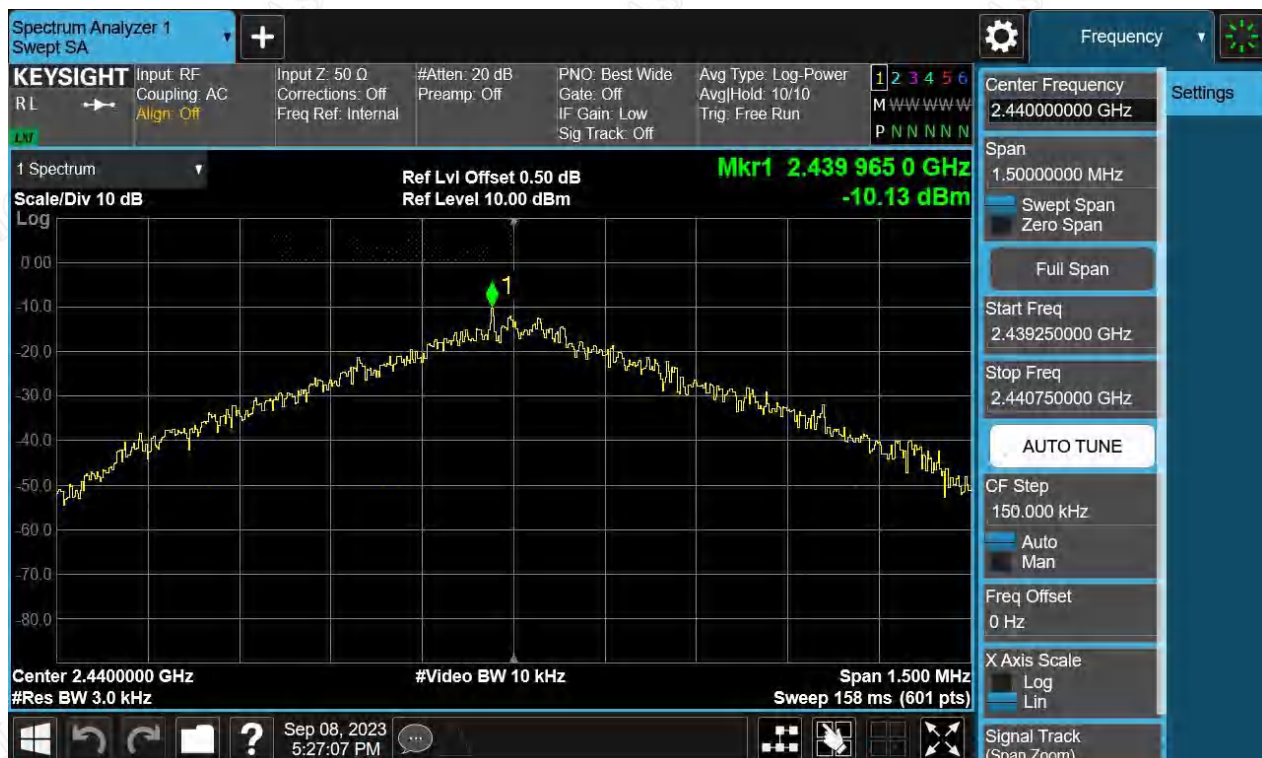
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Figure 19: The plots of Power Spectral Density, BLE-1Mbps, 2402MHz



Figure 20: The plots of Power Spectral Density, BLE-1Mbps, 2440MHz





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Figure 21: The plots of Power Spectral Density, BLE-1Mbps, 2480MHz

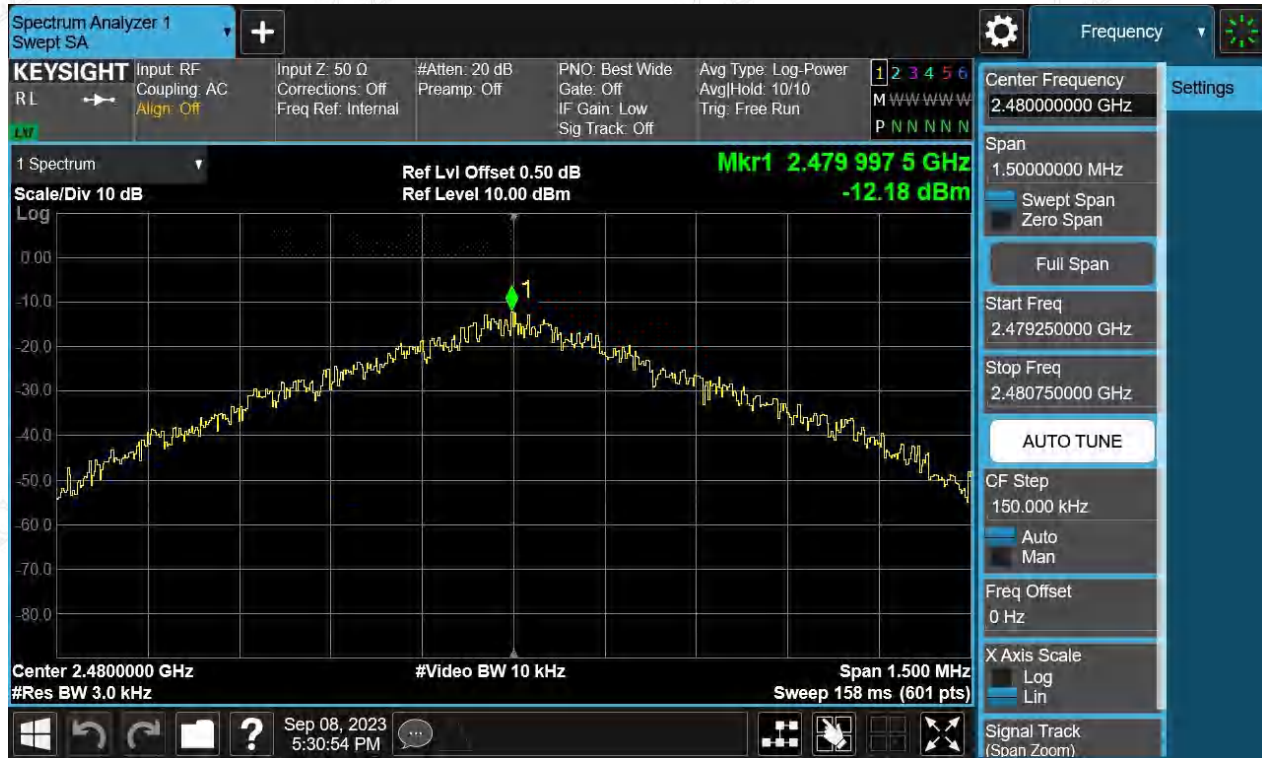


Figure 22: The plots of Power Spectral Density, BLE-2Mbps, 2402MHz





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Figure 23: The plots of Power Spectral Density, BLE-2Mbps, 2440MHz



Figure 24: The plots of Power Spectral Density, BLE-2Mbps, 2480MHz





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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 : 24.5°C
Relative humidity : 52%

For details refer to following test plot.

