RF Test Report

For

Globe Electric Company Inc.

Test Standards:	Part 15C Subpart C §15.247 IC RSS-247 Issue 2
Product Name:	Wi-Fi Smart Outdoor Power Adapter
Tested Model:	50333
Brand Name:	Globe
FCC ID:	2AQUQGE50333
IC:	8290A-GE50333
Classification	(DTS) Digital Transmission System
Report No.:	EC2109022RF02
Tested Date:	2021-09-16 to 2021-12-02
Issued Date:	2021-12-02
Prepared By:	Jack Liu / Engineer
Approved By:	Tiny Yang / RF Manager

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Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	2021.12.02	Valid	Update the PCB board based on the original report EC2011039RF02+A1, replace non-RF components for verification test

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Summary of Test RESULT

FCC Rule	IC Rule	Description	Limit	Result	Remark
15.247(d)	RSS-247 5.5	Conducted Band Edges and Spurious Emission	≤ 20dBc	Pass	-
15.247(d)	RSS-247 5.5	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d) RSS-247 5.5 & RSS-Gen Table 5 , Table 6	Pass	Under limit 7.72 dB at 59.232 MHz
15.207	RSS-GEN 8.8	AC Conducted Emission	15.207(a) RSS-GEN 8.8 Table 4	Pass	Under limit 5.63 dB at 0.437 MHz

1. Test Laboratory

1.1 Test facility

CNAS (accreditation number:L11138)

Hunan Ecloud Testing Technology Co., Ltd. has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS).

FCC (Designation number:CN1244 , Test Firm Registration Number:793308)

Hunan Ecloud Testing Technology Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

ISED(CAB identifier: CN0012, ISED# :24347)

Hunan Ecloud Testing Technology Co., Ltd. has been listed on the Wireless Device Testing Laboratories list of innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements.

A2LA (Certificate Number:4895.01)

Hunan Ecloud Testing Technology Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

2. General Description

2.1 Applicant

Globe Electric Company Inc.
150 Oneida, Montreal, Quebec, Canada, H9R 1A8

2.2 Manufacturer

Globe Electric Company Inc.
150 Oneida, Montreal, Quebec, Canada, H9R 1A8

2.3 General Description Of EUT

Product	Wi-Fi Smart Outdoor Power Adapter
Model No.	50333
Brand Name	Globe
Additional No.	N/A
Difference Description	N/A
FCC ID	2AQUQGE50333
IC	8290A-GE50333
Power Supply	125Vac
Modulation Technology	BLE
Modulation Type	GFSK
Operating Frequency	2402MHz~2480MHz
Number Of Channel	40
Antenna Type	PCB Antenna type with -1dBi gain
HW Version	V0.2
SW Version	smart_plug 1.0-alpha
I/O Ports	Refer to user's manual

NOTE:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.
2. For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.
3. *: Pre-test AC120V and AC125V, only the worst AC125V test data is recorded in the report

2.4 Modification of EUT

No modifications are made to the EUT during all test items.

2.5 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- ANSI C63.10-2013
- KDB 558074 D01 15.247 Meas Guidance v05r02
- IC RSS-247 Issue 2
- IC RSS-Gen Issue 5

Remark:

1. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B&ICES-003, recorded in a separate test report.

3. Test Configuration of Equipment Under Test

3.1 Descriptions of Test Mode

The transmitter has a maximum peak conducted output power as follows:

Channel	Frequency	Mode	Bluetooth RF Output Power
Ch00	2402MHz	GFSK	8.71
Ch19	2440MHz	GFSK	7.94
Ch39	2480MHz	GFSK	8.68

a. Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

3.2 Test Mode

3.2.1 Antenna Port Conducted Measurement

Summary table of Test Cases	
Test Item	Data Rate / Modulation
	Bluetooth 4.2 – LE GFSK
Conducted Test Cases	Mode 1: CH00_2402 MHz Mode 2: CH19_2440 MHz Mode 3: CH39_2480 MHz

3.2.2 Radiated Emission Test (Below 1GHz)

Radiated Test Cases	Bluetooth 4.2 – LE GFSK
	Mode 1: CH00_2402 MHz

Note : 1. Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, XYZ axis, antenna ports (if EUT with antenna diversity architecture) and packet type. Z orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in Z orientation.

2. Following channel(s) was (were) selected for the final test as listed above

3.2.3 Power Line Conducted Emission Test:

AC Conducted Emission	Mode 1 : BT Linking + Switching On + Lighting

3.3 Support Equipment

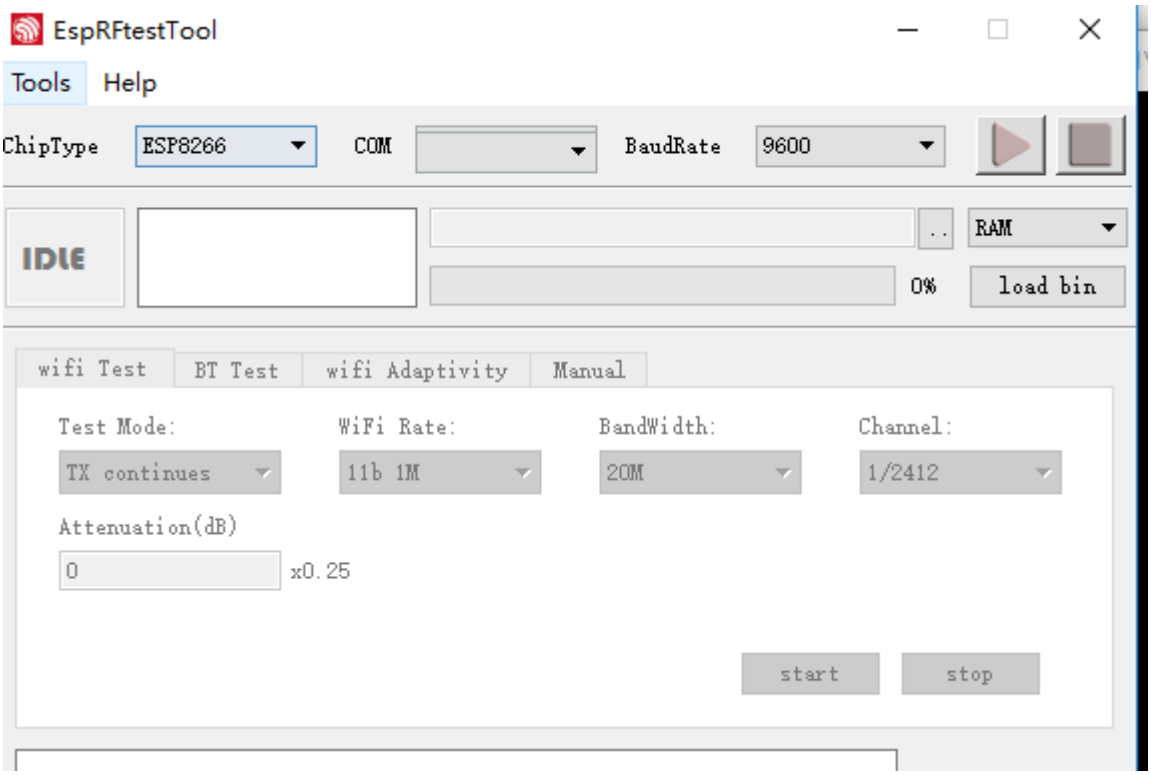
Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	NETGARE	R7800	PY315100319	N/A	unshielded AC I/P cable1.2 m
2.	Notebook	Lenovo	E470C	FCC DoC	N/A	shielded cable DC O/P 1.8 m unshielded AC I/P cable1.2 m
3.	WiFi Smart Bulb	Globe	34202*	2AQUQGB34202	N/A	N/A

