FCC RF Test Report

APPLICANT	:	unitech electronics co., ltd.
EQUIPMENT	:	Rugged Handheld Computer
BRAND NAME	:	unitech
MODEL NAME	:	EA660
FCC ID	:	HLEEA660BWNW
STANDARD	:	FCC Part 15 Subpart C §15.247
CLASSIFICATION	:	(DSS) Spread Spectrum Transmitter
TEST DATE(S)	:	Aug. 29, 2023 ~ Sep. 18, 2023

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
FR372407A	Rev. 01	Initial issue of report	Oct. 13, 2023

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(1)	Number of Channels	≥ 15Chs	Pass	-
3.2	15.247(a)(1)	Hopping Channel Separation	≥ 2/3 of 20dB BW	Pass	-
3.3	15.247(a)(1)	Dwell Time of Each Channel	≤ 0.4sec in 31.6sec period	Pass	-
3.4	15.247(a)(1)	20dB Bandwidth	-	Report only	-
3.4	-	99% Bandwidth	-	Report only	-
3.5	15.247(b)(1)	Peak Output Power	≤ 125 mW	Pass	-
3.6	15.247(d)	Conducted Band Edges	≤ 20dBc	Pass	-
3.7	15.247(d)	Conducted Spurious Emission	≤ 20dBc	Pass	-
3.8	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 6.24 dB at 58.130 MHz
3.9	15.207	AC Conducted Emission	15.207(a)	Pass	Under limit 13.62 dB at 0.184 MHz
3.10	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

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

unitech electronics co., ltd.
5F., No. 136, Ln. 235, Baoqiao Rd., Xindian Dist., New Taipei City, Taiwan

1.2 Manufacturer

unitech electronics co., ltd.
5F., No. 136, Ln. 235, Baoqiao Rd., Xindian Dist., New Taipei City, Taiwan

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	Rugged Handheld Computer
Brand Name	unitech
Model Name	EA660
FCC ID	HLEEA660BWNW
IMEI Code	Conducted: 004400152020000 Conduction: 004400152020000 Radiation: 357458980006356
HW Version	V4
SW Version	ST6729A_1280_Unitech_patchbuild_20230815181058934
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
Maximum Output Power to Antenna	Bluetooth BR(1Mbps) : 6.30 dBm (0.0043 W) Bluetooth EDR (2Mbps) : 5.68 dBm (0.0037 W) Bluetooth EDR (3Mbps) : 6.03 dBm (0.0040 W)
99% Occupied Bandwidth	Bluetooth BR(1Mbps) : 0.833MHz Bluetooth EDR (2Mbps) : 1.166MHz Bluetooth EDR (3Mbps) : 1.148MHz
Antenna Type / Gain	PIFA Antenna type with gain -1.00 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.**
	CO01-KS 03CH06-KS TH01-KS	CN1257	314309

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	TH01-KS	Tonscend	JS1120-3 test system China_210602	3.3.10
2.	03CH06-KS	AUDIX	E3	210616
3.	CO01-KS	AUDIX	E3	6.2009-8-24

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:

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

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: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report, and the worst mode of radiated spurious emissions is Bluetooth 1Mbps mode, and recorded in this report.

b. AC power line Conducted Emission was tested under maximum output power.

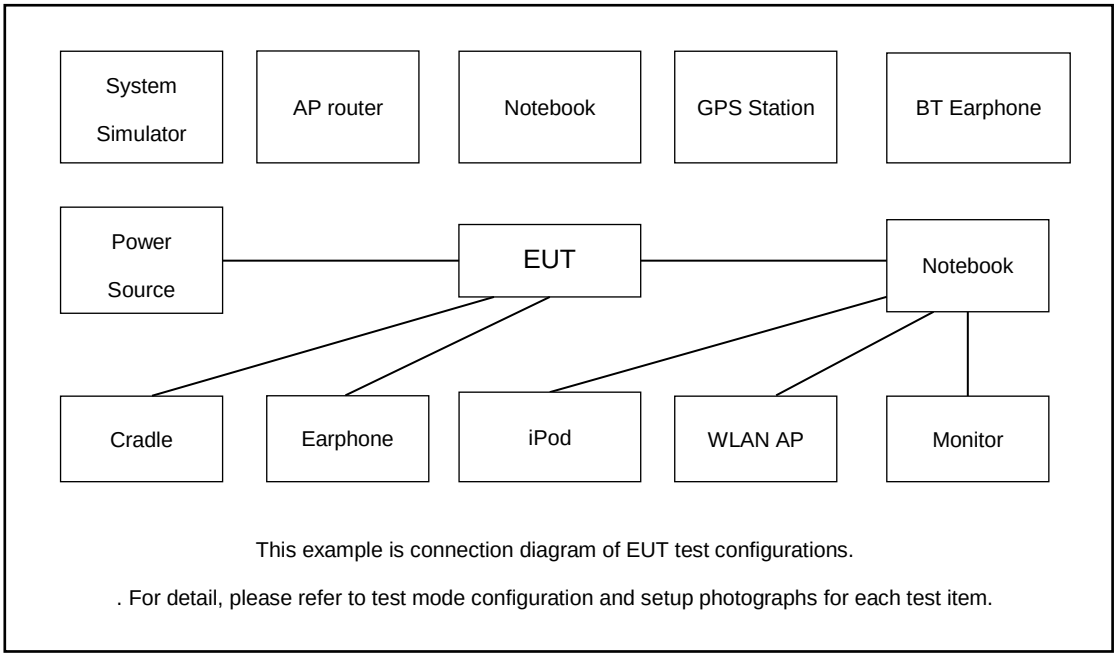
The following summary table is showing all test modes to demonstrate in compliance with the standard.

Summary table of Test Cases			
Test Item	**Data Rate / Modulation**		
	Bluetooth BR 1Mbps GFSK	**Bluetooth EDR 2Mbps π/4-DQPSK**	**Bluetooth EDR 3Mbps 8-DPSK**
Conducted Test Cases	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz	Mode 4: CH00_2402 MHz Mode 5: CH39_2441 MHz Mode 6: CH78_2480 MHz	Mode 7: CH00_2402 MHz Mode 8: CH39_2441 MHz Mode 9: CH78_2480 MHz
Radiated Test Cases	**Bluetooth BR 1Mbps GFSK**		
	Mode 1: CH00_2402 MHz Mode 2: CH39_2441 MHz Mode 3: CH78_2480 MHz		
AC Conducted Emission	Mode 1 : GSM 850 Idle + Bluetooth Link + WLAN Link (2.4G) + USB Cable (Charging from Adapter)		

Remark:

1. For radiated test cases, the worst mode data rate 1Mbps 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. For Radiated Test Cases, The tests were performed with Adapter , and USB Cable .

2.3 Connection Diagram of Test System



This example is connection diagram of EUT test configurations.

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

2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	LTE Base Station	Anritus	MT8821C	N/A	N/A	Unshielded,1.8m
2.	WLAN AP	D-link	DIR-655	KA21R655B1	N/A	Unshielded,1.8m
3.	Notebook	Lenovo	G480	QDS-BRCM1050I	N/A	shielded cable DC O/P 1.8m , Unshielded AC I/P cable 1.8m
4.	Bluetooth Earphone	Lenovo	thinkplus-BH3	N/A	N/A	N/A
5.	SD Card	Kingston	8GB	N/A	N/A	N/A

2.5 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.

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

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss6.10 dB

Offset(dB) = RF cable loss(dB)

= 6.10(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.

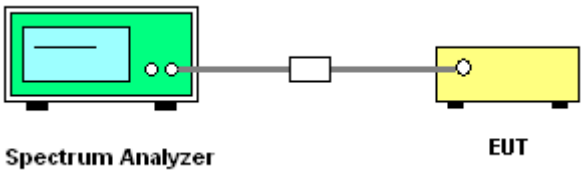
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of 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 was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings: Span = the frequency band of operation; RBW = 300kHz; 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.

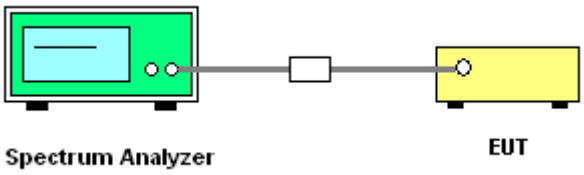
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of 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 was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Enable the EUT hopping function.
5. Use the following spectrum analyzer settings:
   Span = wide enough to capture the peaks of two adjacent channels;
   RBW = 300kHz; 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.

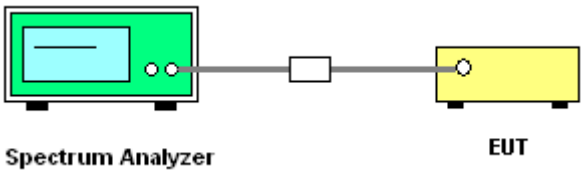
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of 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 was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. 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

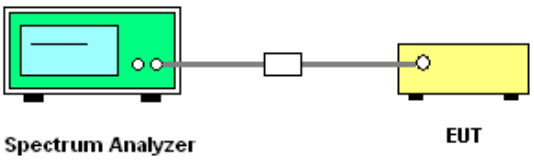
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of 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 was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
   Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel;
   The RBW is set to 1% to 5% of the 99% OBW, the VBW is set to 3 times the 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;
   The RBW is set to 1% to 5% of the 99% OBW, the VBW is set to 3 times the 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: (1) 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. The power limit for 1Mbps, 2Mbps, 3Mbps and AFH modes are 0.125 watts.

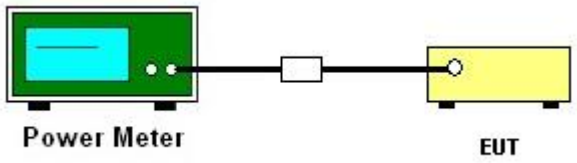
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of 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 was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power 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.

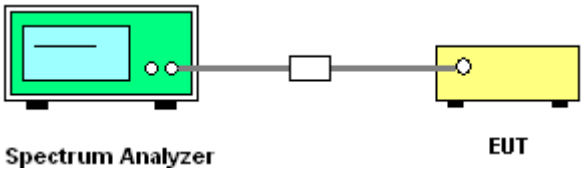
3.6.2 Measuring Instruments

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

3.6.3 Test Procedures

1. The testing follows ANSI C63.10-2013 clause 7.8.6.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. Set RBW = 100kHz, VBW = 300kHz. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100kHz 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.

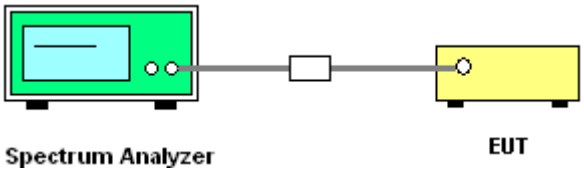
3.7.2 Measuring Instruments

The measuring equipment is listed in the section 4 of 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 was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Set RBW = 100 kHz, VBW = 300kHz, scan up through 10th harmonic. All harmonics / spurs 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

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

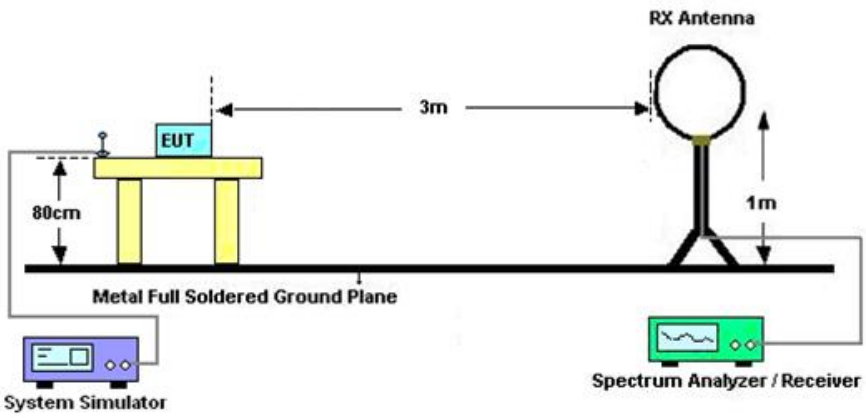
3.8.3 Test Procedures

1. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
4. Set to the maximum power setting and enable the EUT transmit continuously.
5. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW=100 kHz for f < 1 GHz, RBW=1MHz for f>1GHz ; VBW ≥ 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. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

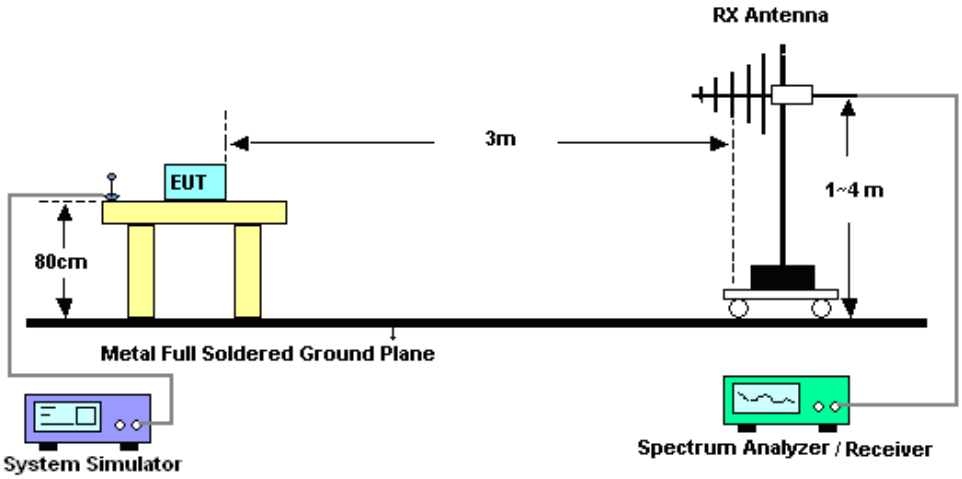
Note: The average levels were calculated from the peak level corrected with duty cycle correction factor (-24.79dB) derived from 20log (dwell time/100ms). This correction is only for signals that hop with the fundamental signal, such as band-edge and harmonic. Other spurious signals that are independent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

3.8.4 Test Setup

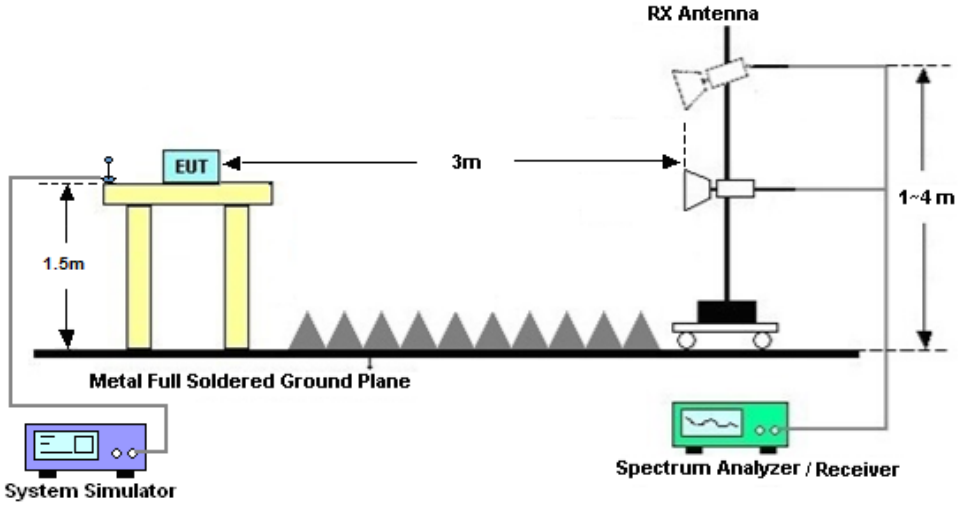
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



3.8.5 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.