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Figure 25: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE-1Mbps, Carrier Level



Figure 26: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE-1Mbps, Band Edge



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Figure 27: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE-1Mbps, Conducted spurious emissions 30MHz-3GHz

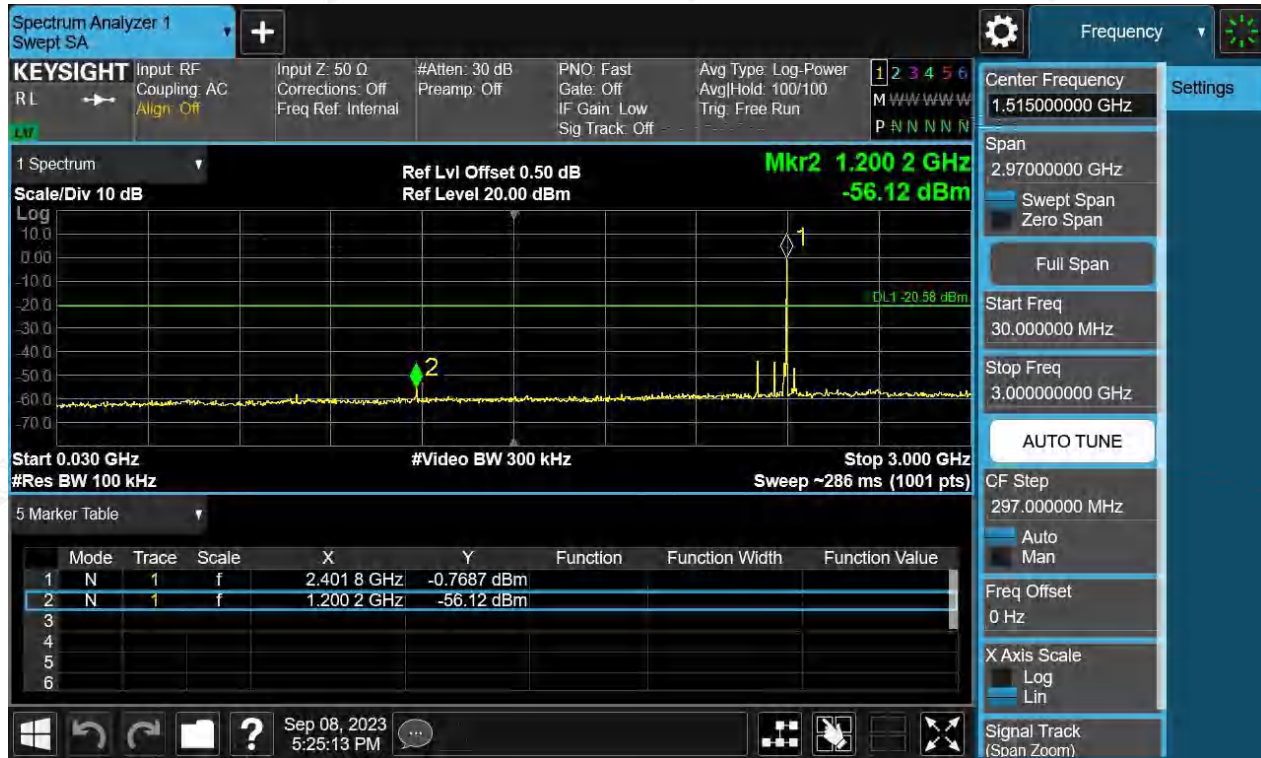


Figure 28: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE-1Mbps, Conducted spurious emissions 2GHz-25GHz





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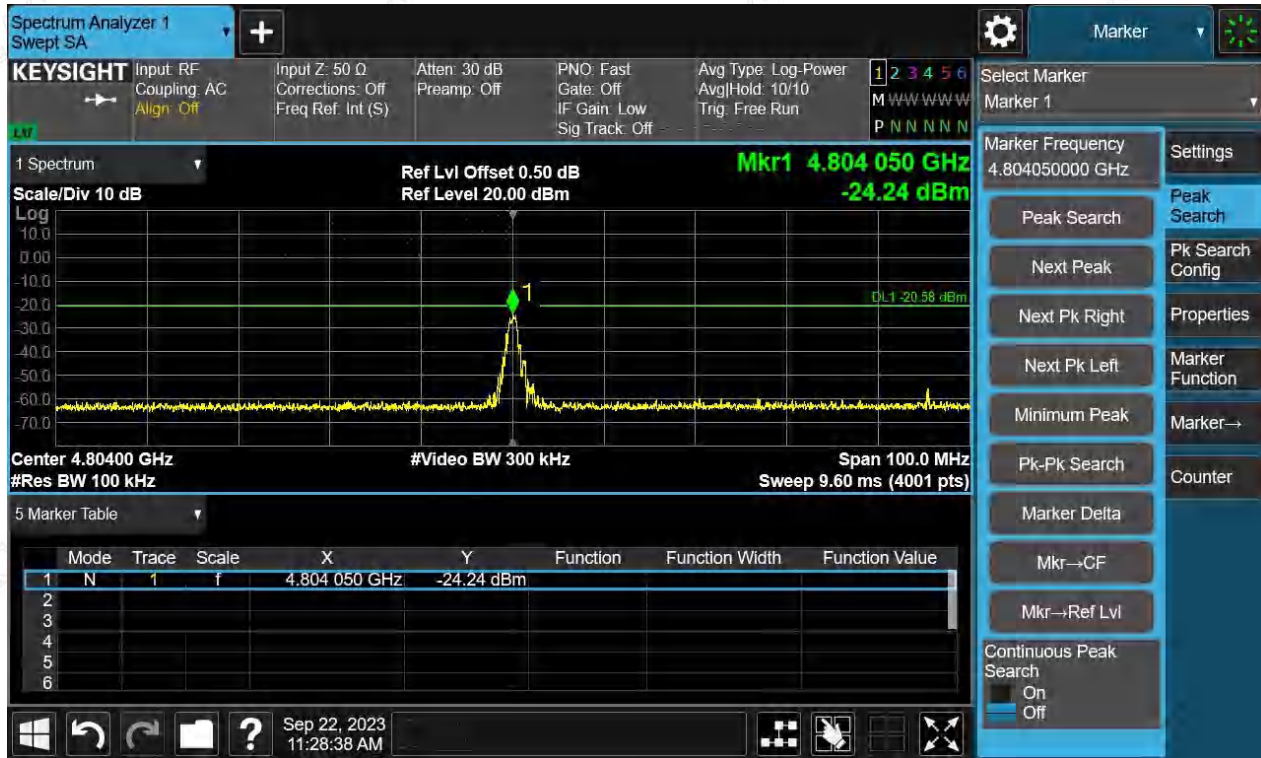


