FCC RF Test Report

APPLICANT	:	FoxInsights GmbH
EQUIPMENT	:	FoxPressure
BRAND NAME	:	FoxInsights
MODEL NAME	:	FoxPressure-V1
FCC ID	:	2BKML-FOXPRESSURE
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter
TEST DATE(S)	:	Oct. 14, 2024

This product installed a RF module (Brand Name: WROOM, Model Name: ESP-WROOM-32D, FCC ID: 2AC7Z-ESPWROOM32D) during the test, only the RSE worst mode was verified in this report, all the other test results are leveraged from module RF report.

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
FR492610A	Rev. 01	Initial issue of report	Nov. 04, 2024

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
-	15.247(a)(1)	Number of Channels	≥ 15Chs	Pass	1
-	15.247(a)(1)	Hopping Channel Separation	≥ 2/3 of 20dB BW	Pass	1
-	15.247(a)(1)	Dwell Time of Each Channel	≤ 0.4sec in 31.6sec period	Pass	1
-	15.247(a)(1)	20dB Bandwidth	-	Report only	1
-	-	99% Bandwidth	-	Report only	1
-	15.247(b)(1)	Peak Output Power	≤ 125 mW	Pass	1
-	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	1
-	15.247(d)	Conducted Spurious Emission	≤ 20dBc	Pass	1
3.1	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 11.06 dB at 800.18 MHz
-	15.207	AC Conducted Emission	15.207(a)	Not Applicable	EUT not connect to AC Mains
3.2	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Remark 1:
Verify the maximum conducted power of the host is lower than and very close to the module, all the conducted test results were leveraged from module RF report which can refer to Report No. RXA1710-0352RF02.

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

FoxInsights GmbH
Ridlerstr. 57 80339 Munich Germany

1.2 Manufacturer

FoxInsights GmbH
Ridlerstr. 57 80339 Munich Germany

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	FoxPressure
Brand Name	FoxInsights
Model Name	FoxPressure-V1
FCC ID	2BKML-FOXPRESSURE
SN Code	Radiation: ONP417602655
HW Version	1.0
SW Version	1.0.0
EUT Stage	Identical Prototype

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	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Antenna Type / Gain	PCB Antenna type with gain 3.7 dBi
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) :π/4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK

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.**
	03CH05-KS	CN1257	314309

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH05-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 C63.10-2013

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)	Channel	Freq. (MHz)
2400-2483.5 MHz	0	2402	27	2429	54	2456
	1	2403	28	2430	55	2457
	2	2404	29	2431	56	2458
	3	2405	30	2432	57	2459
	4	2406	31	2433	58	2460
	5	2407	32	2434	59	2461
	6	2408	33	2435	60	2462
	7	2409	34	2436	61	2463
	8	2410	35	2437	62	2464
	9	2411	36	2438	63	2465
	10	2412	37	2439	64	2466
	11	2413	38	2440	65	2467
	12	2414	39	2441	66	2468
	13	2415	40	2442	67	2469
	14	2416	41	2443	68	2470
	15	2417	42	2444	69	2471
	16	2418	43	2445	70	2472
	17	2419	44	2446	71	2473
	18	2420	45	2447	72	2474
	19	2421	46	2448	73	2475
	20	2422	47	2449	74	2476
	21	2423	48	2450	75	2477
	22	2424	49	2451	76	2478
	23	2425	50	2452	77	2479
	24	2426	51	2453	78	2480
	25	2427	52	2454	-	-
	26	2428	53	2455	-	-

