FCC RF Test Report

APPLICANT	:	Ningbo Lingzhu Technology CO., Ltd.
EQUIPMENT	:	ATag
MODEL NAME	:	TTFM-50
FCC ID	:	2A789-TTFM-50
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DTS) Digital Transmission System
TEST DATE(S)	:	Jul. 01, 2024 ~ Aug. 11, 2024

We, Sporton International Inc. (Kunshan), 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. (Kunshan), the test report shall not be reproduced except in full.

Jason Jia

Approved by: Jason Jia

ACCREDITED Cert #5145.02

Sporton International Inc. (Kunshan)
No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300
People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR382914	Rev. 01	Initial issue of report	Aug. 13, 2024

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	-	Pass	-
3.2	15.247(b)(3)	Peak 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	≤ 20dBc	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 0.37 dB at 9919.00 MHz
-	15.207	AC Conducted Emission	15.207(a)	Not Required	only employ battery power
3.6	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Remark: Not required means after assessing, test items are not necessary to carry out.

Conformity Assessment Condition:

1. 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.

1 General Description

1.1 Applicant

Ningbo Lingzhu Technology CO., Ltd.
No.578,Building 7,No.535 Kangqiao South Road,Jiangbei District,Ningbo,PRC

1.2 Manufacturer

Ningbo Lingzhu Technology CO., Ltd.
No.578,Building 7,No.535 Kangqiao South Road,Jiangbei District,Ningbo,PRC

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	ATag
Model Name	TTFM-50
FCC ID	2A789-TTFM-50
HW Version	V106
SW Version	V1

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
Maximum Output Power to Antenna	BLE 1Mbps: 2.65 dBm (0.0018 W) BLE 2Mbps: 2.81 dBm (0.0019 W)
Maximum EIRP	BLE 1Mbps: 3.92 dBm (0.0025 W) BLE 2Mbps: 4.08 dBm (0.0026 W)
99% Occupied Bandwidth	BLE 1Mbps:1.017MHz BLE 2Mbps:2.006MHz
Antenna Type / Gain	PCB Antenna type with gain 1.27 dBi
Type of Modulation	Bluetooth LE : GFSK

1.5 Modification of EUT

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

1.6 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)		
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China TEL : +86-512-57900158		
Test Site No.	**Sporton Site No.**	**FCC Designation No.**	**FCC Test Firm Registration No.**
	03CH06-KS TH01-KS	CN1257	314309

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	TH01-KS	SPORTON	FCC 15C-15E Test Tools Ver10.0_210607	10.0
2.	03CH06-KS	AUDIX	E3	210616

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 C63.10-2020

Remark: All test items were verified and recorded according to the standards and without any deviation during the test.

2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 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
	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	-	-

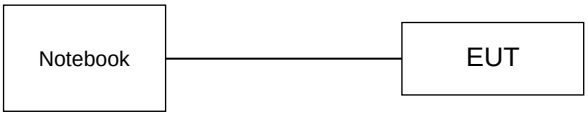
2.2 Test Mode

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: 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 (X plane) were recorded in this report.

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**
	Bluetooth – LE / GFSK
Conducted TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_BLE 1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_BLE 1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_BLE 1Mbps Mode 4: Bluetooth Tx CH00_2402 MHz_BLE 2Mbps Mode 5: Bluetooth Tx CH19_2440 MHz_BLE 2Mbps Mode 6: Bluetooth Tx CH39_2480 MHz_BLE 2Mbps
Radiated TCs	Mode 1: Bluetooth Tx CH00_2402 MHz_BLE 1Mbps Mode 2: Bluetooth Tx CH19_2440 MHz_BLE 1Mbps Mode 3: Bluetooth Tx CH39_2480 MHz_BLE 1Mbps Mode 4: Bluetooth Tx CH00_2402 MHz_BLE 2Mbps Mode 5: Bluetooth Tx CH19_2440 MHz_BLE 2Mbps Mode 6: Bluetooth Tx CH39_2480 MHz_BLE 2Mbps

2.3 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

. For detail, please refer to test mode configuration and setup photographs for each test item.

2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.5 EUT Operation Test Setup

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

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.

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.

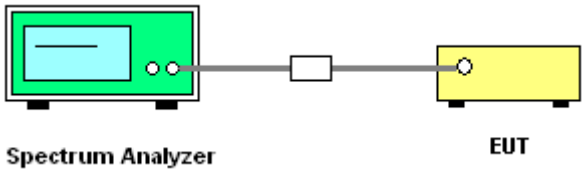
3.1.2 Measuring Instruments

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 C63.10-2020 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.
6. Measure and record the results in the test report.

3.1.4 Test Setup

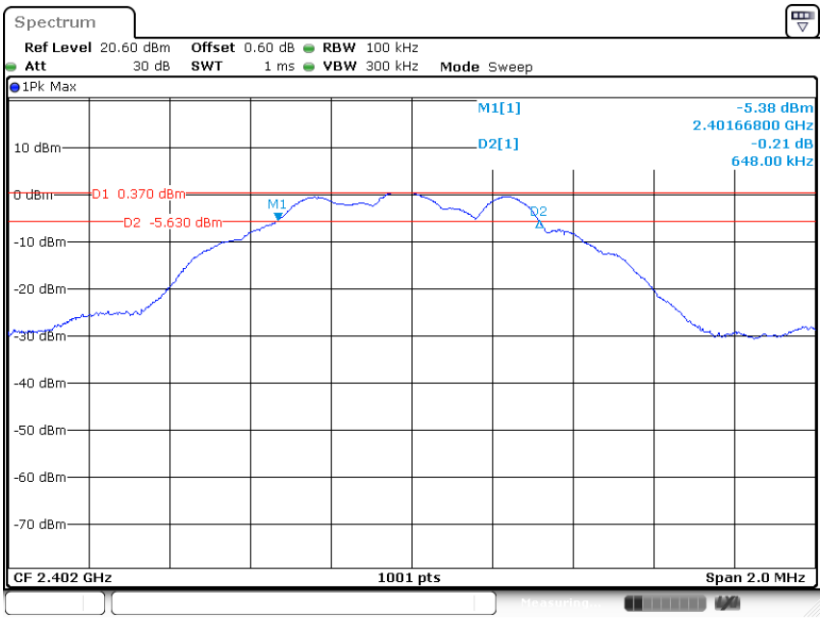


3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

BLE 1Mbps

6 dB Bandwidth Plot on Channel 00



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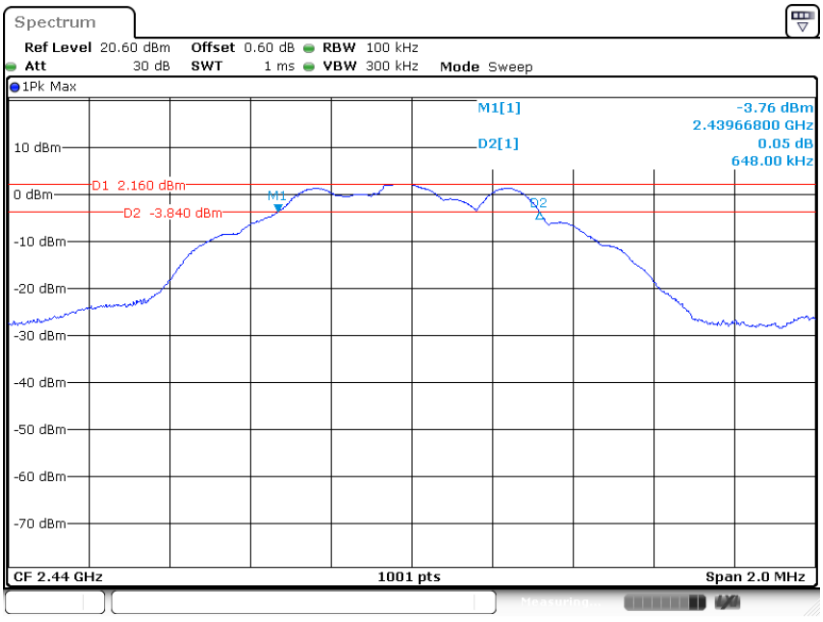
6 dB Bandwidth Plot on Channel 19



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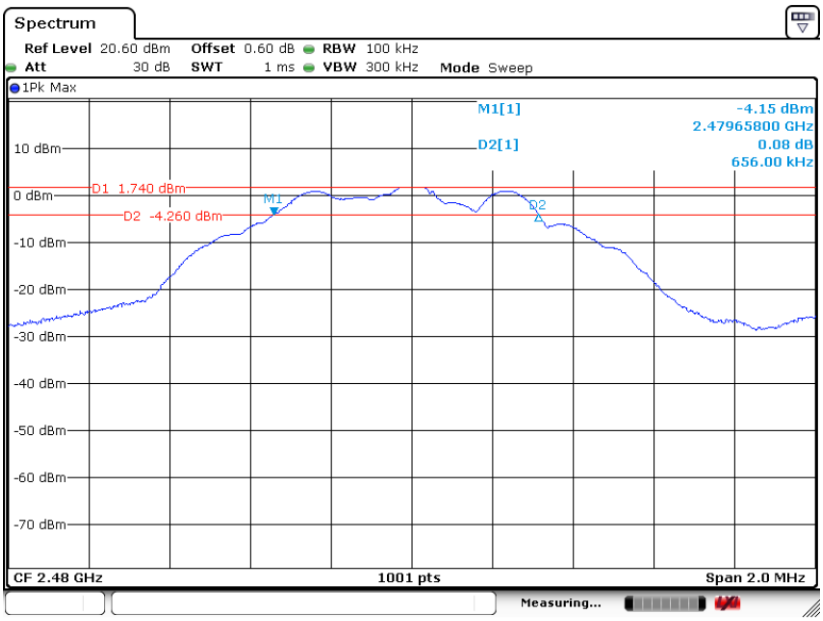
6 dB Bandwidth Plot on Channel 39



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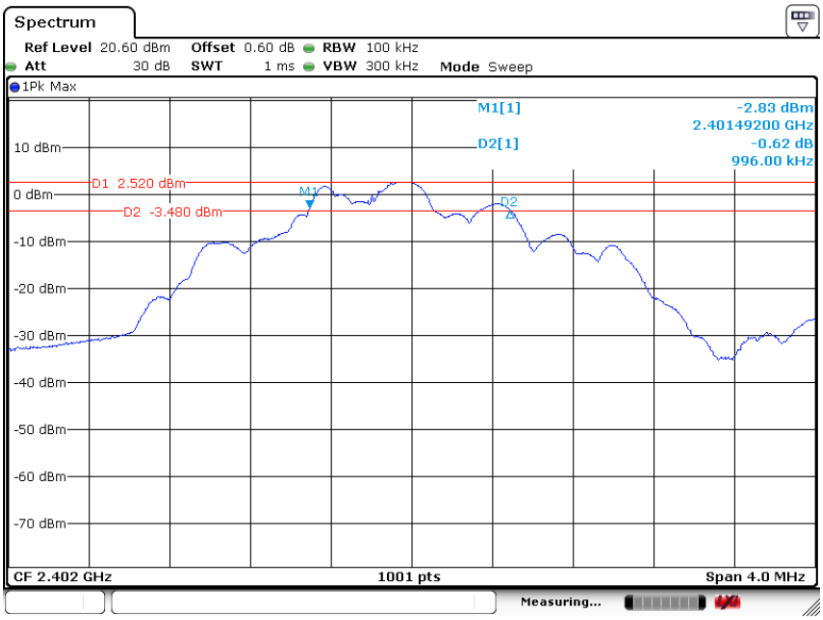
BLE 2Mbps

6 dB Bandwidth Plot on Channel 00



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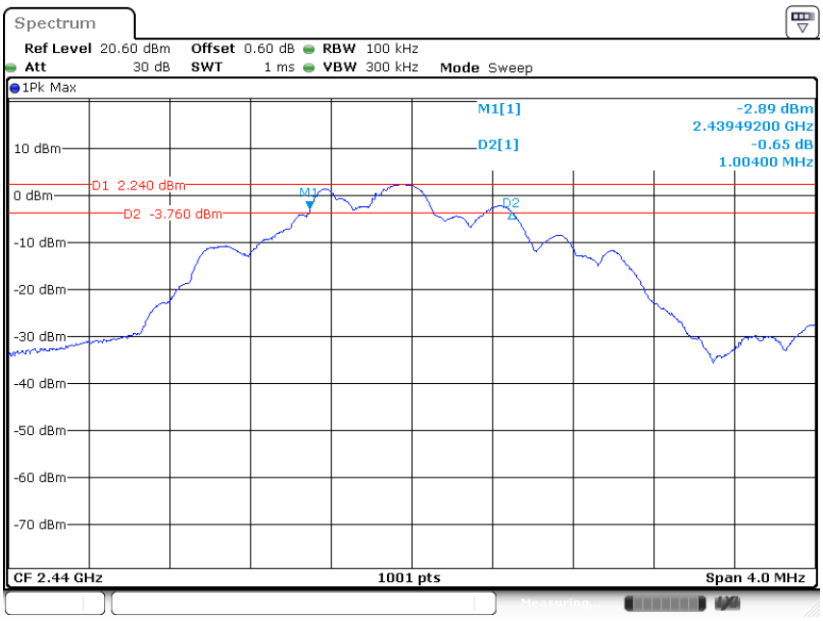
6 dB Bandwidth Plot on Channel 19



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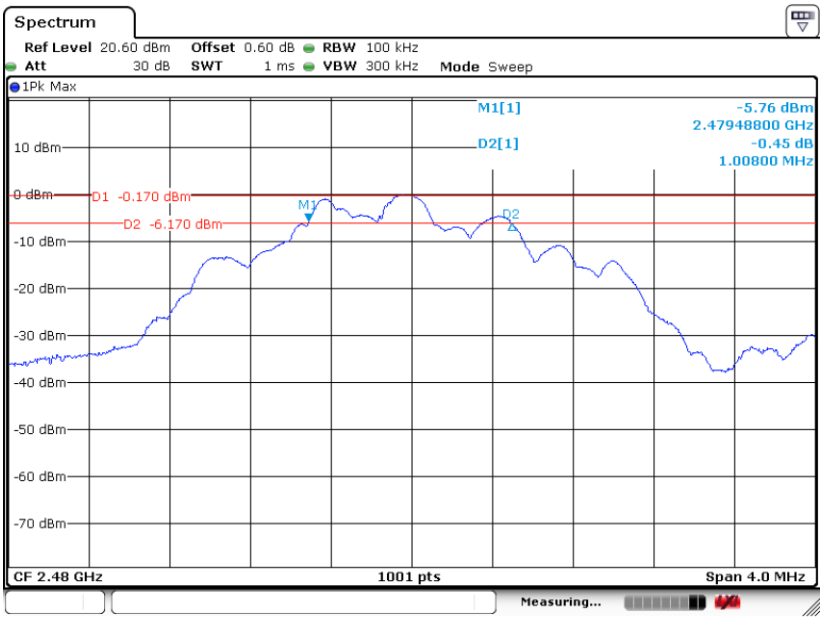
6 dB Bandwidth Plot on Channel 39



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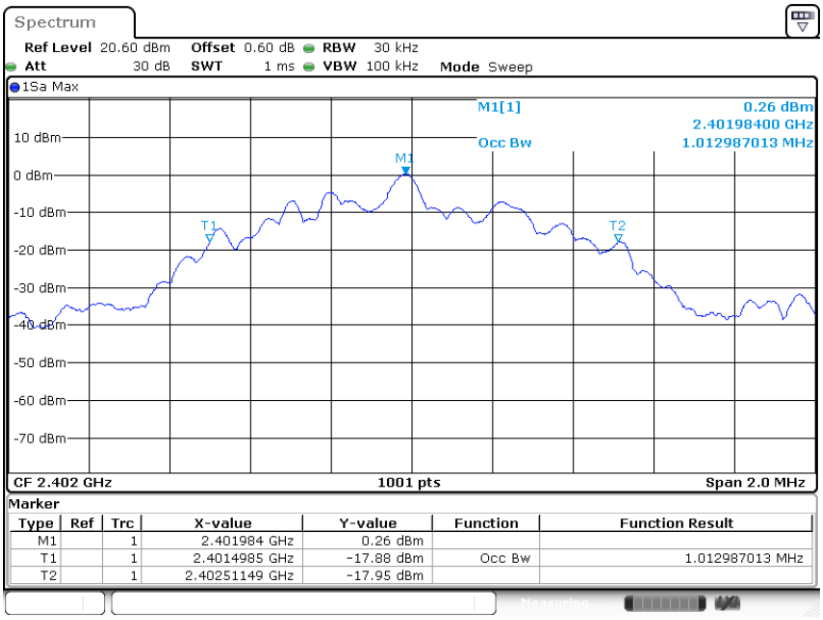
3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

BLE 1Mbps

99% Occupied Bandwidth Plot on Channel 00



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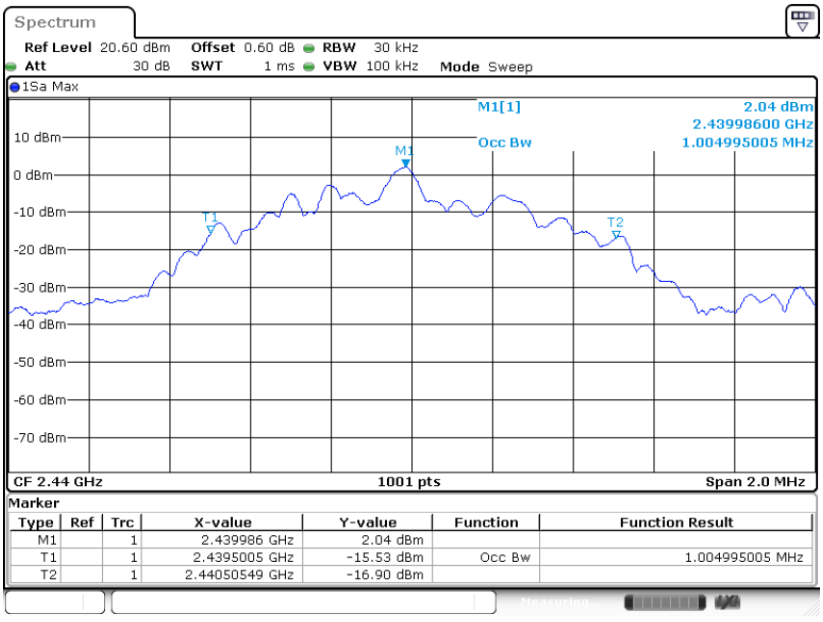
99% Occupied Bandwidth Plot on Channel 19



