

TEST REPORT

Report No.: SHE21040017-02AE

Date: 2021-05-17

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Applicant : Home Tech Innovation, Inc
Address of Applicant : 1035 Cambridge St, Suite 11A, Cambridge, MA 02141

Product Name : Suvie Kitchen Robot
Model No. : S020M
Sample No. : E21040017-01#01
FCC ID : 2AT2K-S020M

Standards : FCC CFR47 Part 15, Subpart C

Date of Receipt : 2021-04-26
Date of Test : 2021-04-26 ~ 2021-05-17
Date of Issue : 2021-05-17

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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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	Home Tech Innovation, Inc
Address	1035 Cambridge St, Suite 11A, Cambridge, MA 02141
Contact Person	Kevin Incorvia
Telephone	+1 617 800 5336
Email	kincorvia@suvie.com
Manufacturer Company Name	Home Tech Innovation, Inc
Address	1035 Cambridge St, Suite 11A, Cambridge, MA 02141

1.3 Details of EUT

Product Name	Suvie Kitchen Robot
Brand Name	Suvie
Test Model No.	S020M
FCC ID	2AT2K-S020M
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	3.42dBi
Test Voltage	AC 120V
Hardware version	S020M1.0.1
Software version	fw
RF power setting in TEST SW	ESP

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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	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.

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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 and 99% 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	2020-08-19	2021-08-18
Spectrum Analyzer	Rohde & Schwarz	FSV40N	101450	2020-06-09	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESPI3	100173	2020-06-09	2021-06-08
EMI Test Receiver	Rohde & Schwarz	ESR 7	101911	2020-06-09	2021-06-08
V-network	SCHWARZBECK	NSLK 8127	8127-902	2020-07-29	2021-07-28
Wideband Radio Communication Tester	Rohde & Schwarz	CMW 500	100687	2020-08-19	2021-08-18
Broadband Antenna	SCHWARZBECK	VULB9163	9163-1037	2020-06-09	2021-06-08
Horn Antenna-18G	SCHWARZBECK	BBHA9120D	9120D-1775	2020-07-29	2021-07-28
Loop Antenna	SCHWARZBECK	FMZB 1513	N/A	2020-11-23	2021-11-22
Horn Antenna-40G	YINGLIAN	LB-180400-KF	N/A	2020-07-27	2021-07-26
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	2021-06-08
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

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
Conducted Emission on AC Mains	9 kHz to 30 MHz	± 1.96 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	N/A	ESP

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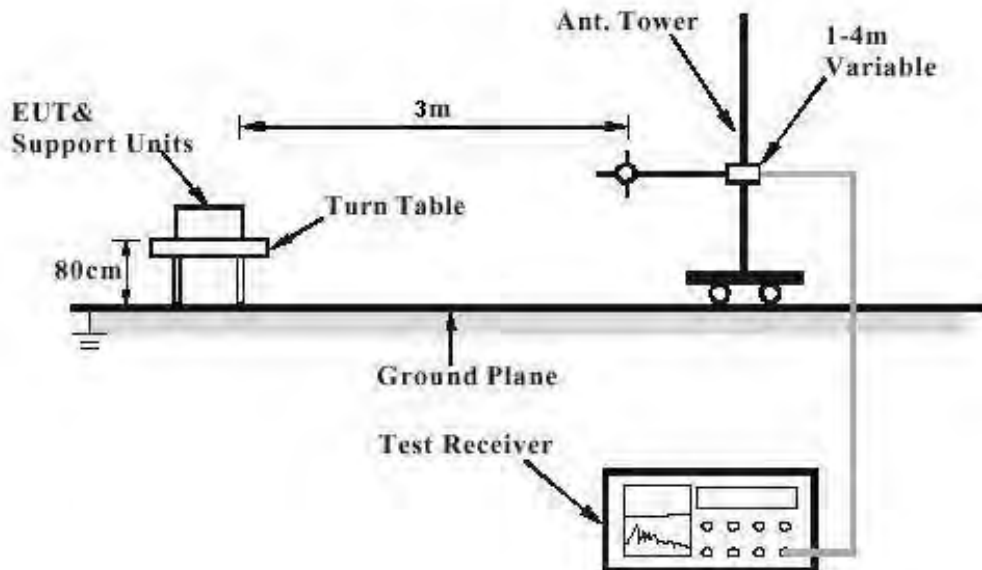
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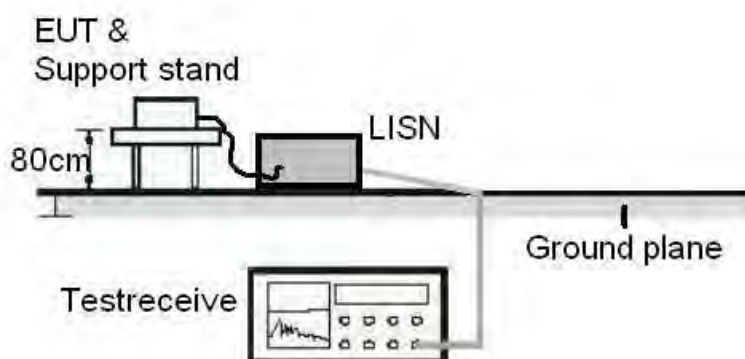
3.4 Test Setup Diagram

