FCC RF Test Report

APPLICANT : PAX Technology Limited

EQUIPMENT: UNATTENDED PAYMENT TERMINAL

BRAND NAME : PAX MODEL NAME : IM30

FCC ID : V5PIM304GBWL

STANDARD : FCC Part 15 Subpart C §15.247

CLASSIFICATION : (DTS) Digital Transmission System

TEST DATE(S) : Aug. 22, 2023 ~ Aug. 28, 2023

We, Sporton International Inc. (Shenzhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Shenzhen), the test report shall not be reproduced except in full.

JasonJia

Approved by: Jason Jia





Report No.: FR380711B

Sporton International Inc. (ShenZhen)

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People's Republic of China

Sporton International Inc. (ShenZhen)

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR380711B	Rev. 01	Initial issue of report	Oct. 12, 2023

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SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Report only	-
3.2	3.2 15.247(b)(3) Average Output Power		≤ 30dBm	Pass	-
3.3	15.247(e) Power Spectral Density		≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	≤ 30dBc	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 8.06 dB at 31.94 MHz
3.6	3.6 15.207 AC Conducted Emis		15.207(a)	Pass	Under limit 15.31 dB at 0.15 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Conformity Assessment Condition:

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or
 in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of
 non-compliance that may potentially occur if measurement uncertainty is taken into account.
- 2. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty"

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

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1 General Description

1.1 Applicant

PAX Technology Limited

Room 2416, 24/F., Sun Hung Kai Centre, 30 Harbour Road, Wanchai, Hong Kong

1.2 Manufacturer

PAX Computer Technology (Shenzhen) Co., Ltd.

401 and 402, Building 3, Shenzhen Software Park, Nanshan District, Shenzhen City, Guangdong Province, P.R.C

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1.3 Product Feature of Equipment Under Test

Product Feature						
Equipment	UNATTENDED PAYMENT TERMINAL					
Brand Name	PAX					
Model Name	IM30					
FCC ID	V5PIM304GBWL					
SN	Conducted: 1640169811 Conduction: 1640169774 Radiation: 1640169807					
HW Version	NA					
SW Version	NA					
EUT Stage	Production Unit					

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification						
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz					
Number of Channels	40					
Carrier Frequency of Each Channel	40 Channel (37 hopping + 3 advertising channel)					
Maximum Output Power to Antenna	3.45 dBm (0.0022 W)					
99% Occupied Bandwidth	1.071 MHz					
Antenna Type / Gain	metal antenna type with gain 1.7 dBi					
Type of Modulation	Bluetooth LE : GFSK					

1.5 Modification of EUT

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

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1.6 Testing Location

Sporton International Inc. (ShenZhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

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Test Firm	Sporton International Inc. (ShenZhen)								
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595								
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.						
rest site No.	CO01-SZ TH01-SZ	CN1256	421272						

Test Firm	Sporton International Inc. (ShenZhen)						
Test Site Location		uilding 1, No. 2, Tengfeng of et, Baoan District, Shenzhe s Republic of China					
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.				
	03CH03-SZ	CN1256	421272				

1.7 Test Software

Item	Site	Site Manufacturer Name		Version		
1.	03CH03-SZ	AUDIX	E3	6.2009-8-24		
2.	CO01-SZ	AUDIX	E3	6.120613b		

1.8 Applicable Standards

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

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ANSI C63.10-2013

Remark:

- All test items were verified and recorded according to the standards and without any deviation during the test.
- 2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

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2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
2400-2483.5 MHz	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
[18	2438	39	2480
[19	2440	-	-
	20	2442	-	-

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2.2 Test Mode

- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (Z plane) were recorded in this report.
- b. AC power line Conducted Emission was tested under maximum output power.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

	Summary table of Test Cases
Test Item	Data Rate / Modulation
rest item	Bluetooth – LE / GFSK
Conducted	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps
	Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps
TCs	Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
Dadiotod	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps
Radiated	Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps
TCs	Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps
AC	
Conducted	Mode 1: WCDMA Band5 Idle + WWAN ANT 2 + Bluetooth Link + Adapter (MDB Port)
Emission	
Remark: For Ra	adiated Test Cases, The tests were performance with Adapter and AC Cable

RSE Co-location

BLE CH39 1Mbps TX + LTE Band13 Link

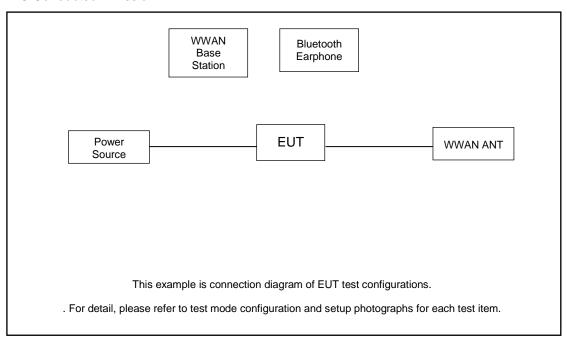
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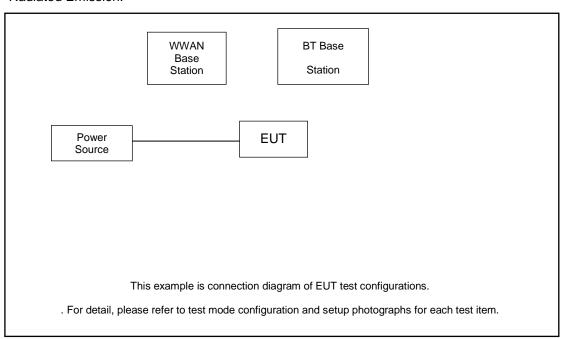
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2.3 Connection Diagram of Test System

AC Conducted Emission:



Radiated Emission:



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2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Base Station(LTE)	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	Bluetooth Earphone	Samsung	EO-MG900	PYAHS-107W	N/A	N/A
3.	WLAN AP	Dlink	DIR-820L	KA2IR820LA1	N/A	Unshielded,1.8m
4.	Adapter	N/A	N/A	N/A	N/A	N/A
5.	AC Cable	N/A	N/A	N/A	N/A	N/A

2.5 EUT Operation Test Setup

For BLE function, the engineering test program was provided and enabled to make EUT continuous transmit.

For AC power line conducted emissions, the EUT was set to connect with the WLAN AP under large package sizes transmission.

2.6 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 2.40 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
=
$$2.40 + 10 = 12.40$$
 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

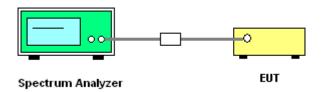
3.1.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.1.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 11.8
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
- 5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1% to 5% of the 99% OBW and the VBW is set to 3 times of the RBW.
- Measure and record the results in the test report.