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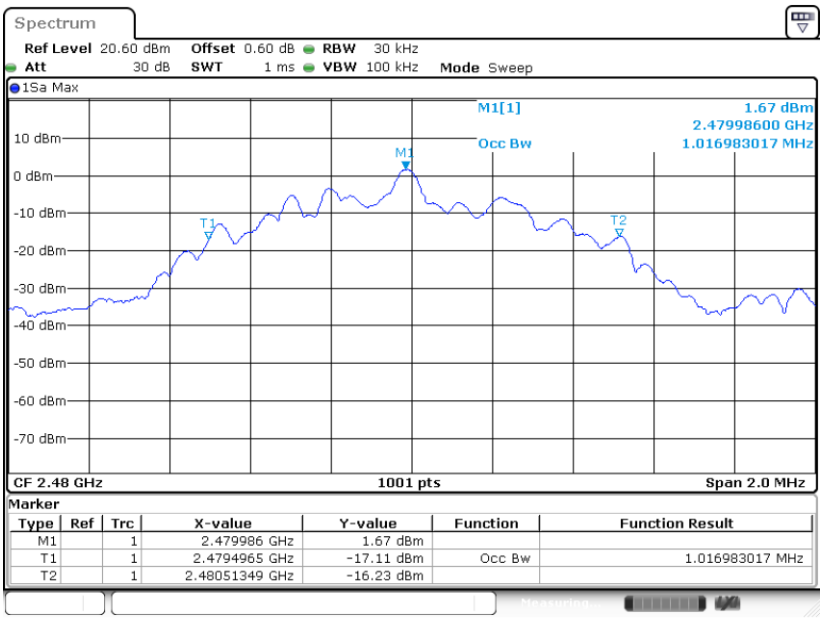
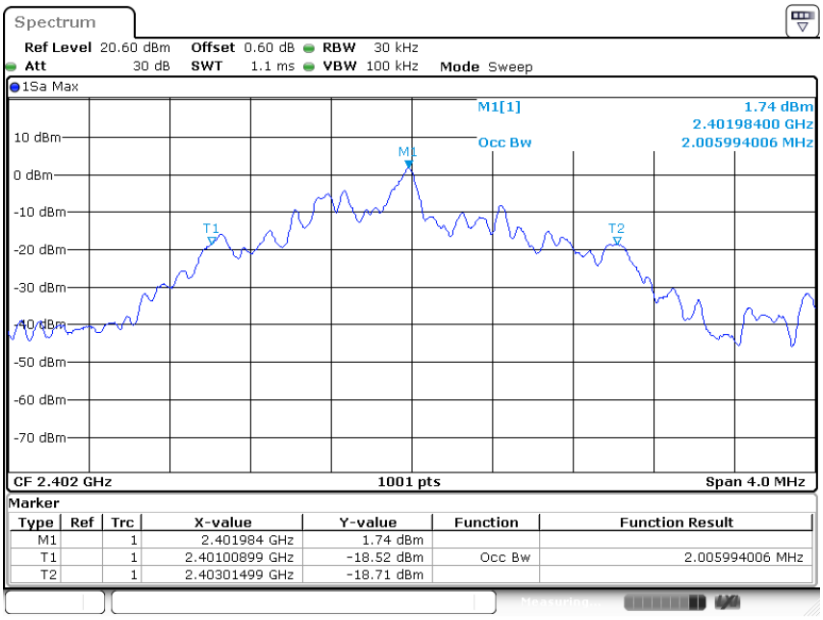
99% Occupied Bandwidth Plot on Channel 39



Date: 11.AUG.2024 10:50:13

BLE 2Mbps

99% Occupied Bandwidth Plot on Channel 00



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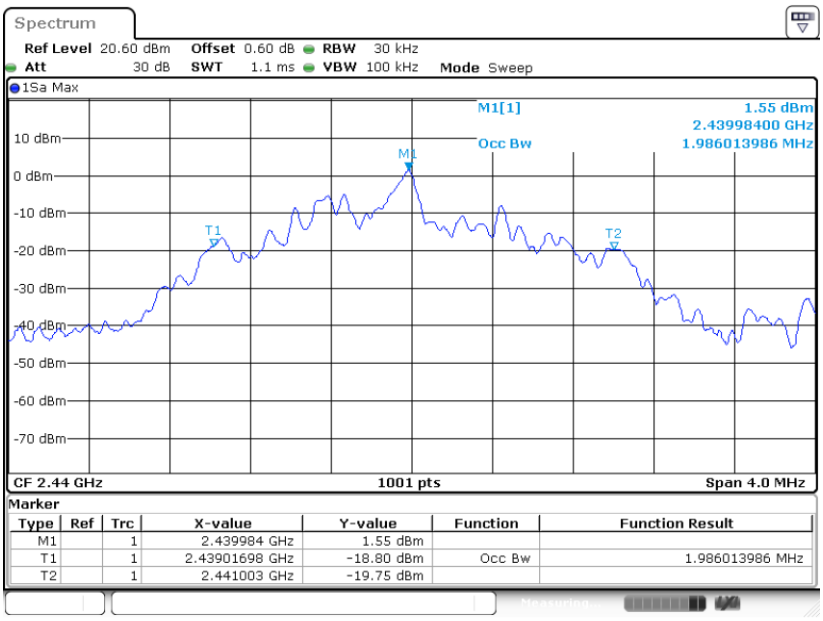
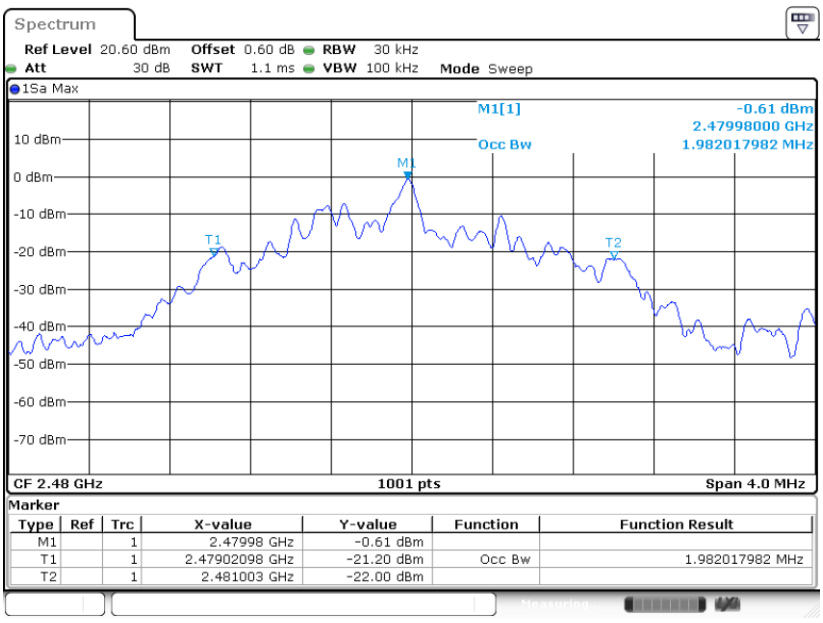
99% Occupied Bandwidth Plot on Channel 19



99% Occupied Bandwidth Plot on Channel 39



Note : The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

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.

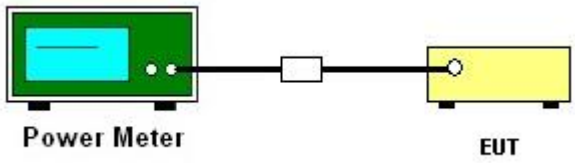
3.2.2 Measuring Instruments

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

3.2.3 Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2020 clause 11.9.1.2 PKPM1 Peak power meter or ANSI C63.10-2020 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 Peak Output Power

Please refer to Appendix A.

3.2.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

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.

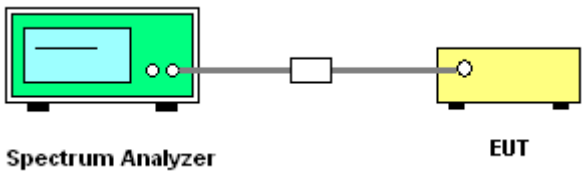
3.3.2 Measuring Instruments

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

3.3.3 Test Procedures

1. The testing follows Measurement Procedure of ANSI C63.10-2020 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



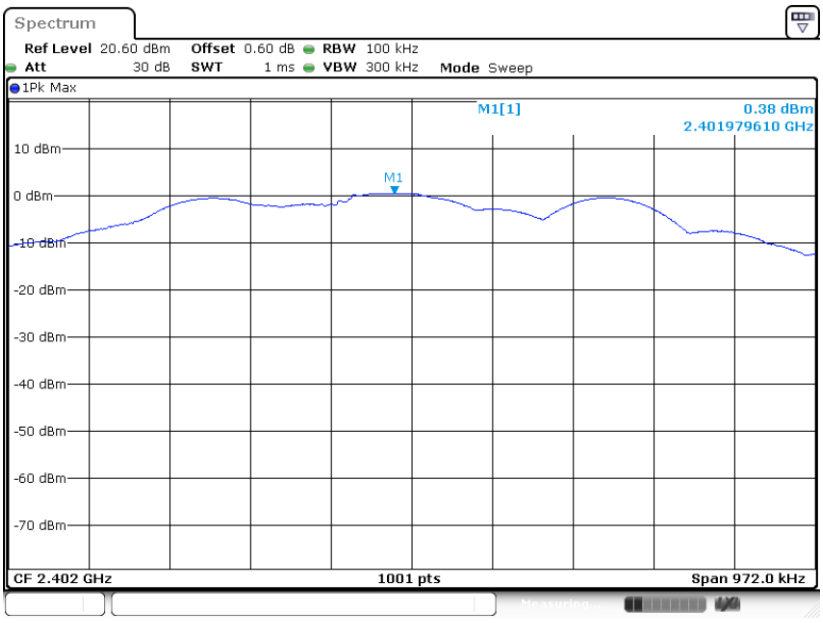
3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

3.3.6 Test Result of Power Spectral Density Plots (100kHz)

BLE 1Mbps

PSD 100kHz Plot on Channel 00



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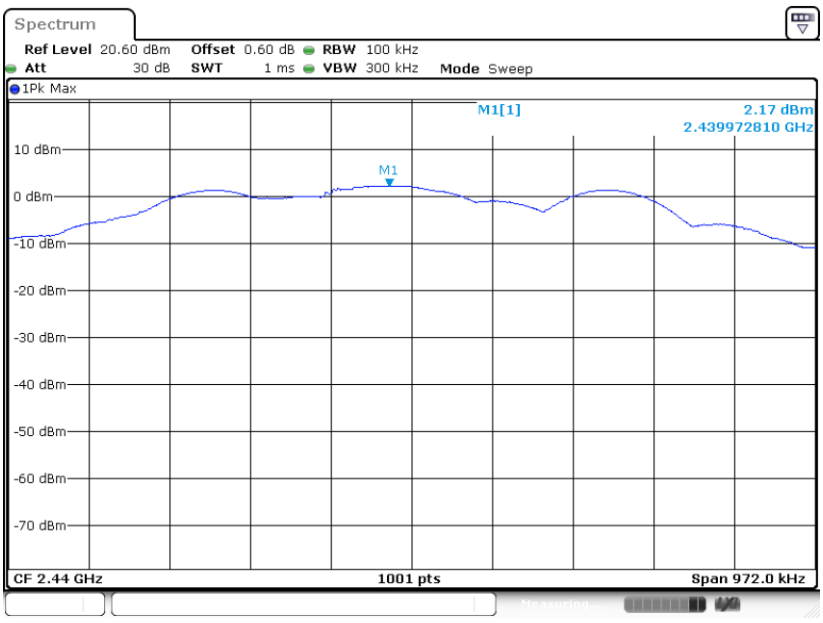
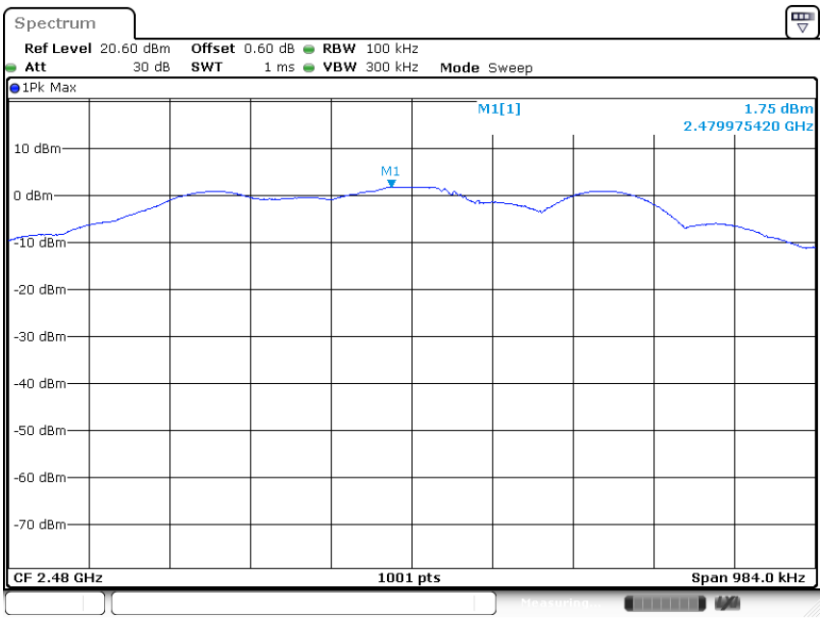
PSD 100kHz Plot on Channel 19



Date: 11.AUG.2024 10:45:37

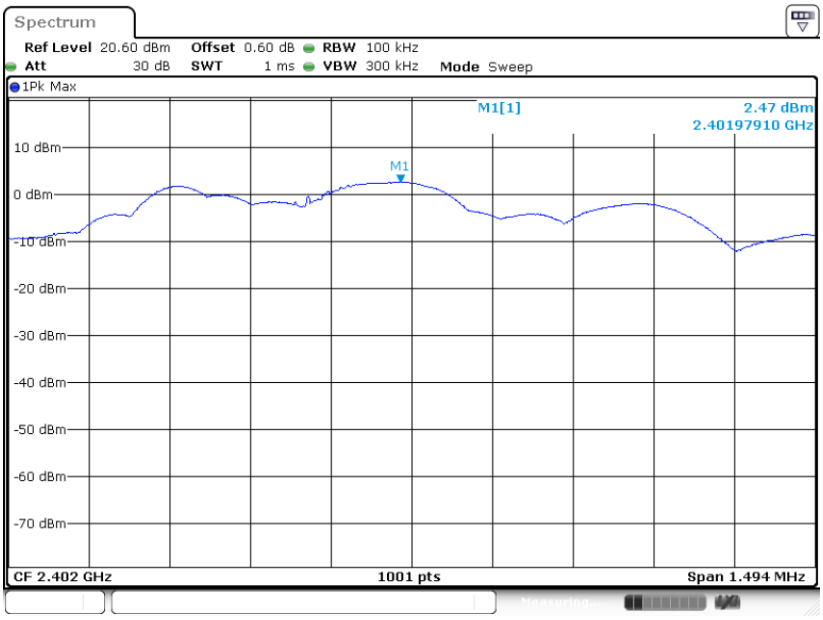
PSD 100kHz Plot on Channel 39



Date: 11.AUG.2024 10:51:55

BLE 2Mbps

PSD 100kHz Plot on Channel 00



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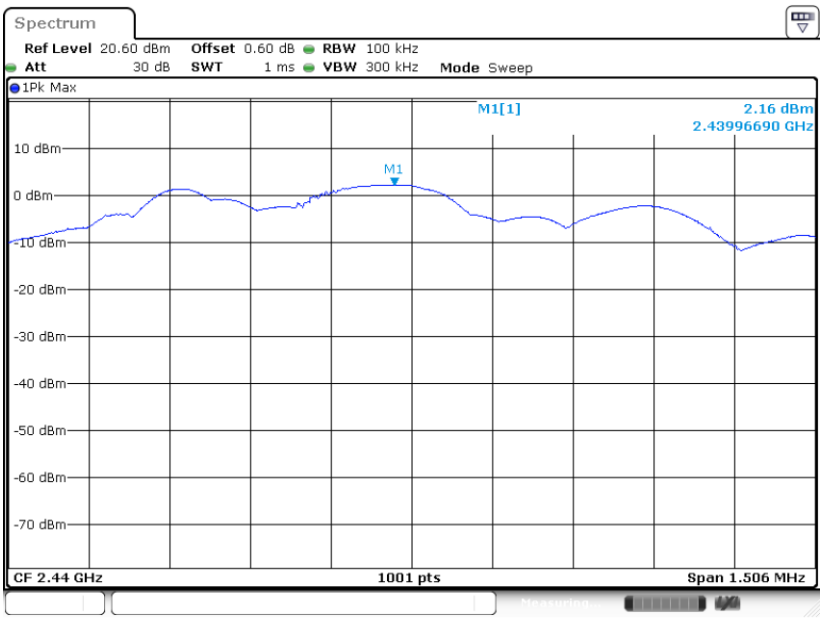
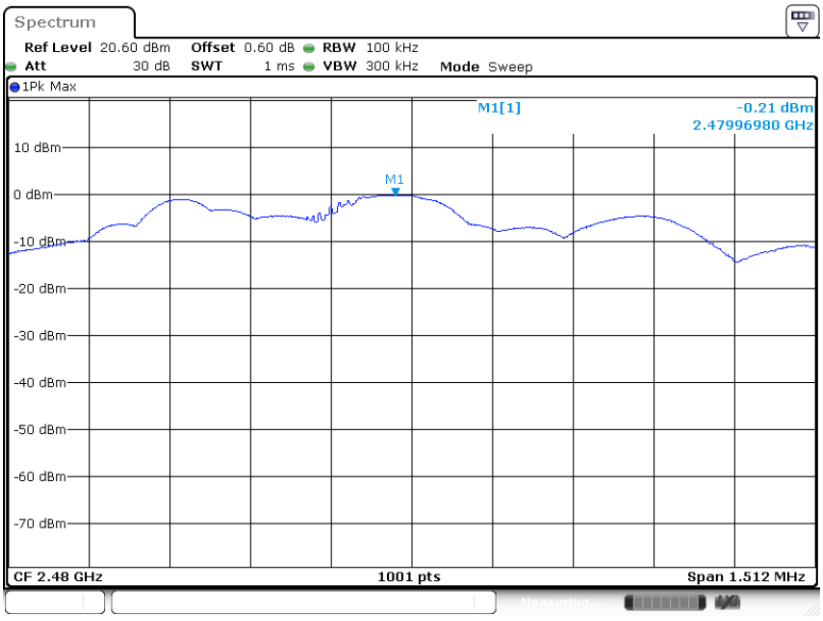
PSD 100kHz Plot on Channel 19



