

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 1 of 36

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

Product Name : Rugged Tablet
Model No. : RS80
Sample No. : E20060042-02 #01
E20060042-02 #07
FCC ID : WYPRS80
ISED Number : 8090A-RS80

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

Date of Receipt : 2020-09-27
Date of Test : 2020-10-14 ~ 2021-01-14
Date of Issue : 2021-01-15

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: Jennifer Zhou
(Jennifer Zhou)

Reviewed by: Oliver Xiang
(Oliver Xiang)

Approved by: Guoyou Chi
(Authorized signatory: Guoyou Chi)

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 2 of 36

Revision Record

Version	Date	Revisions	Revised By
1.0	2019-10-31	Original	--

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 3 of 36

Contents

1	GENERAL INFORMATION	4
1.1	TESTING LABORATORY	4
1.2	DETAILS OF APPLICATION	4
1.3	DETAILS OF EUT	4
1.4	TEST METHODOLOGY	5
2	TEST CONDITION	6
2.1	ENVIRONMENTAL CONDITIONS	6
2.2	EQUIPMENT LIST	6
2.3	MEASUREMENT UNCERTAINTY	6
3	TEST SET-UP AND OPERATION MODES	7
3.1	DETAILS OF TEST MODE	7
3.2	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	7
3.3	SUPPORT SOFTWARE	7
3.4	TEST SETUP DIAGRAM	8
4	TEST RESULTS	10
4.1	TRANSMITTER REQUIREMENT & TEST SUITES	10
4.1.1	<i>Antenna Requirement</i>	10
4.1.2	<i>Peak Output Power and E.I.R.P.</i>	11
4.1.3	<i>6dB Bandwidth and 99% Bandwidth</i>	14
4.1.4	<i>Power Spectral Density</i>	18
4.1.5	<i>Conducted Spurious Emission & Authorized-band band-edge</i>	21
4.1.6	<i>Spurious Emission</i>	29
4.1.7	<i>Band Edge (Restricted-band band-edge)</i>	30
4.2	MAINS EMISSIONS	31
4.2.1	<i>Conducted Emission on AC Mains</i>	31
5	APPENDIXES	34
5.1	PHOTOGRAPHS OF THE SAMPLE	34
5.2	SET-UP FOR CONDUCTED EMISSIONS	35
5.3	SET-UP FOR CONDUCTED RF TEST AT ANTENNA PORT	35
5.4	SET-UP FOR SPURIOUS EMISSIONS BELOW 1GHZ	36
5.5	SET-UP FOR SPURIOUS EMISSIONS ABOVE 1GHZ	36

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 4 of 36

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 Tablet
Brand Name	Sonim
Model No.	RS80
FCC ID	WYPRS80
ISED Number	8090A-RS80
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	1.71 dBi
Extreme Temperature Range	-20°C ~ +55°C
Test Voltage	DC 3.8V
Hardware version	V1.00
Software version	80.0.0-01-10.0.0-00.35.01
Test SW Version	BL410_R;BL410_E
RF power setting in TEST SW	QRCT

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 5 of 36

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.

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 6 of 36

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	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	2021-02-20
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2021-08-18
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2021-06-08
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2021-06-08
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2021-03-19
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2021-07-26
EMC chamber 9*6*6 (L*W*H)	CHANGNING	966	N/A	2021-06-08
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

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 7 of 36

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
Earphone	N/A	N/A	N/A

3.3 Support Software

Description	Manufacturer	Software Name
Software	Qualcomm	QRCT

TEST REPORT

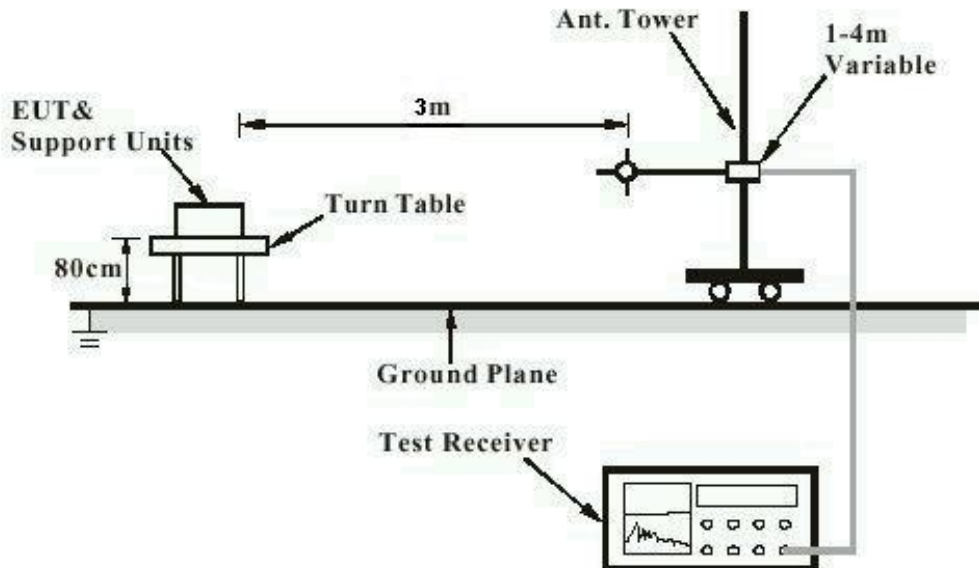
Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 8 of 36

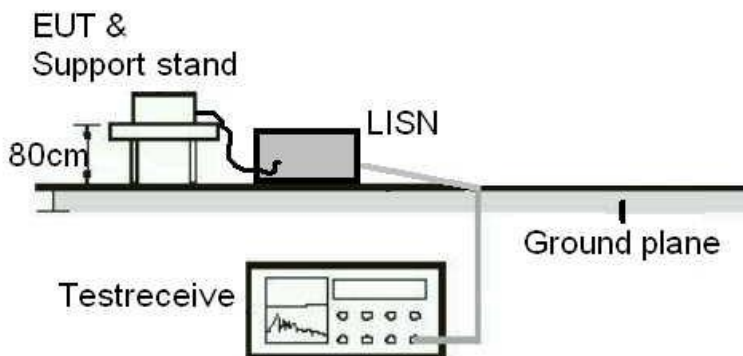
3.4 Test Setup Diagram

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



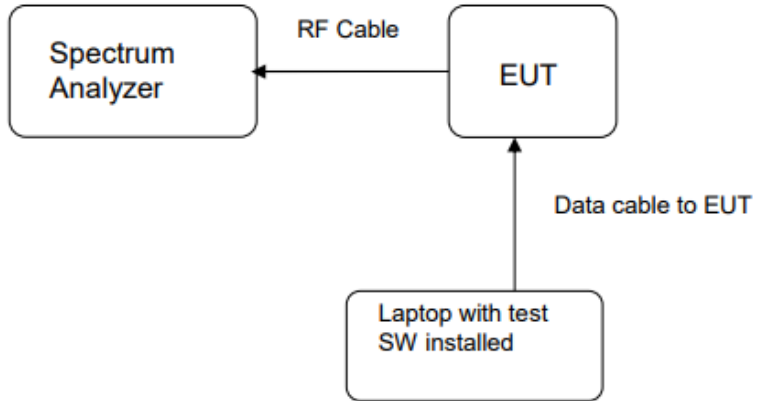
TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 9 of 36

Diagram of Measurement Equipment Configuration for Transmitter Measurement



TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 10 of 36

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 1.71 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.