3.1.4 Test Setup



3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

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3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

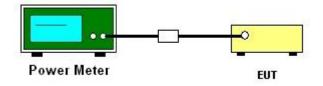
3.2.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.2.3 Test Procedures

- The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1
 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.1 Method AVGPM method.
- 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Average Output Power

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	0.68	3.45	30.00	1.7	5.15	36.00	Pass
BLE	1Mbps	1	19	2440	0.68	3.21	30.00	1.7	4.91	36.00	Pass
BLE	1Mbps	1	39	2480	0.68	1.82	30.00	1.7	3.52	36.00	Pass

Remark: Power setting is the default, and duty cycle factor has been added to the final results.

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3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

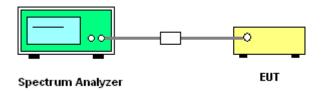
3.3.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.3.3 Test Procedures

- The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
- 5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
- 6. Measure and record the results in the test report.
- 7. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

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3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 30 dB down from the highest emission level within the authorized band.

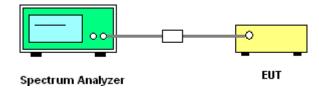
3.4.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.4.3 Test Procedure

- 1. The testing follows ANSI C63.10-2013 clause 11.13
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. 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.
- 5. Measure and record the results in the test report.
- 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup



3.4.5 Test Result of Conducted Band Edges Plots

Please refer to Appendix A.

3.4.6 Test Result of Conducted Spurious Emission Plots

Please refer to Appendix A.

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3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated Band Edges and Spurious Emission

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. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(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

3.5.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

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3.5.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
- 2. 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.
- 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.
- 4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 5. Corrected Reading: Antenna Factor + Cable Loss + Read Level Preamp Factor = Level
- 6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
- 7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- 8. 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; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \ge 1$ GHz for peak measurement. 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.

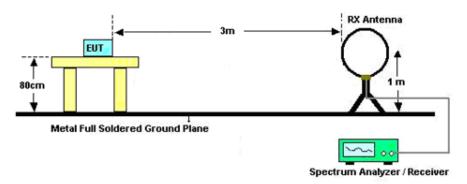
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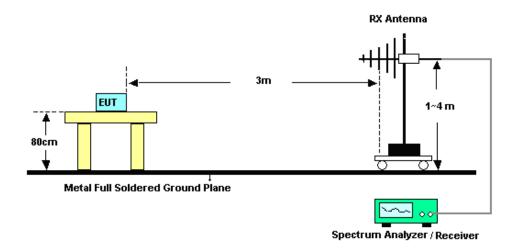
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3.5.4 Test Setup

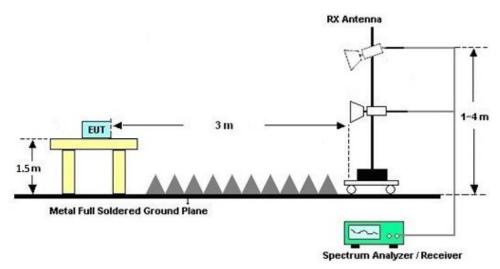
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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3.5.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

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There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.5.7 Duty Cycle

Please refer to Appendix D.

3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix C.

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3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

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.

Eroquency of emission (MUz)	Conducted limit (dBμV)			
Frequency of emission (MHz)	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.

3.6.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

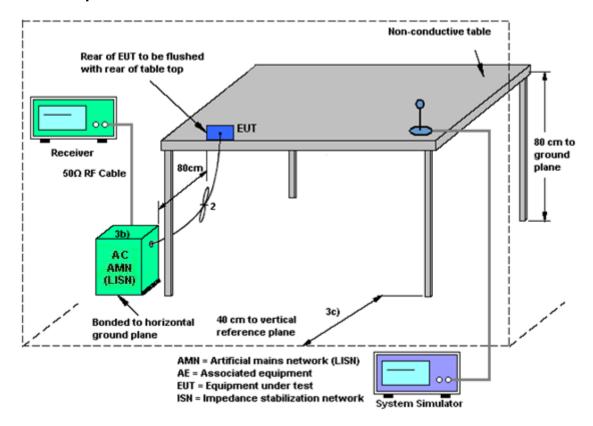
3.6.3 Test Procedures

- 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.

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3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

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3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

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4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver&SA	KEYSIGHT	N9038A	MY544500 83	20Hz~8.4GHz	Apr. 04, 2023	Aug. 22, 2023~ Aug. 28, 2023	Apr. 03, 2024	Radiation (03CH03-SZ)
EXA Spectrum Anaiyzer	KEYSIGHT	N9010A	MY551502 46	10Hz~44GHz;	Apr. 04, 2023	Aug. 22, 2023~ Aug. 28, 2023	Apr. 03, 2024	Radiation (03CH03-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jul. 28, 2022	Aug. 22, 2023~ Aug. 28, 2023	Jul. 27, 2024	Radiation (03CH03-SZ)
Bilog Antenna	TeseQ	CBL6112D	35408	30MHz-2GHz	Aug. 20, 2023	Aug. 22, 2023~ Aug. 28, 2023	Aug. 19, 2025	Radiation (03CH03-SZ)
Double Ridge Horn Antenna	SCHWARZBE CK	BBHA9120D	9120D-135 5	1GHz~18GHz	Apr. 08, 2023	Aug. 22, 2023~ Aug. 28, 2023	Apr. 07, 2024	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	TTA1840-35- HG	1871923	18GHz~40GHz	Jul. 07, 2023	Aug. 22, 2023~ Aug. 28, 2023	Jul.06, 2024	Radiation (03CH03-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Apr. 08, 2023	Aug. 22, 2023~ Aug. 28, 2023	Apr. 07, 2024	Radiation (03CH03-SZ)
Amplifier	Burgeon	BPA-530	102211	0.01Hz ~3000MHz	Oct. 19, 2022	Aug. 22, 2023~ Aug. 28, 2023	Oct. 18, 2023	Radiation (03CH03-SZ)
HF Amplifier	MITEQ	AMF-7D-0010 1800-30-10P- R	1943528	1GHz~18GHz	Oct. 19, 2022	Aug. 22, 2023~ Aug. 28, 2023	Oct. 18, 2023	Radiation (03CH03-SZ)
Amplifier	Agilent Technologies	83017A	MY395013 02	500MHz~26.5GH z	Dec. 26, 2022	Aug. 22, 2023~ Aug. 28, 2023	Dec. 25, 2023	Radiation (03CH03-SZ)
AC Power Source	Chroma	61601	616010002 729	1 N/A	Nov. 10, 2022	Aug. 22, 2023~ Aug. 28, 2023	Nov. 09, 2023	Radiation (03CH03-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Aug. 22, 2023~ Aug. 28, 2023	NCR	Radiation (03CH03-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Aug. 22, 2023~ Aug. 28, 2023	NCR	Radiation (03CH03-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jul. 06, 2023	Aug. 23, 2023	Jul. 05, 2024	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Sep. 15, 2022	Aug. 23, 2023	Sep. 14, 2023	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 17, 2022	Aug. 23, 2023	Oct. 16, 2023	Conduction (CO01-SZ)
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 06, 2023	Aug. 24, 2023~ Aug. 25, 2023	Apr. 05, 2024	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 27, 2022	Aug. 24, 2023~ Aug. 25, 2023	Dec. 26, 2023	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 27, 2022	Aug. 24, 2023~ Aug. 25, 2023	Dec. 26, 2023	Conducted (TH01-SZ)
Thermo meter	Anymetre	JR593	#7	- 10°C ~ 50°C 10%RH~99%RH	Apr. 08, 2023	Aug. 24, 2023~ Aug. 25, 2023	Apr. 07, 2024	Conducted (TH01-SZ)

