

# TEST REPORT

Report No.: SHE20090007-02FE

Date: 2021-04-09

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**Applicant** : Sonim Technologies, Inc.  
**Address of Applicant** : 6836 Bee Cave Road, Building 1, Suite 279, Austin, Texas 78746, USA

**Product Name** : Rugged Smart Phone  
**Model No.** : RS60  
**Sample No.** : E20090007-01 #01  
E20090007-01 #12  
**FCC ID** : WYPRS60  
**ISED Number** : 8090A-RS60

**Standards** : FCC CFR47 Part 15, Subpart C  
RSS-Gen (Issue 5, March 2019)  
RSS-247 (Issue 2, February 2017)

**Date of Receipt** : 2020-09-29  
**Date of Test** : 2020-10-14 ~ 2021-03-04  
**Date of Issue** : 2021-04-09

**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: 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

Company Name	Sonim Technologies, Inc.
Address	6836 Bee Cave Road, Building 1, Suite 279, Austin, Texas 78746, USA
Contact Person	Avena.Xu
Telephone	1-650-378-8100
Email	avena.xu@sonimtech.com

### 1.3 Details of EUT

Product Name	Rugged Smart Phone
Brand Name	Sonim
Model No.	RS60
FCC ID	WYPRS60
ISED Number	8090A-RS60
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	3.23 dBi
Extreme Temperature Range	-20°C ~ +55°C
Test Voltage	DC 3.8V
Hardware version	V1.0
Software version	60.0.0-01-10.0.0-00.01.01
Test SW Version	BL410_R;BL410_E
RF power setting in TEST SW	QRCT

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## 1.4 Test Methodology

47 CFR Part 15, Subpart C (10-1-16 Edition)	Miscellaneous Wireless Communications Services
KDB Publication 558074 D01 v05r02	DTS Meas Guidance.
RSS-Gen (Issue 5, March 2019)	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.

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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	N9020A	MY59260184	2021-08-23
Spectrum Analyzer	Keysight	N9020B	MY59260184	2021-08-18
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2021-06-08
V-network	SCHWARZBECK	NSLK 8127	8127-902	2021-07-28
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2021-07-28
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2021-11-22
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2021-07-26
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2023-06-08
Shielded Enclosure 8*5*4 (L*W*H)	CHANGNING	854	N/A	2021-06-08
Test Software	BL	BL410_E	N/A	N/A
Test Software	BL	BL410_R	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	QRCT

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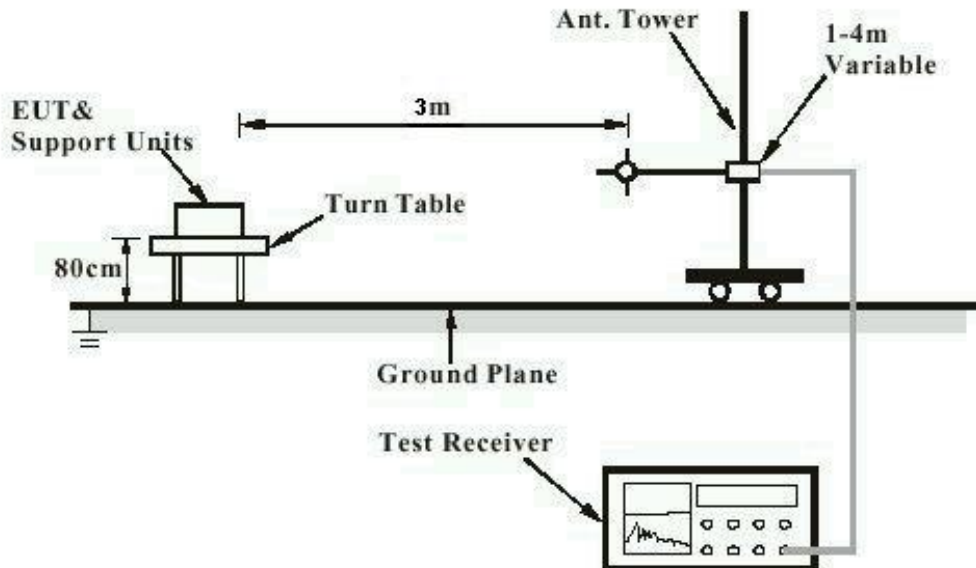
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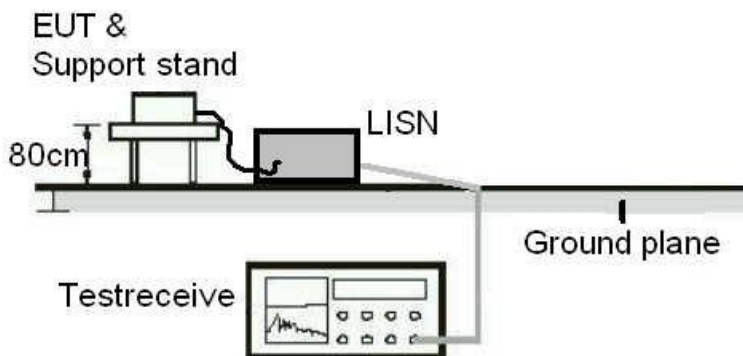
## 3.4 Test Setup Diagram

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



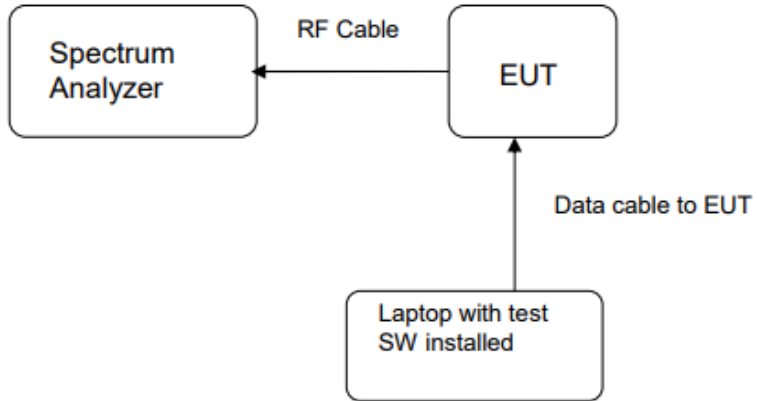
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## Diagram of Measurement Equipment Configuration for Transmitter Measurement





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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  
RSS-247 5.4(6)

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 3.23 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 and E.I.R.P

RESULT:

PASS

Test standard : FCC Part 15.247(b)(3)  
RSS-247 5.4(4)  
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	-0.17	0.96	< 1
	2440	0.96	1.25	
	2480	0.73	1.18	

Table 2: E.I.R.P

Test Mode	Test Channel (MHz)	E.I.R.P		Limit (W)
		(dBm)	(mW)	
BLE	2402	3.06	2.02	< 4
	2440	4.19	2.62	
	2480	3.96	2.49	

Note: The antenna gain is 3.23dBi

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Figure 1: Peak Output Power, 2402MHz

