FCC RADIO TEST REPORT

FCC ID	:	**I28-WYSBHVDXP**
Equipment	:	**WLAN/BTLE module**
Brand Name	:	**ZEBRA**
Model Name	:	**WYSBHVDXP**
Applicant	:	**Zebra Technologies Corporation** **3 Overlook Point, Lincolnshire, IL 60069, United States**
Manufacturer	:	**Zebra Technologies Corporation** **3 Overlook Point, Lincolnshire, IL 60069, United States**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Jun. 27, 2023 and testing was performed from Jul. 06, 2023 to Aug. 01, 2023. We, Sporton International Inc. Wensan Laboratory, 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 variant report apply exclusively to the tested model / sample. Without written approval from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

Sporton International Inc. Wensan Laboratory
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History of this test report

Report No.	Version	Description	Issue Date
FR0D2423-05A	01	Initial issue of report	Sep. 25, 2023

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(1)	Number of Channels	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	Pass	-
3.4	2.1049	99% Occupied Bandwidth	Reporting only	-
3.5	15.247(b)(1) 15.247(b)(4)	Peak Output Power	Pass	-
3.6	15.247(d)	Conducted Band Edges	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	8.72 dB under the limit at 42.61 MHz
-	15.207	AC Conducted Emission	Not Required	-
3.9	15.203	Antenna Requirement	Pass	-

Note:

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report by changing the Bluetooth antenna trace design and additionally assess Bluetooth and WLAN antennas. All the test cases were performed on original report which can be referred to Sporton Report Number FR0D2423-01A. Based on the original report, only worst case was verified.

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.

Reviewed by: Wei Chen
Report Producer: Ming Chen

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	WLAN/BTLE module
Brand Name	ZEBRA
Model Name	WYSBHVDXP
FCC ID	I28-WYSBHVDXP
EUT supports Radios application	WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80 WLAN 11ax HE20/HE40/HE80 Bluetooth BR/EDR/LE
HW Version	Revision G
SW Version	17.68.01.p94
EUT Stage	Identical Prototype

Remark: The EUT's information above is declared by manufacturer.

Supported Unit Used in Test Configuration and System				
Test Fixture	**Brand Name**	ZEBRA	**Model Name**	P1129126-101
AC Adapter	**Brand Name**	ZEBRA	**Model Name**	FSP025-DYAA3
Bluetooth Antenna 1	**Brand Name**	gigaAnt	**Model Name**	3030A5645-01
Bluetooth Antenna 2	**Brand Name**	TAIYO YUDEN	**Model Name**	AH 168M245001
Bluetooth Antenna 3	**Brand Name**	Johanson Technology	**Model Name**	2450AT07A0100
Bluetooth Antenna 4	**Brand Name**	Laird	**Model Name**	RD2458-5
Bluetooth Antenna 5	**Brand Name**	Auden	**Model Name**	220370-09
Bluetooth Antenna 6	**Brand Name**	Auden	**Model Name**	A73009-00
Bluetooth Antenna 7	**Brand Name**	Auden	**Model Name**	B53026-90
WLAN Antenna 1	**Brand Name**	Laird	**Model Name**	RD2458-5
WLAN Antenna 2	**Brand Name**	Pulse	**Model Name**	W3006
WLAN Antenna 3	**Brand Name**	Auden	**Model Name**	220370-09
WLAN Antenna 4	**Brand Name**	Auden	**Model Name**	B91882-30
WLAN Antenna 5	**Brand Name**	Auden	**Model Name**	B53023-30
WLAN Antenna 6	**Brand Name**	Auden	**Model Name**	B53025-30

1.2 Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz
Number of Channels	79
Carrier Frequency of Each Channel	2402+n*1 MHz; n=0~78
Maximum Output Power to Antenna	Bluetooth BR (1Mbps): 9.66 dBm / 0.0092W Bluetooth EDR (2Mbps): 8.95 dBm / 0.0079 W Bluetooth EDR (3Mbps): 9.25 dBm / 0.0084W
99% Occupied Bandwidth	Bluetooth BR (1Mbps): 0.855 MHz Bluetooth EDR (2Mbps): 1.167 MHz Bluetooth EDR (3Mbps): 1.157 MHz
Antenna Type	**<3030A5645-01>:** Monopole Antenna with gain 2.70 dBi **<AH 168M245001>:** Monopole Antenna with gain 3.00 dBi **<2450AT07A0100>:** Monopole Antenna with gain 1.00 dBi **<RD2458-5>:** Dipole Antenna with gain 3.00 dBi **<220370-09>:** Monopole Antenna with gain 3.81 dBi **<A73009-00>:** Monopole Antenna with gain 3.20 dBi **<B53026-90>:** Monopole Antenna with gain 5.50 dBi
Type of Modulation	Bluetooth BR (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π /4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

1.3 Modification of EUT

No modifications made to the EUT during the testing.

1.4 Testing Location

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	TH05-HY, 03CH20-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW3786

1.5 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 15.247 Meas Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013

Remark:

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.

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, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst plane, and the worst mode of radiated spurious emissions is Bluetooth 1Mbps mode, and recorded in this report.

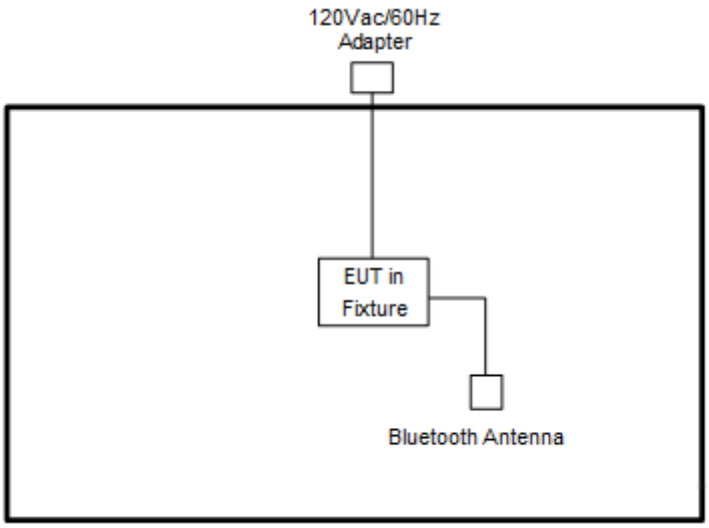
The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases			
Test Item	**Data Rate / Modulation**		
Conducted Test Cases	**Bluetooth BR 1Mbps GFSK**	**Bluetooth EDR 2Mbps π/4-DQPSK**	**Bluetooth EDR 3Mbps 8-DPSK**
	Mode 1: CH00_2402 MHz	Mode 4: CH00_2402 MHz	Mode 7: CH00_2402 MHz
	Mode 2: CH39_2441 MHz	Mode 5: CH39_2441 MHz	Mode 8: CH39_2441 MHz
	Mode 3: CH78_2480 MHz	Mode 6: CH78_2480 MHz	Mode 9: CH78_2480 MHz
Radiated Test Cases	**Bluetooth BR 1Mbps GFSK**		
	<EUT with Bluetooth Antenna (RD2458-5)>		
	Mode 1: CH00_2402 MHz		
	Mode 2: CH39_2441 MHz		
	Mode 3: CH78_2480 MHz		
	<EUT with Bluetooth Antenna (B53026-90)>		
	Mode 4: CH00_2402 MHz		
	Mode 5: CH39_2441 MHz		
	Mode 6: CH78_2480 MHz		

Remark:
1. For Radiated Test Cases, the worst mode data rate 1Mbps was reported only since the highest RF output power in the preliminary tests. The conducted spurious emissions and conducted band edge measurement for other data rates were not worse than 1Mbps, and no other significantly frequencies found in conducted spurious emission.
2. For Radiated Test Cases, the tests were performed with Bluetooth Antenna (RD2458-5) and Bluetooth Antenna (B53026-90)

2.3 Connection Diagram of Test System

<Bluetooth Tx Mode>



2.4 EUT Operation Test Setup

The RF test items, utility “Tool box Version 1.84” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

2.5 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 4.2 dB and 10 dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 Number of Channel Measurement

3.1.1 Limits of Number of Hopping Frequency

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

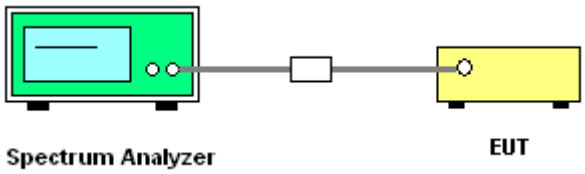
3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.1.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.3.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW = 300 kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. The number of hopping frequency used is defined as the number of total channel.
7. Record the measurement data derived from spectrum analyzer.

3.1.4 Test Setup



3.1.5 Test Result of Number of Hopping Frequency

Please refer to Appendix A.

3.2 Hopping Channel Separation Measurement

3.2.1 Limit of Hopping Channel Separation

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

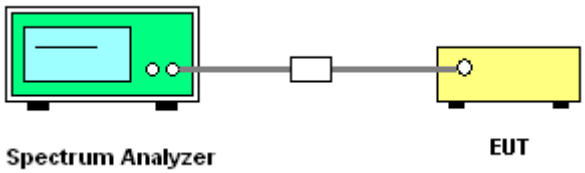
3.2.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.2.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.2.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels;
   RBW = 300 kHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Hopping Channel Separation

Please refer to Appendix A.

3.3 Dwell Time Measurement

3.3.1 Limit of Dwell Time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

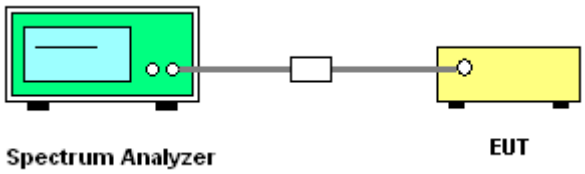
3.3.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.3.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.4.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = zero span, centered on a hopping channel; RBW = 1 MHz; VBW ≥ RBW; Sweep = as necessary to capture the entire dwell time per hopping channel; Detector function = peak; Trace = max hold.
6. Measure and record the results in the test report.

3.3.4 Test Setup



3.3.5 Test Result of Dwell Time

Please refer to Appendix A.

3.4 20dB and 99% Bandwidth Measurement

3.4.1 Limit of 20dB and 99% Bandwidth

Reporting only

3.4.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.4.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 6.9.2 and 6.9.3.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Use the following spectrum analyzer settings for 20 dB Bandwidth measurement.
   Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;
   RBW ≥ 1% of the 20 dB bandwidth; VBW ≥ RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
5. Use the following spectrum analyzer settings for 99 % Bandwidth measurement.
   Span = approximately 1.5 to 5 times the 99% bandwidth, centered on a hopping channel;
   RBW ≥ 1-5% of the 99% bandwidth; VBW ≥ 3 * RBW; Sweep = auto; Detector function = peak;
   Trace = max hold.
6. Measure and record the results in the test report.

3.4.4 Test Setup

3.4.5 Test Result of 20dB Bandwidth

Please refer to Appendix A.

3.4.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

3.5 Output Power Measurement

3.5.1 Limit of Output Power

The maximum peak conducted output power of the intentional radiator shall not exceed the following: For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band 0.125 watts.

If directional gain of transmitting antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi.

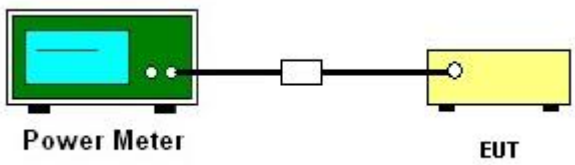
3.5.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.5.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.5.
2. The RF output of EUT is connected to the power meter by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Measure the conducted output power with cable loss and record the results in the test report.
5. Measure and record the results in the test report.

3.5.4 Test Setup



3.5.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.5.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

3.6 Conducted Band Edges Measurement

3.6.1 Limit of Band Edges

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

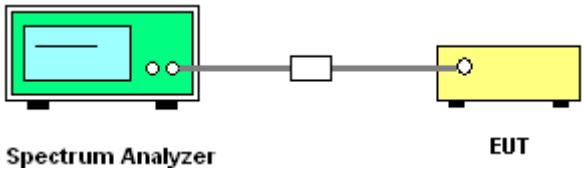
3.6.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.6.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.6.
2. Set the maximum power setting and enable the EUT to transmit continuously.
3. Set RBW = 100 kHz, VBW = 300 kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used.
4. Enable hopping function of the EUT and then repeat step 2 and 3.
5. Measure and record the results in the test report.

3.6.4 Test Setup



3.6.5 Test Result of Conducted Band Edges

Please refer to Appendix A.

3.6.6 Test Result of Conducted Hopping Mode Band Edges

Please refer to Appendix A.

3.7 Conducted Spurious Emission Measurement

3.7.1 Limit of Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiation frequency band, the radio frequency power shall be at least 20 dB below the highest level of the radiated power. In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

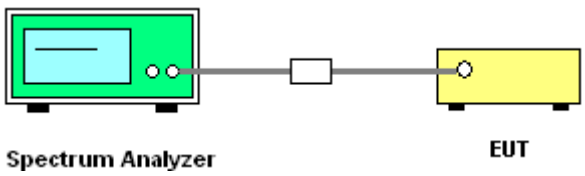
3.7.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.7.3 Test Procedure

1. The testing follows ANSI C63.10-2013 clause 7.8.8.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Set RBW = 100 kHz, VBW = 300 kHz, scan up through 10th harmonic. All harmonics / spurious must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.
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.

3.7.4 Test Setup



3.7.5 Test Result of Conducted Spurious Emission

Please refer to Appendix A.

3.8 Radiated Band Edges and Spurious Emission Measurement

3.8.1 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

3.8.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

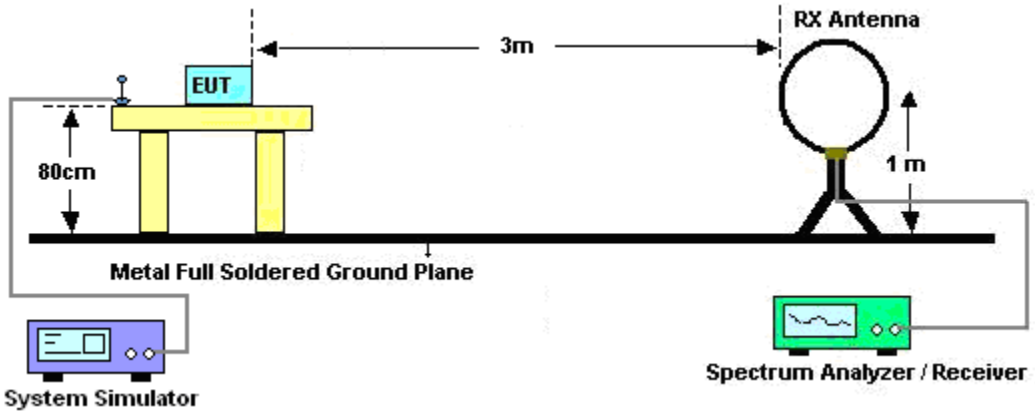
3.8.3 Test Procedures

1. The EUT is placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
2. The EUT is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT is 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 the maximum power setting and enable the EUT to 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 = 1 MHz for f>1 GHz ; 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)
6. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
7. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as "-".
8. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".