NCR: No Calibration Required

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5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Measurement

Test Item	Uncertainty
Conducted Power	±1.34 dB
Conducted Emissions	±1.34 dB
Occupied Channel Bandwidth	±0.012 %
Conducted Power Spectral Density	±1.32 dB

<u>Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)</u>

Measuring Uncertainty for a Level of Confidence	
of 95% (U = 2Uc(y))	2.7 dB

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

	1
Measuring Uncertainty for a Level of Confidence	E O ID
of 95% (U = 2Uc(y))	5.0 dB
0.93% (0 = 200(y))	

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

	
Measuring Uncertainty for a Level of Confidence	4.9 dB
of 95% (U = 2Uc(y))	4.9 UB

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence	5.0 dB
of 95% (U = 2Uc(y))	5.0 dB

----- THE END -----

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Appendix A. Conducted Test Results

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Ambient Condition: $\underline{24\text{--}26}$ °C, $\underline{45\text{--}55}$ %RH

Test Date: 2023/8/24~2023/8/25 Test Engineer: Zhang Xue Yi

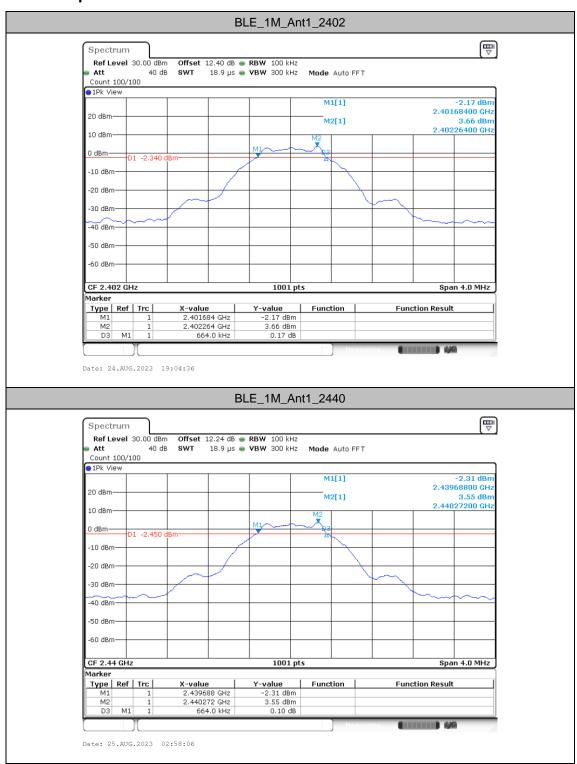
DTS Bandwidth

Test Result

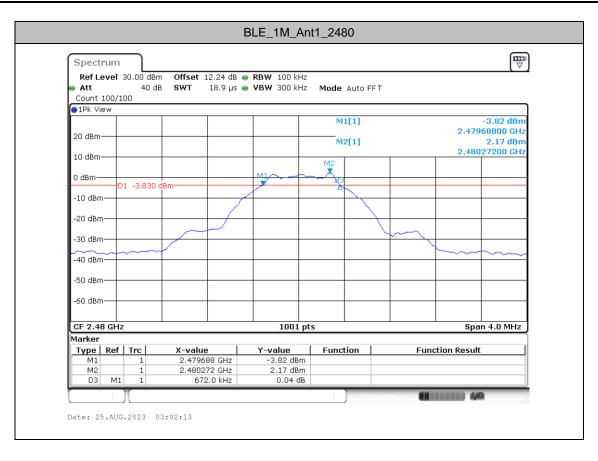
TestMode	Antenna	Freq(MHz)	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
		2402	0.66	2401.68	2402.35	0.5	PASS
BLE_1M	Ant1	2440	0.66	2439.69	2440.35	0.5	PASS
		2480	0.67	2479.69	2480.36	0.5	PASS

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Test Graphs



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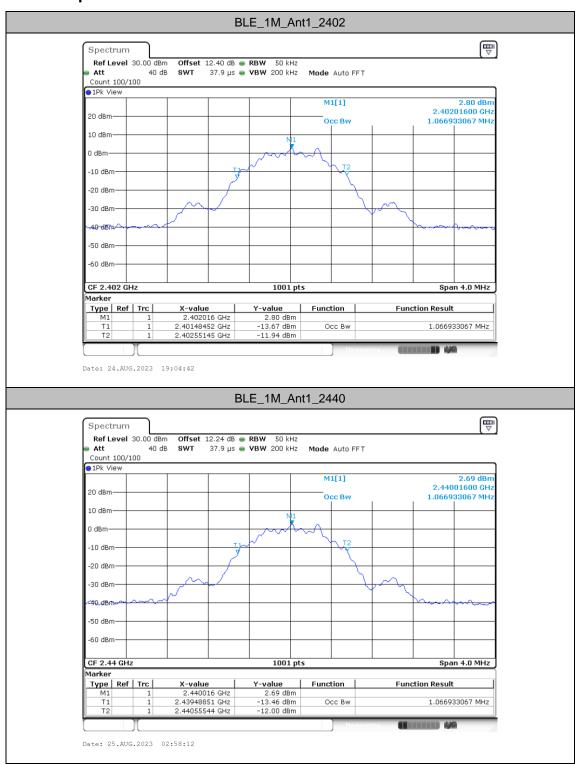
Occupied Channel Bandwidth

Test Result

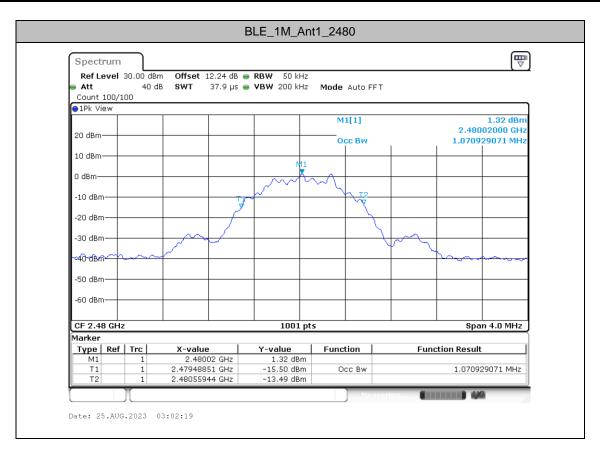
TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]
	2402	1.067	2401.4845	2402.5514	
BLE_1M	BLE_1M Ant1	2440	1.067	2439.4885	2440.5554
		2480	1.071	2479.4885	2480.5594