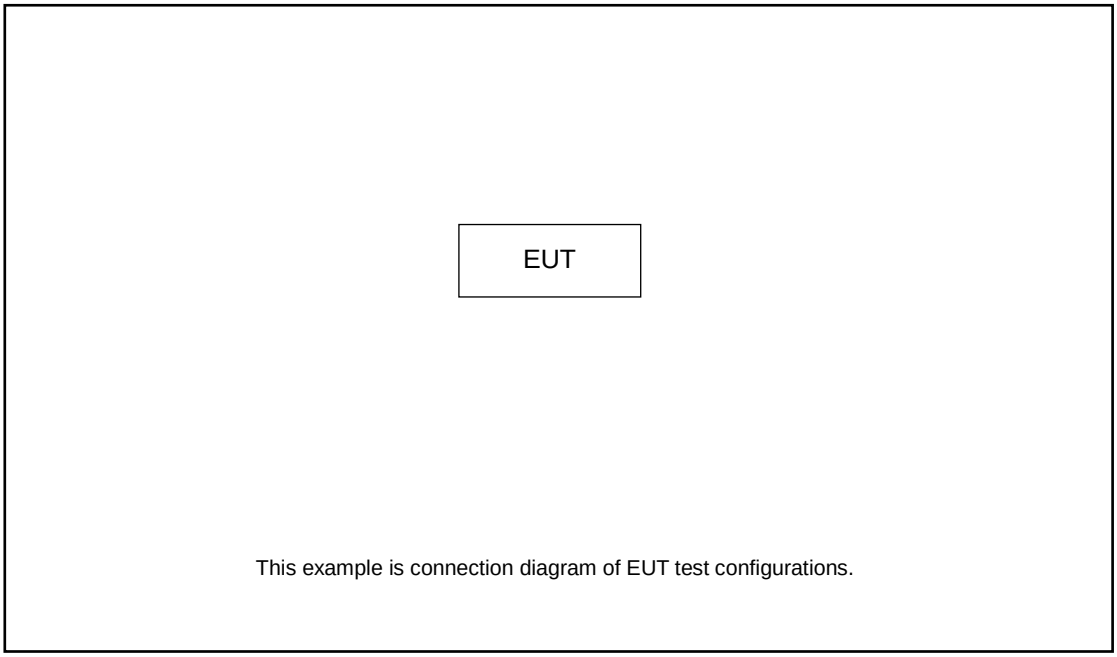
2.2 Test Mode

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, and the worst mode of radiated spurious emissions is Bluetooth 3Mbps mode, and 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**
Radiated Test Cases	**Bluetooth EDR 3Mbps 8-DPSK**
	Mode 1: CH78_2480 MHz
Remark:	For radiated test cases, the worst mode data rate 3Mbps was reported only, because this data rate has the highest RF output power at preliminary tests, and no other significantly frequencies found in conducted spurious emission.

2.3 Connection Diagram of Test System



2.4 EUT Operation Test Setup

For Bluetooth function, the engineering test program was provided and enabled to make EUT connect with Bluetooth base station to continuous transmit.

3 Test Result

3.1 Radiated Band Edges and Spurious Emission Measurement

3.1.1 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. 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

3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

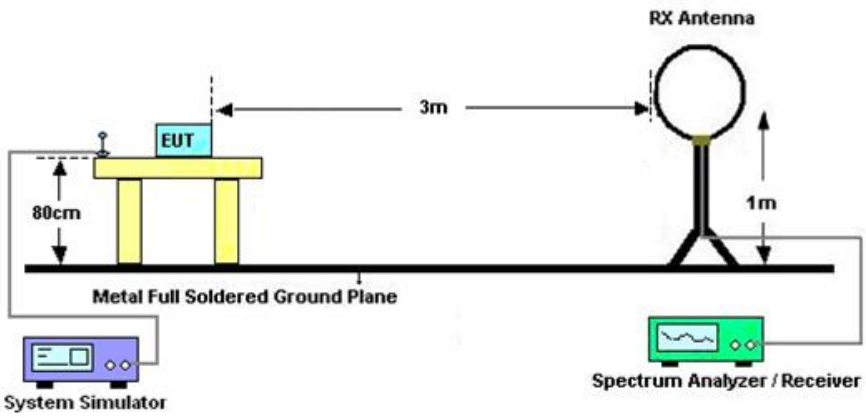
3.1.3 Test Procedures

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.
1. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
2. 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.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold for peak
   (3) For average measurement: use duty cycle correction factor method per 15.35(c).
   Duty cycle = On time/100 milliseconds
   On time = $N_1*L_1+N_2*L_2+...+N_{n-1}*LN_{n-1}+N_n*L_n$
   Where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.
   Average Emission Level = Peak Emission Level + 20*log(Duty cycle)
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.

