FCC RF Test Report

APPLICANT : Motorola Mobility LLC EQUIPMENT : Mobile Cellular Phone

BRAND NAME : Motorola

MODEL NAME : XT2413-1, XT2413-3

FCC ID : IHDT56AN3

STANDARD : FCC Part 15 Subpart C §15.247

CLASSIFICATION : (DTS) Digital Transmission System

TEST DATE(S) : Oct. 18, 2023 ~ Oct. 30, 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



Sporton International Inc. (ShenZhen)

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055

People's Republic of China

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR391515-01B	Rev. 01	Initial issue of report	Nov. 07, 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	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 12.46 dB at 2499.76 MHz
3.6	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 11.97 dB at 0.61 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

Motorola Mobility LLC

222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.2 Manufacturer

Motorola Mobility LLC

222 W, Merchandise Mart Plaza, Chicago IL 60654 USA

1.3 Product Feature of Equipment Under Test

Product Feature			
Equipment	Mobile Cellular Phone		
Brand Name	Motorola		
Model Name	XT2413-1, XT2413-3		
FCC ID	IHDT56AN3		
IMEI Code	Conducted: 350803920011890 Conduction: 350803920010785 Radiation: 350803920011585		
HW Version	DVT2		
SW Version	T3TF33.55		
EUT Stage	Identical Prototype		

Remark:

- 1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
- 2. The model name XT2413-1, XT2413-3 are the same product except model name different for market segment.

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	BLE 1Mbps: 6.45 dBm (0.0044 W)		
Maximum Output Power to Antenna	BLE 2Mbps: 6.59 dBm (0.0046 W)		
99% Occupied Bandwidth	BLE 1Mbps: 1.025 MHz		
99 % Occupied Baildwidth	BLE 2Mbps: 2.034 MHz		
Antenna Type / Gain	IFA Antenna type with gain -5.6 dBi		
Type of Modulation	Bluetooth LE : GFSK		

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1.5 Modification of EUT

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

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.			
	CO01-SZ TH01-SZ	CN1256	421272			

Test Firm	Sporton International Inc. (ShenZhen)				
Test Site Location	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City, Guangdong Province 518103 People's Republic of China TEL: +86-755-86066985				
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.		
	03CH01-SZ	CN1256	421272		

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH01-SZ	AUDIX	E3	6.2009-8-24
2.	CO01-SZ	AUDIX	E3	6.120613b

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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.

1.9 Specification of Accessory

Specification of Accessory					
AC Adapter 1	Brand Name	Motorola(AOHAI)	Model Name	MC-101	
AC Adapter 2	Brand Name	Motorola(Salcomp)	Model Name	MC-101	
AC Adapter 3	Brand Name	Motorola(Chenyang)	Model Name	MC-101	
Battery 1	Brand Name	Motorola (Sunwoda)	Model Name	QF50	
Battery 2	Brand Name	Motorola (SCUD)	Model Name	QF50	
USB Cable 1	Brand Name	Motorola(Saibao)	Model Name	S928D97979/S928D97981	
USB Cable 2	Brand Name	Motorola(Naiyi)	Model Name	S928D97980/S928D97982	

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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
Took Itom	Data Rate / Modulation
Test Item	Bluetooth – LE / GFSK
	Mode 1: Bluetooth Tx CH00_2402 MHz_BLE 1Mbps
	Mode 2: Bluetooth Tx CH19_2440 MHz_BLE 1Mbps
Conducted	Mode 3: Bluetooth Tx CH39_2480 MHz_BLE 1Mbps
TCs	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
	Mode 1: Bluetooth Tx CH00_2402 MHz_BLE 1Mbps
	Mode 2: Bluetooth Tx CH19_2440 MHz_BLE 1Mbps
Radiated	Mode 3: Bluetooth Tx CH39_2480 MHz_BLE 1Mbps
TCs	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
AC	
Conducted	Mode 1: GSM 850 Idle + Bluetooth Link + Adapter 1 + USB Cable + Battery 1 + Earphone
Emission	
Remark: For R	adiated Test Cases, The tests were performance with Adapter 1, Earphone and USB Cable 1.

Simultaneous transmission	
Bluetooth LE(2 Mbps) CH00_TX + LTE Band 13 link	

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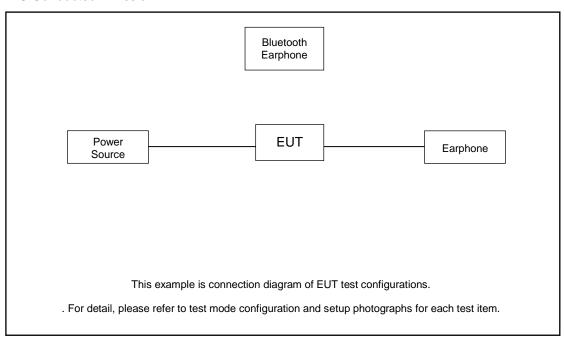
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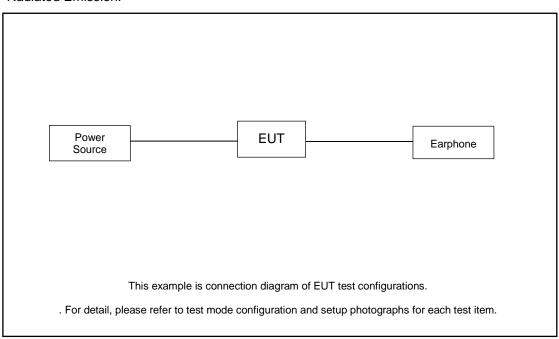
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2.3 Connection Diagram of Test System

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	Anritsu	MT8820C	N/A	N/A	Unshielded,1.8m
2.	Earphone	apple	DCAY1V-A900FZJW3-000	N/A	N/A	N/A
3.	Earphone	sony	MT755	N/A	Fcc DoC	N/A
4.	Bluetooth	Samsung	EO-MG900	PYAHS-107W	N/A	N/A
	Earphone					

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.

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 13.60 dB and 10dB attenuator.

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

= 13.60 + 10 = 23.60 (dB)

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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.

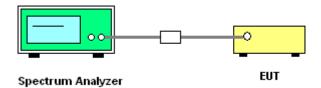
3.1.2 Measuring Instruments

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.
- 6. Measure and record the results in the test report.

3.1.4 Test Setup



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3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

BLE 1Mbps:

6 dB Bandwidth Plot on Channel 00



Date: 23.0CT.2023 16:06:51

6 dB Bandwidth Plot on Channel 19



Date: 23.0CT.2023 16:18:10

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6 dB Bandwidth Plot on Channel 39



Date: 23.0CT.2023 16:22:11

BLE 2Mbps:

6 dB Bandwidth Plot on Channel 00



Date: 23.0CT.2023 16:25:01

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6 dB Bandwidth Plot on Channel 19



Date: 23.0CT.2023 16:27:05

6 dB Bandwidth Plot on Channel 39



Date: 23.0CT.2023 16:28:59

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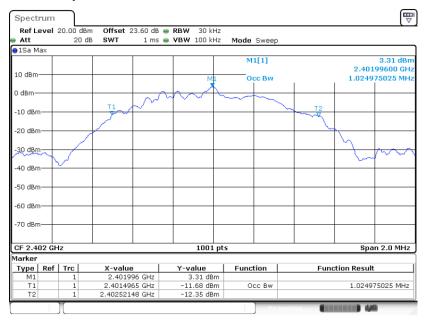
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3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

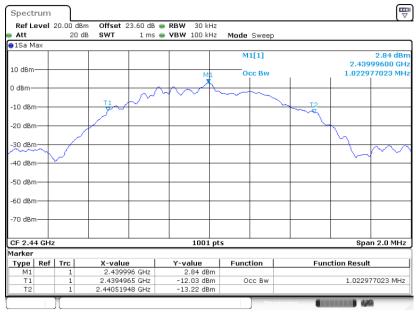
BLE 1Mbps:

99% Occupied Bandwidth Plot on Channel 00



Date: 23.0CT.2023 16:06:37

99% Occupied Bandwidth Plot on Channel 19



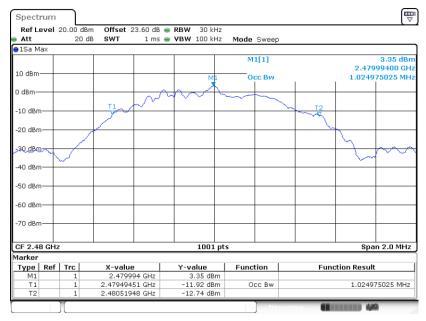
Date: 23.0CT.2023 16:17:57

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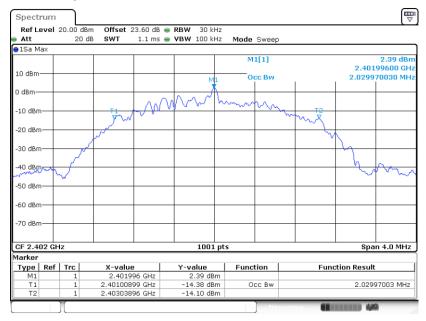
99% Occupied Bandwidth Plot on Channel 39



Date: 23.0CT.2023 16:21:40

BLE 2Mbps:

99% Occupied Bandwidth Plot on Channel 00



Date: 23.0CT.2023 16:24:21

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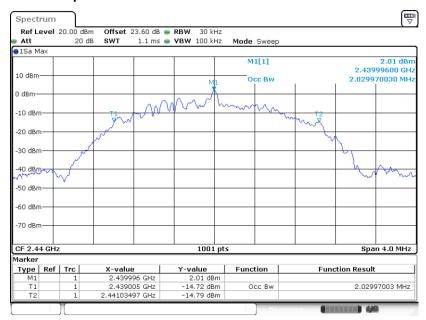
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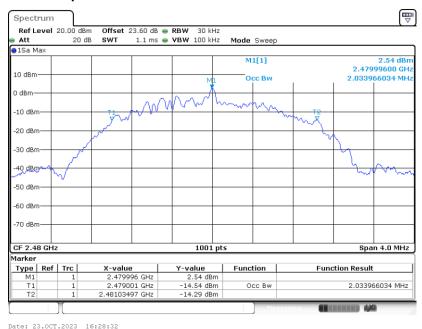
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99% Occupied Bandwidth Plot on Channel 19



Date: 23.0CT.2023 16:26:54

99% Occupied Bandwidth Plot on Channel 39



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

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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.