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



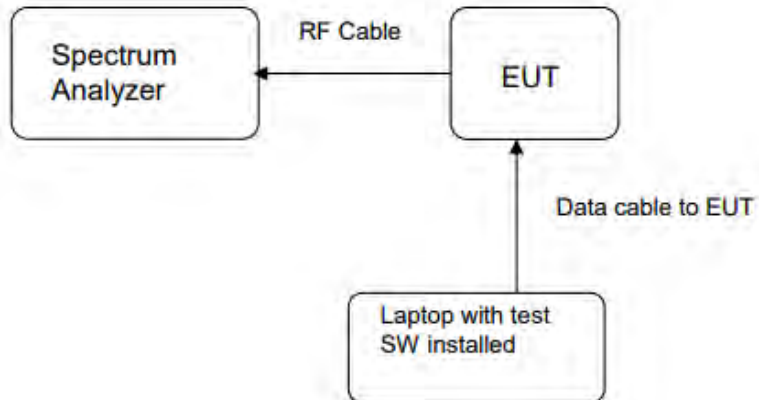
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Diagram of Measurement Equipment Configuration for Transmitter Measurement



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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
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 3.42 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

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 : 25°C
Relative humidity : 52%

Table 1: Peak Output Power

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(mW)	
BLE	2402	0.04	1.01	≤ 1
	2440	0.95	1.24	
	2480	1.06	1.28	

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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)
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 2: 6dB Bandwidth and 99% Bandwidth

Test Mode	Test Channel (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	6dB Bandwidth Limit
BLE	2402	0.6687	1.0179	≥ 0.5 MHz
	2440	0.6104	1.0202	
	2480	0.6521	1.0026	

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



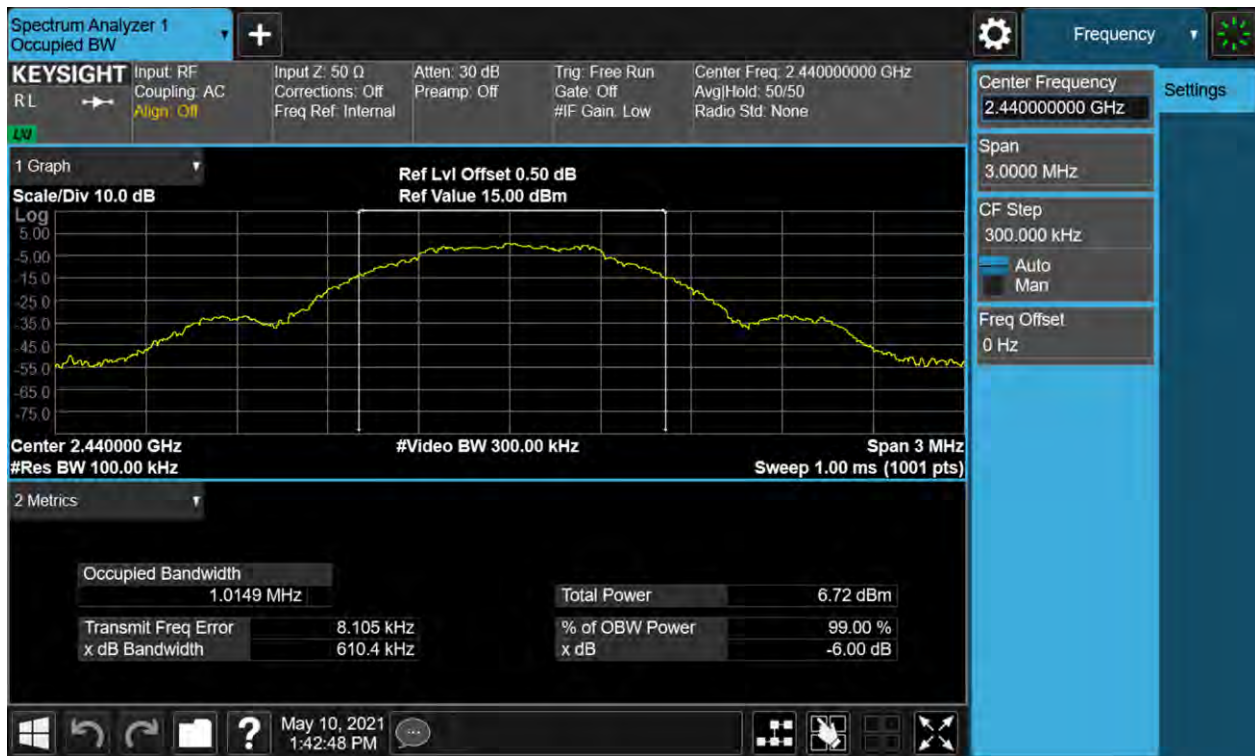
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Figure 5: 6dB Bandwidth and 99% Bandwidth, 2440MHz