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Test Graphs



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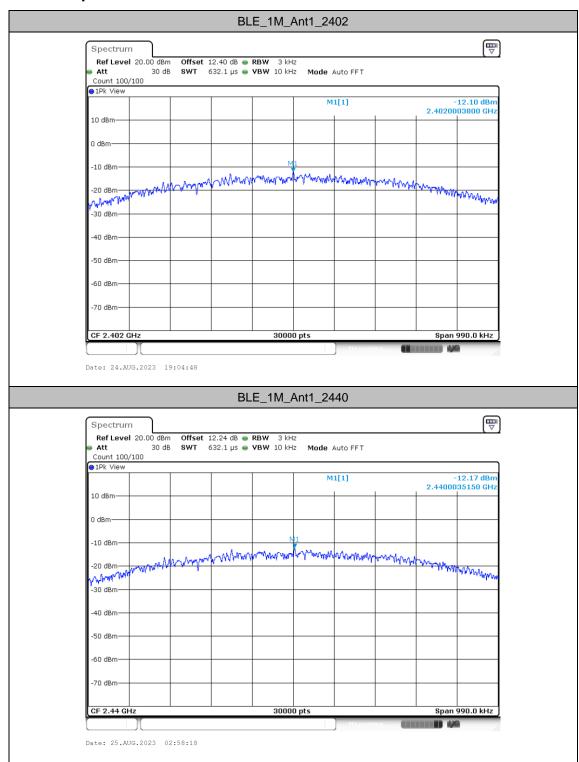
Maximum power spectral density

Test Result

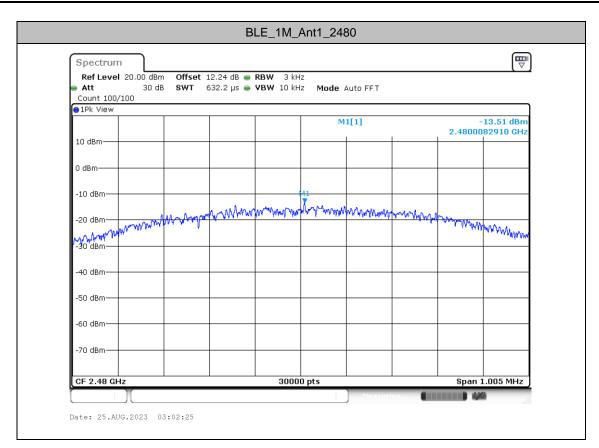
TestMode	Antenna	Freq(MHz)	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
		2402	-12.10	≤8.00	PASS
BLE_1M	Ant1	2440	-12.17	≤8.00	PASS
		2480	-13.51	≤8.00	PASS

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Test Graphs



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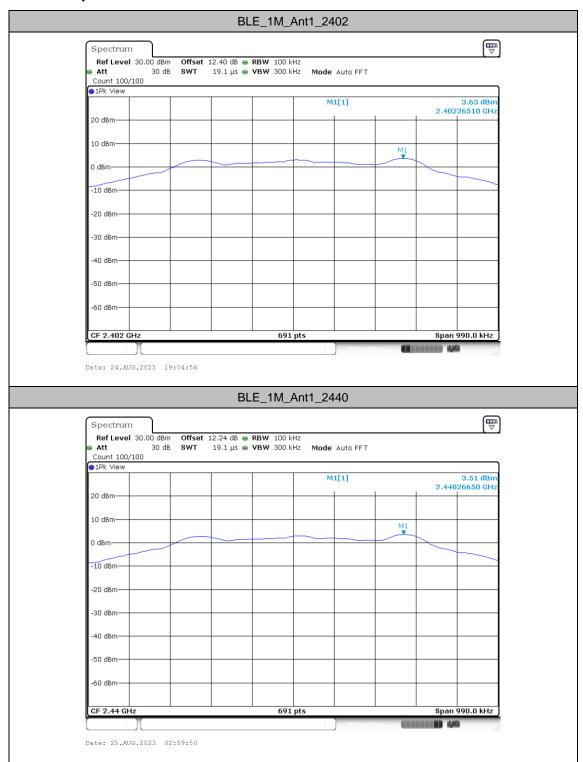
Reference level measurement

Test Result

TestMode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm/100KHz]
		2402	2402.27	3.63
BLE_1M	Ant1	2440	2440.27	3.51
		2480	2480.27	2.14

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Test Graphs



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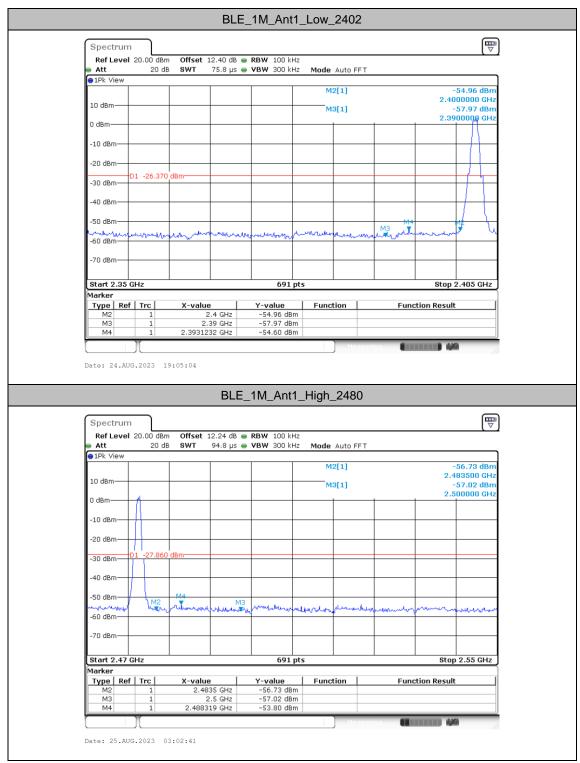
Band edge measurements

Test Result

TestMode	Antenna	ChName	Freq	RefLevel	Result	Limit	Verdict	
restivioue	Antenna	Cilivaille	(MHz)	[dBm/100KHz]	[dBm/100KHz]	[dBm/100KHz]		
DIE 4M	A mtd	Low	2402	3.63	-54.6	≤-26.37	PASS	
BLE_1M	Ant1	High	2480	2.14	-53.8	≤-27.86	PASS	

