



Certificate #5376.01



EUROFINS ELECTRICAL TESTING SERVICE (SHENZHEN) CO., LTD.

RADIO TEST - REPORT

FCC & ISED Compliance Test Report for

Product name: WLAN + Bluetooth LE module

Model name: LBEE0ZZ2HV

FCC ID: VPYLB2HV

IC: 772C-LB2HV

Test Report Number: EFGX24100311-IE-01-E02



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Page 1 of 21

1	General Information	3
1.1	Notes	3
1.2	Testing laboratory	4
1.3	Details of applicant	4
1.4	Details of manufacturer	4
1.5	Application details	5
1.6	Test item	5
1.7	Test standards	6
2	Technical test	7
2.1	Summary of test results	7
2.2	Test environment	7
2.3	Measurement uncertainty	7
2.4	Test mode	8
2.5	Test equipment utilized	9
2.6	Auxiliary equipment used during test	10
2.7	Test software information	10
2.8	Test setup	11
2.9	Test results	14
3	Technical Requirement	15
3.1	Conducted emission	15
3.2	Spurious radiated emissions for transmitter	18
4	Test Setup Photos	21
5	Appendix	21

1 General Information

1.1 Notes

The results of this test report relate exclusively to the item tested as specified in chapter "Description of test item" and are not transferable to any other test items.

Eurofins Electrical Testing Service (Shenzhen) Co., Ltd. is not responsible for any generalisations and conclusions drawn from this report. Any modification of the test item can lead to invalidity of test results and this test report may therefore be not applicable to the modified test item.

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Operator:

2024-11-12

Bruce Zheng / Project Engineer



Date

Eurofins-Lab.

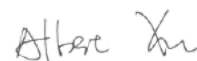
Name / Title

Signature

Technical responsibility for area of testing:

2024-11-12

Albert Xu / Lab Manager



Date

Eurofins-Lab.

Name / Title

Signature

1.2 Testing laboratory

Eurofins Electrical Testing Service (Shenzhen) Co., Ltd.

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The Laboratory has passed the Accreditation by the American Association for Laboratory Accreditation (A2LA). The Accreditation number is 5376.01

The Laboratory has been listed by industry Canada to perform electromagnetic emission measurements, The CAB identifier is CN0088

1.3 Details of applicant

Name	:	Murata Manufacturing Co., Ltd.
Address	:	10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan
Telephone	:	./.
Fax	:	./.

1.4 Details of manufacturer

Name	:	Murata Manufacturing Co., Ltd.
Address	:	10-1, Higashikotari 1-chome, Nagaokakyo-shi, Kyoto 617-8555, Japan
Telephone	:	./.
Fax	:	./.

1.5 Application details

Date of receipt of application : 2024-10-24
Date of receipt of test item : 2024-10-24
Date of test : 2024-10-24 to 2024-11-12
Date of issue : 2024-11-12

1.6 Test item

Product type : WLAN + Bluetooth LE module
Test Model : LBEE0ZZ2HV
Sample ID : 241024-14-001
Brand : Murata
Serial number : ./.
Hardware Version : 1.0
Software / Firmware Version : 0.3.2
Ratings : DC 3.3V
Test voltage : DC 3.3V
PMN : WLAN + Bluetooth LE module
HVIN : LBEE0ZZ2HV

RadioTechnical data

Frequency range : 2402MHz – 2480MHz
Radio Tech. : Bluetooth Low Energy
Frequency channel : 40 Channels
Modulation : GFSK
Antenna type : PCB antenna
Maximum antenna gain : 0 dBi
Additional information : ./.

The above sample(s) and sample information was/were submitted and identified on behalf of the applicant.
Eurofins assures objectivity and impartiality of the test, and fulfills the obligation of confidentiality for applicant's commercial information and technical documents.