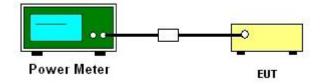
3.2.2 Measuring Instruments

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 Peak Output Power

Please refer to Appendix A.

3.2.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

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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.

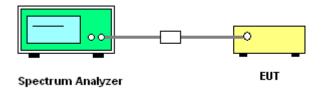
3.3.2 Measuring Instruments

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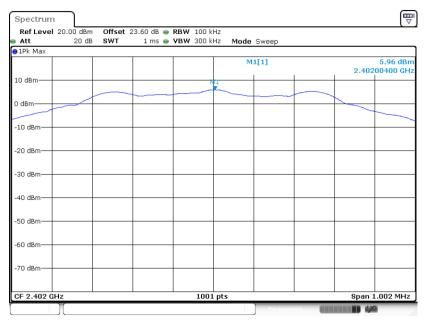
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3.3.6 Test Result of Power Spectral Density Plots (100kHz)

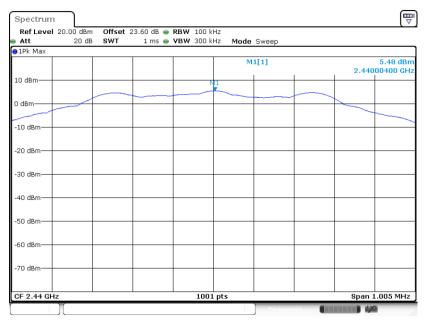
BLE 1Mbps:

PSD 100kHz Plot on Channel 00



Date: 23.0CT.2023 16:07:22

PSD 100kHz Plot on Channel 19



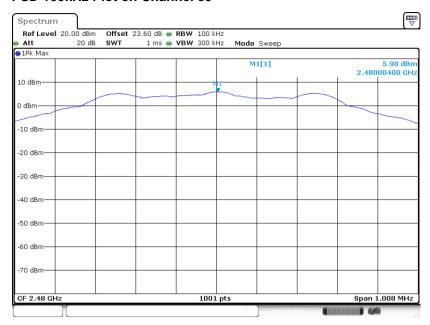
Date: 23.0CT.2023 16:20:20

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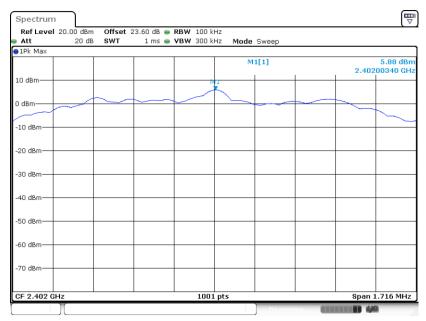
PSD 100kHz Plot on Channel 39



Date: 23.0CT.2023 16:22:42

BLE 2Mbps:

PSD 100kHz Plot on Channel 00



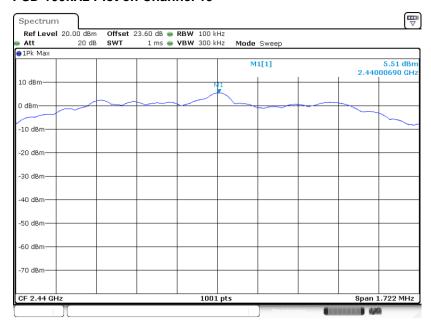
Date: 23.0CT.2023 16:25:40

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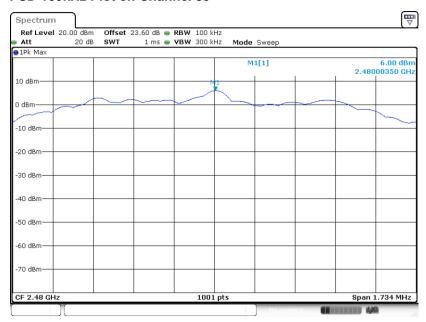
Report No.: FR391515-01B

PSD 100kHz Plot on Channel 19



Date: 23.0CT.2023 16:27:32

PSD 100kHz Plot on Channel 39



Date: 23.0CT.2023 16:29:29

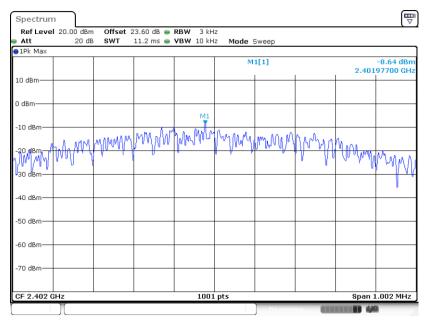
TEL: +86-755-8637-9589 FAX: +86-755-8637-9595 FCC ID: IHDT56AN3 Page Number : 23 of 44
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3.3.7 Test Result of Power Spectral Density Plots (3kHz)

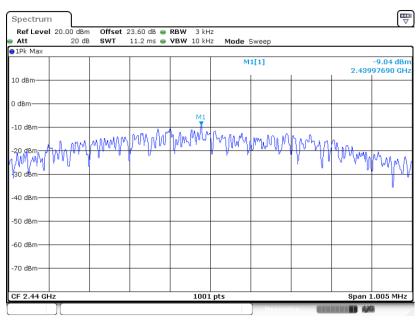
BLE 1Mbps:

PSD 3kHz Plot on Channel 00



Date: 23.0CT.2023 16:07:05

PSD 3kHz Plot on Channel 19

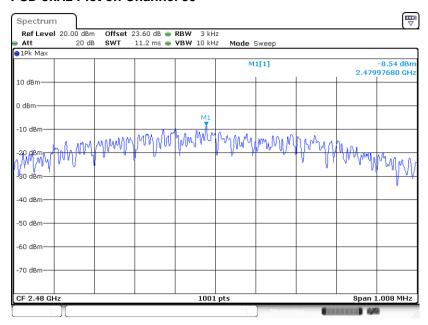


Date: 23.0CT.2023 16:18:20

TEL: +86-755-8637-9589 FAX: +86-755-8637-9595 FCC ID: IHDT56AN3 Page Number : 24 of 44
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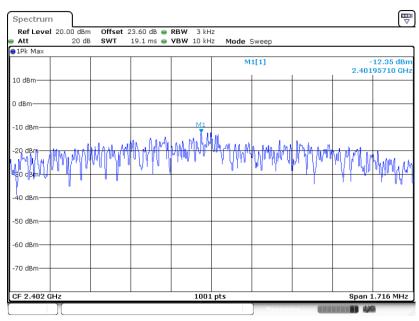
PSD 3kHz Plot on Channel 39



Date: 23.0CT.2023 16:22:23

BLE 2Mbps:

PSD 3kHz Plot on Channel 00

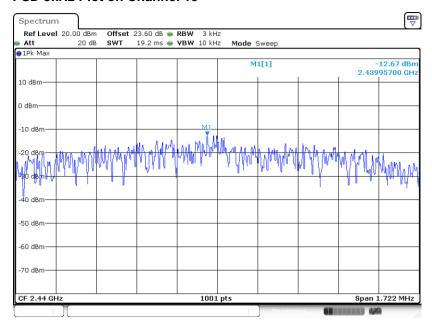


Date: 23.0CT.2023 16:25:16

TEL: +86-755-8637-9589 FAX: +86-755-8637-9595 FCC ID: IHDT56AN3 Page Number : 25 of 44
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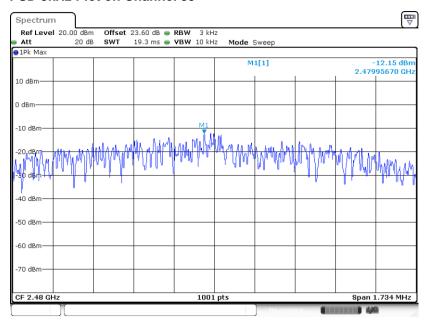
Report No.: FR391515-01B

PSD 3kHz Plot on Channel 19



Date: 23.0CT.2023 16:27:16

PSD 3kHz Plot on Channel 39



Date: 23.0CT.2023 16:29:10

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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 20 dB down from the highest emission level within the authorized band.