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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)
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: Power Spectral Density

Test Mode	Test Channel (MHz)	Measured Result (dBm/3kHz)	Limit (dBm/3kHz)
BLE	2402	-16.08	≤ 8
	2440	-15.26	
	2480	-14.92	

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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	: 25C
Relative humidity	: 52%

For details refer to following test plot.

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



Band Edge



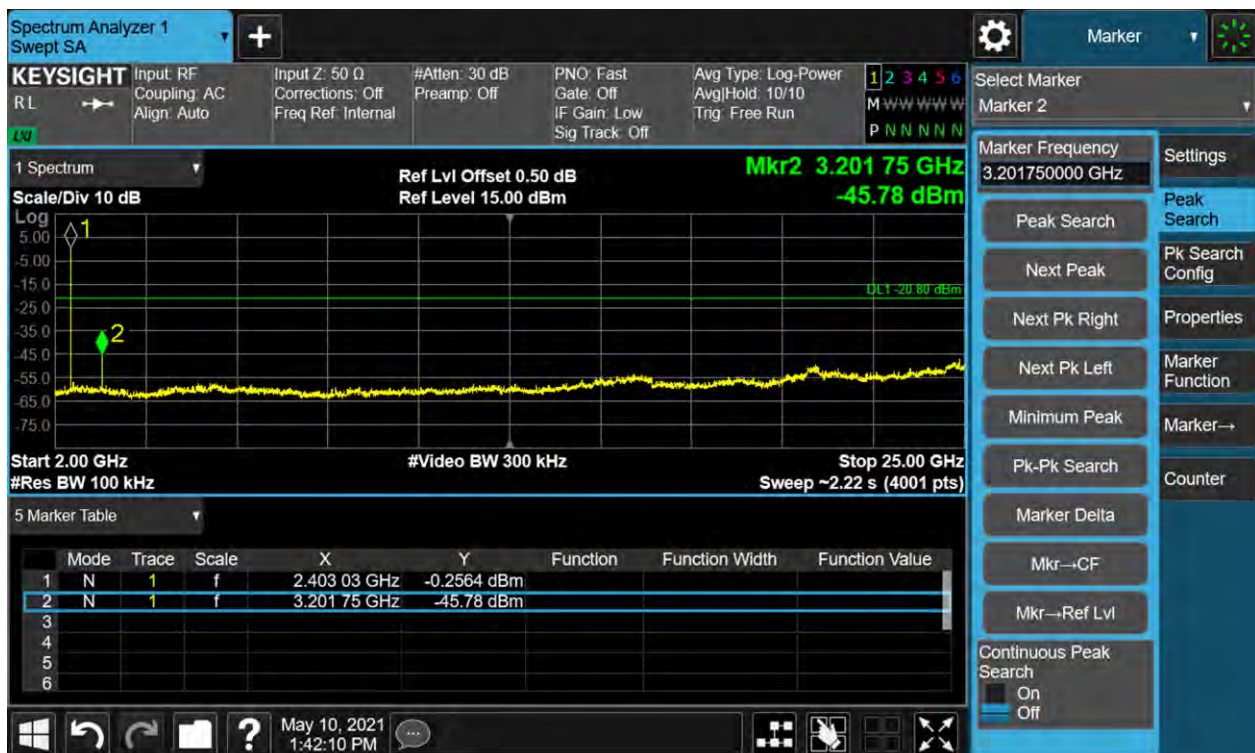
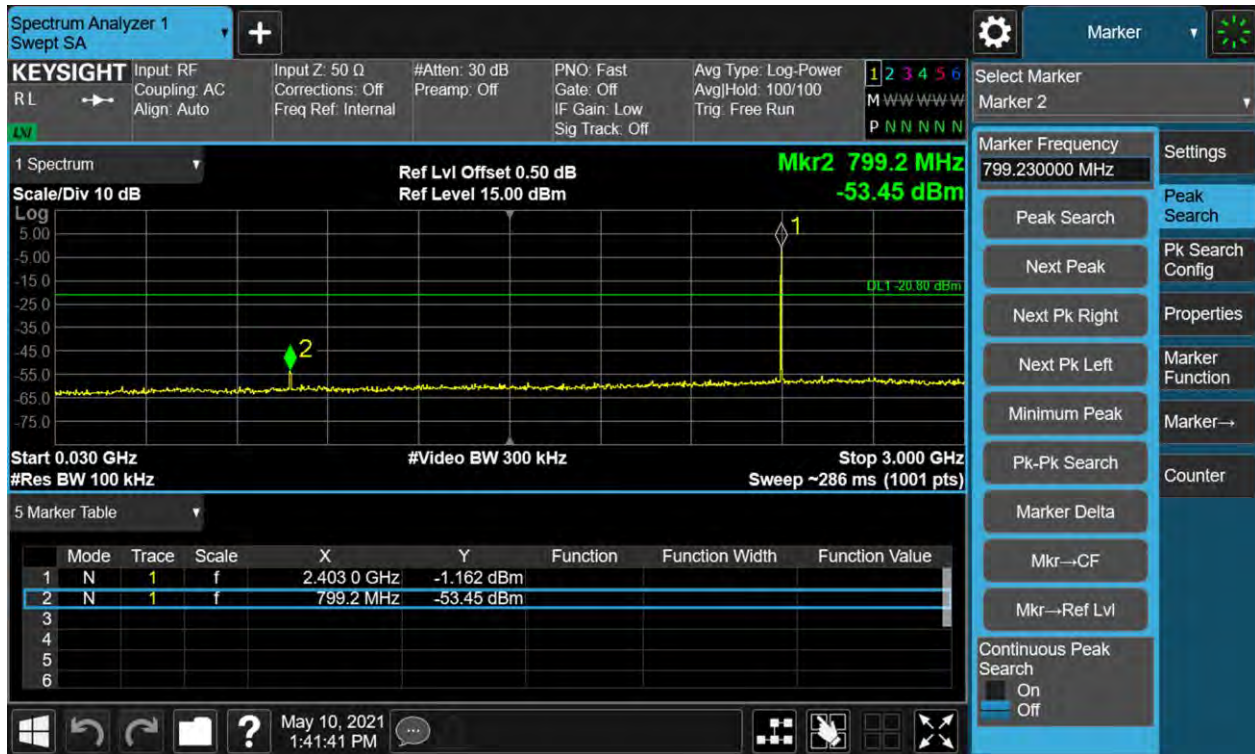
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Conducted spurious emissions 30MHz-25GHz