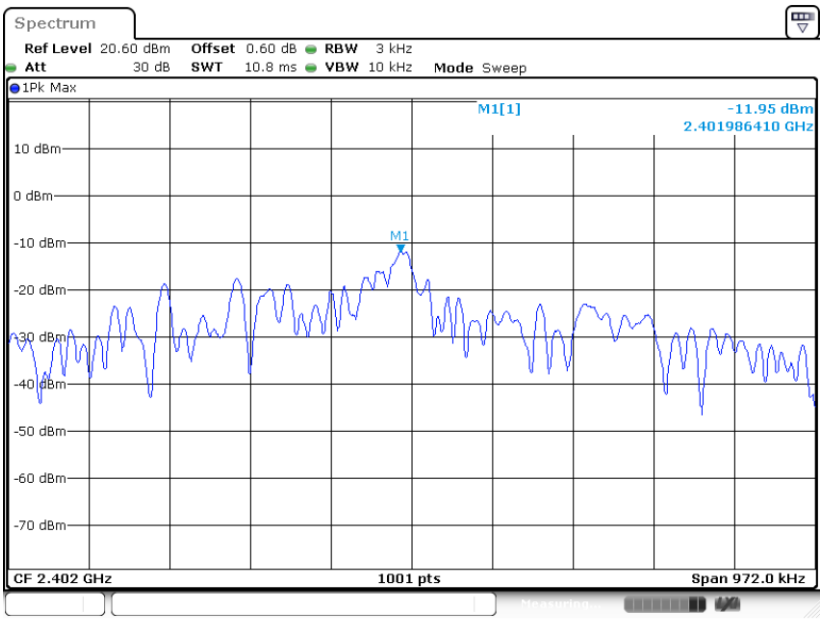
PSD 100kHz Plot on Channel 39



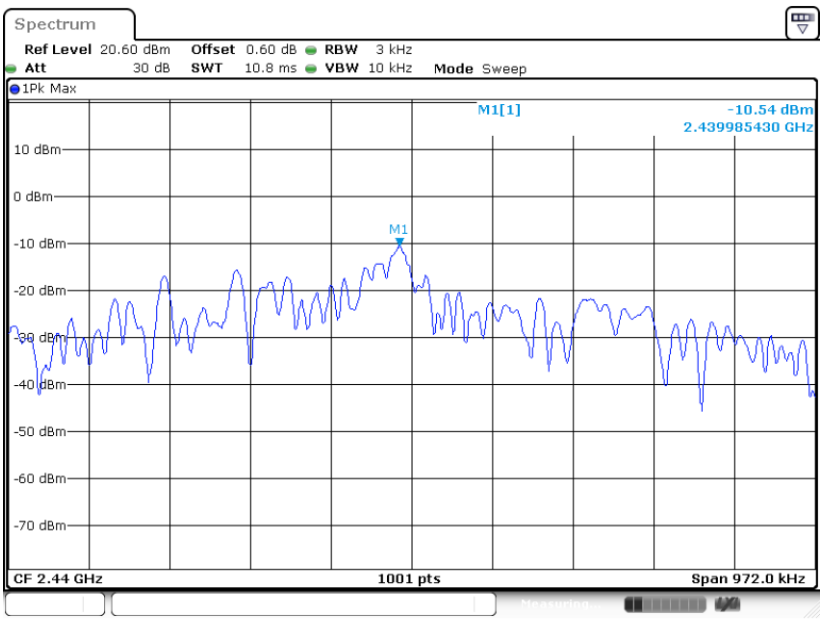
3.3.7 Test Result of Power Spectral Density Plots (3kHz)

BLE 1Mbps

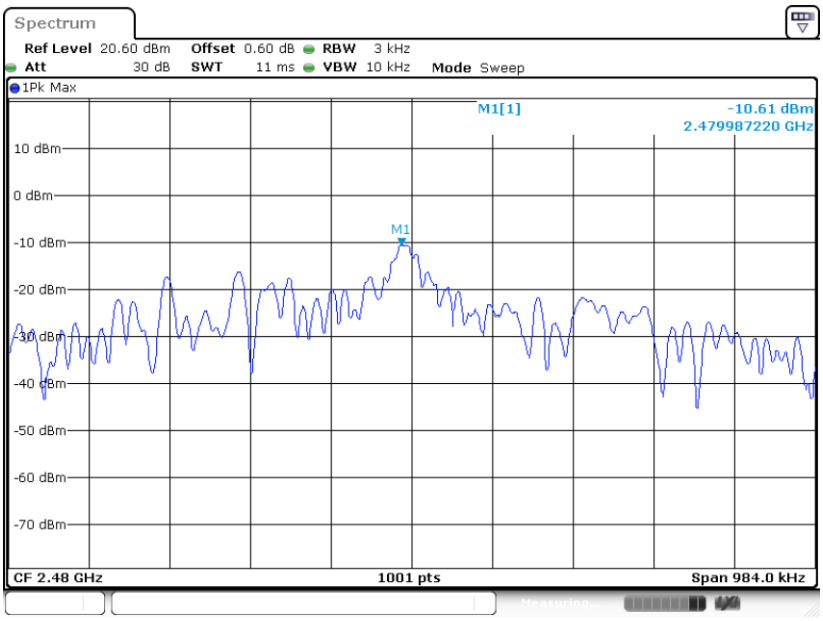
PSD 3kHz Plot on Channel 00



PSD 3kHz Plot on Channel 19



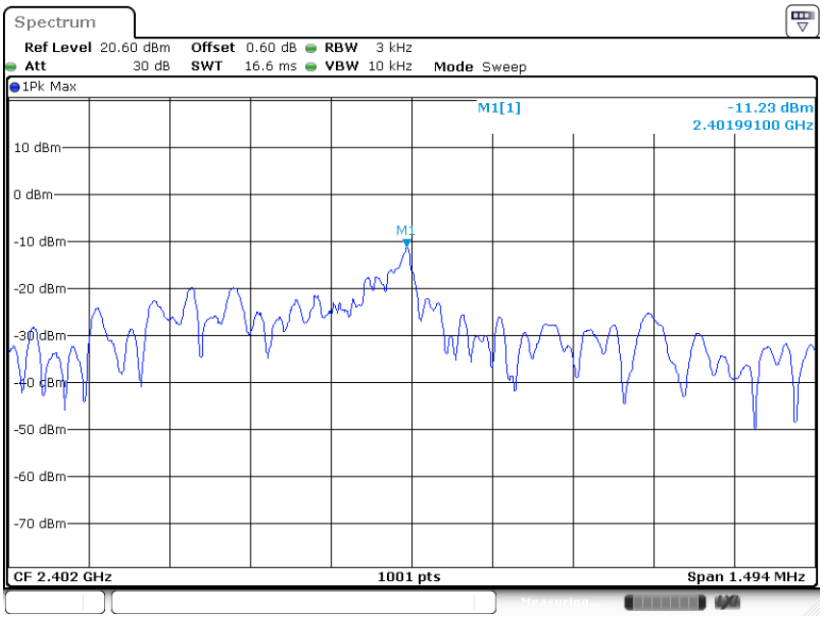
PSD 3kHz Plot on Channel 39



Date: 11.AUG.2024 10:51:21

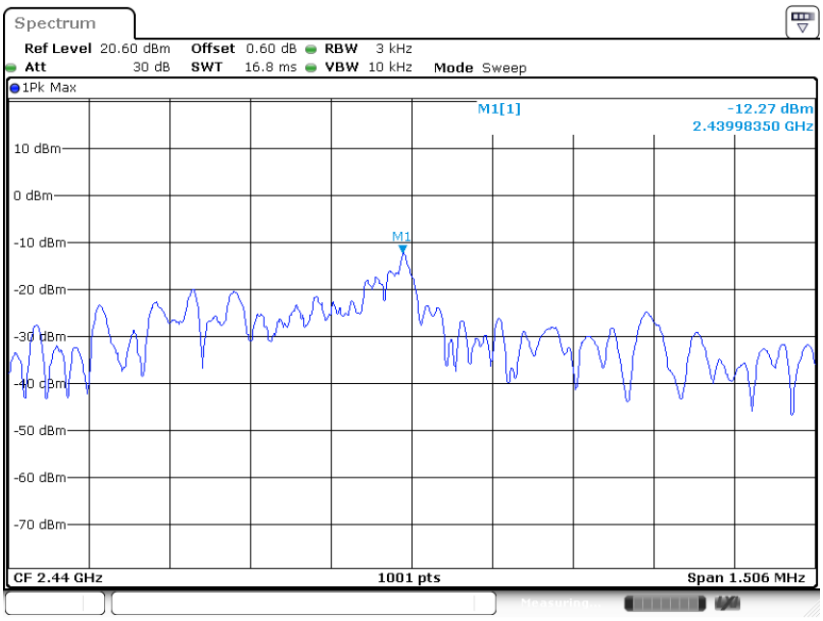
BLE 2Mbps

PSD 3kHz Plot on Channel 00



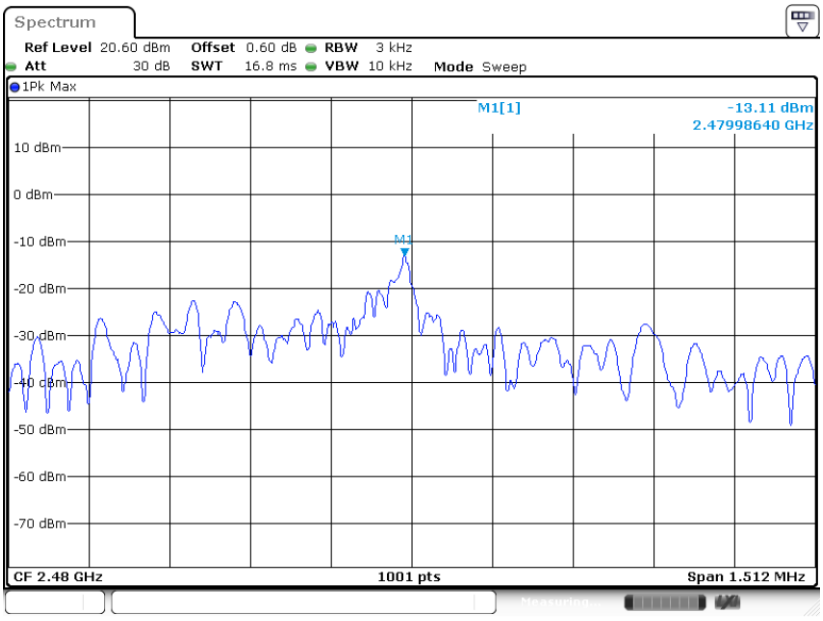
Date: 11.AUG.2024 11:00:27

PSD 3kHz Plot on Channel 19



Date: 11.AUG.2024 11:23:54

PSD 3kHz Plot on Channel 39



Date: 11.AUG.2024 11:34:00

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 20 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

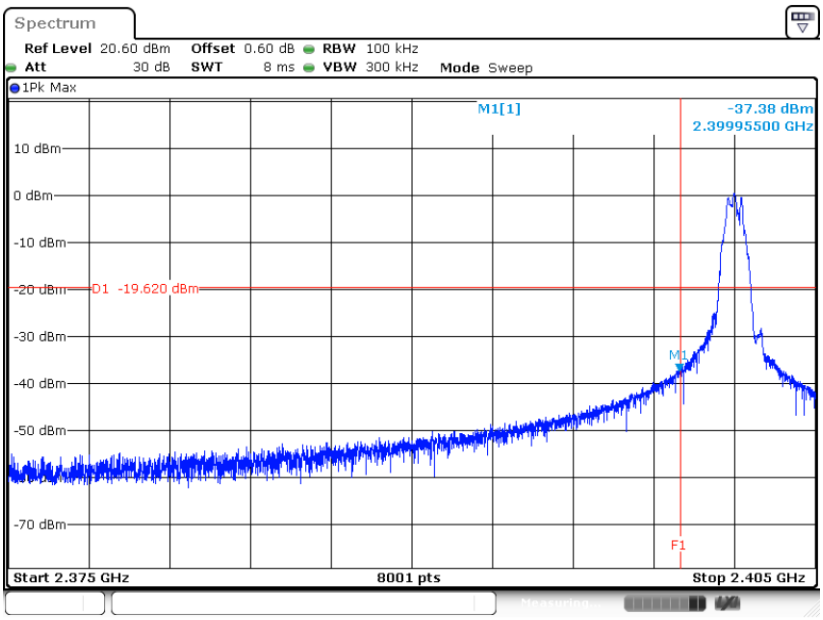
1. The testing follows ANSI C63.10-2020 clause 11.12
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 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