1.7 Test standards

Test Standards	
FCC Part 15 Subpart C	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators
RSS-247	RSS-247 — Digital Transmission Systems (DTSS), Frequency Hop- ping Systems (FHSs) and Licence-Exempt Local Area Network (LE- LAN) Devices
RSS-GEN	RSS-Gen — General Requirements for Compliance of Radio Appa- ratus

Test Method

- 1: ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
- 2: ANSI C63.10-2013, American National Standard for Testing Unlicensed Wireless Devices.
- 3: KDB558074 D01 15.247 Meas Guidance v05r02

2 Technical test

2.1 Summary of test results

No deviations from the technical specification(s) were ascertained in the course of the tests performed.



or

The deviations as specified were ascertained in the course of the tests performed.



2.2 Test environment

Ac line conducted

Environment Parameter	Temperature	Relative Humidity
101.2kPa	23.7 °C	61.3%

RF conducted

Environment Parameter	Temperature	Relative Humidity
101.2kPa	24.7 °C	43.1%

Radiated

Environment Parameter	Temperature	Relative Humidity
101.2kPa	24.3 °C	51.6%

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 ISO.

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty in conducted measurements	1.96dB
Uncertainty for Conducted RF test	RF Power Conducted: 1.16dB Frequency test involved: 1.05×10 ⁻⁷ or 1%
Uncertainty for Radiated Spurious Emission 25MHz-3000MHz	Horizontal: 4.46dB; Vertical: 4.54dB;
Uncertainty for Radiated Spurious Emission 3000MHz-18000MHz	Horizontal: 4.42dB; Vertical: 4.41dB;
Uncertainty for Radiated Spurious Emission 18000MHz-40000MHz	Horizontal: 4.63dB; Vertical: 4.62dB;

2.4 Test mode

40 channels are provided for BT-LE-1M&2M&S=2&S=8:

CHANNEL	FREQ. (MHZ)	CHAN- NEL	FREQ. (MHZ)	CHAN- NEL	FREQ. (MHZ)	CHAN- NEL	FREQ. (MHZ)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

The EUT was set at continuously transmitting mode during the test.

The Lowest Channel 0, Middle 19 and Highest 39 were selected for test in the report.

2.5 Test equipment utilized

EQUIPMENT ID	EQUIPMENT NAME	MODEL NO.	CAL. DUE DATE
23-2-13-05	EMI Test Receiver	ESR3	2025-03-25
23-2-13-06	LISN	NNLK 8127 RC	2025-03-25
23-2-10-16	Attenuator	VTSD 9561-F	2025-03-25
23-2-10-63	Temperature & Humidity Meter	COS-03	2025-03-25
23-2-10-65	Barometer	Baro	2025-03-25
23-2-13-12	Signal Analyzer	N9010B-544	2025-03-25
23-2-13-13	BT/WLAN Tester	CMW270	2025-03-25
23-2-13-14	Signal Generator	N5183B-520	2025-03-25
23-2-13-15	Vector Signal Generator	N5182B-506	2025-03-25
23-2-10-43	Switch and Control Unit	ERIT-E-JS0806-2	2025-03-25
23-2-10-44	DC power supply	E3642A	2025-03-25
23-2-10-45	Temperature test chamber	SG-80-CC-2	2025-03-25
23-2-10-50	Temperature & Humidity Meter	COS-03	2025-03-25
23-2-10-66	Barometer	Baro	2025-03-25
23-2-13-01	EMI Test Receiver	ESR7	2025-03-25
23-2-13-02	Signal Analyzer	N9020B-544	2025-03-25
23-2-12-01	Active Loop Antenna	FMZB 1519B	2025-06-02
23-2-12-02	TRILOG Broadband Antenna	VULB9168	2025-06-02
23-2-12-03	Horn Antenna	3117	2025-06-02
23-2-12-04	Horn Antenna	BBHA 9170	2025-06-02
23-2-10-01	Preamplifier	BBV9745	2025-03-25
23-2-10-02	Preamplifier	TAP01018048	2025-03-25
23-2-10-03	Preamplifier	TAP18040048	2025-03-25
23-2-10-62	Temperature & Humidity Meter	COS-03	2025-03-25
23-2-10-64	Barometer	Baro	2025-03-25
23-2-10-14	Switch and Control Unit	ERIT-E-JS0806-SF1	N/A
23-2-13-03	EMI Test Receiver	ESR7	2025-03-25
23-2-13-04	Signal Analyzer	N9020B-526	2025-03-25
23-2-10-61	Temperature & Humidity Meter	COS-03	2025-03-25
23-2-10-52	Barometer	Baro	2025-03-25
23-2-10-15	Switch and Control Unit	ERIT-E-JS0806-SF1	N/A