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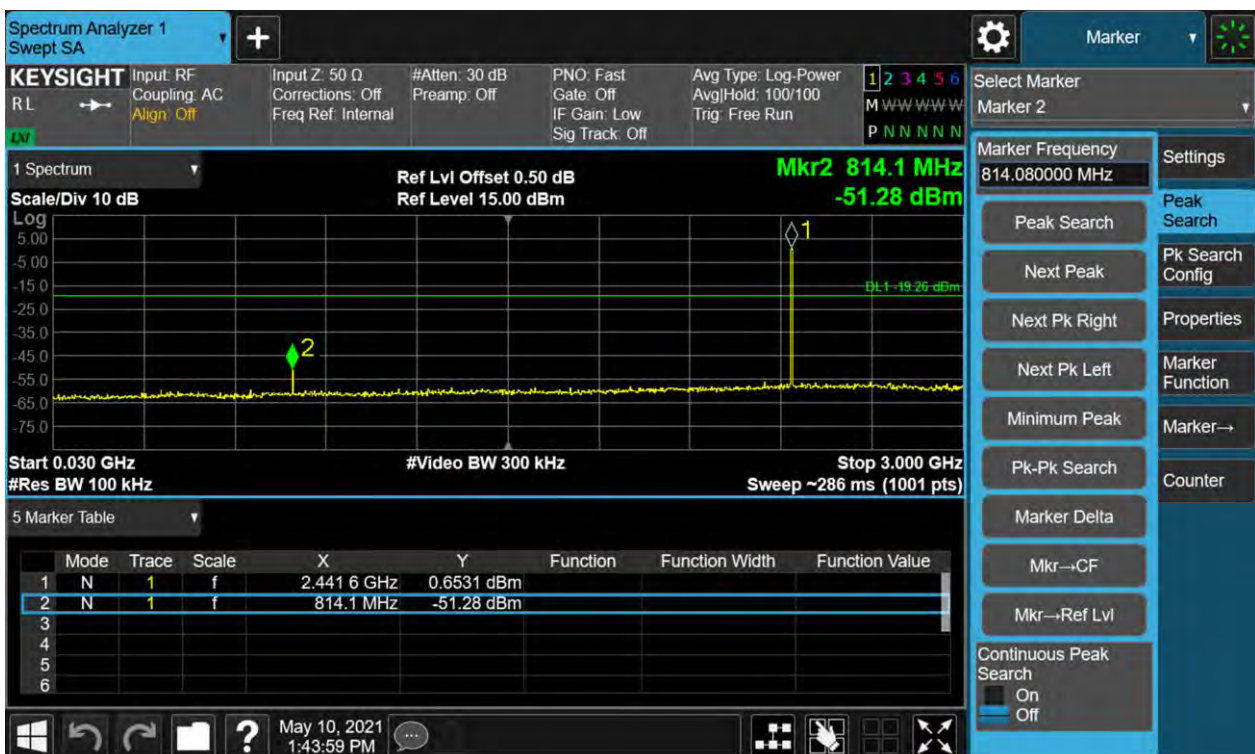
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Figure 11: Conducted Spurious Emission & Authorized-band band-edge, 2440MHz, BLE Carrier Level



Conducted spurious emissions 30MHz-25GHz



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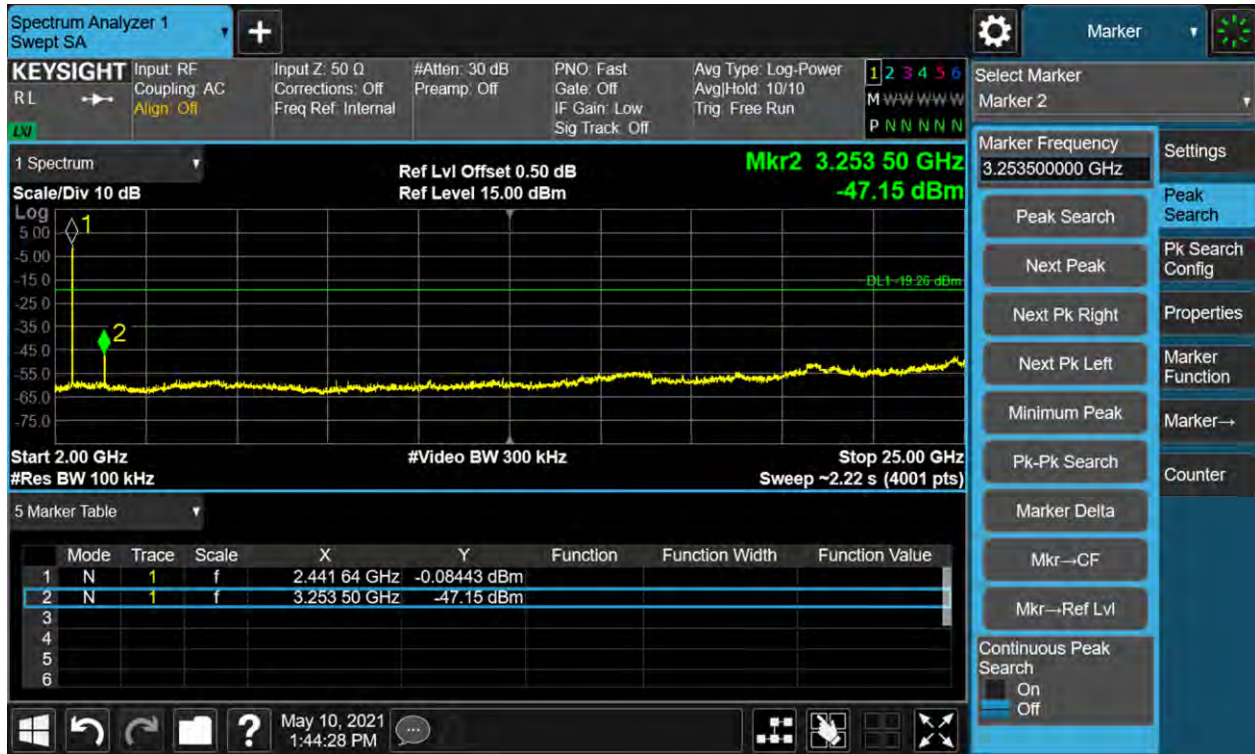