Figure 29: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE-1Mbps, Carrier Level



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Figure 30: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE-1Mbps, Conducted spurious emissions 30MHz-3GHz



Figure 31: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE-1Mbps, Conducted spurious emissions 2GHz-25GHz



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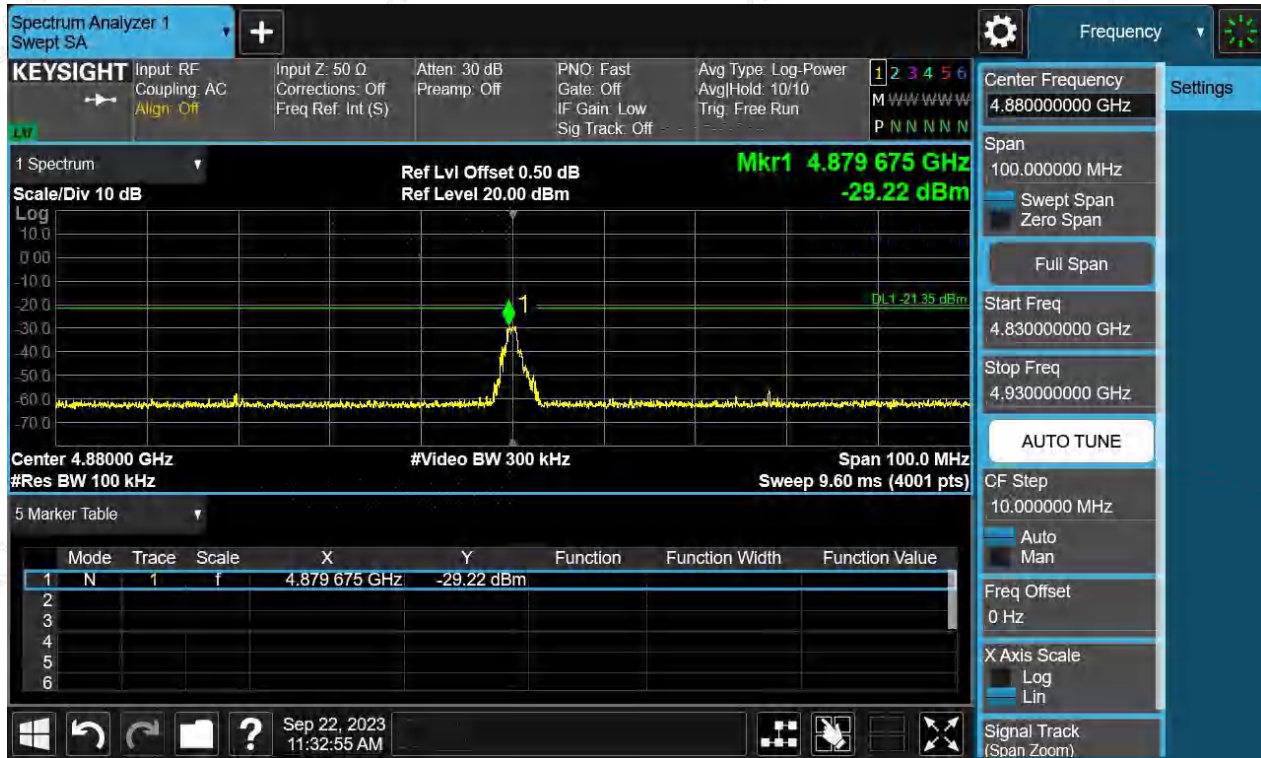


Figure 32: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE-1Mbps, Carrier Level



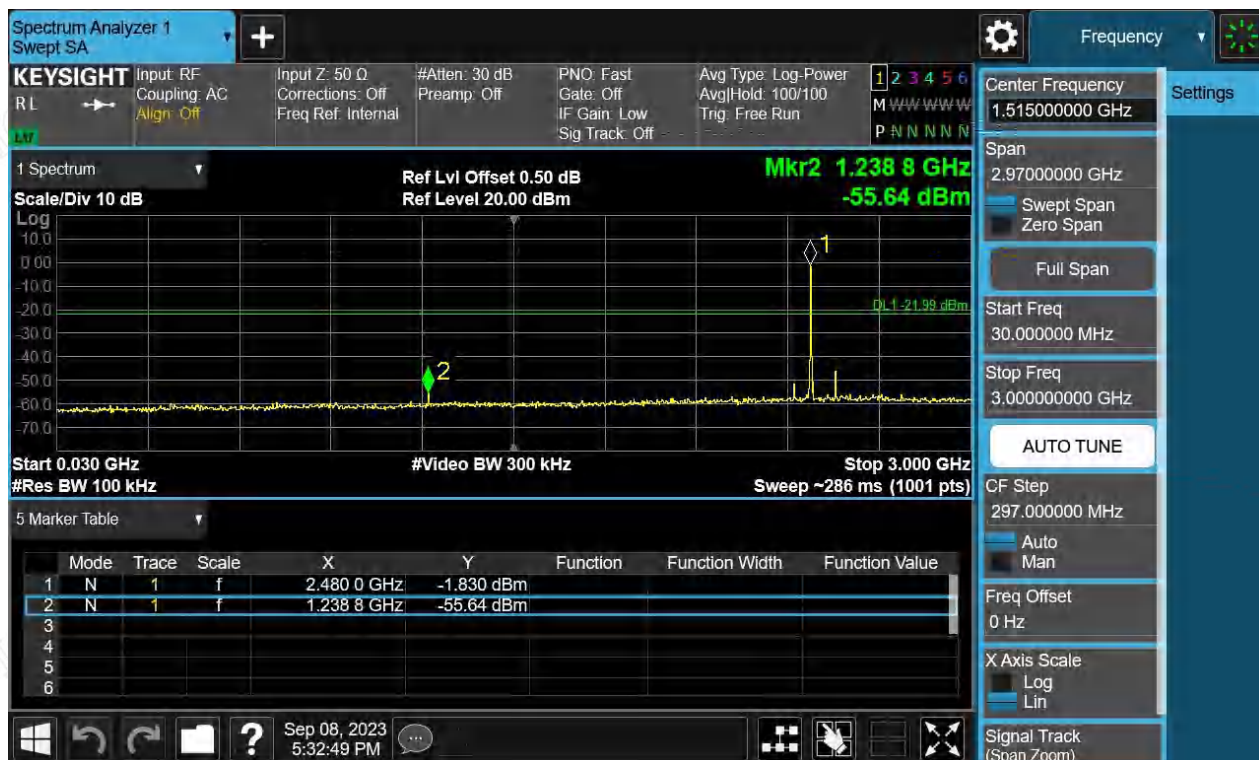
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Figure 33: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE-1Mbps, Band Edge



Figure 34: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE-1Mbps, Conducted spurious emissions 30MHz-3GHz