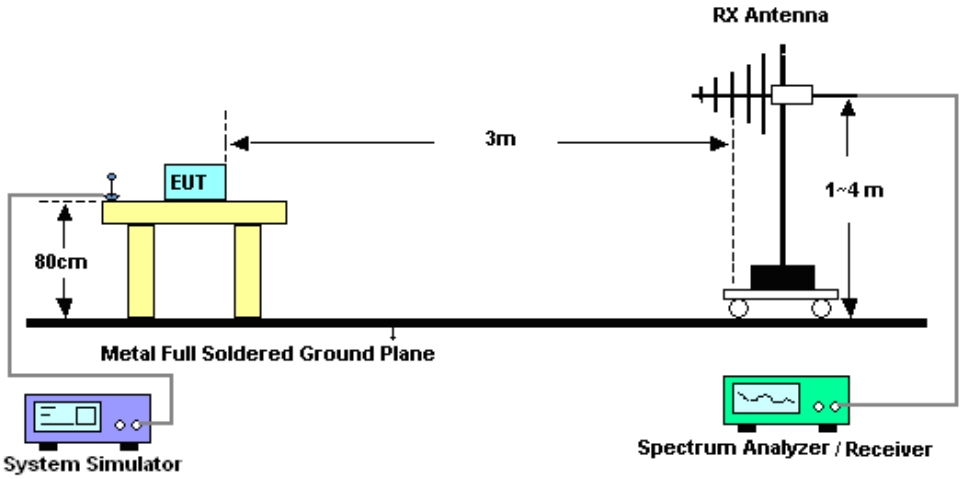
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent of the hopping signal would not use this correction.

3.1.4 Test Setup

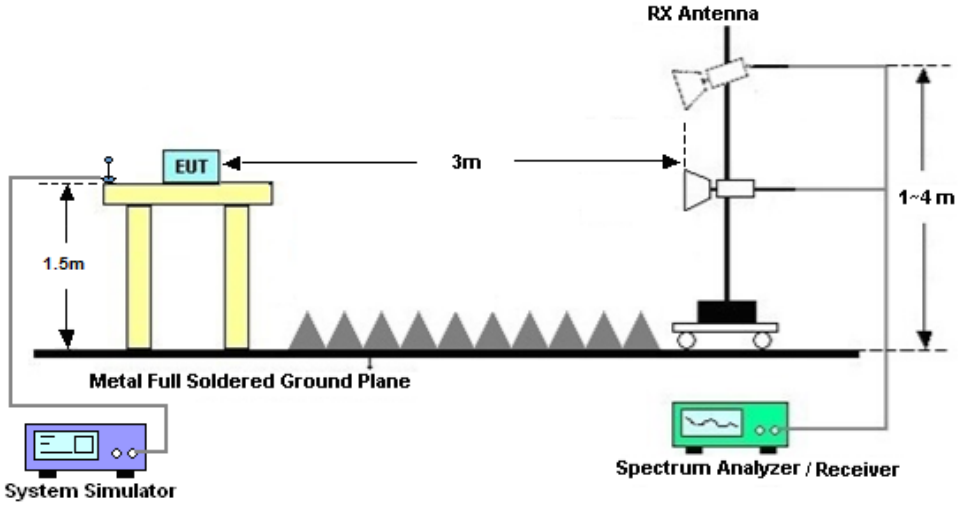
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.1.5 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.

3.1.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

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

Please refer to Appendix A.

3.1.8 Duty cycle correction factor for average measurement

Please refer to Appendix B.

3.2 Antenna Requirements

3.2.1 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.

3.2.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.2.3 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
EMI Test Receiver	Keysight	N9038A	MY57290151	3Hz~8.5GHz;Max 30dBm	Jul. 04, 2024	Oct. 14, 2024	Jul. 03, 2025	Radiation (03CH05-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY60242126	10Hz-44G,MAX 30dB	Oct. 10, 2024	Oct. 14, 2024	Oct. 09, 2025	Radiation (03CH05-KS)
Loop Antenna	R&S	HFH2-Z2E	101125	9kHz~30MHz	Sep. 08, 2024	Oct. 14, 2024	Sep. 07, 2025	Radiation (03CH05-KS)
Bilog Antenna	TeseQ	CBL6111D	49921	30MHz-1GHz	Apr. 18, 2024	Oct. 14, 2024	Apr. 17, 2025	Radiation (03CH05-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218642	1GHz~18GHz	Apr. 11, 2024	Oct. 14, 2024	Apr. 10, 2025	Radiation (03CH05-KS)
SHF-EHF Horn	Com-power	AH-840	101093	18GHz~40GHz	Jan. 06, 2024	Oct. 14, 2024	Jan. 05, 2025	Radiation (03CH05-KS)
Amplifier	SONOMA	310N	381512	9KHz-1GHz	Jan. 02, 2024	Oct. 14, 2024	Jan. 01, 2025	Radiation (03CH05-KS)
Amplifier	EM	EM18G40GA	060852	18~40GHz	Jan. 02, 2024	Oct. 14, 2024	Jan. 01, 2025	Radiation (03CH05-KS)
high gain Amplifier	EM	EM01G18GA	060843	1Ghz-18Ghz	Jan. 03, 2024	Oct. 14, 2024	Jan. 02, 2025	Radiation (03CH05-KS)
Amplifier	EM	EM01G18GA	060833	1Ghz-18Ghz	Jan. 03, 2024	Oct. 14, 2024	Jan. 02, 2025	Radiation (03CH05-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Oct. 14, 2024	NCR	Radiation (03CH05-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Oct. 14, 2024	NCR	Radiation (03CH05-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Oct. 14, 2024	NCR	Radiation (03CH05-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 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))	**6.02dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.22dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.34dB**