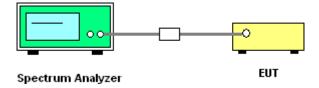
3.4.2 Measuring Instruments

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 C63.10-2013 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



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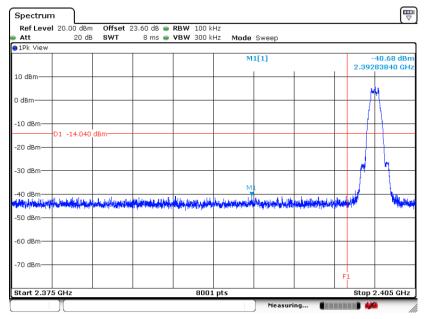
TEL: +86-755-8637-9589 FAX: +86-755-8637-9595 FCC ID: IHDT56AN3 Page Number : 27 of 44
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3.4.5 Test Result of Conducted Band Edges Plots

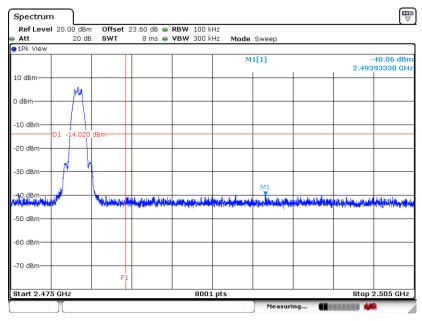
BLE 1Mbps:

Low Band Edge Plot on Channel 00



Date: 23.0CT.2023 16:08:15

High Band Edge Plot on Channel 39



Date: 23.0CT.2023 16:23:34

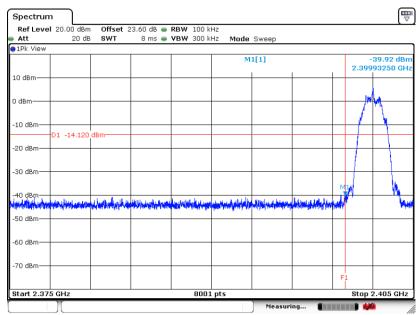
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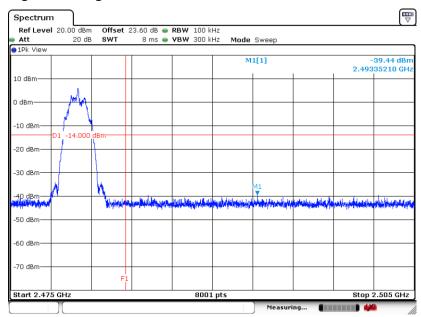
BLE 2Mbps:

Low Band Edge Plot on Channel 00



Date: 23.0CT.2023 16:26:34

High Band Edge Plot on Channel 39



Date: 23.0CT.2023 16:30:53

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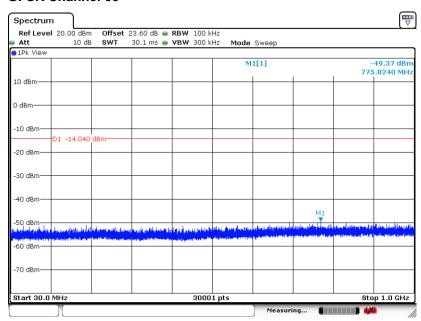
Report Version : Rev. 01

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3.4.6 Test Result of Conducted Spurious Emission Plots

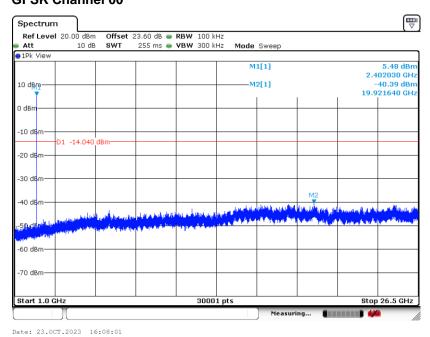
BLE 1Mbps:

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps **GFSK Channel 00**



Date: 23.0CT.2023 16:07:44

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps **GFSK Channel 00**



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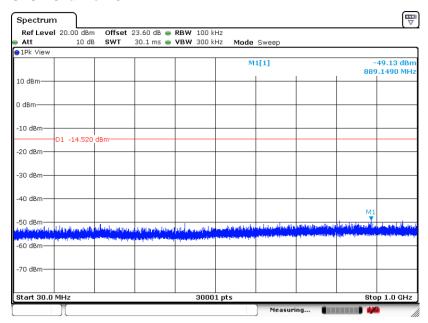
Report Template No.: BU5-FR15CBT4.0 Version 2.0

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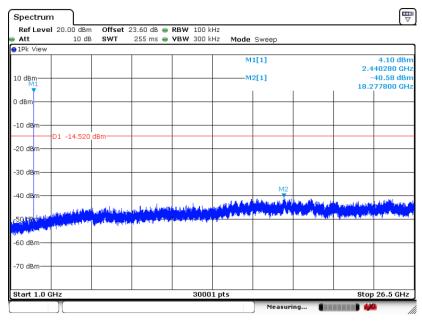
Report No.: FR391515-01B

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19



Date: 23.0CT.2023 16:20:44

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19



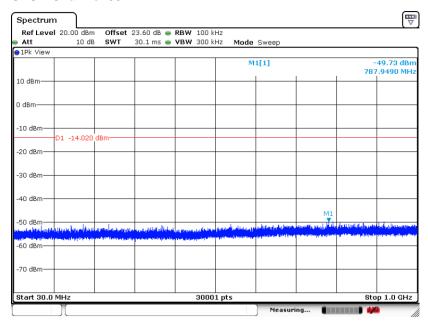
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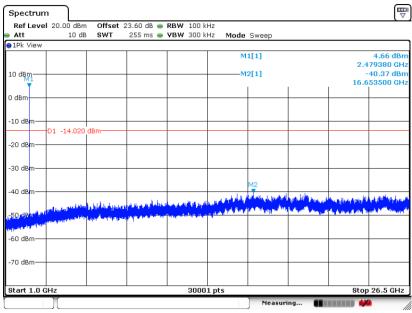
Report No.: FR391515-01B

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39



Date: 23.0CT.2023 16:23:08

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39



Date: 23.0CT.2023 16:23:23

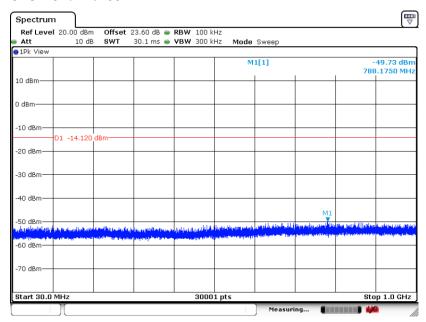
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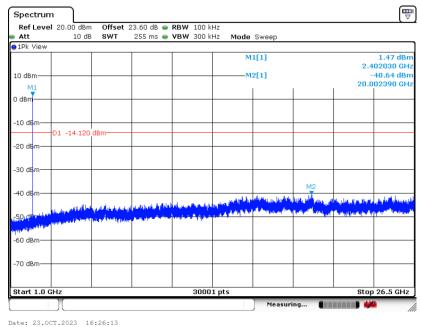
BLE 2Mbps:

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



Date: 23.0CT.2023 16:25:58

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



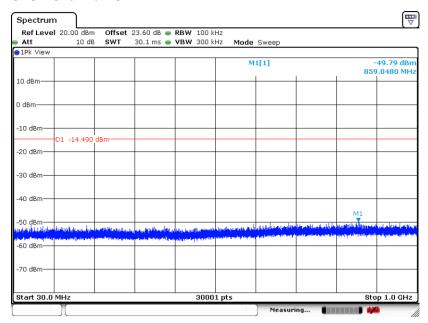
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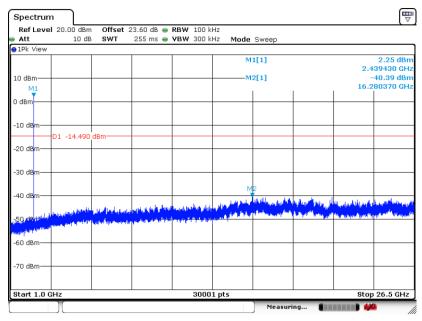
Report No.: FR391515-01B

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19



Date: 23.0CT.2023 16:27:50

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19



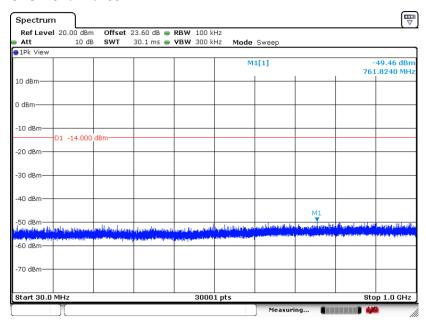
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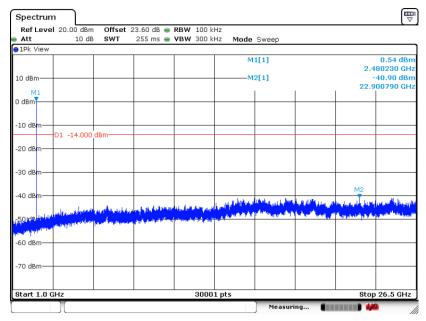
Report No.: FR391515-01B

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39



Date: 23.0CT.2023 16:30:03

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39



Date: 23.0CT.2023 16:30:21

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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.

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- 3. 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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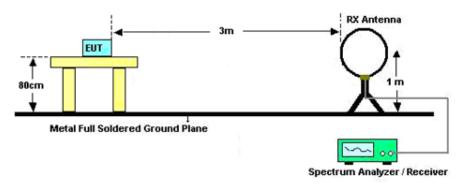
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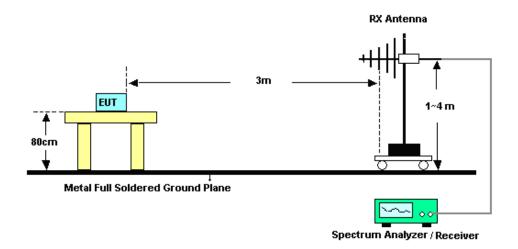
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3.5.4 Test Setup

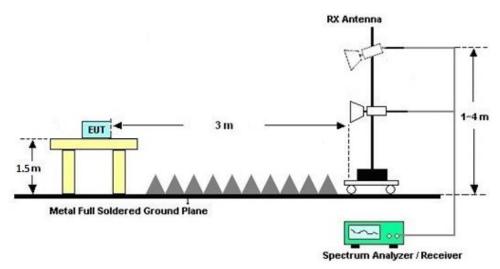
For radiated emissions below 30MHz



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.
- 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.