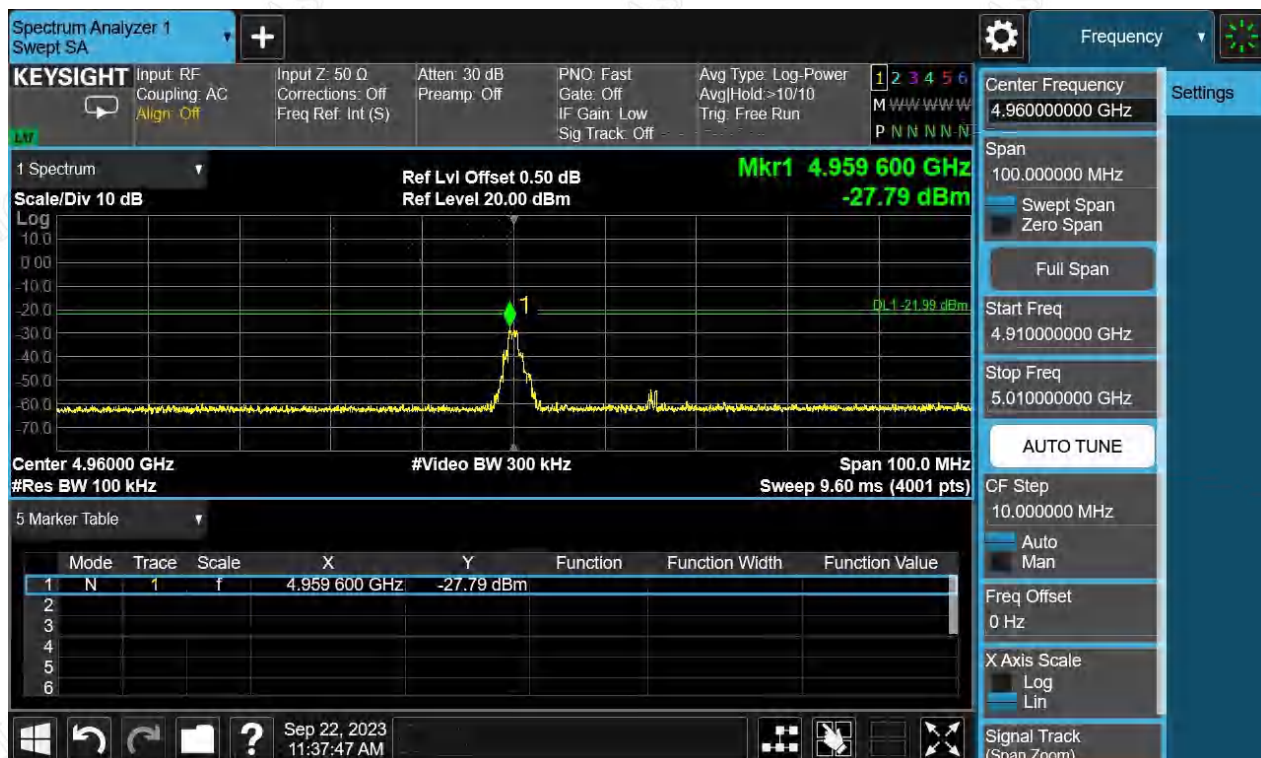
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Figure 35: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE-1Mbps, Conducted spurious emissions 2GMHz-25GHz





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Figure 36: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE-2Mbps, Carrier Level



Figure 37: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE-2Mbps, Band Edge



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Figure 38: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE-2Mbps, Conducted spurious emissions 30MHz-3GHz

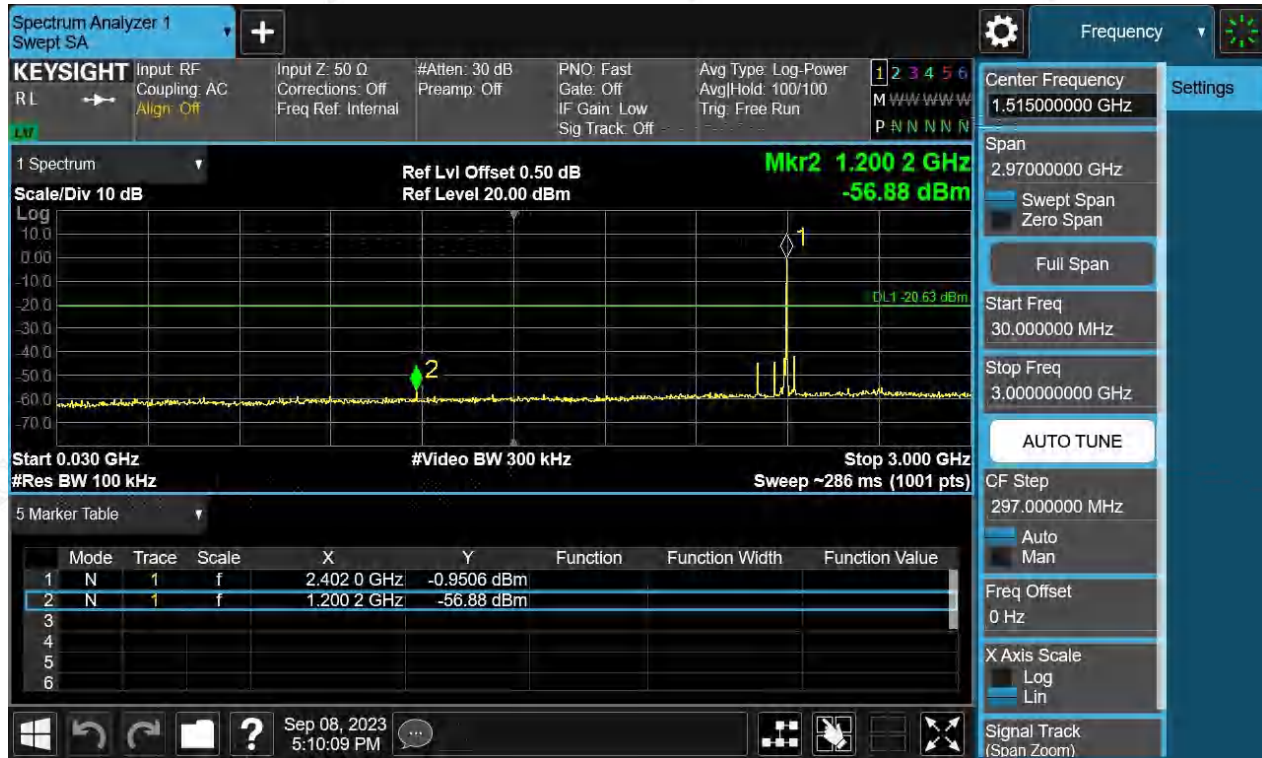


Figure 39: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE-2Mbps, Conducted spurious emissions 2GHz-25GHz