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

Appendix A. Radiated Spurious Emission Test Data

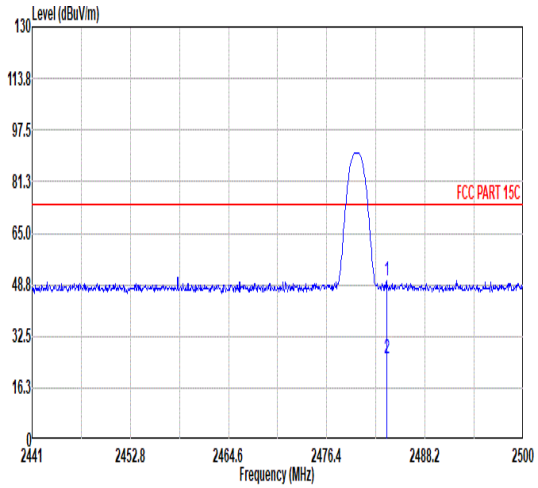
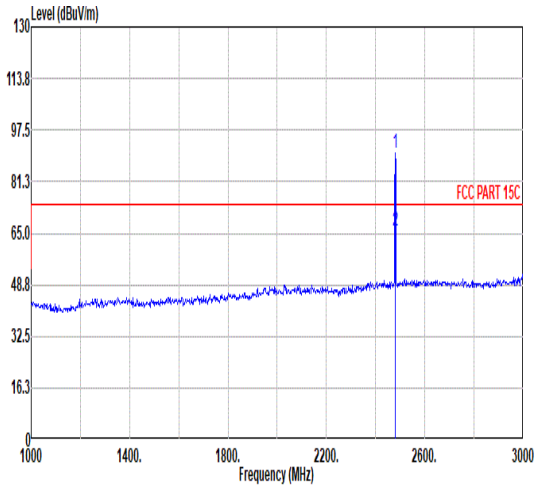
Test Engineer :	Jake	**Relative Humidity :**	41 ~ 42 %
		Temperature :	22 ~ 23 ℃

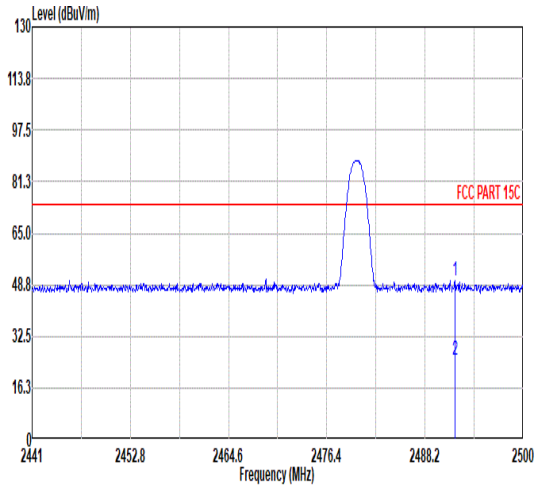
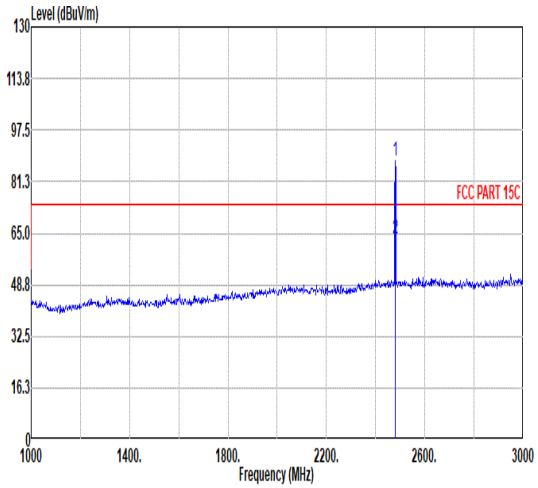
Radiated Spurious Emission Test Modes