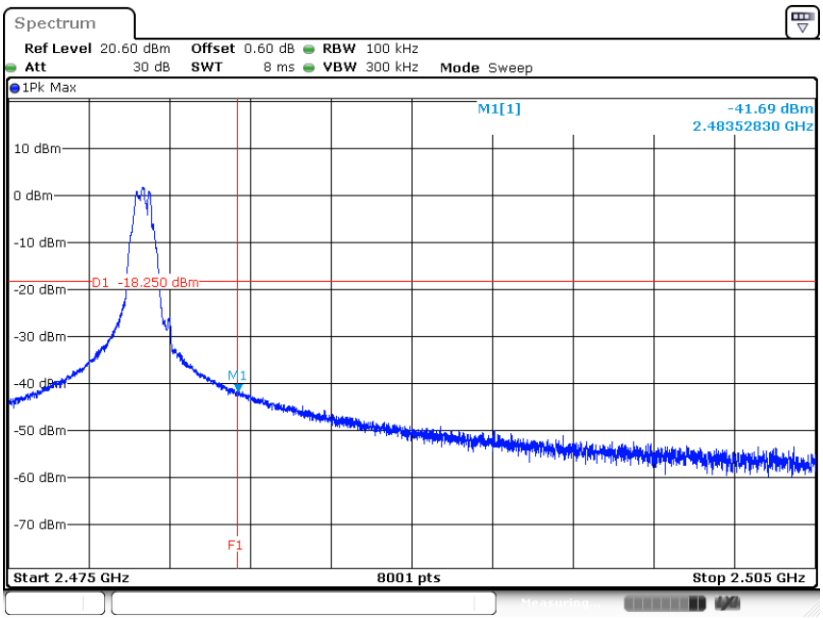
BLE 1Mbps

Low Band Edge Plot on Channel 00



Date: 11.AUG.2024 10:44:19

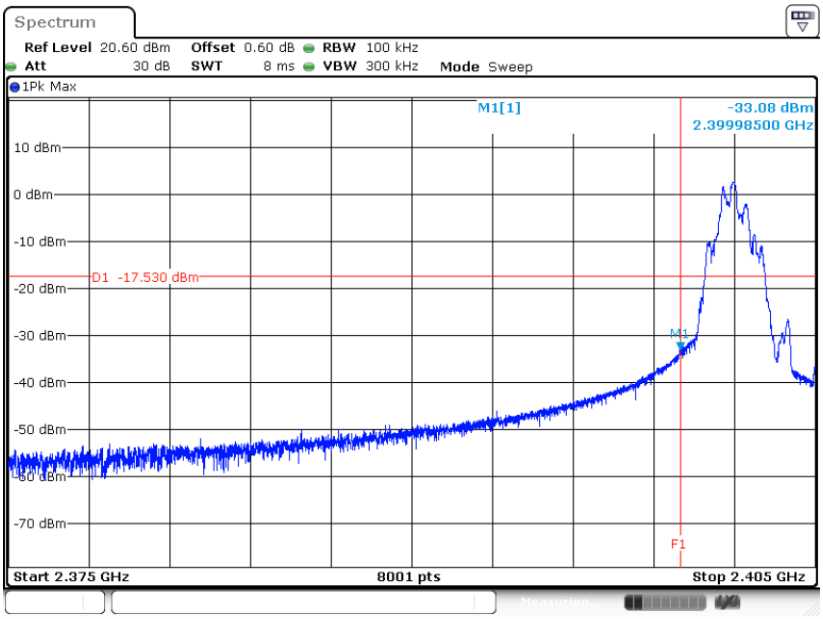
High Band Edge Plot on Channel 39



Date: 11.AUG.2024 10:53:17

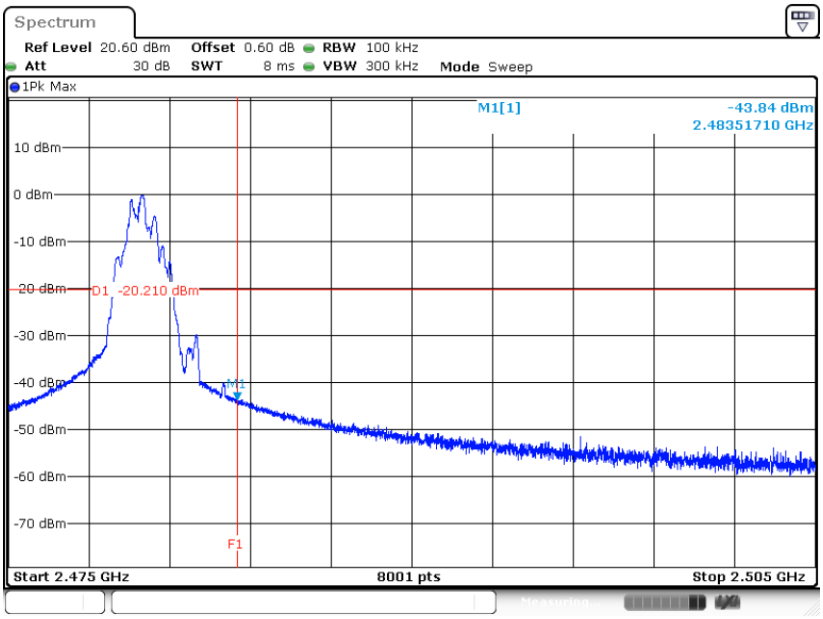
BLE 2Mbps

Low Band Edge Plot on Channel 00



Date: 11.AUG.2024 11:02:26

High Band Edge Plot on Channel 39

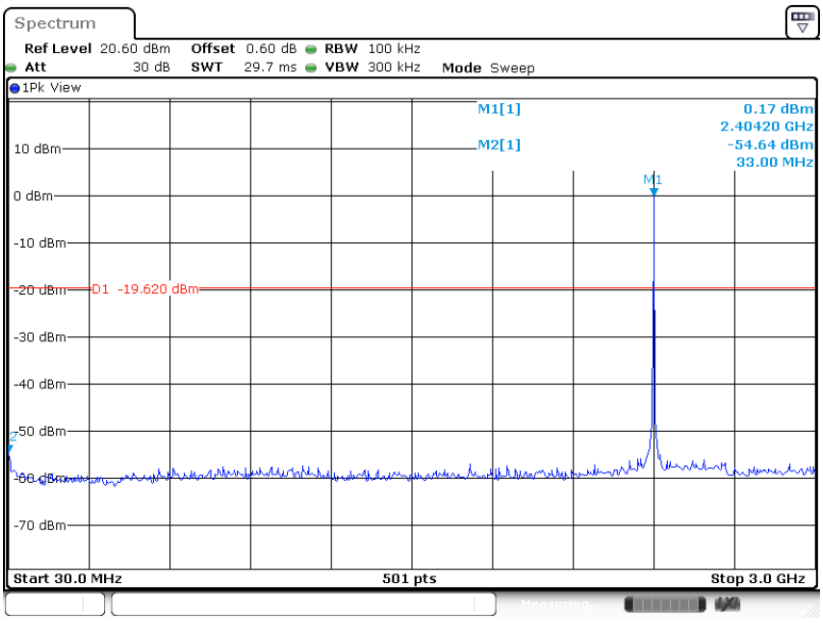


Date: 11.AUG.2024 11:35:40

3.4.6 Test Result of Conducted Spurious Emission Plots

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

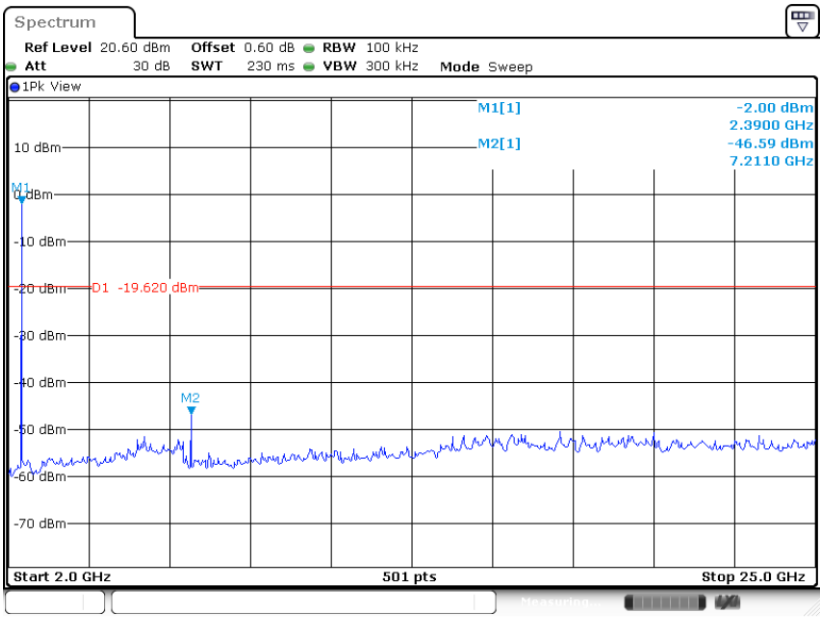
GFSK Channel 00



Date: 11.AUG.2024 10:43:22

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

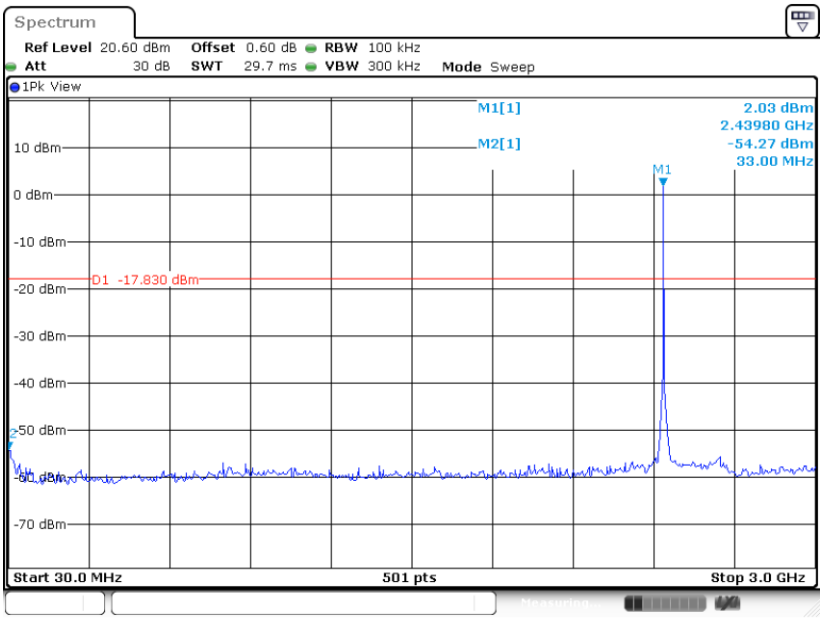
GFSK Channel 00



Date: 11.AUG.2024 10:43:42

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

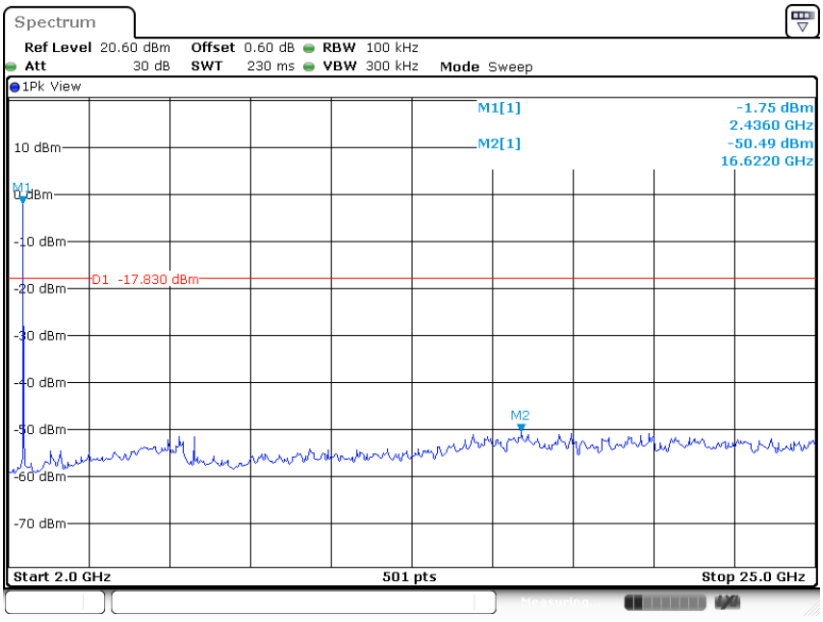
GFSK Channel 19



Date: 11.AUG.2024 10:47:41

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

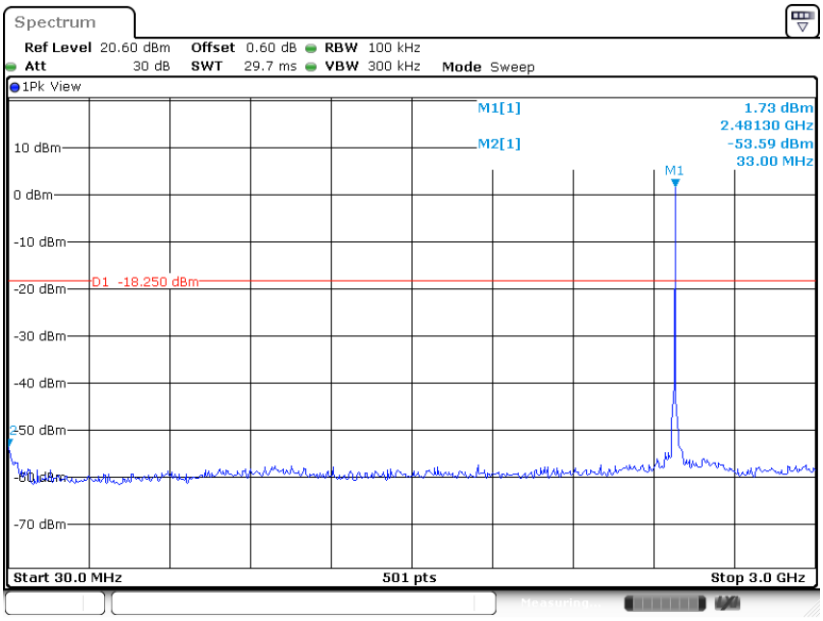
GFSK Channel 19



Date: 11.AUG.2024 10:47:55

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

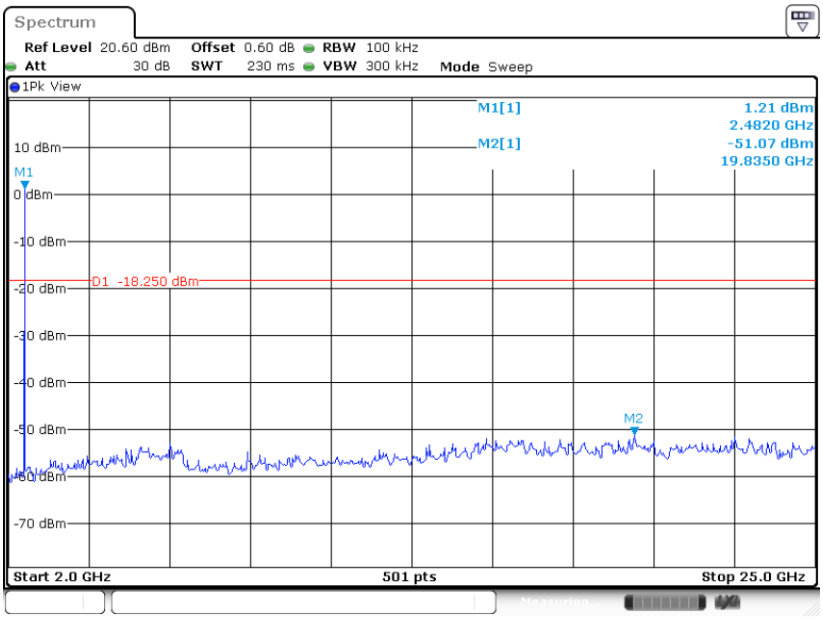
GFSK Channel 39



Date: 11.AUG.2024 10:53:33

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps

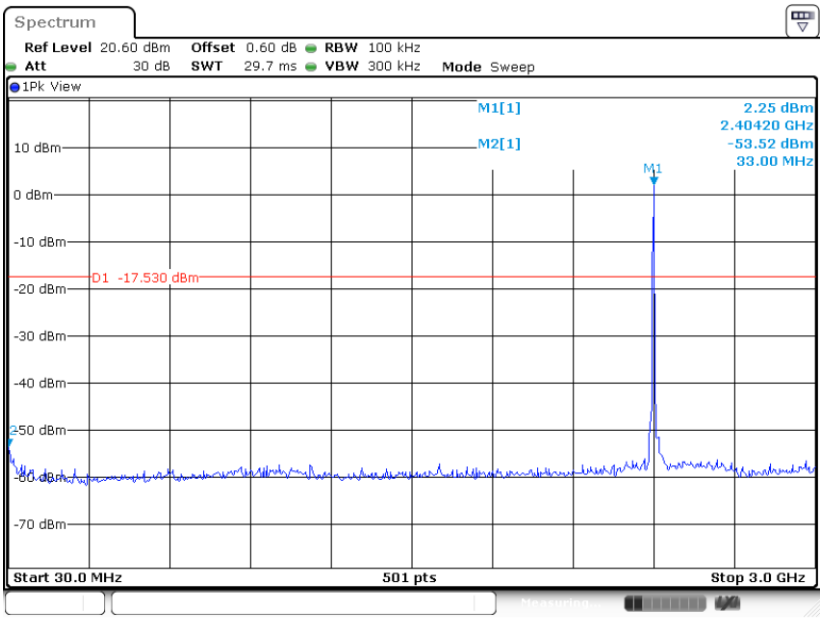
GFSK Channel 39



Date: 11.AUG.2024 10:54:47

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

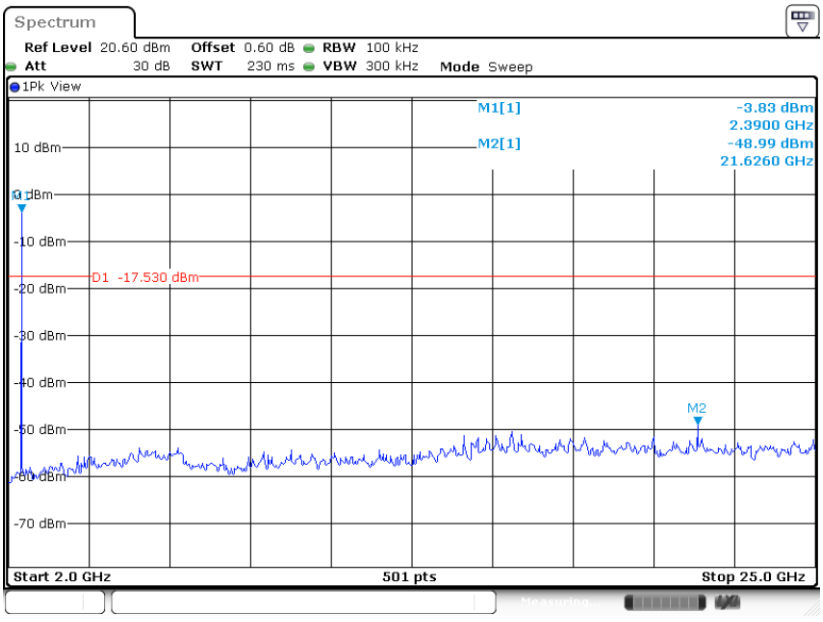
GFSK Channel 00



Date: 11.AUG.2024 11:03:34

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

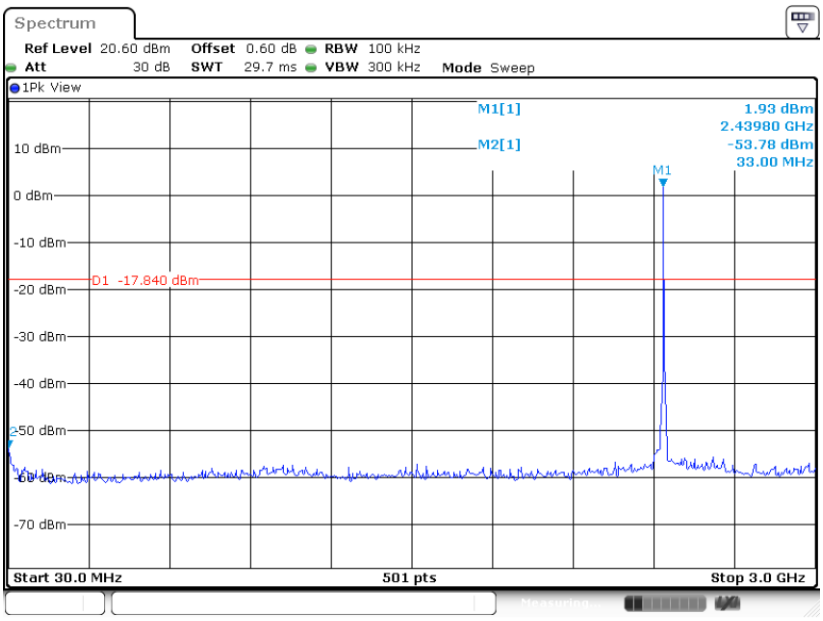
GFSK Channel 00



Date: 11.AUG.2024 11:04:37

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

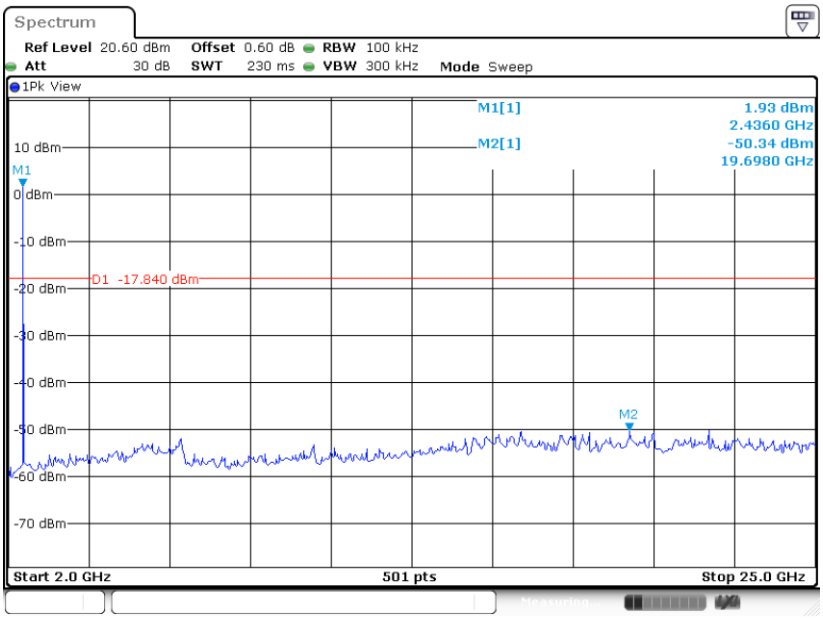
GFSK Channel 19



Date: 11.AUG.2024 11:24:33

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

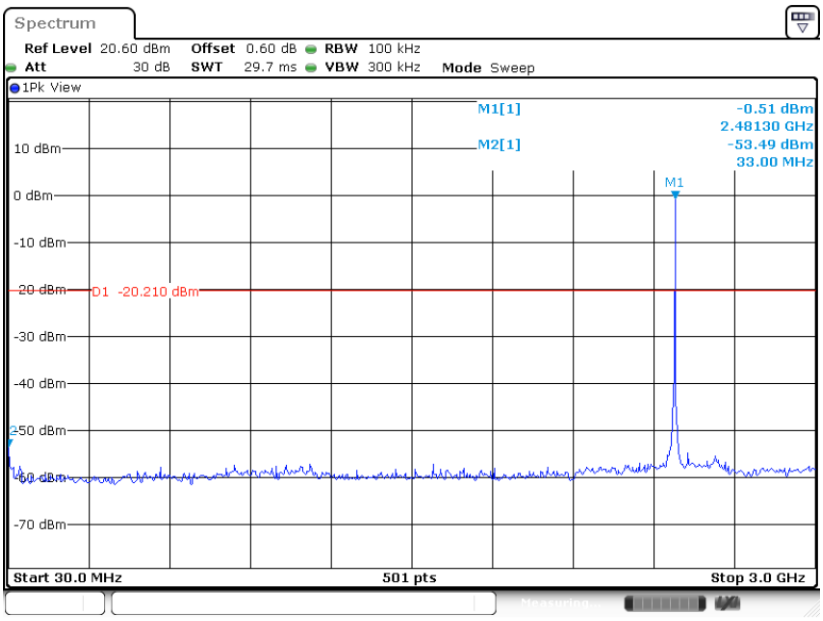
GFSK Channel 19



Date: 11.AUG.2024 11:24:53

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

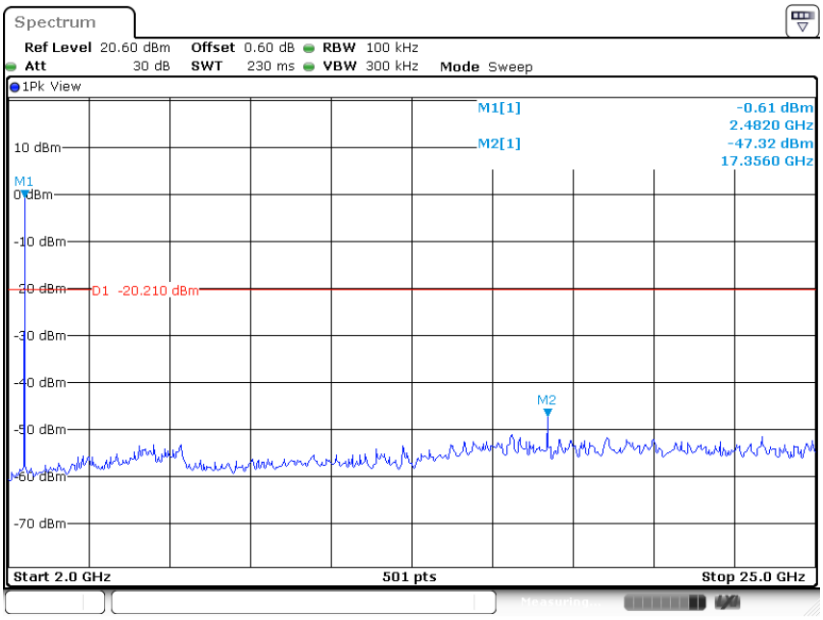
GFSK Channel 39



Date: 11.AUG.2024 11:36:11

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps

GFSK Channel 39



Date: 11.AUG.2024 11:36:44

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 (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

3.5.2 Measuring Instruments

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

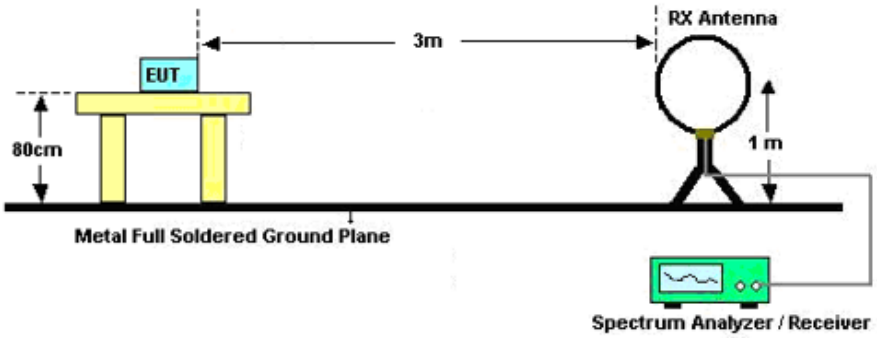
3.5.3 Test Procedures

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 EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
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 ≥ 3 x RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per C63.10-2020 11.12.2.5.2.2. A correction factor shall be subtracted from the measurement results prior to comparing with the emission limit to compute the average emission level. The correction factor is computed as follows:
   Average Emission Level = Peak Emission Level - 20*log(1/Duty cycle).
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. 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.
8. 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.