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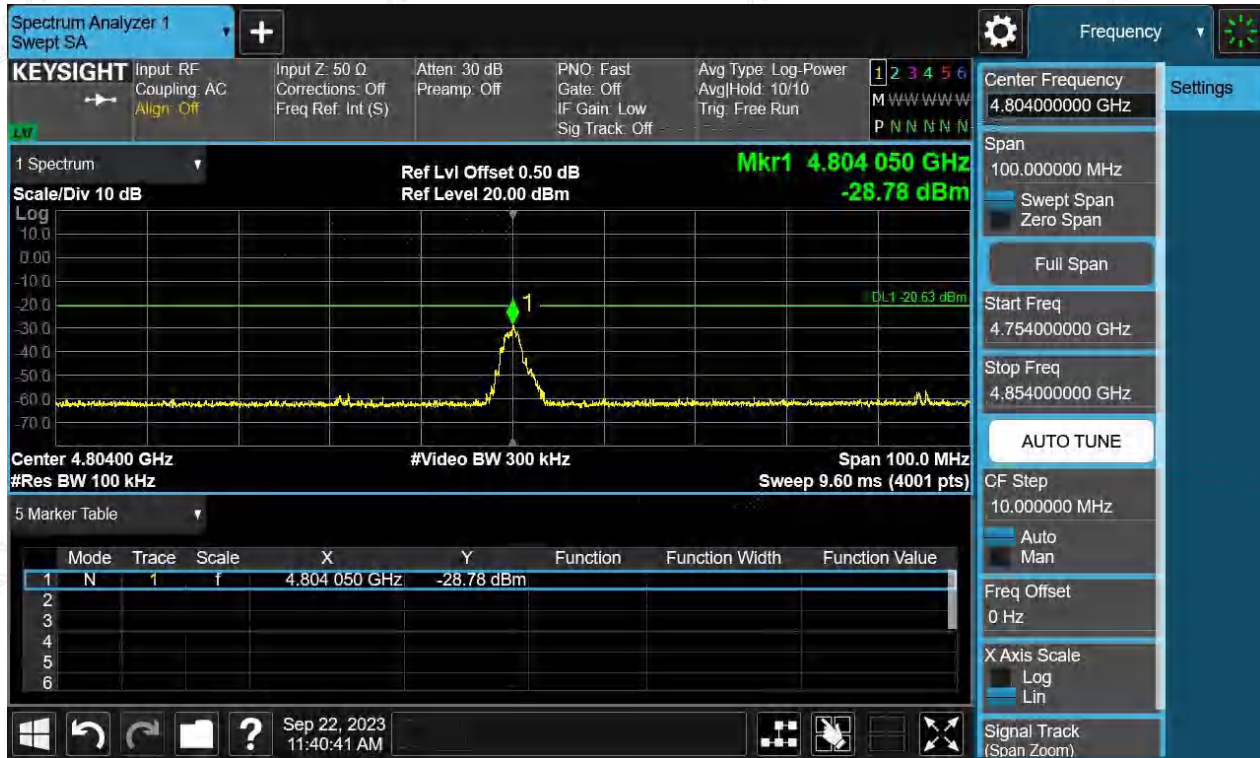


Figure 40: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE-2Mbps, Carrier Level



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Figure 41: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE-2Mbps, Conducted spurious emissions 30MHz-3GHz

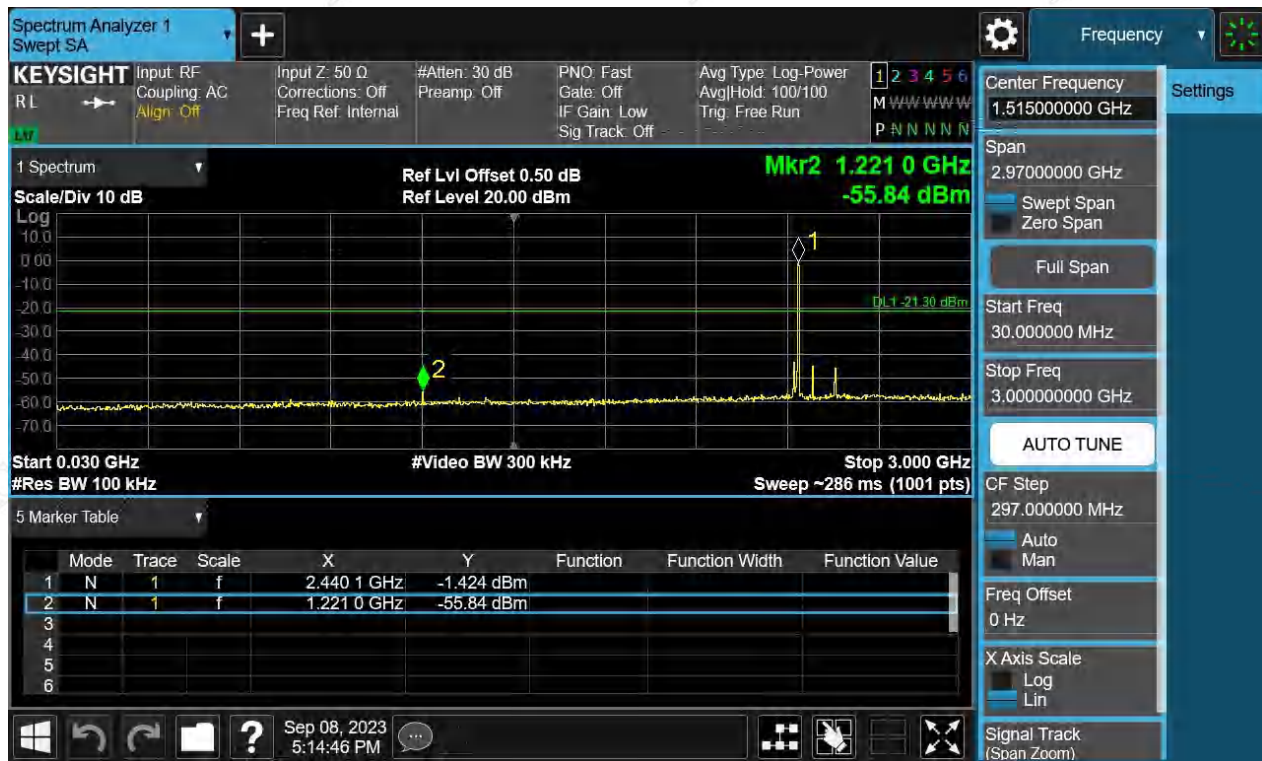


Figure 42: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE-2Mbps, Conducted spurious emissions 2GHz-25GHz