3.4 Test Setup

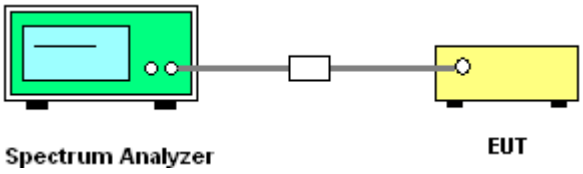
The EUT is continuously communicating to the Bluetooth tester during the tests.

EUT was set in the Hidden menu mode to enable BT communications.

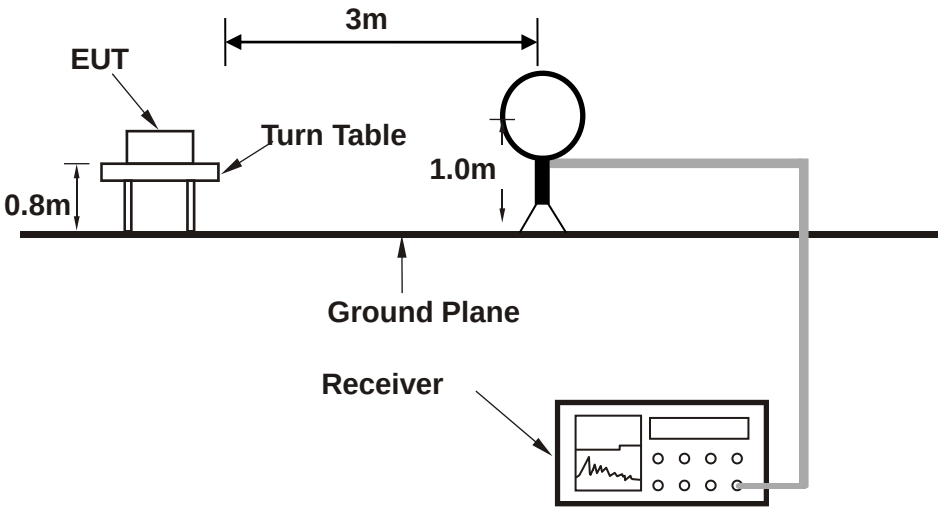
The following picture is a screenshot of the test software



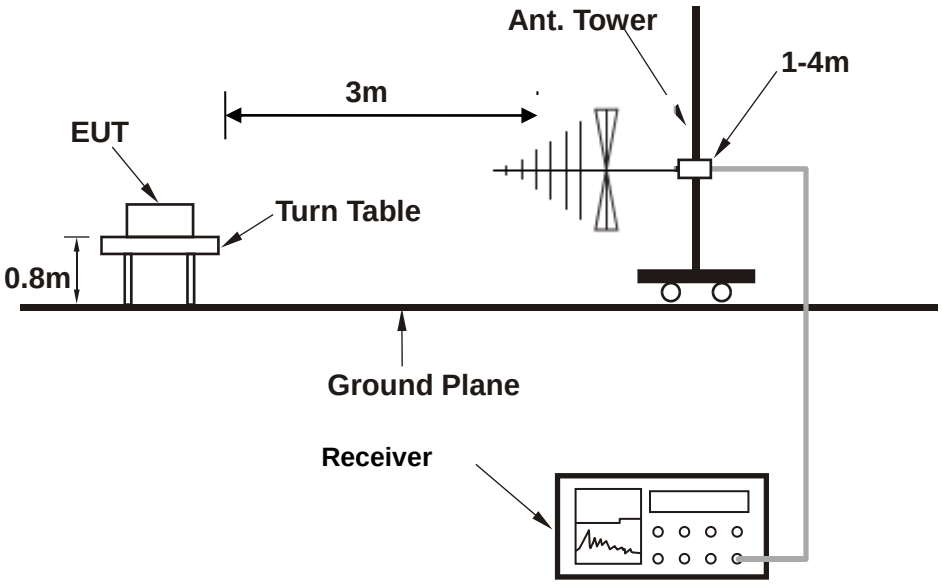
Setup diagram for Conducted Test



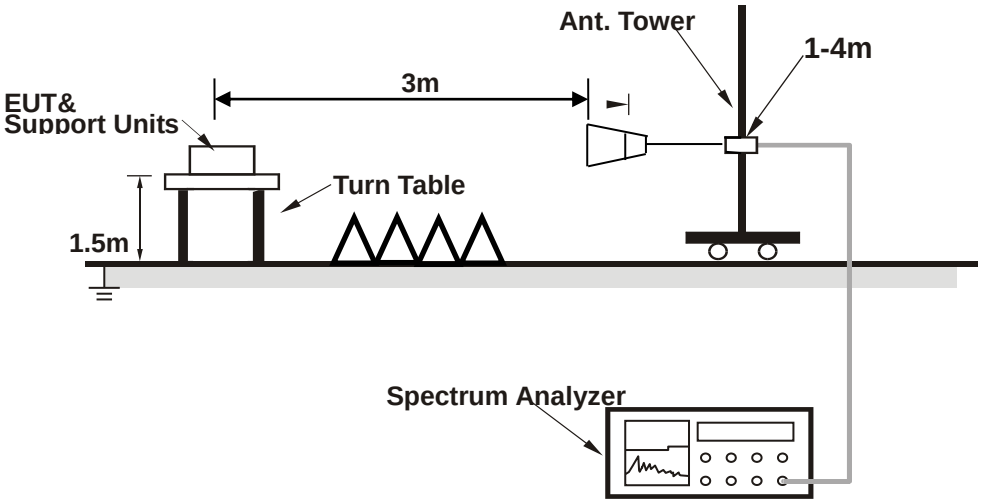
Setup diagram for Radiation(9KHz~30MHz) Test