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Test Graphs



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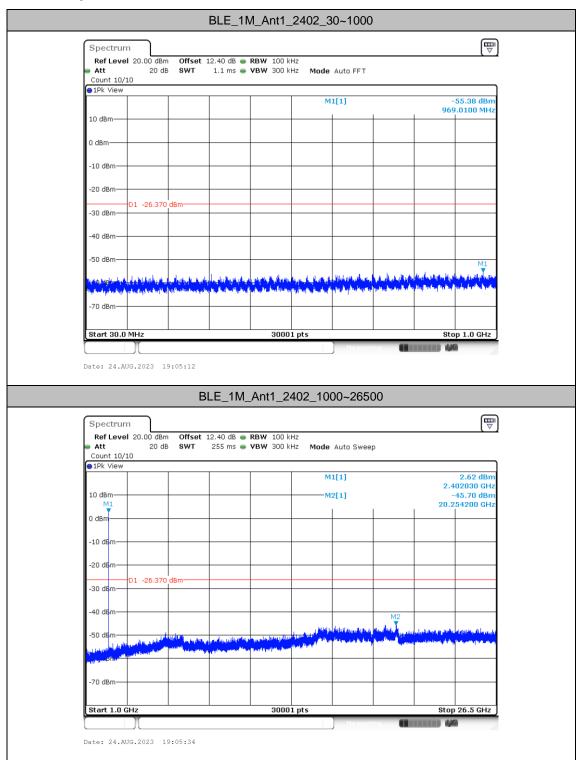
Conducted Spurious Emission

Test Result

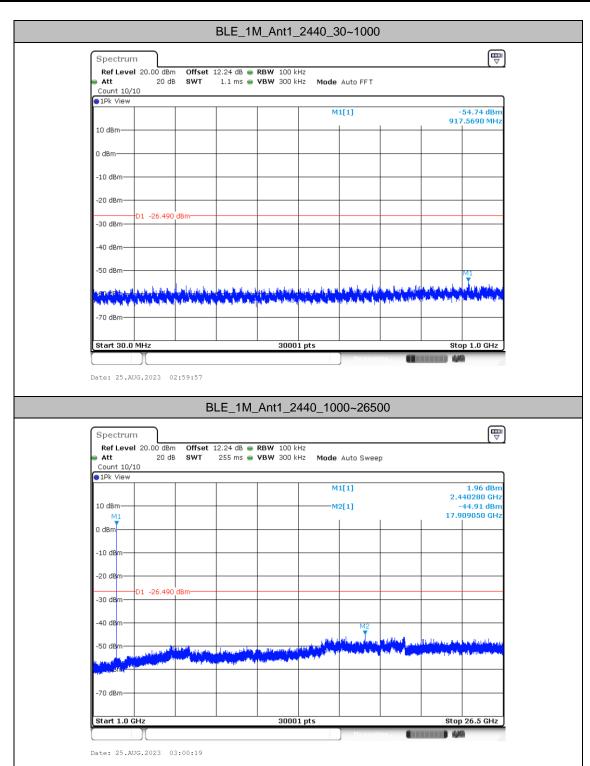
TaatMaala	Antonno	(_4\)	FreqRange	RefLevel	Result	Limit	Verdict		
TestMode	Antenna	Freq(MHZ)	req(MHz) [MHz] [dBm/100KHz] [dBm/100k		[dBm/100KHz]	[dBm/100KHz]	verdict		
		2402 Ant1 2440	30~1000	3.63	-55.38	≤-26.37	PASS		
			1000~26500	3.63	-45.7	≤-26.37	PASS		
BLE 1M	Ant1		30~1000	3.51	-54.74	≤-26.49	PASS		
DLE_IIVI	AIILI		1000~26500	3.51	-44.91	≤-26.49	PASS		
			30~1000	2.14	-55.44	≤-27.86	PASS		
						2480	1000~26500	2.14	-45.69

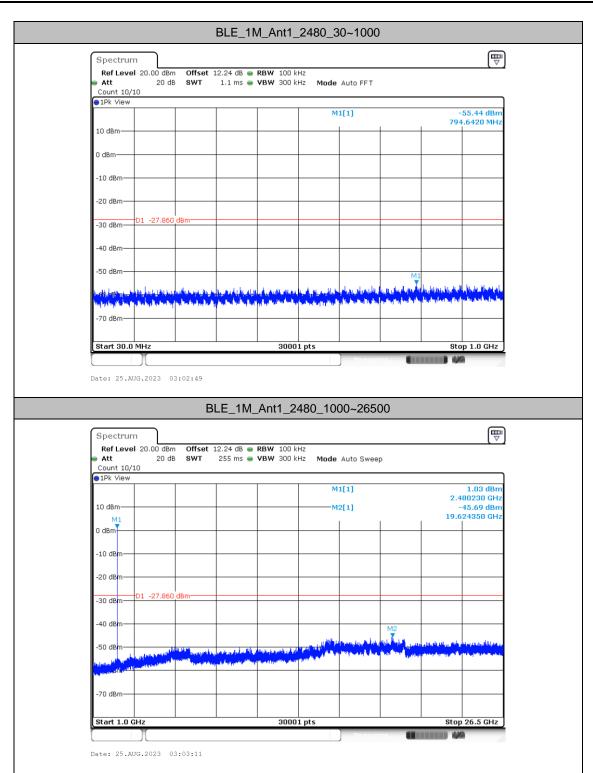
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Test Graphs

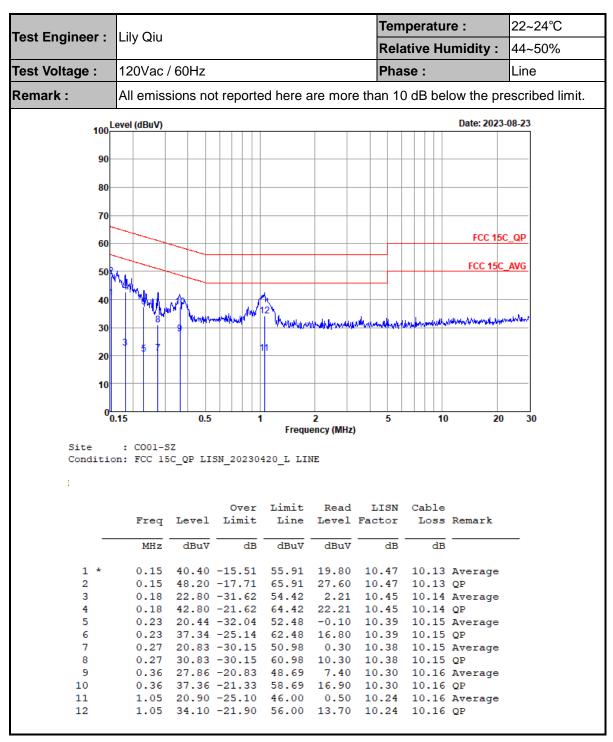


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Appendix B. AC Conducted Emission Test Results