2.6 Auxiliary equipment used during test

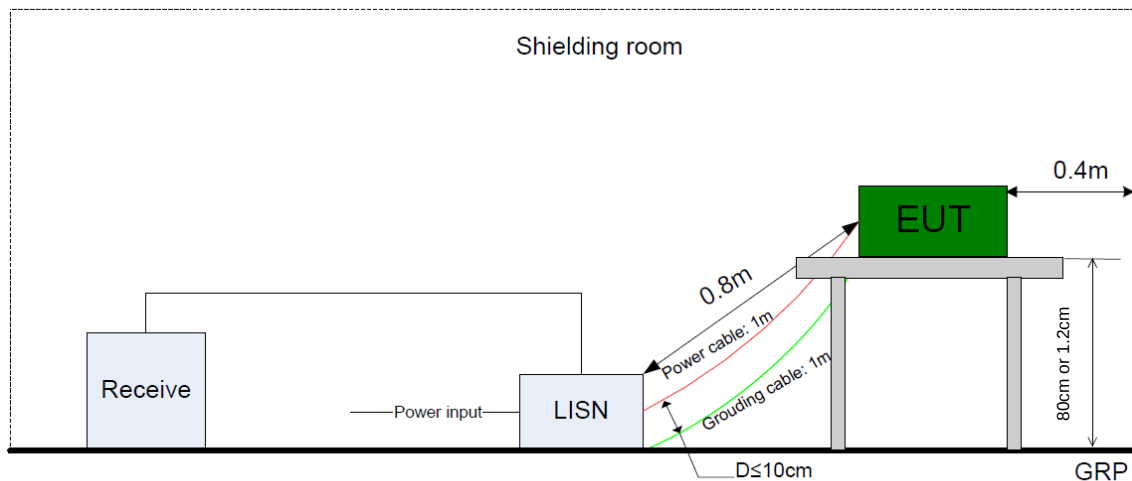
DESCRIPTION	MANUFACTURER	MODEL NO.	S/N
Laptop	LENOVO	TP00096A	PF-1QH0LV

2.7 Test software information

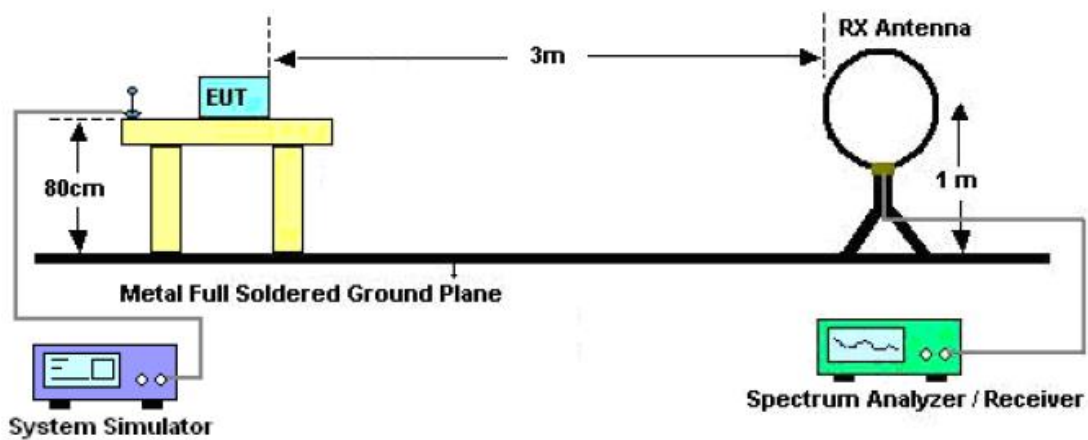
Test Software&Version	sscom5.13.1			
Mode	Power setting			Modulation Type
BLE_1M/2M/S=2/S=8	CH0	CH19	CH39	GFSK
	29	29	29	