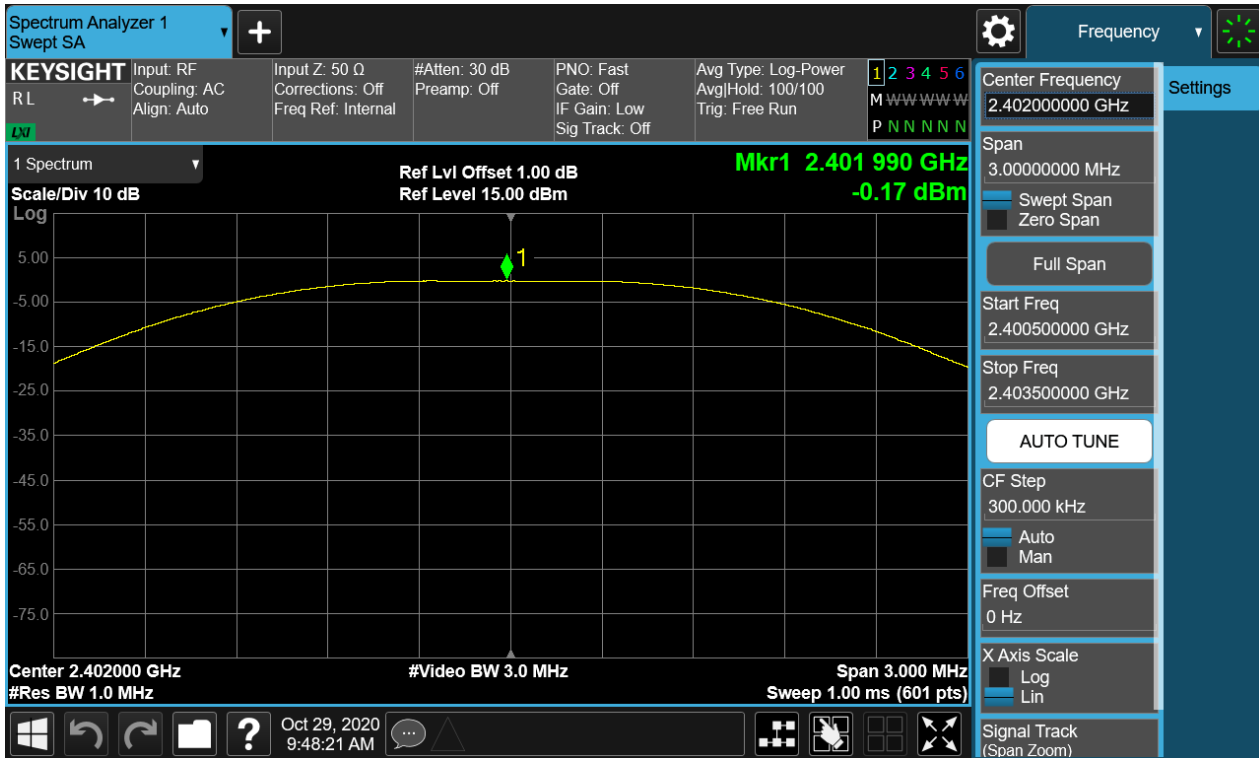


Figure 2: Peak Output Power, 2440MHz



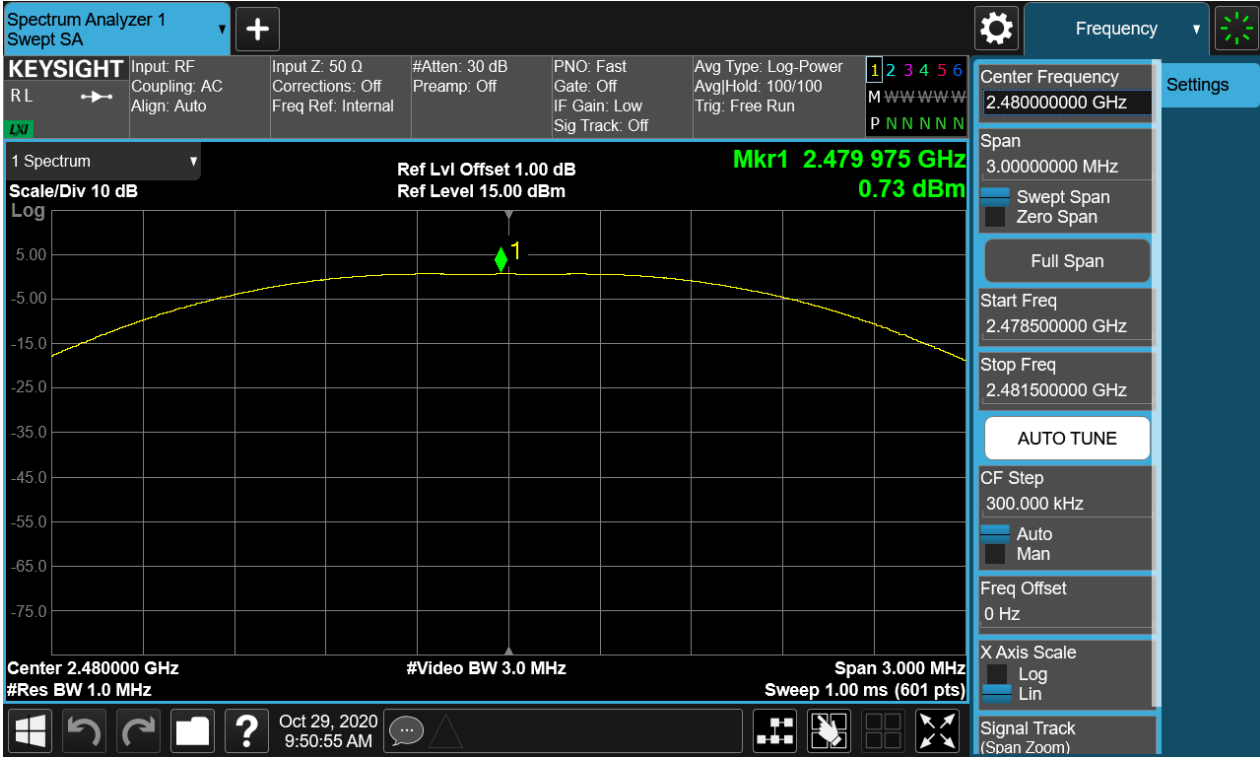
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Figure 3: Peak Output Power, 2480MHz



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## 4.1.3 6dB Bandwidth and 99% Bandwidth

RESULT:

PASS

Test standard : FCC Part 15.247(a)(2)  
RSS-247 5.2(1)  
RSS-Gen 6.6  
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: 6dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth Limit
BLE	2402	0.7002	1.0746	>0.5 MHz
	2440	0.7125	1.0701	
	2480	0.6298	1.0762	

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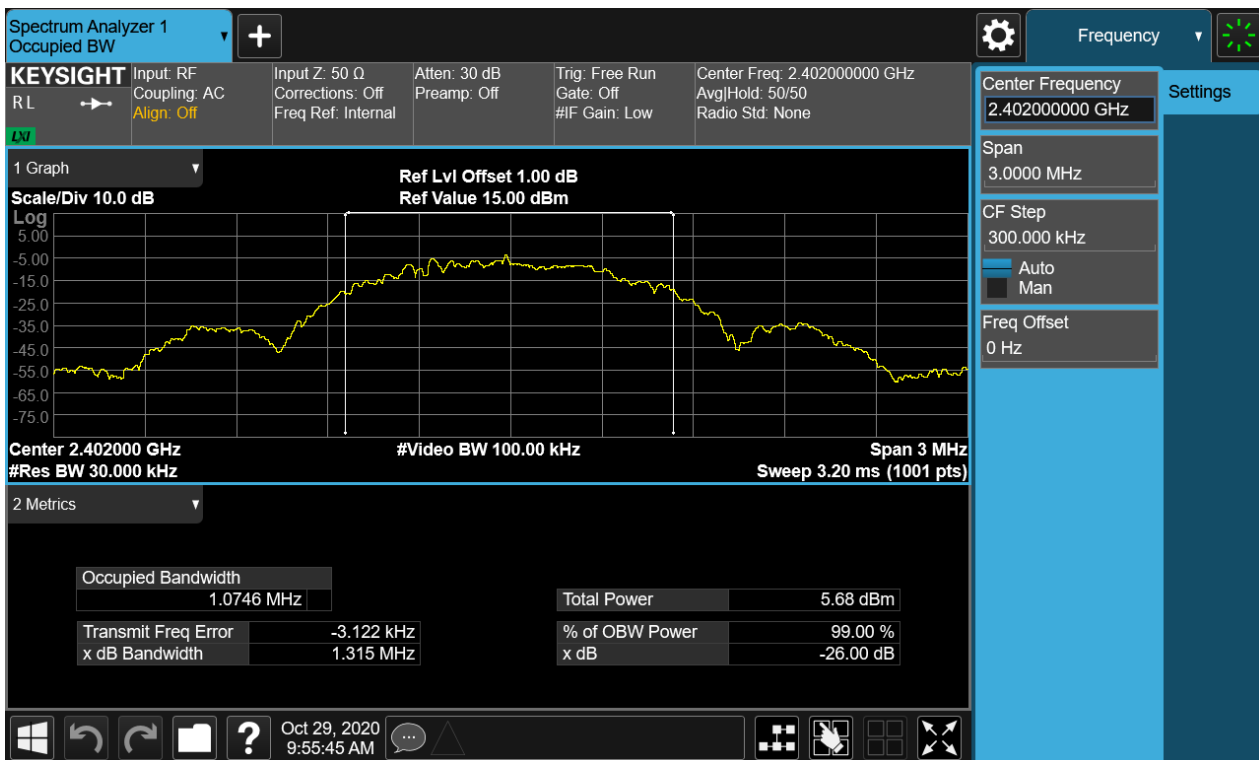
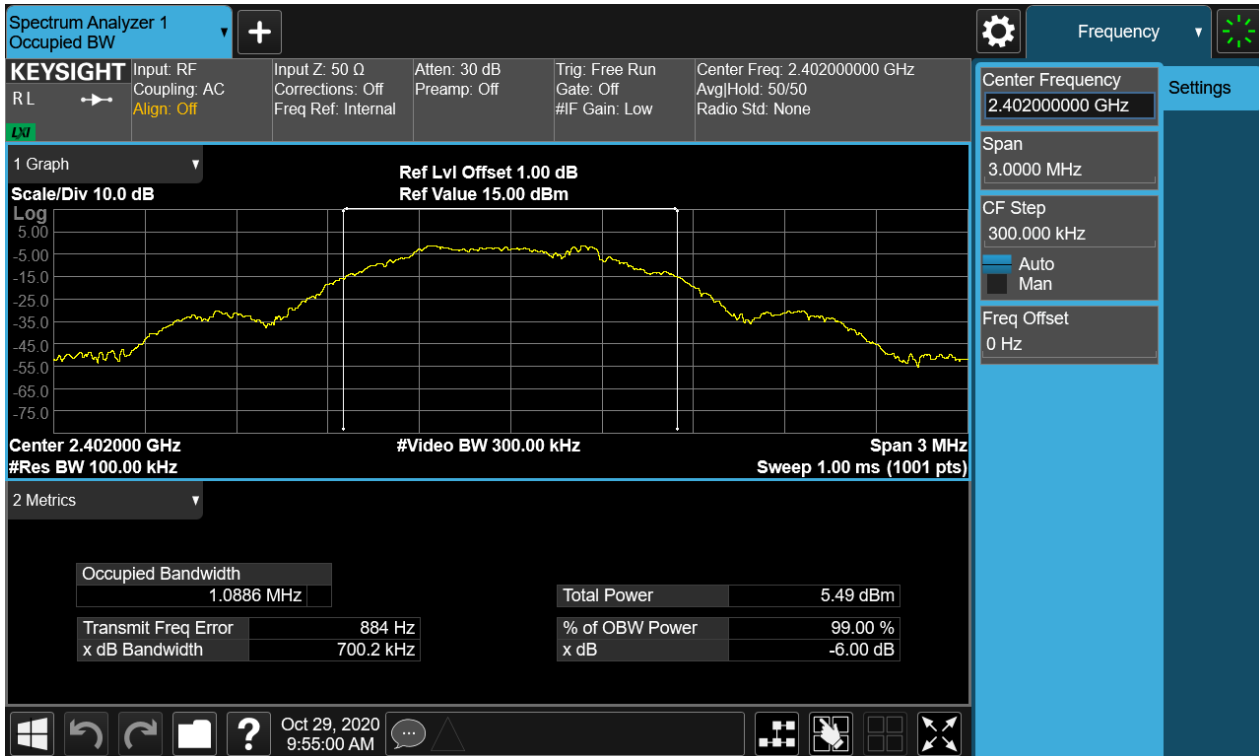
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Figure 4: 6dB Bandwidth and 99% Bandwidth, 2402MHz