Figure 12: Conducted Spurious Emission & Authorized-band band-edge, 2480MHz, BLE Carrier Level



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Band Edge



Conducted spurious emissions 30MHz-25GHz

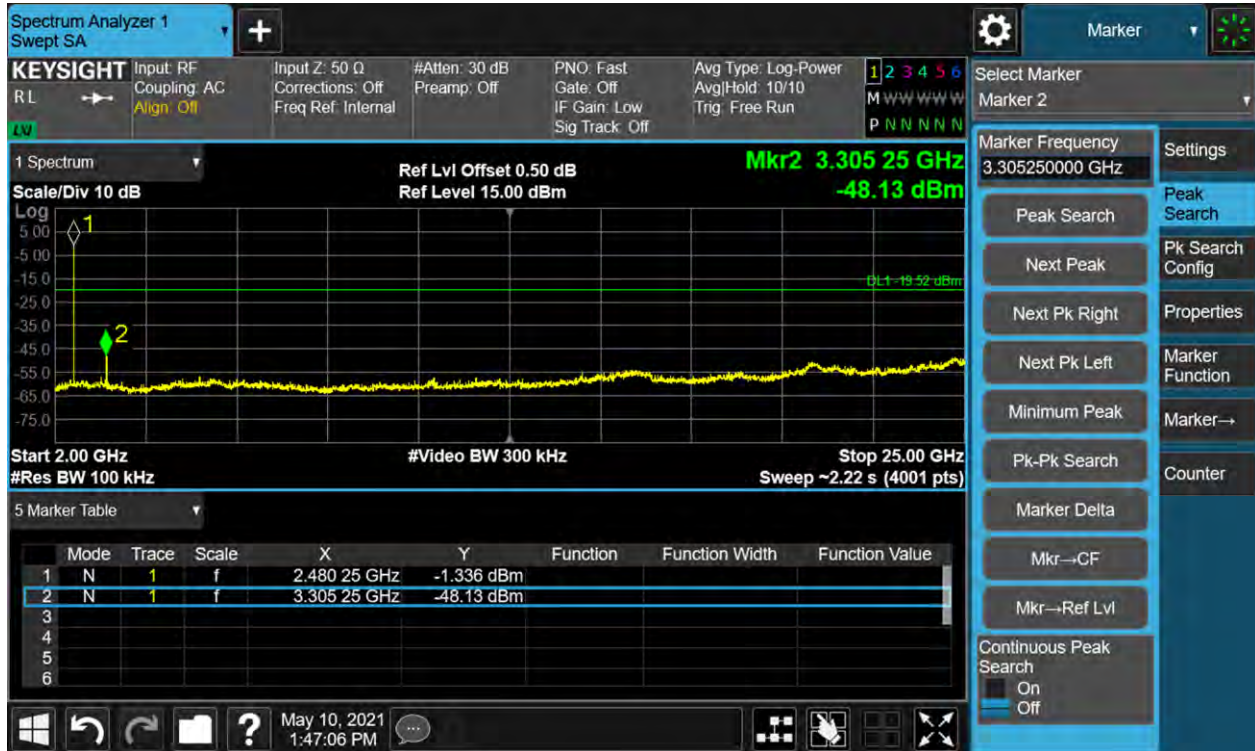


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4.1.6 Radiated Spurious Emission

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	: 25°C
Relative humidity	: 52%

Notes

Test plots please refer to the annex document "SHE21040017-02AE 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. The EUT is working in the Normal link mode below 1 GHz.
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	: 25°C
Relative humidity	: 52%

Notes

Test plots please refer to the annex document "SHE21040017-02AE 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	: 25°C
Relative humidity	: 52%

For details refer to following test plot.