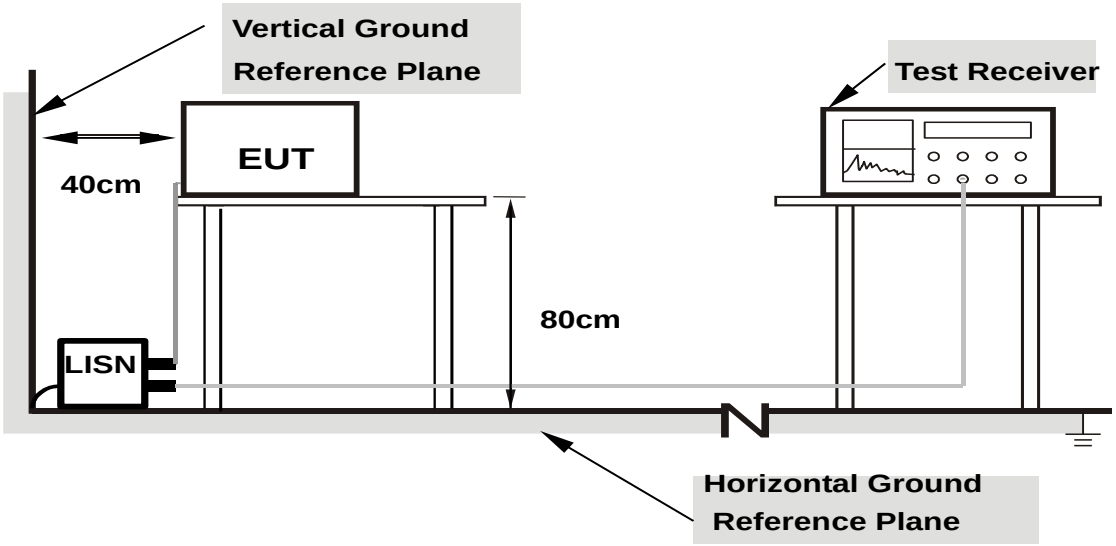
Setup diagram for Radiation(Below 1G) Test



Setup diagram for Radiation (Above1G) Test



Setup diagram for AC Conducted Emission Test



Note: 1.Support units were connected to second LISN.

2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.5 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 5 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 5 + 10 = 15 (dB)

For all radiated test items:

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

Over Limit (dB μ V/m) = Level(dB μ V/m) - Limit Level (dB μ V/m)

4. Test Result

4.1 Conducted Band Edges and Spurious Emission Measurement

4.1.1 Limit of Conducted Band Edges and Spurious Emission

FCC §15.247 (d)

IC RSS-247 5.5

Maximum conducted (average) output power was used to determine compliance, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz (i.e., 20 dBc).

4.1.2 Test Procedures

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Turn on the EUT and connect it to measurement instrument.
3. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
4. Measure and record the results in the test report.
5. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

4.1.3 Test Result of Conducted Band Edges

Refer to Appendix E of this test report.

4.1.4 Test Result of Conducted Spurious Emission

Refer to Appendix F of this test report.

4.2 Radiated Band Edges and Spurious Emission Measurement

4.2.1 Limit of Radiated Band Edges and Spurious Emission

FCC §15.247 (d)

IC RSS-247 5.5

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

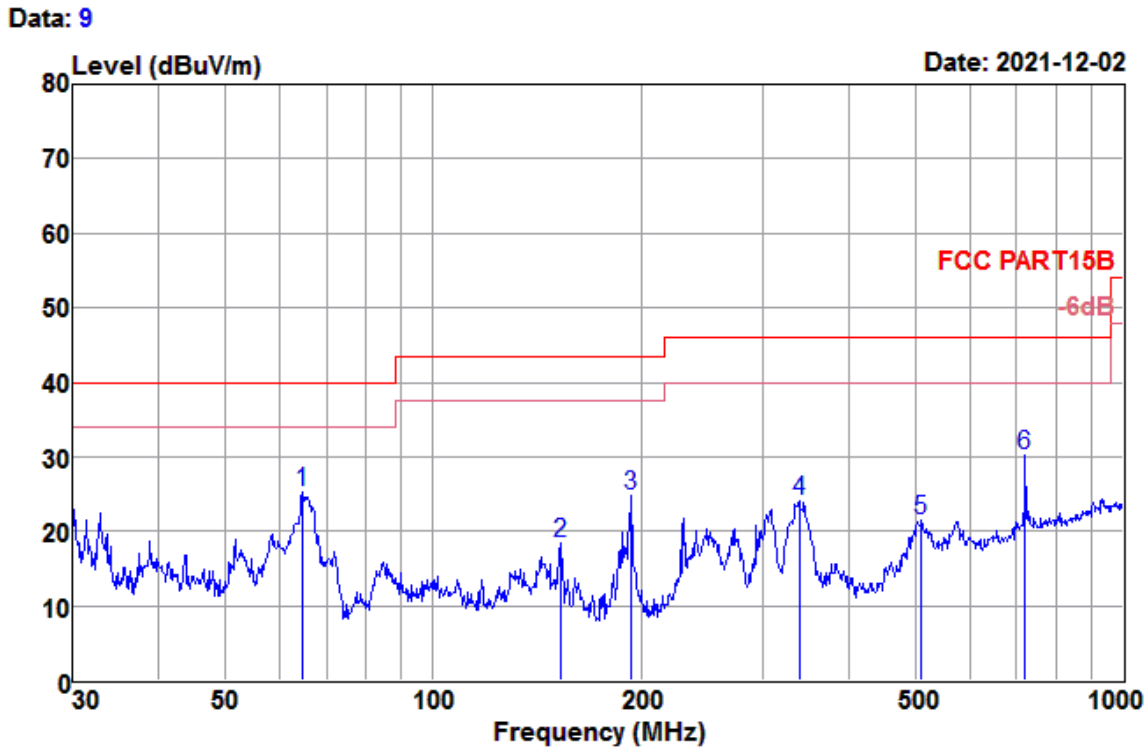
4.2.2 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The measurement distance is 3 meter.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement:
   VBW = 10 Hz, when duty cycle is no less than 98 percent.
   VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission

duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

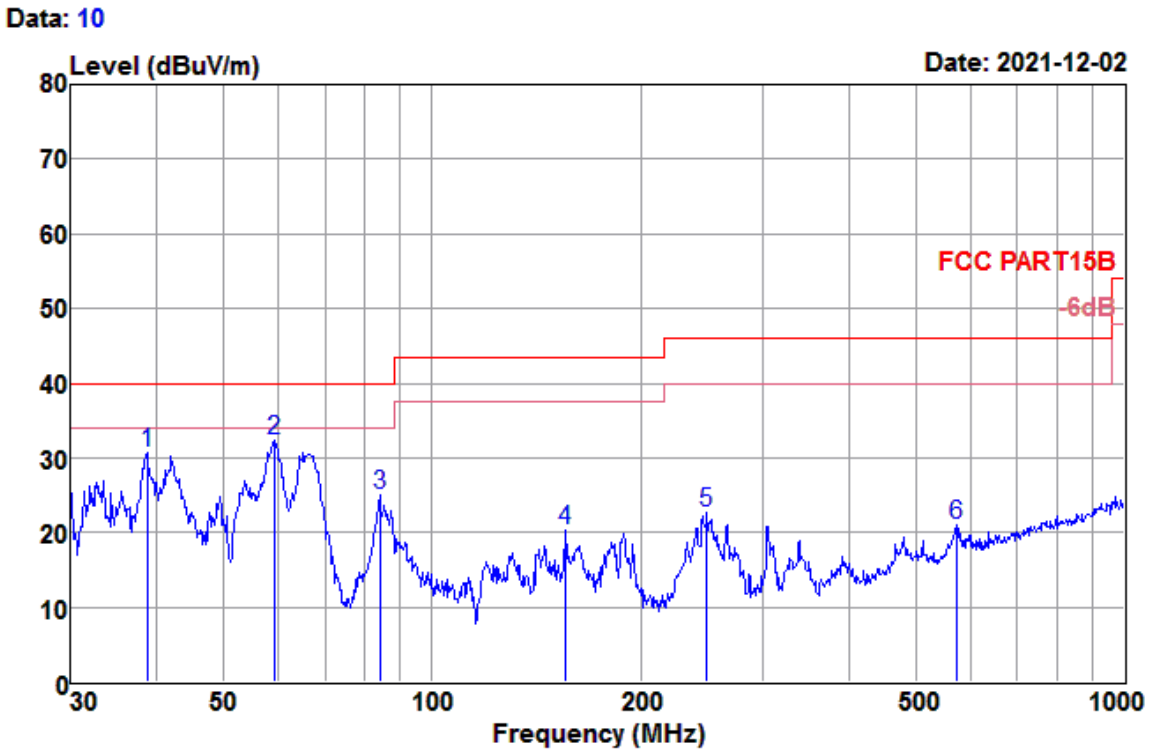
4.2.3 Test Result of Radiated Spurious Emission (30MHz ~ 1GHz)

Test Mode :	BLE CH00 (2402 MHz)	**Temperature :**	21~23℃
Test Engineer :	Jack Liu	**Relative Humidity :**	61~63%
Frequencey Range	30MHz~1GHz	**Polarization :**	Horizontal



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
64.659	42.82	13.58	1.33	32.57	25.16	40.00	-14.84	QP
152.664	34.68	14.21	2.12	32.55	18.46	43.50	-25.04	QP
193.095	44.32	10.70	2.39	32.59	24.82	43.50	-18.68	QP
339.589	39.61	13.86	3.22	32.64	24.05	46.00	-21.95	QP
510.044	33.23	17.03	4.06	32.79	21.53	46.00	-24.47	QP
721.726	37.69	20.22	4.91	32.58	30.24	46.00	-15.76	QP

Test Mode :	BLE CH00 (2402 MHz)	Temperature :	21~23℃
Test Engineer :	Jack Liu	Relative Humidity :	61~63%
Frequencey Range	30MHz~1GHz	Polarization :	Vertical



Freq MHz	Reading level dBuV	Antenna factor dB/m	Cable loss dB	Preamp factor dB	level dBuV/m	Limit level dBuV/m	Over limit dB	Remark
38.752	48.02	14.28	0.99	32.60	30.69	40.00	-9.31	QP
59.232	48.71	14.87	1.28	32.58	32.28	40.00	-7.72	QP
84.110	47.05	8.92	1.51	32.53	24.95	40.00	-15.05	QP
155.364	36.71	14.13	2.14	32.56	20.42	43.50	-23.08	QP
249.425	40.92	11.56	2.74	32.60	22.62	46.00	-23.38	QP
572.614	31.27	18.07	4.29	32.73	20.90	46.00	-25.10	QP