3.8.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C

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

Please refer to Appendix C

3.8.8 Duty cycle correction factor for average measurement

Please refer to Appendix D.

3.9 AC Conducted Emission Measurement

3.9.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

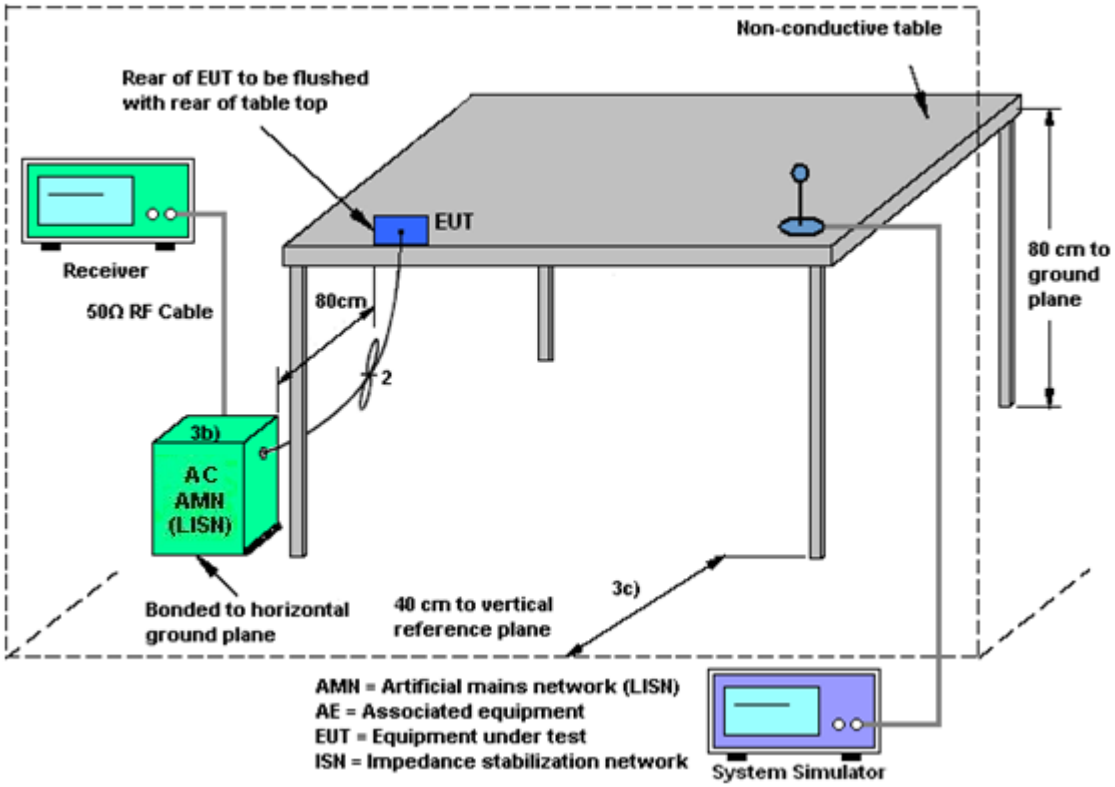
3.9.2 Measuring Instruments

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

3.9.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

3.9.4 Test Setup



3.9.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.10 Antenna Requirements

3.10.1 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.

3.10.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.10.3 Antenna Gain

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

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV30	101338	10Hz~30GHz	May 16, 2023	Aug. 29, 2023 ~Aug. 31, 2023	May 15, 2024	Conducted (TH01-KS)
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 12, 2022	Aug. 29, 2023 ~Aug. 31, 2023	Oct. 11, 2023	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GHz	Jan. 05, 2023	Aug. 29, 2023 ~Aug. 31, 2023	Jan. 04, 2024	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY56400004	3Hz~8.5GHz;Max 30dBm	Oct. 13, 2022	Sep. 05, 2023 ~Sep. 18, 2023	Oct. 12, 2023	Radiation (03CH06-KS)
EXA Spectrum Analyzer	Keysight	N9010B	MY60242126	10Hz-44GHz	Oct. 13, 2022	Sep. 05, 2023 ~Sep. 18, 2023	Oct. 12, 2023	Radiation (03CH06-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 16, 2022	Sep. 05, 2023 ~Sep. 18, 2023	Oct. 15, 2023	Radiation (03CH06-KS)
Bilog Antenna	TeseQ	CBL6111D	49921	30MHz-1GHz	Apr. 09, 2023	Sep. 05, 2023 ~Sep. 18, 2023	Apr. 08, 2024	Radiation (03CH06-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00218652	1GHz~18GHz	Apr. 06, 2023	Sep. 05, 2023 ~Sep. 18, 2023	Apr. 05, 2024	Radiation (03CH06-KS)
SHF-EHF Horn	Com-power	AH-840	101093	18GHz~40GHz	Jan. 08, 2023	Sep. 05, 2023 ~Sep. 18, 2023	Jan. 07, 2024	Radiation (03CH06-KS)
Amplifier	SONOMA	310N	380827	9KHz ~1GHZ	Jul. 06, 2023	Sep. 05, 2023 ~Sep. 18, 2023	Jul. 05, 2024	Radiation (03CH06-KS)
Amplifier	MITEQ	EM18G40GGA	060728	18~40GHz	Jan. 05, 2023	Sep. 05, 2023 ~Sep. 18, 2023	Jan. 04, 2024	Radiation (03CH06-KS)
high gain Amplifier	MITEQ	AMF-7D-00101800-30-10P	2082395	1Ghz-18Ghz	Jan. 05, 2023	Sep. 05, 2023 ~Sep. 18, 2023	Jan. 04, 2024	Radiation (03CH06-KS)
Amplifier	Keysight	83017A	MY53270319	500MHz~26.5GHz	Oct. 12, 2022	Sep. 05, 2023 ~Sep. 18, 2023	Oct. 12, 2023	Radiation (03CH06-KS)
AC Power Source	Chroma	61601	F104090004	N/A	NCR	Sep. 05, 2023 ~Sep. 18, 2023	NCR	Radiation (03CH06-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	Sep. 05, 2023 ~Sep. 18, 2023	NCR	Radiation (03CH06-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	Sep. 05, 2023 ~Sep. 18, 2023	NCR	Radiation (03CH06-KS)
EMI Receiver	R&S	ESCI7	100768	9kHz~7GHz;	May 16, 2023	Aug. 31, 2023 ~Sep. 01, 2023	May 15, 2024	Conduction (CO01-KS)
AC LISN (for auxiliary equipment)	MessTec	AN3016	060103	9kHz~30MHz	Oct. 13, 2022	Aug. 31, 2023 ~Sep. 01, 2023	Oct. 12, 2023	Conduction (CO01-KS)
AC LISN	MessTec	AN3016	060105	9kHz~30MHz	May 16, 2023	Aug. 31, 2023 ~Sep. 01, 2023	May 15, 2024	Conduction (CO01-KS)
AC Power Source	Chroma	61602	ABP000000811	AC 0V~300V, 45Hz~1000Hz	Oct. 12, 2022	Aug. 31, 2023 ~Sep. 01, 2023	Oct. 11, 2023	Conduction (CO01-KS)

NCR: No Calibration Required

5 Measurement Uncertainty

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

Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.94dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.26dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.02dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.26dB**

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

Appendix A. Conducted Test Results

Case No. : FR372407A	
Ambient Condition: 25 ℃, 45 %RH	
According Standard: ■Part15C	
Test Date: 2023.8.29~2023.8.31	**Test Engineer:** Jiang Jun

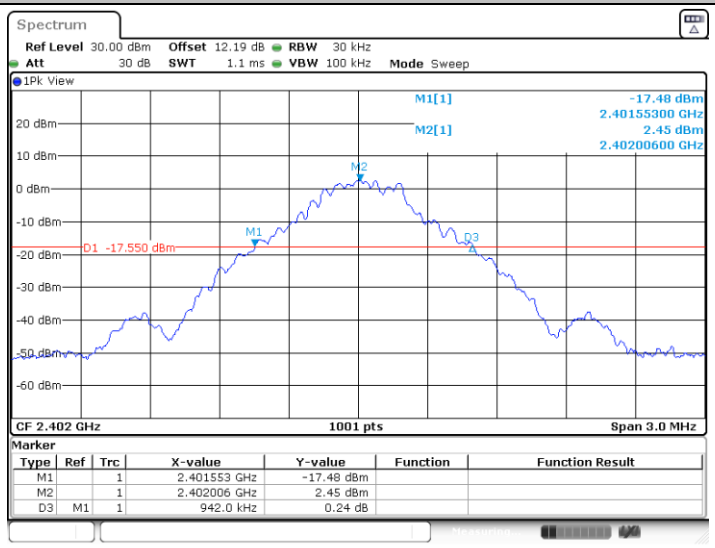
20dB Emission Bandwidth

Test Result

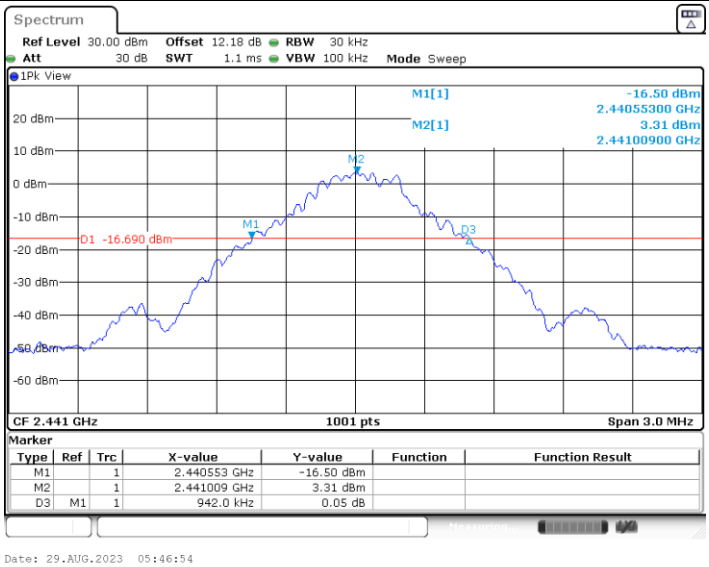
TestMode	Antenna	Freq(MHz)	20dB EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant2	2402	0.940	2401.55	2402.50	---	---
		2441	0.940	2440.55	2441.50	---	---
		2480	0.940	2479.56	2480.50	---	---
2DH1	Ant2	2402	1.290	2401.36	2402.65	---	---
		2441	1.290	2440.36	2441.65	---	---
		2480	1.220	2479.39	2480.61	---	---
3DH1	Ant2	2402	1.240	2401.41	2402.65	---	---
		2441	1.240	2440.41	2441.65	---	---
		2480	1.240	2479.41	2480.65	---	---