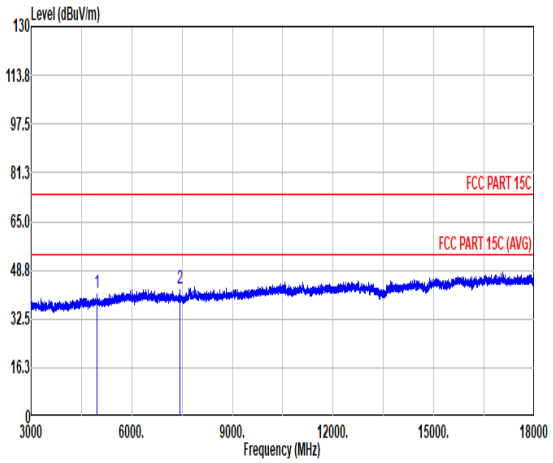
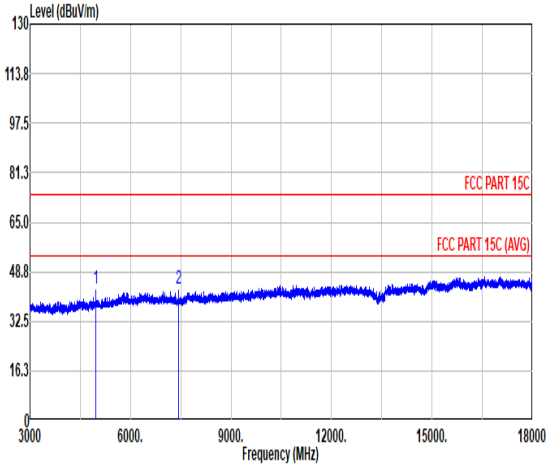
Mode	Band (MHz)	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 1	2400-2483.5	Bluetooth EDR_8-DPSK	78	2480	-	-	-

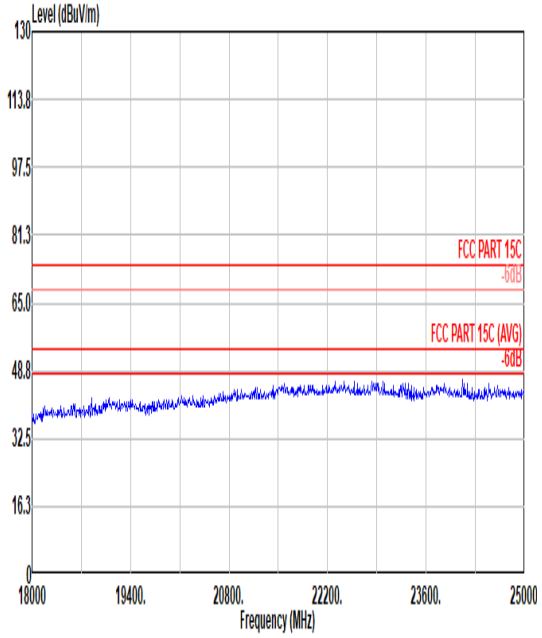
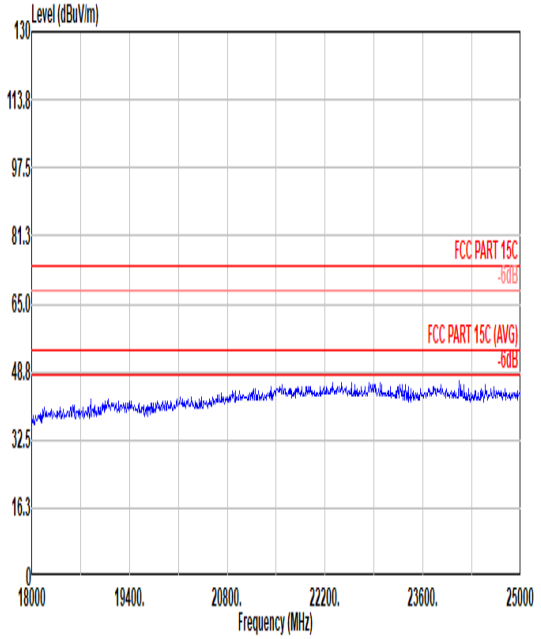
Summary of each worse mode