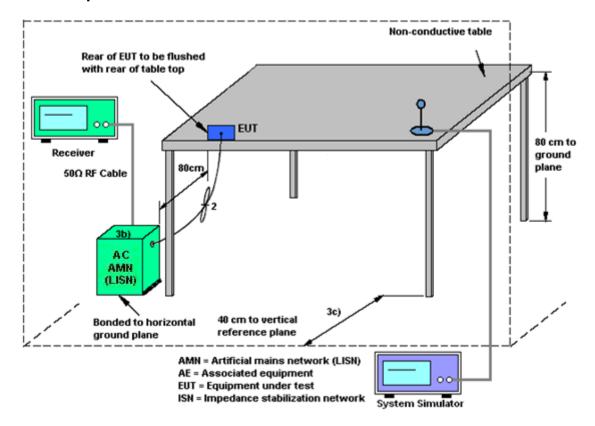
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3.6.4 Test Setup



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	Agilent	N9038A	MY52260185	20Hz~26.5GHz	Dec. 26, 2022	Oct. 18 2023~ Oct. 26 2023	Dec. 25, 2023	Radiation (03CH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY55150213	10Hz~44GHz	Jul. 07, 2023	Oct. 18 2023~ Oct. 26 2023	Jul. 06, 2024	Radiation (03CH01-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jul. 28, 2022	Oct. 18 2023~ Oct. 26 2023	Jul. 27, 2024	Radiation (03CH01-SZ)
Bilog Antenna	TeseQ	CBL6111D	41909	30MHz~1GHz	May. 14, 2023	Oct. 18 2023~ Oct. 26 2023	May. 13, 2024	Radiation (03CH01-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00119436	1GHz~18GHz	Jul. 08, 2023	Oct. 18 2023~ Oct. 26 2023	Jul. 07, 2024	Radiation (03CH01-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Apr. 08,2023	Oct. 18 2023~ Oct. 26 2023	Apr. 07,2024	Radiation (03CH01-SZ)
LF Amplifier	Burgeon	BPA-530	102209	0.01~3000Mhz	Apr. 04, 2023	Oct. 18 2023~ Oct. 26 2023	Apr. 03,2024	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	AMF-7D-00101 800-30-10P-R	1943528	1GHz~18GHz	Oct. 18,2023	Oct. 18 2023~ Oct. 26 2023	Oct. 17,2024	Radiation (03CH01-SZ)
HF Amplifier	KEYSIGHT	83017A	MY53270105	0.5GHz~26.5Ghz	Oct. 18,2023	Oct. 18 2023~ Oct. 26 2023	Oct. 17,2024	Radiation (03CH01-SZ)
HF Amplifier	MITEQ	TTA1840-35-H G	1871923	18GHz~40GHz	Jul. 07, 2023	Oct. 18 2023~ Oct. 26 2023	Jul. 06, 2024	Radiation (03CH01-SZ)
AC Power Source	Chroma	61601	6160100019 85	N/A	Nov. 10, 2022	Oct. 18 2023~ Oct. 26 2023	Nov. 09, 2023	Radiation (03CH01-SZ)
Turn Table	EM	EM1000	N/A	0~360 degree	NCR	Oct. 18 2023~ Oct. 26 2023	NCR	Radiation (03CH01-SZ)
Antenna Mast	EM	EM1000	N/A	1 m~4 m	NCR	Oct. 18 2023~ Oct. 26 2023	NCR	Radiation (03CH01-SZ)
EMI Receiver	R&S	ESR7	101630	9kHz~7GHz;	Jul. 06, 2023	Oct. 30 2023	Jul. 05, 2024	Conduction (CO01-SZ)
AC LISN	R&S	ENV216	100063	9kHz~30MHz	Aug. 21, 2023	Oct. 30 2023	Aug. 20, 2024	Conduction (CO01-SZ)
AC LISN (for auxiliary equipment)	EMCO	3816/2SH	00103892	9kHz~30MHz	Oct. 16, 2023	Oct. 30 2023	Oct. 15, 2024	Conduction (CO01-SZ)
AC Power Source	Chroma	61602	6160200008 91	100Vac~250Vac	Jul. 07, 2023	Oct. 30 2023	Jul. 06, 2024	Conduction (CO01-SZ)
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 06, 2023	Oct. 23 2023	Apr. 05, 2024	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 27, 2022	Oct. 23 2023	Dec. 26, 2023	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 27, 2022	Oct. 23 2023	Dec. 26, 2023	Conducted (TH01-SZ)
Thermo meter	Anymetre	JR593	#7	- 10℃ ~ 50℃ 10%RH~99%RH	Apr. 08, 2023	Oct. 23 2023	Apr. 07, 2024	Conducted (TH01-SZ)

NCR: No Calibration Required

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Report Version : Rev. 01

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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.

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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	2.7 dB
of 95% (U = 2Uc(y))	2.7 UB

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

Measuring Uncertainty for a Level of Confidence	4.2.15
of 95% (U = 2Uc(y))	4.2 dB

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

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

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

Measuring Uncertainty for a Level of Confidence	4.3 dB
of 95% (U = 2Uc(y))	4.3 dB

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

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Appendix A. Conducted Test Results

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Appendix A. Test Result of Conducted Test Items

Test Engineer:	Zhang Jiang	Temperature:	21~25	°C
Test Date:	2023/10/23	Relative Humidity:	51~54	%

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	1.025	0.668	0.50	Pass
BLE	1Mbps	1	19	2440	1.023	0.670	0.50	Pass
BLE	1Mbps	1	39	2480	1.025	0.672	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	6.45	30.00	-5.60	0.85	36.00	Pass
BLE	1Mbps	1	19	2440	6.25	30.00	-5.60	0.65	36.00	Pass
BLE	1Mbps	1	39	2480	6.44	30.00	-5.60	0.84	36.00	Pass

TEST RESULTS DATA Average Power Table

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	2.04	6.00	30.00	-5.60	0.40	36.00	Pass
BLE	1Mbps	1	19	2440	2.04	5.70	30.00	-5.60	0.10	36.00	Pass
BLE	1Mbps	1	39	2480	2.04	6.00	30.00	-5.60	0.40	36.00	Pass

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	5.96	-8.64	-5.60	8.00	Pass
BLE	1Mbps	1	19	2440	5.48	-9.04	-5.60	8.00	Pass
BLE	1Mbps	1	39	2480	5.98	-8.54	-5.60	8.00	Pass

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

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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	2.030	1.144	0.50	Pass
BLE	2Mbps	1	19	2440	2.030	1.148	0.50	Pass
BLE	2Mbps	1	39	2480	2.034	1.156	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	6.59	30.00	-5.60	0.99	36.00	Pass
BLE	2Mbps	1	19	2440	6.36	30.00	-5.60	0.76	36.00	Pass
BLE	2Mbps	1	39	2480	6.57	30.00	-5.60	0.97	36.00	Pass

TEST RESULTS DATA Average Power Table

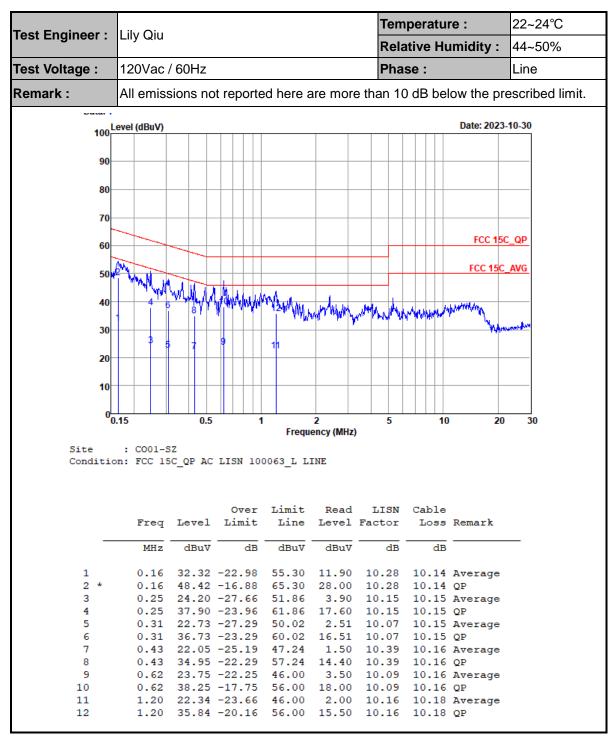
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	2Mbps	1	0	2402	4.83	5.90	30.00	-5.60	0.30	36.00	Pass
BLE	2Mbps	1	19	2440	4.83	5.60	30.00	-5.60	0.00	36.00	Pass
BLE	2Mbps	1	39	2480	4.83	5.90	30.00	-5.60	0.30	36.00	Pass

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	5.88	-12.35	-5.60	8.00	Pass
BLE	2Mbps	1	19	2440	5.51	-12.67	-5.60	8.00	Pass
BLE	2Mbps	1	39	2480	6.00	-12.15	-5.60	8.00	Pass

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

Appendix B. AC Conducted Emission Test Results



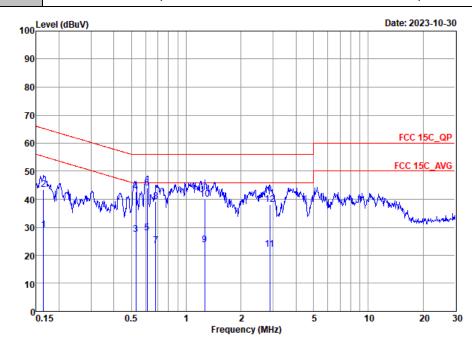
TEL: +86-755-8637-9589 FAX: +86-755-8637-9595 FCC ID: IHDT56AN3 Report No.: FR391515-01B

 Test Engineer :
 Lily Qiu
 Temperature :
 22~24°C

 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.