Test Graphs

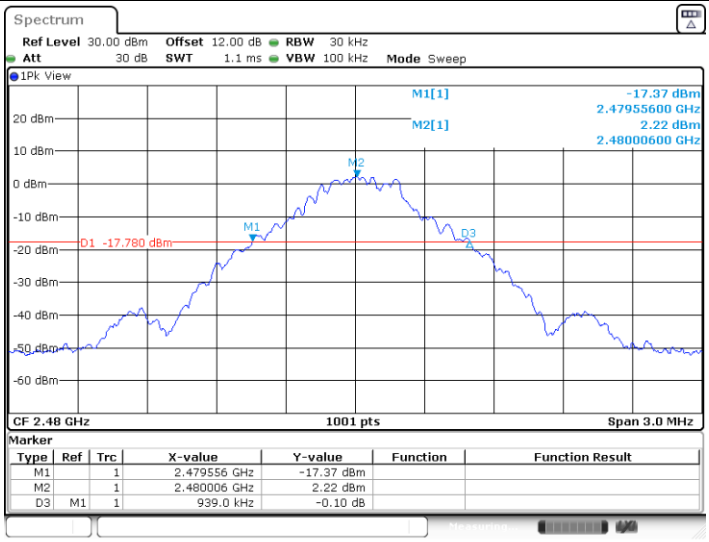
DH5_Ant2_2402



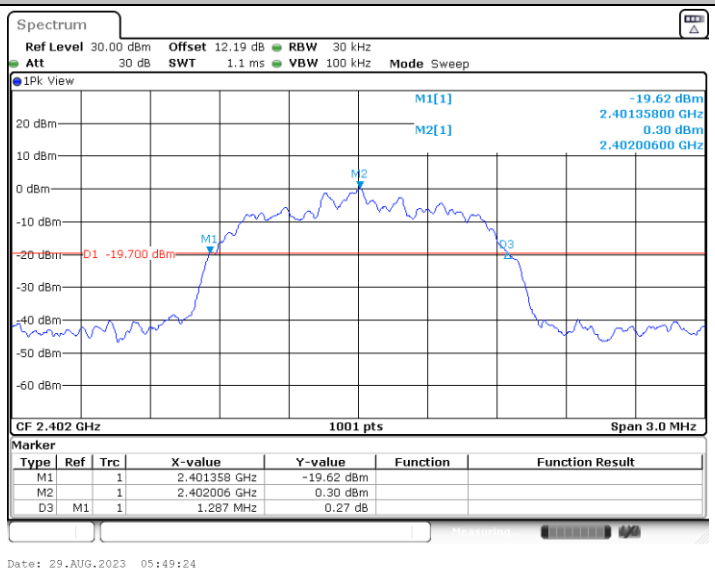
DH5_Ant2_2441



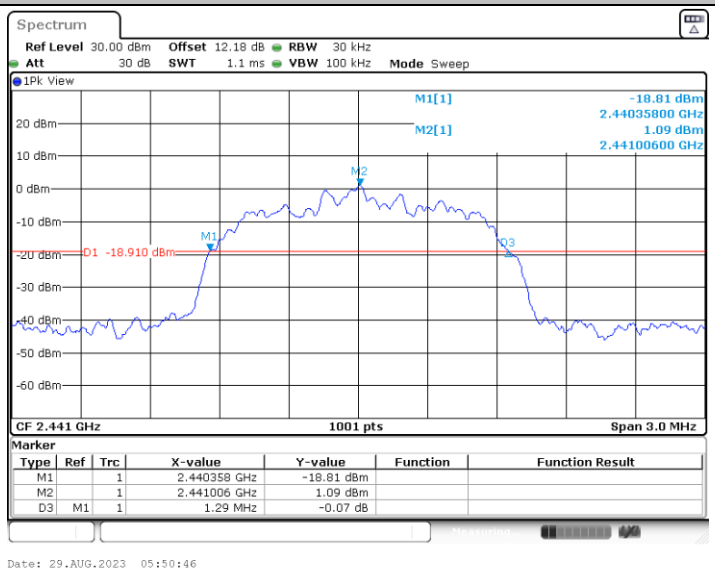
DH5_Ant2_2480



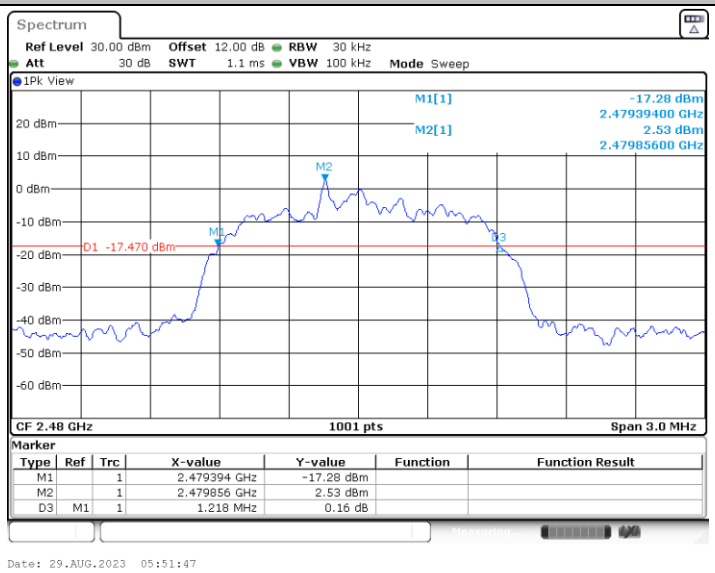
2DH1_Ant2_2402



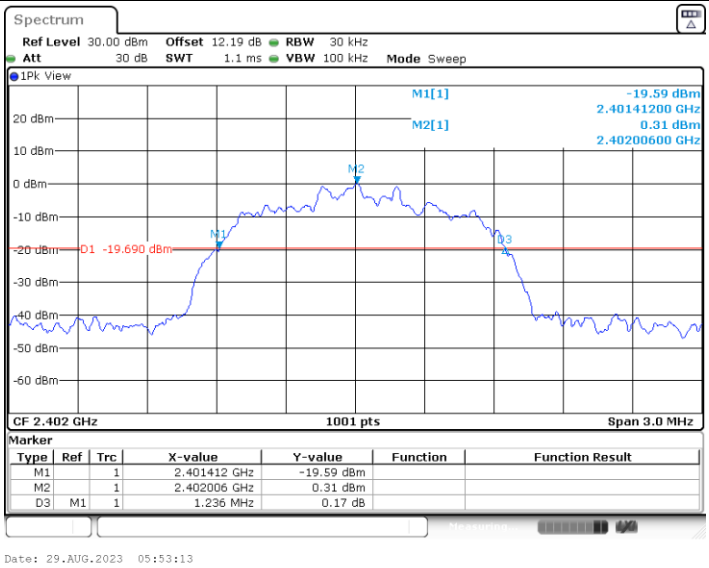
2DH1_Ant2_2441



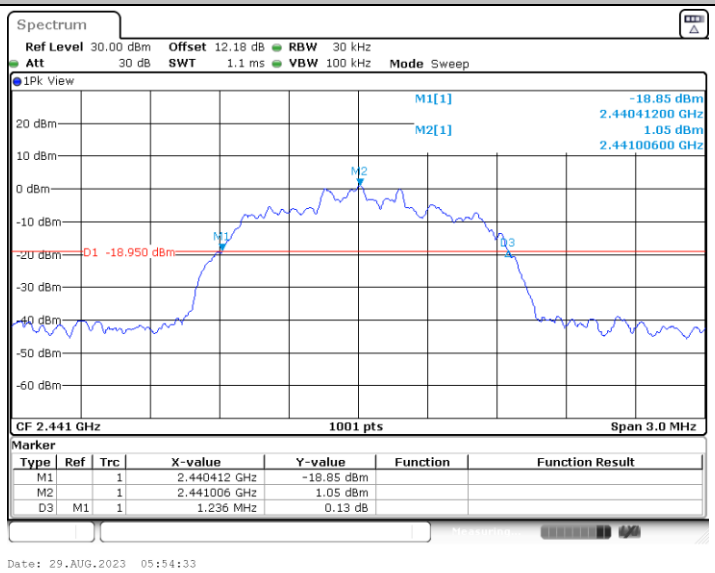
2DH1_Ant2_2480



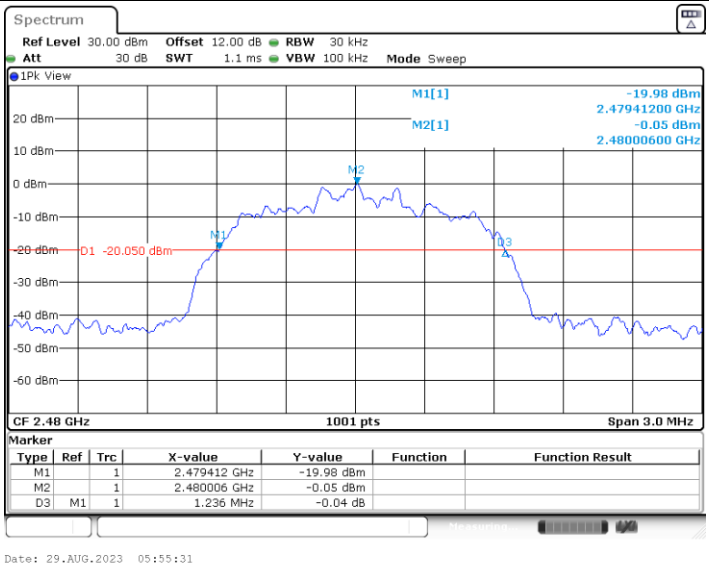
3DH1_Ant2_2402



3DH1_Ant2_2441



3DH1_Ant2_2480



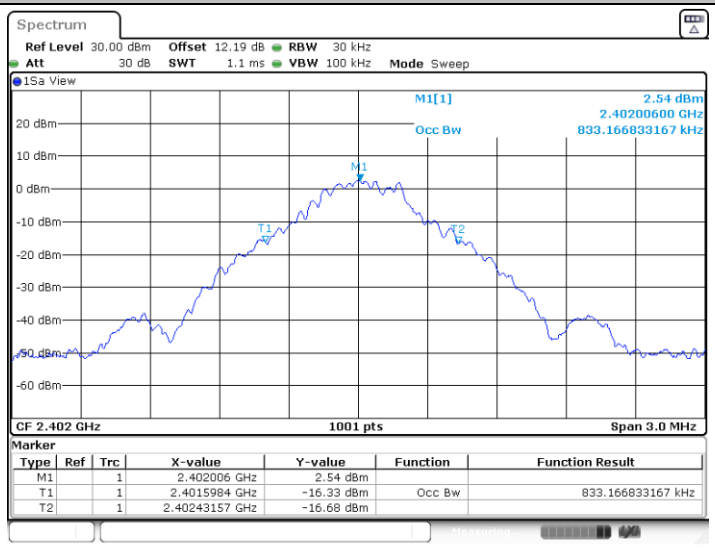
Occupied Channel Bandwidth

Test Result

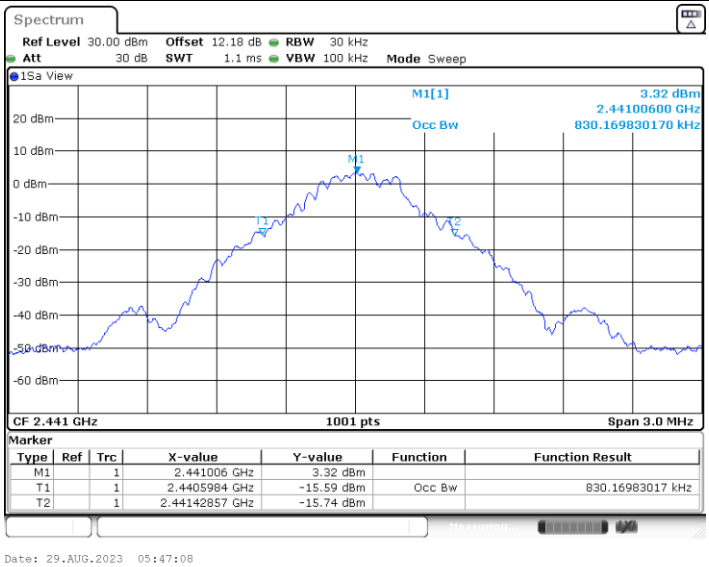
TestMode	Antenna	Freq(MHz)	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant2	2402	0.833	2401.5984	2402.4316	---	---
		2441	0.83	2440.5984	2441.4286	---	---
		2480	0.83	2479.5984	2480.4286	---	---
2DH1	Ant2	2402	1.166	2401.4246	2402.5904	---	---
		2441	1.163	2440.4276	2441.5904	---	---
		2480	1.166	2479.4276	2480.5934	---	---
3DH1	Ant2	2402	1.148	2401.4545	2402.6024	---	---
		2441	1.148	2440.4545	2441.6024	---	---
		2480	1.148	2479.4545	2480.6024	---	---