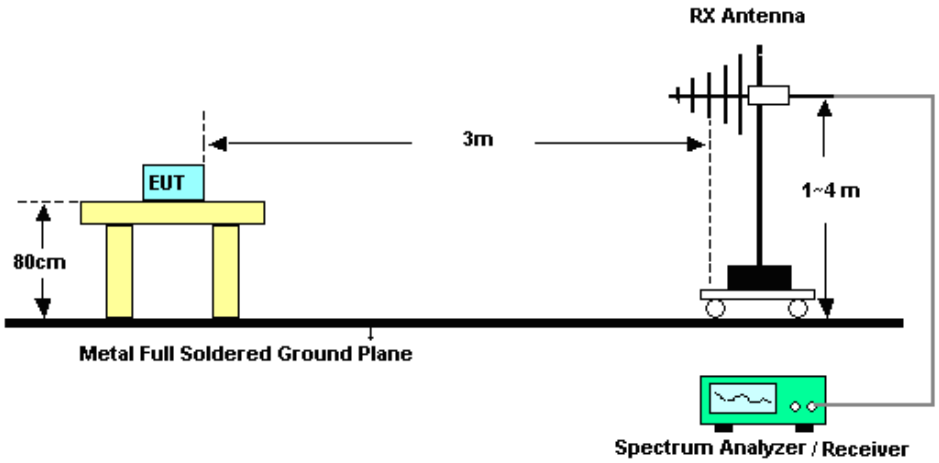
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (19.33dB/21.51dB) derived from 20log (1/DT). This correction is only for signals that the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.5.4 Test Setup

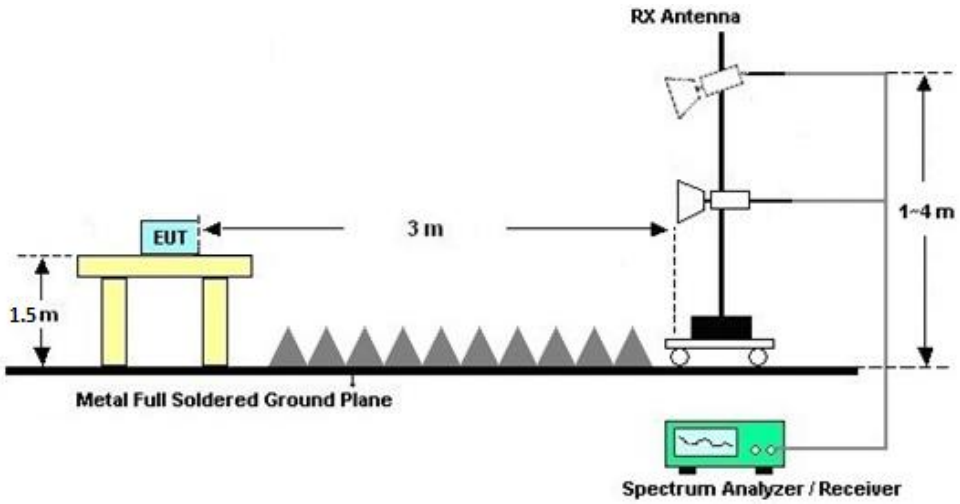
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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.

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

3.6 Antenna Requirements

3.6.1 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.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.6.3 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.

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 11, 2023	Aug. 11, 2024	Oct. 10, 2024	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 02, 2024	Aug. 11, 2024	Jan. 01, 2025	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 02, 2024	Aug. 11, 2024	Jan. 01, 2025	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 10, 2023	Jul. 01, 2024	Oct. 09, 2024	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY60242126	10Hz-44GHz	Oct. 10, 2023	Jul. 01, 2024	Oct. 09, 2024	Radiation (03CH06-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 10, 2023	Jul. 01, 2024	Oct. 09, 2024	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	59913	30MHz-1GHz	Aug. 19, 2023	Jul. 01, 2024	Aug. 18, 2024	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00240132	1GHz~18GHz	Jul. 12, 2023	Jul. 01, 2024	Jul. 11, 2024	Radiation (03CH06-KS)
SHF-EHF Horn	Com-power	AH-840	101093	18GHz~40GHz	Jan. 05, 2024	Jul. 01, 2024	Jan. 04, 2025	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	380827	9KHz ~1GHZ	Jul. 06, 2023	Jul. 01, 2024	Jul. 05, 2024	Radiation (03CH06-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 04, 2024	Jul. 01, 2024	Jan. 03, 2025	Radiation (03CH06-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2082395	1Ghz-18Ghz	Jan. 04, 2024	Jul. 01, 2024	Jan. 03, 2025	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270319	500MHz~26.5GHz	Oct. 10, 2023	Jul. 01, 2024	Oct. 09, 2024	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Jul. 01, 2024	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Jul. 01, 2024	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Jul. 01, 2024	NCR	Radiation (03CH06-KS)

NCR: No Calibration Required

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

Conducted Spurious Emission & Bandedge	**±2.26 dB**
Occupied Channel Bandwidth	**±0.1%**
Conducted Power	**±0.50 dB**
Conducted Power Spectral Density	**±0.90 dB**
Frequency	**±0.04ppm**

Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.30dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.06dB**

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.18dB**

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.38dB**

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

Appendix A. Conducted Test Results

Report Number : FR382914

Bluetooth Low Energy

Test Engineer:	Jacob Zhang	Temperature:	20~26	°C
Test Date:	2024/8/11	Relative Humidity:	40~51	%

BLE1M-Ant1

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	1Mbps	1	0	2402	1.013	0.648	0.50	Pass
BLE	1Mbps	1	19	2440	1.005	0.648	0.50	Pass
BLE	1Mbps	1	39	2480	1.017	0.656	0.50	Pass

TEST RESULTS DATA
Peak Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	0.75	30.00	1.27	2.02	36.00	Pass
BLE	1Mbps	1	19	2440	2.65	30.00	1.27	3.92	36.00	Pass
BLE	1Mbps	1	39	2480	2.56	30.00	1.27	3.83	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
BLE	1Mbps	1	0	2402	9.57	0.66
BLE	1Mbps	1	19	2440	9.57	2.56
BLE	1Mbps	1	39	2480	9.57	2.48

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	1Mbps	1	0	2402	0.38	-11.95	1.27	8.00	Pass
BLE	1Mbps	1	19	2440	2.17	-10.54	1.27	8.00	Pass
BLE	1Mbps	1	39	2480	1.75	-10.61	1.27	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 20dBc limit.

Report Number : FR382914

Bluetooth Low Energy

Test Engineer:	Jacob Zhang	Temperature:	20~26	°C
Test Date:	2024/8/11	Relative Humidity:	40~51	%

BLE2M-Ant1

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	2Mbps	1	0	2402	2.006	0.996	0.50	Pass
BLE	2Mbps	1	19	2440	1.986	1.004	0.50	Pass
BLE	2Mbps	1	39	2480	1.982	1.008	0.50	Pass

TEST RESULTS DATA
Peak Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	2Mbps	1	0	2402	2.81	30.00	1.27	4.08	36.00	Pass
BLE	2Mbps	1	19	2440	2.65	30.00	1.27	3.92	36.00	Pass
BLE	2Mbps	1	39	2480	0.26	30.00	1.27	1.53	36.00	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
BLE	2Mbps	1	0	2402	10.89	2.71
BLE	2Mbps	1	19	2440	10.89	2.58
BLE	2Mbps	1	39	2480	10.89	-0.35

TEST RESULTS DATA
Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	2Mbps	1	0	2402	2.47	-11.23	1.27	8.00	Pass
BLE	2Mbps	1	19	2440	2.16	-12.27	1.27	8.00	Pass
BLE	2Mbps	1	39	2480	-0.21	-13.11	1.27	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 20dBc limit.

Appendix B. Radiated Spurious Emission Test Data

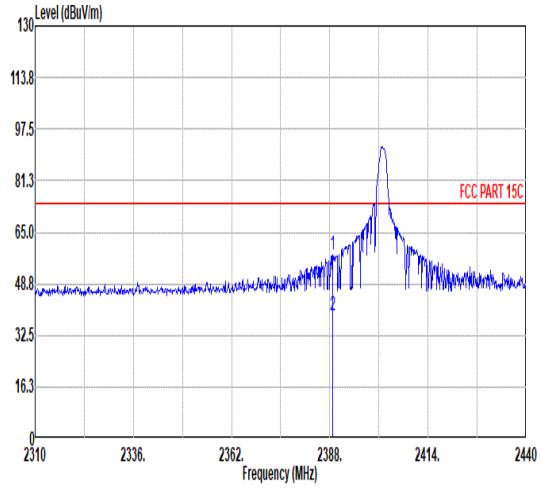
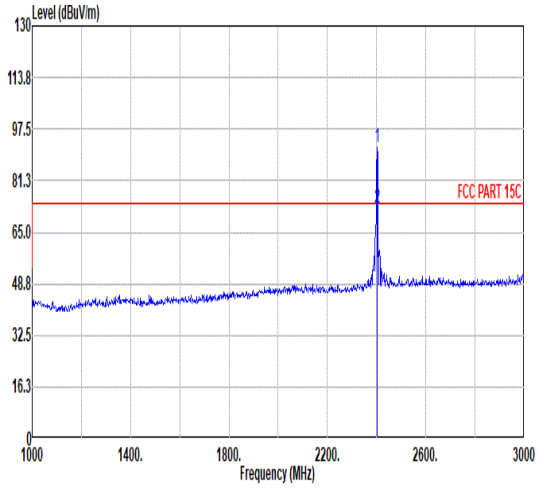
Test Engineer :	Ryan Xu	Relative Humidity :	22 ~ 23 ℃
		Temperature :	41 ~ 42 %

Radiated Spurious Emission Test Modes

Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 1	2400-2483.5	1	Bluetooth BR_GFSK	0	2402	1Mbps	-	-
Mode 2	2400-2483.5	1	Bluetooth BR_GFSK	19	2440	1Mbps	-	-
Mode 3	2400-2483.5	1	Bluetooth BR_GFSK	39	2480	1Mbps	-	-
Mode 4	2400-2483.5	1	Bluetooth BR_GFSK	0	2402	2Mbps	-	-
Mode 5	2400-2483.5	1	Bluetooth BR_GFSK	19	2440	2Mbps	-	-
Mode 6	2400-2483.5	1	Bluetooth BR_GFSK	39	2480	2Mbps	-	-

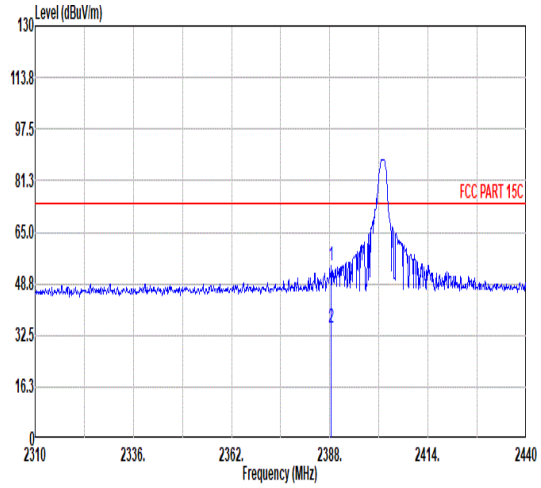
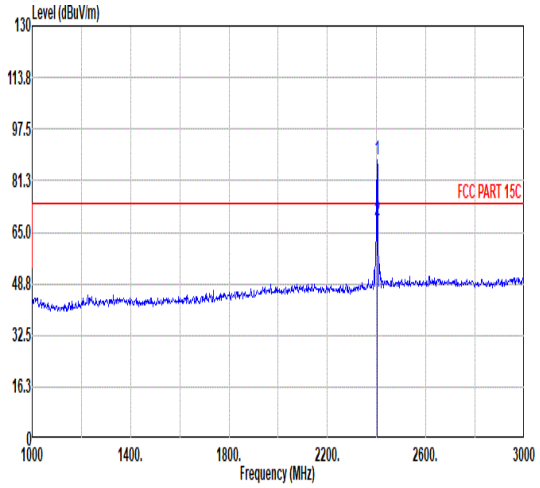
Summary of each worse mode

Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	Remark
1	Bluetooth BR_GFSK	0	2388.78	38.63	54.00	-15.37	H	AVERAGE	Pass	Band Edge
	Bluetooth BR_GFSK	0	9607.00	62.23	65.96	-3.73	H	Peak	Pass	Harmonic
2	Bluetooth BR_GFSK	19	2488.24	31.11	54.00	-22.89	H	AVERAGE	Pass	Band Edge
	Bluetooth BR_GFSK	19	9760.00	64.73	67.26	-2.53	V	Peak	Pass	Harmonic
3	Bluetooth BR_GFSK	39	2483.66	50.20	54.00	-3.80	H	AVERAGE	Pass	Band Edge
	Bluetooth BR_GFSK	39	9919.00	63.34	63.71	-0.37	V	Peak	Pass	Harmonic
4	Bluetooth BR_GFSK	0	2389.17	58.19	74.00	-15.81	H	PEAK	Pass	Band Edge
	Bluetooth BR_GFSK	0	9607.00	63.04	65.76	-2.72	V	Peak	Pass	Harmonic
5	Bluetooth BR_GFSK	19	2485.84	51.89	74.00	-22.11	H	PEAK	Pass	Band Edge
	Bluetooth BR_GFSK	19	9759.00	63.27	67.95	-4.68	V	Peak	Pass	Harmonic
6	Bluetooth BR_GFSK	39	2483.54	69.38	74.00	-4.62	H	PEAK	Pass	Band Edge
	Bluetooth BR_GFSK	39	9919.00	61.29	63.47	-2.18	V	Peak	Pass	Harmonic

Mode	1	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH0_2402MHz	
ANT	1	
Pol.	Horizontal	Fundamental
Peak		

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2388.78	57.96	74.00	-16.04	49.72	32.19	7.10	37.05	6.00	155	294	PEAK
2	2388.78	38.63	54.00	-15.37	30.39	32.19	7.10	37.05	6.00	155	294	AVERAGE

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2402.00	91.72	------	------	83.34	32.30	7.12	37.04	6.00	155	294	PEAK
2	2402.00	72.39	------	------	64.01	32.30	7.12	37.04	6.00	155	294	AVERAGE

Mode	1	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH0_2402MHz	
ANT	1	
Pol.	Vertical	Fundamental
Peak		

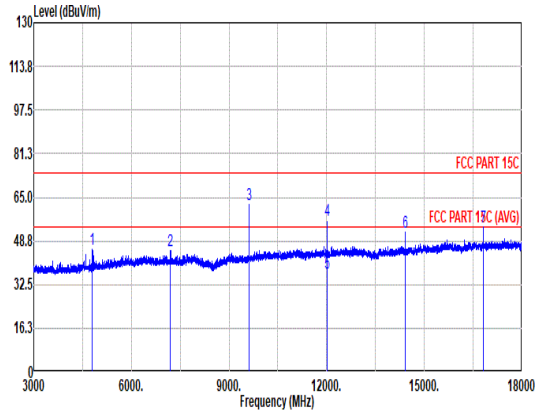
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2388.39	54.26	74.00	-19.74	46.03	32.18	7.10	37.05	6.00	377	288	PEAK
2	2388.39	34.93	54.00	-19.07	26.70	32.18	7.10	37.05	6.00	377	288	AVERAGE

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2402.00	88.00	------	------	79.62	32.30	7.12	37.04	6.00	377	288	PEAK
2	2402.00	68.67	------	------	60.29	32.30	7.12	37.04	6.00	377	288	AVERAGE

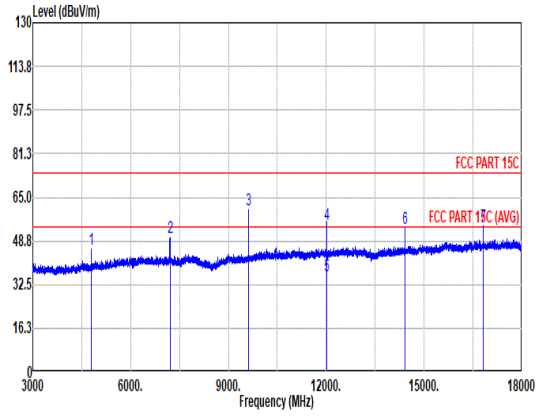
Mode	1
	Harmonic
	2400-2483.5_Bluetooth BR_GFSK_CH0_2402MHz
ANT	1

Pol.	Horizontal	Vertical

Peak



	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4804.00	45.61	74.00	-28.39	66.81	34.08	10.20	65.48	0.00	--	--	Peak
2	7204.00	45.20	65.96	-20.76	62.80	35.70	12.71	66.01	0.00	--	--	Peak
3	9607.00	62.23	65.96	-3.73	77.67	36.70	14.92	67.06	0.00	--	--	Peak
4	12010.00	56.22	74.00	-17.78	67.24	38.61	16.69	66.32	0.00	100	274	PEAK
5	12010.00	36.89	54.00	-17.11	47.91	38.61	16.69	66.32	0.00	100	274	AVERAGE
6	14412.00	52.18	65.96	-13.78	59.40	39.11	18.31	64.64	0.00	--	--	Peak
7	16813.00	54.01	65.96	-11.95	56.83	41.37	19.88	64.07	0.00	--	--	Peak