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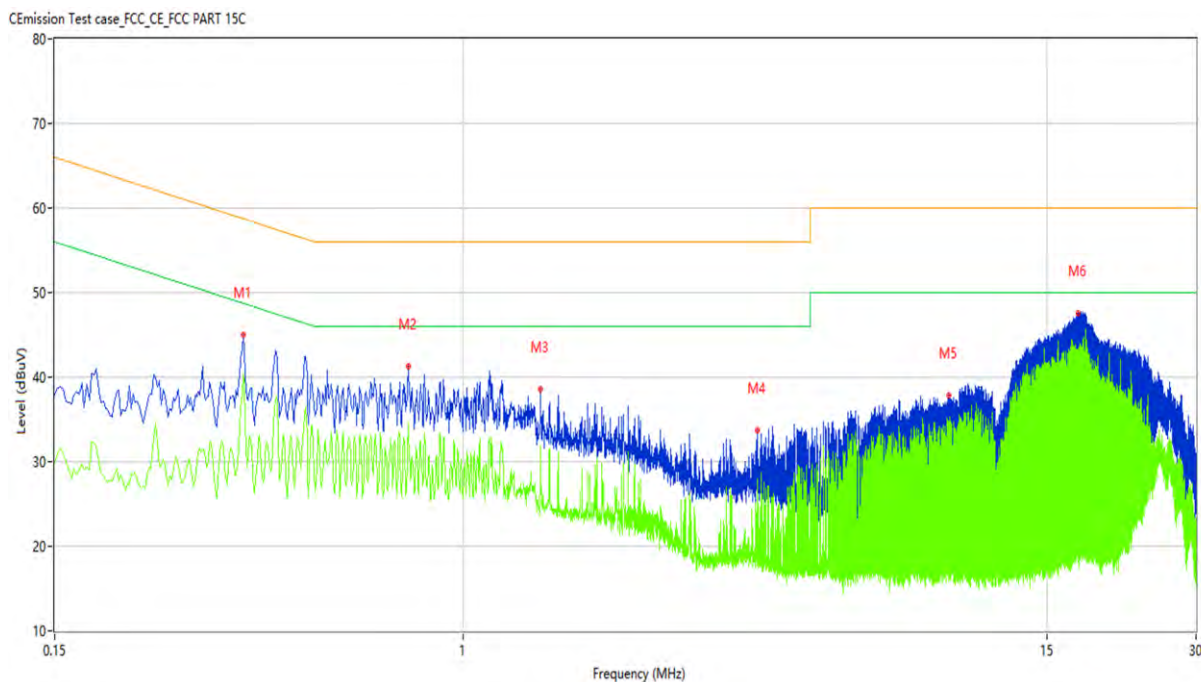
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Note: The all configurations were tested respectively, but only the worst configuration shown here.

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	0.360	43.83	9.72	58.73	-14.90	Peak	L	Pass
1*	0.360	40.96	9.72	58.73	-17.77	QP	L	Pass
1**	0.360	40.35	9.72	48.73	-8.38	AV	L	Pass
2	0.774	39.72	9.75	56.00	-16.28	Peak	L	Pass
2*	0.774	36.18	9.75	56.00	-19.82	QP	L	Pass
2**	0.774	34.61	9.75	46.00	-11.39	AV	L	Pass
3	1.430	34.47	9.67	56.00	-21.53	Peak	L	Pass
3*	1.430	29.71	9.67	56.00	-26.29	QP	L	Pass
3**	1.430	31.90	9.67	46.00	-14.10	AV	L	Pass
4	3.918	33.88	9.68	56.00	-22.12	Peak	L	Pass
4*	3.918	25.85	9.68	56.00	-30.15	QP	L	Pass
4**	3.918	28.03	9.68	46.00	-17.97	AV	L	Pass
5	9.506	37.21	9.66	60.00	-22.79	Peak	L	Pass
5*	9.506	34.11	9.66	60.00	-25.89	QP	L	Pass
5**	9.506	34.74	9.66	50.00	-15.26	AV	L	Pass
6	17.322	47.80	9.49	60.00	-12.20	Peak	L	Pass
6*	17.322	44.79	9.49	60.00	-15.21	QP	L	Pass
6**	17.322	41.59	9.49	50.00	-8.41	AV	L	Pass