Test Graphs

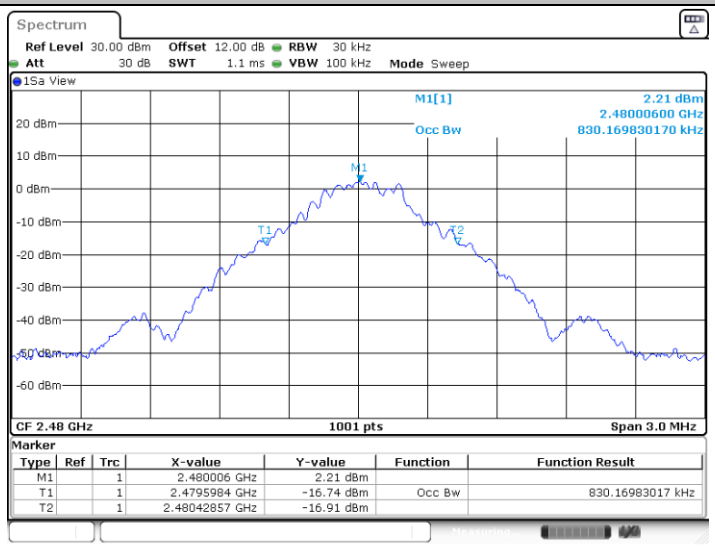
DH5_Ant2_2402



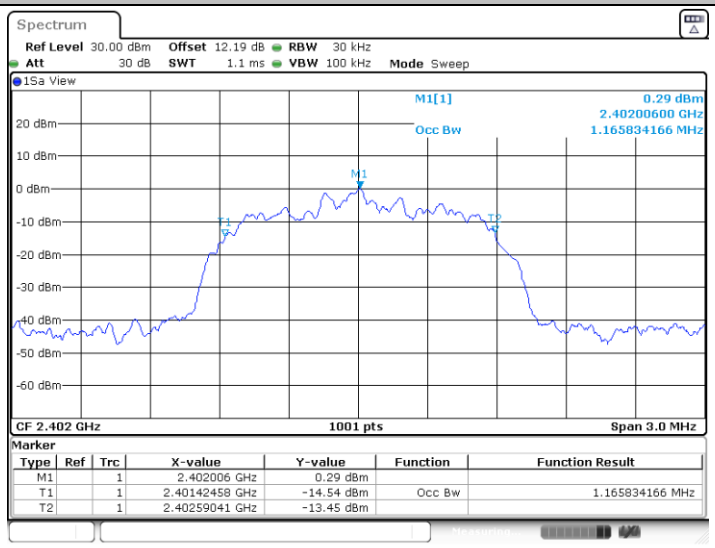
DH5_Ant2_2441



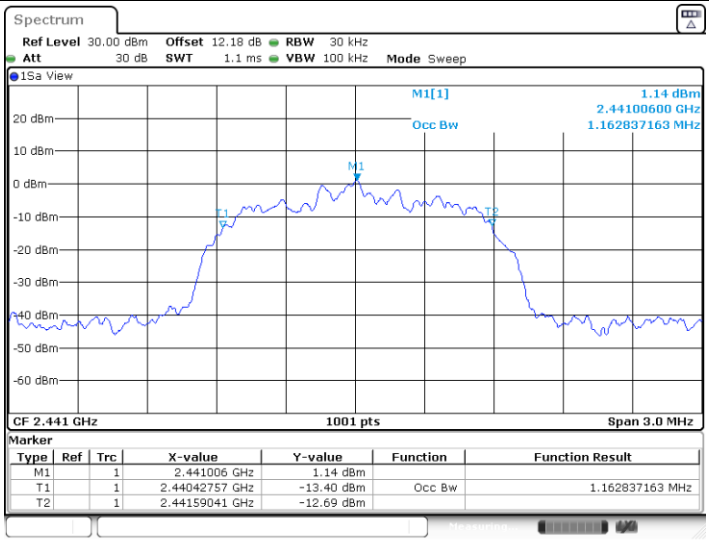
DH5_Ant2_2480



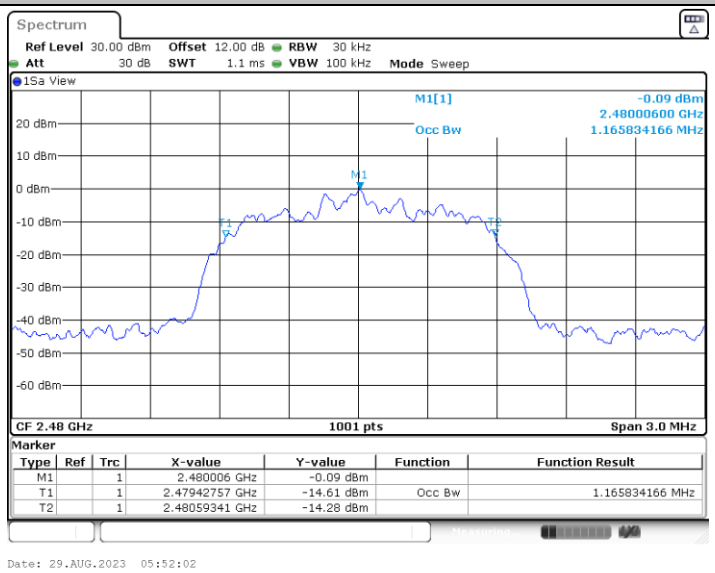
2DH1_Ant2_2402



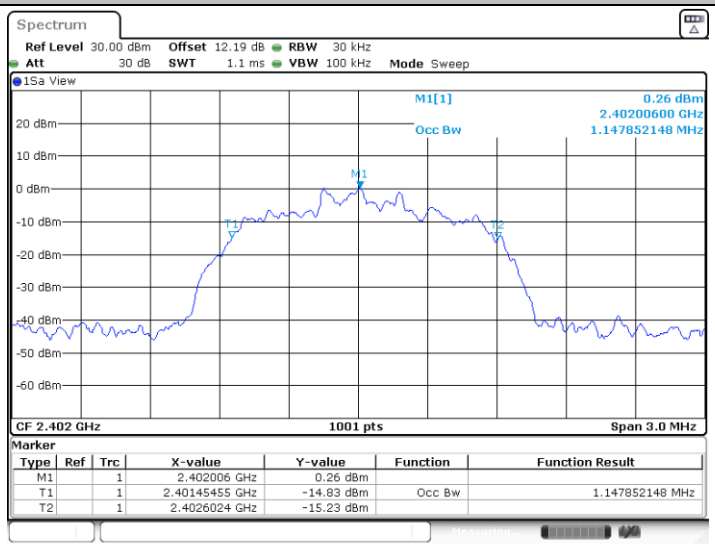
2DH1_Ant2_2441



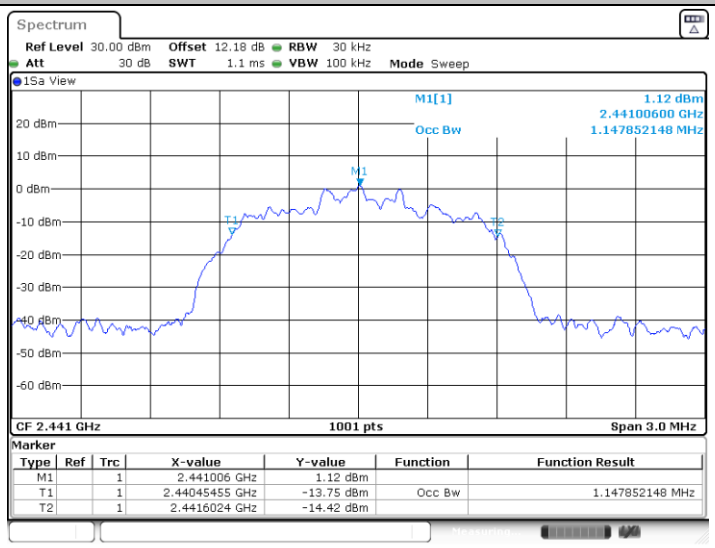
2DH1_Ant2_2480



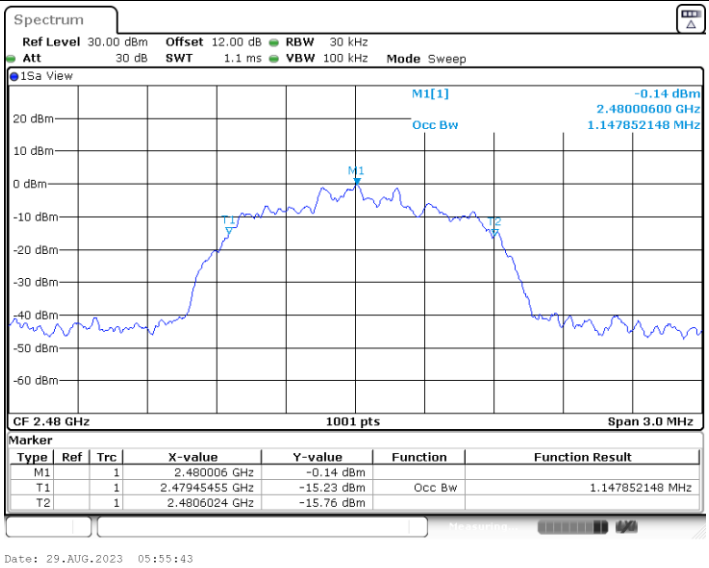
3DH1_Ant2_2402



3DH1_Ant2_2441



3DH1_Ant2_2480



Maximum conducted output power

Test Result Peak

TestMode	Antenna	CH.	Peak Power (dBm)	Power Limit (dBm)	Pass/Fail
DH5	Ant2	0	5.93	20.97	Pass
		39	**6.30**	20.97	Pass
		78	4.97	20.97	Pass
2DH5	Ant2	0	5.29	20.97	Pass
		39	**5.68**	20.97	Pass
		78	4.33	20.97	Pass
3DH5	Ant2	0	5.68	20.97	Pass
		39	**6.03**	20.97	Pass
		78	4.69	20.97	Pass

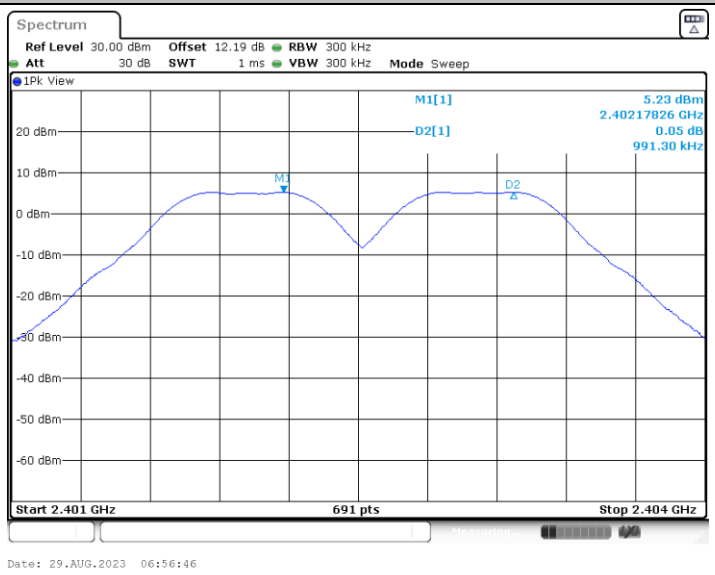
Carrier frequency separation

Test Result

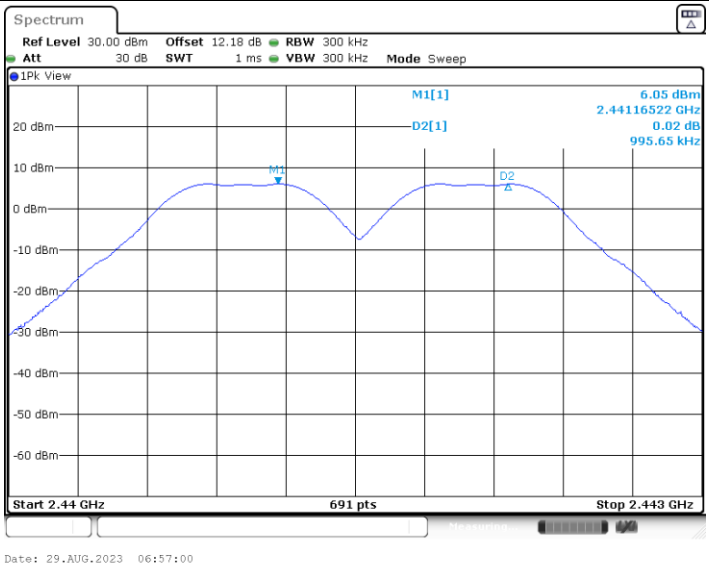
TestMode	Antenna	Freq(MHz)	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant2	2402	0.991	≥0.627	PASS
		2441	0.996	≥0.627	PASS
		2480	0.991	≥0.627	PASS
2DH1	Ant2	2402	1.009	≥0.860	PASS
		2441	1.004	≥0.860	PASS
		2480	1	≥0.813	PASS
3DH1	Ant2	2402	1	≥0.827	PASS
		2441	0.996	≥0.827	PASS
		2480	1.004	≥0.827	PASS

Test Graphs

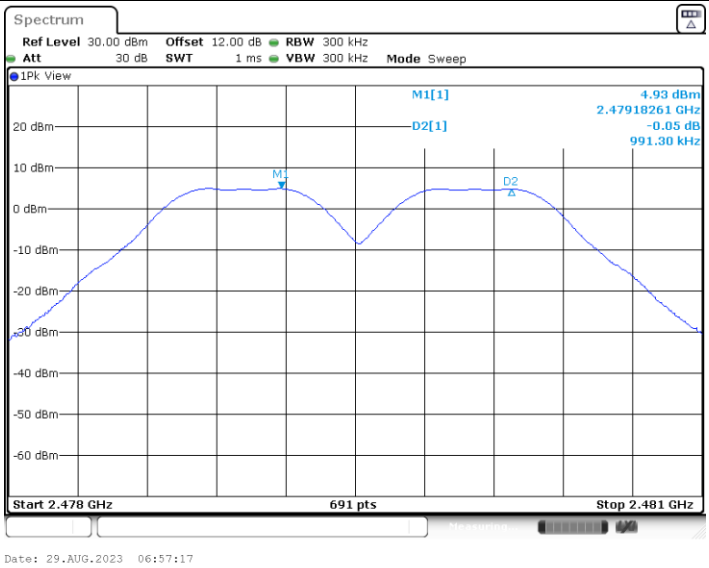
DH5_Ant2_2402



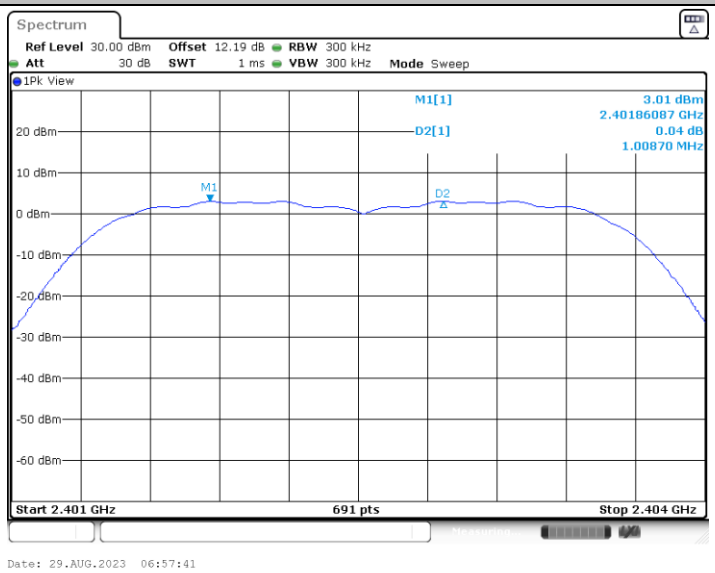
DH5_Ant2_2441



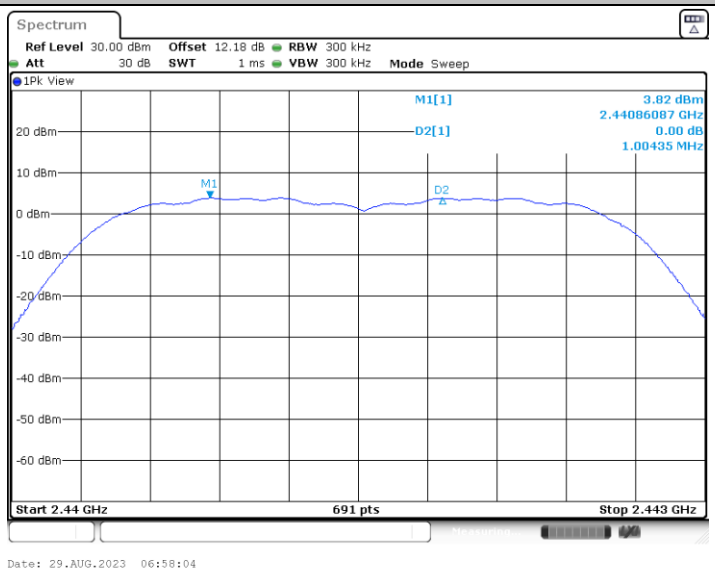
DH5_Ant2_2480



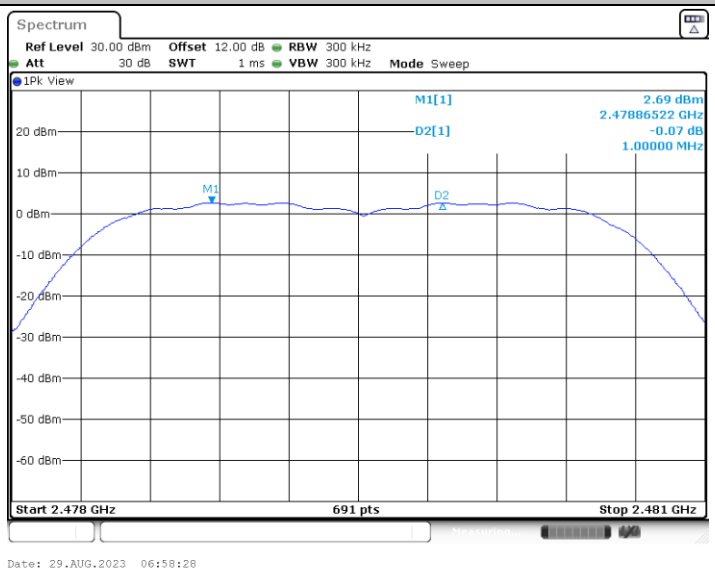
2DH1_Ant2_2402



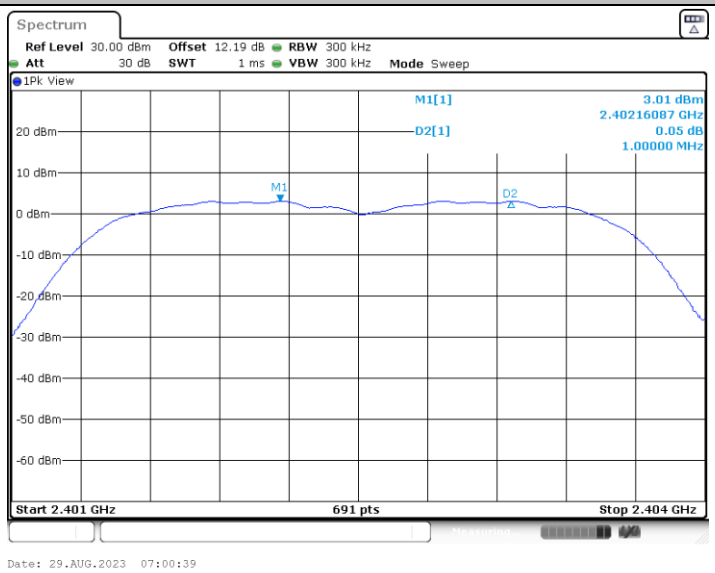
2DH1_Ant2_2441



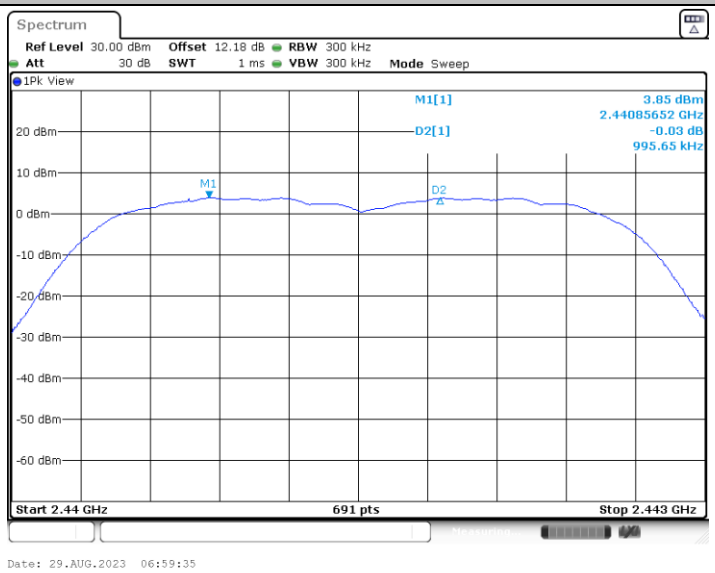
2DH1_Ant2_2480



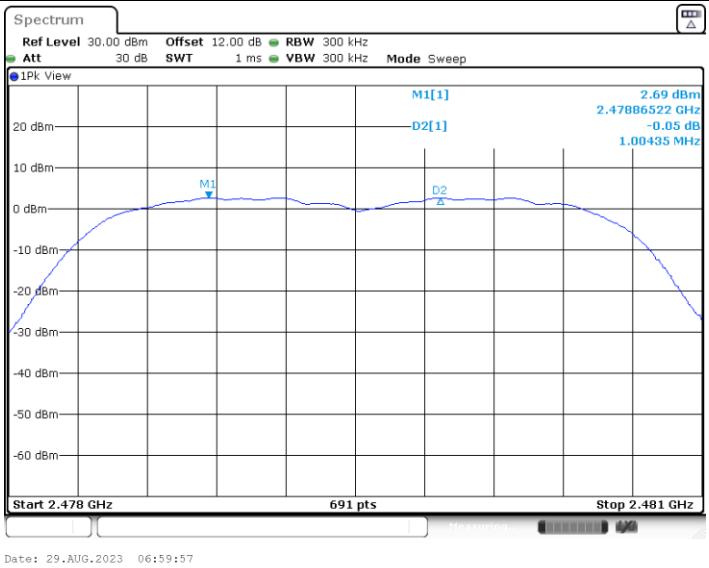
3DH1_Ant2_2402



3DH1_Ant2_2441



3DH1_Ant2_2480



Dwell Time

Test Result

TestMode	Antenna	Hopping Channel Number Rate	Hops Over Occupancy Time(hops)	Package Transfer Time (msec) (MHz)	Dwell Time (sec)	Limits (sec)	Pass/Fail
Normal	Ant2	79	106.67	2.880	0.31	0.4	Pass
AFH	Ant2	20	53.33	2.880	0.15	0.4	Pass