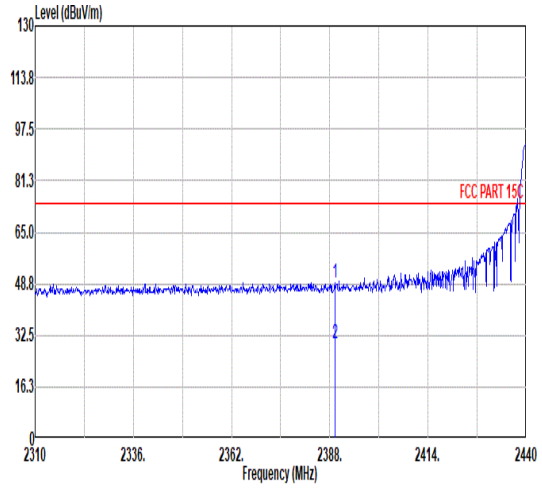


	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4803.00	45.45	74.00	-28.55	66.65	34.08	10.20	65.48	0.00	--	--	Peak
2	7206.00	49.81	64.27	-14.46	67.42	35.70	12.71	66.02	0.00	--	--	Peak
3	9609.00	60.27	64.27	-4.00	75.71	36.70	14.92	67.06	0.00	--	--	Peak
4	12010.00	55.05	74.00	-18.95	66.07	38.61	16.69	66.32	0.00	100	33	PEAK
5	12010.00	35.72	54.00	-18.28	46.74	38.61	16.69	66.32	0.00	100	33	AVERAGE
6	14412.00	53.59	64.27	-10.68	60.81	39.11	18.31	64.64	0.00	--	--	Peak
7	16812.00	54.49	64.27	-9.78	57.30	41.38	19.88	64.07	0.00	--	--	Peak

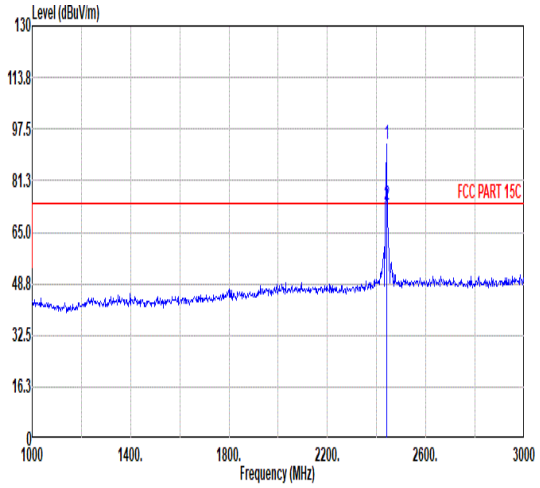
Avg

Mode	2	
	Band Edge - L	
	2400-2483.5_Bluetooth BR_GFSK_CH19_2440MHz	
ANT	1	
Pol.	Horizontal	Fundamental

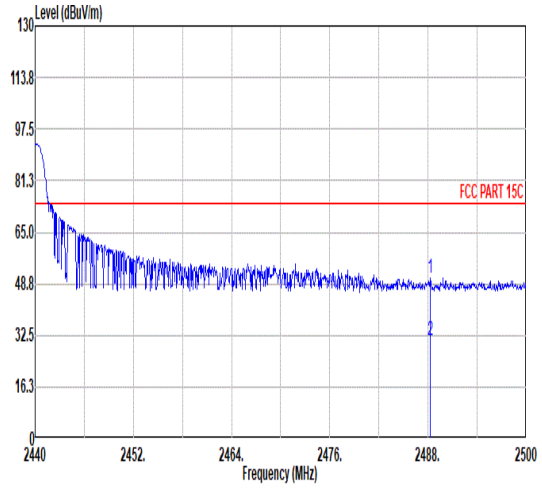
Peak



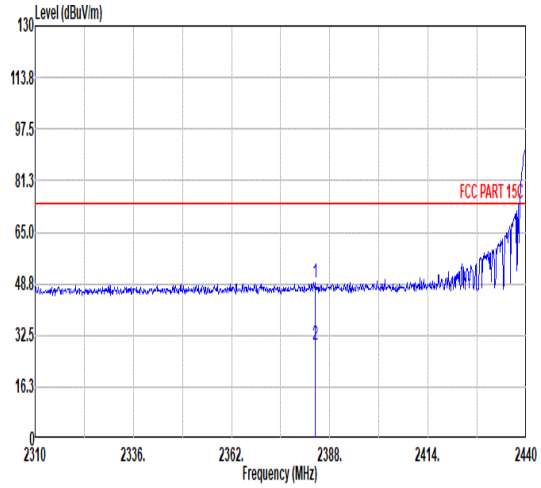
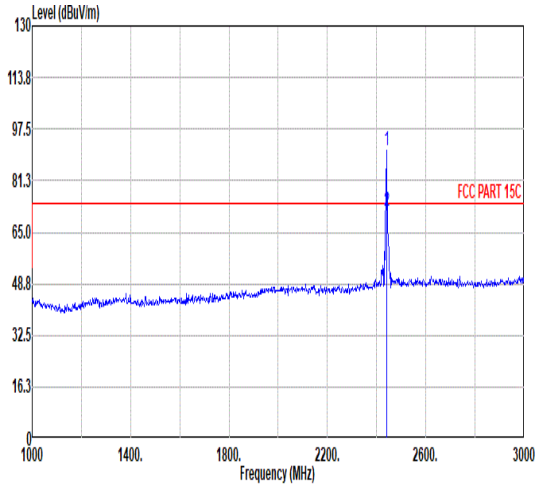
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2389.30	49.06	74.00	-24.94	40.82	32.19	7.10	37.05	6.00	116	274	PEAK
2	2389.30	29.73	54.00	-24.27	21.49	32.19	7.10	37.05	6.00	116	274	AVERAGE



	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2440.00	92.79	------	------	84.17	32.38	7.19	36.95	6.00	116	274	PEAK
2	2440.00	73.46	------	------	64.84	32.38	7.19	36.95	6.00	116	274	AVERAGE

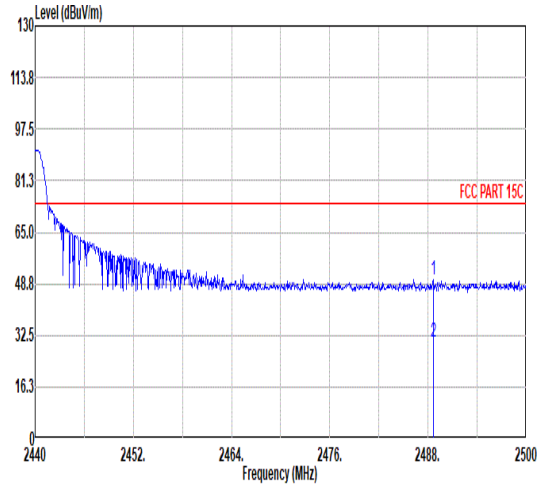
Mode	2	
	Band Edge - R	
	2400-2483.5_Bluetooth BR_GFSK_CH19_2440MHz	
ANT	1	
Pol.	Horizontal	Fundamental
Peak		Blank

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2488.24	50.44	74.00	-23.56	41.54	32.48	7.26	36.84	6.00	116	274	PEAK
2	2488.24	31.11	54.00	-22.89	22.21	32.48	7.26	36.84	6.00	116	274	AVERAGE

Mode	2	
	Band Edge - L	
	2400-2483.5_Bluetooth BR_GFSK_CH19_2440MHz	
ANT	1	
Pol.	Vertical	Fundamental
Peak		

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2384.10	49.00	74.00	-25.00	40.81	32.14	7.10	37.05	6.00	363	292	PEAK
2	2384.10	29.67	54.00	-24.33	21.48	32.14	7.10	37.05	6.00	363	292	AVERAGE

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2440.00	91.00	------	------	82.38	32.38	7.19	36.95	6.00	363	292	PEAK
2	2440.00	71.67	------	------	63.05	32.38	7.19	36.95	6.00	363	292	AVERAGE

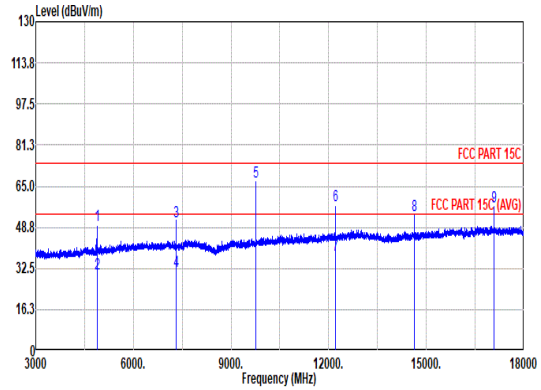
Mode	2	
	Band Edge - R	
	2400-2483.5_Bluetooth BR_GFSK_CH19_2440MHz	
ANT	1	
Pol.	Vertical	Fundamental
Peak		Blank

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2488.66	49.85	74.00	-24.15	40.95	32.48	7.26	36.84	6.00	363	292	PEAK
2	2488.66	30.52	54.00	-23.48	21.62	32.48	7.26	36.84	6.00	363	292	AVERAGE

Mode	2
	Harmonic
	2400-2483.5_Bluetooth BR_GFSK_CH19_2440MHz
ANT	1

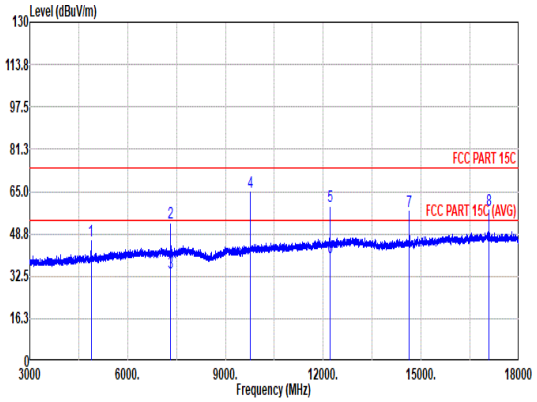
Pol.	Horizontal	Vertical

Peak

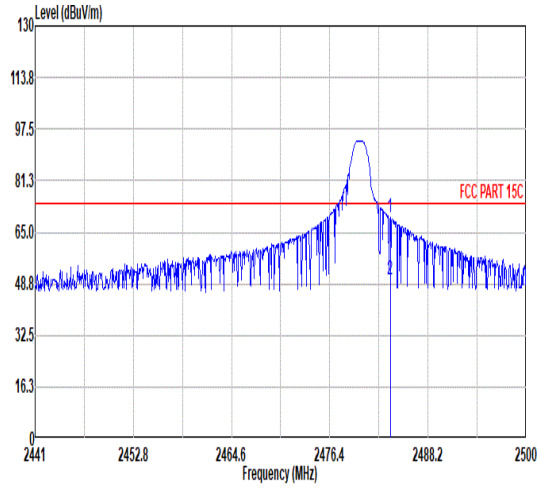
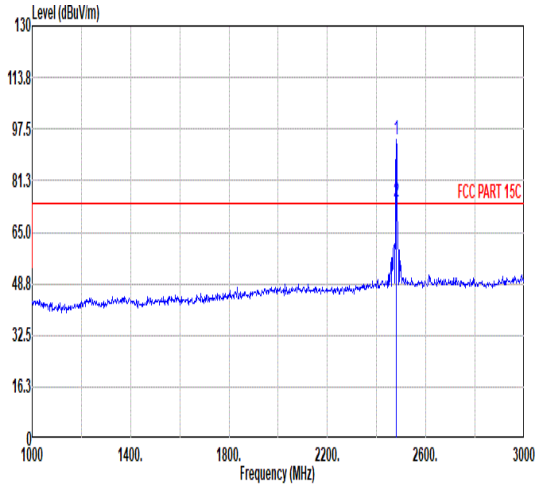


	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4880.00	49.78	74.00	-24.22	70.86	34.15	10.30	65.53	0.00	100	124	PEAK
2	4880.00	30.45	54.00	-23.55	51.53	34.15	10.30	65.53	0.00	100	124	AVERAGE
3	7320.00	50.79	74.00	-23.21	68.65	35.74	12.72	66.32	0.00	100	290	PEAK
4	7320.00	31.46	54.00	-22.54	49.32	35.74	12.72	66.32	0.00	100	290	AVERAGE
5	9760.00	66.60	70.20	-3.60	81.81	36.90	14.99	67.10	0.00	--	--	Peak
6	12200.00	57.17	74.00	-16.83	67.70	38.80	16.81	66.14	0.00	100	303	PEAK
7	12200.00	37.84	54.00	-16.16	48.37	38.80	16.81	66.14	0.00	100	303	AVERAGE
8	14640.00	53.53	70.20	-16.67	60.19	39.34	18.46	64.46	0.00	--	--	Peak
9	17079.00	57.14	70.20	-13.06	60.12	41.12	20.05	64.15	0.00	--	--	Peak

Avg

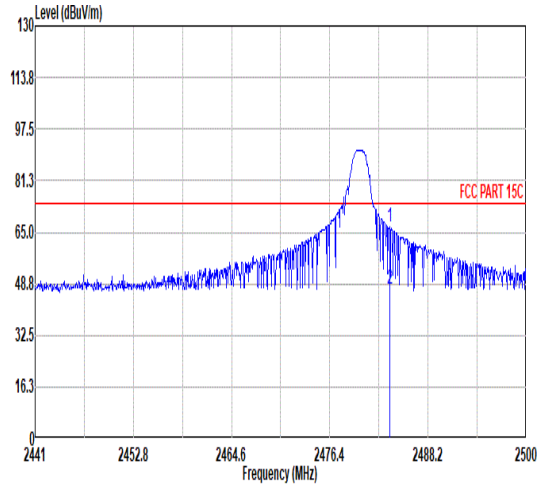
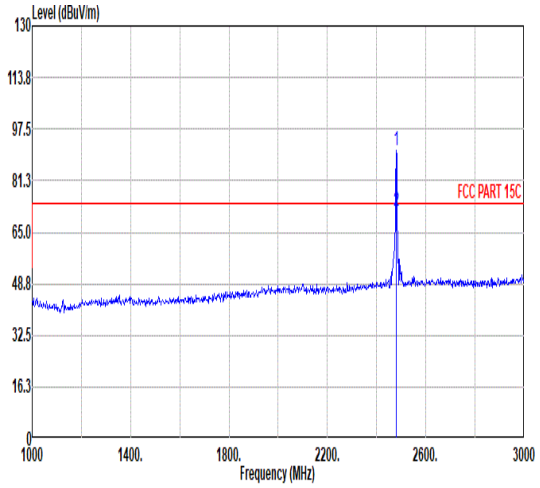


	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4879.00	46.30	74.00	-27.70	67.38	34.15	10.30	65.53	0.00	--	--	Peak
2	7320.00	53.13	74.00	-20.87	70.99	35.74	12.72	66.32	0.00	102	130	PEAK
3	7320.00	33.80	54.00	-20.20	51.66	35.74	12.72	66.32	0.00	102	130	AVERAGE
4	9760.00	64.73	67.26	-2.53	79.94	36.90	14.99	67.10	0.00	--	--	Peak
5	12200.00	59.27	74.00	-14.73	69.80	38.80	16.81	66.14	0.00	103	285	PEAK
6	12200.00	39.94	54.00	-14.06	50.47	38.80	16.81	66.14	0.00	103	285	AVERAGE
7	14638.00	57.38	67.26	-9.88	64.06	39.34	18.45	64.47	0.00	--	--	Peak
8	17077.00	57.64	67.26	-9.62	60.62	41.12	20.05	64.15	0.00	--	--	Peak

Mode	3	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH39_2480MHz	
ANT	1	
Pol.	Horizontal	Fundamental
Peak		

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2483.66	69.53	74.00	-4.47	60.65	32.47	7.26	36.85	6.00	143	275	PEAK
2	2483.66	50.20	54.00	-3.80	41.32	32.47	7.26	36.85	6.00	143	275	AVERAGE

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2480.00	93.96	------	------	85.11	32.46	7.25	36.86	6.00	143	275	PEAK
2	2480.00	74.63	------	------	65.78	32.46	7.25	36.86	6.00	143	275	AVERAGE

Mode	3	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH39_2480MHz	
ANT	1	
Pol.	Vertical	Fundamental
Peak		

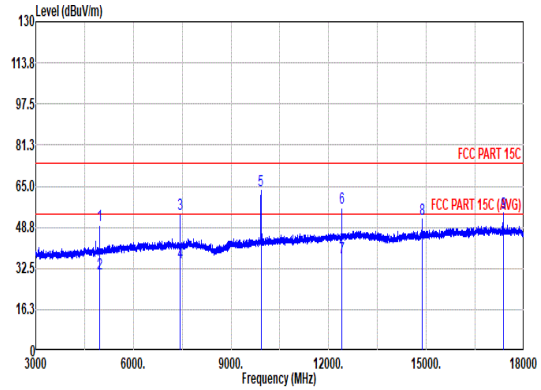
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2483.60	66.50	74.00	-7.50	57.62	32.47	7.26	36.85	6.00	395	293	PEAK
2	2483.60	47.17	54.00	-6.83	38.29	32.47	7.26	36.85	6.00	395	293	AVERAGE

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2480.00	90.86	------	------	82.01	32.46	7.25	36.86	6.00	395	293	PEAK
2	2480.00	71.53	------	------	62.68	32.46	7.25	36.86	6.00	395	293	AVERAGE

Mode	3
	Harmonic
	2400-2483.5_Bluetooth BR_GFSK_CH39_2480MHz
ANT	1

Pol. — Horizontal

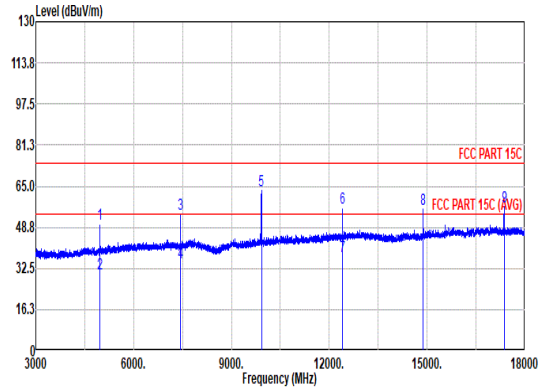
Peak



	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4960.00	49.70	74.00	-24.30	70.67	34.22	10.40	65.59	0.00	100	131	PEAK
2	4960.00	30.37	54.00	-23.63	51.34	34.22	10.40	65.59	0.00	100	131	AVERAGE
3	7440.00	54.07	74.00	-19.93	72.12	35.80	12.78	66.63	0.00	103	292	PEAK
4	7440.00	34.74	54.00	-19.26	52.79	35.80	12.78	66.63	0.00	103	292	AVERAGE
5	9919.00	63.20	68.01	-4.81	78.13	37.14	15.07	67.14	0.00	--	--	Peak
6	12400.00	56.26	74.00	-17.74	66.46	38.80	16.94	65.94	0.00	100	137	PEAK
7	12400.00	36.93	54.00	-17.07	47.13	38.80	16.94	65.94	0.00	100	137	AVERAGE
8	14881.00	52.04	68.01	-15.97	58.21	39.50	18.61	64.28	0.00	--	--	Peak
9	17359.00	54.41	68.01	-13.60	57.47	41.10	20.24	64.40	0.00	--	--	Peak