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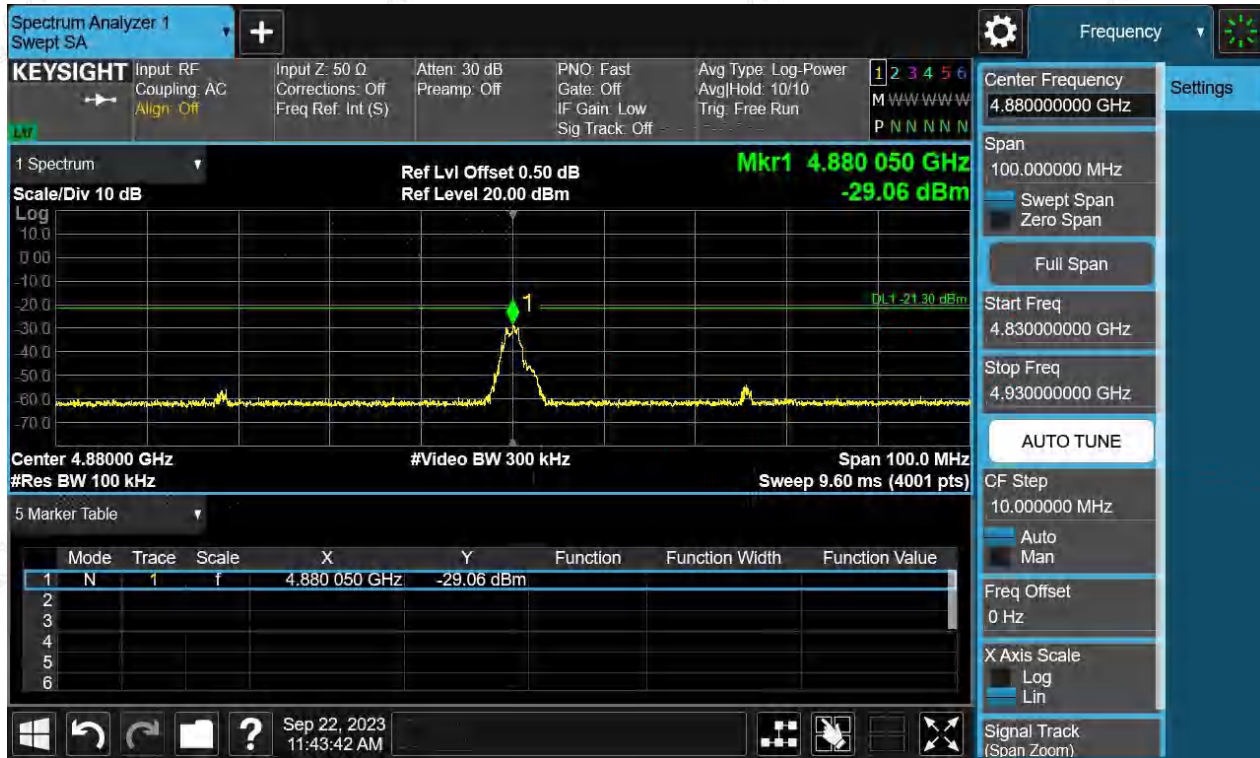


Figure 43: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE-2Mbps, Carrier Level



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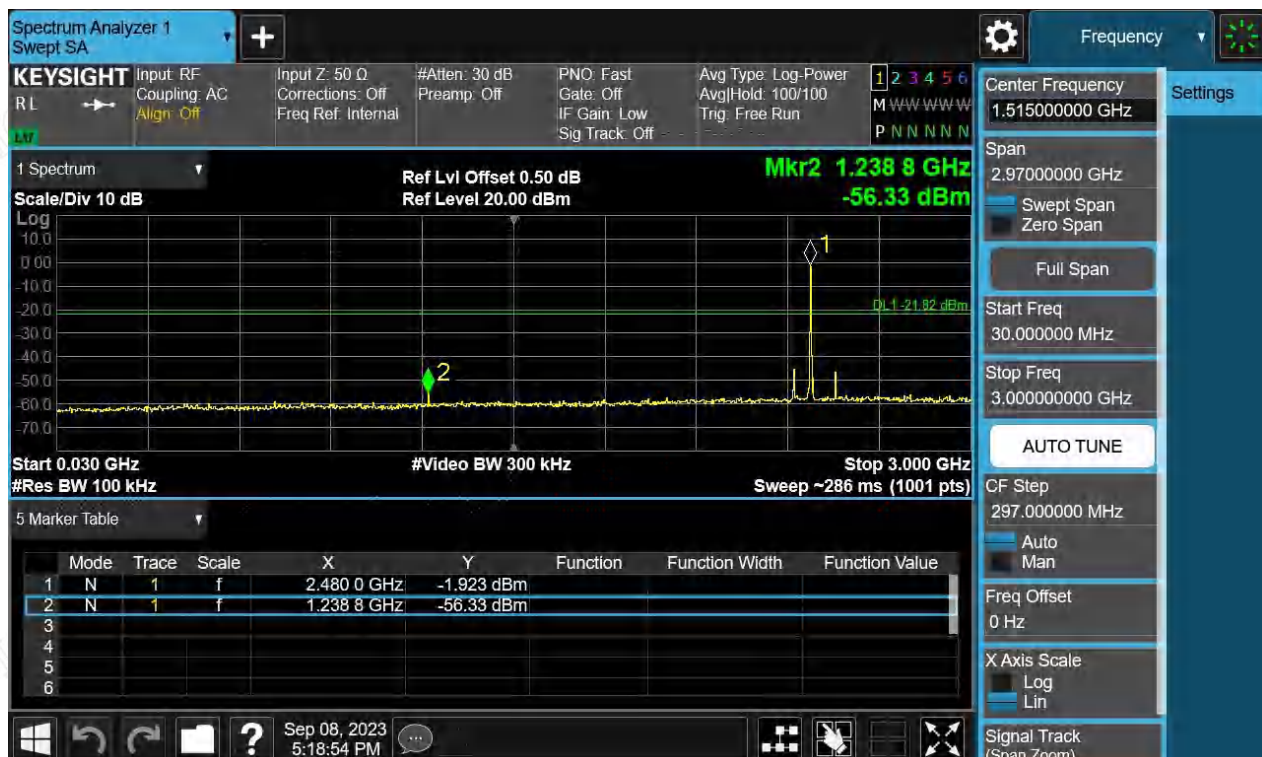
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Figure 44: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE-2Mbps, Band Edge



Figure 45: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE-2Mbps, Conducted spurious emissions 30MHz-3GHz