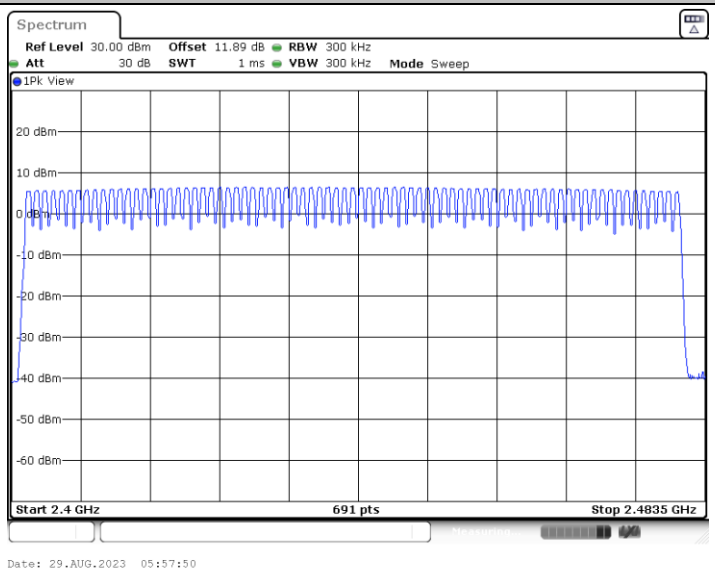
Number of hopping channels

Test Result

TestMode	Antenna	Freq(MHz)	Result[Num]	Limit[Num]	Verdict
DH5	Ant2	Hop	79	≥15	PASS

Test Graphs

DH5_Ant2_Hop



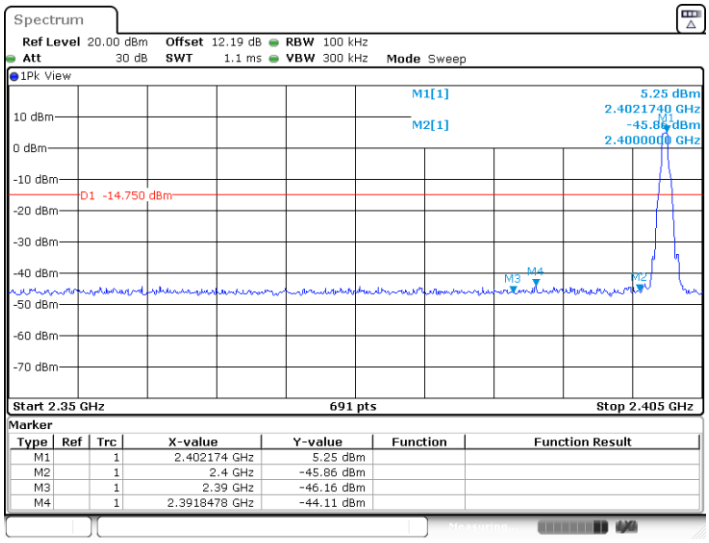
Band edge measurements

Test Result

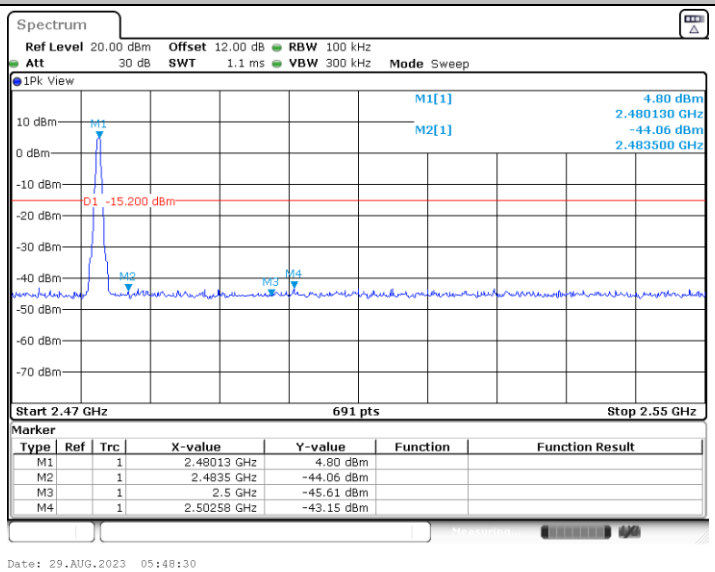
TestMode	Antenna	ChName	Freq(MHz)	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant2	Low	2402	5.25	-44.11	≤-14.75	PASS
		High	2480	4.80	-43.15	≤-15.2	PASS
		Low	Hop_2402	4.64	-44.29	≤-15.36	PASS
		High	Hop_2480	5.05	-42.63	≤-14.95	PASS
2DH1	Ant2	Low	2402	2.89	-43.45	≤-17.11	PASS
		High	2480	2.84	-43.07	≤-17.16	PASS
		Low	Hop_2402	2.47	-44.02	≤-17.53	PASS
		High	Hop_2480	3.02	-42.82	≤-16.98	PASS
3DH1	Ant2	Low	2402	5.00	-43.77	≤-15	PASS
		High	2480	2.46	-43.16	≤-17.54	PASS
		Low	Hop_2402	2.53	-43.72	≤-17.47	PASS
		High	Hop_2480	3.01	-43.37	≤-16.99	PASS