2.8 Test setup

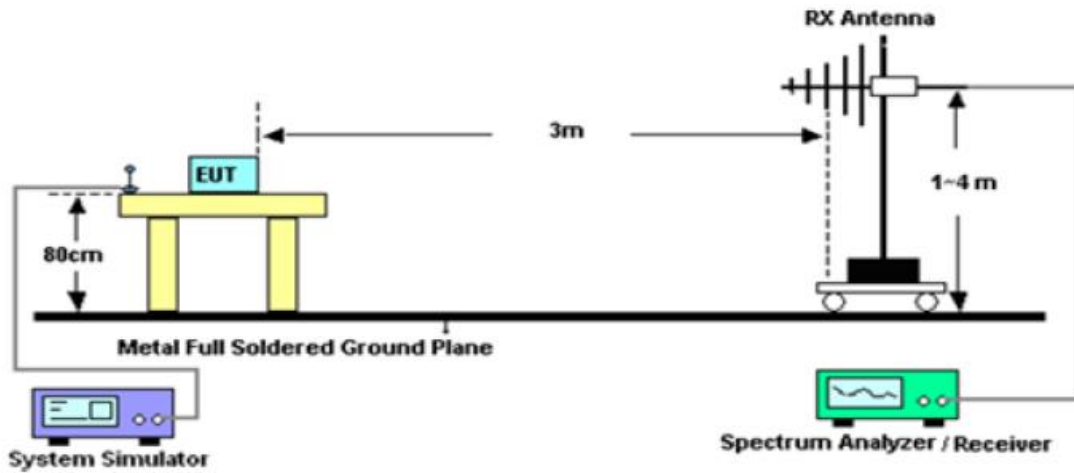
AC line conducted



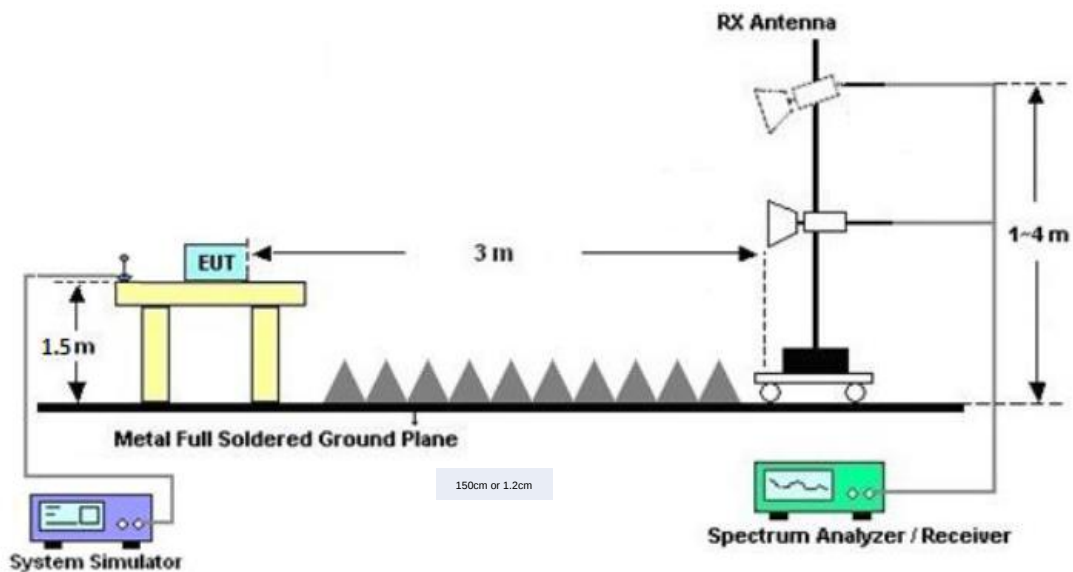
For radiated tests below 30MHz



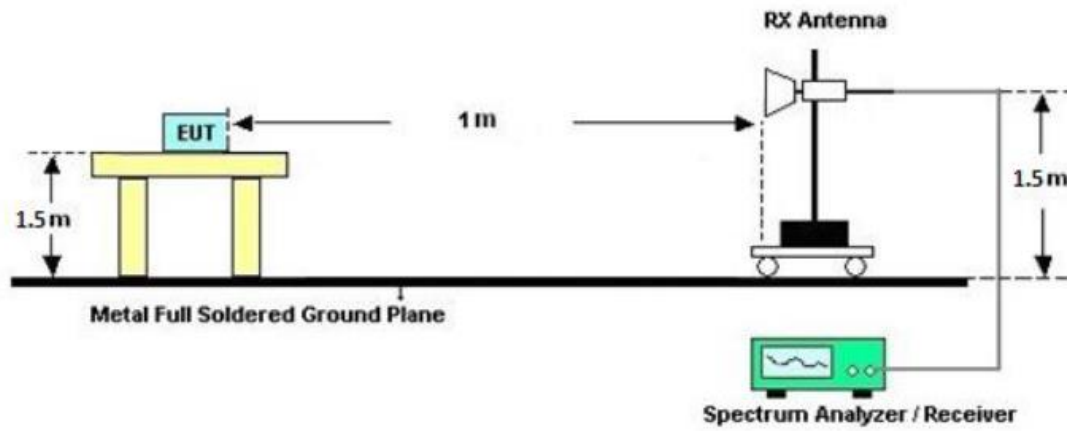
For radiated tests from 30MHz to 1GHz



For radiated tests from 1GHz to 18GHz



For radiated tests above 18GHz



2.9 Test results

☒ 1st test

☐ test after modification

☐ production test

Technical Requirements					
FCC Part 15 Subpart C/RSS-247 Issue 3/RSS-Gen Issue 5					