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Temperature: 22~24°C Test Engineer: Lily Qiu Relative Humidity: 44~50% Test Voltage: 120Vac / 60Hz Phase: Neutral Remark: All emissions not reported here are more than 10 dB below the prescribed limit. 100 Level (dBuV) Date: 2023-08-23 90 80 70 FCC 15C_QP 60 FCC 15C_AVG 50 40 30 20 0<mark>0.15</mark> 0.5 10 30 Frequency (MHz) Site : CO01-SZ Condition: FCC 15C_QP LISN_20230420_N NEUTRAL Over Limit Read LISN Cable Freq Level Limit Line Level Factor Loss Remark dB dBuV MHz dBu∀ dBuV dB dB

0.15 40.69 -15.31 56.00 20.10 10.46 10.13 Average

0.29 31.27 -29.36 60.63 10.81 10.31 10.15 QP 0.36 29.51 -19.18 48.69 9.10 10.25 10.16 Average

0.16 45.68 -19.62 65.30 25.10 10.44 10.14 QP 31.59 -21.51 53.10 11.10 10.34 39.89 -23.21 63.10 19.40 10.34

0.36 37.91 -20.78 58.69 17.50 10.25 10.16 QP

33.40 -22.60 56.00 13.00

10.46

10.24

4.00 10.44 10.14 Average

1.11 10.31 10.15 Average

0.30 10.24 10.16 Average

10.13 QP

10.15 QP

10.16 QP

10.15 Average

Ν	ote
ı٧	ote

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)

0.29 21.57 -29.06 50.63

1.00 20.70 -25.30 46.00

0.15 48.19 -17.81 66.00 27.60 0.16 24.58 -30.72 55.30 4.00

2. Over Limit(dB) = Level(dB μ V) – Limit Line(dB μ V)

0.21

0.21

1.00

1 *

5

8 9

10

11

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Appendix C. Radiated Spurious Emission Test Data

Toot Engineer	Doid Huong	Relative Humidity :	48~49%
Test Engineer :	Reid Huang	Temperature :	24~25 ℃

Radiated Spurious Emission Test Modes

Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 1	2400-2483.5	SISO	Bluetooth-LE_GSFK	00	2402	1Mbps	-	-
Mode 2	2400-2483.5	SISO	Bluetooth-LE_GSFK	19	2440	1Mbps	-	-
Mode 3	2400-2483.5	SISO	Bluetooth-LE_GSFK	39	2480	1Mbps	-	=
Mode 4	2400-2483.5	SISO	Bluetooth-LE_GSFK	39	2480	(1DH5)	-	LF
Mada 5	Co lo cotico	SISO	Bluetooth-LE	39	2480	1Mbps	-	-
Mode 5	Co-location	ANT 1	LTE Band 13 Link	-	-	-	-	-

Summary of each worse mode

Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	Remark
1	Bluetooth-LE_GSFK	00	2387.74	40.53	54.00	-13.47	Н	AVERAGE	Pass	Band Edge
1	Bluetooth-LE_GSFK	00	4804.00	42.74	74.00	-31.26	Н	Peak	Pass	Harmonic
2	Bluetooth-LE_GSFK	19	-	-	-	-	-	-	-	Band Edge
2	Bluetooth-LE_GSFK	19	7320.00	44.16	74.00	-29.84	٧	Peak	Pass	Harmonic
3	Bluetooth-LE_GSFK	39	2483.70	41.43	54.00	-12.57	V	AVERAGE	Pass	Band Edge
3	Bluetooth-LE_GSFK	39	7440.00	43.79	74.00	-30.21	Н	Peak	Pass	Harmonic
4	Bluetooth-LE_GSFK	39	31.94	31.94	40	-8.06	V	Peak	Pass	LF
5	Bluetooth-LE	39	2499.80	41.41	54.00	-12.59	V	AVERAGE	Pass	Band Edge
5	Bluetooth-LE	39	4960.00	43.36	74.00	-30.64	Н	Peak	Pass	Harmonic

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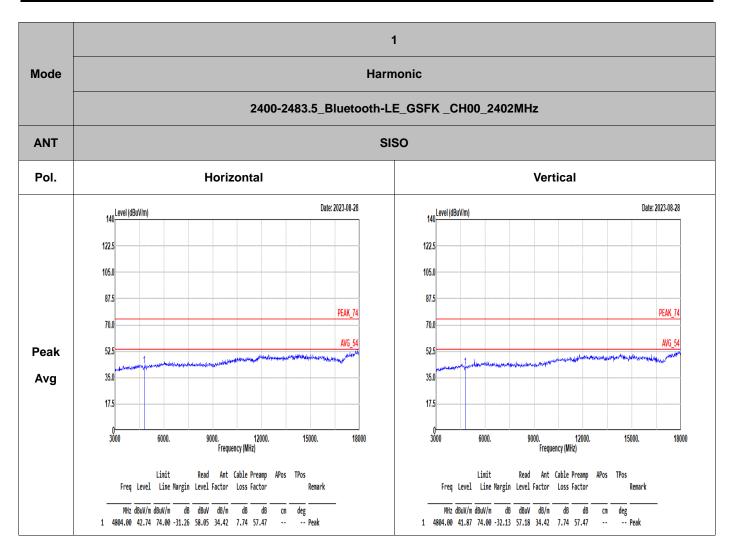
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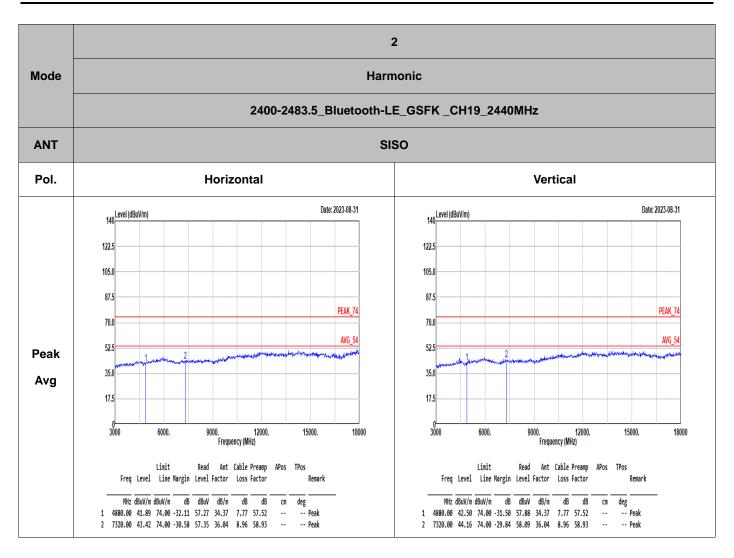
Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH00_2402MHz SISO **ANT** Pol. Horizontal **Fundamental** 130 Level (dBuV/m) Date: 2023-08-24 Date: 2023-08-24 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 48.8 48.8 Peak 32.5 32.5 16.3 16.3 1000 0, 2200. Frequency (MHz) 2310 2346.8 2365.2 Frequency (MHz) 2402 1400. 3000 Limit Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Remark Freq Level Line Margin Level Factor Loss Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg MHz dBuV/m dBuV/m dB dBuV dB/m dB dB 1 2365.66 51.37 74.00 -22.63 48.13 32.15 4.77 33.68 152 177 PEAK 1 2402.00 92.85 ----- 89.45 32.25 4.81 33.66 152 177 Peak Date: 2023-08-24 130 Level (dBuV/m) Date: 2023-09-07 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 AVG_54 48.8 48.8 Avg 32.5 32.5 16.3 16.3 1000 2200. 3000 2310 2383.6 2402 Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp APos Read Ant Cable Preamp APos TPos Limit Freq Level Line Margin Level Factor Loss Factor Remark Freq Level Line Margin Level Factor Loss Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg 1 2402.00 91.75 54.00 37.75 88.35 32.25 4.81 33.66 152 177 Average 177 AVERAGE 1 2387.74 40.53 54.00 -13.47 37.20 32.21 4.79 33.67 152