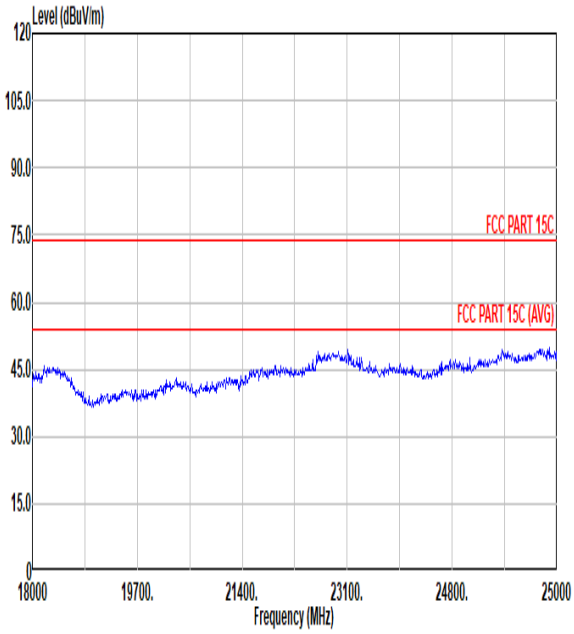
Pol. — Vertical

Peak

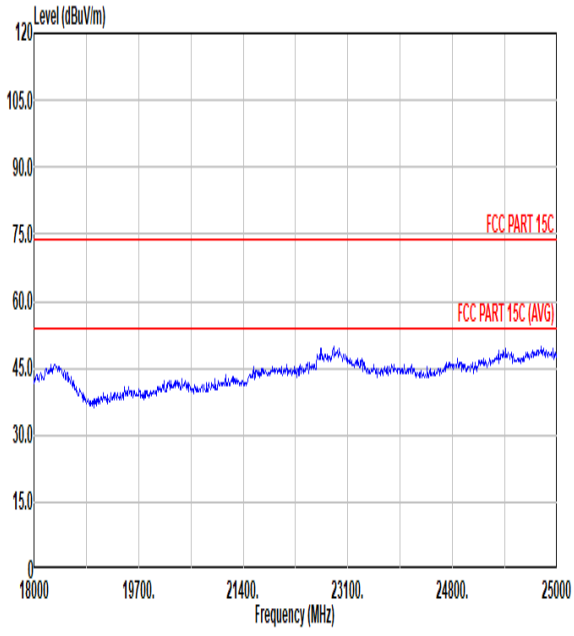


	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4960.00	49.90	74.00	-24.10	70.87	34.22	10.40	65.59	0.00	100	198	PEAK
2	4960.00	30.57	54.00	-23.43	51.54	34.22	10.40	65.59	0.00	100	198	AVERAGE
3	7440.00	54.12	74.00	-19.88	72.17	35.80	12.78	66.63	0.00	100	136	PEAK
4	7440.00	34.79	54.00	-19.21	52.84	35.80	12.78	66.63	0.00	100	136	AVERAGE
5	9919.00	63.34	63.71	-0.37	78.27	37.14	15.07	67.14	0.00	--	--	Peak
6	12400.00	56.59	74.00	-17.41	66.79	38.80	16.94	65.94	0.00	100	285	PEAK
7	12400.00	37.26	54.00	-16.74	47.46	38.80	16.94	65.94	0.00	100	285	AVERAGE
8	14880.00	55.95	63.71	-7.76	62.12	39.50	18.61	64.28	0.00	--	--	Peak
9	17359.00	56.85	63.71	-6.86	59.91	41.10	20.24	64.40	0.00	--	--	Peak

Peak



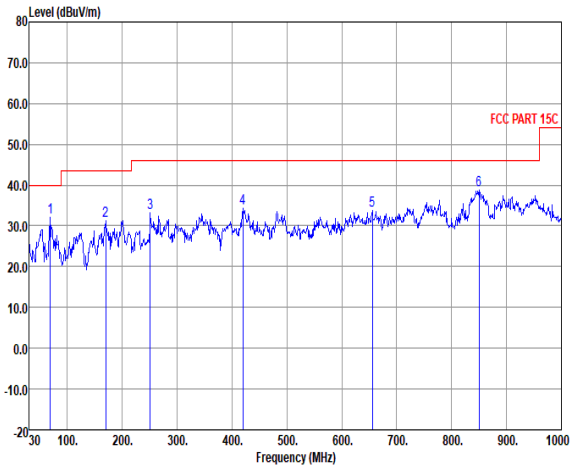
Peak



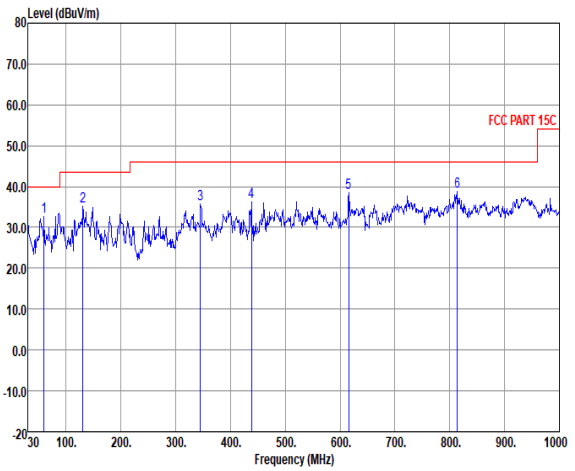
Mode	3	
	LF	
	2400-2483.5_Bluetooth-LE_GSFK_CH39_2480MHz	
ANT	1	
Pol.	Horizontal	Vertical

Peak

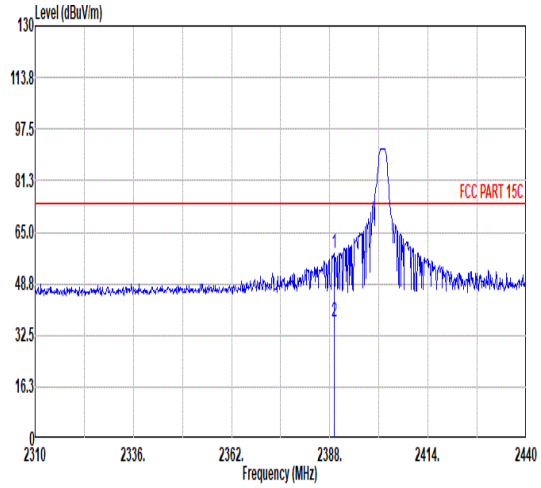
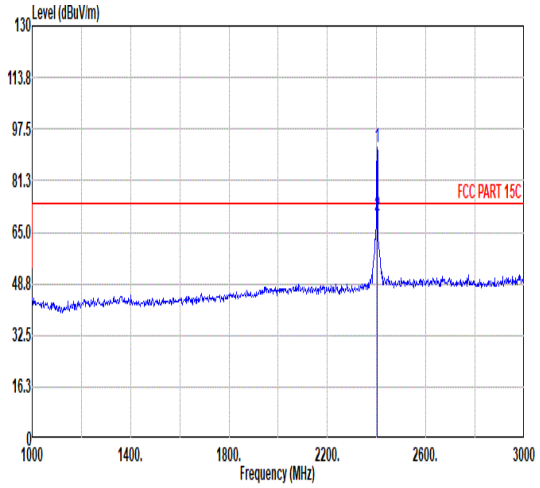
QP



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	68.80	32.11	-7.89	40.00	51.56	12.23	0.94	32.62	---	---	Peak
2	169.68	31.18	-12.32	43.50	46.20	15.59	1.74	32.35	---	---	Peak
3	251.16	33.24	-12.76	46.00	44.81	18.66	2.14	32.37	---	---	Peak
4	419.94	34.25	-11.75	46.00	41.34	22.60	2.76	32.45	---	---	Peak
5	655.65	33.79	-12.21	46.00	36.52	26.39	3.47	32.59	---	---	Peak
6	849.65	38.70	-7.30	46.00	37.74	29.08	3.93	32.05	---	---	Peak

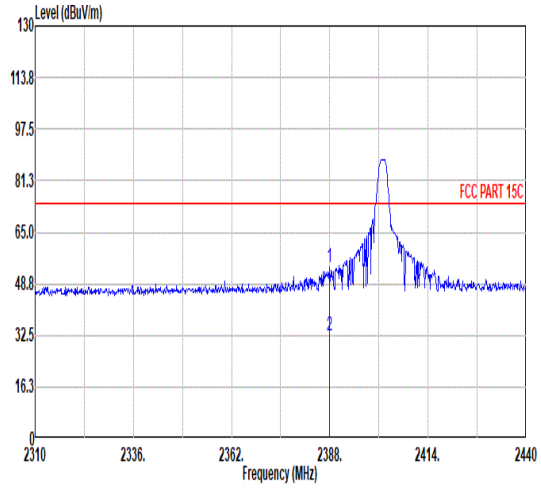
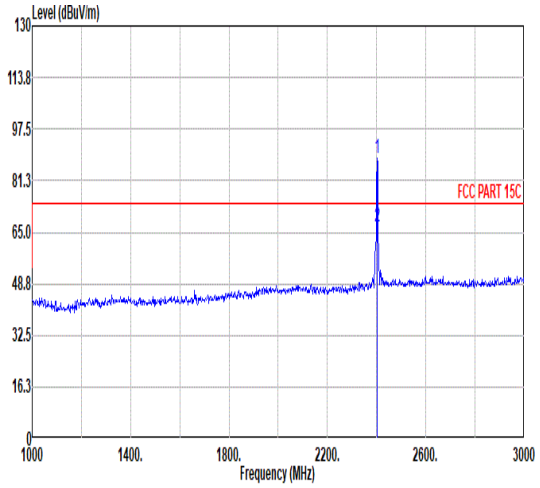


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	60.07	32.64	-7.36	40.00	52.36	11.93	0.84	32.49	---	---	Peak
2	130.88	35.11	-8.39	43.50	48.30	17.66	1.52	32.37	---	---	Peak
3	345.25	35.82	-10.18	46.00	45.47	20.25	2.51	32.41	---	---	Peak
4	438.37	36.39	-9.61	46.00	43.25	22.85	2.82	32.53	---	---	Peak
5	615.88	38.59	-7.41	46.00	42.12	25.73	3.35	32.61	---	---	Peak
6	813.76	38.87	-7.13	46.00	38.48	28.76	3.85	32.22	---	---	Peak

Mode	4	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH0_2402MHz	
ANT	1	
Pol.	Horizontal	Fundamental
Peak		

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2389.17	58.19	74.00	-15.81	49.95	32.19	7.10	37.05	6.00	156	295	PEAK
2	2389.17	36.68	54.00	-17.32	28.44	32.19	7.10	37.05	6.00	156	295	AVERAGE

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2402.00	91.66	------	------	83.28	32.30	7.12	37.04	6.00	156	295	PEAK
2	2402.00	70.15	------	------	61.77	32.30	7.12	37.04	6.00	156	295	AVERAGE

Mode	4	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH0_2402MHz	
ANT	1	
Pol.	Vertical	Fundamental
Peak		

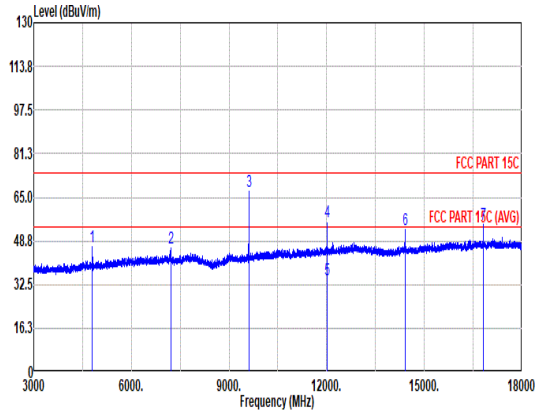
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2388.00	54.00	74.00	-20.00	45.77	32.18	7.10	37.05	6.00	378	288	PEAK
2	2388.00	32.49	54.00	-21.51	24.26	32.18	7.10	37.05	6.00	378	288	AVERAGE

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2402.00	88.08	------	------	79.70	32.30	7.12	37.04	6.00	378	288	PEAK
2	2402.00	66.57	------	------	58.19	32.30	7.12	37.04	6.00	378	288	AVERAGE

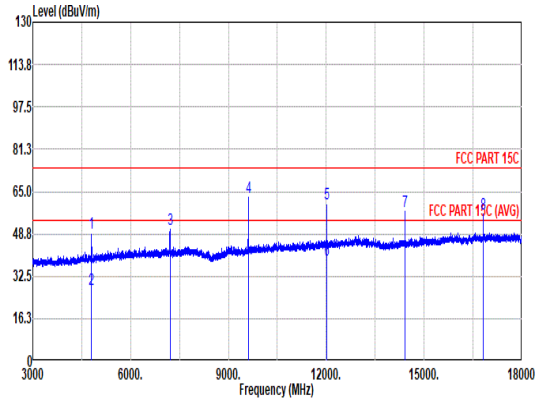
Mode	4
	Harmonic
	2400-2483.5_Bluetooth BR_GFSK_CH0_2402MHz
ANT	1

Pol.	Horizontal	Vertical

Peak

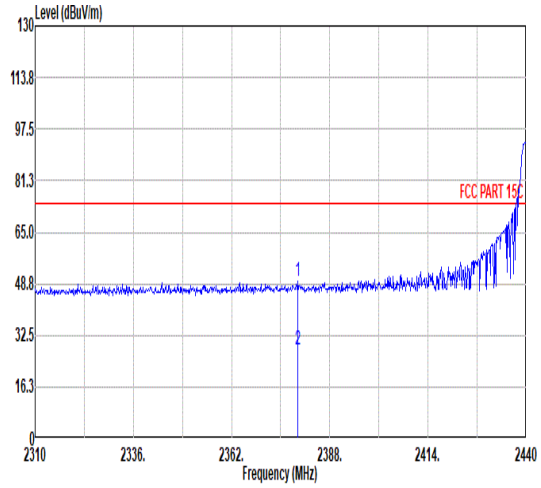
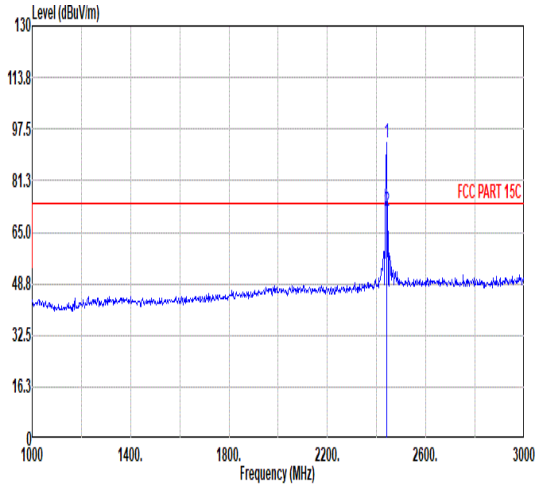


	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4804.00	46.43	74.00	-27.57	67.63	34.08	10.20	65.48	0.00	--	--	Peak
2	7206.00	46.23	71.27	-25.04	63.84	35.70	12.71	66.02	0.00	--	--	Peak
3	9607.00	67.36	71.27	-3.91	82.80	36.70	14.92	67.06	0.00	--	--	Peak
4	12010.00	56.04	74.00	-17.96	67.06	38.61	16.69	66.32	0.00	100	302	PEAK
5	12010.00	34.53	54.00	-19.47	45.55	38.61	16.69	66.32	0.00	100	302	AVERAGE
6	14412.00	52.94	71.27	-18.33	60.16	39.11	18.31	64.64	0.00	--	--	Peak
7	16813.00	55.15	71.27	-16.12	57.97	41.37	19.88	64.07	0.00	--	--	Peak



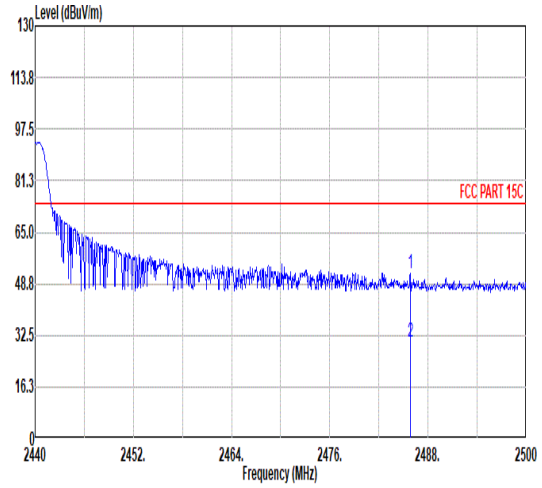
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4804.00	48.91	74.00	-25.09	70.11	34.08	10.20	65.48	0.00	101	198	PEAK
2	4804.00	27.40	54.00	-26.60	48.60	34.08	10.20	65.48	0.00	101	198	AVERAGE
3	7206.00	50.38	65.76	-15.38	67.99	35.70	12.71	66.02	0.00	--	--	Peak
4	9607.00	63.04	65.76	-2.72	78.48	36.70	14.92	67.06	0.00	--	--	Peak
5	12010.00	60.13	74.00	-13.87	71.15	38.61	16.69	66.32	0.00	300	170	PEAK
6	12010.00	38.62	54.00	-15.38	49.64	38.61	16.69	66.32	0.00	300	170	AVERAGE
7	14415.00	57.18	65.76	-8.58	64.38	39.12	18.31	64.63	0.00	--	--	Peak
8	16810.00	56.28	65.76	-9.48	59.09	41.38	19.88	64.07	0.00	--	--	Peak