4.3 AC Conducted Emission Measurement

4.3.1 Limit of AC Conducted Emission

FCC §15.207

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

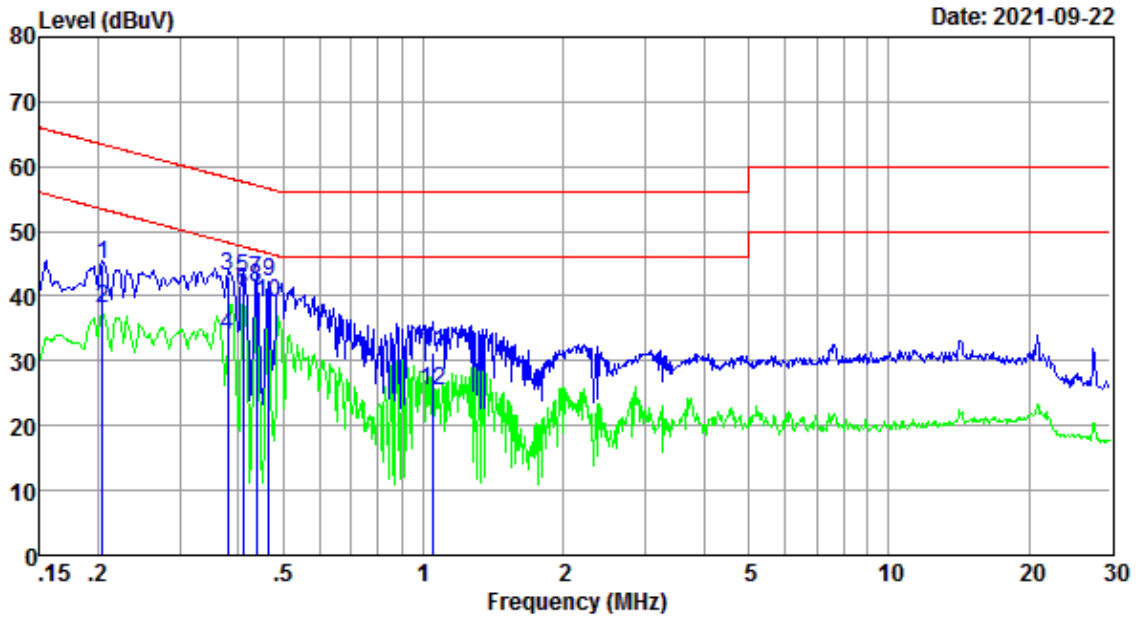
*Decreases with the logarithm of the frequency.

4.3.2 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

4.3.3 Test Result of AC Conducted Emission

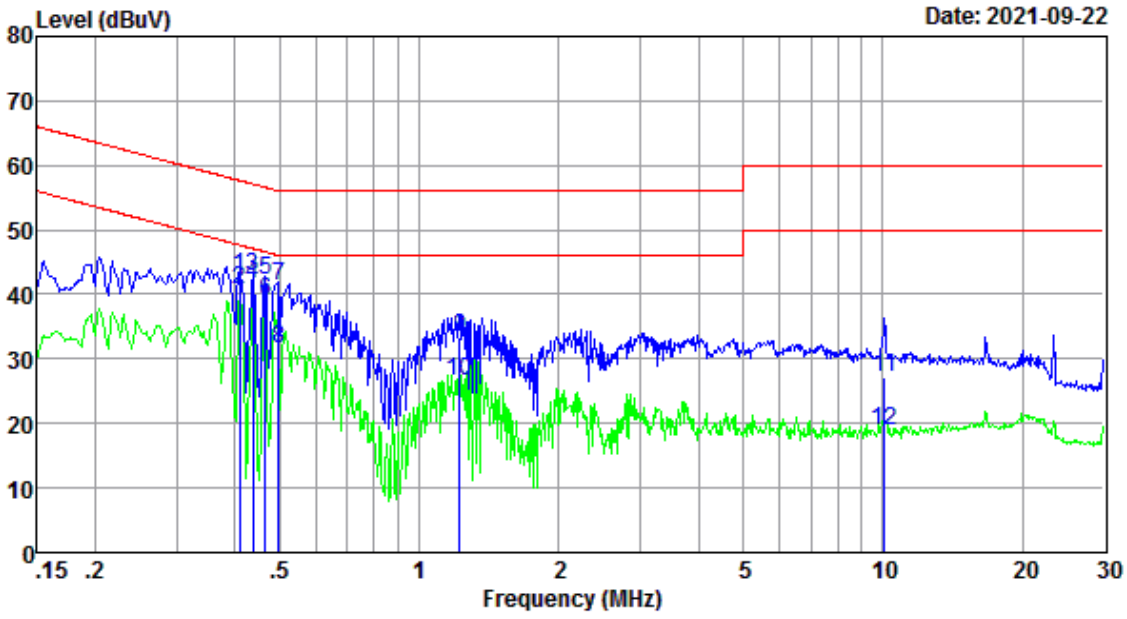
Test Mode :	Mode 1	**Temperature :**	20℃
Test Engineer :	Jack Liu	**Relative Humidity :**	64%
Test Voltage :	125Vac / 60Hz	**Phase :**	Line
Function Type :	Bluetooth Linking + Lighting		



Freq MHz	Reading level dBuV	LISN/ISN factor dB	Cable loss dB	Result level dBuV	Limit level dBuV	Over limit dB	Remark
0.204	35.19	9.56	0.01	44.76	63.45	-18.69	QP
0.204	28.39	9.56	0.01	37.96	53.45	-15.49	Average
0.379	33.60	9.57	0.01	43.18	58.30	-15.12	QP
0.379	24.40	9.57	0.01	33.98	48.30	-14.32	Average
0.410	33.30	9.57	0.01	42.88	57.64	-14.76	QP
0.410	31.20	9.57	0.01	40.78	47.64	-6.86	Average
0.437	33.00	9.57	0.01	42.58	57.11	-14.53	QP
0.437	31.80	9.57	0.01	41.38	47.11	-5.73	Average
0.466	32.59	9.58	0.01	42.18	56.58	-14.40	QP
0.466	29.39	9.58	0.01	38.98	46.58	-7.60	Average
1.049	21.80	9.59	0.02	31.41	56.00	-24.59	QP
1.049	15.70	9.59	0.02	25.31	46.00	-20.69	Average

Result Level= Reading Level + LISN Factor + Cable Loss

Test Mode :	Mode 1	Temperature :	20℃
Test Engineer :	Jack Liu	Relative Humidity :	64%
Test Voltage :	125Vac / 60Hz	Phase :	NEUTRAL
Function Type :	Bluetooth Linking + Lighting		



Freq MHz	Reading level dBuV	LISN/ISN factor dB	Cable loss dB	Result level dBuV	Limit level dBuV	Over limit dB	Remark
0.410	33.30	9.57	0.01	42.88	57.64	-14.76	QP
0.410	31.20	9.57	0.01	40.78	47.64	-6.86	Average
0.437	33.10	9.57	0.01	42.68	57.11	-14.43	QP
0.437	31.90	9.57	0.01	41.48	47.11	-5.63	Average
0.466	32.70	9.57	0.01	42.28	56.58	-14.30	QP
0.466	29.40	9.57	0.01	38.98	46.58	-7.60	Average
0.497	31.80	9.57	0.01	41.38	56.05	-14.67	QP
0.497	21.90	9.57	0.01	31.48	46.05	-14.57	Average
1.223	23.80	9.58	0.02	33.40	56.00	-22.60	QP
1.223	17.00	9.58	0.02	26.60	46.00	-19.40	Average
10.072	17.10	9.83	0.09	27.02	60.00	-32.98	QP
10.072	9.10	9.83	0.09	19.02	50.00	-30.98	Average