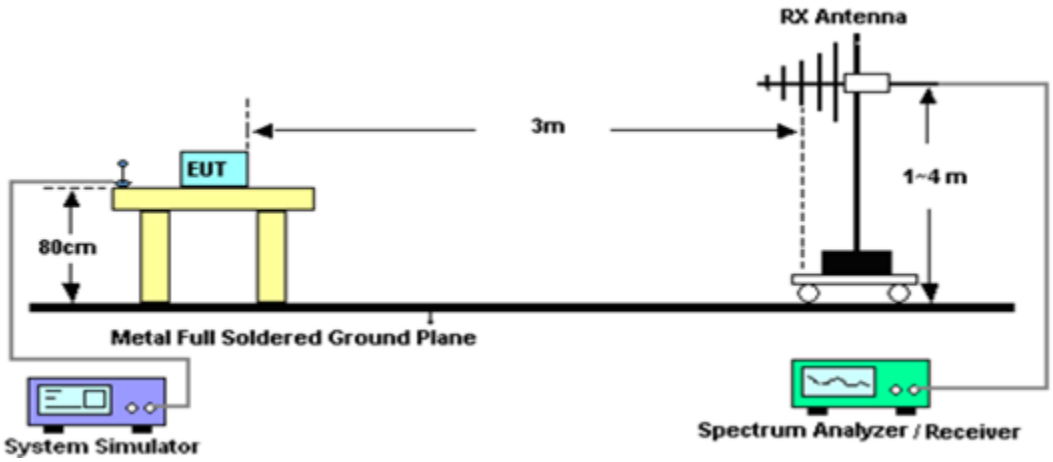
Note: The average levels are calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent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

3.8.4 Test Setup

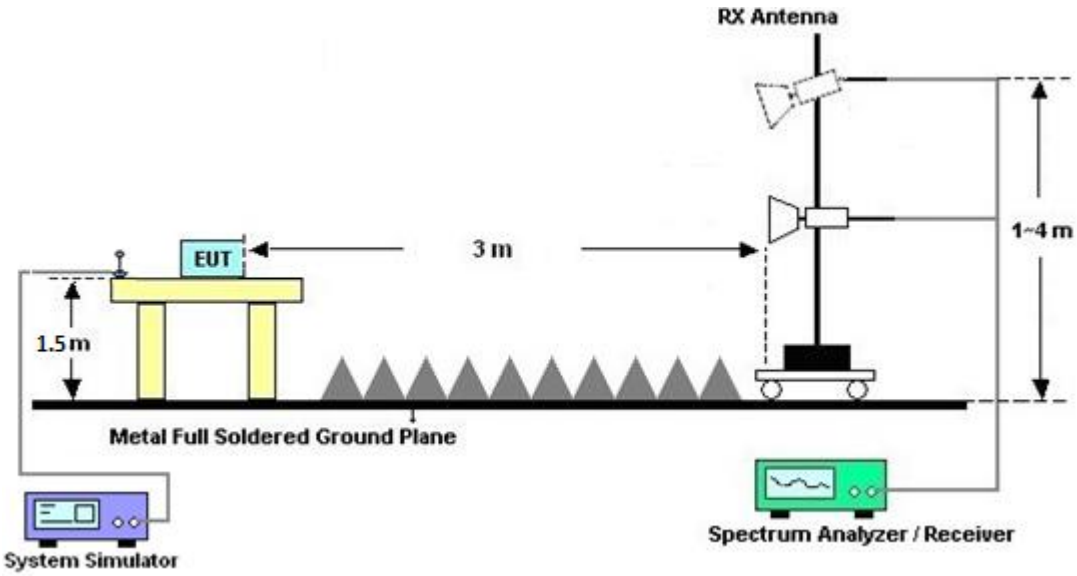
For radiated test below 30MHz



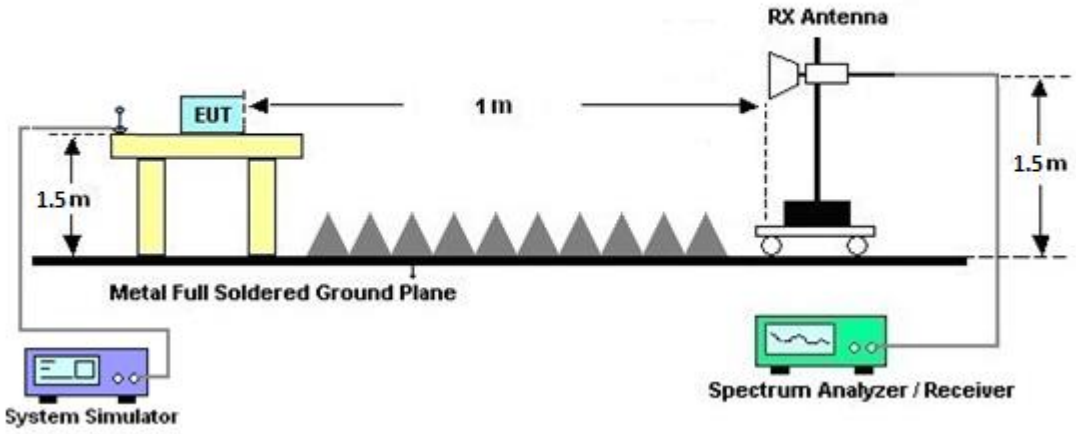
For radiated test from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



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

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

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result comes out very similar.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

3.8.7 Duty Cycle

Please refer to Appendix D.

3.8.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B and C.

3.9 Antenna Requirements

3.9.1 Standard Applicable

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.

3.9.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	Keysight	N9038A	MY59053012	N/A	Nov. 18, 2022	Jul. 11, 2023 ~ Aug. 01, 2023	Nov. 17, 2023	Radiation (03CH20-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Sep. 20, 2022	Jul. 11, 2023 ~ Aug. 01, 2023	Sep. 19, 2023	Radiation (03CH20-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 07, 2022	Jul. 11, 2023 ~ Aug. 01, 2023	Dec. 06, 2023	Radiation (03CH20-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Jul. 11, 2023 ~ Aug. 01, 2023	N/A	Radiation (03CH20-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Jul. 11, 2023 ~ Aug. 01, 2023	N/A	Radiation (03CH20-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Jul. 11, 2023 ~ Aug. 01, 2023	N/A	Radiation (03CH20-HY)
Signal Analyzer	Keysight	N9010B	MY60240520	N/A	Dec. 22, 2022	Jul. 11, 2023 ~ Aug. 01, 2023	Dec. 21, 2023	Radiation (03CH20-HY)
Bilog Antenna	TESEQ	CBL 6111D&00802 N1D01N-06	55606 & 08	30MHz~1GHz	Oct. 22, 2022	Jul. 11, 2023 ~ Aug. 01, 2023	Oct. 21, 2023	Radiation (03CH20-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	02360	1GHz-18GHz	Nov. 04, 2022	Jul. 11, 2023 ~ Aug. 01, 2023	Nov. 03, 2023	Radiation (03CH20-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	00994	18GHz-40GHz	Nov. 04, 2022	Jul. 11, 2023 ~ Aug. 01, 2023	Nov. 03, 2023	Radiation (03CH20-HY)
Preamplifier	COM-POWER	PAM-103	18020201	1MHz-1000MHz	Jan. 02, 2023	Jul. 11, 2023 ~ Aug. 01, 2023	Jan. 01, 2024	Radiation (03CH20-HY)
Amplifier	EMCI	EMC118A45SE	980792	N/A	Nov. 14, 2022	Jul. 11, 2023 ~ Aug. 01, 2023	Nov. 13, 2023	Radiation (03CH20-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	519229/2,804015/2,804027/2	N/A	Jan. 18, 2023	Jul. 11, 2023 ~ Aug. 01, 2023	Jan. 17, 2024	Radiation (03CH20-HY)
Hygrometer	TECPEL	DTM-303B	TP200728	N/A	Mar. 28, 2023	Jul. 11, 2023 ~ Aug. 01, 2023	Mar. 27, 2024	Radiation (03CH20-HY)
Software	Audix	N/A	RK-002156	N/A	N/A	Jul. 11, 2023 ~ Aug. 01, 2023	N/A	Radiation (03CH20-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 17, 2022	Jul. 06, 2023~ Jul. 19, 2023	Nov. 16, 2023	Conducted (TH05-HY)
Power Meter	Anritsu	ML2495A	1036004	N/A	Aug. 08, 2022	Jul. 06, 2023~ Jul. 19, 2023	Aug. 07, 2023	Conducted (TH05-HY)
Power Sensor	Anritsu	MA2411B	1027253	300MHz~40GHz	Aug. 08, 2022	Jul. 06, 2023~ Jul. 19, 2023	Aug. 07, 2023	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101905	10Hz - 40GHz(amp)	Aug. 03, 2022	Jul. 06, 2023~ Jul. 19, 2023	Aug. 02, 2023	Conducted (TH05-HY)
BT Base Station(Measure)	Rohde & Schwarz	CBT	101136	BT 3.0	Oct. 25, 2022	Jul. 06, 2023~ Jul. 19, 2023	Oct. 24, 2023	Conducted (TH05-HY)

5 Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.5 dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

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

Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.8 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.4 dB**

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Ray Wang and Junyu Jhou	Temperature:	21~25	°C
Test Date:	2023/7/6~2023/7/19	Relative Humidity:	51~54	%

TEST RESULTS DATA
20dB and 99% Occupied Bandwidth and Hopping Channel Separation

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	20db BW (MHz)	99% Bandwidth (MHz)	Hopping Channel Separation Measurement (MHz)	Hopping Channel Separation Measurement Limit (MHz)	Pass/Fail
DH	1Mbps	1	0	2402	0.896	0.825	0.999	0.5971	Pass
DH	1Mbps	1	39	2441	0.948	0.855	1.003	0.6319	Pass
DH	1Mbps	1	78	2480	0.943	0.855	0.999	0.6290	Pass
2DH	2Mbps	1	0	2402	1.257	1.157	1.324	0.8377	Pass
2DH	2Mbps	1	39	2441	1.309	1.167	1.003	0.8725	Pass
2DH	2Mbps	1	78	2480	1.309	1.167	1.007	0.8725	Pass
3DH	3Mbps	1	0	2402	1.270	1.155	0.990	0.8464	Pass
3DH	3Mbps	1	39	2441	1.270	1.157	0.999	0.8464	Pass
3DH	3Mbps	1	78	2480	1.270	1.157	1.003	0.8464	Pass

TEST RESULTS DATA
Dwell Time

Mod.	Hopping Channel Number Rate	Hops Over Occupancy Time (hops)	Package Transfer Time (msec)	Dwell Time (sec)	Limits (sec)	Pass/Fail
DH5	79	106.670	2.89	0.31	0.4	Pass
DH5 (AFH)	20	53.330	2.89	0.15	0.4	Pass

TEST RESULTS DATA
Peak Power Table

DH	CH.	NTX	Peak Power (dBm)	Power Limit (dBm)	Test Result
DH1	0	1	**9.66**	20.97	Pass
	39	1	9.56	20.97	Pass
	78	1	9.35	20.97	Pass
2DH1	0	1	**8.95**	20.97	Pass
	39	1	8.84	20.97	Pass
	78	1	8.57	20.97	Pass
3DH1	0	1	**9.25**	20.97	Pass
	39	1	9.13	20.97	Pass
	78	1	8.85	20.97	Pass

TEST RESULTS DATA
Average Power Table
(Reporting Only)

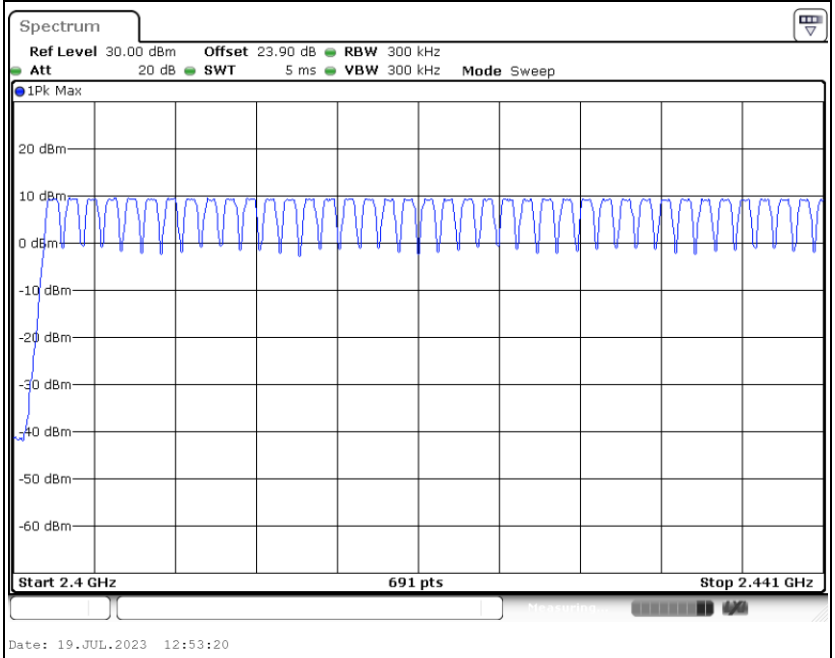
DH	CH.	NTX	Average Power (dBm)	Duty Factor (dB)
DH5	0	1	**9.18**	1.13
	39	1	9.07	1.13
	78	1	8.86	1.13
2DH3	0	1	**6.25**	1.83
	39	1	6.09	1.83
	78	1	5.87	1.83
3DH1	0	1	**6.42**	5.17
	39	1	6.20	5.17
	78	1	6.17	5.17

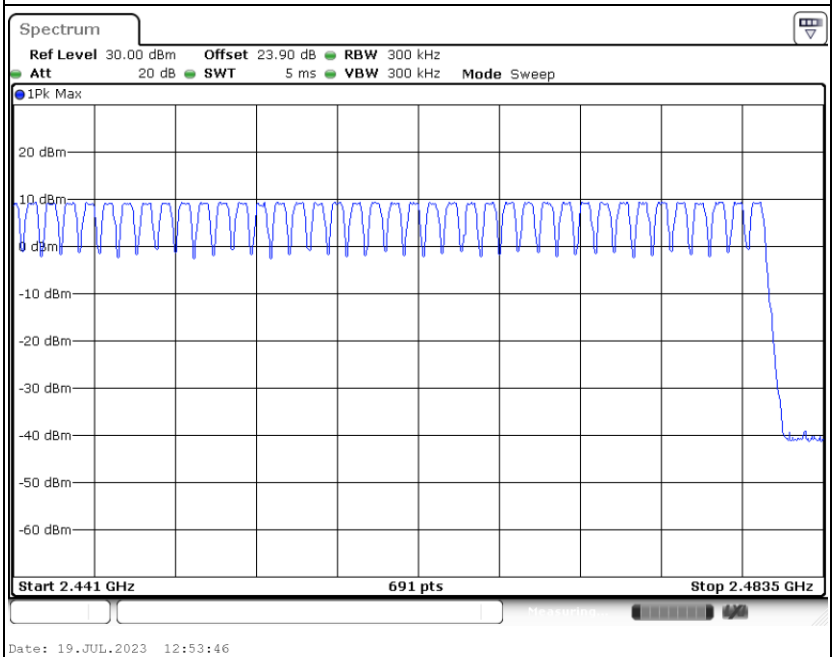
TEST RESULTS DATA
Number of Hopping Frequency

Number of Hopping (Channel)	Adaptive Frequency Hopping (Channel)	Limits (Channel)	Pass/Fail
79	20	> 15	Pass

Number of Hopping Frequency

Number of Hopping Channel Plot on Channel 00 - 78

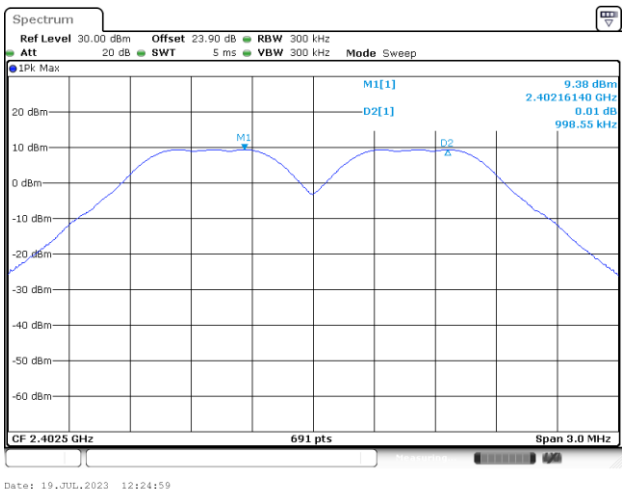




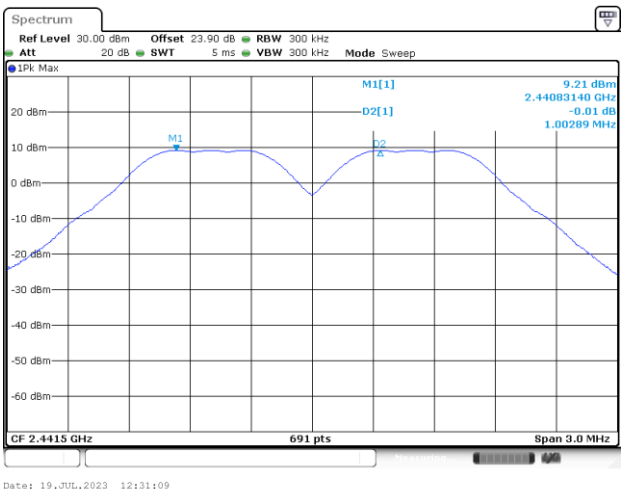
Hopping Channel Separation

<1Mbps>

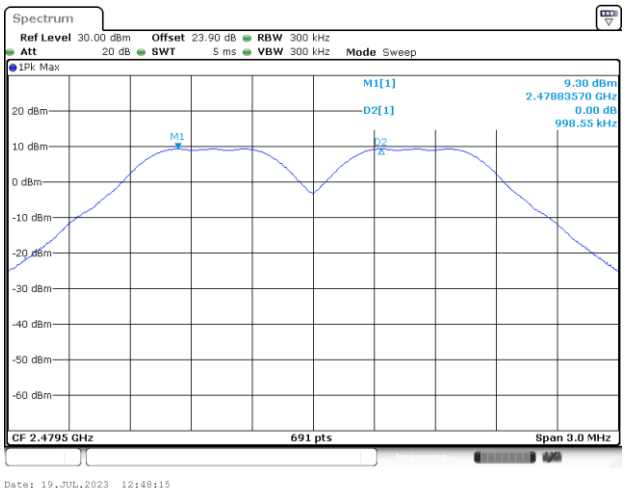
Channel Separation Plot on Channel 00 - 01