Site : CO01-SZ

Condition: FCC 15C_QP AC LISN 100063_N NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.16	28.94	-26.31	55.25	8.40	10.40	10.14	Average
2	0.16	43.34	-21.91	65.25	22.80	10.40	10.14	QP
3	0.53	27.60	-18.40	46.00	7.30	10.14	10.16	Average
4	0.53	42.60	-13.40	56.00	22.30	10.14	10.16	QP
5	0.61	28.03	-17.97	46.00	7.70	10.17	10.16	Average
6 *	0.61	44.03	-11.97	56.00	23.70	10.17	10.16	QP
7	0.68	23.58	-22.42	46.00	3.10	10.32	10.16	Average
8	0.68	39.28	-16.72	56.00	18.80	10.32	10.16	QP
9	1.26	23.84	-22.16	46.00	3.41	10.25	10.18	Average
10	1.26	40.04	-15.96	56.00	19.61	10.25	10.18	QP
11	2.88	22.08	-23.92	46.00	1.40	10.40	10.28	Average
12	2.88	38.08	-17.92	56.00	17.40	10.40	10.28	QP

Note:

- 1. Level(dB μ V) = Read Level(dB μ V) + LISN Factor(dB) + Cable Loss(dB)
- 2. Over Limit(dB) = Level(dB μ V) Limit Line(dB μ V)

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Appendix C Radiated Spurious Emission Test Data

Test Engineer :	Shiwei Wen	Relative Humidity :	48~49%
rest Engineer.	Siliwei Weil	Temperature :	24-25°C

Radiated Spurious Emission Test Modes

Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 1	2400-2483.5	2	Bluetooth-LE_GSFK	00	2402	1Mbps	-	-
Mode 2	2400-2483.5	2	Bluetooth-LE_GSFK	19	2440	1Mbps	-	-
Mode 3	2400-2483.5	2	Bluetooth-LE_GSFK	39	2480	1Mbps	-	-
Mode 4	2400-2483.5	2	Bluetooth-LE_GSFK	00	2402	2Mbps	-	-
Mode 5	2400-2483.5	2	Bluetooth-LE_GSFK	19	2440	2Mbps	-	-
Mode 6	2400-2483.5	2	Bluetooth-LE_GSFK	39	2480	2Mbps	-	-
Mode 7	2400-2483.5	2	Bluetooth-LE_GSFK	39	2480	2Mbps	-	LF
Mode 8	Co-location	2	Bluetooth-LE_GSFK +LTE B30 Link	39	2480	2Mbps	-	-

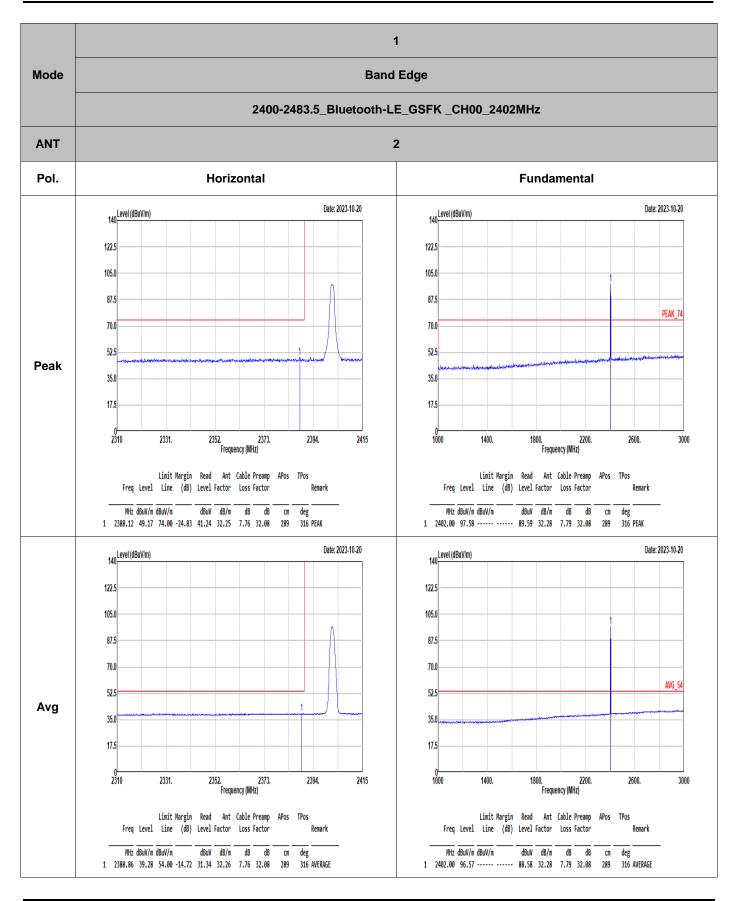
Summary of each worse mode

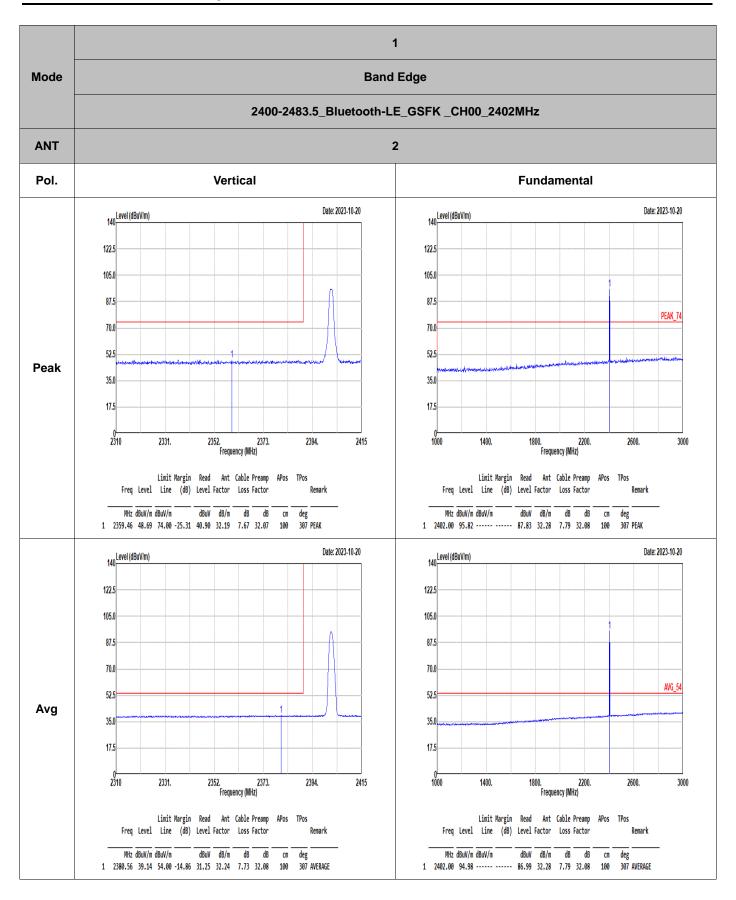
Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	Remark
1	Bluetooth-LE_GSFK	00	2388.86	39.28	54.00	-14.72	Н	AVERAGE	Pass	Band Edge
!	Bluetooth-LE_GSFK	00	4804.00	46.42	74.00	-27.58	V	Peak	Pass	Harmonic
2	Bluetooth-LE_GSFK	19	-	-	-	-	-	-	-	Band Edge
2	Bluetooth-LE_GSFK	19	7320.00	46.96	74.00	-27.04	Н	Peak	Pass	Harmonic
3	Bluetooth-LE_GSFK	39	2491.24	39.63	54.00	-14.37	Н	AVERAGE	Pass	Band Edge
3	Bluetooth-LE_GSFK	39	7440.00	47.09	74.00	-26.91	V	Peak	Pass	Harmonic
4	Bluetooth-LE_GSFK	00	2380.46	40.80	54.00	-13.20	Н	AVERAGE	Pass	Band Edge
4	Bluetooth-LE_GSFK	00	4804.00	46.39	74.00	-27.61	Н	Peak	Pass	Harmonic
5	Bluetooth-LE_GSFK	19	-	-	-	-	-	-	-	Band Edge
5	Bluetooth-LE_GSFK	19	7320.00	47.79	74.00	-26.21	V	Peak	Pass	Harmonic
6	Bluetooth-LE_GSFK	39	2499.76	41.54	54.00	-12.46	Н	AVERAGE	Pass	Band Edge
0	Bluetooth-LE_GSFK	39	7440.00	47.71	74.00	-26.29	Н	Peak	Pass	Harmonic
7	Bluetooth-LE_GSFK	39	193.93	28.98	43.5	-14.52	V	Peak	Pass	LF
8	Bluetooth-LE_GSFK	39	2484.84	40.22	54.00	-13.78	V	Average	Pass	Band Edge
0	Bluetooth-LE_GSFK	39	4960.00	47.10	74.00	-26.90	V	Peak	Pass	Harmonic