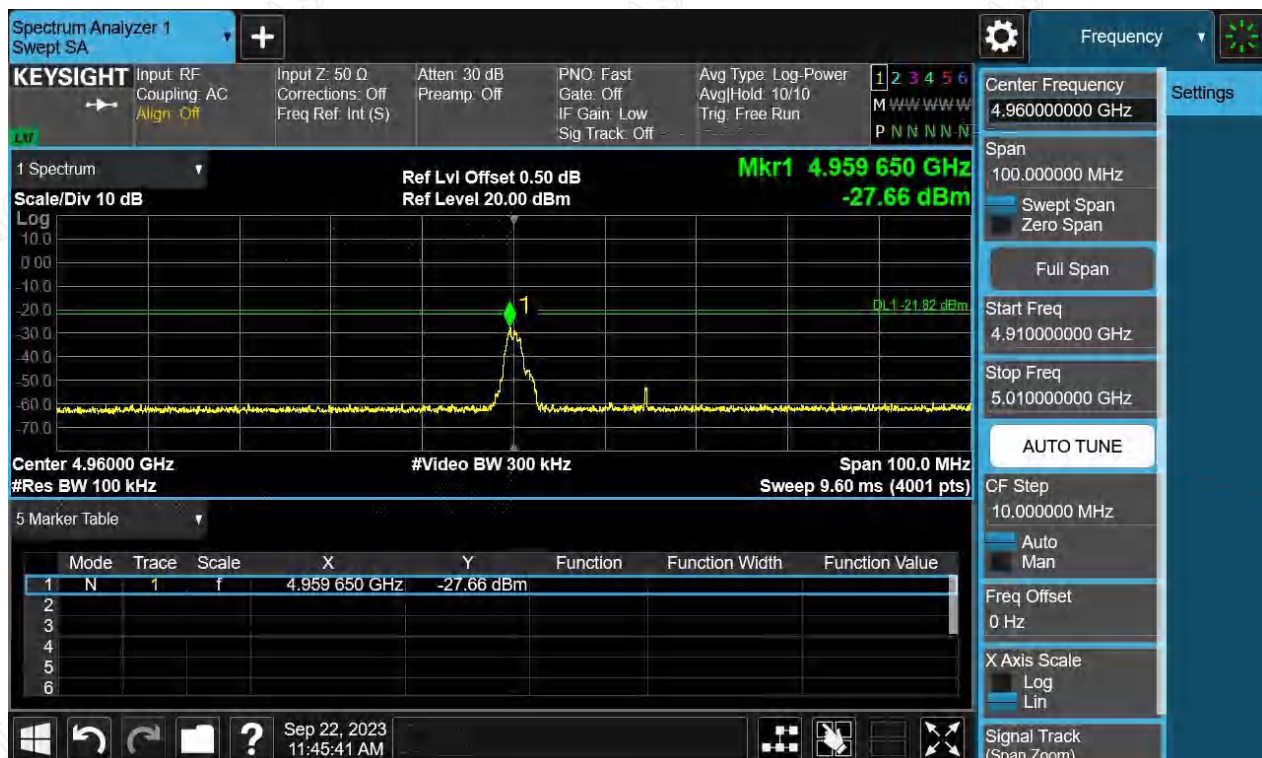




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Figure 46: The plots of Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE-2Mbps, Conducted spurious emissions 2GMHz-25GHz





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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 : 25.2°C
Relative humidity : 53%

Notes

Test plots please refer to the annex document "SHE23090001-02AE 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 the BLE-1M&2M at low 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
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 : 25.2°C
Relative humidity : 53%

Notes

Test plots please refer to the annex document "SHE23090001-02AE DATA BLE-TX EXHIBIT A".