Test Graphs

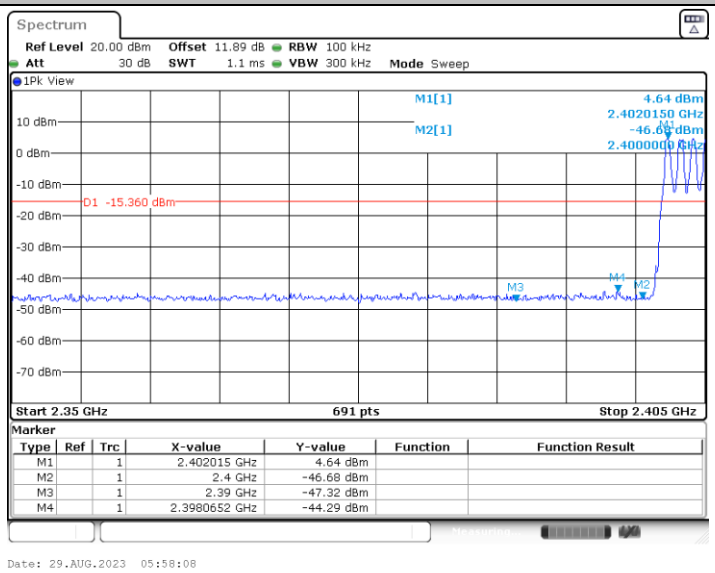
DH5_Ant2_Low_2402



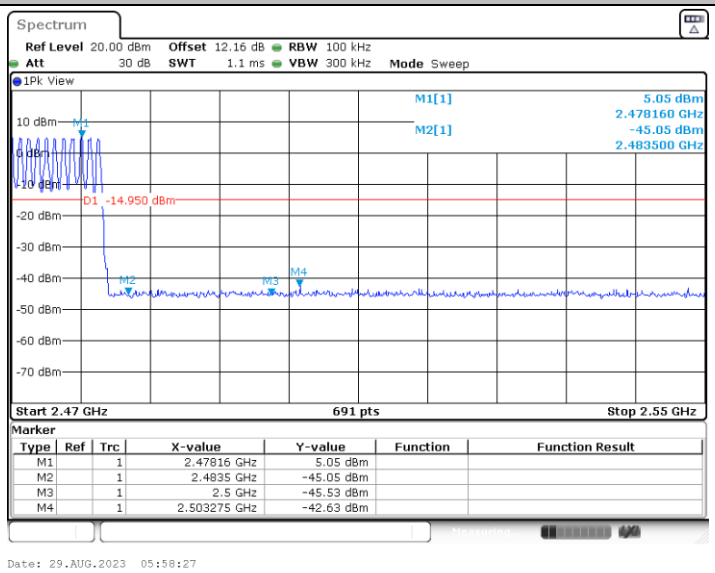
DH5_Ant2_High_2480



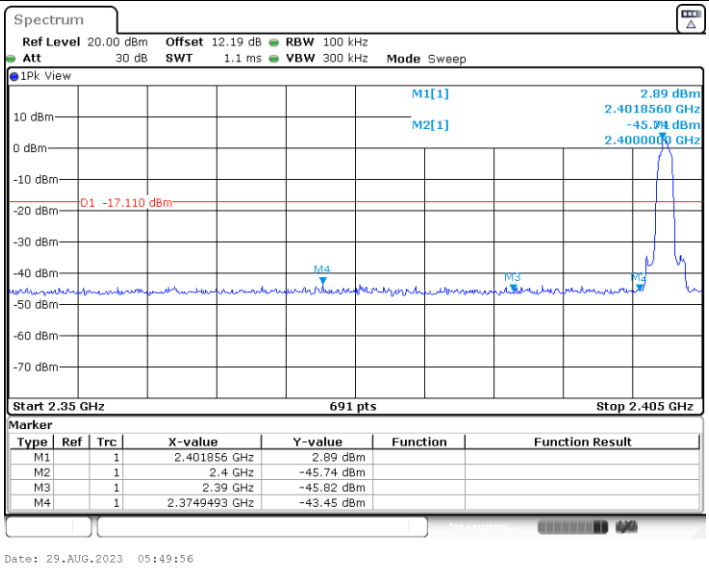
DH5_Ant2_Low_Hop_2402



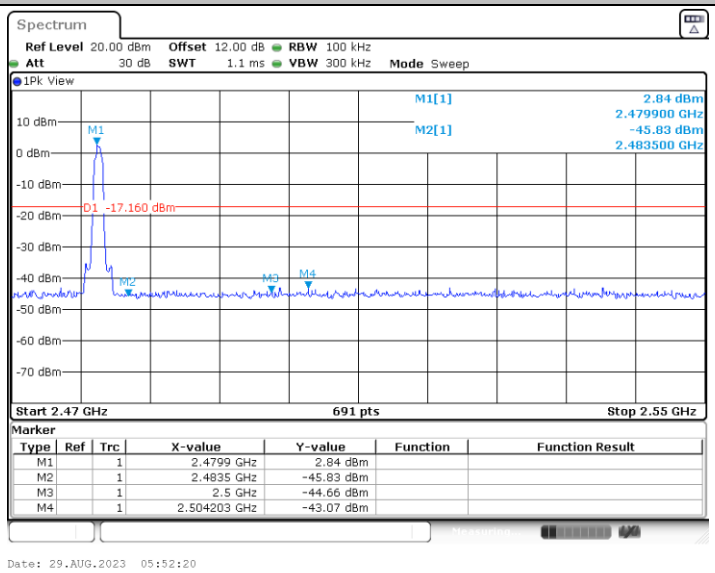
DH5_Ant2_High_Hop_2480



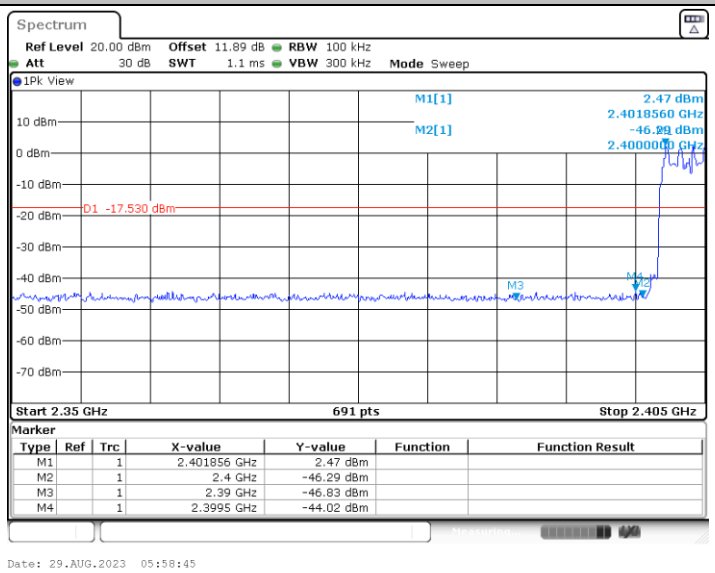
2DH1_Ant2_Low_2402



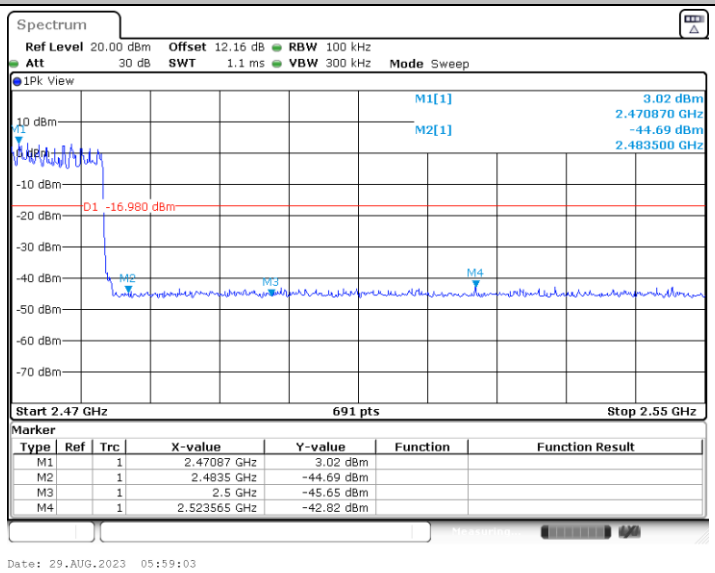
2DH1_Ant2_High_2480



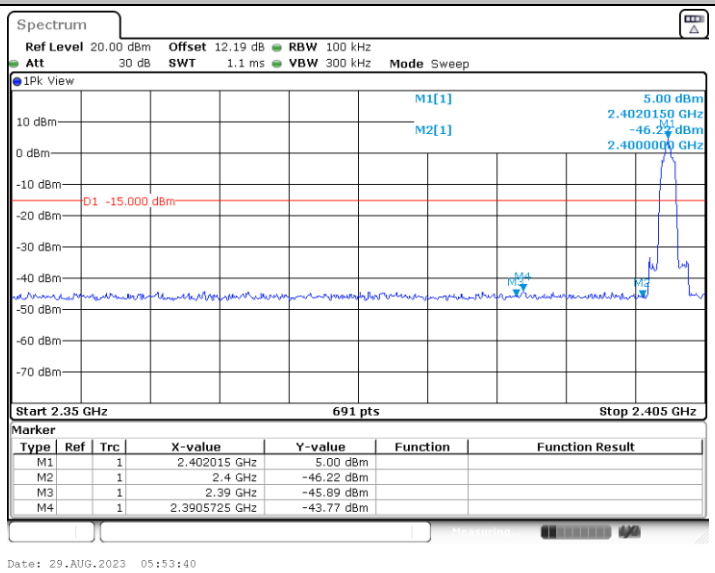
2DH1_Ant2_Low_Hop_2402



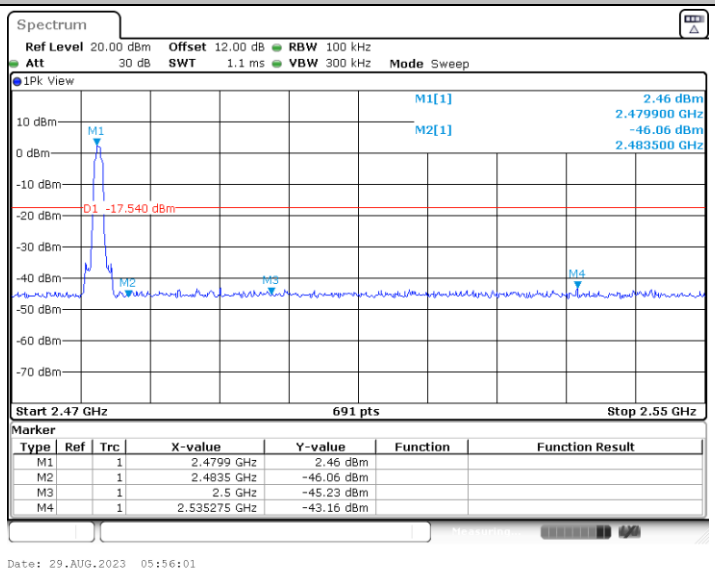
2DH1_Ant2_High_Hop_2480



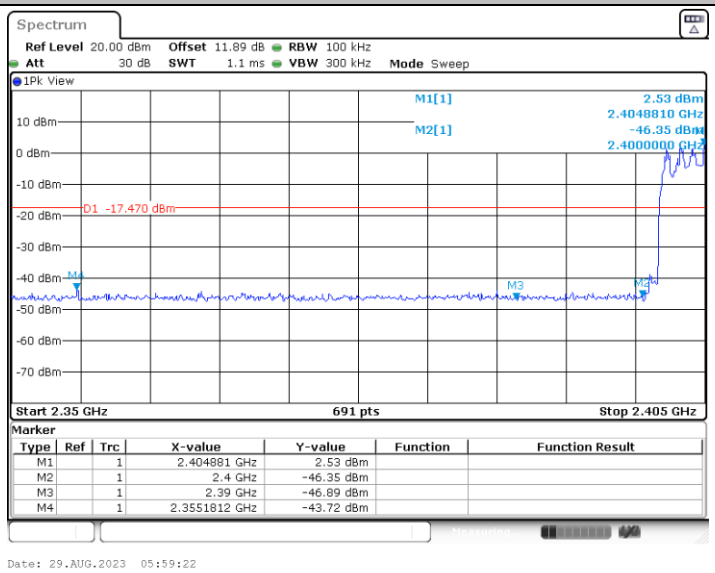
3DH1_Ant2_Low_2402



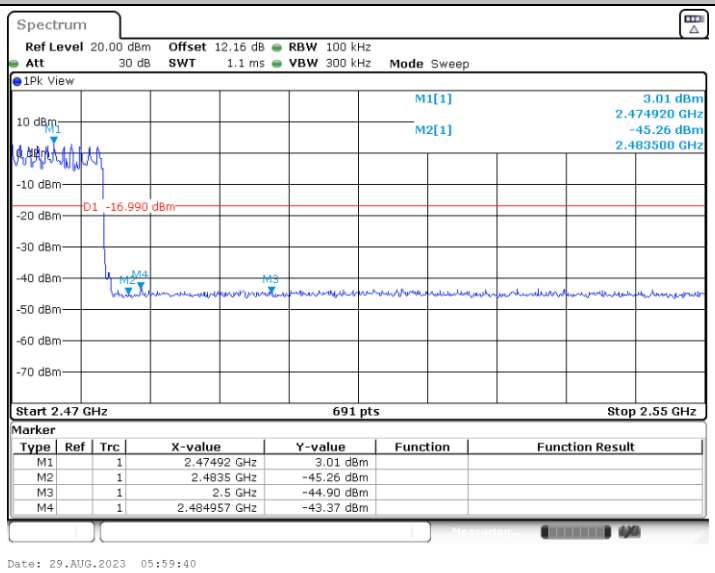
3DH1_Ant2_High_2480



3DH1_Ant2_Low_Hop_2402



3DH1_Ant2_High_Hop_2480



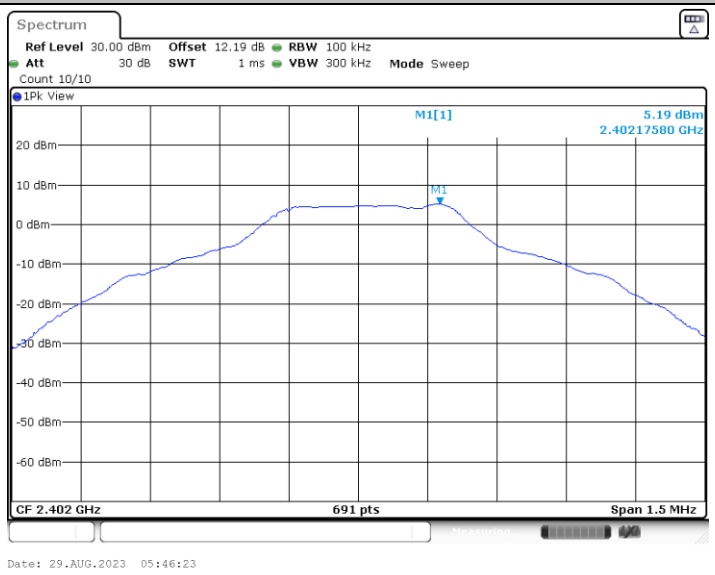
Conducted Spurious Emission

Test Result

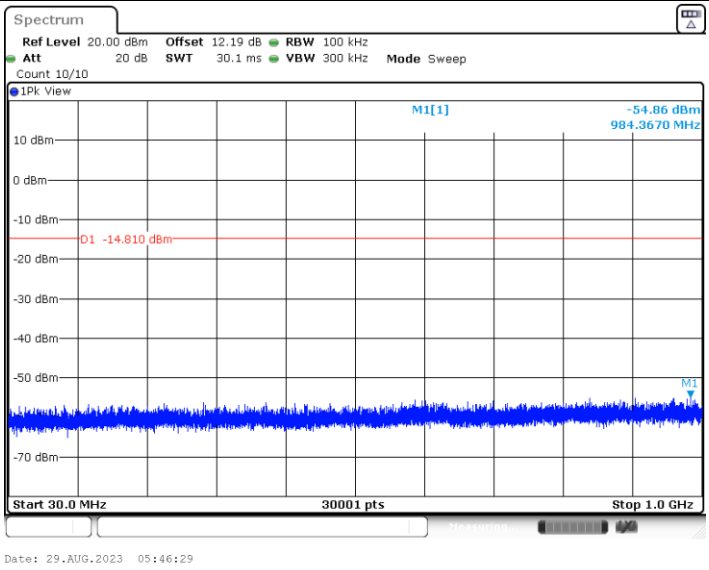
TestMode	Antenna	Freq(MHz)	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant2	2402	Reference	5.19	5.19	---	---
			30~1000	5.19	-54.86	≤-14.81	PASS
			1000~26500	5.19	-45.7	≤-14.81	PASS
		2441	Reference	6.01	6.01	---	---
			30~1000	6.01	-54.94	≤-13.99	PASS
			1000~26500	6.01	-46.25	≤-13.99	PASS
		2480	Reference	4.81	4.81	---	---
			30~1000	4.81	-54.31	≤-15.19	PASS
			1000~26500	4.81	-46.52	≤-15.19	PASS
2DH1	Ant2	2402	Reference	2.77	2.77	---	---
			30~1000	2.77	-54.87	≤-17.23	PASS
			1000~26500	2.77	-45.89	≤-17.23	PASS
		2441	Reference	5.89	5.89	---	---
			30~1000	5.89	-53.91	≤-14.11	PASS
			1000~26500	5.89	-45.59	≤-14.11	PASS
		2480	Reference	3.54	3.54	---	---
			30~1000	3.54	-55.19	≤-16.46	PASS
			1000~26500	3.54	-46.27	≤-16.46	PASS
3DH1	Ant2	2402	Reference	2.89	2.89	---	---
			30~1000	2.89	-54.22	≤-17.11	PASS
			1000~26500	2.89	-46.53	≤-17.11	PASS
		2441	Reference	3.76	3.76	---	---
			30~1000	3.76	-54.57	≤-16.24	PASS
			1000~26500	3.76	-45.84	≤-16.24	PASS
		2480	Reference	2.55	2.55	---	---
			30~1000	2.55	-54.49	≤-17.45	PASS
			1000~26500	2.55	-45.38	≤-17.45	PASS