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Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH00_2402MHz SISO **ANT** Pol. **Vertical Fundamental** 130 Level (dBuV/m) Date: 2023-08-24 Date: 2023-08-24 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 PEAK_74 65.0 65.0 48.8 48.8 Peak 32.5 32.5 16.3 16.3 1000 2310 6.8 2365.2 Frequency (MHz) 1800, 2200. Frequency (MHz) 2383.6 3000 Limit Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Freq Level Line Margin Level Factor Loss Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg 1 2318.83 51.73 74.00 -22.27 48.69 32.03 4.72 33.71 120 97 PEAK 1 2402.00 96.74 ----- 93.34 32.25 4.81 33.66 120 97 Peak Date: 2023-08-24 130 Level (dBuV/m) 130 Level (dBuV/m) Date: 2023-09-07 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 AVG_54 48.8 48.8 Avg 32.5 32.5 16.3 16.3 1000 1400. 2310 2328.4 2383.6 2402 1800. 2200. 2600. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Freq Level Line Margin Level Factor Loss Factor MHz dBuV/m dBuV/m dB dBuV dB/m MHz dBuV/m dBuV/m dB dBuV dB/m dB dB CM 1 2402.00 95.66 54.00 41.66 92.26 32.25 4.81 33.66 1 2375.87 40.45 54.00 -13.55 37.17 32.18 4.78 33.68 97 AVERAGE

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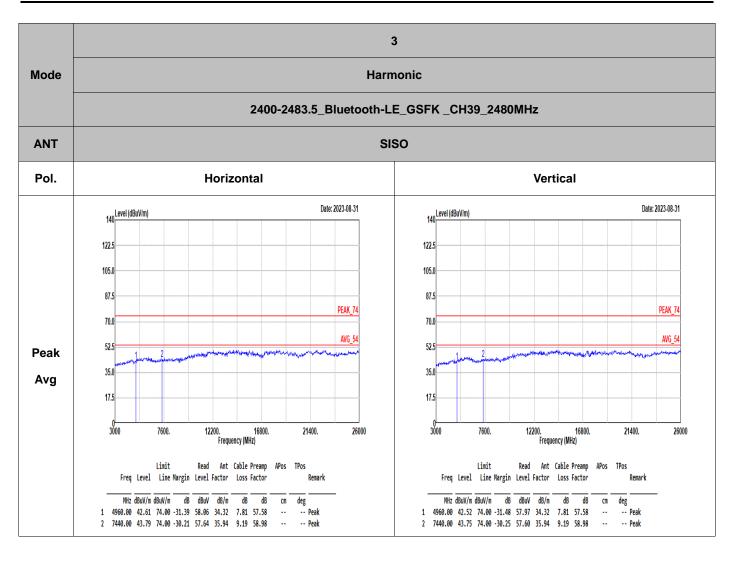
3 Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH39_2480MHz SISO **ANT** Pol. Horizontal **Fundamental** Date: 2023-08-24 Date: 2023-08-24 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 48.8 48.8 Peak 32.5 32.5 16.3 16.3 2480 1000 Frequency (MHz) B. 2492. Frequency (MHz) 2484. 2500 1400. 3000 Limit Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Freq Level Line Margin Level Factor Loss Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg MHz dBuV/m dBuV/m dB dBuV dB/m dB cm deg 1 2499.22 51.72 74.00 -22.28 47.88 32.50 4.94 33.60 131 136 PEAK 1 2480.00 91.61 ----- 87.85 32.45 4.92 33.61 131 136 Peak Date: 2023-08-24 Date: 2023-09-07 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 AVG_54 AVG_BE_54 48.8 48.8 Avg 32.5 32.5 16.3 16.3 1000 9. 2200. Frequency (MHz) 1400. 3000 2484. 2500 Frequency (MHz) Limit Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Freq Level Line Margin Level Factor Loss Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB Cm deg MHz dBuV/m dBuV/m dB dBuV dB/m dB dB 1 2480.00 90.61 54.00 36.61 86.85 32.45 4.92 33.61 131 136 Average CM 1 2498.40 41.18 54.00 -12.82 37.34 32.50 4.94 33.60 131 136 AVERAGE

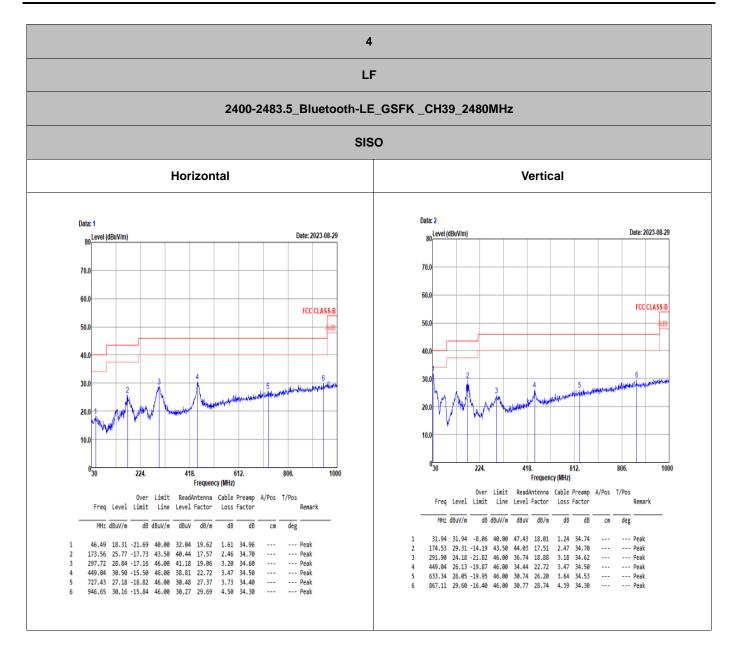
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3 Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH39_2480MHz SISO **ANT** Pol. **Vertical Fundamental** 130 Level (dBuV/m) Date: 2023-08-24 Date: 2023-08-24 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 PEAK BE 74 PEAK 74 65.0 65.0 48.8 48.8 Peak 32.5 32.5 16.3 16.3 0 1000 2488. 2492. Frequency (MHz) 1800. 2200. Frequency (MHz) 2480 2500 1400. 3000 Limit Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Remark Freq Level Line Margin Level Factor Loss Factor MHz dBuV/m dBuV/m dB dBuV dB/m cm deg MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg 1 2491.36 51.96 74.00 -22.04 48.16 32.48 4.93 33.61 127 84 PEAK 1 2480.00 96.46 ----- 92.70 32.45 4.92 33.61 127 84 Peak Date: 2023-08-24 130 Level (dBuV/m) 130 Level (dBuV/m) Date: 2023-09-07 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 AVG_BE_54 AVG_54 48.8 48.8 Avg 32.5 32.5 16.3 16.3 1000 1800. 2200. Frequency (MHz) 1400. 2600 3000 2480 2500 Frequency (MHz) Limit Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Remark Freq Level Line Margin Level Factor Loss Factor dB dBuV dB/m MHz dBuV/m dBuV/m deg dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB CM 1 2480.00 95.39 54.00 41.39 91.63 32.45 4.92 33.61 127 84 AVERAGE 1 2483.70 41.43 54.00 -12.57 37.66 32.46 4.92 33.61 127