Test Condition			Test Result	Verdict	Test Site
§15.207	RSS-GEN 8.8	Conducted emission AC power port	See Page 16	Pass	Site 1
§15.209 & §15.205	RSS-GEN 8.9 RSS-GEN 8.10	Spurious emissions , Band edge & Restricted Band	Appendix B Appendix C	Pass	Site 1

3 Technical Requirement

3.1 Conducted emission

Test Method:

The test method was referred to the subclause 6.2 of ANSI C63.10-2013.

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both Neutral and Live lines.

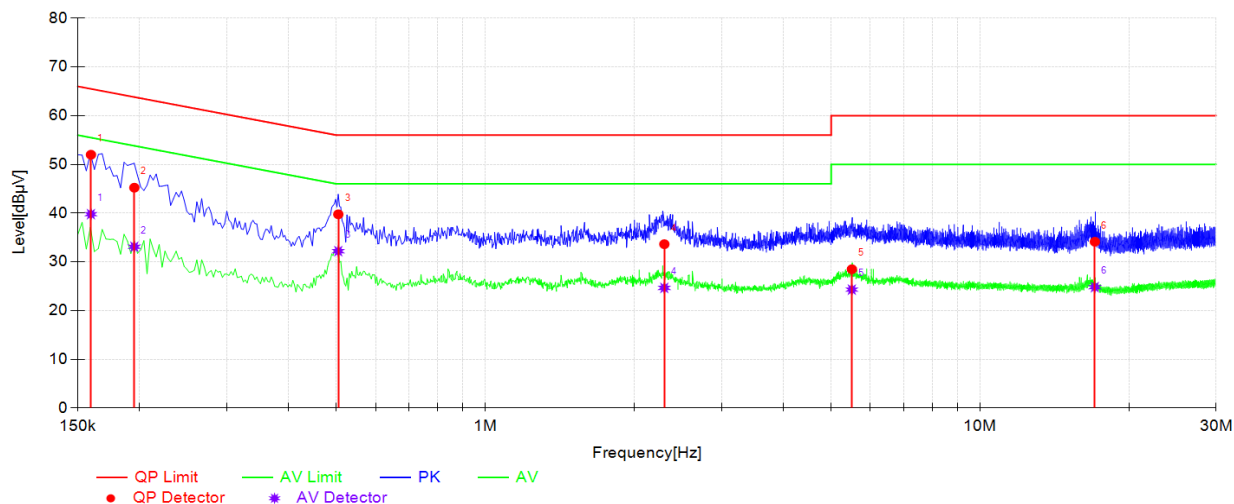
Limit:

FCC §15.207 (a)

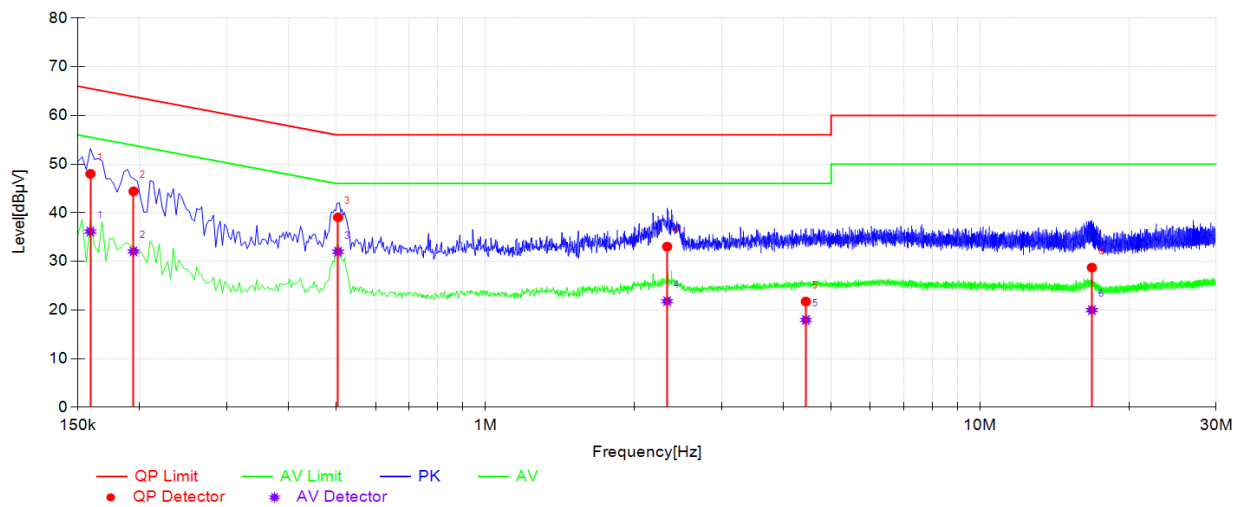
RSS-Gen 8.8

Frequency	QP Limit	AV Limit
MHz	dB μ V	dB μ V
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

Decreasing linear.

Test Result:


Final Data List										
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Type	Verdict
1	0.1594	10.25	51.99	65.50	13.51	39.79	55.50	15.71	L1	PASS
2	0.1951	10.25	45.22	63.82	18.60	33.10	53.82	20.72	L1	PASS
3	0.5041	10.25	39.77	56.00	16.23	32.20	46.00	13.80	L1	PASS
4	2.2996	10.28	33.64	56.00	22.36	24.67	46.00	21.33	L1	PASS
5	5.5055	10.36	28.49	60.00	31.51	24.31	50.00	25.69	L1	PASS
6	17.0620	10.57	34.14	60.00	25.86	24.82	50.00	25.18	L1	PASS