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5 Appendixes

5.1 Photographs of the Sample



Front of the sample



Rear of the sample



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Left of the sample



Right of the sample

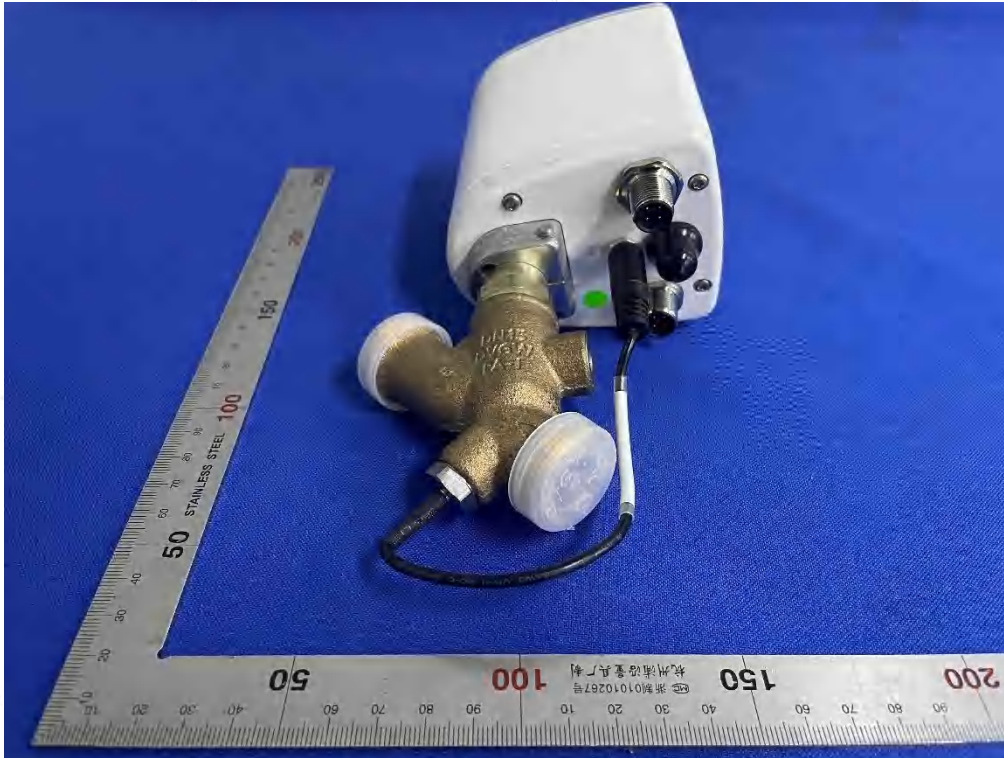


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Top of the sample



Bottom of the sample



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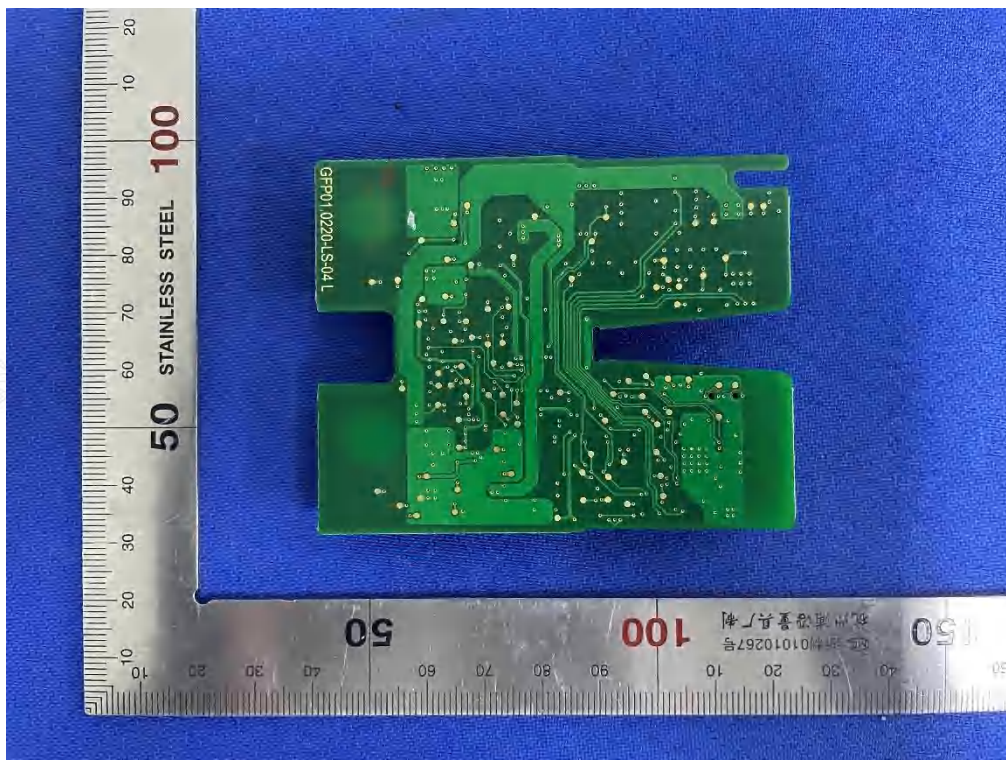
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Open of the sample



Internal-1 of the sample

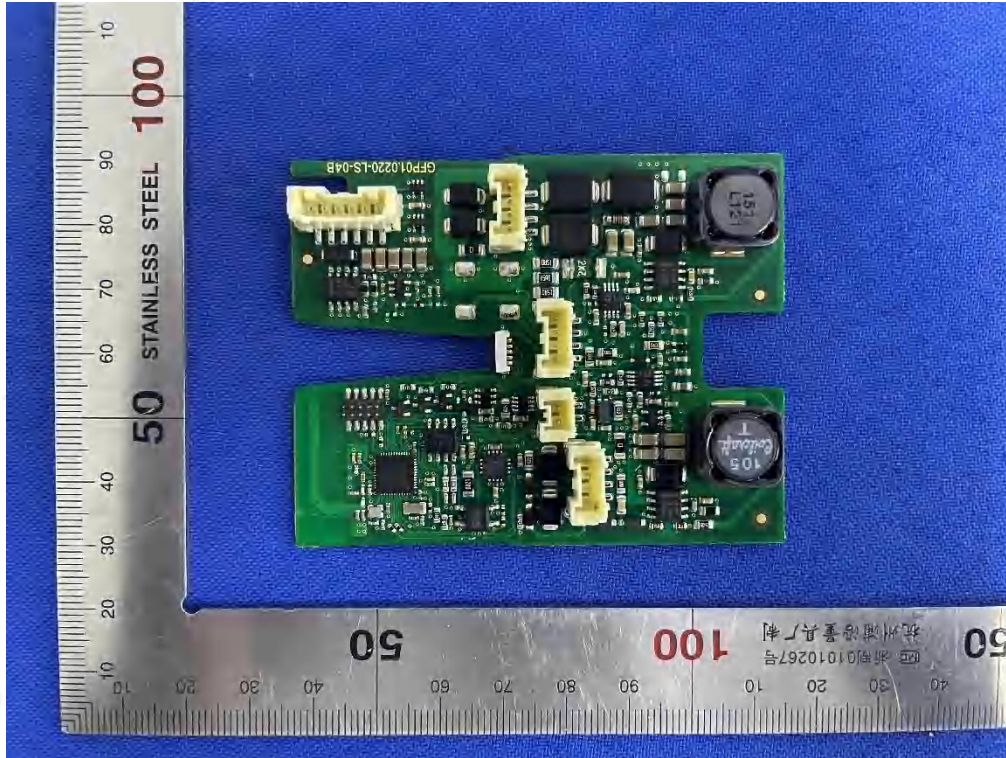


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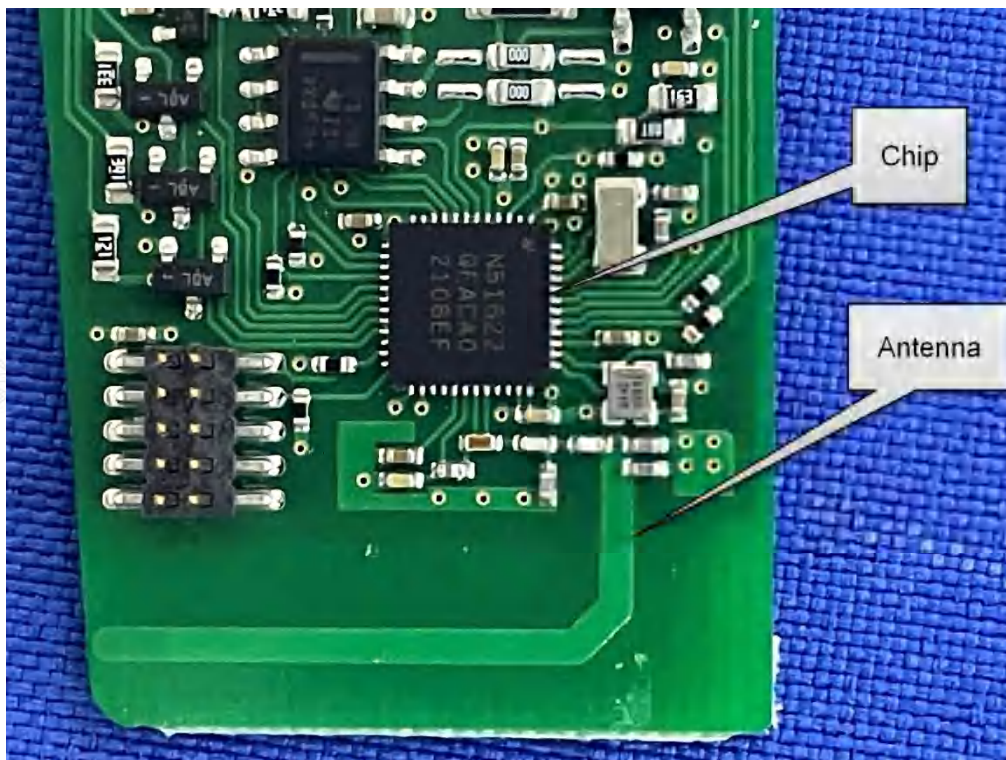
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Internal-2 of the sample



Antenna Position of the sample

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5.2 Set-up for Conducted RF test at Antenna Port



5.3 Set-up for Spurious Emissions below 1GHz





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5.4 Set-up for Spurious Emissions above 1GHz



End of the report

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