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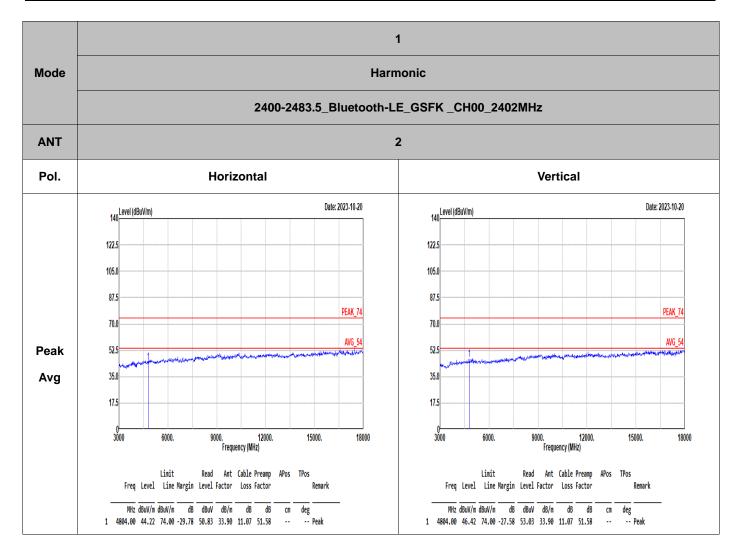
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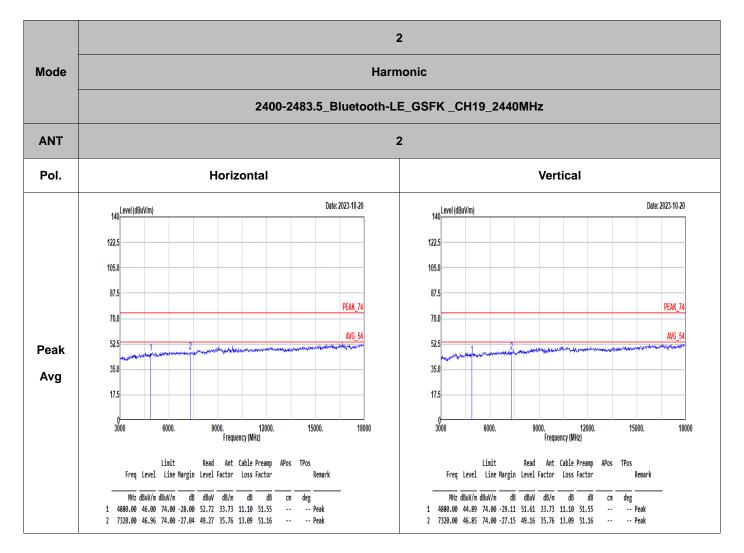