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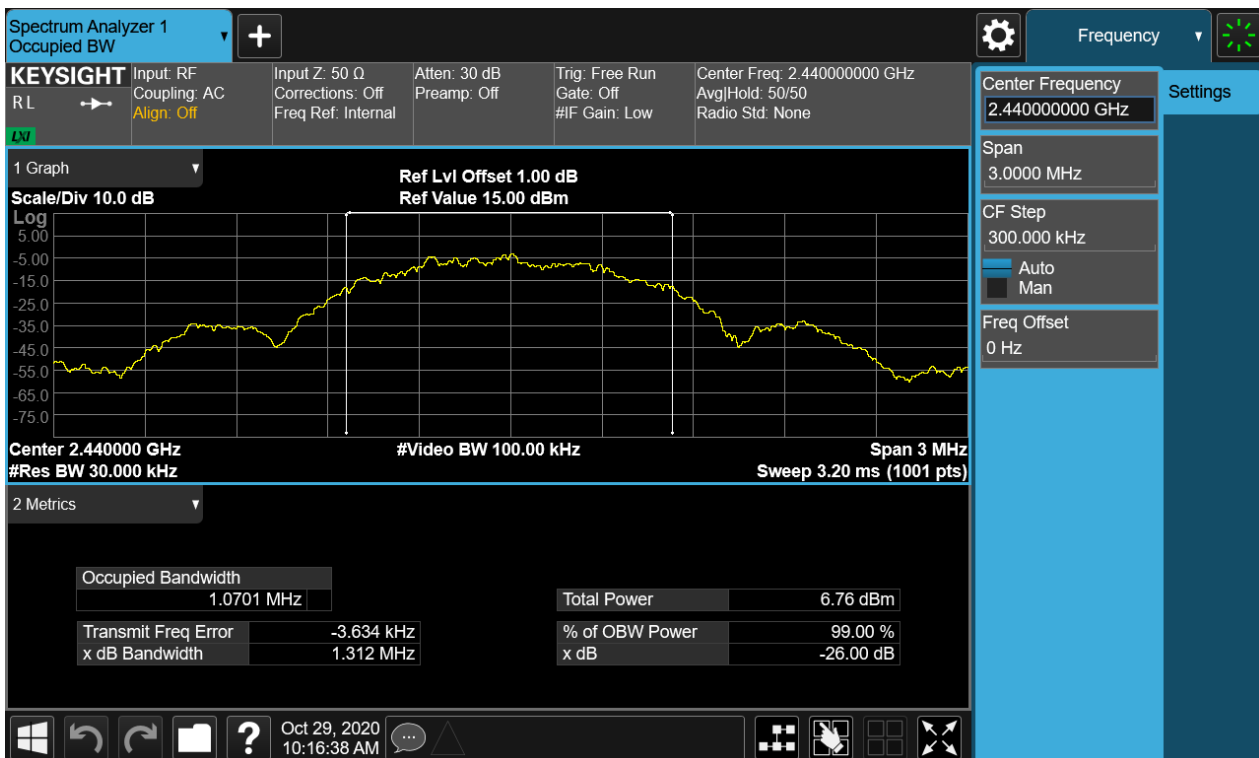
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Figure 5: 6dB Bandwidth and 99% Bandwidth, 2440MHz



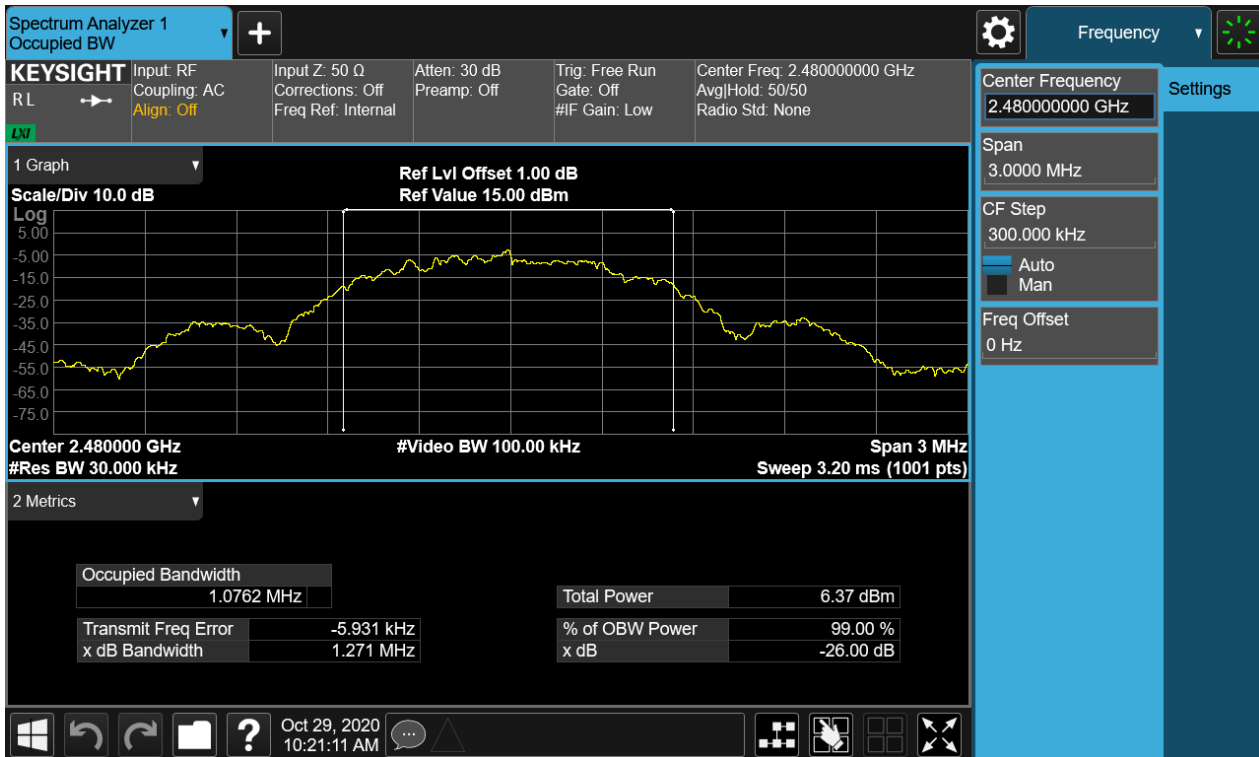
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Figure 6: 6dB Bandwidth and 99% Bandwidth, 2480MHz





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## 4.1.4 Power Spectral Density

RESULT:

**PASS**

Test standard : FCC Part 15.247(e)  
RSS-247 5.2(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 4: Power Spectral Density**

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE	2402	-15.86	8
	2440	-14.89	
	2480	-15.14	

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Figure 7: Power Spectral Density, 2402MHz