Channel Separation Plot on Channel 39 - 40



Channel Separation Plot on Channel 77 - 78



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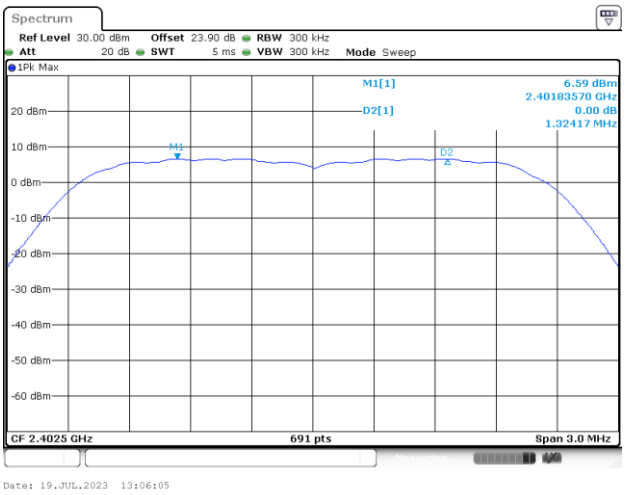
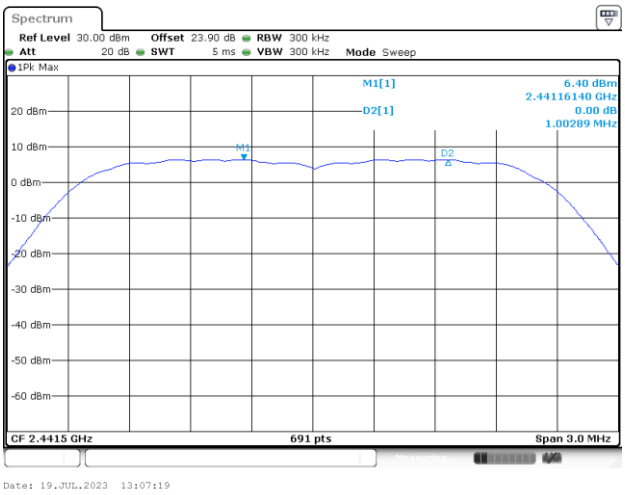
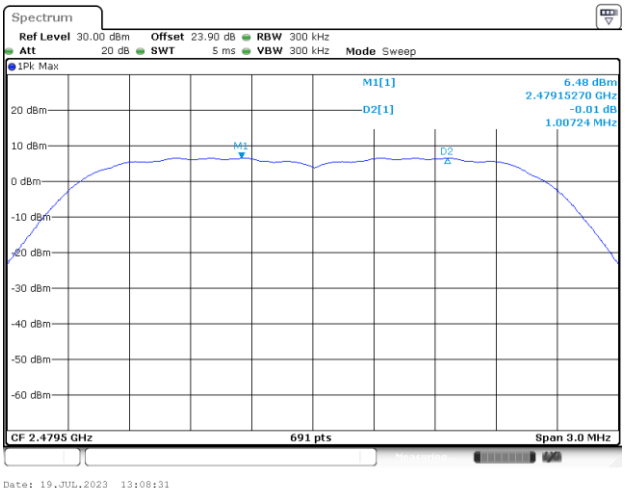
Channel Separation Plot on Channel 00 - 01	**Channel Separation Plot on Channel 39 - 40**
	
Channel Separation Plot on Channel 77 - 78	
	

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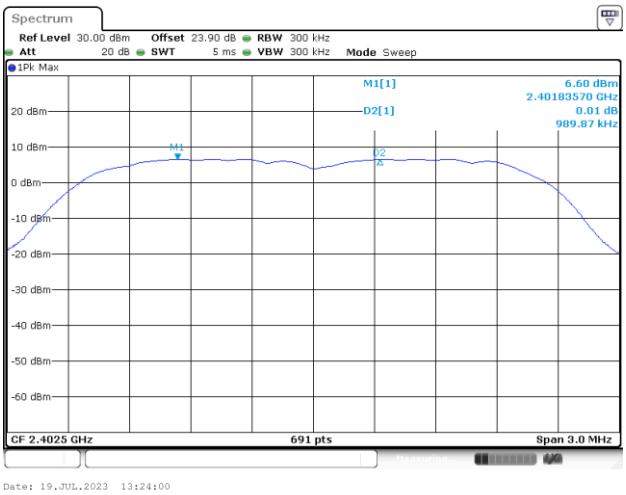
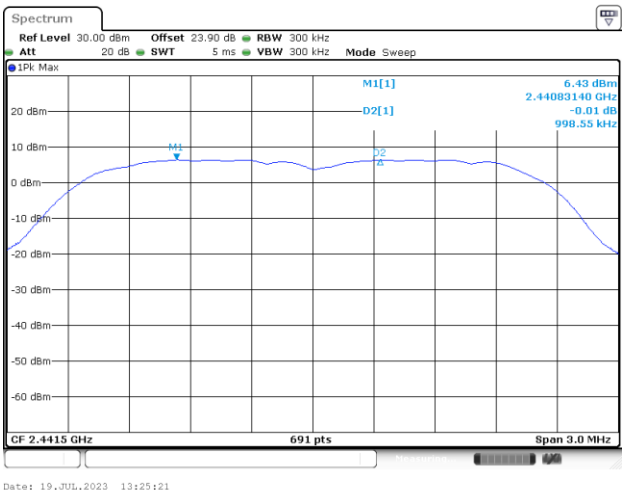
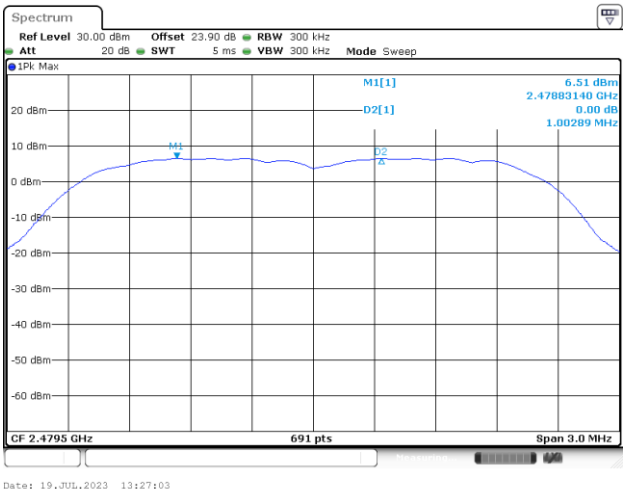
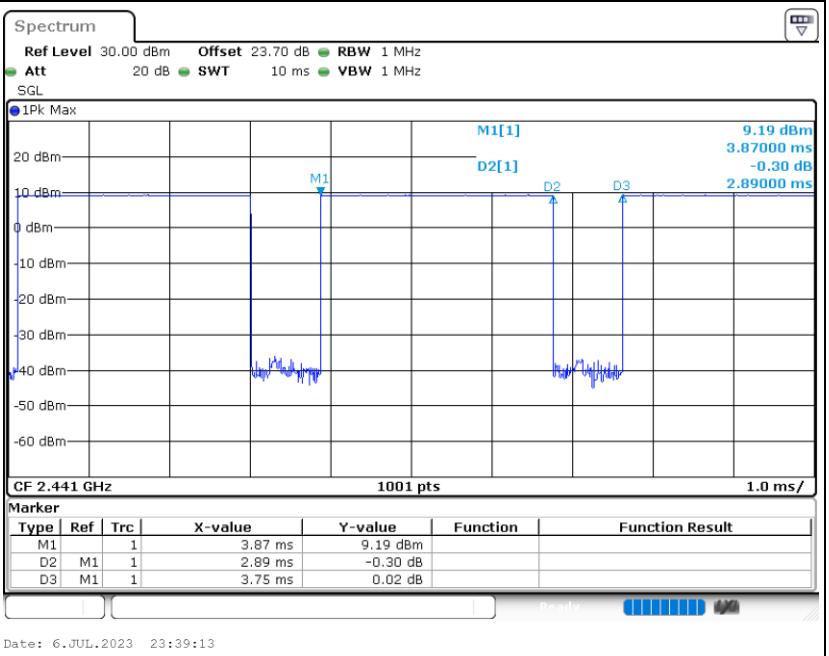
Channel Separation Plot on Channel 00 - 01	**Channel Separation Plot on Channel 39 - 40**
	
Channel Separation Plot on Channel 77 - 78	
	

Dwell Time

Package Transfer Time Plot



Remark:

1. In normal mode, hopping rate is 1600 hops/s with 6 slots in 79 hopping channels. With channel hopping rate (1600 / 6 / 79) in Occupancy Time Limit (0.4 x 79) (s),Hops Over Occupancy Time comes to (1600 / 6 / 79) x (0.4 x 79) = 106.67 hops.

2. In AFH mode, hopping rate is 800 hops/s with 6 slots in 20 hopping channels. With channel hopping rate (800 / 6 / 20) in Occupancy Time Limit (0.4 x 20) (s), Hops Over Occupancy Time comes to (800 / 6 / 20) x (0.4 x 20) = 53.33 hops.

3. Dwell Time(s) = Hops Over Occupancy Time (hops) x Package Transfer Time

20dB Bandwidth

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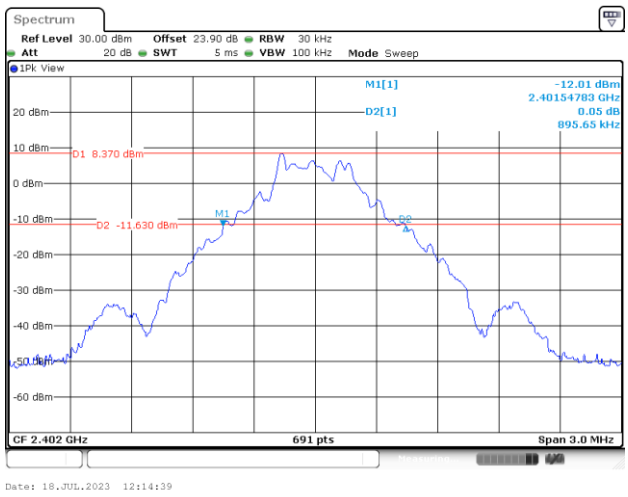
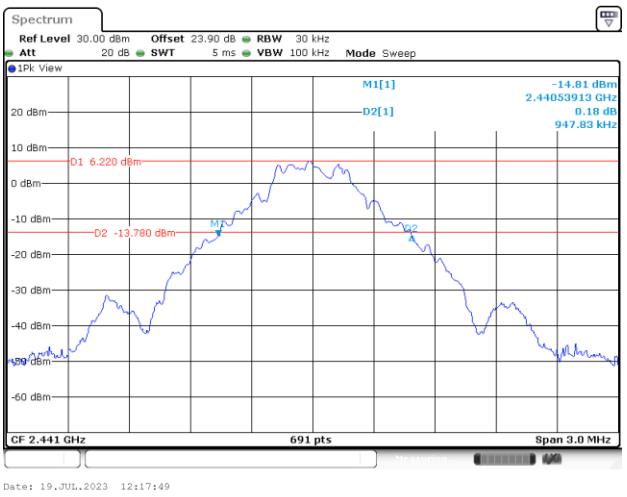
<tr><td> 
</td><td> 
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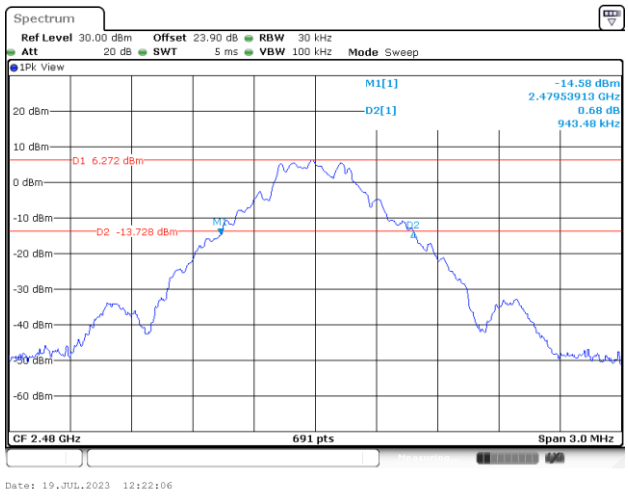
<tr><td> 
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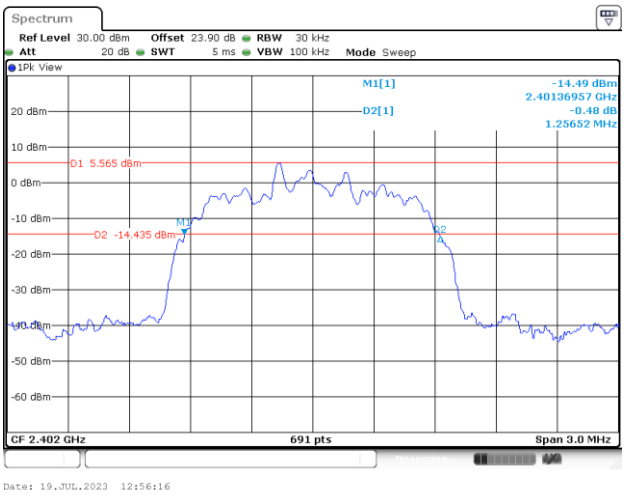
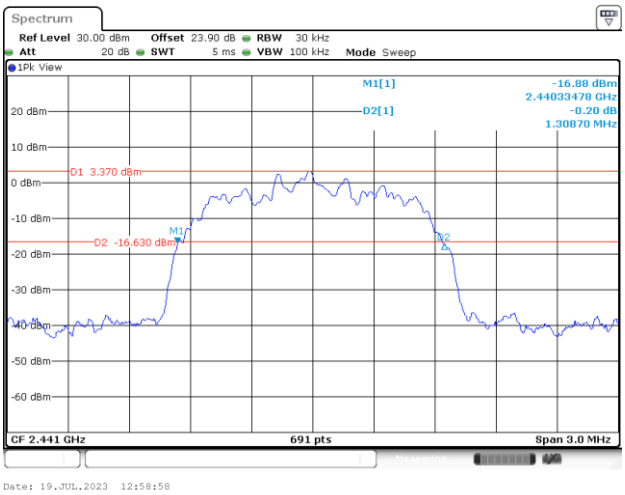
20 dB Bandwidth Plot on Channel 00	**20 dB Bandwidth Plot on Channel 39**
	
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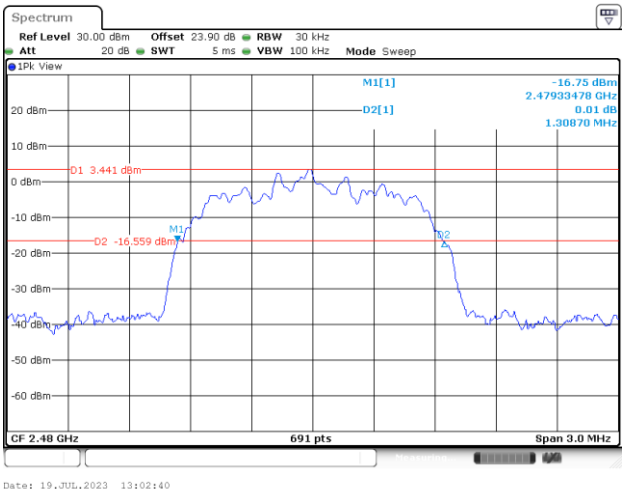	

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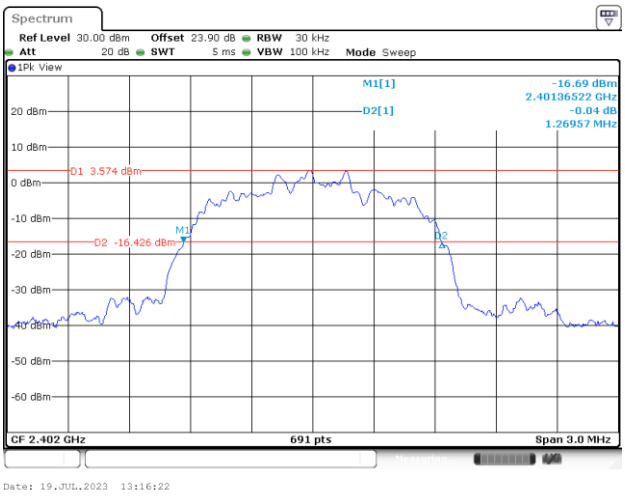
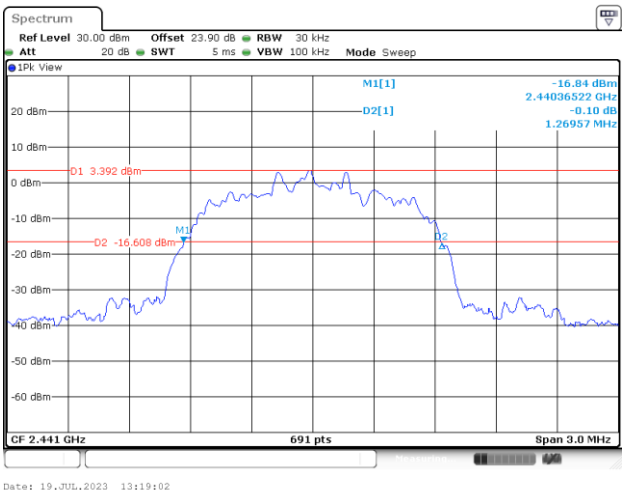
20 dB Bandwidth Plot on Channel 00	**20 dB Bandwidth Plot on Channel 39**
	
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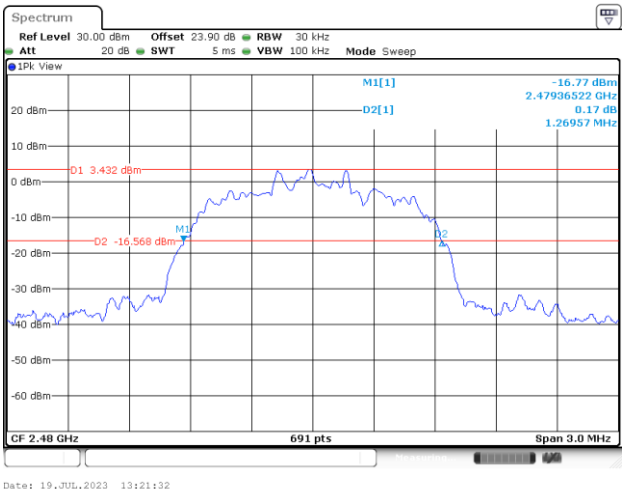
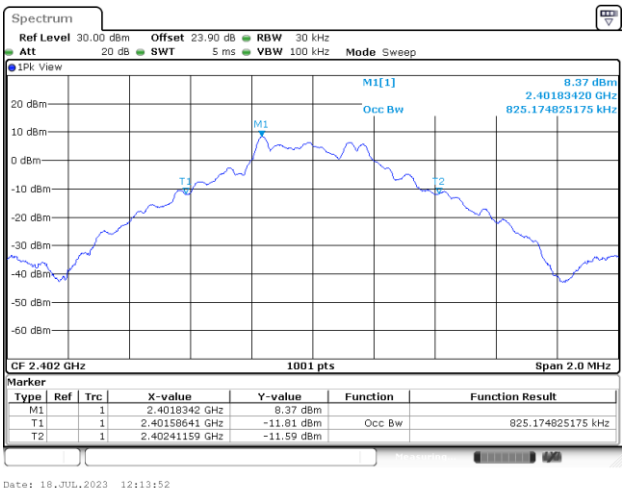
	