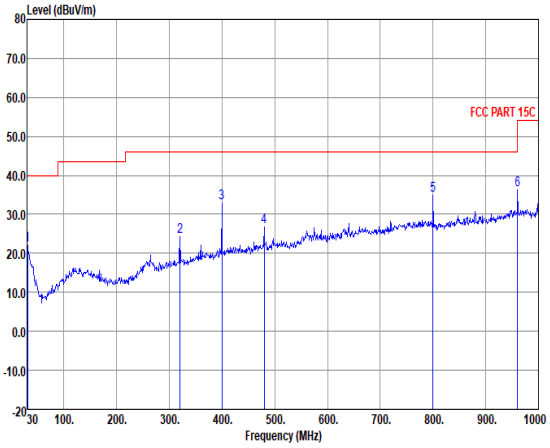
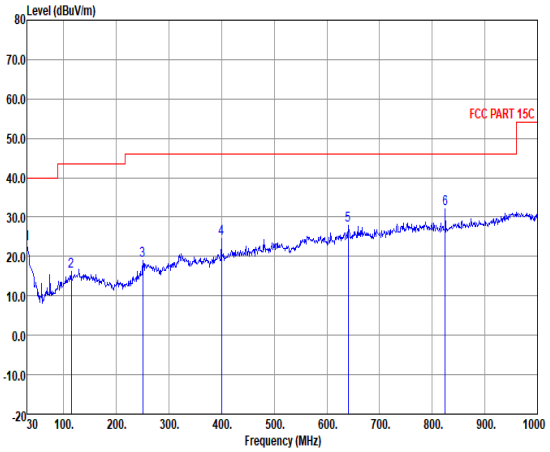
Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	Remark
1	Bluetooth EDR_8-DPSK	78	2483.60	50.25	74.00	-23.75	H	PEAK	Pass	Band Edge
1	Bluetooth EDR_8-DPSK	78	7440.00	43.40	74.00	-30.60	H	Peak	Pass	Harmonic

Mode	1	
	Band Edge	
	2400-2483.5_Bluetooth EDR_8-DPSK_CH78_2480MHz	
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 2483.60 50.25 74.00 -23.75 41.37 32.47 7.26 36.85 6.00 122 28 PEAK 2 2483.60 25.46 54.00 -28.54 16.58 32.47 7.26 36.85 6.00 122 28 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 90.50 ------ ------ 81.65 32.46 7.25 36.86 6.00 122 28 PEAK 2 2480.00 65.71 ------ ------ 56.86 32.46 7.25 36.86 6.00 122 28 AVERAGE

Mode	1	
	Band Edge	
	2400-2483.5_Bluetooth EDR_8-DPSK_CH78_2480MHz	
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 2491.80 49.82 74.00 -24.18 40.90 32.48 7.27 36.83 6.00 249 296 PEAK 2 2491.80 25.03 54.00 -28.97 16.11 32.48 7.27 36.83 6.00 249 296 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 87.93 ------ ------ 79.08 32.46 7.25 36.86 6.00 249 296 PEAK 2 2480.00 63.14 ------ ------ 54.29 32.46 7.25 36.86 6.00 249 296 AVERAGE

Mode	1	
	Harmonic	
	2400-2483.5_Bluetooth EDR_8-DPSK_CH78_2480MHz	
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 40.99 74.00 -33.01 61.96 34.22 10.40 65.59 0.00 -- -- PEAK 2 7440.00 42.45 74.00 -31.55 60.50 35.80 12.78 66.63 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 4960.00 43.17 74.00 -30.83 64.14 34.22 10.40 65.59 0.00 -- -- PEAK 2 7440.00 43.40 74.00 -30.60 61.45 35.80 12.78 66.63 0.00 -- -- PEAK

Mode	1	
	18G-25G	
	2400-2483.5_Bluetooth EDR_8-DPSK_CH78_2480MHz	
Pol.	Horizontal	Vertical
Peak Avg		