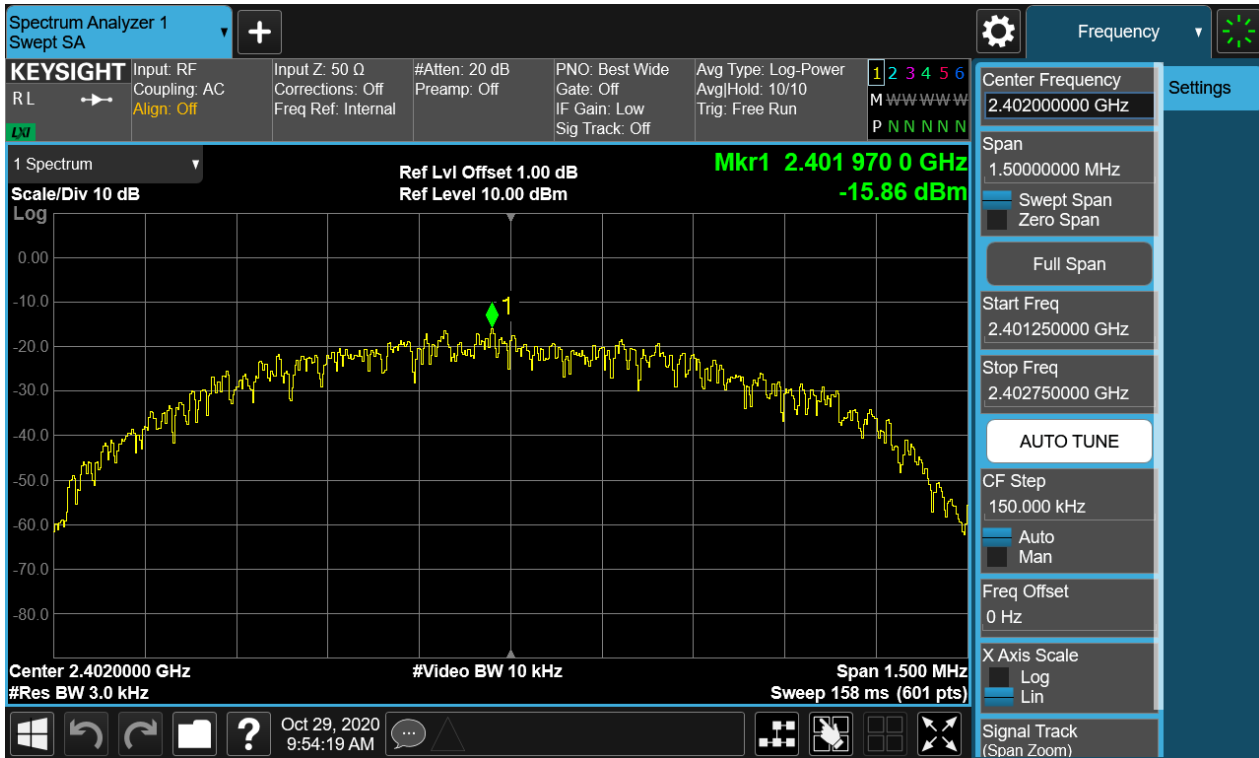
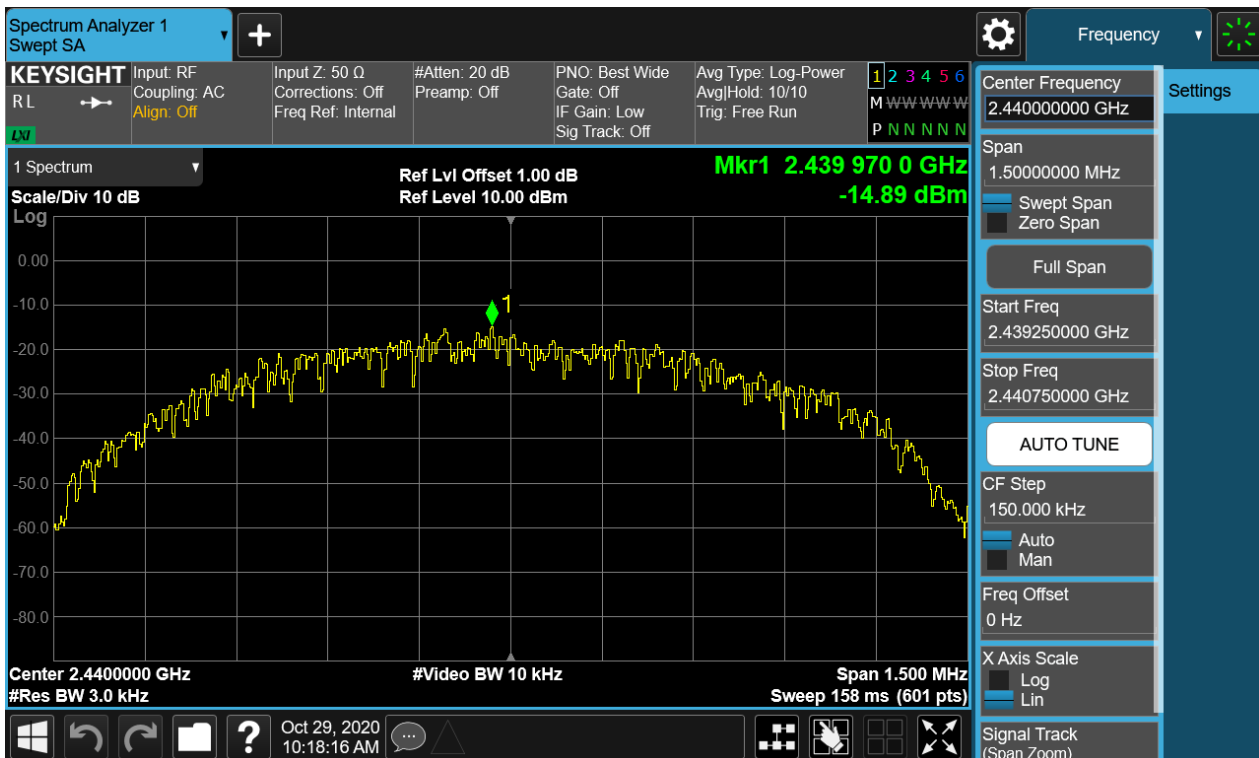


Figure 8: Power Spectral Density, 2440MHz



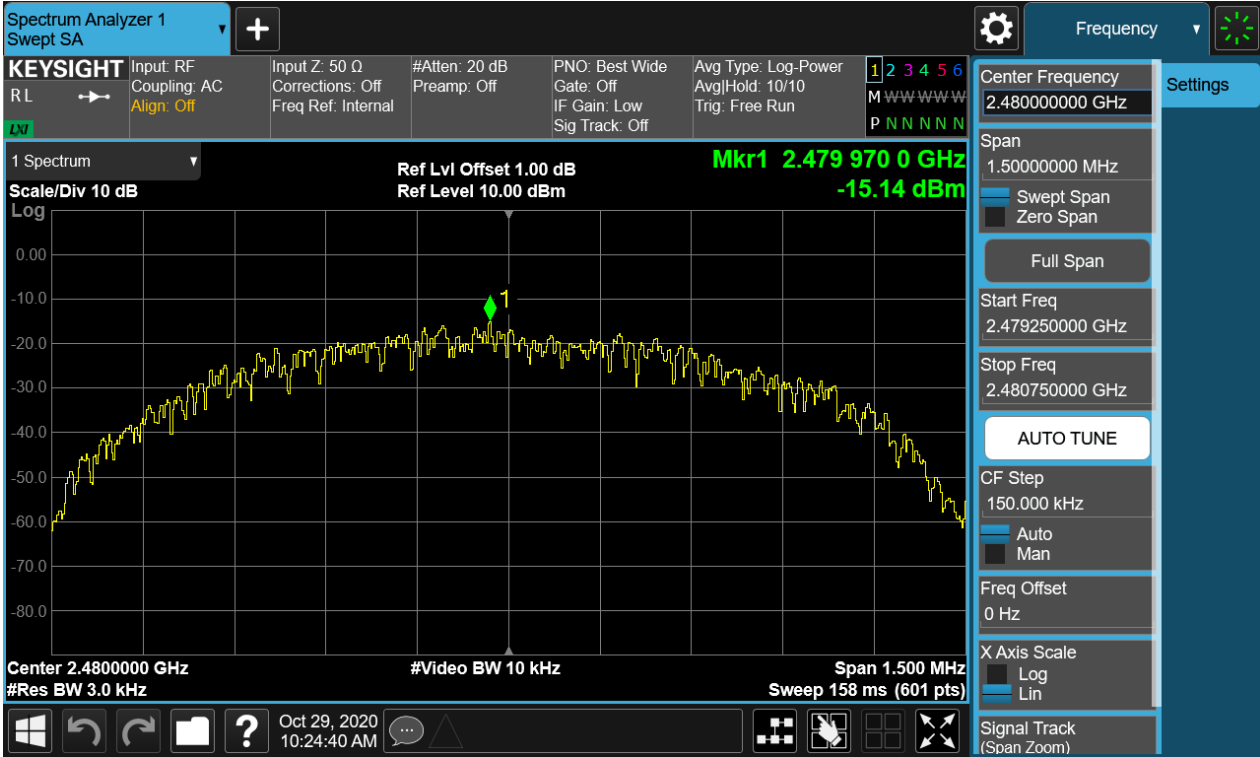
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Figure 9: Power Spectral Density, 2480MHz



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## 4.1.5 Conducted Spurious Emission & Authorized-band band-edge

RESULT:

**PASS**

Test standard : FCC Part 15.247(d)  
RSS-247 5.5  
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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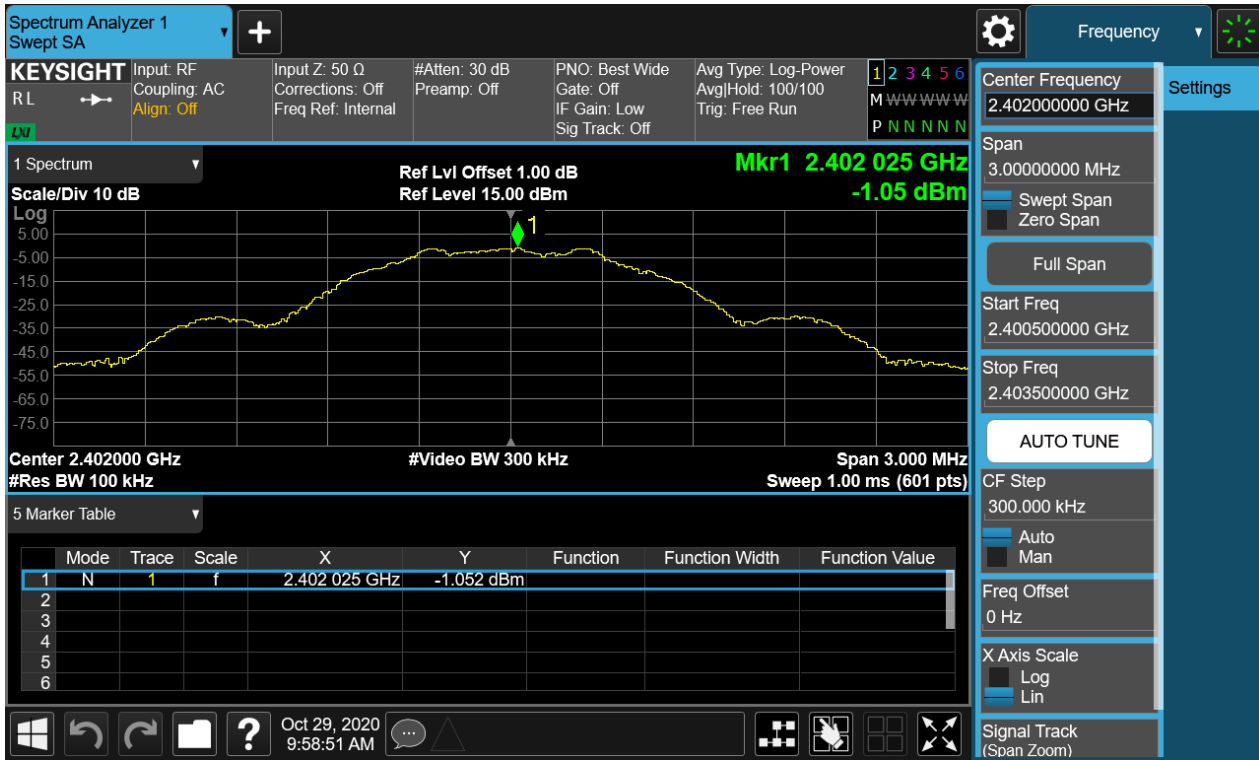
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Figure 10: Conducted Spurious Emission & Authorized-band band-edge, 2402MHz, BLE Carrier Level



## Band Edge



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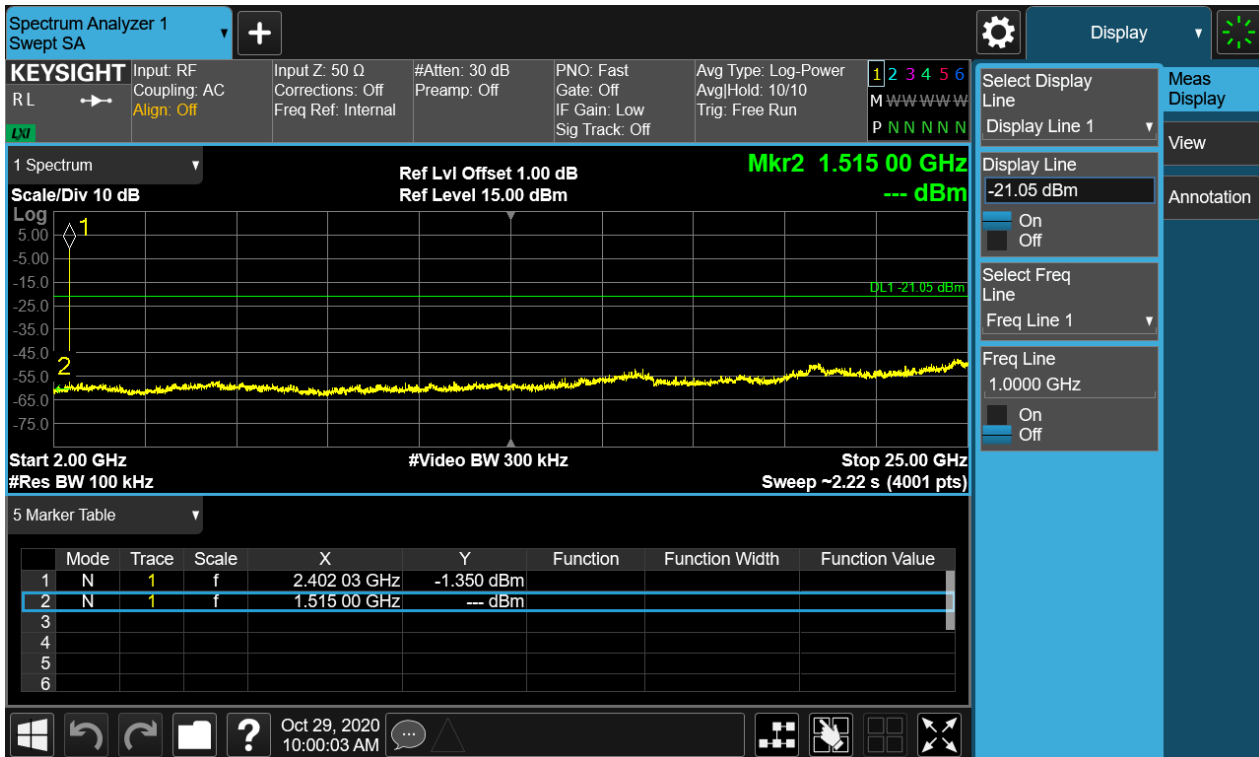
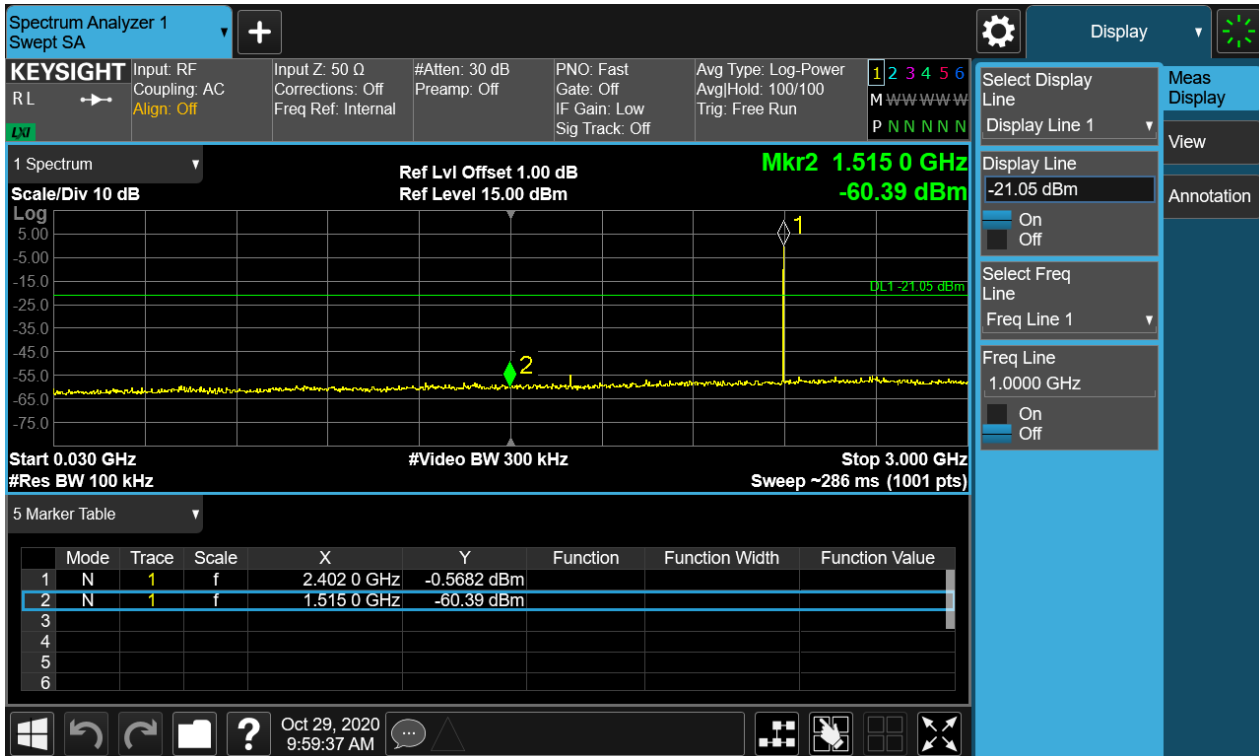
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## Conducted spurious emissions 30MHz-25GHz