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 11 of 36

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	-1.02	0.79	< 1
	2440	-0.10	0.98	
	2480	0.15	1.04	

Table 2: E.I.R.P

Test Mode	Test Channel (MHz)	E.I.R.P		Limit (W)
		(dBm)	(mW)	
BLE	2402	0.69	1.17	< 4
	2440	1.61	1.45	
	2480	1.86	1.53	

Note: The antenna gain is 1.71dBi

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 12 of 36

Figure 1: Peak Output Power, 2402MHz

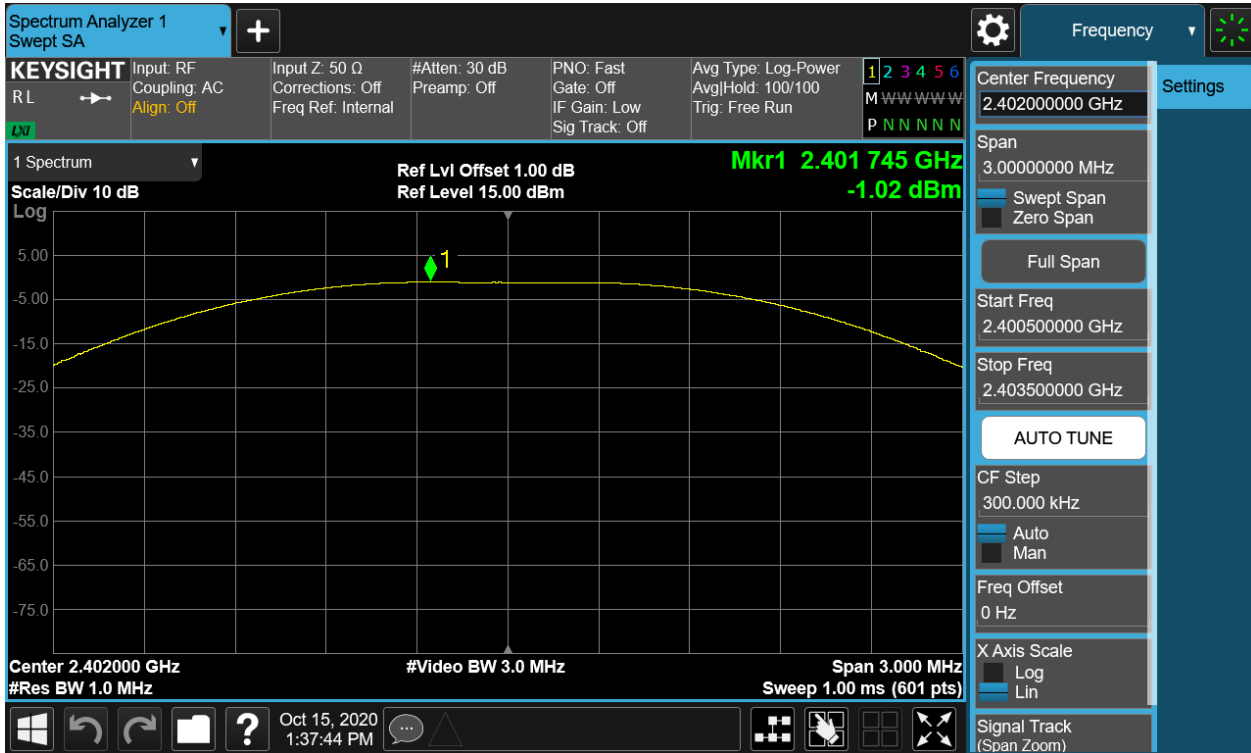


Figure 2: Peak Output Power, 2440MHz



TEST REPORT

Report No.:

SHE20060042-02FE

Date:

2021-01-15

Page 13 of 36

Figure 3: Peak Output Power, 2480MHz



TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 14 of 36

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	0.710	1.067	>0.5 MHz
	2440	0.669	1.059	
	2480	0.659	1.066	

TEST REPORT

Report No.:

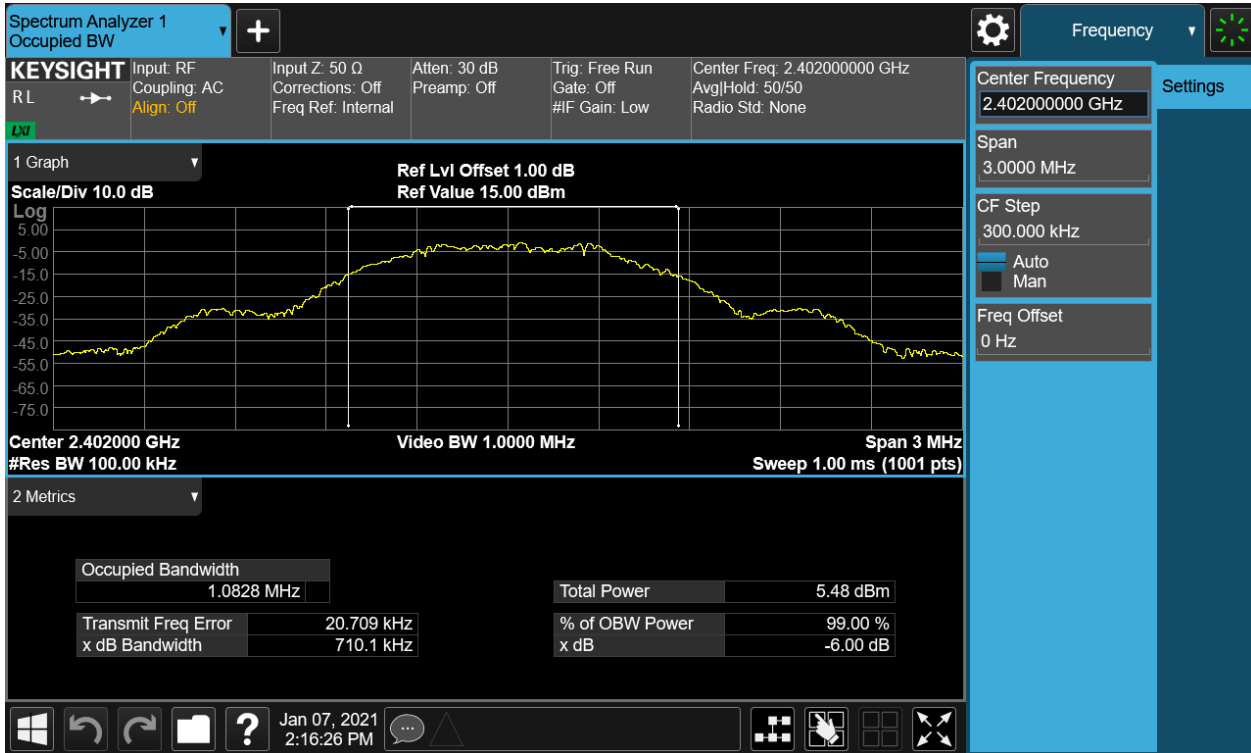
SHE20060042-02FE

Date:

2021-01-15

Page 15 of 36

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



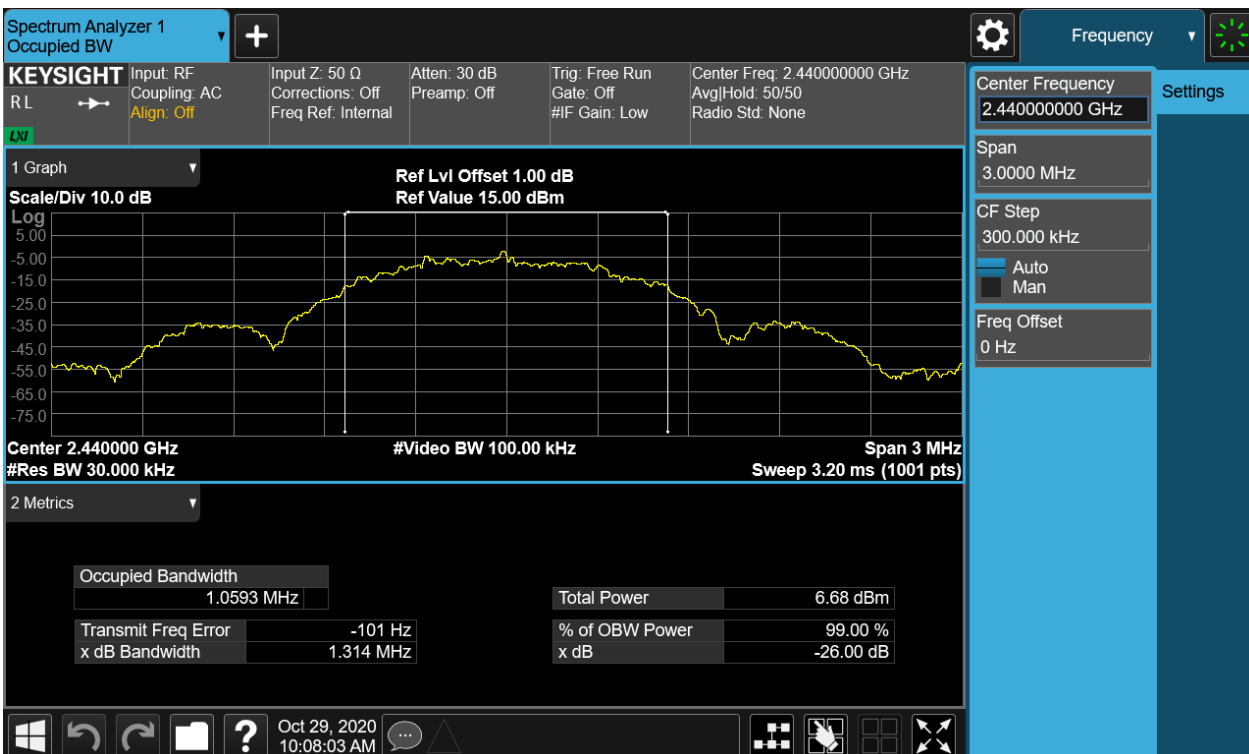
TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 16 of 36