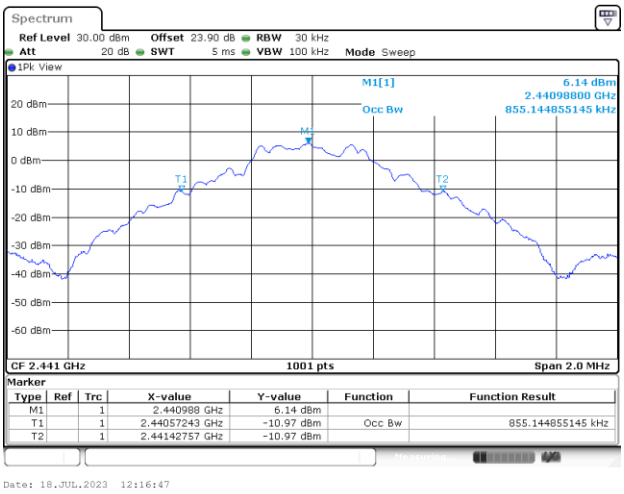
99% Occupied Bandwidth

<1Mbps>

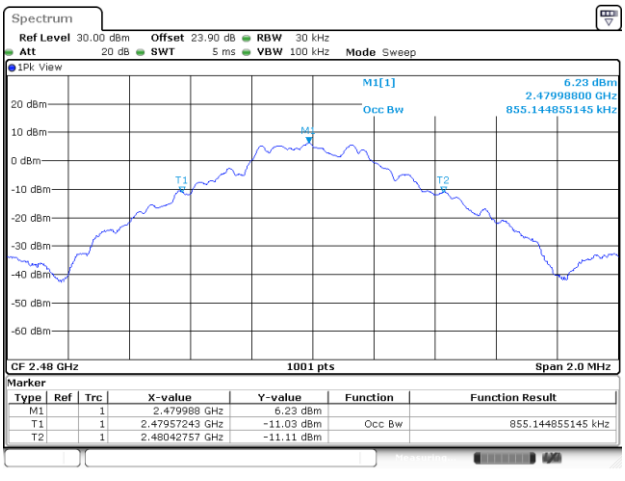
99% Occupied Bandwidth on Channel 00



99% Occupied Bandwidth on Channel 39



99% Occupied Bandwidth on Channel 78



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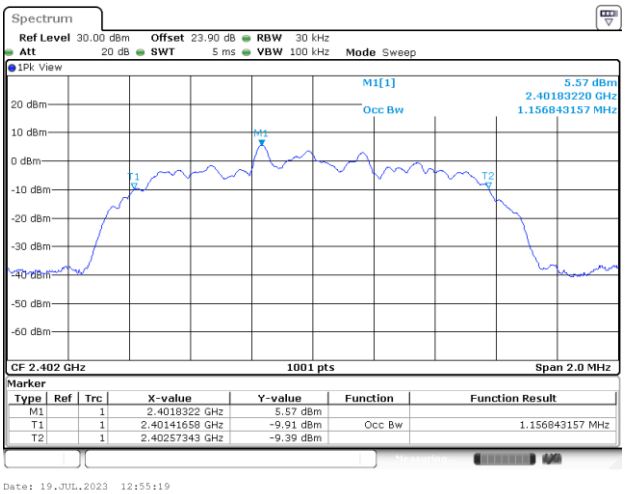
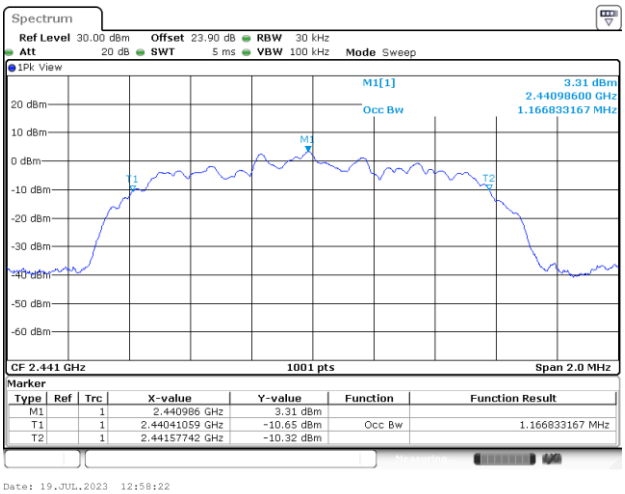
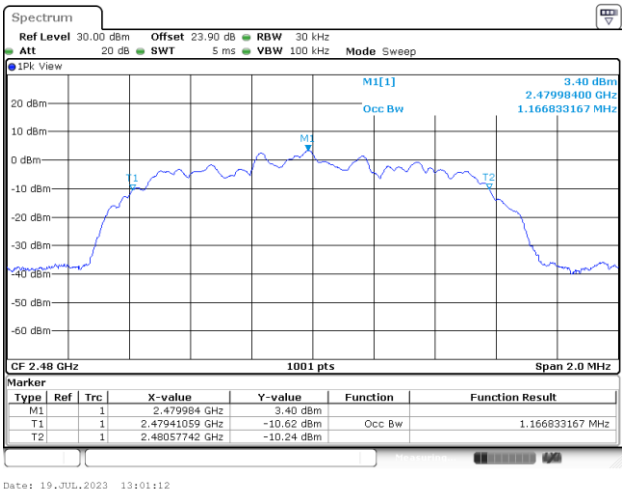
	
99% Occupied Bandwidth on Channel 78	
	

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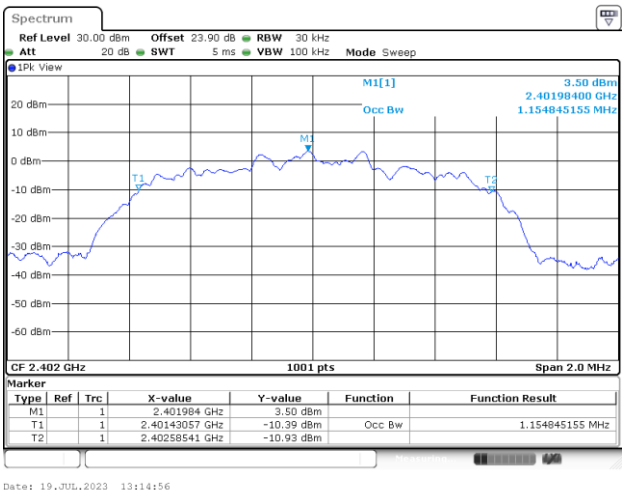
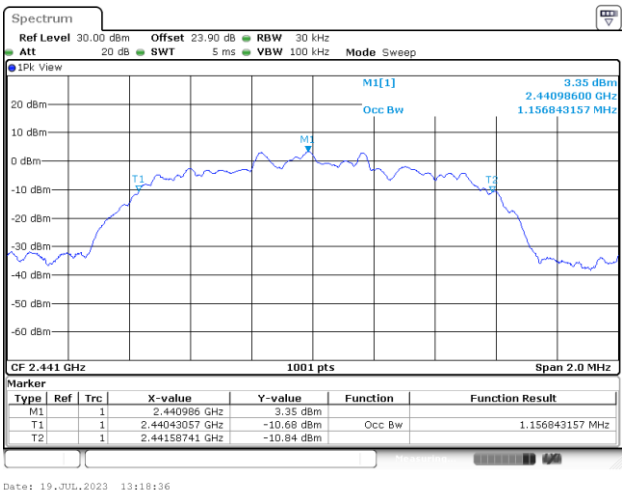
99% Occupied Bandwidth on Channel 00	**99% Occupied Bandwidth on Channel 39**
	
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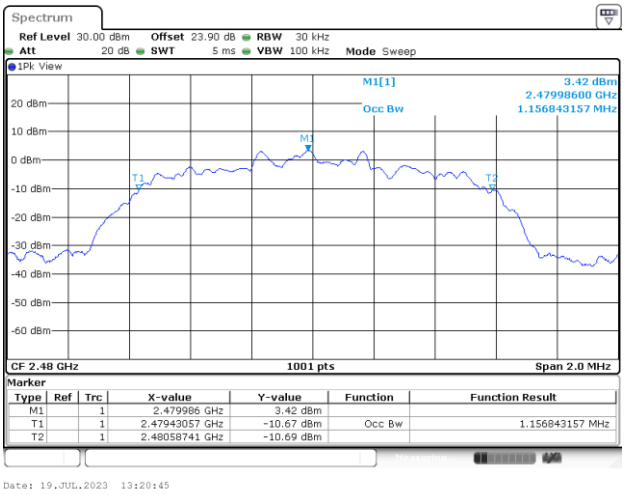
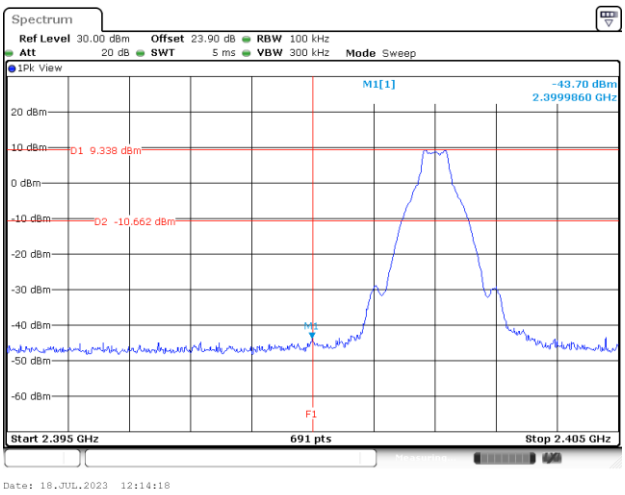
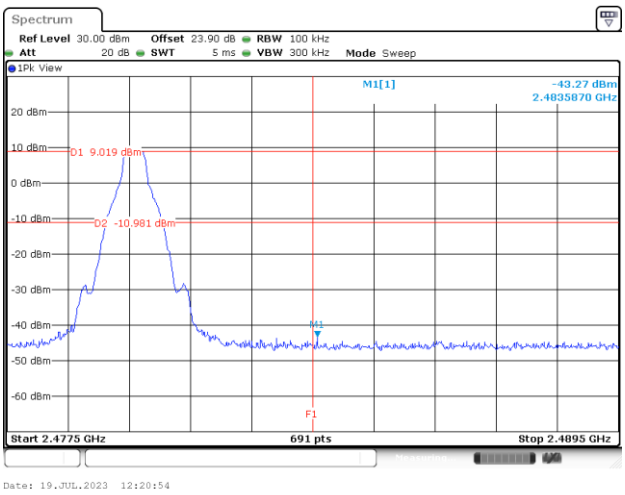
	

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

Band Edges

<1Mbps>	
Low Band Edge Plot on Channel 00	**High Band Edge Plot on Channel 78**
	

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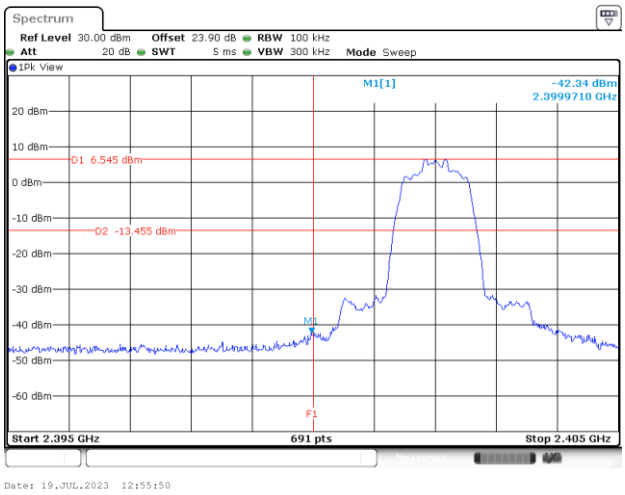
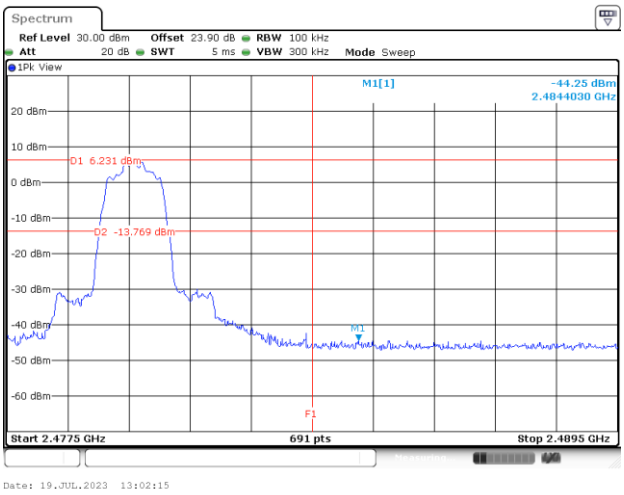
Low Band Edge Plot on Channel 00	**High Band Edge Plot on Channel 78**
	

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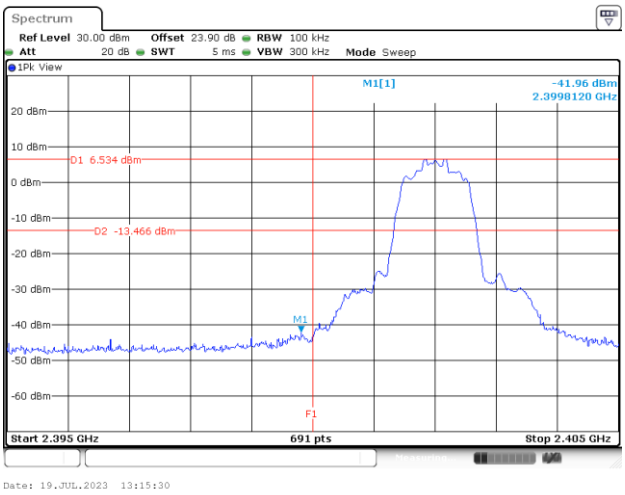
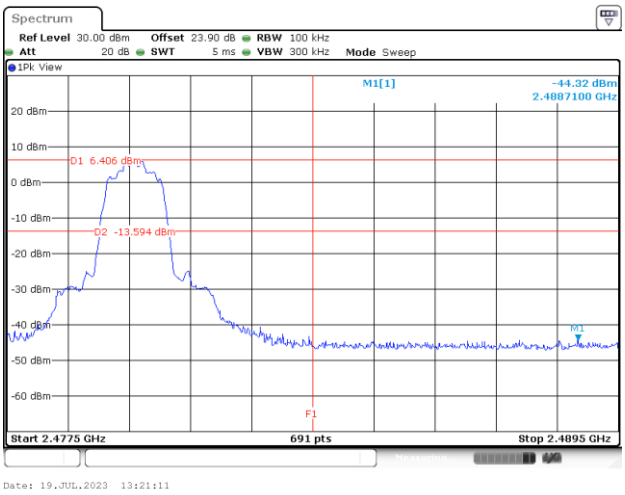
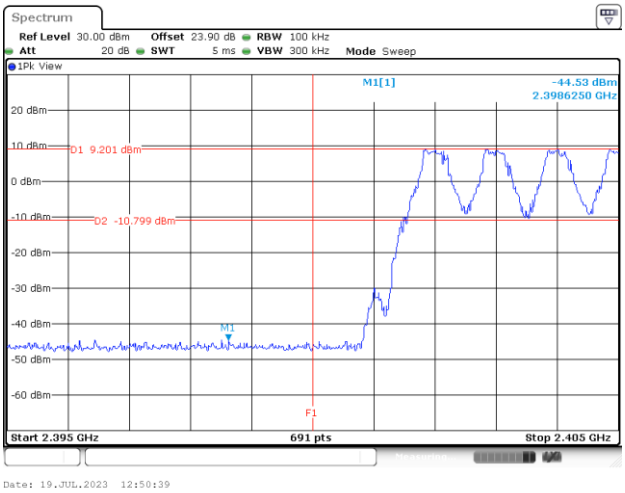
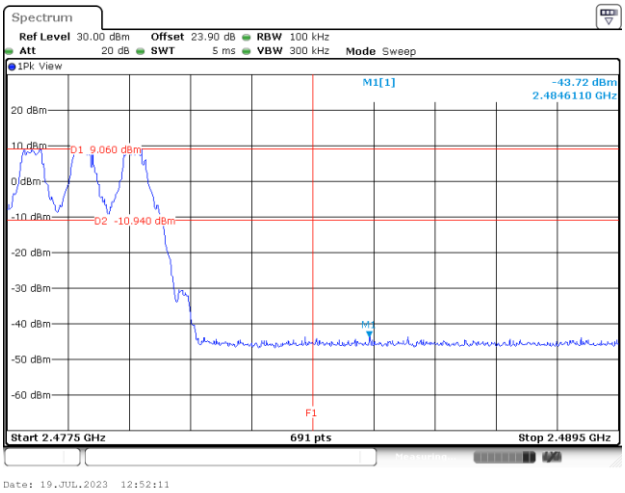
Low Band Edge Plot on Channel 00	**High Band Edge Plot on Channel 78**
	