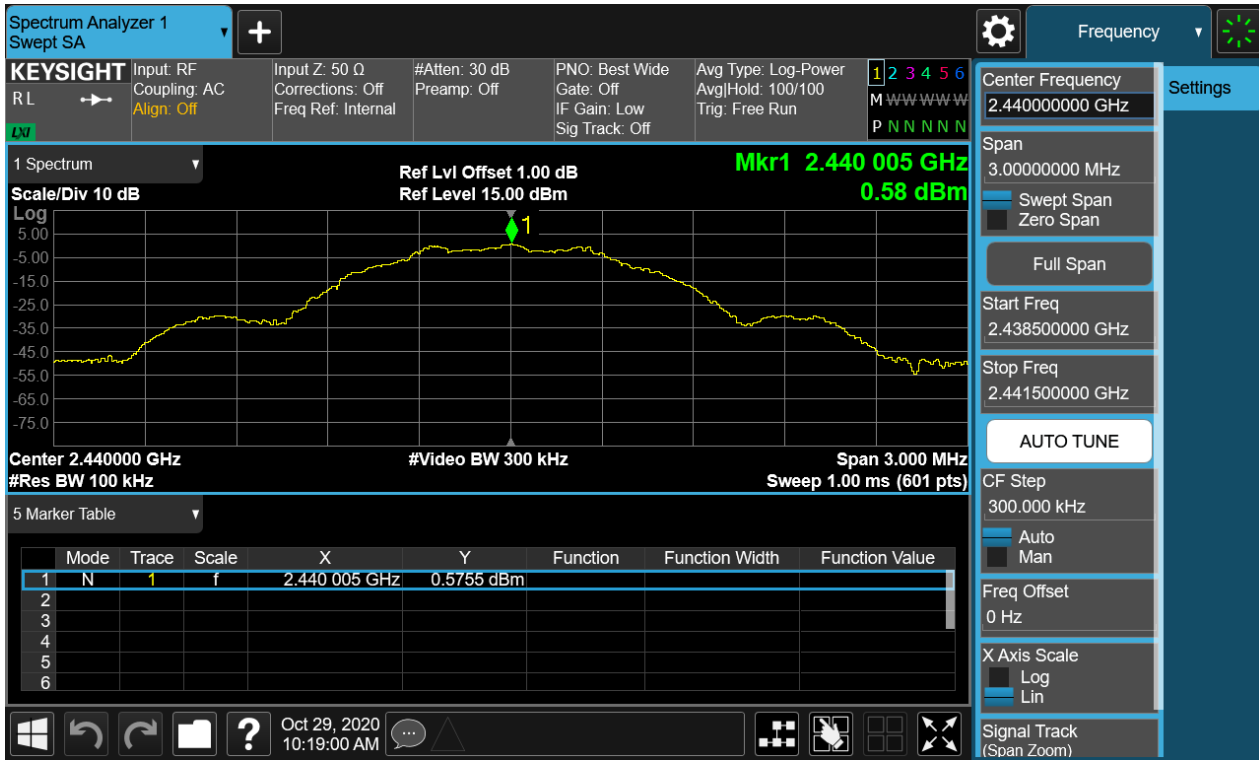
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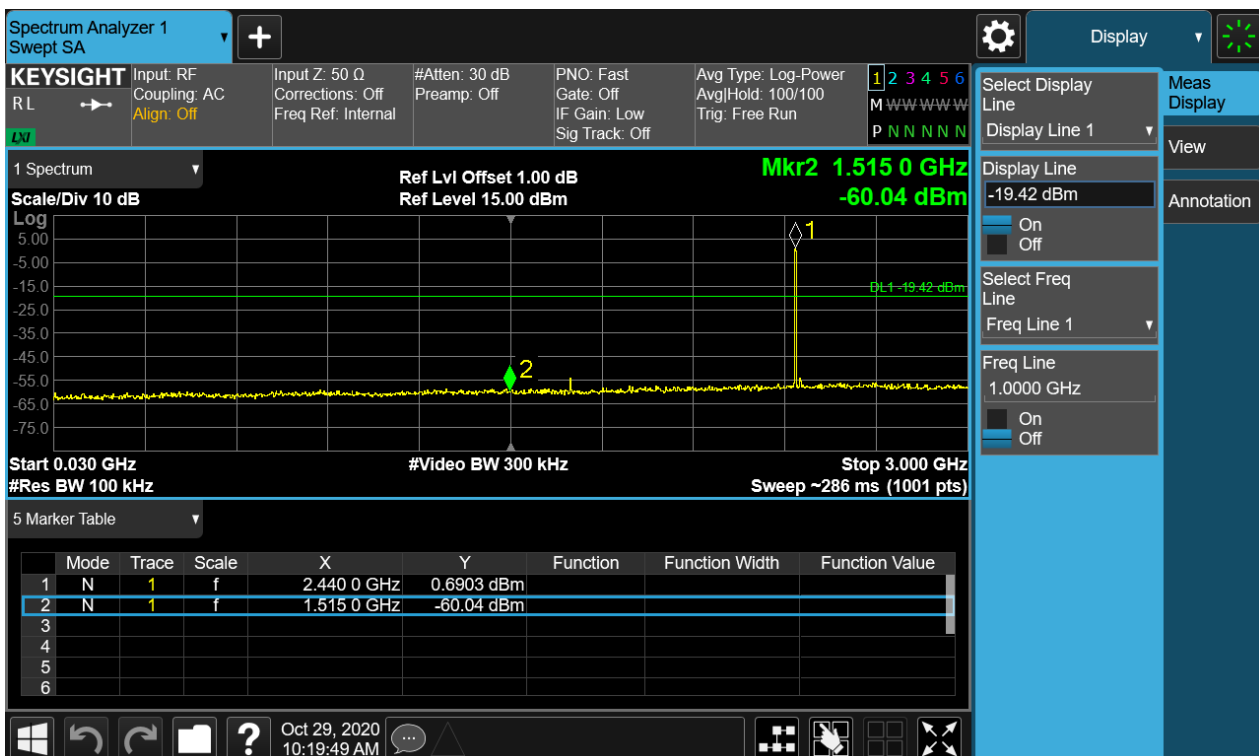
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Figure 11: Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE Carrier Level