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



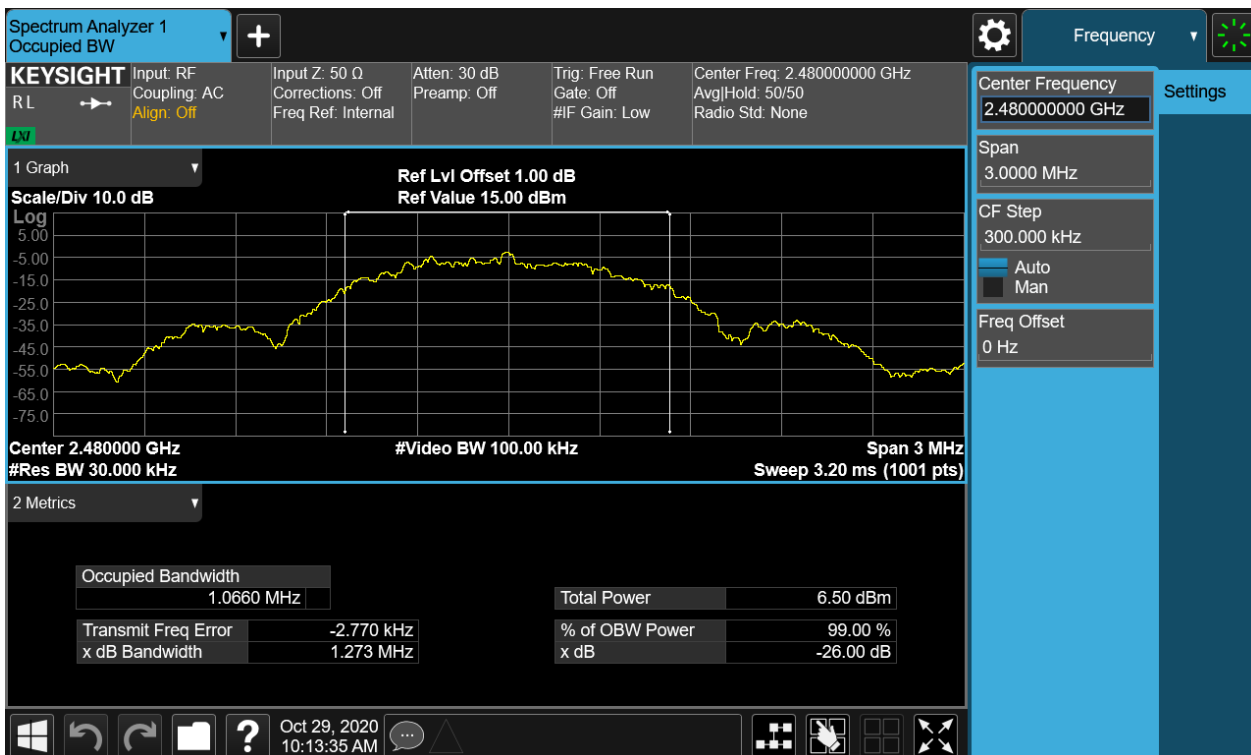
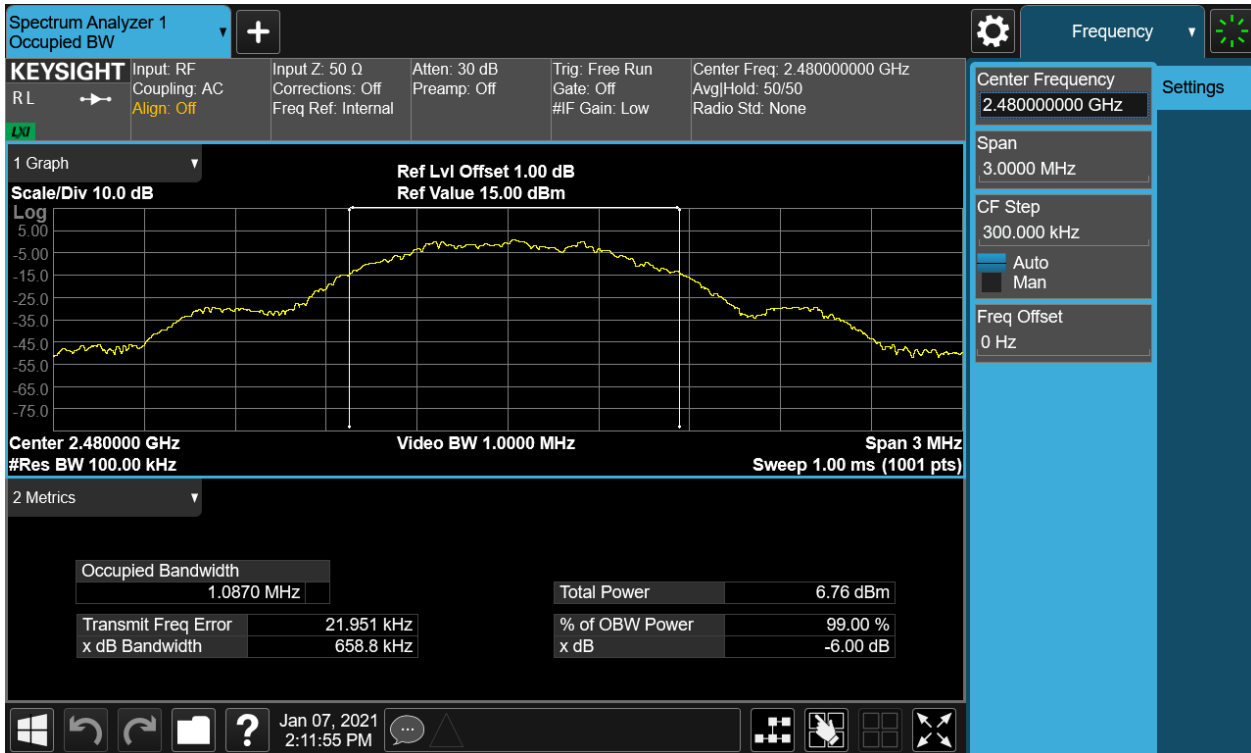
TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 17 of 36

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



TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 18 of 36

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	-15.89	8
	2440	-14.83	
	2480	-15.07	

TEST REPORT

Report No.:

SHE20060042-02FE

Date:

2021-01-15

Page 19 of 36

Figure 7: Power Spectral Density, 2402MHz

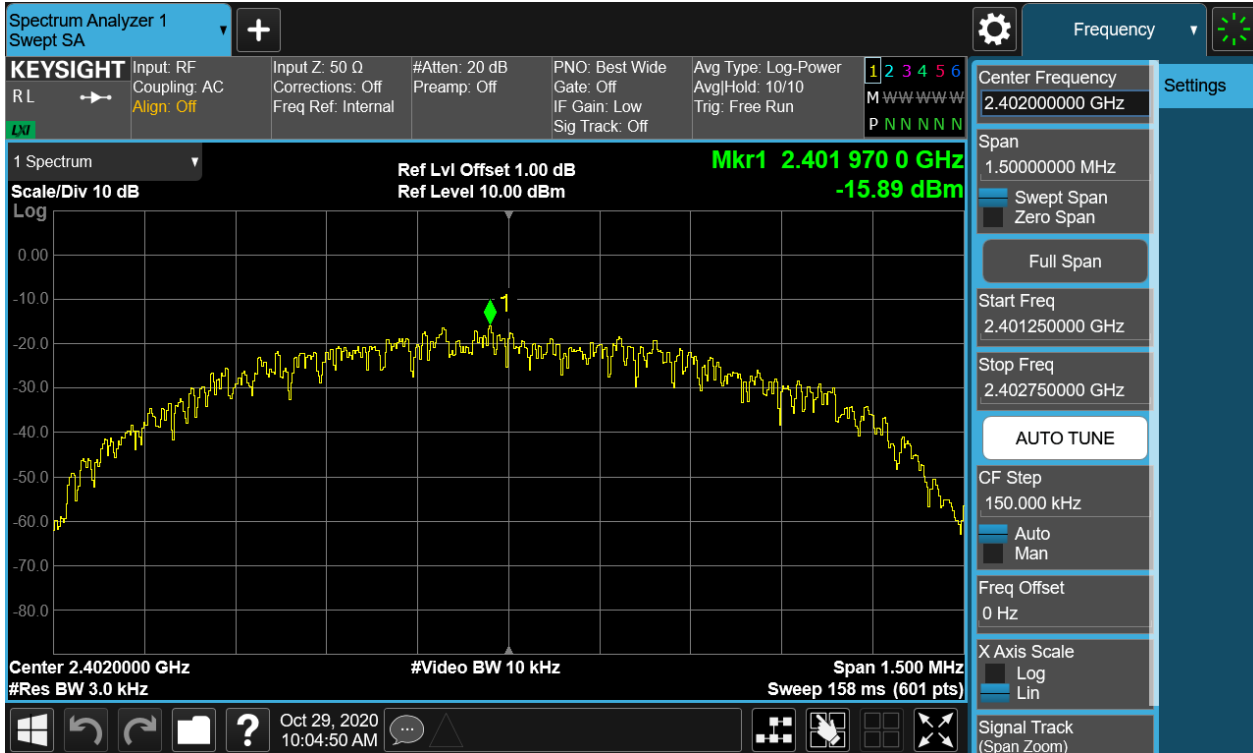
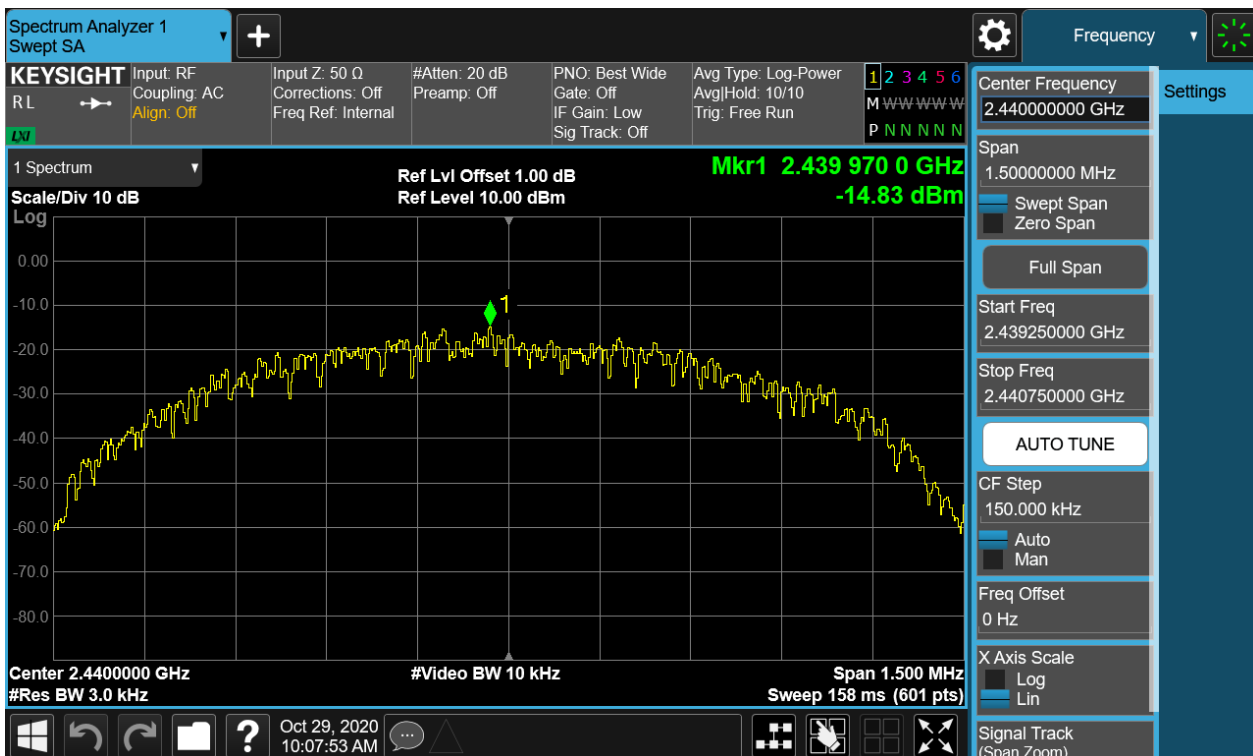


Figure 8: Power Spectral Density, 2440MHz



TEST REPORT

Report No.:

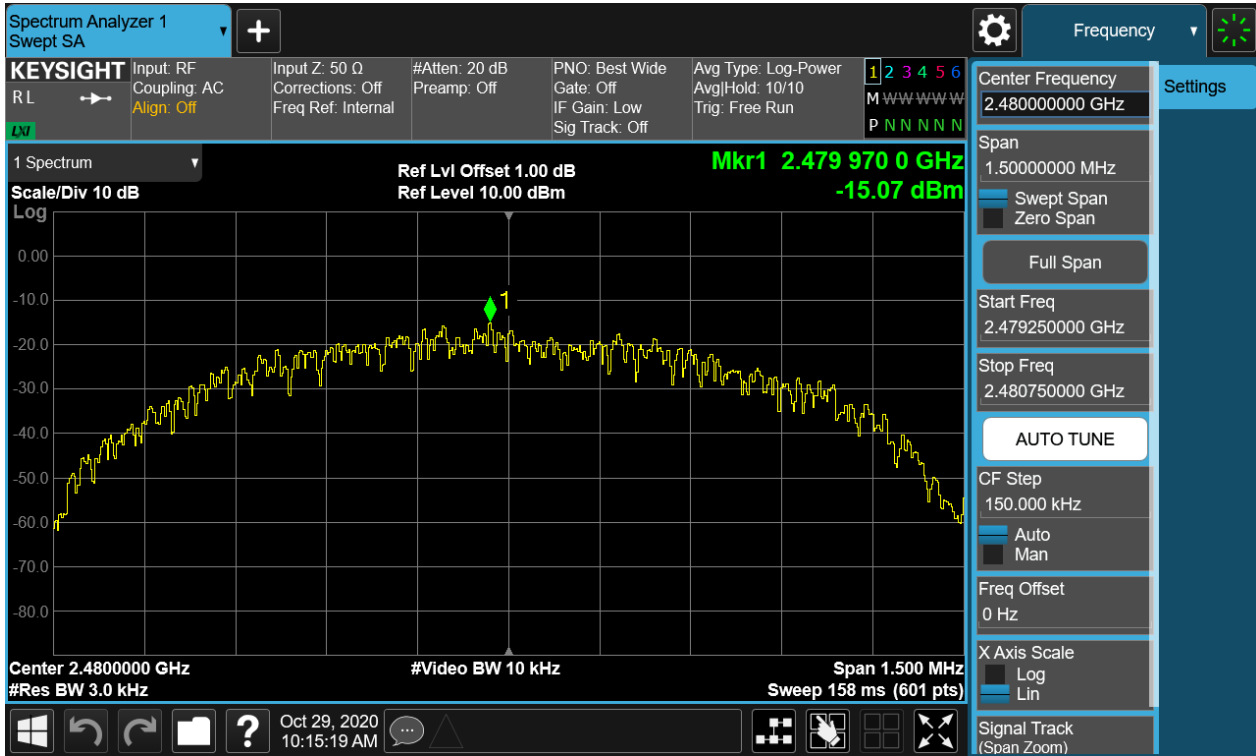
SHE20060042-02FE

Date:

2021-01-15

Page 20 of 36

Figure 9: Power Spectral Density, 2480MHz



TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 21 of 36

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.