Hopping Mode Band Edges

<1Mbps>	
Hopping Mode Low Band Edge Plot	**Hopping Mode High Band Edge Plot**
	

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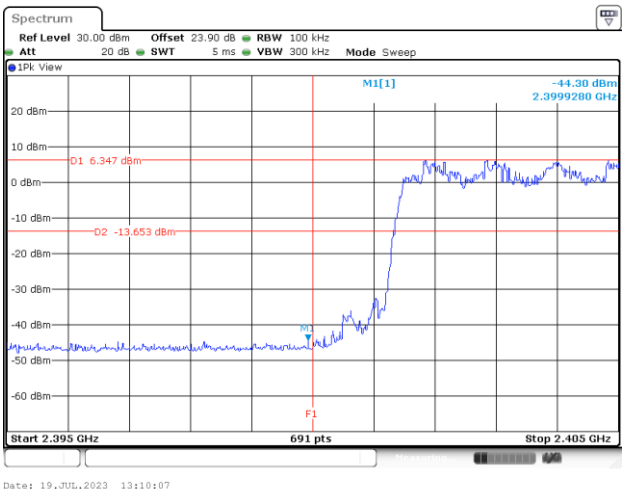
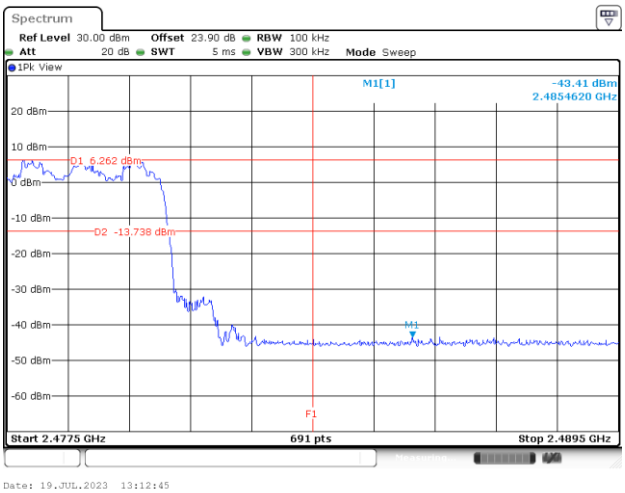
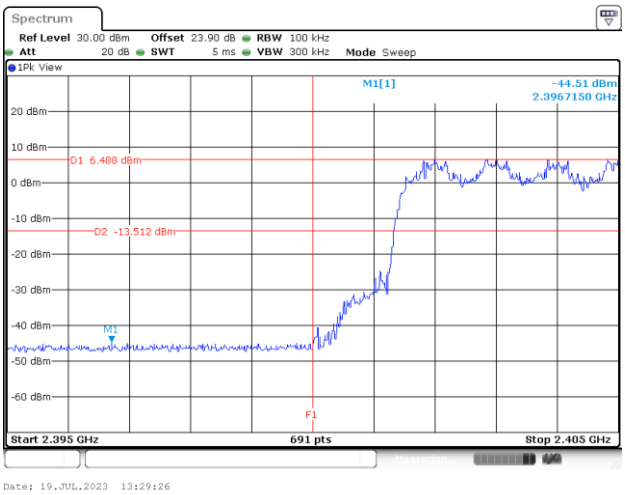
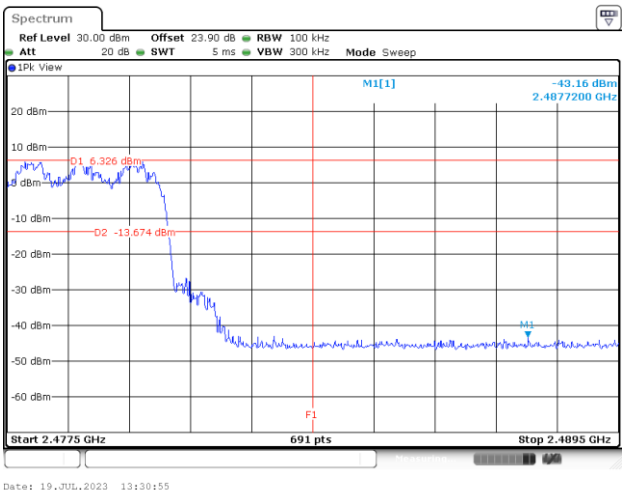
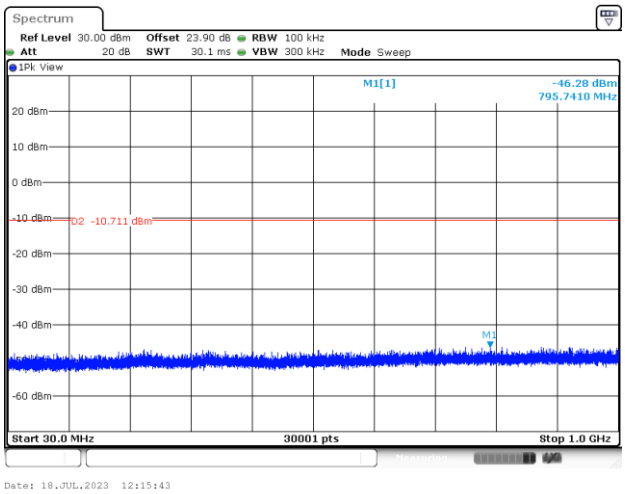
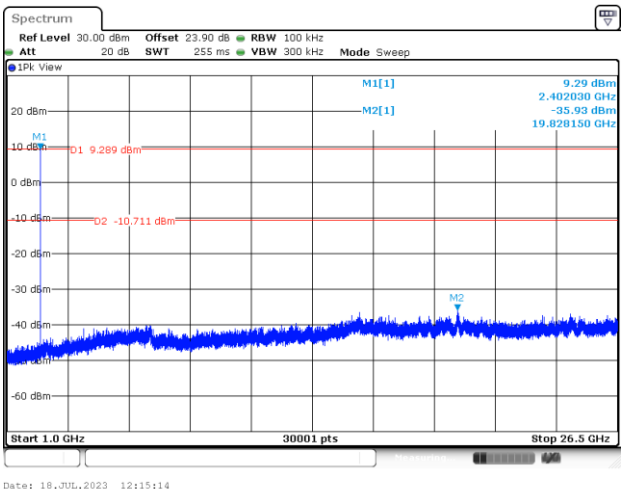
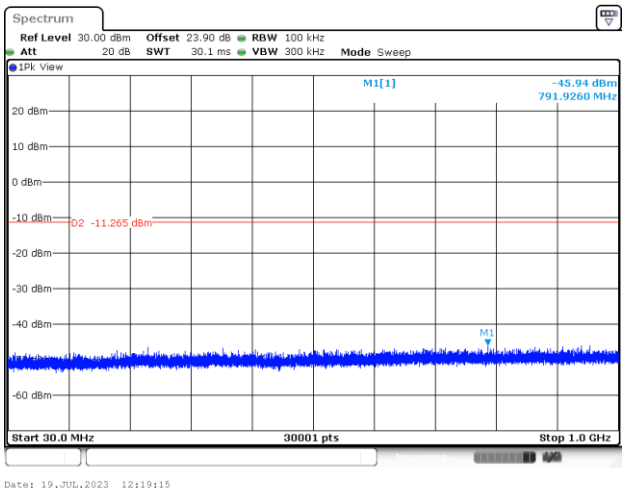
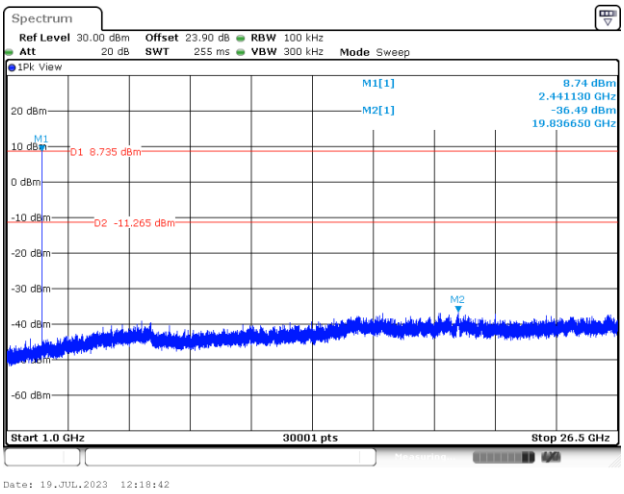
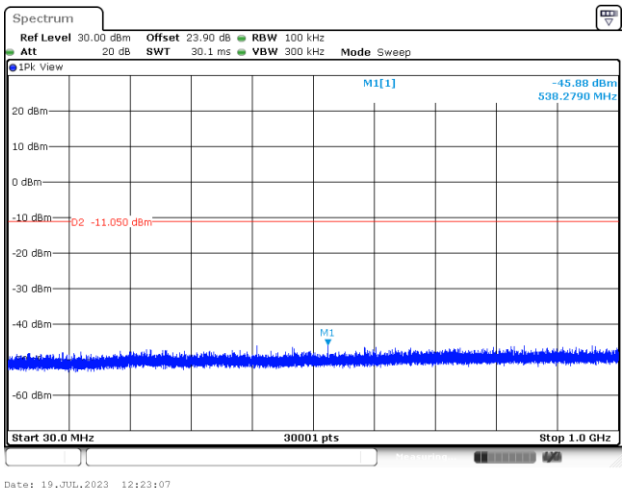
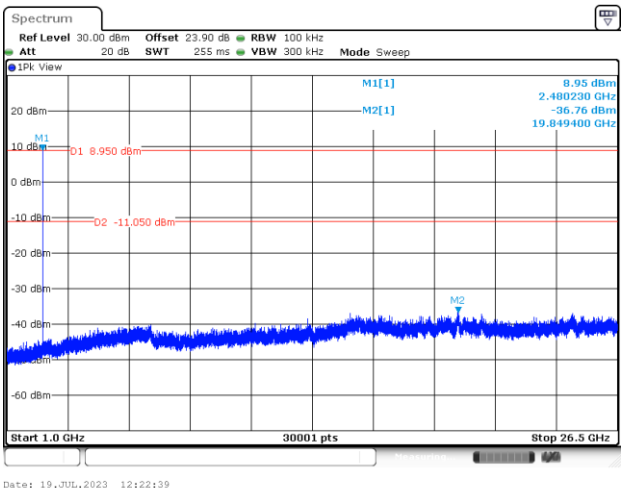
Hopping Mode Low Band Edge Plot	**Hopping Mode High Band Edge Plot**
	

<3Mbps>	
Hopping Mode Low Band Edge Plot	**Hopping Mode High Band Edge Plot**
	

Spurious Emission

<1Mbps>	
CSE Plot on Ch 00 between 30MHz ~ 3 GHz	**CSE Plot on Ch 00 between 2 GHz ~ 25 GHz**
	
CSE Plot on Ch 39 between 30MHz ~ 3 GHz	**CSE Plot on Ch 39 between 2 GHz ~ 25 GHz**
	

CSE Plot on Ch 78 between 30MHz ~ 3 GHz	CSE Plot on Ch 78 between 2 GHz ~ 25 GHz
	

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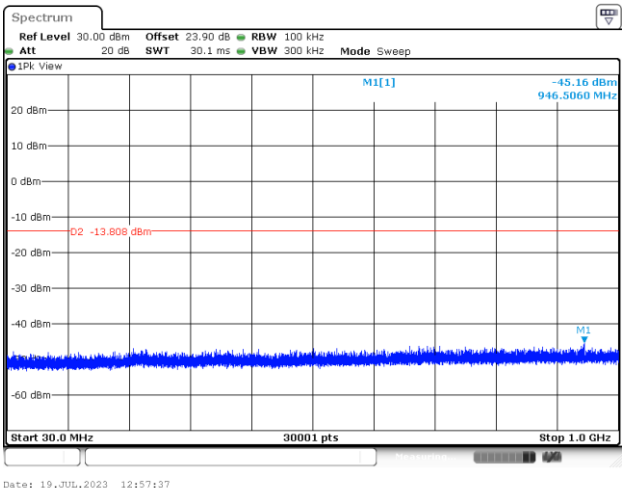
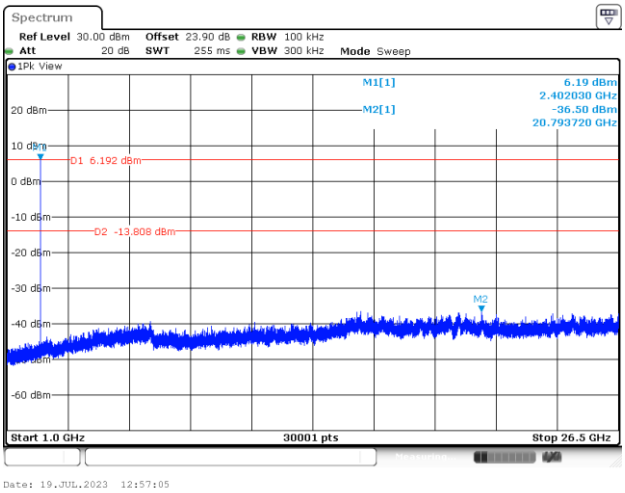
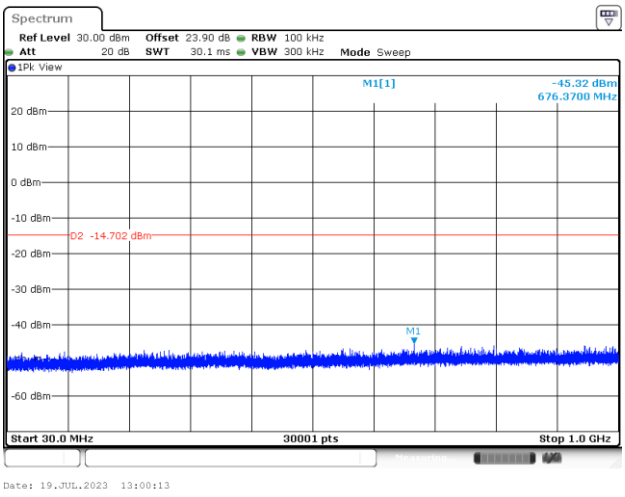
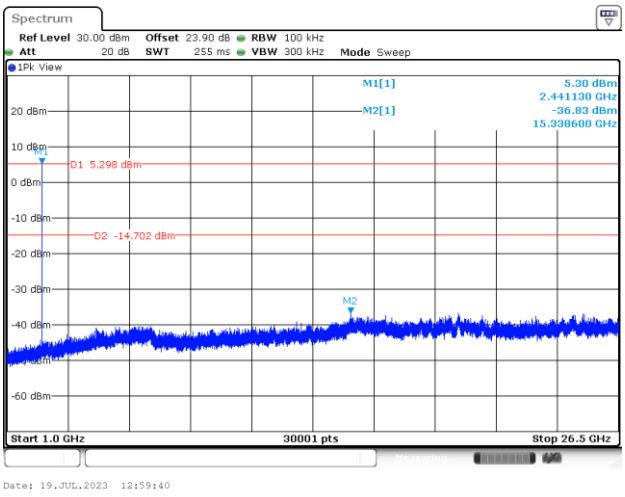
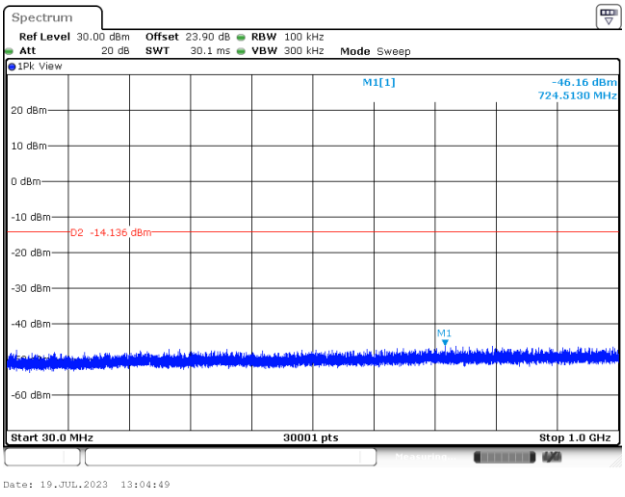
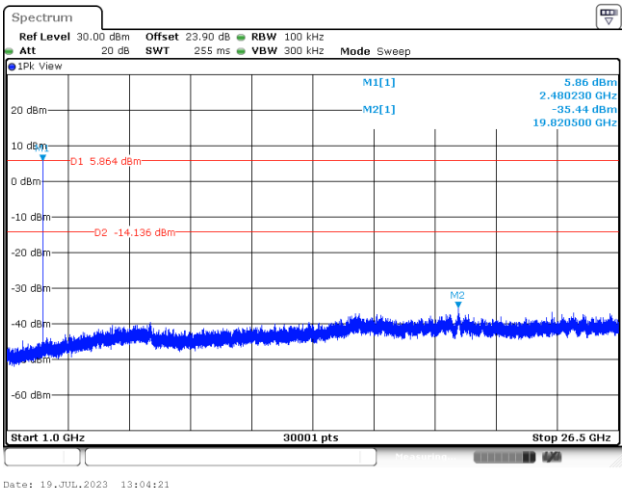
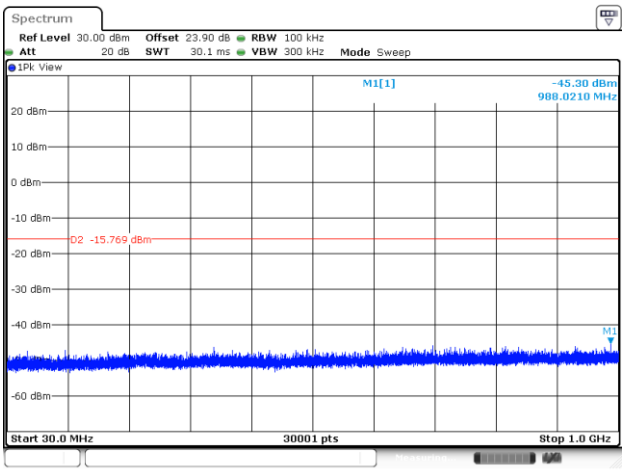
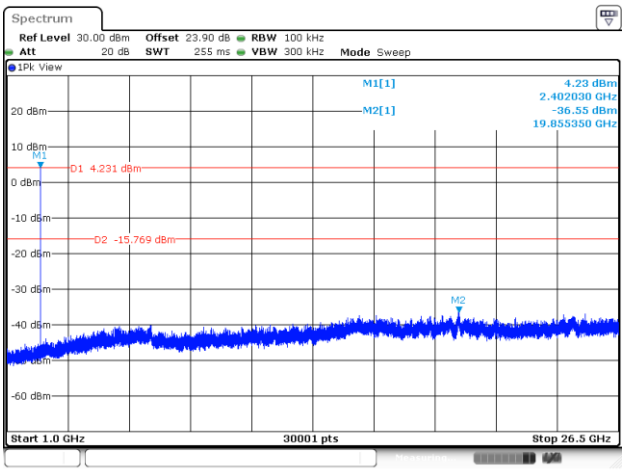
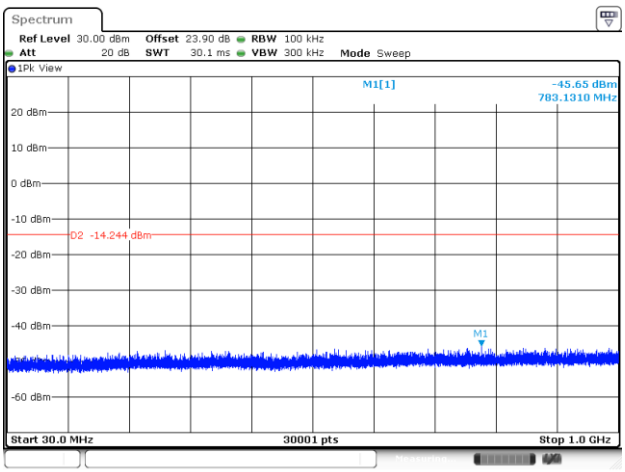
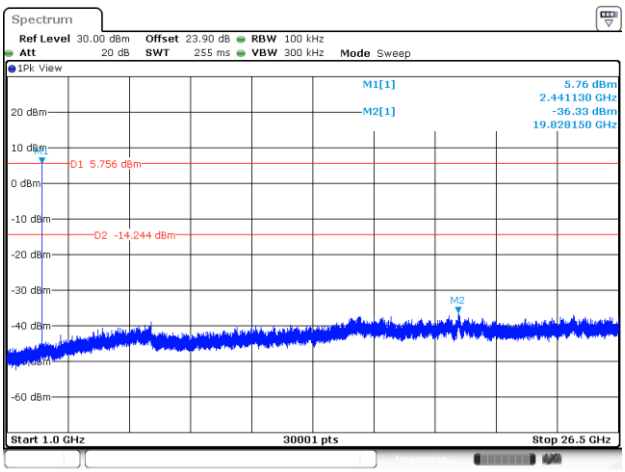
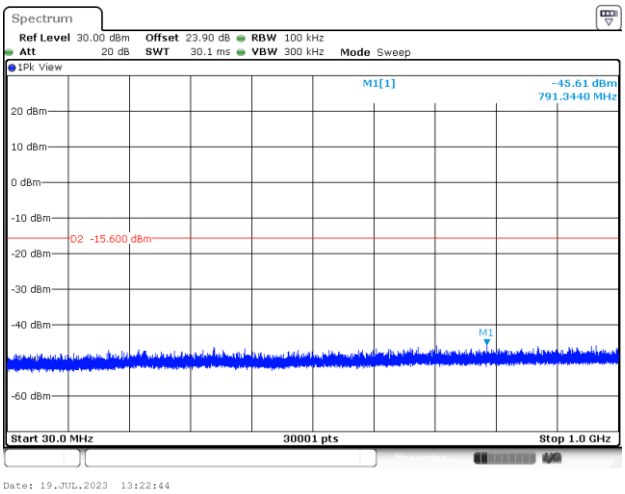
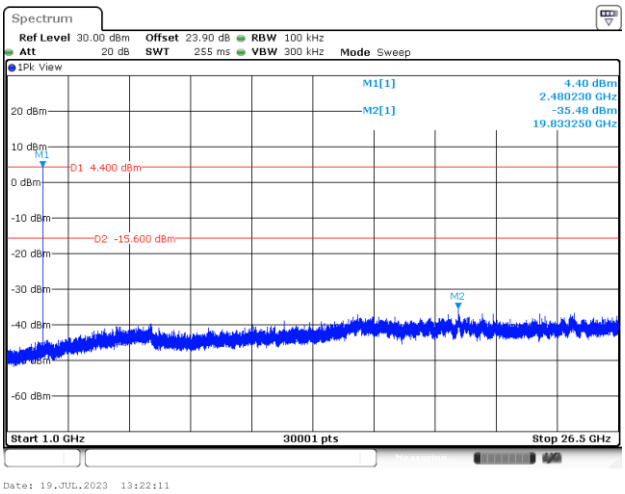
CSE Plot on Ch 00 between 30MHz ~ 3 GHz	**CSE Plot on Ch 00 between 2 GHz ~ 25 GHz**
	