Final Data List										
NO.	Freq. [MHz]	Factor [dB]	QP Value [dBμV]	QP Limit [dBμV]	QP Margin [dB]	AV Value [dBμV]	AV Limit [dBμV]	AV Margin [dB]	Type	Verdict
1	0.1590	10.25	48.00	65.52	17.52	36.13	55.52	19.39	N	PASS
2	0.1944	10.25	44.40	63.85	19.45	32.05	53.85	21.80	N	PASS
3	0.5037	10.25	39.06	56.00	16.94	31.98	46.00	14.02	N	PASS
4	2.3303	10.30	33.03	56.00	22.97	21.80	46.00	24.20	N	PASS
5	4.4453	10.40	21.75	56.00	34.25	17.95	46.00	28.05	N	PASS
6	16.8261	10.61	28.72	60.00	31.28	19.98	50.00	30.02	N	PASS

3.2 Spurious radiated emissions for transmitter

Test Method:

The test method was referred to the subclause 11.11/11.12 of ANSI C63.10-2013.

- 1: The EUT was placed on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
- 3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- 4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 5: Use the following spectrum analyzer settings According to C63.10:
For Above 1GHz
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW ≥ RBW for peak measurement and VBW = 10Hz for average measurement, Sweep = auto, Detector function = peak, Trace = max hold.
For Below 1GHz
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 KHz, VBW ≥ RBW for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.
For Below 30MHz
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 200 Hz, VBW ≥ RBW from 9KHz to 0.15MHz, RBW 9KHz VBW ≥ RBW from 0.15MHz to 30MHz for peak measurement, Sweep = auto, Detector function = peak, Trace = max hold.

Note:

- 1: The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Quasi-peak detection (QP) at frequency below 1GHz.
- 2: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for peak detection (PK) at frequency above 1GHz.
- 3: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average ((duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($20\log(1/\text{duty cycle})$).
- 4: The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
- 5: When duty cycle < 98%, The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\text{VBW} \geq 1 / T$, the T is transmission duration (T).

Limit:

FCC §15.205 and §15.209

RSS-GEN, Section 8.9 and 8.10.

Frequency Range	Field Strength Limit	Field Strength Limit
(MHz)	(uV/m) at 3 m	(dBuV/m) at 3 m
0.009-0.490	2400/F(kHz) @ 300 m	-
0.490-1.705	24000/F(kHz) @ 30 m	-
1.705 - 30	30 @ 30m	-
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

§15.205 Restricted bands of operation

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	
13.36-13.41			

RSS-GEN 8.10

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	1660 - 1710	9.0 - 9.2
0.495 - 0.505	16.69475 - 16.69525	1718.8 - 1722.2	9.3 - 9.5
2.1735 - 2.1905	25.5 - 25.67	2200 - 2300	10.6 - 12.7
3.020 - 3.026	37.5 - 38.25	2310 - 2390	13.25 - 13.4
4.125 - 4.128	73 - 74.6	2483.5 - 2500	14.47 - 14.5
4.17725 - 4.17775	74.8 - 75.2	2655 - 2900	15.35 - 16.2
4.20725 - 4.20775	108 - 138	3260 - 3267	17.7 - 21.4
5.677 - 5.683	149.9 - 150.05	3332 - 3339	22.01 - 23.12
6.215 - 6.218	156.52475 - 156.52525	3345.8 - 3358	23.6 - 24.0
6.26775 - 6.26825	156.7 - 156.9	3500 - 4400	31.2 - 31.8
6.31175 - 6.31225	162.0125 - 167.17	4500 - 5150	36.43 - 36.5
8.291 - 8.294	167.72 - 173.2	5350 - 5460	Above 38.6
8.362 - 8.366	240 - 285	7250 - 7750	
8.37625 - 8.38675	322 - 335.4	8025 - 8500	
8.41425 - 8.41475	399.9 - 410		
12.29 - 12.293	608 - 614		
12.51975 - 12.52025	960 - 1427		
12.57675 - 12.57725	1435 - 1626.5		
13.36 - 13.41	1645.5 - 1646.5		

4 Test Setup Photos

Ref "EFGX24100311-IE-01_Setup_Photos.pdf"

5 Appendix

Ref "EFGX24100311-IE-01-E02_appendix.pdf"

-End of report-