TEST REPORT

Report No.: SHE20060042-02FE

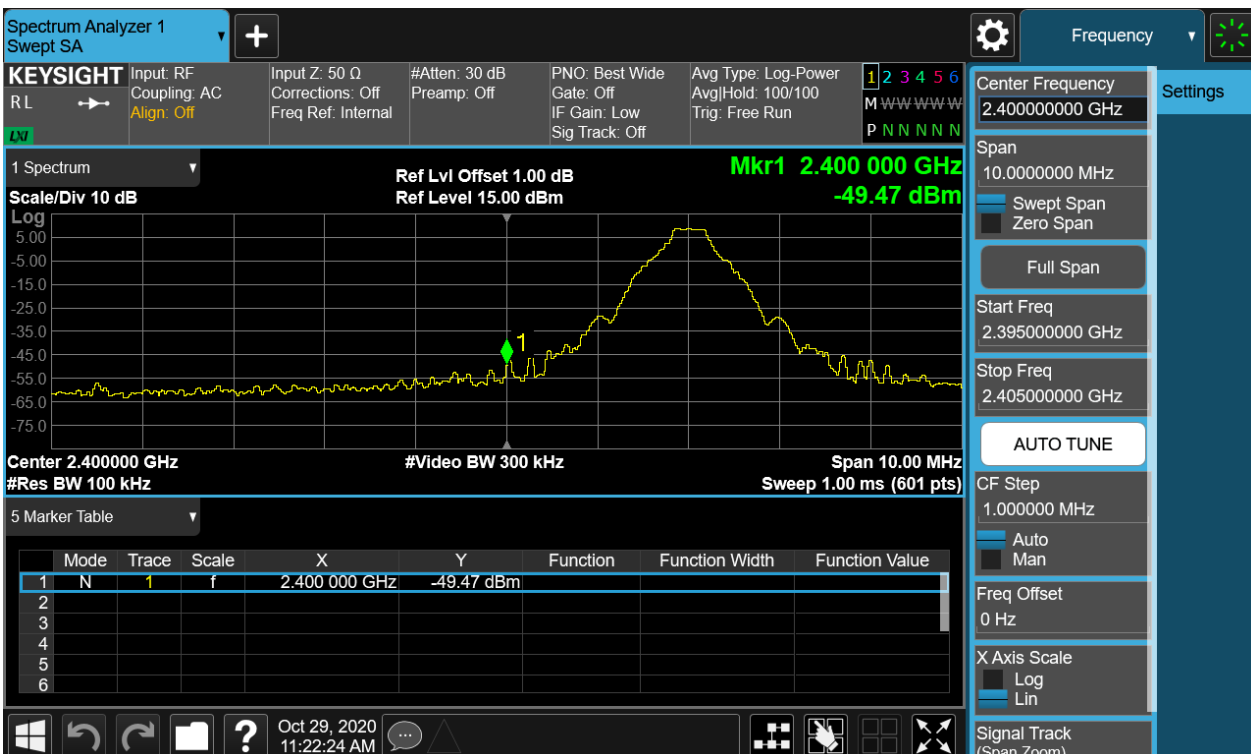
Date: 2021-01-15

Page 22 of 36

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



Band Edge



TEST REPORT

Report No.:

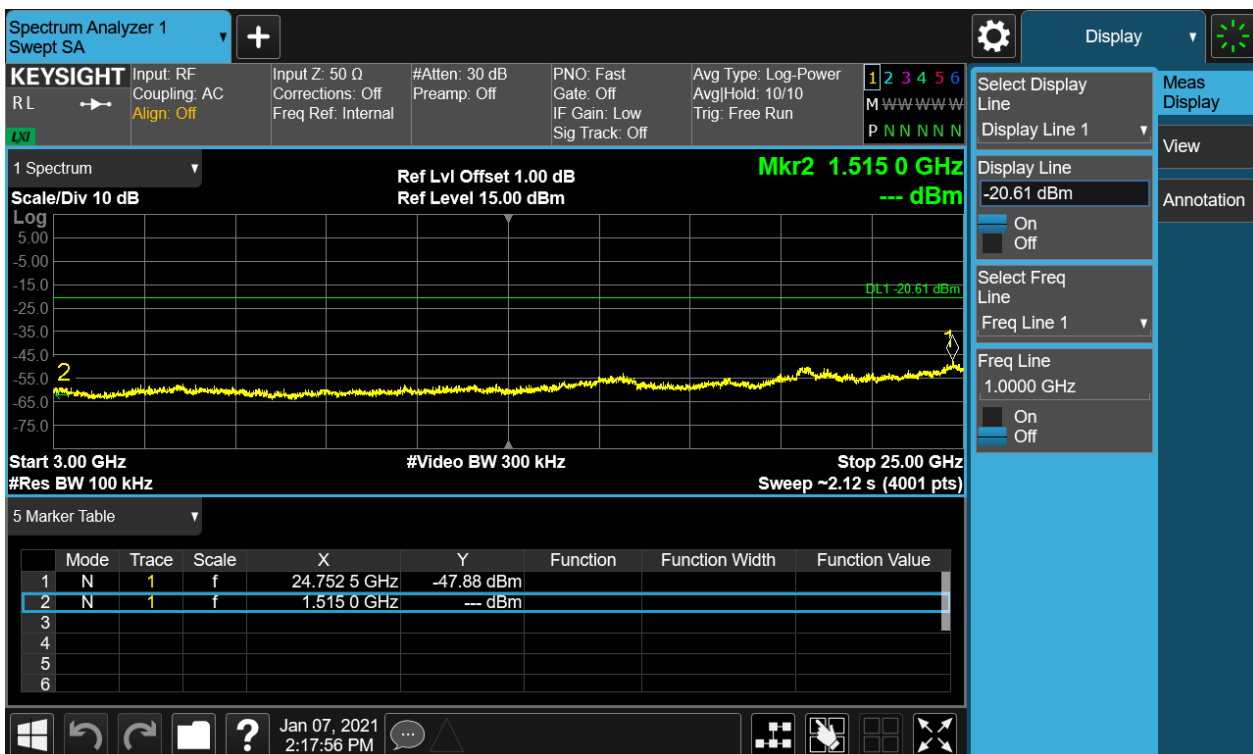
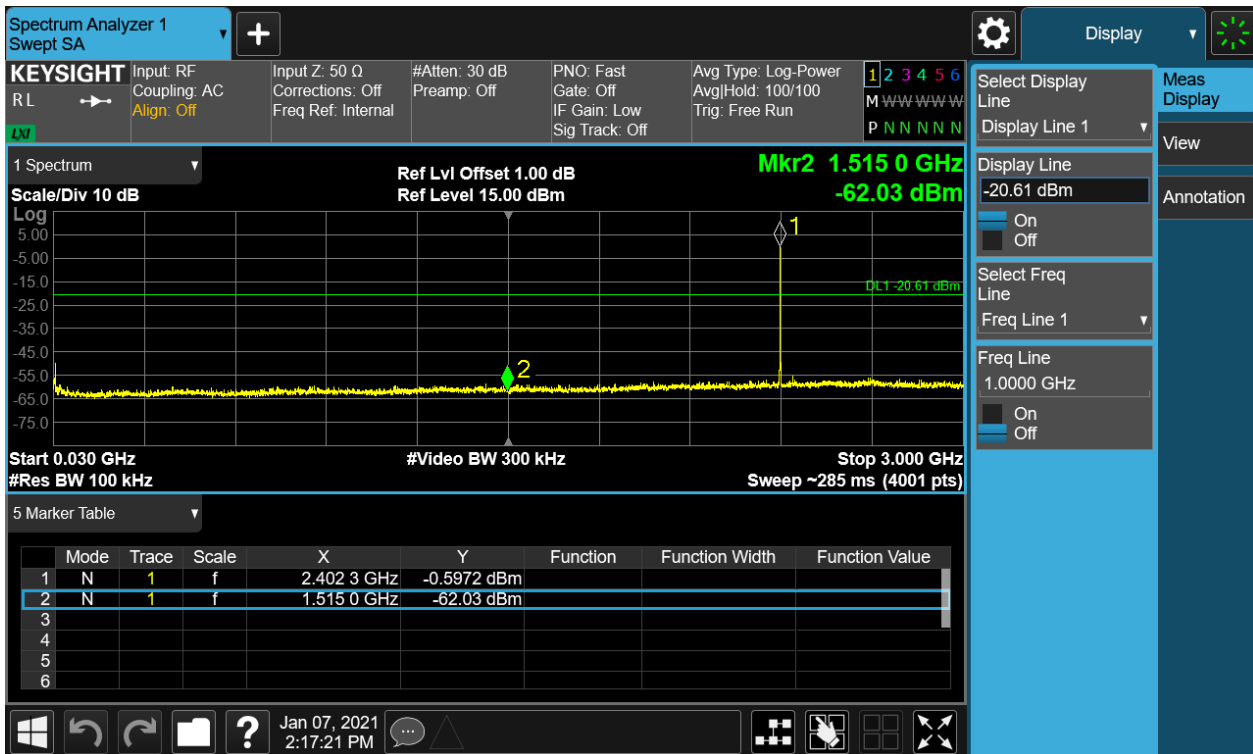
SHE20060042-02FE

Date:

2021-01-15

Page 23 of 36

Conducted spurious emissions 30MHz-25GHz



TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 24 of 36

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



Conducted spurious emissions 30MHz-25GHz

TEST REPORT

Report No.:

SHE20060042-02FE

Date:

2021-01-15

Page 25 of 36

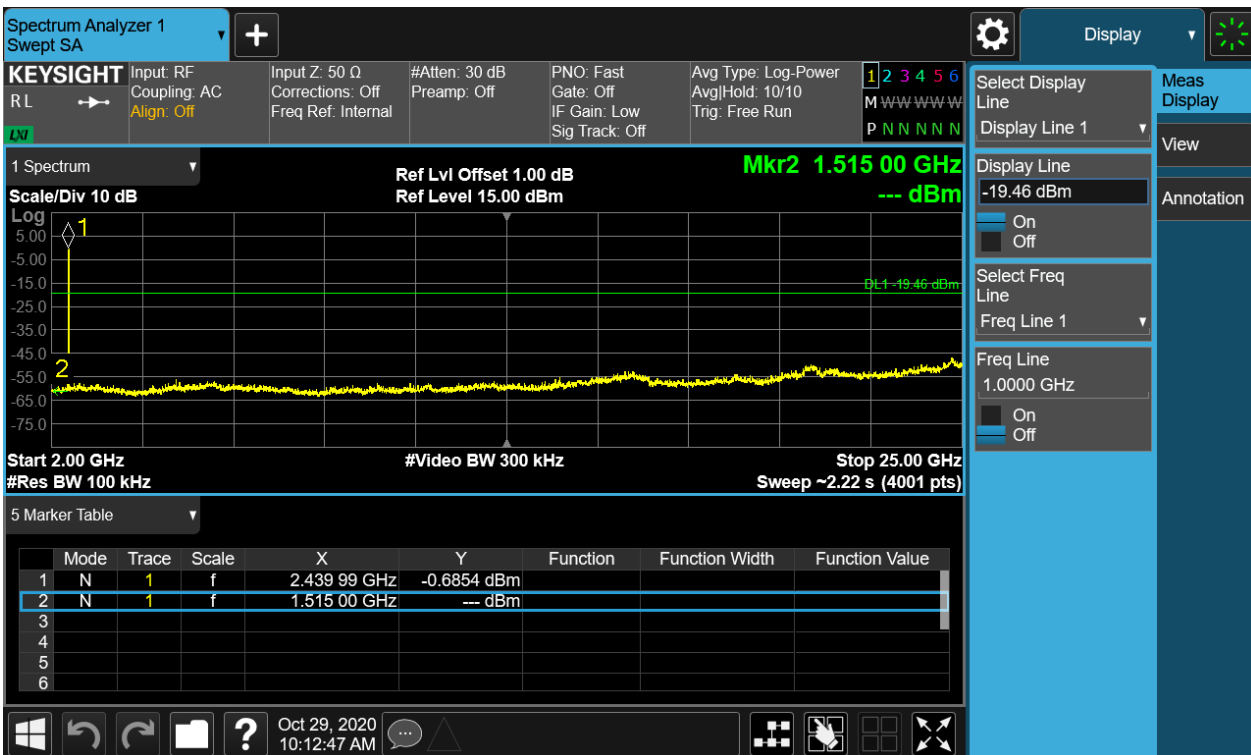
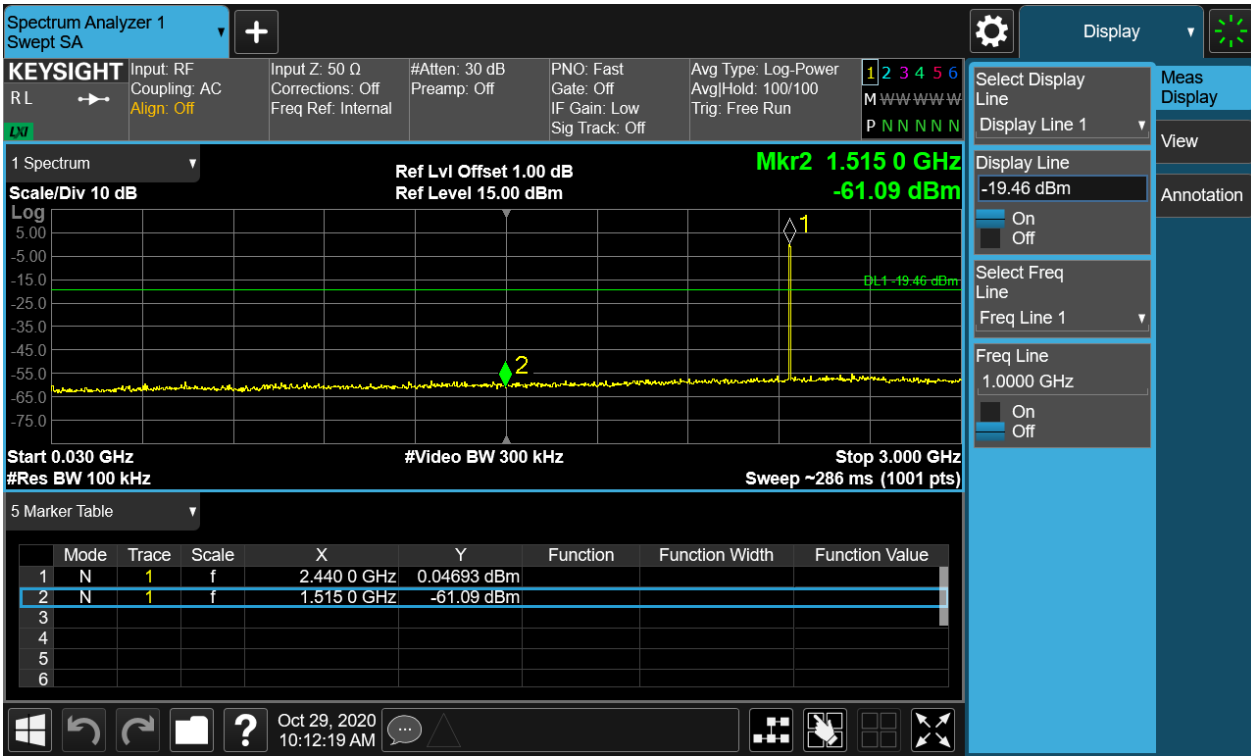


Figure 12: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE Carrier Level

TEST REPORT

Report No.:

SHE20060042-02FE

Date:

2021-01-15

Page 26 of 36



Band Edge

TEST REPORT

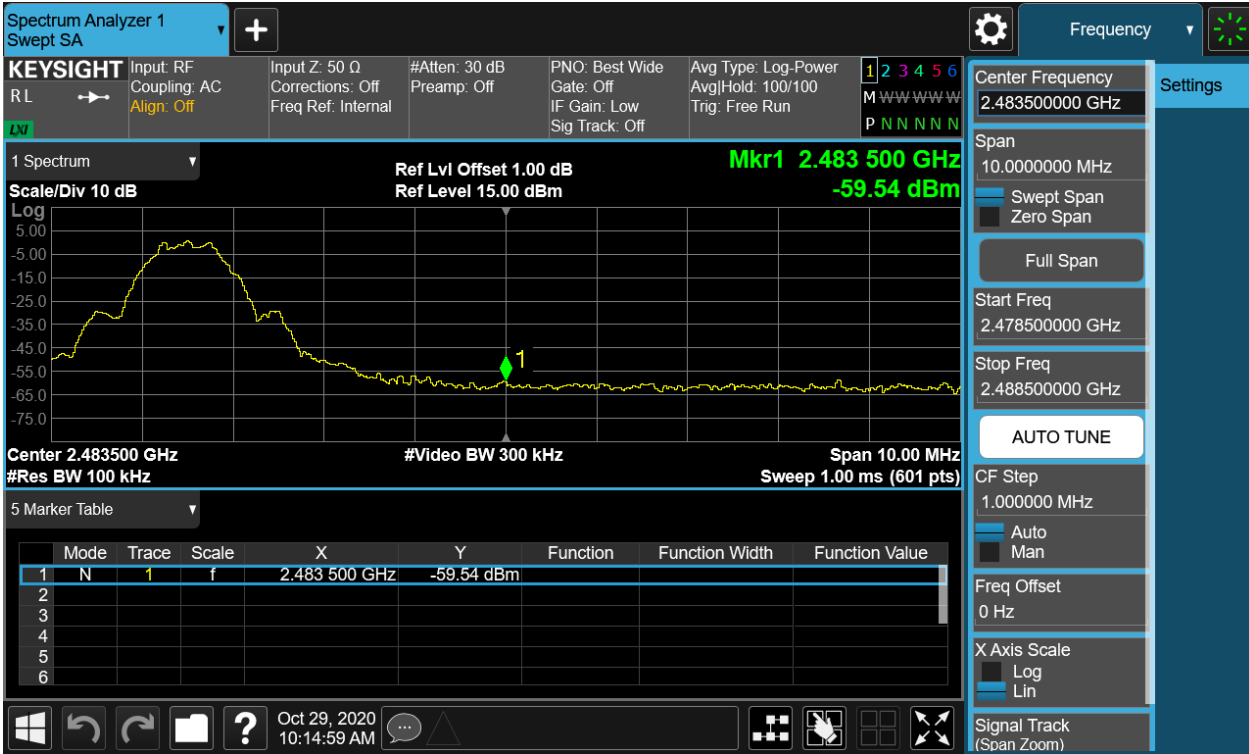
Report No.:

SHE20060042-02FE

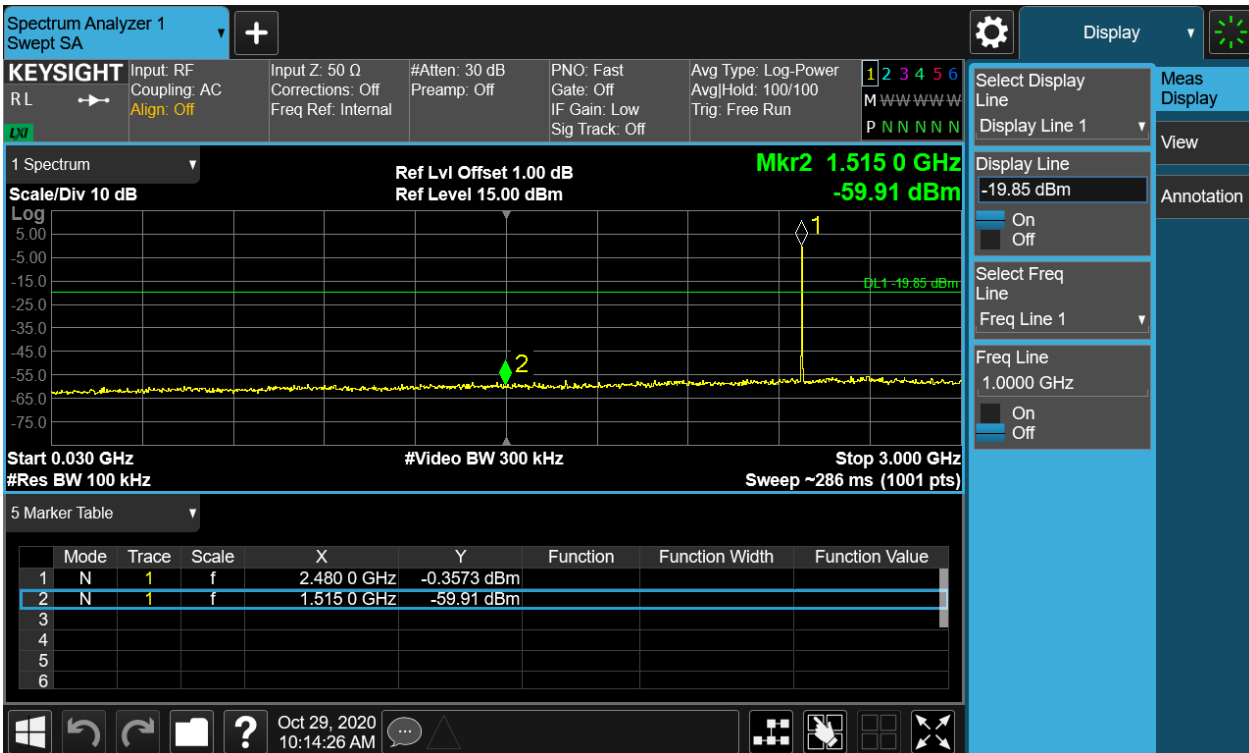
Date:

2021-01-15

Page 27 of 36



Conducted spurious emissions 30MHz-25GHz



TEST REPORT

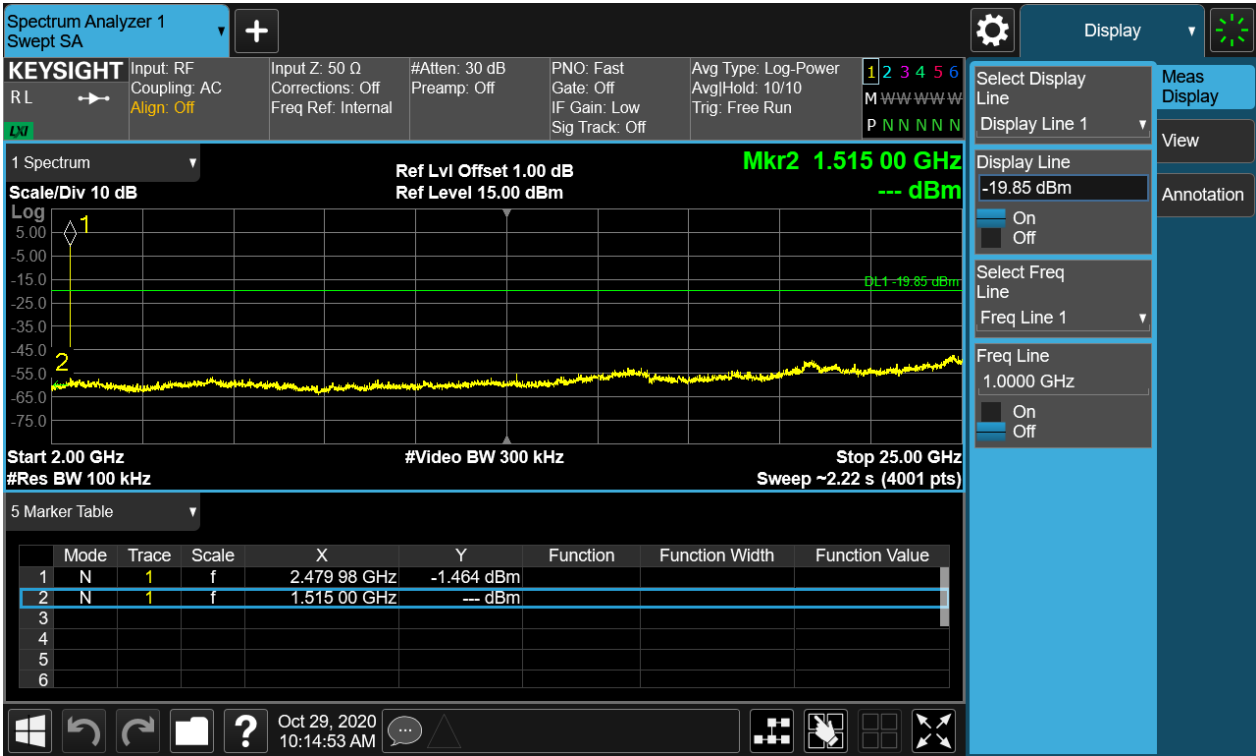
Report No.:

SHE20060042-02FE

Date:

2021-01-15

Page 28 of 36



TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 29 of 36

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 "BLE-TX EXHIBIT A of SHE20060042-02FE".

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.

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 30 of 36

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 "BLE-TX EXHIBIT A of SHE20060042-02FE".

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 31 of 36

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.

TEST REPORT

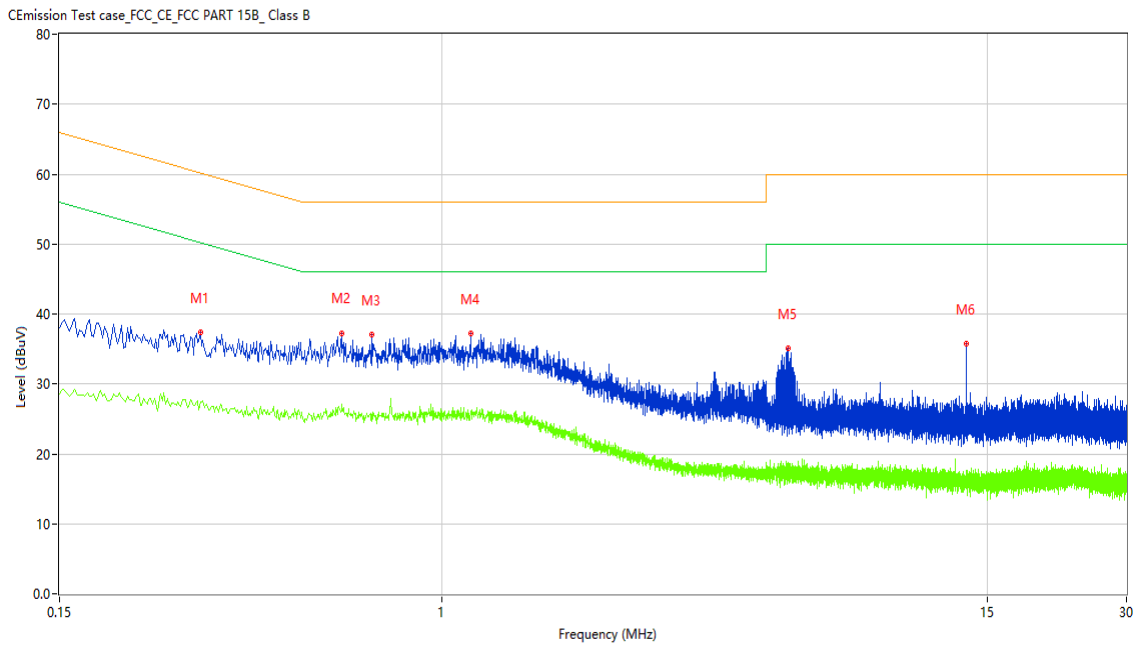
Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 32 of 36