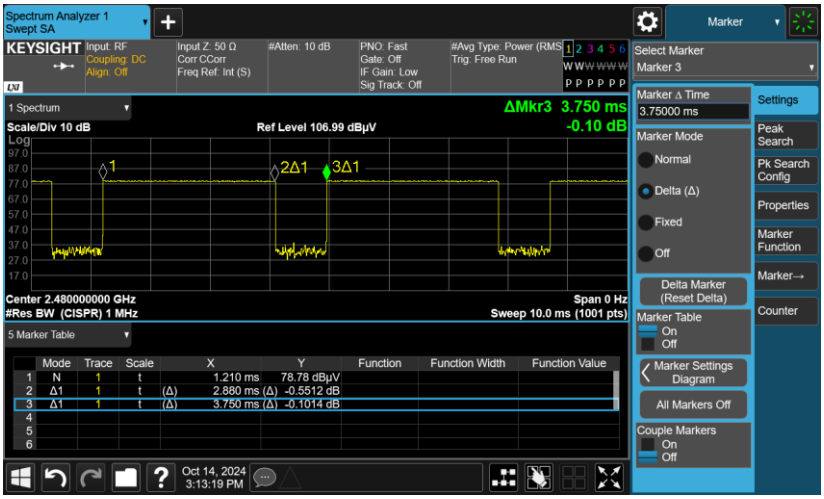
Mode	1	
	30M-1G	
	2400-2483.5_Bluetooth EDR_8-DPSK_CH78_2480MHz	
Pol.	Horizontal	Vertical
Peak		

	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Aux Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	30.97	22.04	40.00	-17.96	29.29	24.79	0.76	32.80	0.00	---	---	Peak
2	320.03	24.36	46.00	-21.64	34.96	19.61	2.63	32.84	0.00	---	---	Peak
3	399.57	33.01	46.00	-12.99	41.23	21.81	3.00	33.03	0.00	---	---	Peak
4	480.08	26.81	46.00	-19.19	33.23	23.55	3.14	33.11	0.00	---	---	Peak
5	800.18	34.94	46.00	-11.06	35.31	28.42	4.22	33.01	0.00	---	---	Peak
6	960.23	36.21	54.00	-17.79	32.16	31.00	4.61	31.56	0.00	---	---	Peak

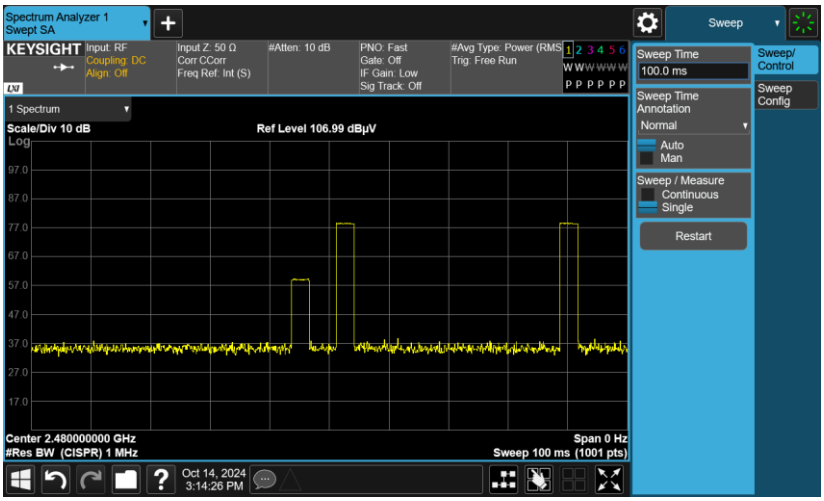
	Freq	Level	Limit Line	Over Limit	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Aux Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	30.00	23.04	40.00	-16.96	30.78	24.57	0.71	33.02	0.00	---	---	Peak
2	114.39	16.32	43.50	-27.18	30.69	16.88	1.61	32.86	0.00	---	---	Peak
3	250.19	19.02	46.00	-26.98	30.95	18.42	2.42	32.77	0.00	---	---	Peak
4	399.57	24.60	46.00	-21.40	32.71	21.67	3.05	32.83	0.00	---	---	Peak
5	640.13	27.87	46.00	-18.13	31.81	25.17	3.86	32.97	0.00	---	---	Peak
6	824.43	32.22	46.00	-13.78	33.98	26.42	4.38	32.56	0.00	---	---	Peak

Appendix B. Duty Cycle Plots

3DH5 on time (One Pulse) Plot on Channel 00



3DH5 on time (Count Pulses) Plot on Channel 00



Note:

1. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.88 / 100 = 5.76 %
2. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.79 dB
3. 3DH5 has the highest duty cycle worst case and is reported.