Conducted spurious emissions 30MHz-25GHz



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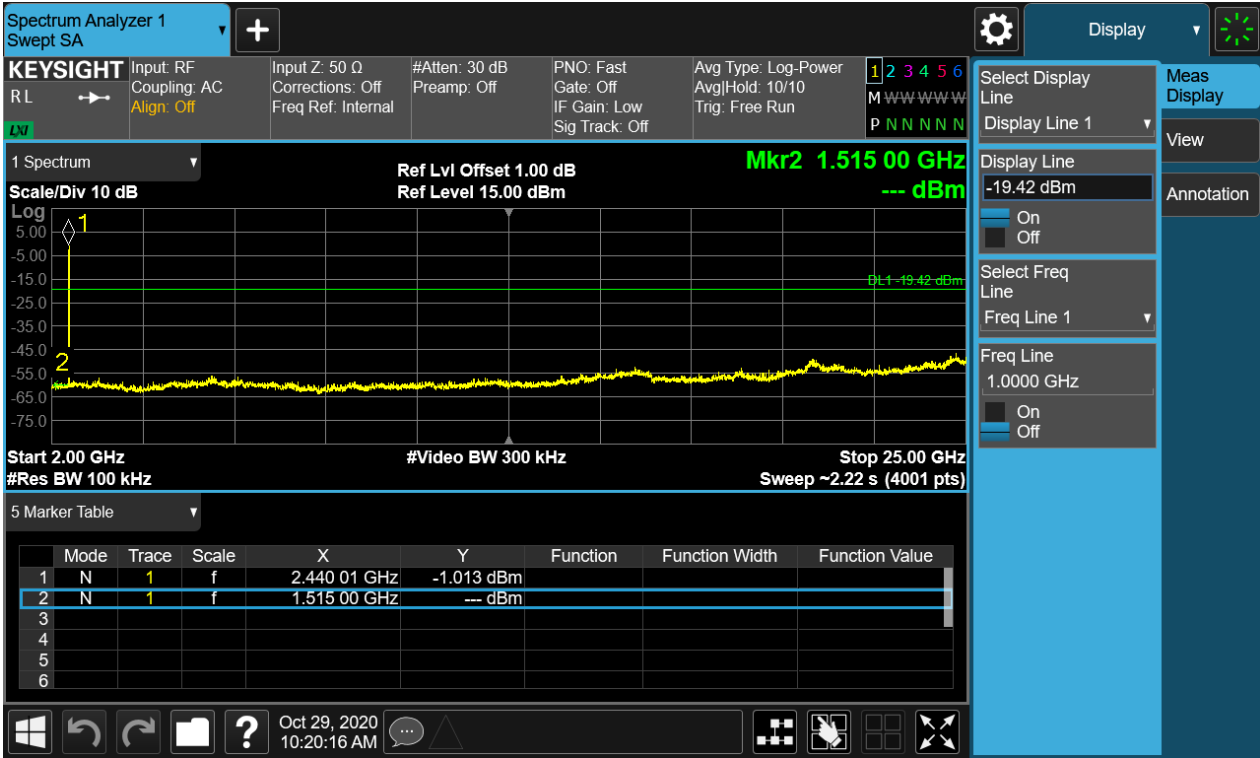
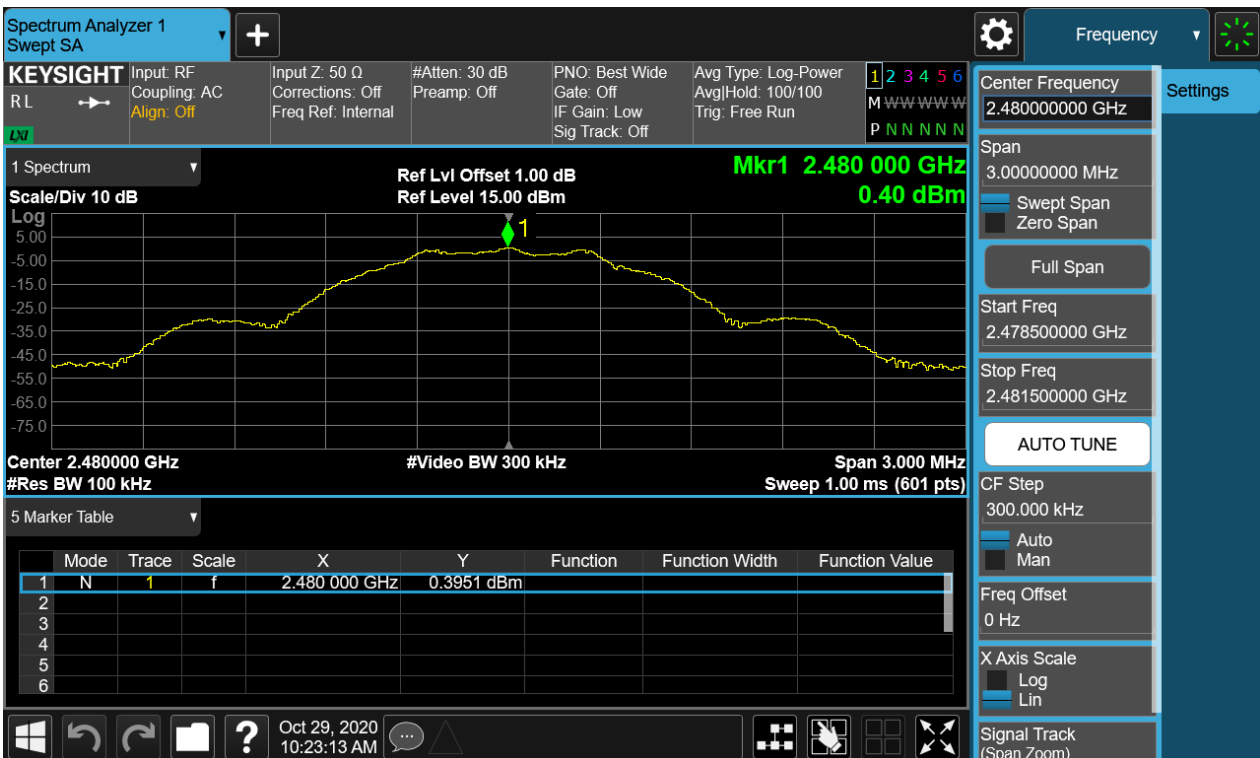


Figure 12: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE Carrier Level





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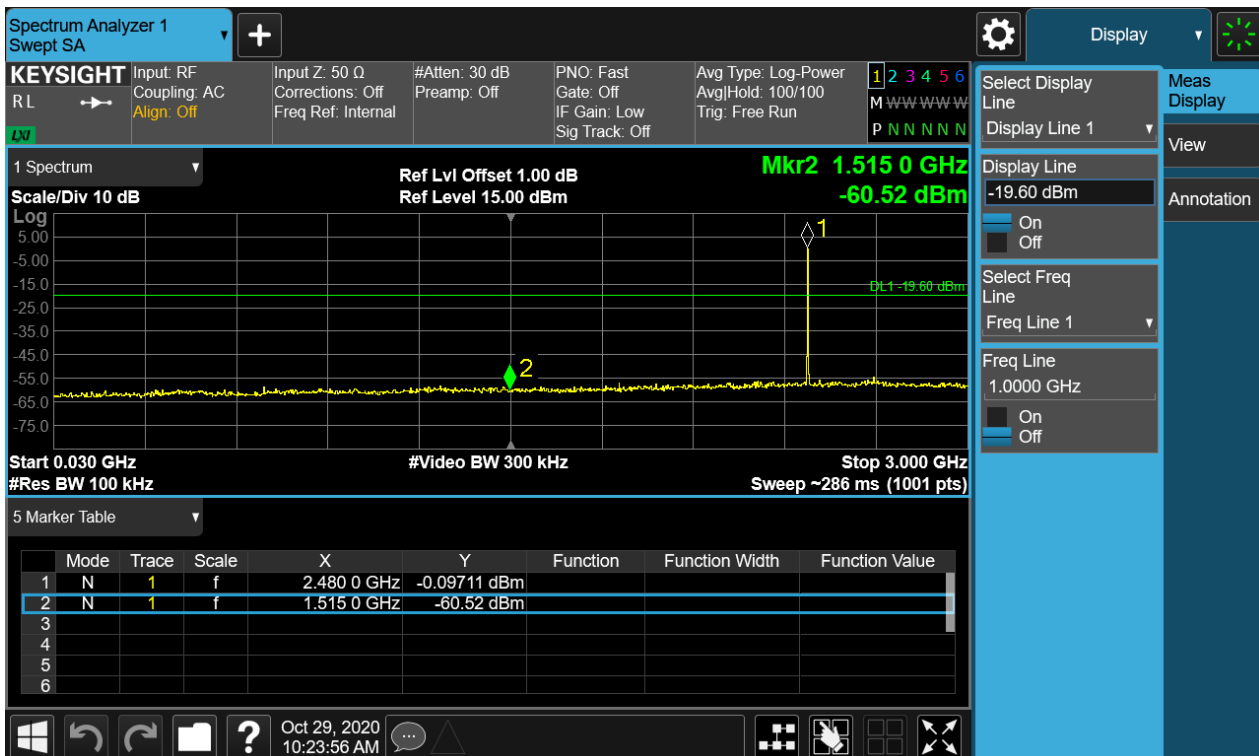
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## Band Edge



## Conducted spurious emissions 30MHz-25GHz



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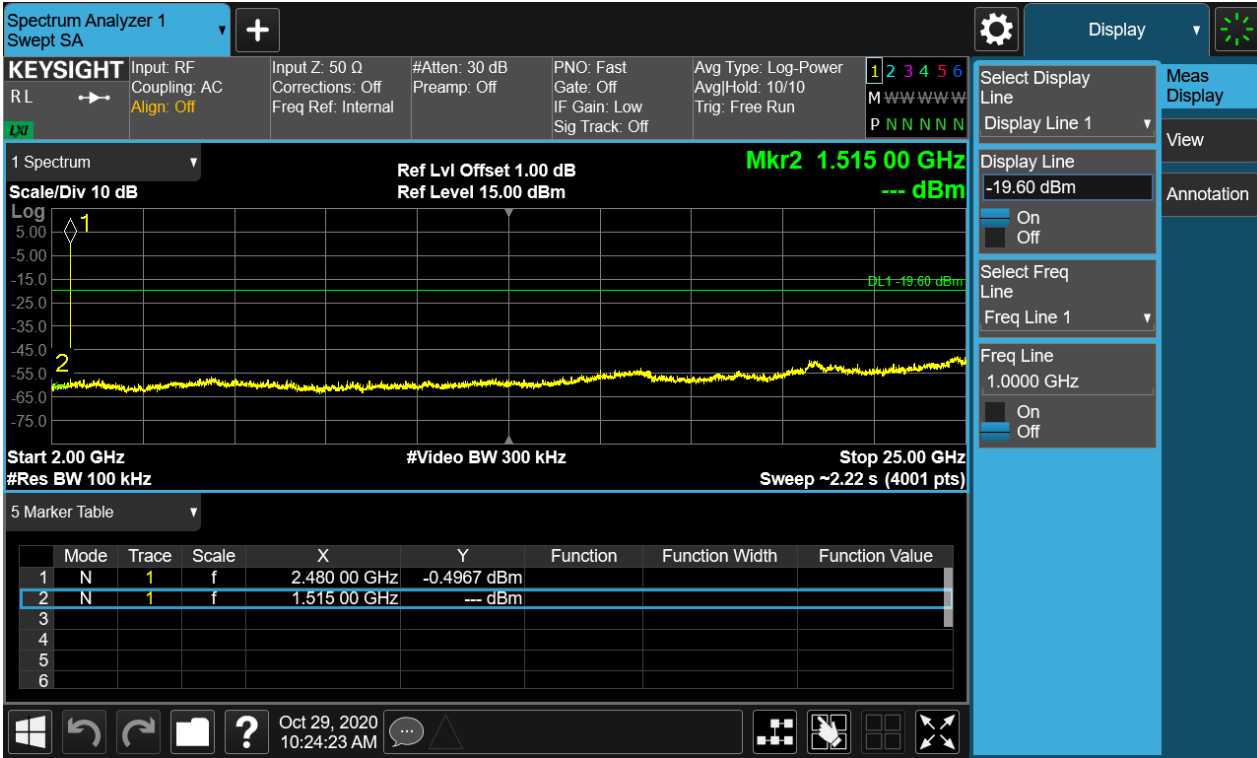
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## 4.1.6 Spurious Emission