Result Level= Reading Level + LISN Factor + Cable Loss

5. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark
Spectrum Analyzer	Keysight	N9010A	MY56070788	2021-01-05	2022-01-04	Conducted
Power Sensor	Keysight	U2021XA	MY56510025	2021-01-05	2022-01-04	Conducted
Power Sensor	Keysight	U2021XA	MY57030005	2021-01-05	2022-01-04	Conducted
Power Sensor	Keysight	U2021XA	MY56510018	2021-01-05	2022-01-04	Conducted
Power Sensor	Keysight	U2021XA	MY56480002	2021-01-05	2022-01-04	Conducted
Thermal Chamber	Howkin	UHL-34	19111801	2021-04-21	2022-04-20	Conducted
Base Station	R&S	CMW 270	101231	2021-01-05	2022-01-04	Conducted
Signal Generator (Interferer)	Keysight	N5182B	MY56200384	2021-01-05	2022-01-04	Conducted
Signal Generator (Blocker)	Keysight	N5171B	MY56200661	2021-01-05	2022-01-04	Conducted

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV 40	101433	2021-01-05	2022-01-04	Radiation
Amplifier	Sonoma	310	363917	2021-01-06	2022-01-05	Radiation
Amplifier	Schwarzbeck	BBV 9718	327	2021-01-06	2022-01-05	Radiation
Amplifier	Narda	TTA1840-35-HG	2034380	2021-11-27	2024-11-26	Radiation
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-051	2020-02-14	2023-02-13	Radiation
Broadband Antenna	Schwarzbeck	VULB 9168	9168-757	2020-09-27	2023-09-26	Radiation
Horn Antenna	Schwarzbeck	BBHA 9120 D	1677	2020-02-14	2023-02-13	Radiation
Horn Antenna	COM-POWER	AH-1840	101117	2021-06-05	2024-06-04	Radiation
Test Software	Audix	E3	6.111221a	N/A	N/A	Radiation
Filter	Micro-Tronics	BRM 50702	G266	N/A	N/A	Radiation

Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Due Date	Remark
LISN	R&S	ENV216	102125	2021-01-05	2022-01-04	Conducted
LISN	R&S	ENV432	101327	2021-01-06	2022-01-05	Conducted
EMI Test Receiver	R&S	ESR3	102143	2021-01-06	2022-01-05	Conducted
EMI Test Software	Audix	E3	N/A	N/A	N/A	Conducted

N/A: No Calibration Required

6. Uncertainty of Evaluation

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	9kHz~30MHz	2.42dB
Radiated emission	30MHz ~ 1GMHz	2.50dB
	1GHz ~ 18GHz	3.51dB
	18GHz ~ 40GHz	3.96dB

MEASUREMENT	UNCERTAINTY
Occupied Channel Bandwidth	±196.4Hz
RF output power, conducted	±2.31dB
Power density, conducted	±2.31dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

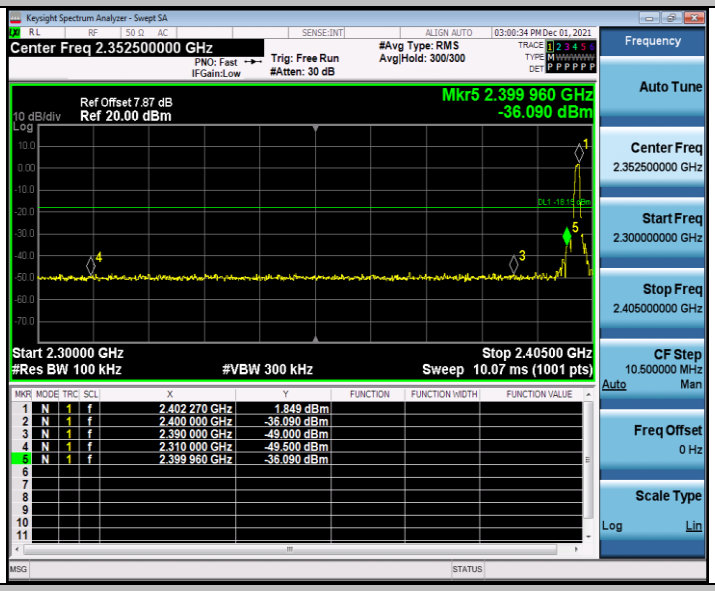
Appendix E: Band edge measurements

Test Result

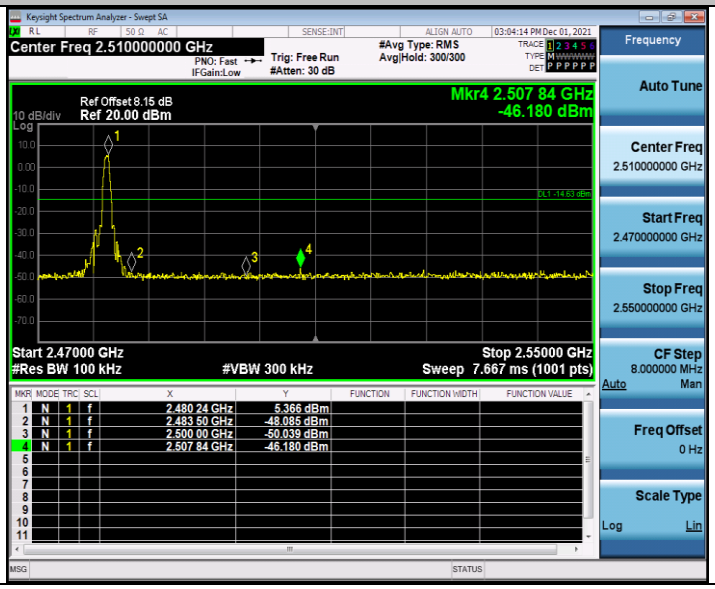
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	1.85	-36.09	≤-18.15	PASS
		High	2480	5.37	-46.18	≤-14.63	PASS