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	0.302	32.46	9.65	60.19	-27.73	Peak	L	Pass
1*	0.302	25.11	9.65	60.19	-35.08	QP	L	Pass
1**	0.302	27.49	9.65	50.19	-22.70	AV	L	Pass
2	0.608	37.30	9.74	56.00	-18.70	Peak	L	Pass
2*	0.608	29.53	9.74	56.00	-26.47	QP	L	Pass
2**	0.608	26.08	9.74	46.00	-19.92	AV	L	Pass
3	0.708	31.73	9.73	56.00	-24.27	Peak	L	Pass
3*	0.708	22.52	9.73	56.00	-33.48	QP	L	Pass
3**	0.708	25.47	9.73	46.00	-20.53	AV	L	Pass
4	1.154	29.54	9.67	56.00	-26.46	Peak	L	Pass
4*	1.154	22.05	9.67	56.00	-33.95	QP	L	Pass
4**	1.154	26.09	9.67	46.00	-19.91	AV	L	Pass
5	5.598	26.52	9.70	60.00	-33.48	Peak	L	Pass
5*	5.598	18.23	9.70	60.00	-41.77	QP	L	Pass
5**	5.598	17.56	9.70	50.00	-32.44	AV	L	Pass
6	13.570	46.00	9.60	60.00	-14.00	Peak	L	Pass
6*	13.570	27.46	9.60	60.00	-32.54	QP	L	Pass
6**	13.570	17.67	9.60	50.00	-32.33	AV	L	Pass

TEST REPORT

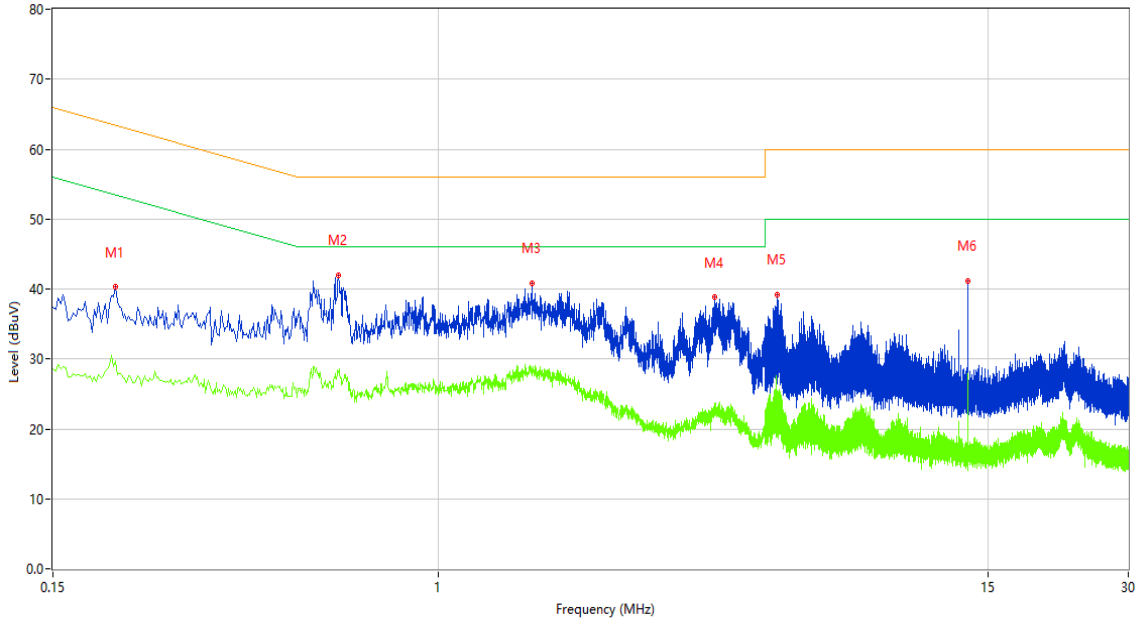
Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 33 of 36

Figure 14: Conducted Emission on AC Mains, N Phase

CEmission Test case_FCC_CE_FCC PART 15B_Class B



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.204	37.29	9.66	63.45	-26.16	Peak	N	Pass
1*	0.204	33.10	9.66	63.45	-30.35	QP	N	Pass
1**	0.204	29.71	9.66	53.45	-23.74	AV	N	Pass
2	0.612	41.41	9.76	56.00	-14.59	Peak	N	Pass
2*	0.612	36.92	9.76	56.00	-19.08	QP	N	Pass
2**	0.612	28.10	9.76	46.00	-17.90	AV	N	Pass
3	1.590	38.34	9.67	56.00	-17.66	Peak	N	Pass
3*	1.590	31.56	9.67	56.00	-24.44	QP	N	Pass
3**	1.590	28.65	9.67	46.00	-17.35	AV	N	Pass
4	3.910	38.88	9.68	56.00	-17.12	Peak	N	Pass
4*	3.910	32.29	9.68	56.00	-23.71	QP	N	Pass
4**	3.910	23.74	9.68	46.00	-22.26	AV	N	Pass
5	5.310	39.16	9.70	60.00	-20.84	Peak	N	Pass
5*	5.310	32.05	9.70	60.00	-27.95	QP	N	Pass
5**	5.310	23.46	9.70	50.00	-26.54	AV	N	Pass
6	13.634	44.29	9.58	60.00	-15.71	Peak	N	Pass
6*	13.634	26.18	9.58	60.00	-33.82	QP	N	Pass
6**	13.634	27.93	9.58	50.00	-22.07	AV	N	Pass

TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 34 of 36

5 Appendixes

5.1 Photographs of the Sample



Front of the sample



Rear of the sample

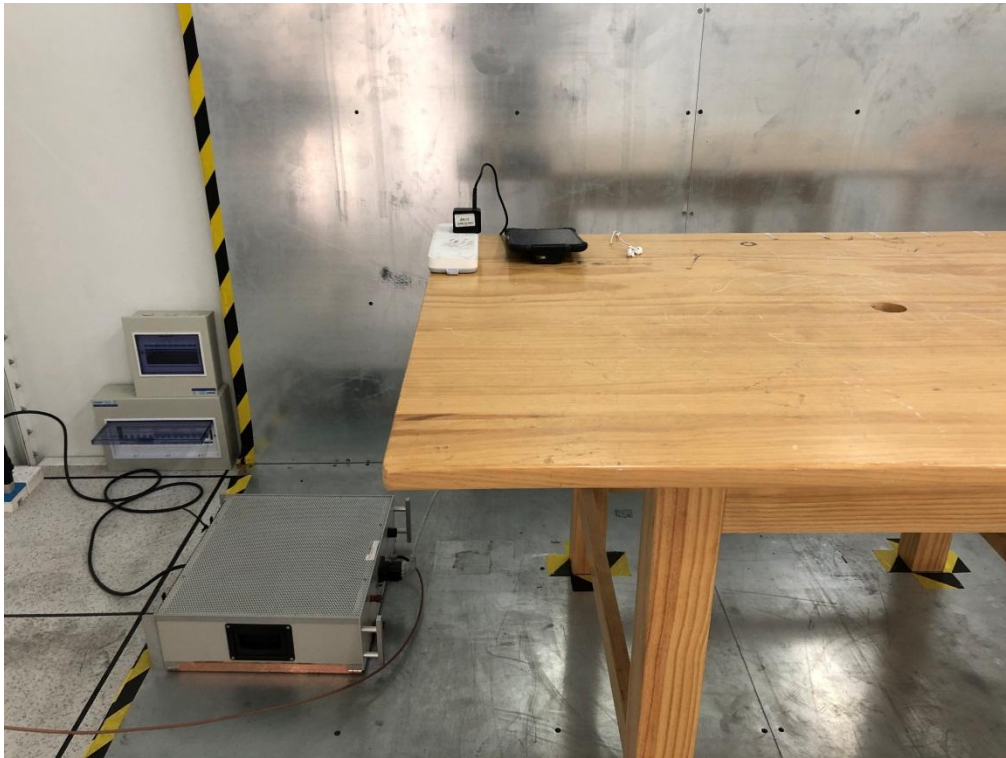
TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 35 of 36

5.2 Set-up for Conducted Emissions



5.3 Set-up for Conducted RF test at Antenna Port



TEST REPORT

Report No.: SHE20060042-02FE

Date: 2021-01-15

Page 36 of 36

5.4 Set-up for Spurious Emissions below 1GHz



Below 1 GHz

5.5 Set-up for Spurious Emissions above 1GHz



Above 1GHz

End of the report