Test Graphs

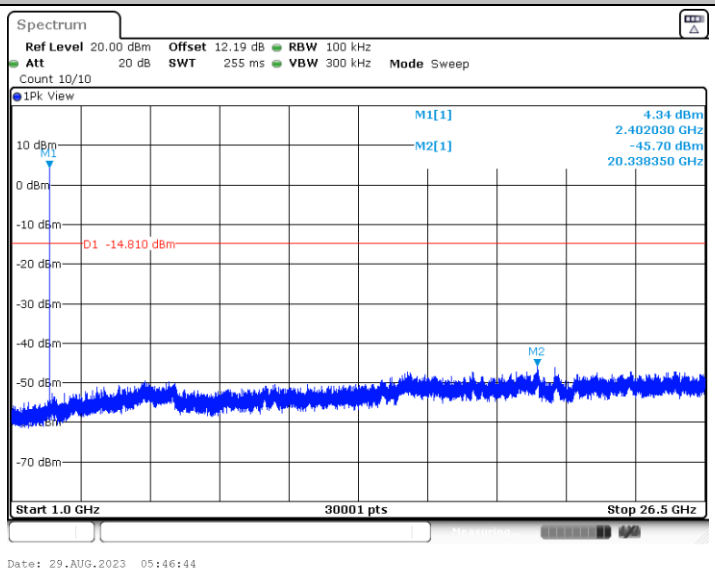
DH5_Ant2_2402_0~Reference



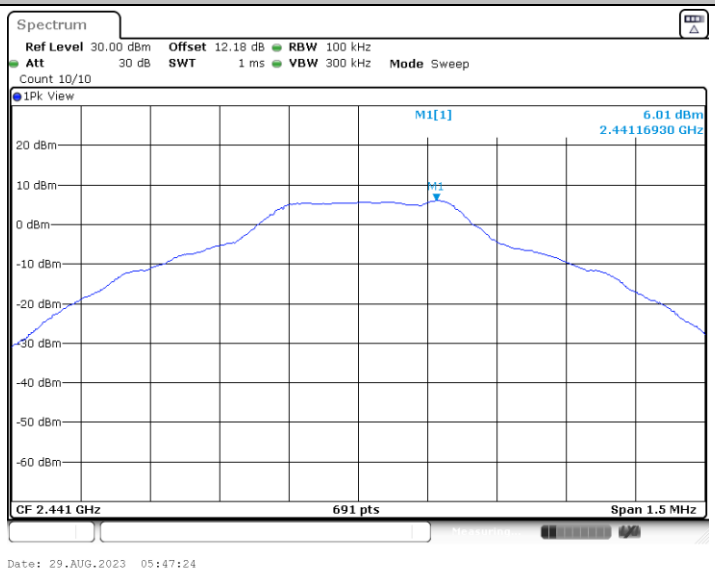
DH5_Ant2_2402_30~1000



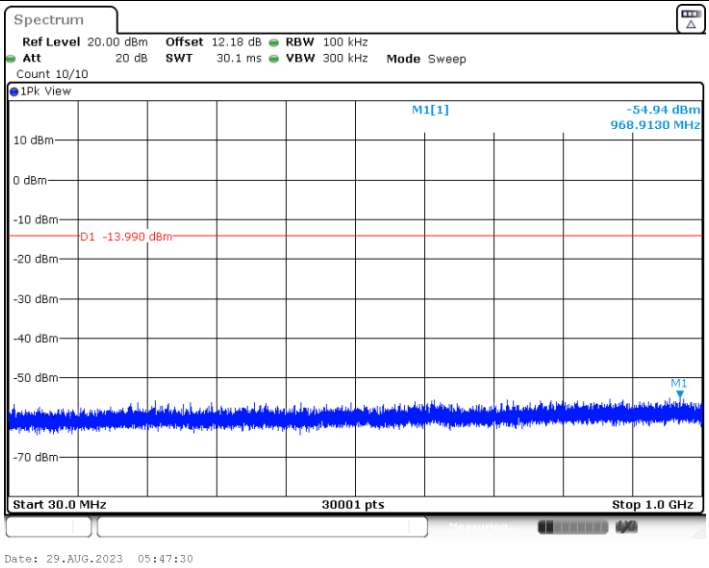
DH5_Ant2_2402_1000~26500



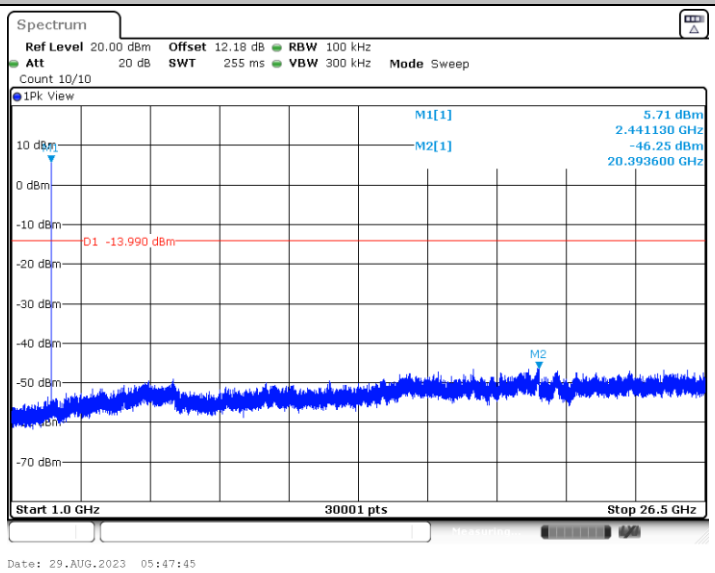
DH5_Ant2_2441_0~Reference



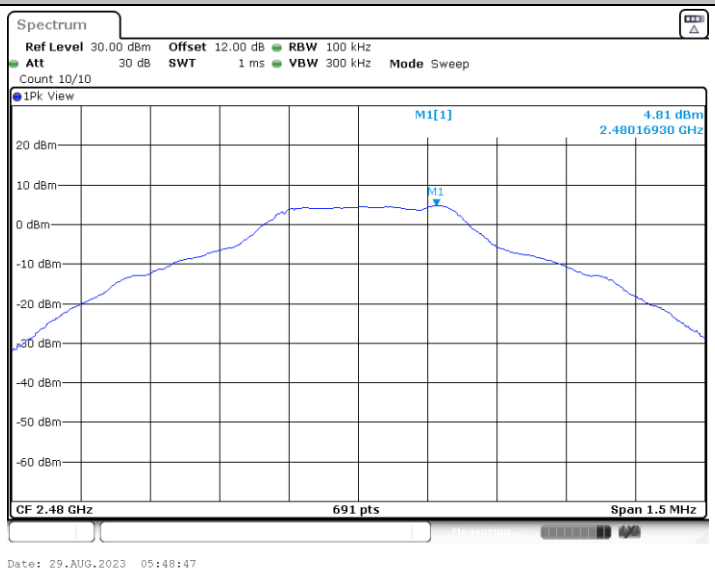
DH5_Ant2_2441_30~1000



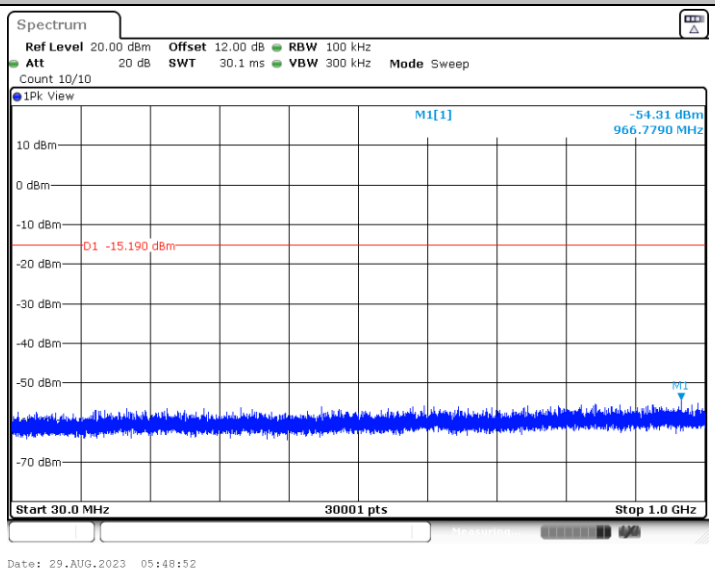
DH5_Ant2_2441_1000~26500



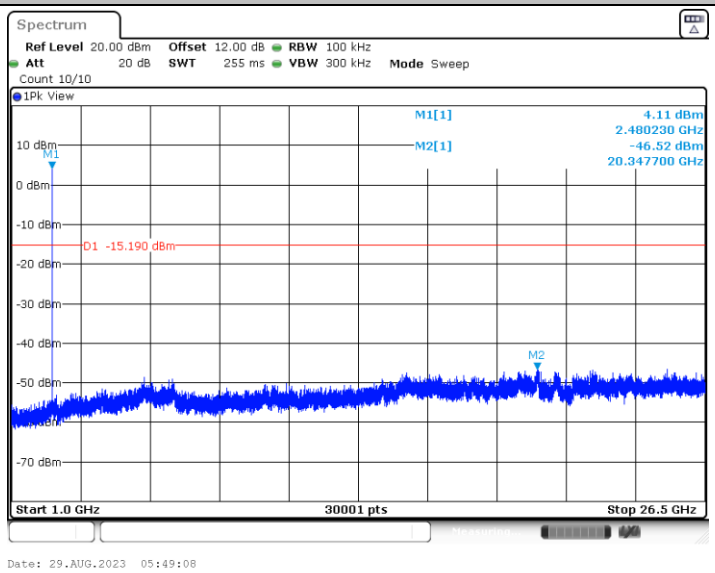
DH5_Ant2_2480_0~Reference



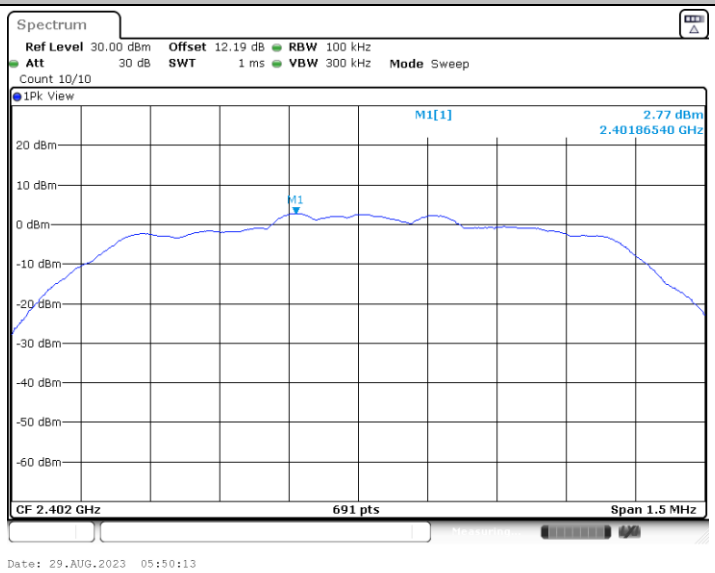
DH5_Ant2_2480_30~1000



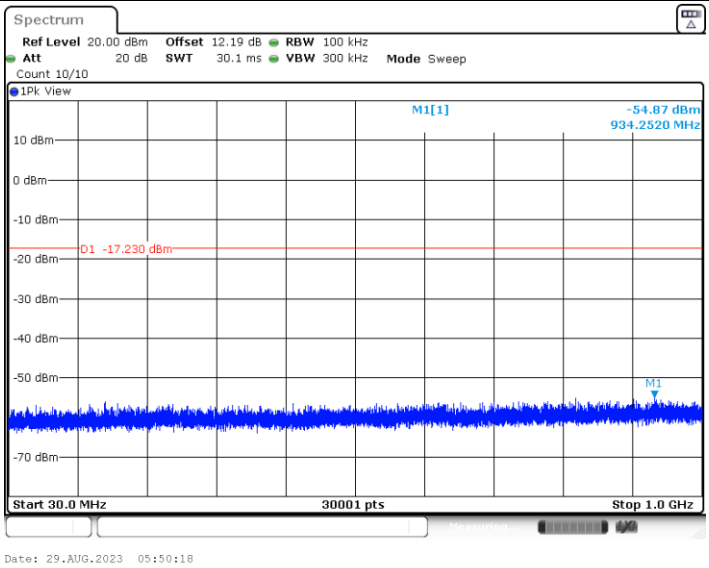
DH5_Ant2_2480_1000~26500



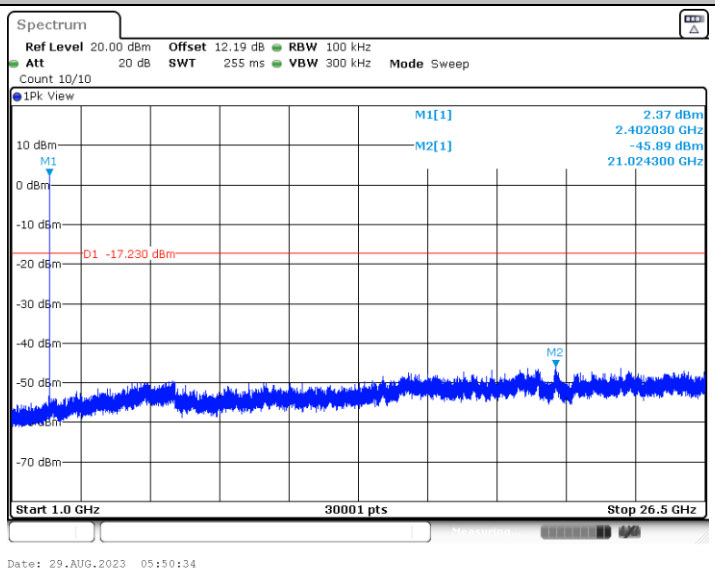
2DH1_Ant2_2402_0~Reference



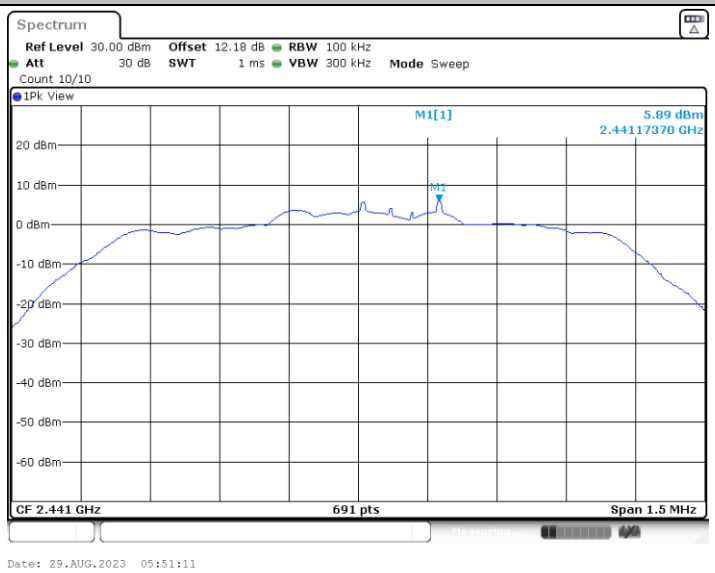
2DH1_Ant2_2402_30~1000



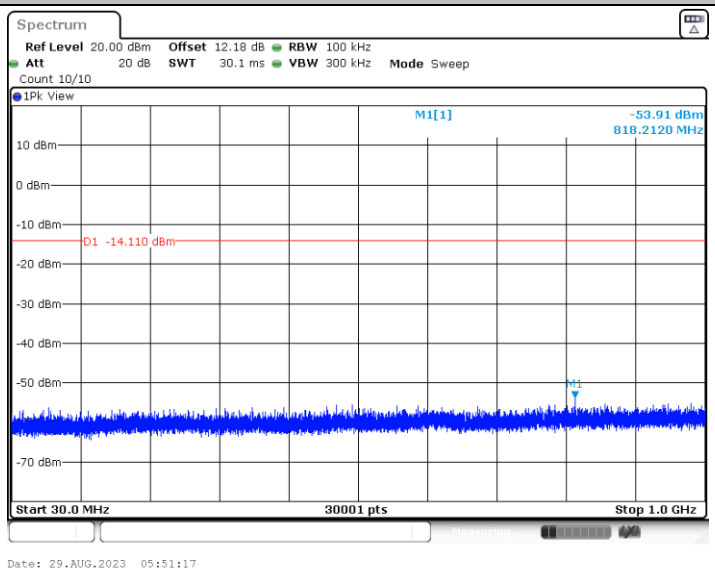
2DH1_Ant2_2402_1000~26500



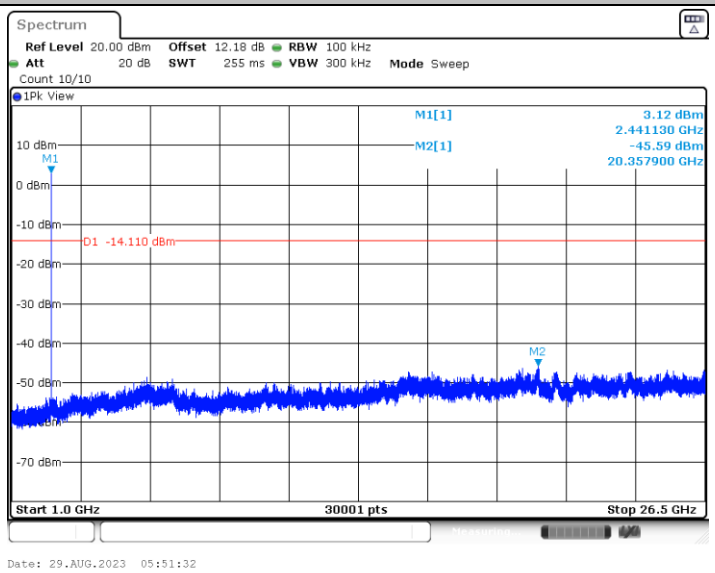