Test Graphs

BLE_1M_Ant1_Low_2402



BLE_1M_Ant1_High_2480



Appendix F: Conducted Spurious Emission

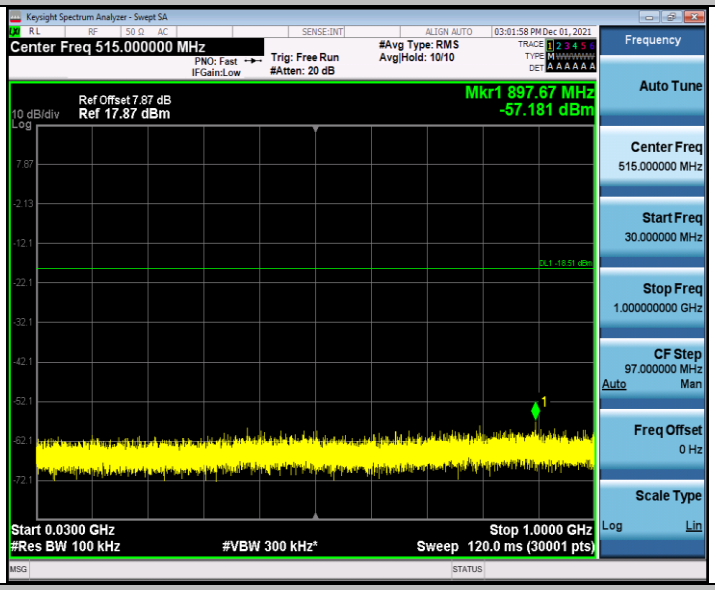
Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	1.49	1.49	---	PASS
			30~1000	1.49	-57.18	≤-18.51	PASS
			1000~26500	1.49	-37.76	≤-18.51	PASS
		2440	Reference	1.38	1.38	---	PASS
			30~1000	1.38	-57.96	≤-18.62	PASS
			1000~26500	1.38	-38.6	≤-18.62	PASS
		2480	Reference	4.75	4.75	---	PASS
			30~1000	4.75	-55.03	≤-15.26	PASS
			1000~26500	4.75	-37.57	≤-15.26	PASS