CSE Plot on Ch 39 between 30MHz ~ 3 GHz	CSE Plot on Ch 39 between 2 GHz ~ 25 GHz
	
CSE Plot on Ch 78 between 30MHz ~ 3 GHz	**CSE Plot on Ch 78 between 2 GHz ~ 25 GHz**
	

<3Mbps>	
CSE Plot on Ch 00 between 30MHz ~ 3 GHz	**CSE Plot on Ch 00 between 2 GHz ~ 25 GHz**
	
CSE Plot on Ch 39 between 30MHz ~ 3 GHz	**CSE Plot on Ch 39 between 2 GHz ~ 25 GHz**
	

CSE Plot on Ch 78 between 30MHz ~ 3 GHz	CSE Plot on Ch 78 between 2 GHz ~ 25 GHz
	

Appendix B. Radiated Spurious Emission

Test Engineer :	John Chuang, David Dai and Howard Huang	**Temperature :**	18.6~22.4°C
		Relative Humidity :	66.8~69.2%

<EUT with Bluetooth Antenna (RD2458-5)>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH00 2402MHz		2322.39	42	-32	74	42.27	27.3	8.47	36.04	151	188	P	H
		2322.39	17.21	-36.79	54	-	-	-	-	-	-	A	H
	*	2402	101.92	-	-	101.95	27.41	8.62	36.06	151	188	P	H
	*	2402	77.13	-	-	-	-	-	-	-	-	A	H
													H
													H
		2321.97	45.25	-28.75	74	45.52	27.3	8.47	36.04	210	357	P	V
		2321.97	20.46	-33.54	54	-	-	-	-	-	-	A	V
	*	2402	108.47	-	-	108.5	27.41	8.62	36.06	210	357	P	V
	*	2402	83.68	-	-	-	-	-	-	-	-	A	V
													V
													V
BT CH 39 2441MHz		2321.2	43.7	-30.3	74	43.97	27.3	8.47	36.04	350	253	P	H
		2321.2	18.91	-35.09	54	-	-	-	-	-	-	A	H
	*	2441	101.74	-	-	101.54	27.57	8.7	36.07	350	253	P	H
	*	2441	76.95	-	-	-	-	-	-	-	-	A	H
		2487.61	40.33	-33.67	74	39.87	27.75	8.8	36.09	350	253	P	H
		2487.61	15.54	-38.46	54	-	-	-	-	-	-	A	H
		2321.2	46.99	-27.01	74	47.26	27.3	8.47	36.04	100	187	P	V
		2321.2	22.2	-31.8	54	-	-	-	-	-	-	A	V
	*	2441	107.3	-	-	107.1	27.57	8.7	36.07	100	187	P	V
	*	2441	82.51	-	-	-	-	-	-	-	-	A	V
		2497.9	41.11	-32.89	74	40.59	27.79	8.82	36.09	100	187	P	V
		2497.9	16.32	-37.68	54	-	-	-	-	-	-	A	V

BT CH 78 2480MHz	*	2480	100.96	-	-	100.54	27.72	8.78	36.08	108	110	P	H
	*	2480	76.17	-	-	-	-	-	-	-	-	A	H
		2483.84	46.91	-27.09	74	46.47	27.74	8.79	36.09	108	110	P	H
		2483.84	22.12	-31.88	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	107.04	-	-	106.62	27.72	8.78	36.08	107	356	P	V
	*	2480	82.25	-	-	-	-	-	-	-	-	A	V
		2483.56	54.24	-19.76	74	53.81	27.73	8.79	36.09	107	356	P	V
		2483.56	29.45	-24.55	54	-	-	-	-	-	-	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT CH 00 2402MHz		4804	48.22	-25.78	74	40.21	32.32	12.89	37.2	-	-	P	H
		4804	23.43	-30.57	54	-	-	-	-	-	-	A	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		4804	56.82	-17.18	74	48.81	32.32	12.89	37.2	-	-	P	V
		4804	32.03	-21.97	54	-	-	-	-	-	-	A	V
													V
													V
													V
													V
													V
													V
													V
													V
													V

BT	Note	Frequency (MHz)	Level (dBµV/m)	Margin (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		4882	45.86	-28.14	74	37.36	32.66	13.11	37.27	-	-	P	H
		4882	21.07	-32.93	54	-	-	-	-	-	-	A	H
		7323	48.04	-25.96	74	33.52	36.81	15.89	38.18	-	-	P	H
		7323	23.25	-30.75	54	-	-	-	-	-	-	A	H
													H
													H
													H
													H
													H
													H
													H
BT CH 39 2441MHz		4882	52.18	-21.82	74	43.68	32.66	13.11	37.27	-	-	P	V
		4882	27.39	-26.61	54	-	-	-	-	-	-	A	V
		7323	50.17	-23.83	74	35.65	36.81	15.89	38.18	-	-	P	V
		7323	25.38	-28.62	54	-	-	-	-	-	-	A	V
													V
													V
													V
													V
													V
													V
													V
													V

BT	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT CH 78 2480MHz		4960	44.08	-29.92	74	35.13	32.94	13.34	37.33	-	-	P	H
		4960	19.29	-34.71	54	-	-	-	-	-	-	A	H
		7440	47.96	-26.04	74	33.78	36.42	16.01	38.25	-	-	P	H
		7440	23.17	-30.83	54	-	-	-	-	-	-	A	H
													H
													H
													H
													H
													H
													H
													H
		4960	48.1	-25.9	74	39.15	32.94	13.34	37.33	-	-	P	V
		4960	23.31	-30.69	54	-	-	-	-	-	-	A	V
		7440	48.13	-25.87	74	33.95	36.42	16.01	38.25	-	-	P	V
		7440	23.34	-30.66	54	-	-	-	-	-	-	A	V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Emission after 18GHz

2.4GHz BT (SHF)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT SHF		24874	41.89	-32.11	74	35.68	39.65	19.74	53.18	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		24916	42.65	-31.35	74	36.37	39.67	19.76	53.15	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		30.97	23.72	-16.28	40	34	24.17	1.31	35.76	-	-	P	H
		62.01	22.97	-17.03	40	45.29	11.85	1.54	35.71	-	-	P	H
		307.42	30.93	-15.07	46	43.6	19.34	3.25	35.26	-	-	P	H
		603.27	28.9	-17.1	46	33.15	25.63	4.56	34.44	-	-	P	H
		792.42	35.96	-10.04	46	36.49	28.05	5.18	33.76	-	-	P	H
		955.38	34.92	-11.08	46	31.28	31.03	5.72	33.11	-	-	P	H
													H
													H
													H
													H
													H
													H
		35.82	30.97	-9.03	40	43.66	21.83	1.24	35.76	-	-	P	V
		66.86	24.25	-15.75	40	46.24	12.15	1.58	35.72	-	-	P	V
		303.54	27.12	-18.88	46	39.81	19.34	3.24	35.27	-	-	P	V
		592.6	30.29	-15.71	46	34.52	25.72	4.52	34.47	-	-	P	V
		792.42	36.47	-9.53	46	37	28.05	5.18	33.76	-	-	P	V
		953.44	35.05	-10.95	46	31.55	30.91	5.71	33.12	-	-	P	V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.

<EUT with Bluetooth Antenna (B53026-90)>

2.4GHz 2400~2483.5MHz

BT (Band Edge @ 3m)

BT	Note	Frequency	Level	Margin	Limit Line	Read Level	Antenna Factor	Path Loss	Preamp Factor	Ant Pos	Table Pos	Peak Avg.	Pol.
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH00 2402MHz		2390	42.49	-31.51	74	42.57	27.38	8.6	36.06	110	255	P	H
		2390	17.73	-36.27	54	-	-	-	-	-	-	A	H
	*	2402	105.56	-	-	105.59	27.41	8.62	36.06	110	255	P	H
	*	2402	80.8	-	-	-	-	-	-	-	-	A	H
													H
													H
		2388.855	40.31	-33.69	74	40.39	27.38	8.6	36.06	400	187	P	V
		2388.855	15.55	-38.45	54	-	-	-	-	-	-	A	V
	*	2402	102.63	-	-	102.66	27.41	8.62	36.06	400	187	P	V
	*	2402	77.87	-	-	-	-	-	-	-	-	A	V
													V
													V
BT CH 39 2441MHz		2375.94	41.32	-32.68	74	41.45	27.35	8.57	36.05	118	237	P	H
		2375.94	16.56	-37.44	54	-	-	-	-	-	-	A	H
	*	2441	104.95	-	-	104.76	27.56	8.7	36.07	118	237	P	H
	*	2441	80.19	-	-	-	-	-	-	-	-	A	H
		2491.25	40.96	-33.04	74	40.49	27.76	8.8	36.09	118	237	P	H
		2491.25	16.2	-37.8	54	-	-	-	-	-	-	A	H
		2345.7	40.69	-33.31	74	40.92	27.3	8.51	36.04	390	184	P	V
		2345.7	15.93	-38.07	54	-	-	-	-	-	-	A	V
	*	2441	102.65	-	-	102.46	27.56	8.7	36.07	390	184	P	V
	*	2441	77.89	-	-	-	-	-	-	-	-	A	V
		2485.51	40.64	-33.36	74	40.2	27.74	8.79	36.09	390	184	P	V
		2485.51	15.88	-38.12	54	-	-	-	-	-	-	A	V

BT CH 78 2480MHz	*	2480	105.19	-	-	104.77	27.72	8.78	36.08	115	242	P	H
	*	2480	80.43	-	-	-	-	-	-	-	-	A	H
		2483.68	53.34	-20.66	74	52.91	27.73	8.79	36.09	115	242	P	H
		2483.68	28.58	-25.42	54	-	-	-	-	-	-	A	H
													H
													H
	*	2480	102.85	-	-	102.43	27.72	8.78	36.08	383	194	P	V
	*	2480	78.09	-	-	-	-	-	-	-	-	A	V
		2483.56	49.94	-24.06	74	49.51	27.73	8.79	36.09	383	194	P	V
		2483.56	25.18	-28.82	54	-	-	-	-	-	-	A	V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

2.4GHz 2400~2483.5MHz

BT (Harmonic @ 3m)

BT	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT CH 00 2402MHz		4804	49.89	-24.11	74	41.88	32.32	12.89	37.2	400	0	P	H
		4804	25.13	-28.87	54	-	-	-	-	-	-	A	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		4804	44.35	-29.65	74	36.34	32.32	12.89	37.2	100	0	P	V
		4804	19.59	-34.41	54	-	-	-	-	-	-	A	V
													V
													V
													V
													V
													V
													V
													V
													V
													V

BT	Note	Frequency (MHz)	Level (dBµV/m)	Margin (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
		4882	48.54	-25.46	74	40.04	32.66	13.11	37.27	-	-	P	H
		4882	23.78	-30.22	54	-	-	-	-	-	-	A	H
		7323	48.89	-25.11	74	34.37	36.81	15.89	38.18	-	-	P	H
		7323	24.13	-29.87	54	-	-	-	-	-	-	A	H
													H
													H
													H
													H
													H
													H
													H
BT CH 39 2441MHz		4882	45.79	-28.21	74	37.29	32.66	13.11	37.27	-	-	P	V
		4882	21.03	-32.97	54	-	-	-	-	-	-	A	V
		7323	48.64	-25.36	74	34.12	36.81	15.89	38.18	-	-	P	V
		7323	23.88	-30.12	54	-	-	-	-	-	-	A	V
													V
													V
													V
													V
													V
													V
													V
													V

BT	Note	Frequency (MHz)	Level (dBμV/m)	Margin (dB)	Limit Line (dBμV/m)	Read Level (dBμV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
BT CH 78 2480MHz		4960	47.95	-26.05	74	39	32.94	13.34	37.33	-	-	P	H
		4960	23.19	-30.81	54	-	-	-	-	-	-	A	H
		7440	47.67	-26.33	74	33.49	36.42	16.01	38.25	-	-	P	H
		7440	22.91	-31.09	54	-	-	-	-	-	-	A	H
													H
													H
													H
													H
													H
													H
													H
		4960	44.99	-29.01	74	36.04	32.94	13.34	37.33	-	-	P	V
		4960	20.23	-33.77	54	-	-	-	-	-	-	A	V
		7440	47.52	-26.48	74	33.34	36.42	16.01	38.25	-	-	P	V
		7440	22.76	-31.24	54	-	-	-	-	-	-	A	V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against Peak and Average limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Emission after 18GHz

2.4GHz BT (SHF)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT SHF		24797	42.44	-31.56	74	36.34	39.62	19.7	53.22	-	-	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
													H
		24930	41.98	-32.02	74	35.68	39.67	19.77	53.14	-	-	P	V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.