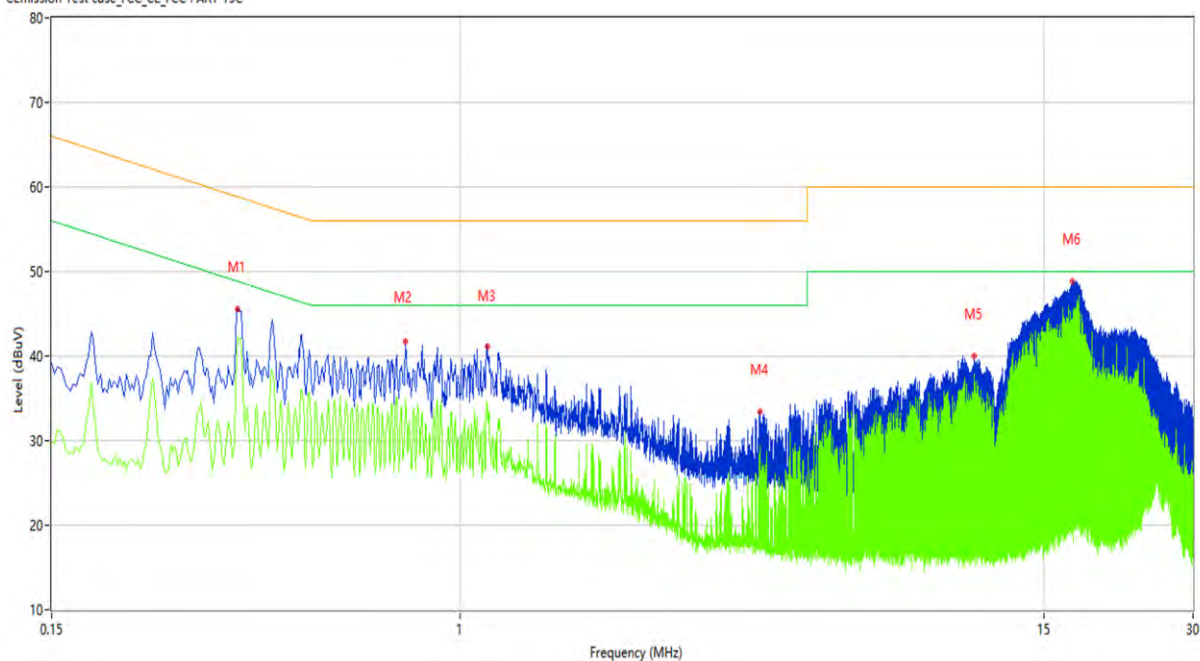
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C:Emission Test case_FCC_CE_FCC PART 15C



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Over Limit (dB)	Detector	Line	Verdict
1	0.356	45.87	9.72	58.82	-12.95	Peak	N	Pass
1*	0.356	43.17	9.72	58.82	-15.65	QP	N	Pass
1**	0.356	42.30	9.72	48.82	-6.52	AV	N	Pass
2	0.774	39.85	9.75	56.00	-16.15	Peak	N	Pass
2*	0.774	36.75	9.75	56.00	-19.25	QP	N	Pass
2**	0.774	33.67	9.75	46.00	-12.33	AV	N	Pass
3	1.136	38.98	9.66	56.00	-17.02	Peak	N	Pass
3*	1.136	33.65	9.66	56.00	-22.35	QP	N	Pass
3**	1.136	32.86	9.66	46.00	-13.14	AV	N	Pass
4	4.018	32.57	9.68	56.00	-23.43	Peak	N	Pass
4*	4.018	27.62	9.68	56.00	-28.38	QP	N	Pass
4**	4.018	29.36	9.68	46.00	-16.64	AV	N	Pass
5	10.862	39.14	9.65	60.00	-20.86	Peak	N	Pass
5*	10.862	36.36	9.65	60.00	-23.64	QP	N	Pass
5**	10.862	37.93	9.65	50.00	-12.07	AV	N	Pass
6	17.158	48.81	9.49	60.00	-11.19	Peak	N	Pass
6*	17.158	46.20	9.49	60.00	-13.80	QP	N	Pass
6**	17.158	43.42	9.49	50.00	-6.58	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