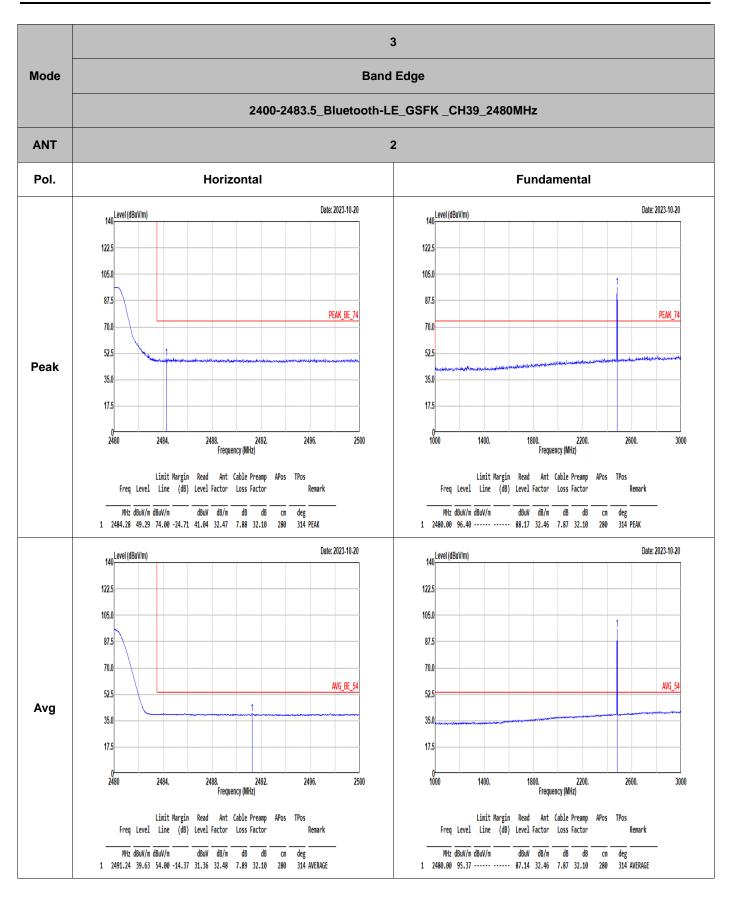


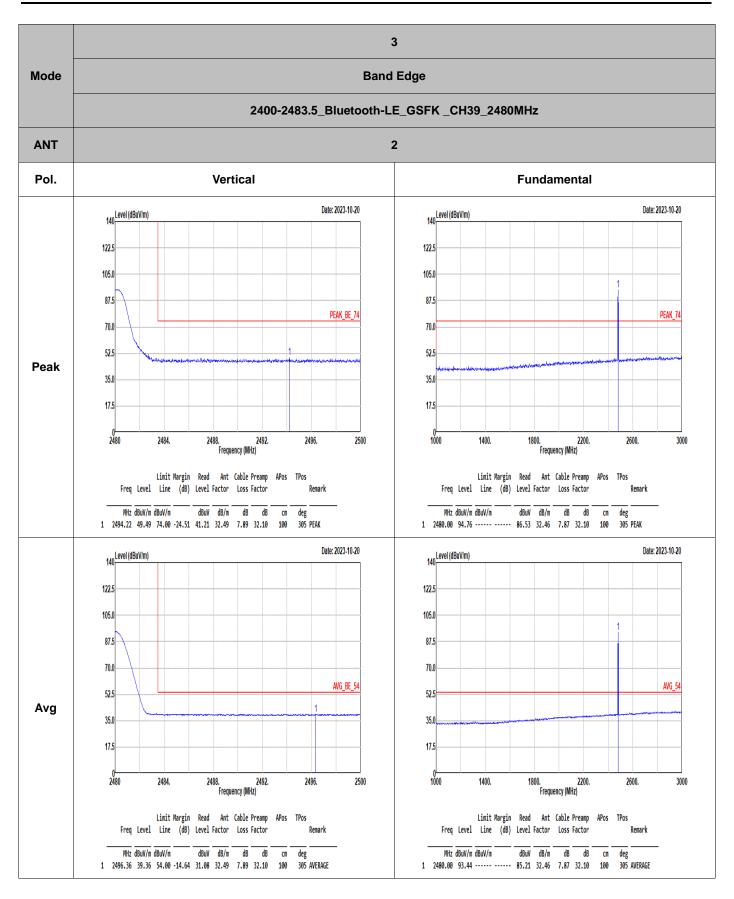


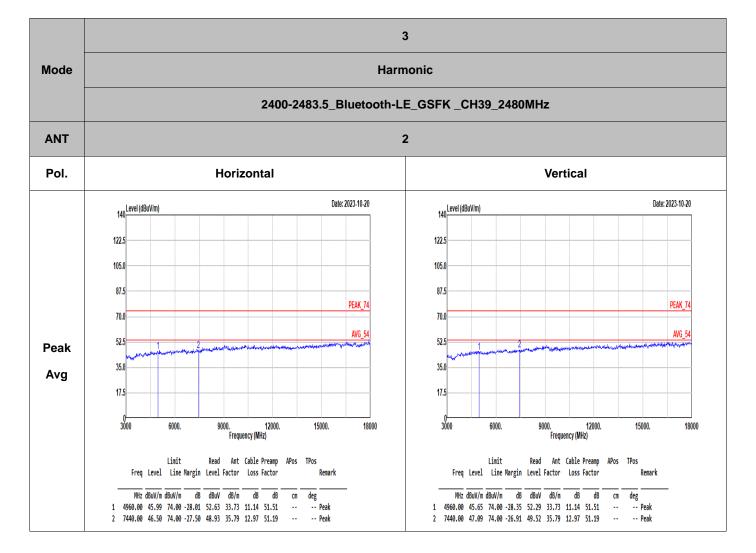


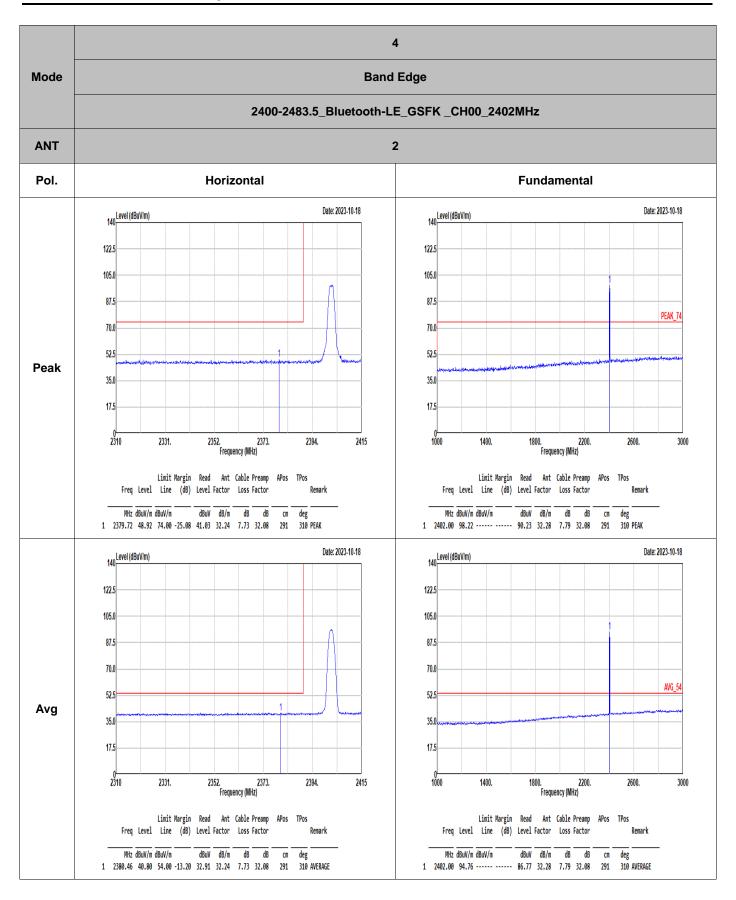


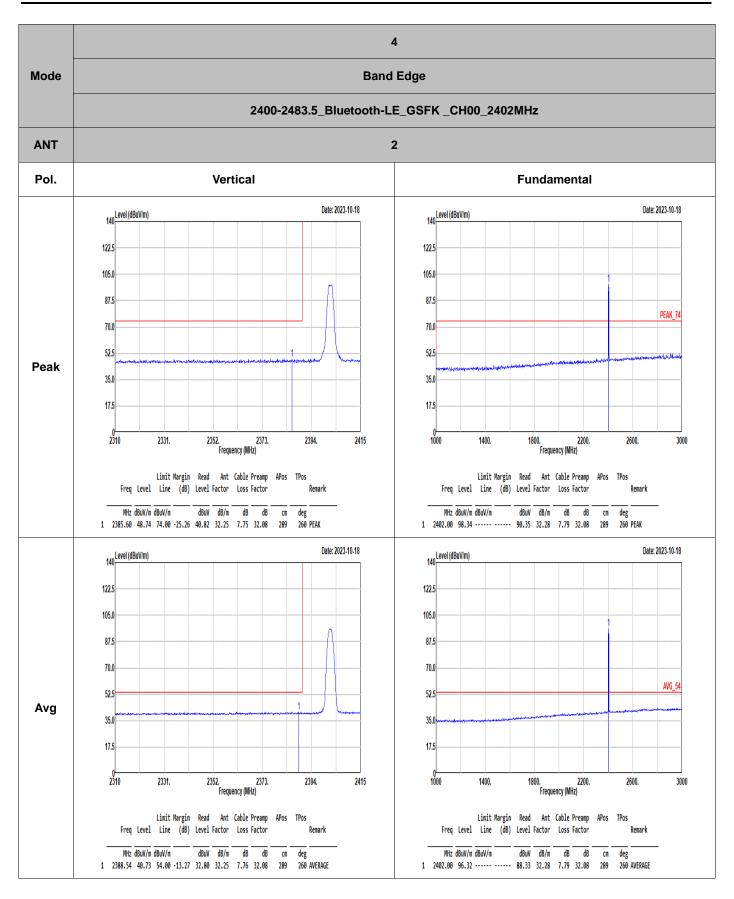


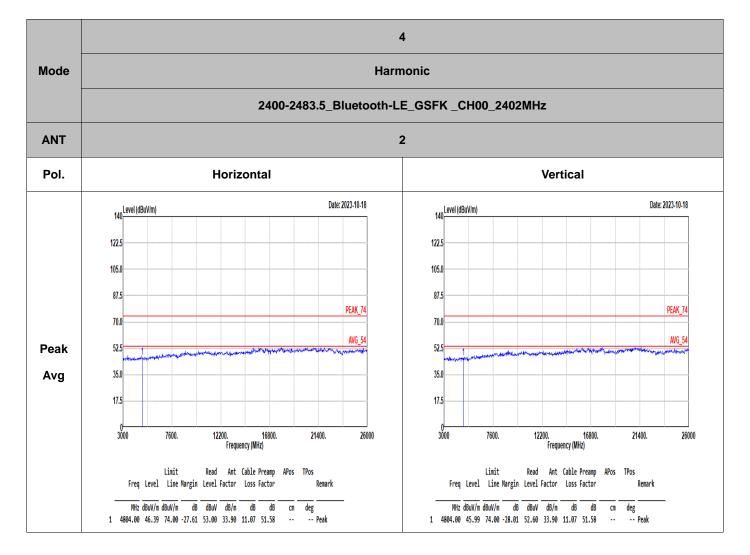












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140 Level (dBuV/m)

Mode

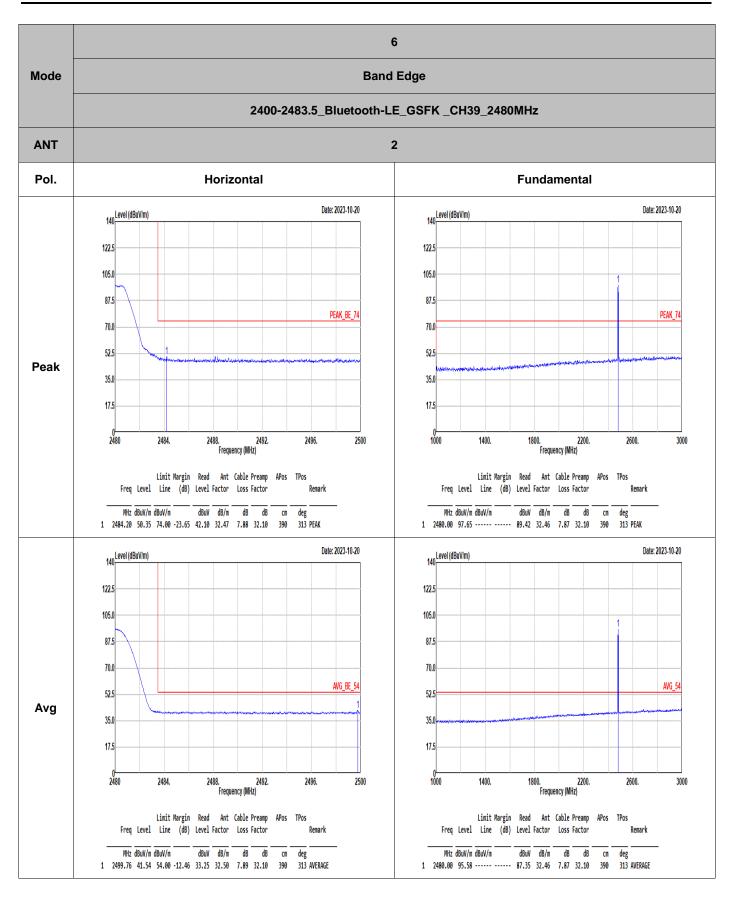
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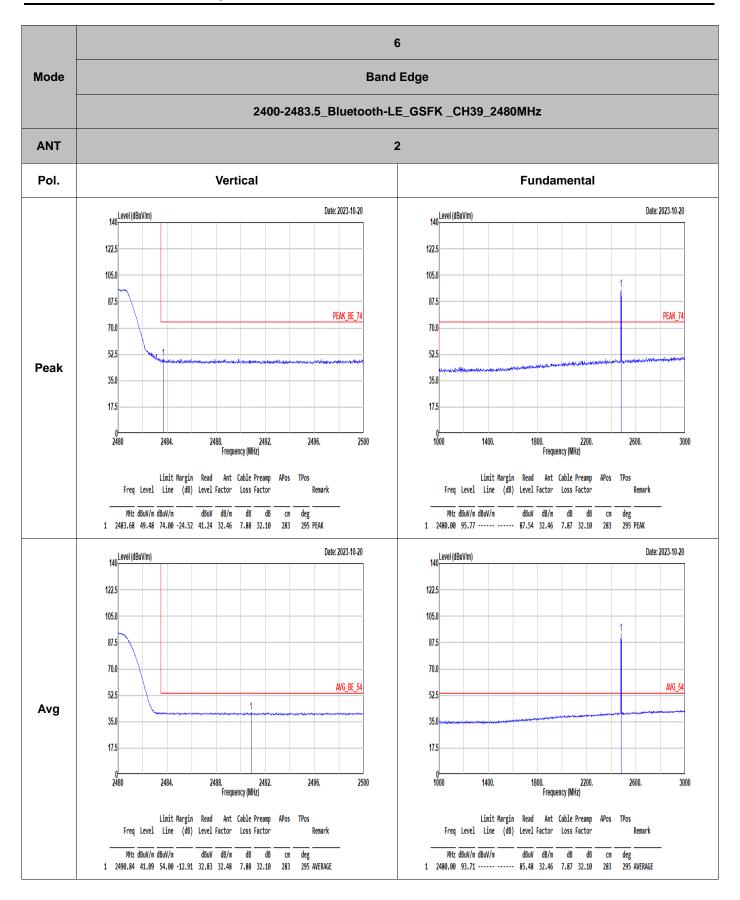
Pol.