Emission below 1GHz

2.4GHz BT (LF)

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
2.4GHz BT LF		62.01	20.71	-19.29	40	43.03	11.85	1.54	35.71	-	-	P	H
		298.69	24.23	-21.77	46	36.98	19.32	3.21	35.28	-	-	P	H
		341.37	24.67	-21.33	46	36.15	20.26	3.42	35.16	-	-	P	H
		452.92	30.48	-15.52	46	38.25	23.2	3.93	34.9	-	-	P	H
		767.2	32.72	-13.28	46	33.46	28.01	5.09	33.84	-	-	P	H
		949.56	35.08	-10.92	46	31.79	30.72	5.7	33.13	-	-	P	H
													H
													H
													H
													H
													H
													H
		35.82	30.26	-9.74	40	42.95	21.83	1.24	35.76	-	-	P	V
		42.61	31.28	-8.72	40	47.63	18.09	1.31	35.75	-	-	P	V
		259.89	23.1	-22.9	46	35.35	20.13	3	35.38	-	-	P	V
		453.89	30.48	-15.52	46	38.21	23.23	3.94	34.9	-	-	P	V
		750.71	32.39	-13.61	46	33.26	27.98	5.04	33.89	-	-	P	V
		953.44	34.73	-11.27	46	31.23	30.91	5.71	33.12	-	-	P	V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.
3. The emission position marked as “-” means no suspected emission found and emission level has at least 6dB margin against limit or emission is noise floor only.

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **Margin** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

BT	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
BT CH 00 2402MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Margin (dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Margin (dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Margin (dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

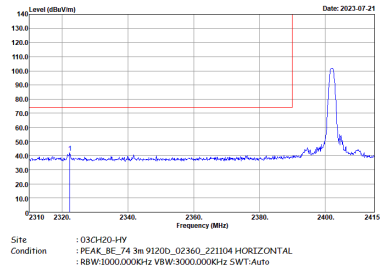
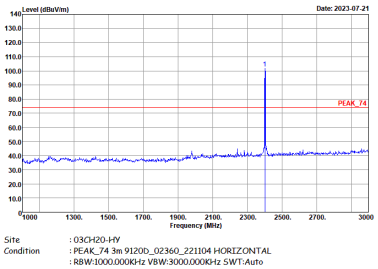
Appendix C. Radiated Spurious Emission Plots

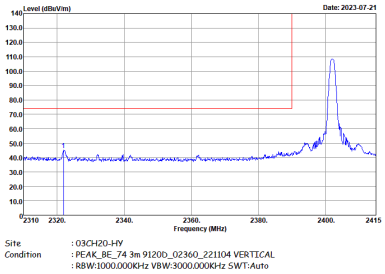
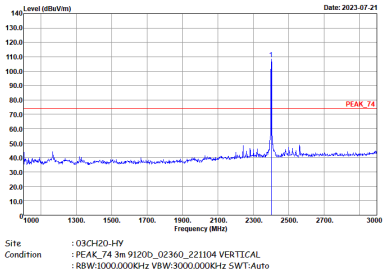
Test Engineer :	Jack Tasi, Gary Guo and Steven Wu	Temperature :	20~25°C
		Relative Humidity :	50~65%

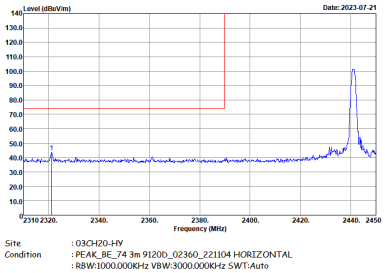
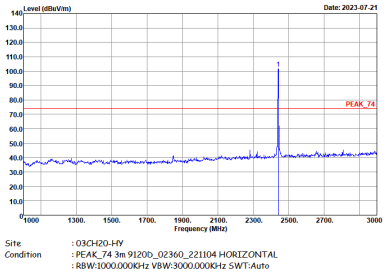
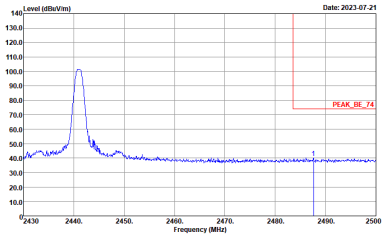
<EUT with Bluetooth enna (RD2458-5)>

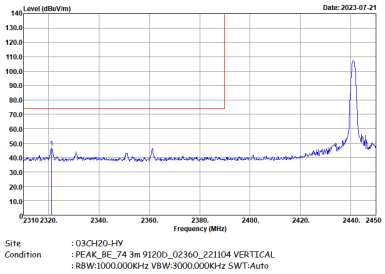
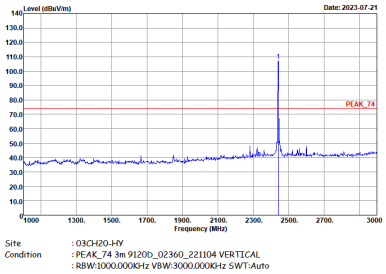
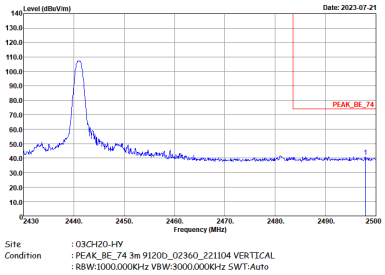
2.4GHz 2400~2483.5MHz

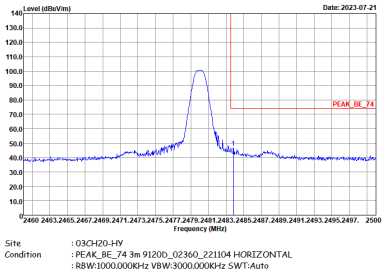
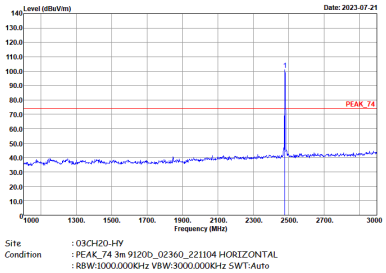
BT (Band Edge @ 3m)

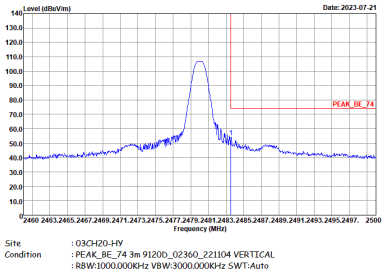
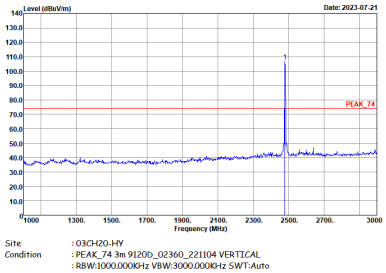
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Horizontal	Fundamental
Peak		

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Vertical	Fundamental
Peak		

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 9120D_02360_221104 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_74 3m 9120D_02360_221104 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 9120D_02360_221104 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank

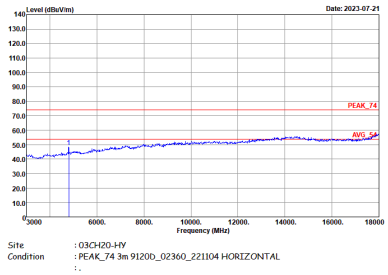
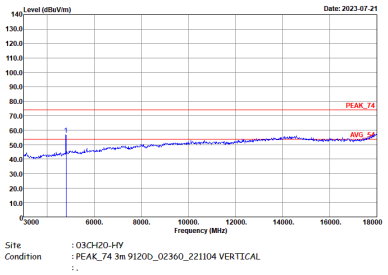
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Vertical	Fundamental
Peak		
Peak		Left blank

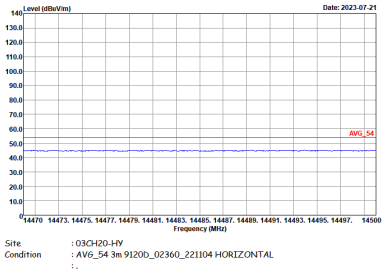
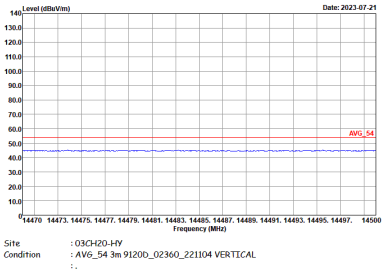
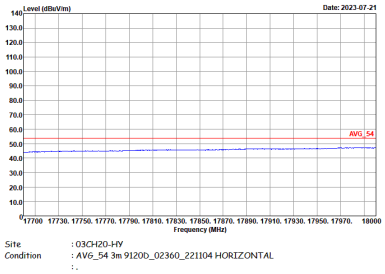
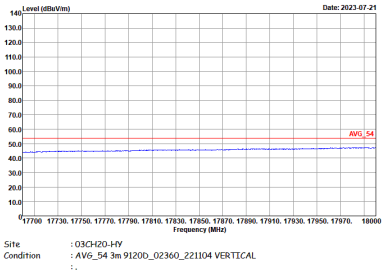
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Horizontal	Fundamental
Peak		

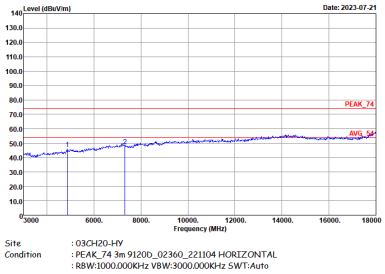
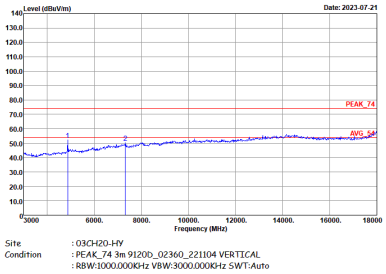
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Vertical	Fundamental
Peak		

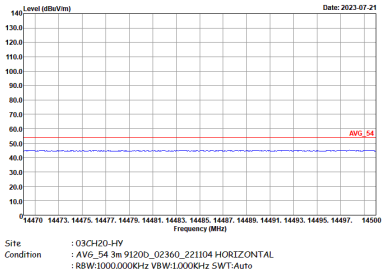
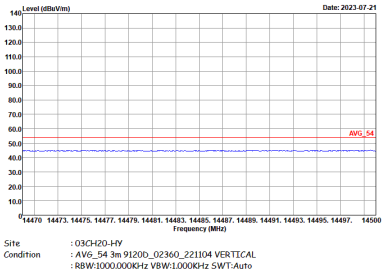
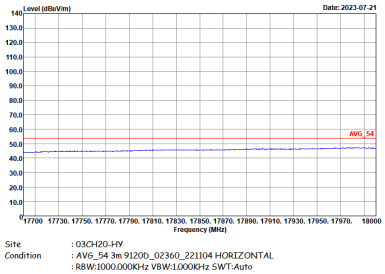
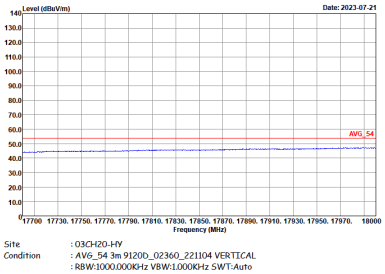
2.4GHz 2400~2483.5MHz

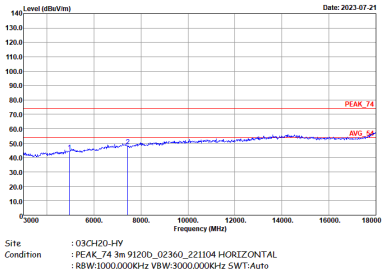
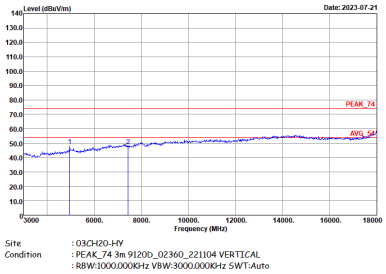
BT (Harmonic @ 3m)

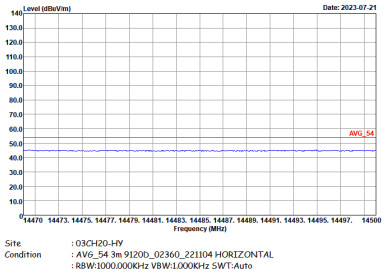
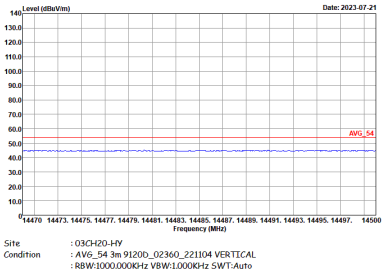
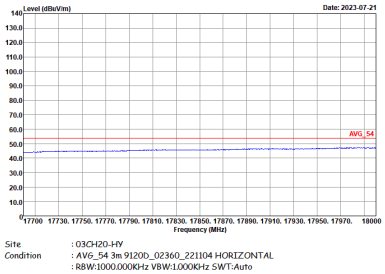
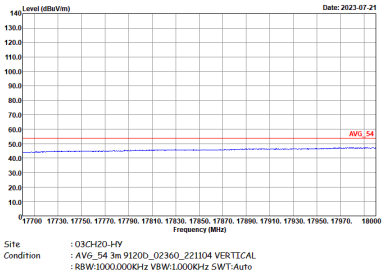
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.		

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH00 2402MHz	
	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH39 2441MHz	
	Horizontal	Vertical
Peak Avg.		

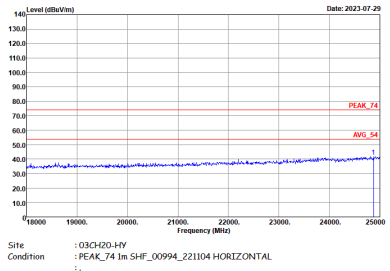
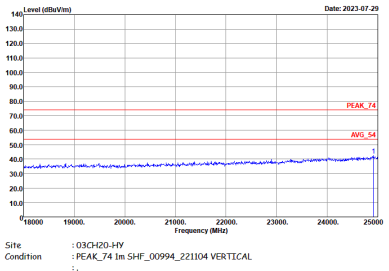
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH39 2441MHz	
	Horizontal	Vertical
14.47G ~14.5G Avg.		
17.7G ~18G Avg		

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
Peak Avg.		