RESULT:

**PASS**

Test standard : FCC Part 15.247(d), 15.205, 15.209  
RSS-247 5.5  
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

*Test plots please refer to the annex document "SHE20090007-02FE 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. 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  
RSS-247 5.5  
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%

### Notes

*Test plots please refer to the annex document "SHE20090007-02FE 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)  
RSS-Gen 8.8  
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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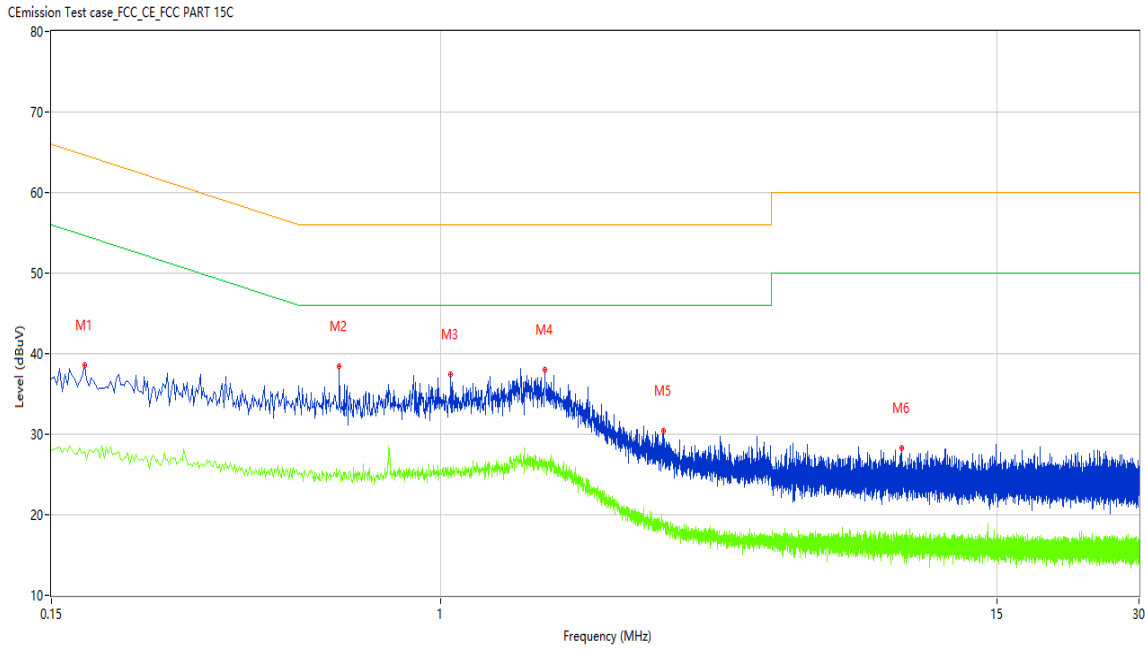
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Note: The all configurations were tested respectively, but only the worst configuration shown here.

**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	0.176	56.25	9.66	64.67	-8.42	Peak	L	Pass
1*	0.176	36.30	9.66	64.67	-28.37	QP	L	Pass
1**	0.176	27.90	9.66	54.67	-26.77	AV	L	Pass
2	0.610	36.26	9.76	56.00	-19.74	Peak	L	Pass
2*	0.610	24.36	9.76	56.00	-31.64	QP	L	Pass
2**	0.610	25.44	9.76	46.00	-20.56	AV	L	Pass
3	1.050	30.40	9.66	56.00	-25.60	Peak	L	Pass
3*	1.050	21.39	9.66	56.00	-34.61	QP	L	Pass
3**	1.050	25.83	9.66	46.00	-20.17	AV	L	Pass
4	1.658	28.91	9.67	56.00	-27.09	Peak	L	Pass
4*	1.658	21.63	9.67	56.00	-34.37	QP	L	Pass
4**	1.658	26.53	9.67	46.00	-19.47	AV	L	Pass
5	2.956	28.56	9.69	56.00	-27.44	Peak	L	Pass
5*	2.956	16.91	9.69	56.00	-39.09	QP	L	Pass
5**	2.956	18.49	9.69	46.00	-27.51	AV	L	Pass
6	9.458	23.68	9.66	60.00	-36.32	Peak	L	Pass
6*	9.458	13.25	9.66	60.00	-46.75	QP	L	Pass
6**	9.458	16.82	9.66	50.00	-33.18	AV	L	Pass

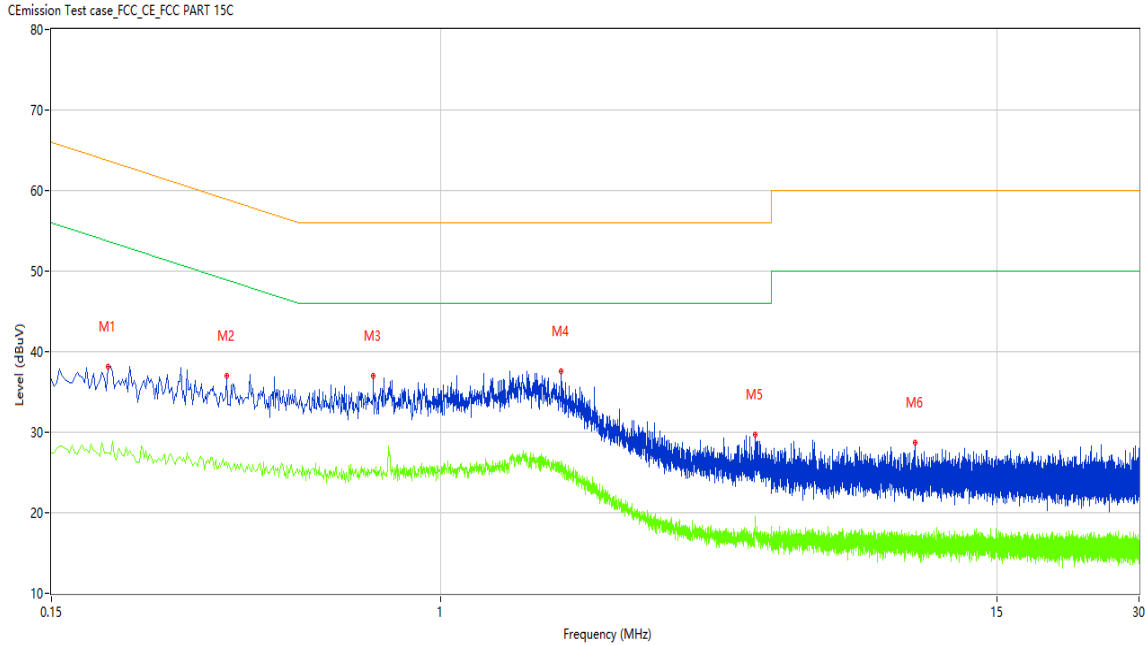
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**Figure 14: Conducted Emission on AC Mains, N Phase**



No.	Frequency (MHz)	Results (dBUV)	Factor (dB)	Limit (dBUV)	Over Limit (dB)	Detector	Line	Verdict
1	0.198	34.57	9.65	63.69	-29.12	Peak	N	Pass
1*	0.198	24.63	9.65	63.69	-39.06	QP	N	Pass
1**	0.198	27.45	9.65	53.69	-26.24	AV	N	Pass
2	0.352	29.77	9.72	58.92	-29.15	Peak	N	Pass
2*	0.352	22.43	9.72	58.92	-36.49	QP	N	Pass
2**	0.352	26.24	9.72	48.92	-22.68	AV	N	Pass
3	0.720	27.57	9.75	56.00	-28.43	Peak	N	Pass
3*	0.720	20.54	9.75	56.00	-35.46	QP	N	Pass
3**	0.720	25.29	9.75	46.00	-20.71	AV	N	Pass
4	1.800	30.07	9.68	56.00	-25.93	Peak	N	Pass
4*	1.800	21.71	9.68	56.00	-34.29	QP	N	Pass
4**	1.800	25.94	9.68	46.00	-20.06	AV	N	Pass
5	4.626	27.16	9.69	56.00	-28.84	Peak	N	Pass
5*	4.626	18.74	9.69	56.00	-37.26	QP	N	Pass
5**	4.626	19.64	9.69	46.00	-26.36	AV	N	Pass
6	10.098	23.50	9.65	60.00	-36.50	Peak	N	Pass
6*	10.098	13.81	9.65	60.00	-46.19	QP	N	Pass
6**	10.098	16.25	9.65	50.00	-33.75	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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## 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\*\*\*