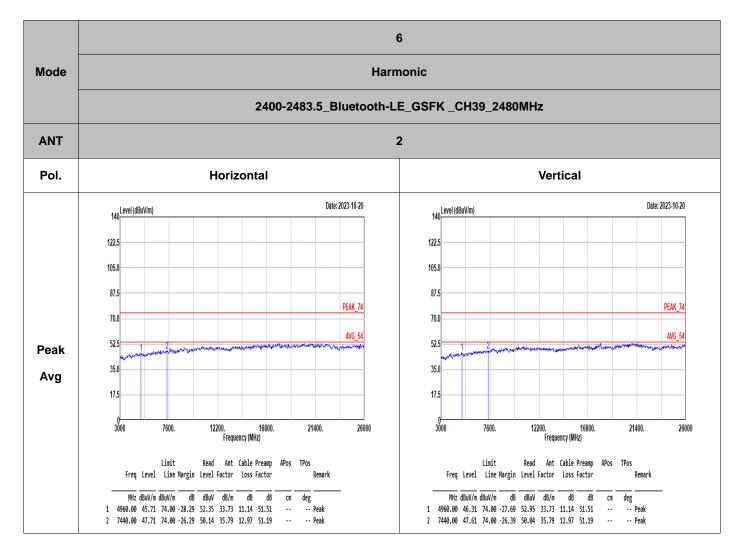
Report No.:FR391515-01B 5 Harmonic 2400-2483.5_Bluetooth-LE_GSFK _CH19_2440MHz 2 Horizontal Vertical Date: 2023-10-20 Date: 2023-10-20 140 Level (dBuV/m) 122.5 87.5 PEAK_74 PEAK_74 70.0 52.5

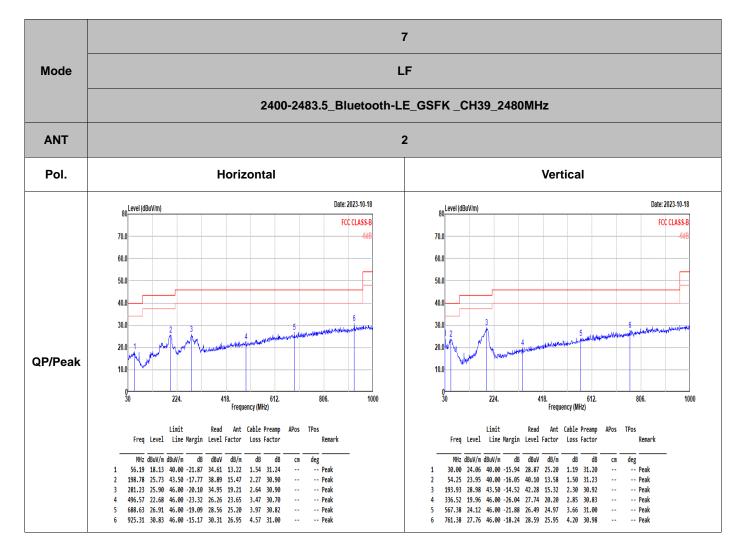
122.5 87.5 70.0 52.5 **Peak** Avg 17.5 3000 9000. 12000. Frequency (MHz) 15000. 6000. 18000 Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg 1 4880.00 45.63 74.00 -28.37 52.35 33.73 11.10 51.55 -- Peak 2 7320.00 47.02 74.00 -26.98 49.33 35.76 13.09 51.16 -- Peak

17.5 3000 9000. 12000. Frequency (MHz) 6000. 15000. 18000 Limit Read Ant Cable Preamp APos TPos Freq Level Line Margin Level Factor Loss Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg 1 4880.00 45.76 74.00 -28.24 52.48 33.73 11.10 51.55 -- Peak 2 7320.00 47.79 74.00 -26.21 50.10 35.76 13.09 51.16 -- Peak

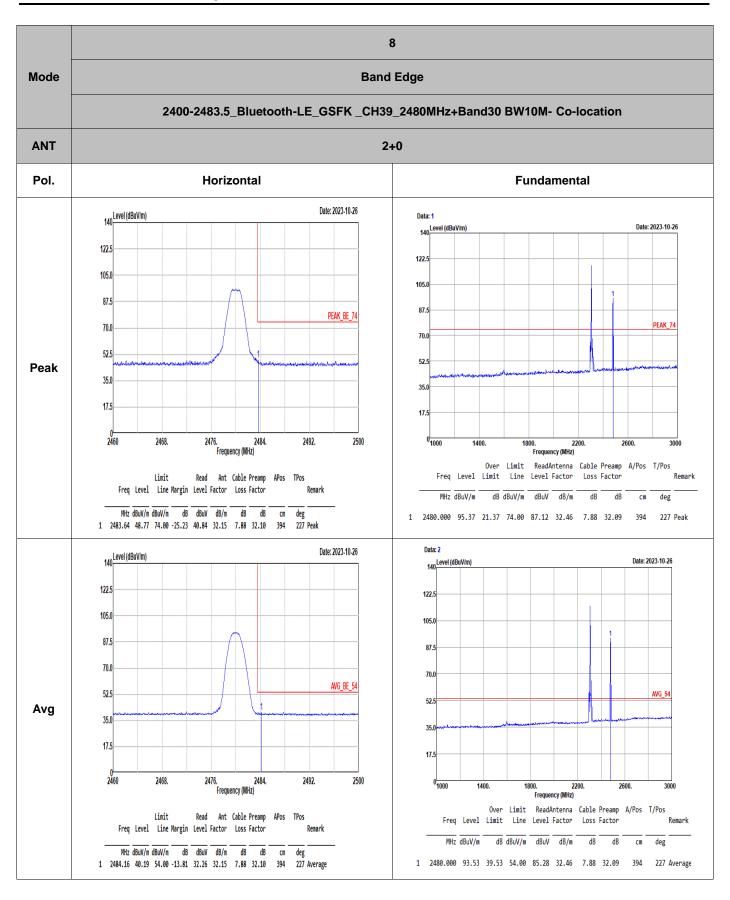




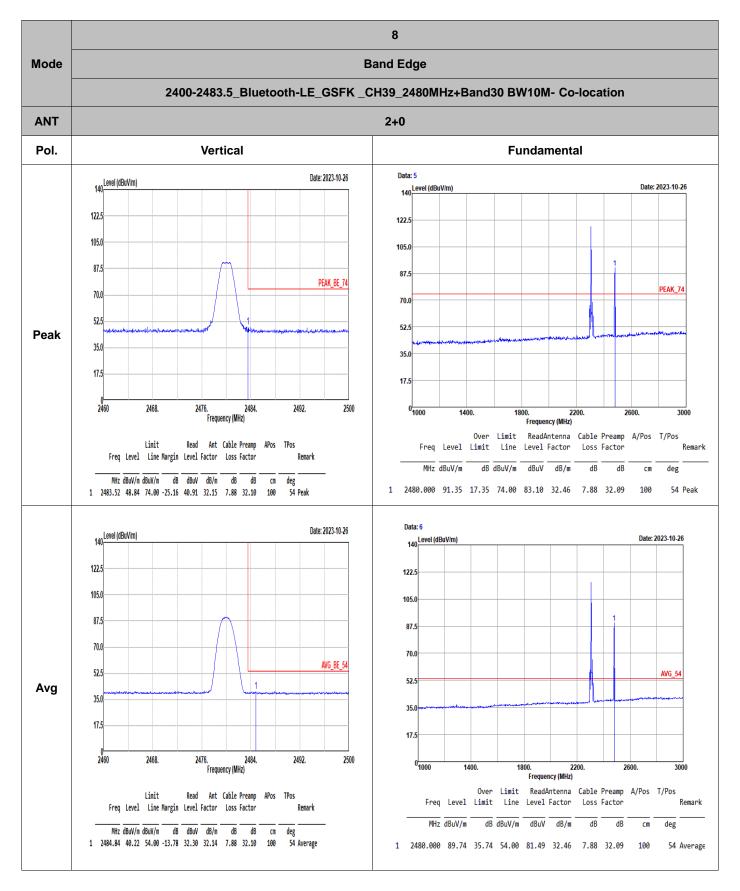


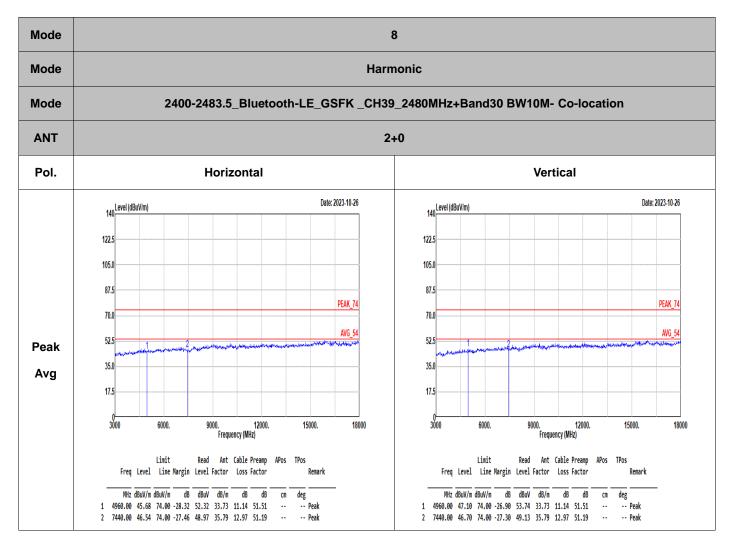






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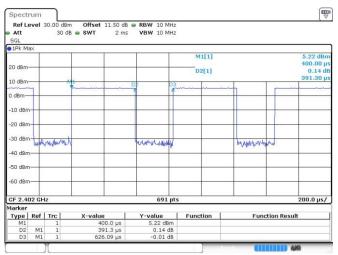




Appendix D. Duty Cycle Plots

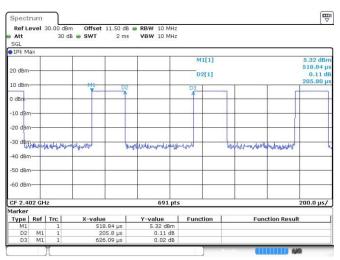
Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting	
Bluetooth LE 1Mbps	62.50	0.391	2.556	3KHz	
Bluetooth LE 2Mbps	32.87	0.206	4.859	10KHZ	

Bluetooth LE 1Mbps



Date: 18.OCT.2023 21:41:47

Bluetooth LE 2Mbps



Date: 18.OCT.2023 21:42:45

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