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
14.47G ~14.5G Avg.	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto
17.7G ~18G Avg	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

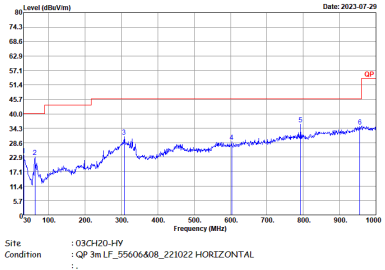
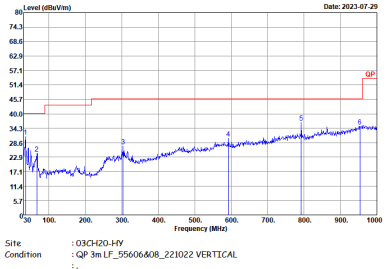
Emission above 18GHz

2.4GHz BT (SHF @ 1m)

BT	2.4GHz 2400~2483.5MHz	
	BT SHF	
	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

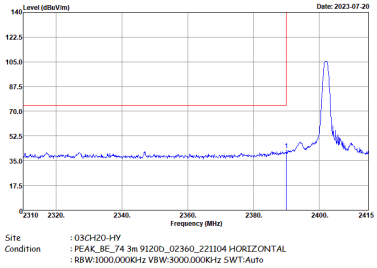
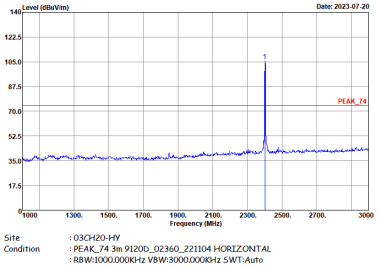
2.4GHz BT (LF)

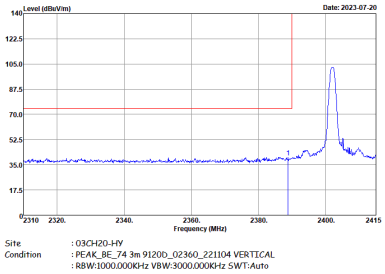
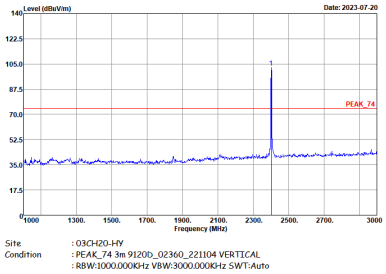
BT	2.4GHz 2400~2483.5MHz	
	BT LF	
	Horizontal	Vertical
QP / Peak		

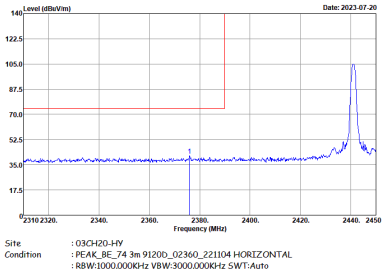
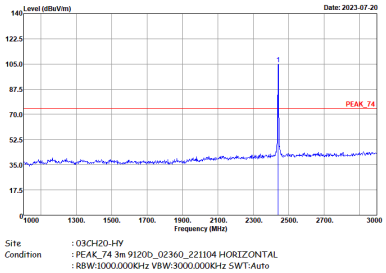
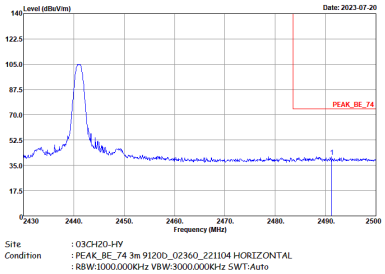
<EUT with Bluetooth enna (B53026-90)>

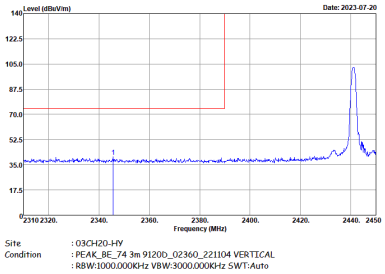
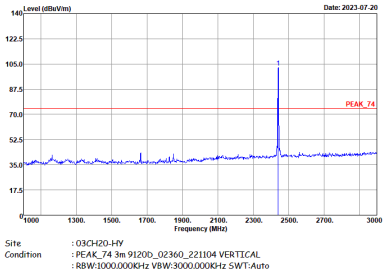
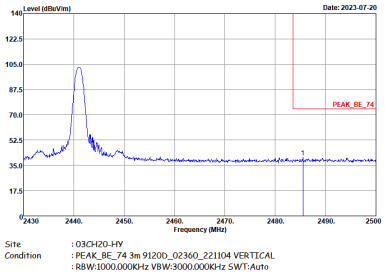
2.4GHz 2400~2483.5MHz

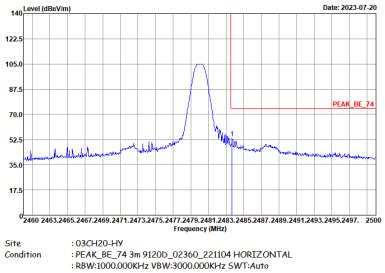
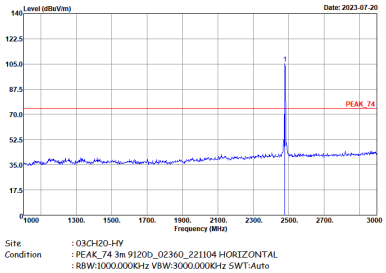
BT (Band Edge @ 3m)

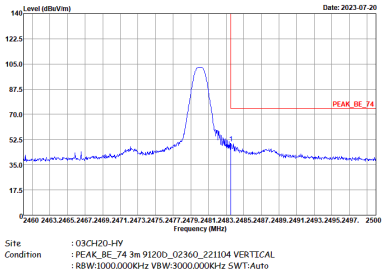
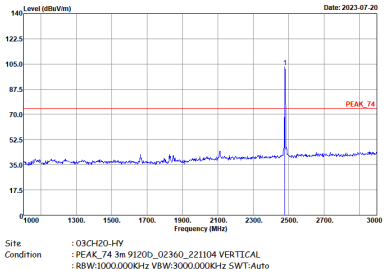
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Horizontal	Fundamental
Peak		

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH00 2402MHz	
	Vertical	Fundamental
Peak		

BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Horizontal	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 9120D_02360_221104 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_74 3m 9120D_02360_221104 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 9120D_02360_221104 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	Left blank

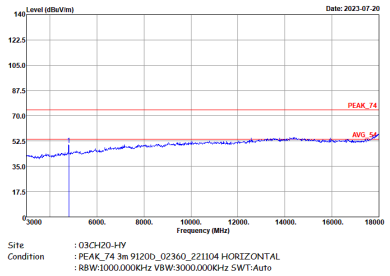
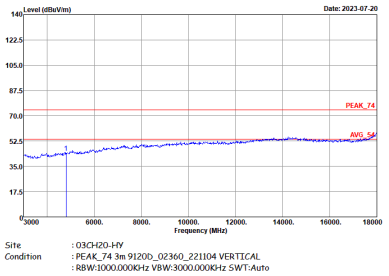
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH39 2441MHz	
	Vertical	Fundamental
Peak		
Peak		Left blank

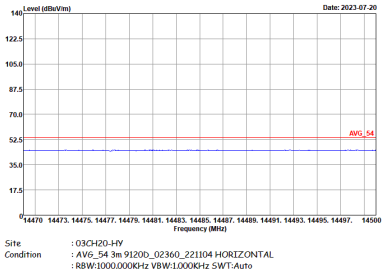
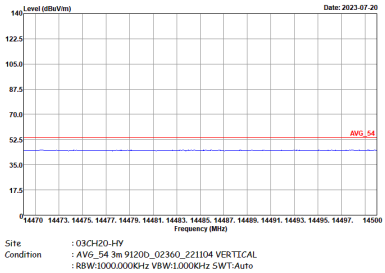
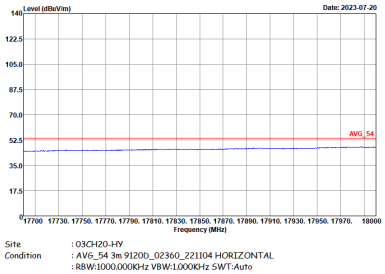
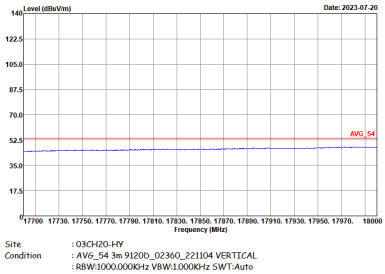
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Horizontal	Fundamental
Peak		

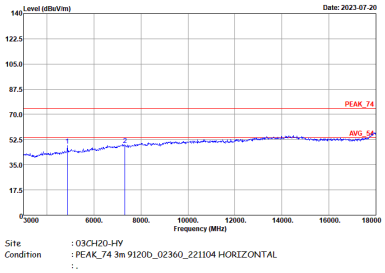
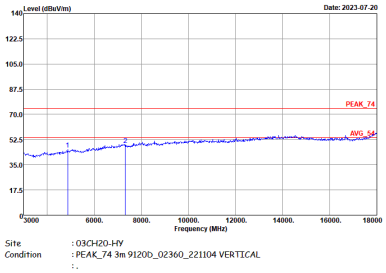
BT	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
	BT CH78 2480MHz	
	Vertical	Fundamental
Peak		

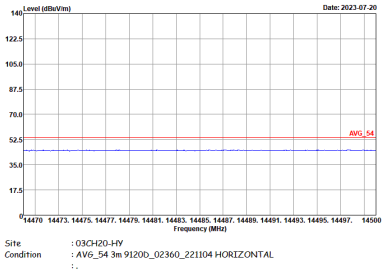
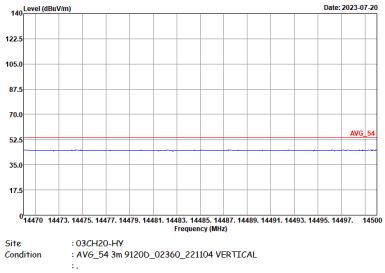
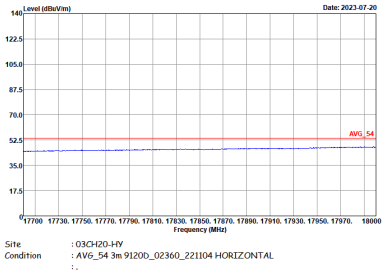
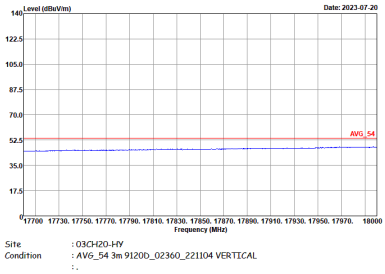
2.4GHz 2400~2483.5MHz

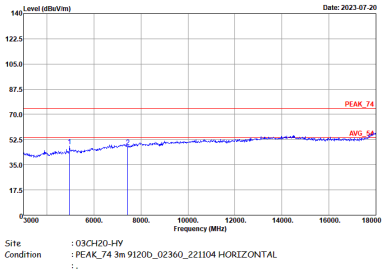
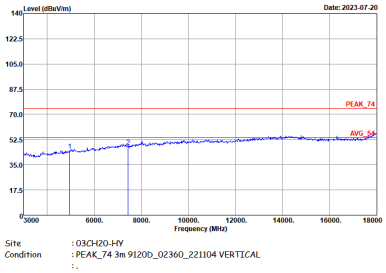
BT (Harmonic @ 3m)

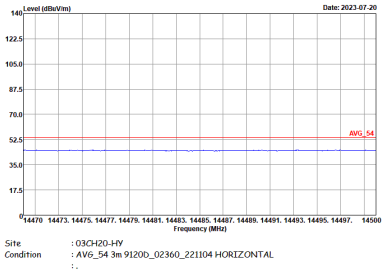
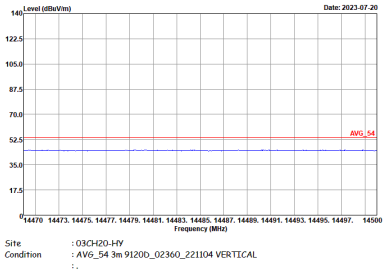
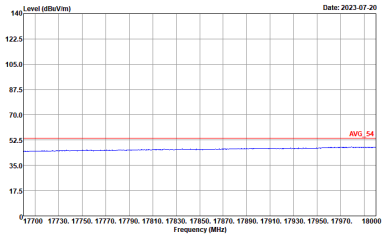
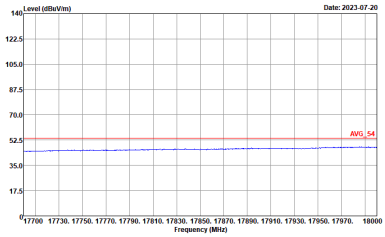
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH00 2402MHz	
	Horizontal	Vertical
Peak Avg.		

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH00 2402MHz	
	Horizontal	Vertical
14.47G ~14.5G Avg.	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto
17.7G ~18G Avg	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH39 2441MHz	
	Horizontal	Vertical
Peak Avg.		

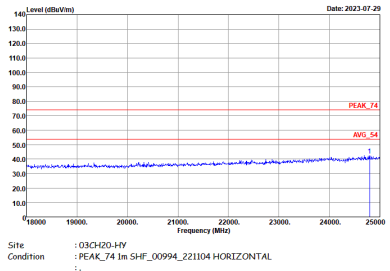
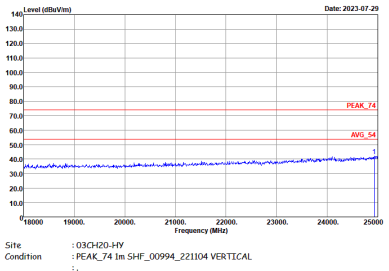
BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH39 2441MHz	
	Horizontal	Vertical
14.47G ~14.5G Avg.	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 HORIZONTAL : .	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 VERTICAL : .
17.7G ~18G Avg	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 HORIZONTAL : .	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 VERTICAL : .

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
Peak Avg.		

BT	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
	BT CH78 2480MHz	
	Horizontal	Vertical
14.47G ~14.5G Avg.	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 HORIZONTAL : .	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 VERTICAL : .
17.7G ~18G Avg	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 HORIZONTAL : .	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_02360_221104 VERTICAL : .

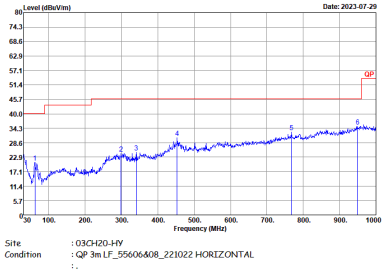
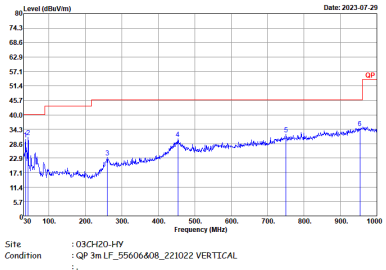
Emission above 18GHz

2.4GHz BT (SHF @ 1m)

BT	2.4GHz 2400~2483.5MHz	
	BT SHF	
	Horizontal	Vertical
Peak Avg.		

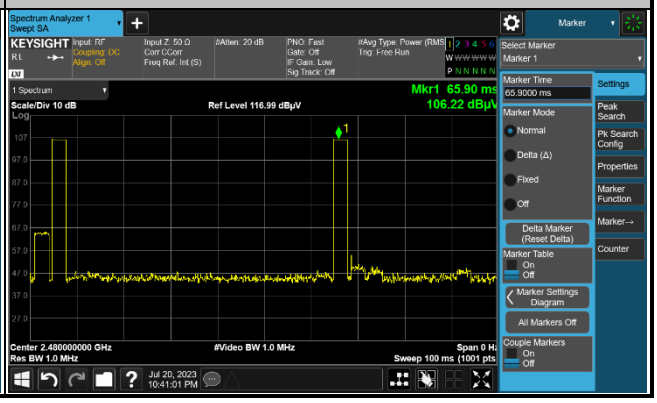
Emission below 1GHz

2.4GHz BT (LF)

BT	2.4GHz 2400~2483.5MHz	
	BT LF	
	Horizontal	Vertical
QP / Peak		

Appendix D. Duty Cycle Plots

<EUT with Bluetooth Antenna (RD2458-5)>

DH5 on time (One Pulse) Plot on Channel 39	on time (Count Pulses) Plot on Channel 39
	

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. **DH5** has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the on time period to have DH5 packet completing one hopping sequence is

2.88 ms x 20 channels = 57.6 ms

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100 ms / 57.6 ms] = 2 hops

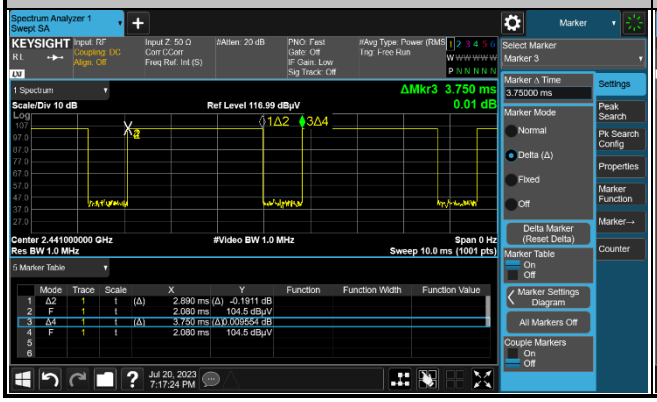
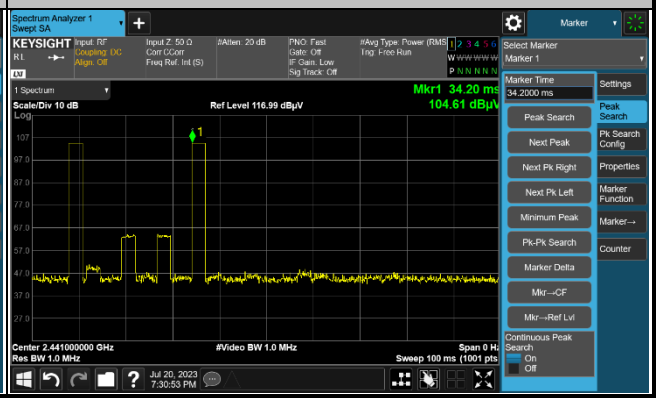
Thus, the maximum possible ON time:

2.88 ms x 2 = 5.76 ms

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.76 ms/100 ms) = -24.79 dB

<EUT with Bluetooth Antenna (B53026-90)>

DH5 on time (One Pulse) Plot on Channel 39	on time (Count Pulses) Plot on Channel 39
	

Note:

4. Worst case Duty cycle = on time/100 milliseconds = 2 * 2.89 / 100 = 5.76 %
5. Worst case Duty cycle correction factor = 20*log(Duty cycle) = -24.79 dB
6. **DH5** has the highest duty cycle worst case and is reported.

Duty Cycle Correction Factor Consideration for AFH mode:

Bluetooth normal hopping rate is 1600Hz and reduced to 800Hz in AFH mode; due to the reduced number of hopping frequencies, with the same packet configuration the dwell time in each channel frequency within 100msec period is longer in AFH mode than normal mode.

In AFH mode, the minimum hopping frequencies are 20, to get the longest dwell time DH5 packet is observed; the on time period to have DH5 packet completing one hopping sequence is

2.88 ms x 20 channels = 57.6 ms

There cannot be 2 complete hopping sequences within 100ms period, considering the random hopping behavior, maximum 2 hops can be possibly observed within the period. [100 ms / 57.6 ms] = 2 hops

Thus, the maximum possible ON time:

2.88 ms x 2 = 5.76 ms

Worst case Duty Cycle Correction factor, which is derived from the maximum possible ON time,

20 x log(5.76 ms/100 ms) = -24.79 dB