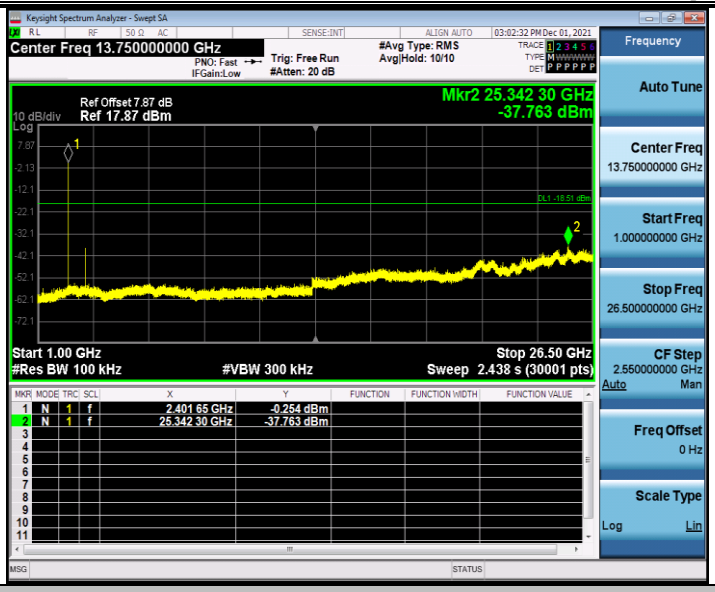
Test Graphs

BLE_1M_Ant1_2402_0~Reference

BLE_1M_Ant1_2402_30~1000

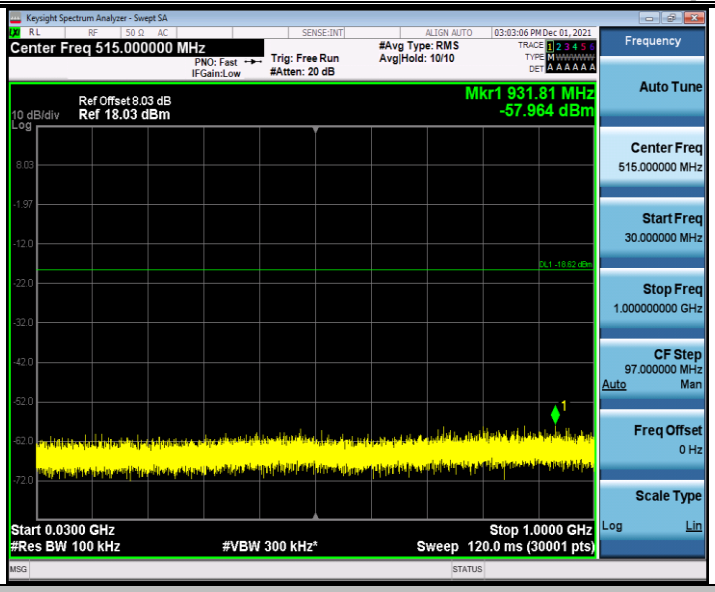


BLE_1M_Ant1_2402_1000~26500

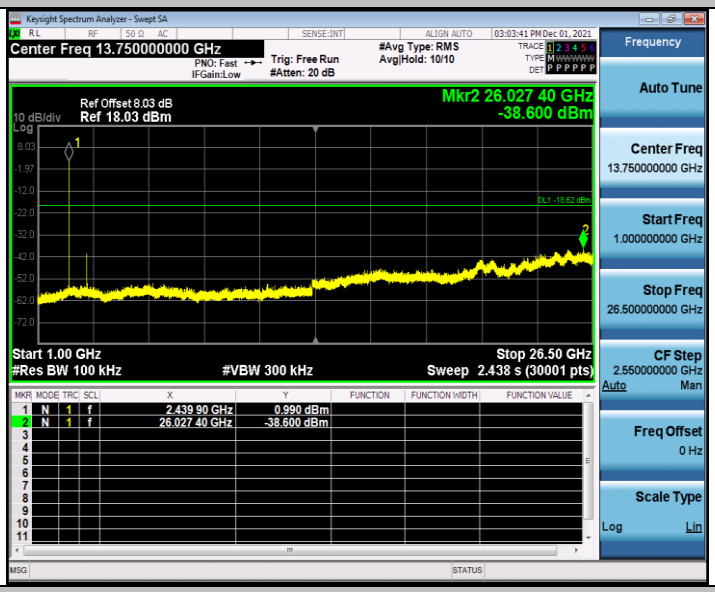


BLE_1M_Ant1_2440_0~Reference

BLE_1M_Ant1_2440_30~1000

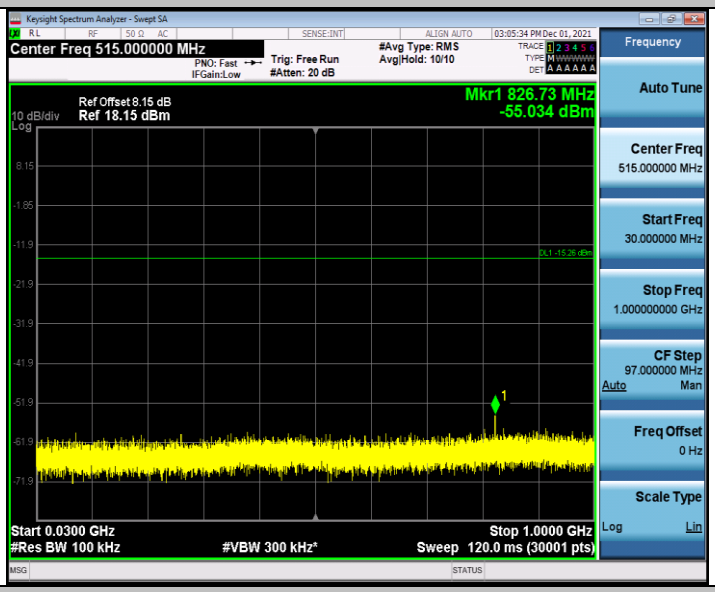


BLE_1M_Ant1_2440_1000~26500

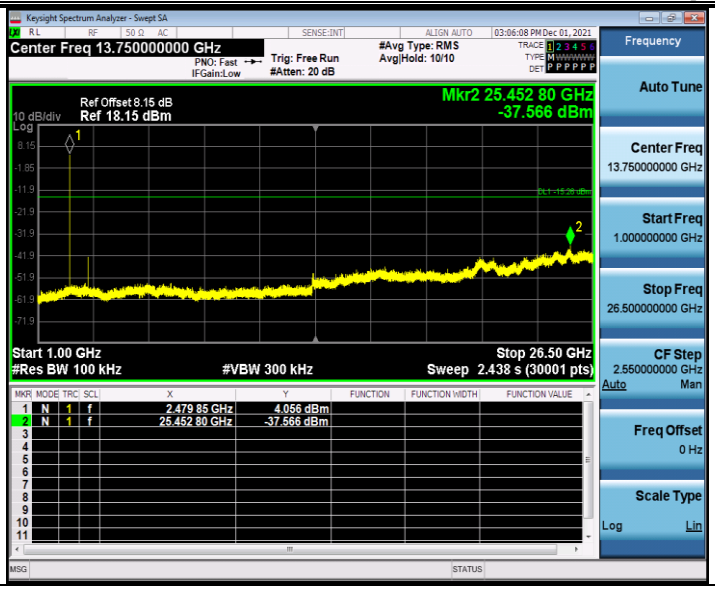


BLE_1M_Ant1_2480_0~Reference

BLE_1M_Ant1_2480_30~1000



BLE_1M_Ant1_2480_1000~26500


Keysight Spectrum Analyzer - Swept SA
Center Freq 13.750000000 GHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 20 dB
#Avg Type: RMS
Avg|Hold: 10/10
03:06:08 PM Dec 01, 2021
Ref Offset 8.15 dB
10 dB/div
Ref 18.15 dBm
Mkr2 25.452 80 GHz
-37.566 dBm
Start 1.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 26.50 GHz
Sweep 2.438 s (30001 pts)
1 N 1 f 2.479 85 GHz 4.056 dBm
2 N 1 f 25.452 80 GHz -37.566 dBm
Frequency
Auto Tune
Center Freq
13.750000000 GHz
Start Freq
1.000000000 GHz
Stop Freq
26.500000000 GHz
CF Step
2.550000000 GHz
Auto
Man
Freq Offset
0 Hz
Scale Type
Log
Lin

Appendix G: Setup Photographs

Fig. 1 Radiated emission setup photo(30MHz-1GHz)

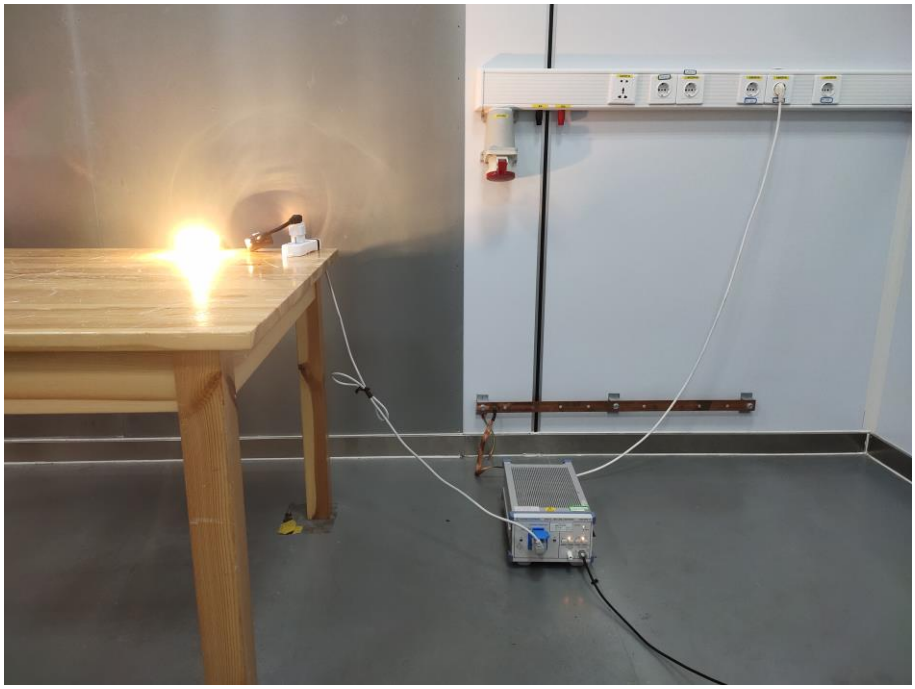


Fig. 2 Power line conducted emission setup photo

----------End of the report----------