Avg

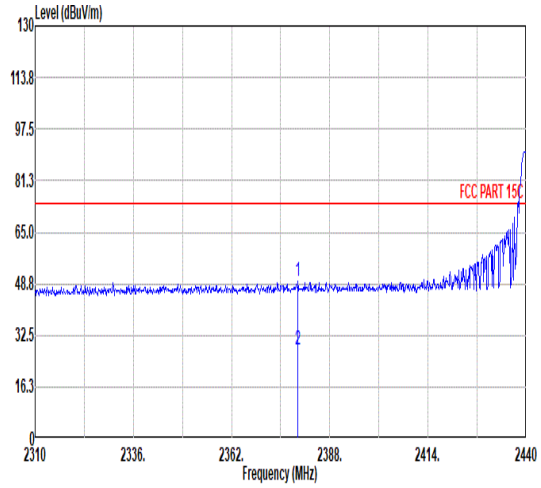
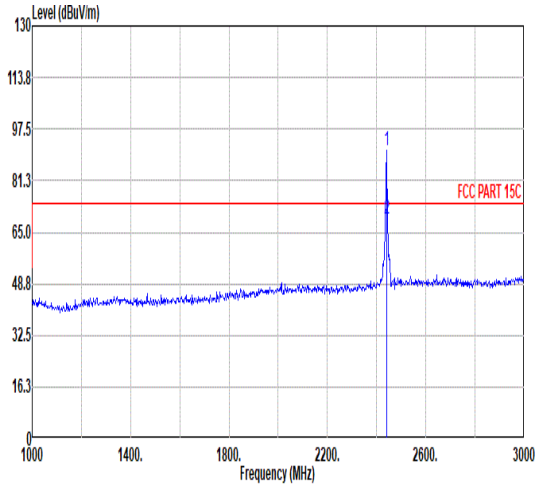
Mode	5	
	Band Edge - L	
	2400-2483.5_Bluetooth BR_GFSK_CH19_2440MHz	
ANT	1	
Pol.	Horizontal	Fundamental
Peak		

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2379.42	49.64	74.00	-24.36	41.51	32.09	7.09	37.05	6.00	115	292	PEAK
2	2379.42	28.13	54.00	-25.87	20.00	32.09	7.09	37.05	6.00	115	292	AVERAGE

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2440.00	93.38	------	------	84.76	32.38	7.19	36.95	6.00	115	292	PEAK
2	2440.00	71.87	------	------	63.25	32.38	7.19	36.95	6.00	115	292	AVERAGE

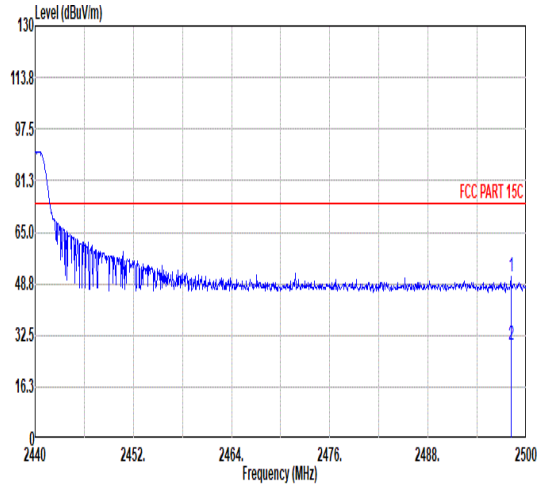
Mode	5	
	Band Edge - R	
	2400-2483.5_Bluetooth BR_GFSK_CH19_2440MHz	
ANT	1	
Pol.	Horizontal	Fundamental
Peak		Blank

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2485.84	51.89	74.00	-22.11	43.00	32.47	7.26	36.84	6.00	115	292	PEAK
2	2485.84	30.38	54.00	-23.62	21.49	32.47	7.26	36.84	6.00	115	292	AVERAGE

Mode	5	
	Band Edge - L	
	2400-2483.5_Bluetooth BR_GFSK_CH19_2440MHz	
ANT	1	
Pol.	Vertical	Fundamental
Peak		

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2379.55	49.70	74.00	-24.30	41.56	32.10	7.09	37.05	6.00	362	290	PEAK
2	2379.55	28.19	54.00	-25.81	20.05	32.10	7.09	37.05	6.00	362	290	AVERAGE

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2440.00	90.51	------	------	81.89	32.38	7.19	36.95	6.00	362	290	PEAK
2	2440.00	69.00	------	------	60.38	32.38	7.19	36.95	6.00	362	290	AVERAGE

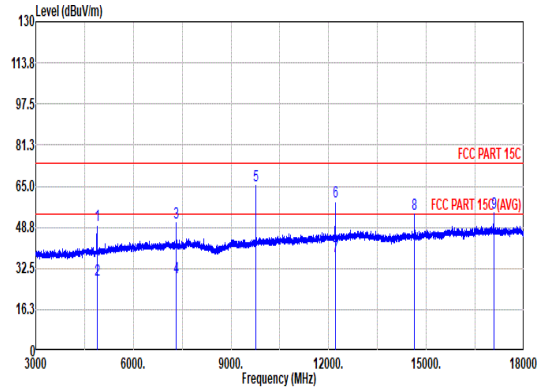
Mode	5	
	Band Edge - R	
	2400-2483.5_Bluetooth BR_GFSK_CH19_2440MHz	
ANT	1	
Pol.	Vertical	Fundamental
Peak		Blank

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2498.14	51.18	74.00	-22.82	42.22	32.50	7.28	36.82	6.00	362	290	PEAK
2	2498.14	29.67	54.00	-24.33	20.71	32.50	7.28	36.82	6.00	362	290	AVERAGE

Mode	5
	Harmonic
	2400-2483.5_Bluetooth BR_GFSK_CH19_2440MHz
ANT	1

Pol. : Horizontal

Peak

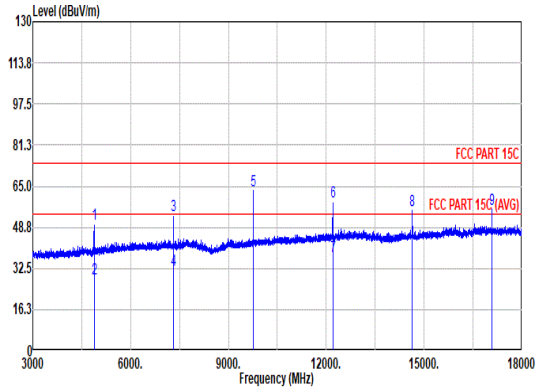


Avg

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4880.00	49.31	74.00	-24.69	70.39	34.15	10.30	65.53	0.00	100	127	PEAK
2	4880.00	27.81	54.00	-26.19	48.89	34.15	10.30	65.53	0.00	100	127	AVERAGE
3	7320.00	50.30	74.00	-23.70	68.16	35.74	12.72	66.32	0.00	100	289	PEAK
4	7320.00	28.79	54.00	-25.21	46.65	35.74	12.72	66.32	0.00	100	289	AVERAGE
5	9760.00	65.48	72.10	-6.62	80.69	36.90	14.99	67.10	0.00	--	--	Peak
6	12200.00	58.76	74.00	-15.24	69.29	38.80	16.81	66.14	0.00	100	305	PEAK
7	12200.00	37.25	54.00	-16.75	47.78	38.80	16.81	66.14	0.00	100	305	AVERAGE
8	14640.00	54.14	72.10	-17.96	60.80	39.34	18.46	64.46	0.00	--	--	Peak
9	17077.00	54.37	72.10	-17.73	57.35	41.12	20.05	64.15	0.00	--	--	Peak

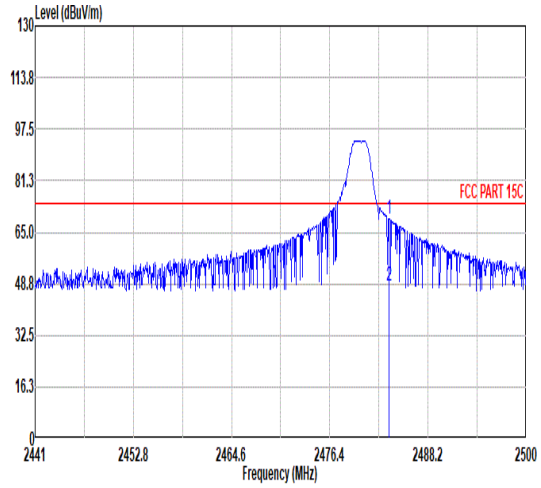
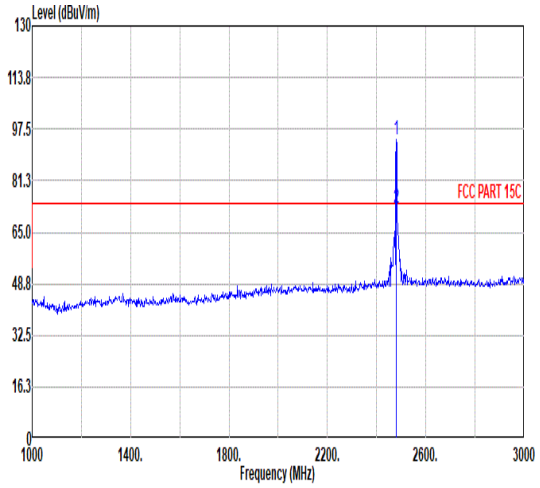
Pol. : Vertical

Peak



Avg

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4880.00	49.99	74.00	-24.01	71.07	34.15	10.30	65.53	0.00	100	203	PEAK
2	4880.00	28.48	54.00	-25.52	49.56	34.15	10.30	65.53	0.00	100	203	AVERAGE
3	7320.00	53.26	74.00	-20.74	71.12	35.74	12.72	66.32	0.00	104	129	PEAK
4	7320.00	31.75	54.00	-22.25	49.61	35.74	12.72	66.32	0.00	104	129	AVERAGE
5	9759.00	63.27	67.95	-4.68	78.48	36.90	14.99	67.10	0.00	--	--	Peak
6	12200.00	58.97	74.00	-15.03	69.50	38.80	16.81	66.14	0.00	103	77	PEAK
7	12200.00	37.46	54.00	-16.54	47.99	38.80	16.81	66.14	0.00	103	77	AVERAGE
8	14640.00	55.26	67.95	-12.69	61.92	39.34	18.46	64.46	0.00	--	--	Peak
9	17079.00	55.75	67.95	-12.20	58.73	41.12	20.05	64.15	0.00	--	--	Peak

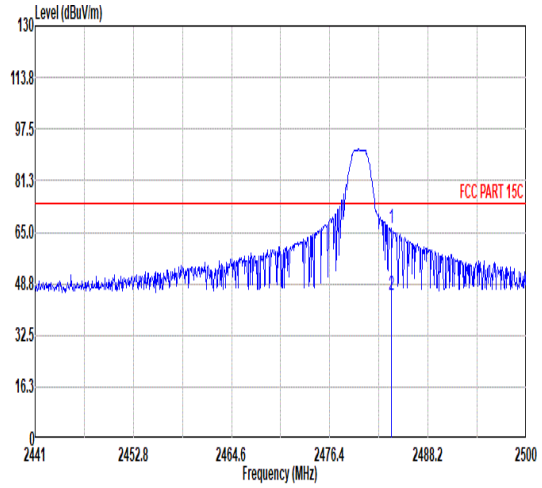
Mode	6	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH39_2480MHz	
ANT	1	
Pol.	Horizontal	Fundamental
Peak		

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2483.54	69.38	74.00	-4.62	60.50	32.47	7.26	36.85	6.00	142	278	PEAK
2	2483.54	47.87	54.00	-6.13	38.99	32.47	7.26	36.85	6.00	142	278	AVERAGE

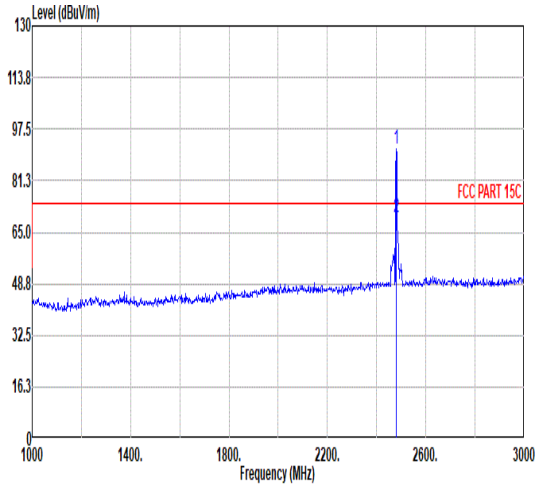
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2480.00	93.97	------	------	85.12	32.46	7.25	36.86	6.00	142	278	PEAK
2	2480.00	72.46	------	------	63.61	32.46	7.25	36.86	6.00	142	278	AVERAGE

Mode	6	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH39_2480MHz	
ANT	1	
Pol.	Vertical	Fundamental

Peak



	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2483.78	66.41	74.00	-7.59	57.53	32.47	7.26	36.85	6.00	398	295	PEAK
2	2483.78	44.90	54.00	-9.10	36.02	32.47	7.26	36.85	6.00	398	295	AVERAGE

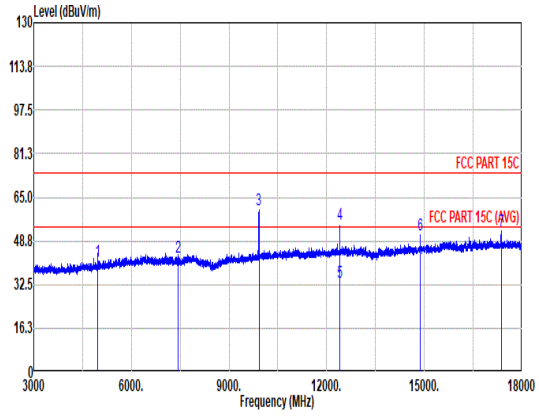


	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2480.00	91.23	------	------	82.38	32.46	7.25	36.86	6.00	398	295	PEAK
2	2480.00	69.72	------	------	60.87	32.46	7.25	36.86	6.00	398	295	AVERAGE

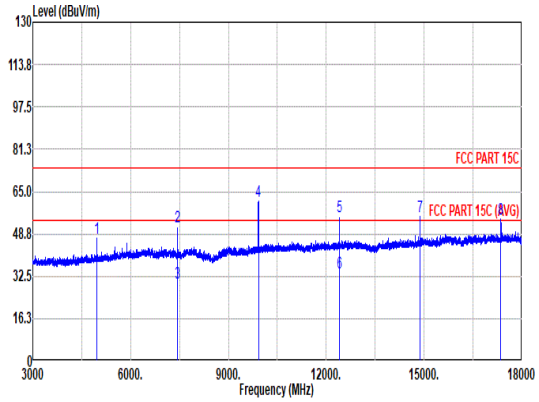
Mode	6	
	Harmonic	
	2400-2483.5_Bluetooth BR_GFSK_CH39_2480MHz	
ANT	1	
Pol.	Horizontal	Vertical

Peak

Avg



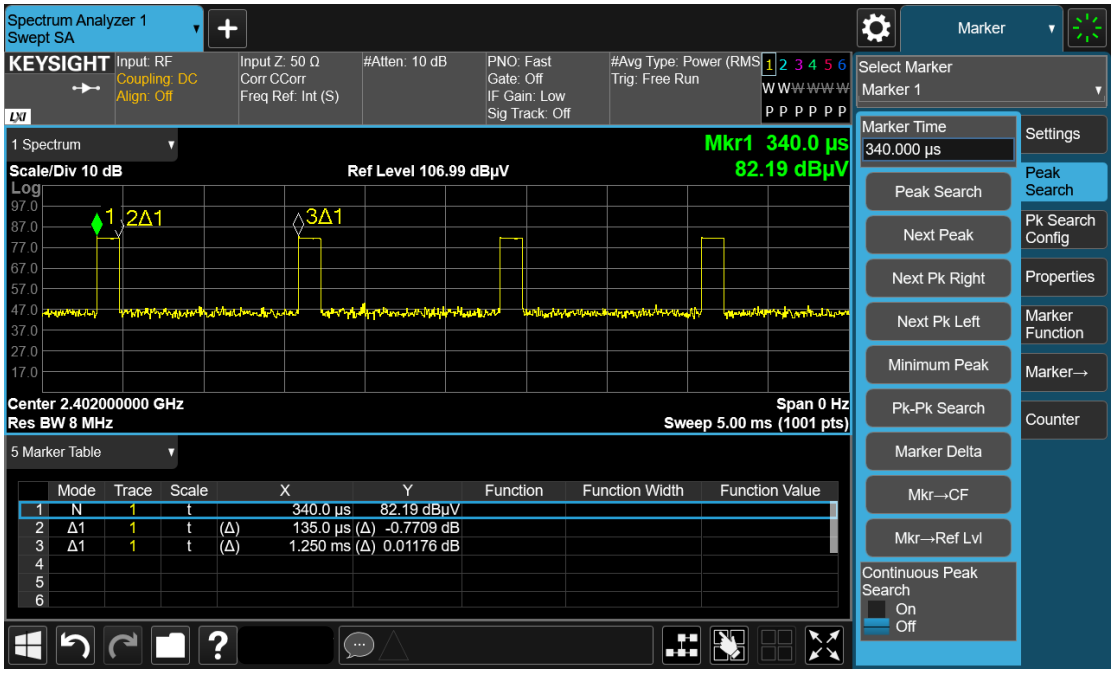
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4960.00	41.30	74.00	-32.70	62.27	34.22	10.40	65.59	0.00	--	--	PEAK
2	7440.00	42.69	74.00	-31.31	60.74	35.80	12.78	66.63	0.00	--	--	PEAK
3	9919.00	60.12	68.90	-8.78	75.05	37.14	15.07	67.14	0.00	--	--	Peak
4	12400.00	54.99	74.00	-19.01	65.19	38.80	16.94	65.94	0.00	103	280	PEAK
5	12400.00	33.48	54.00	-20.52	43.68	38.80	16.94	65.94	0.00	103	280	AVERAGE
6	14880.00	51.21	68.90	-17.69	57.38	39.50	18.61	64.28	0.00	--	--	Peak
7	17359.00	52.33	68.90	-16.57	55.39	41.10	20.24	64.40	0.00	--	--	Peak



	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4959.00	46.87	74.00	-27.13	67.84	34.22	10.40	65.59	0.00	--	--	Peak
2	7440.00	51.38	74.00	-22.62	69.43	35.80	12.78	66.63	0.00	100	124	PEAK
3	7440.00	29.87	54.00	-24.13	47.92	35.80	12.78	66.63	0.00	100	124	AVERAGE
4	9919.00	61.29	63.47	-2.18	76.22	37.14	15.07	67.14	0.00	--	--	Peak
5	12400.00	55.58	74.00	-18.42	65.78	38.80	16.94	65.94	0.00	100	306	PEAK
6	12400.00	34.07	54.00	-19.93	44.27	38.80	16.94	65.94	0.00	100	306	AVERAGE
7	14880.00	55.20	63.47	-8.27	61.37	39.50	18.61	64.28	0.00	--	--	Peak
8	17356.00	54.64	63.47	-8.83	57.70	41.10	20.24	64.40	0.00	--	--	Peak

Appendix C. Duty Cycle Plots

Bluetooth LE 1Mbps



Note:

Duty cycle = Tx_on / Tx_(on+off) = 0.135 (ms) / 1.25 (ms) = 10.8 %

Duty cycle correction factor = 20*log(1/Duty cycle) = 19.33 dB

Bluetooth LE 2Mbps

Note:

Duty cycle = Tx_on / Tx_(on+off) = 0.105 (ms) / 1.25 (ms) = 8.40 %

Duty cycle correction factor = 20*log(1/Duty cycle) = 21.51 dB