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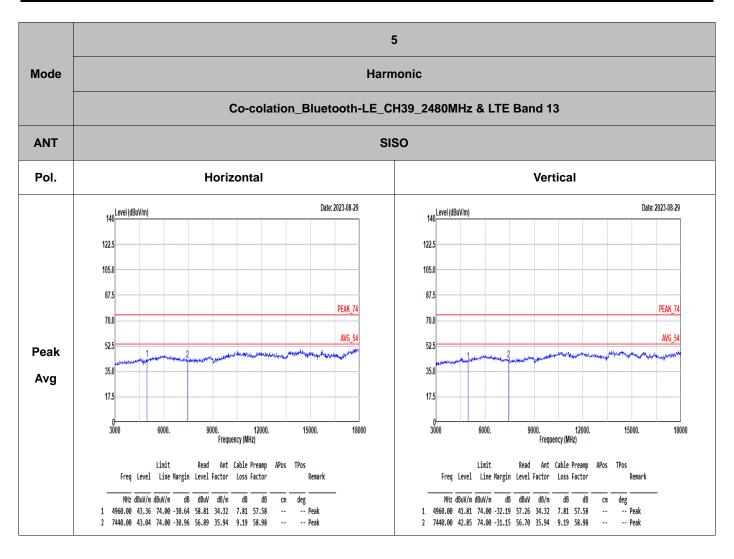
5 Mode **Band Edge** Co-colation_Bluetooth-LE_CH39_2480MHz & LTE Band 13 SISO **ANT** Horizontal **Fundamental** Pol. Date: 2023-09-07 130 Level (dBuV/m) Date: 2023-09-07 130 Level (dBuV/m) 113.8 113.8 97.5 97. 81.3 81.3 PEAK_BE_74 PEAK_74 65.0 65.0 48.8 48. Peak 32.5 32. 16.3 16.3 1000 2480 2488. Frequency (MHz) 1800. 2200. Frequency (MHz) 2600. 3000 2496. 2484. 2492. 2500 Limit Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Freq Level Line Margin Level Factor Loss Factor dB dBuV dB/m MHz dBuV/m dBuV/m MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm
1 2492.64 52.76 74.00 -21.24 48.96 32.48 4.93 33.61 300 1 2480.00 89.32 74.00 15.32 85.56 32.45 4.92 33.61 300 166 PEAK 166 PEAK 130 Level (dBuV/m) Date: 2023-09-07 130 Level (dBuV/m) Date: 2023-09-07 113.8 113.8 97.5 97.5 81.3 81.3 65.0 AVG_BE_54 AVG_54 48.8 48.8 Avg 32.5 32.5 16.3 16.3 2480 2488. 2492. Frequency (MHz) 2496. 1000 1800. 2200. Frequency (MHz) 1400. 3000 Limit Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Freq Level Line Margin Level Factor Loss Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB _ dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB 1 2486.26 41.38 54.00 -12.62 37.61 32.46 4.92 33.61 300 166 AVERAGE 1 2480.00 86.18 54.00 32.18 82.42 32.45 4.92 33.61 300 166 AVERAGE

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5 Mode **Band Edge** Co-colation_Bluetooth-LE_CH39_2480MHz & LTE Band 13 SISO ANT Pol. **Vertical Fundamental** Date: 2023-09-07 130 Level (dBuV/m) Date: 2023-09-07 130 Level (dBuV/m) 113.8 97.5 97.5 81.3 PEAK_BE_74 PEAK_74 65.0 65.0 48.8 48.8 Peak 32.5 16.3 16.3 1000 1800. Frequency (MHz) 1400. 3000 2480 2484. 2488. 2492. Frequency (MHz) 2496. 2500 Read Ant Cable Preamp APos TPos Limit Read Ant Cable Preamp APos TPos Limit Freq Level Line Margin Level Factor Loss Factor Freq Level Line Margin Level Factor Loss Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm 1 2480.00 96.64 74.00 22.64 92.88 32.45 4.92 33.61 254 deg 360 PEAK dB dB MHz dBuV/m dBuV/m dB dBuV dB/m deg 1 2489.06 52.20 74.00 -21.80 48.41 32.47 4.93 33.61 254 360 Peak Date: 2023-09-07 130 Level (dBuV/m) 130 Level (dBuV/m) Date: 2023-09-07 113.8 113.8 81.3 81.3 65.0 65.0 AVG 54 AVG_BE_54 48.8 48.8 Avg 32.5 16.3 16.3 1000 1400. 1800. 2200. Frequency (MHz) 2600. 3000 8. 2492. Frequency (MHz) 2496. Read Ant Cable Preamp APos TPos Limit Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Remark Freq Level Line Margin Level Factor Loss Factor Remark | MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg | 1 2480.00 91.51 54.00 37.51 87.75 32.45 4.92 33.61 254 360 AVERAGE MHz dBuV/m dBuV/m dB dBuV dB/m dB dB cm deg
1 2491.06 41.15 54.00 -12.85 37.35 32.48 4.93 33.61 254 360 Peak

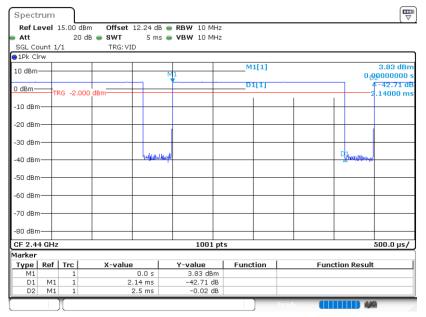
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Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
Bluetooth LE 1Mbps	85.6	2.14	0.467	1KHz

Bluetooth LE 1Mbps



Date: 22.AUG.2023 18:40:40

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