2DH1_Ant2_2441_0~Reference



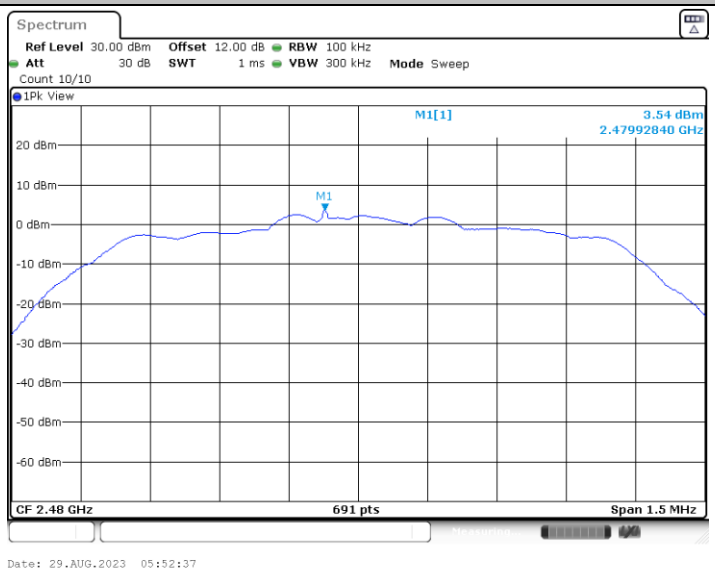
2DH1_Ant2_2441_30~1000



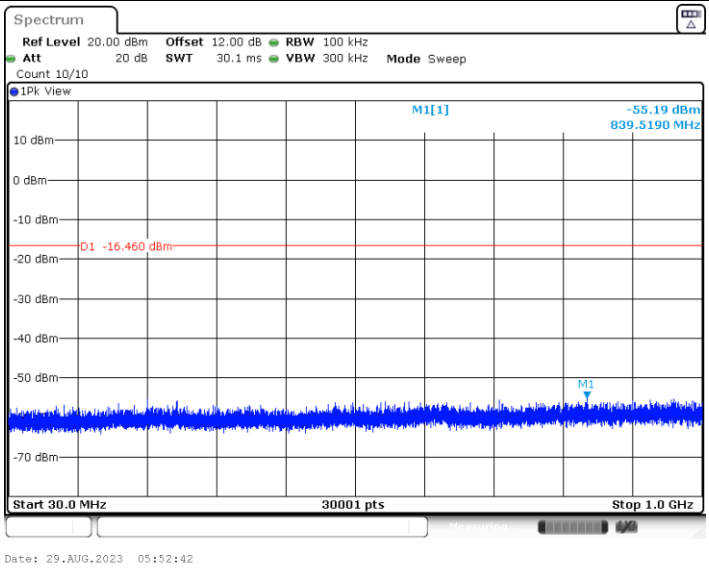
2DH1_Ant2_2441_1000~26500



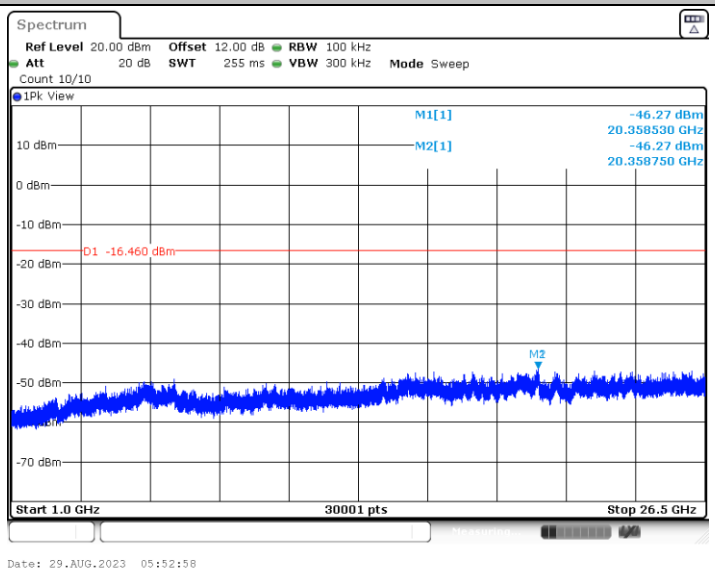
2DH1_Ant2_2480_0~Reference



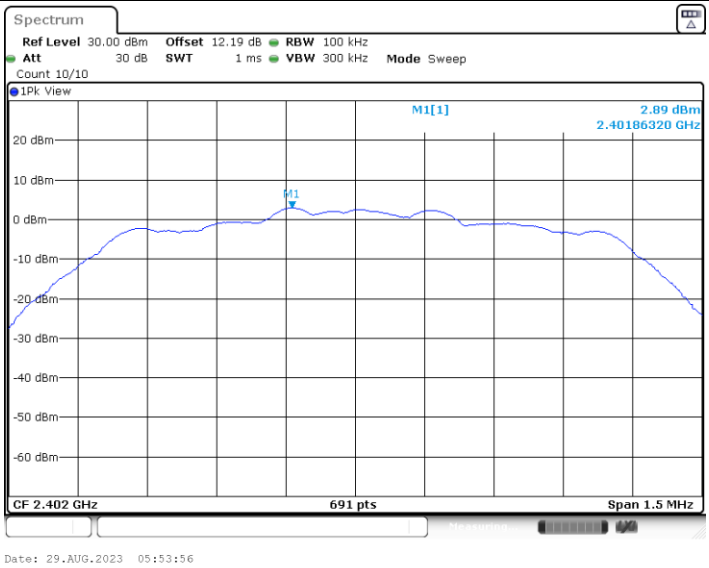
2DH1_Ant2_2480_30~1000



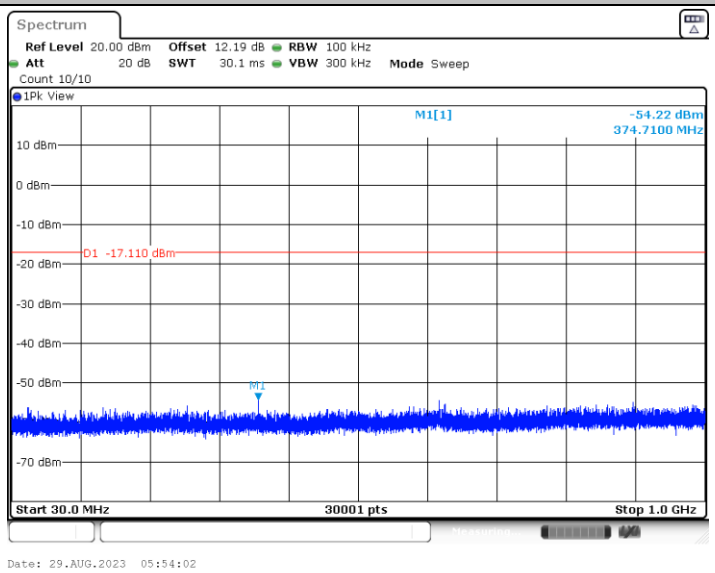
2DH1_Ant2_2480_1000~26500



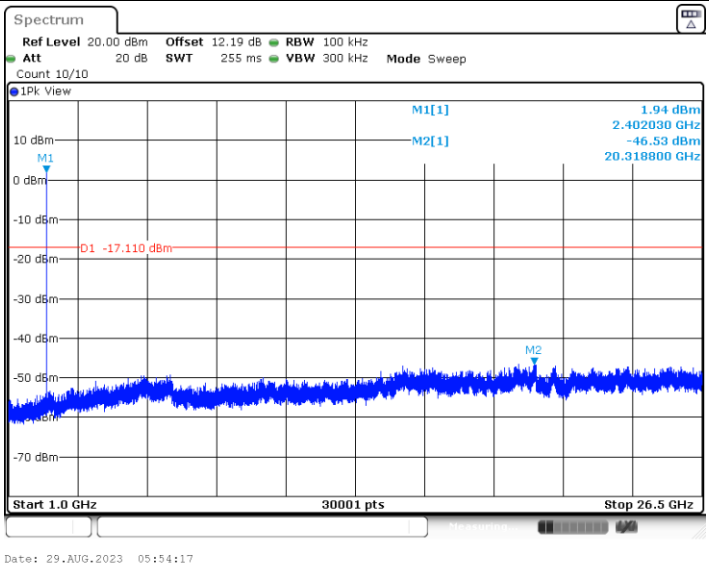
3DH1_Ant2_2402_0~Reference



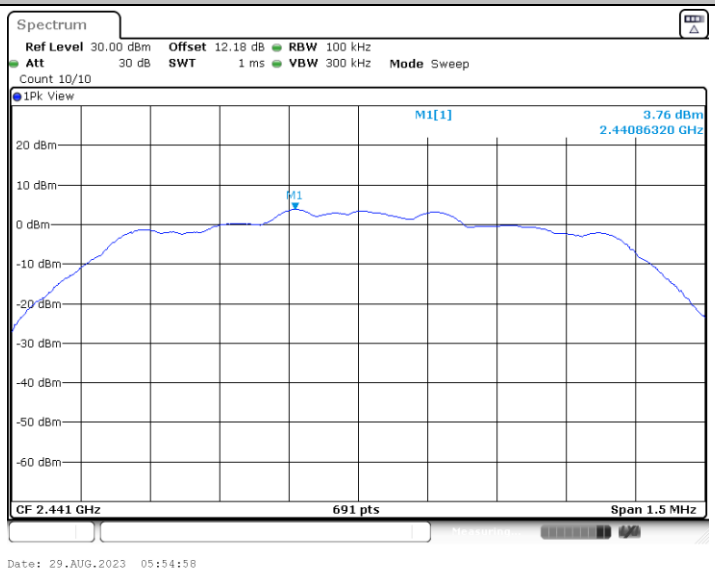
3DH1_Ant2_2402_30~1000



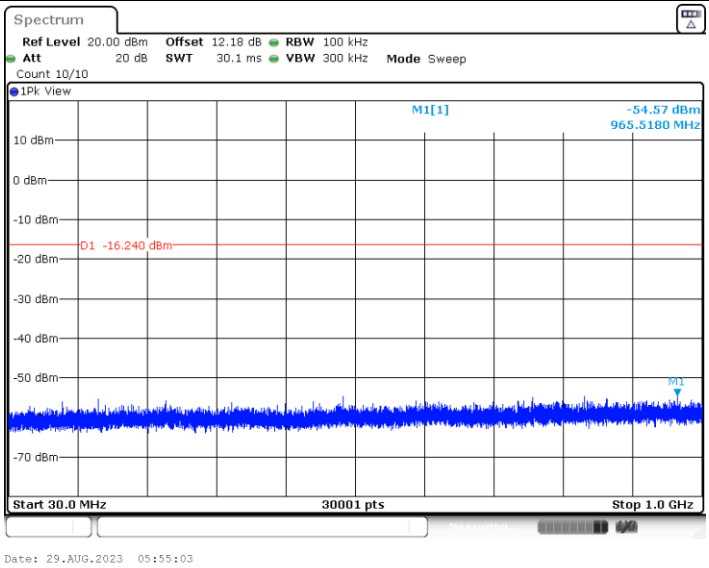
3DH1_Ant2_2402_1000~26500



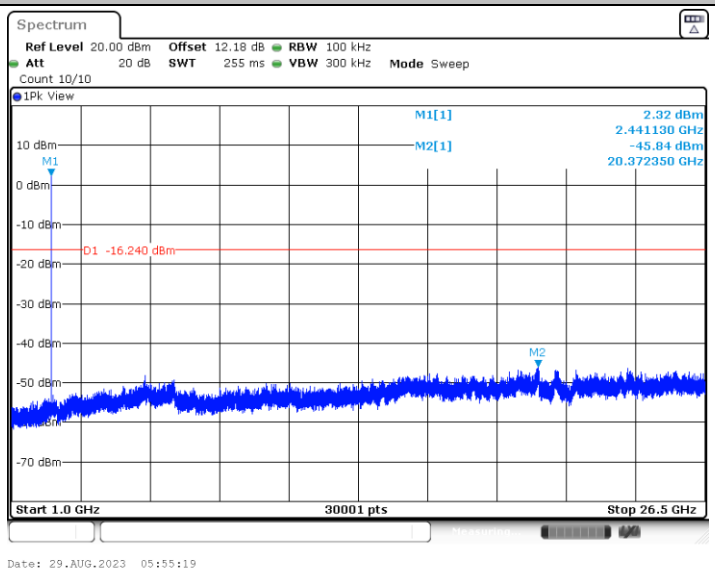
3DH1_Ant2_2441_0~Reference



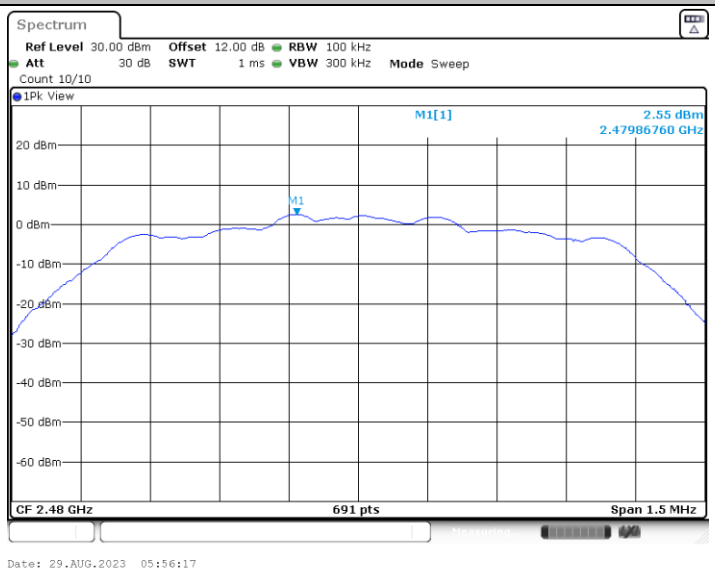
3DH1_Ant2_2441_30~1000



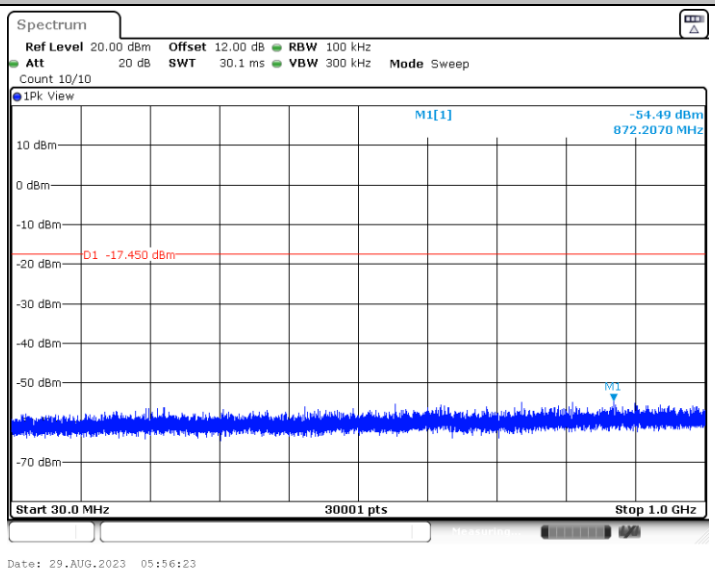
3DH1_Ant2_2441_1000~26500



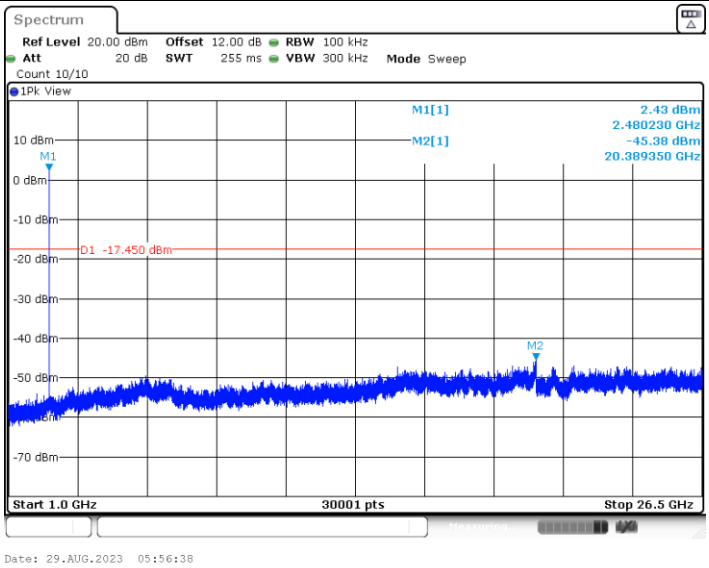
3DH1_Ant2_2480_0~Reference



3DH1_Ant2_2480_30~1000

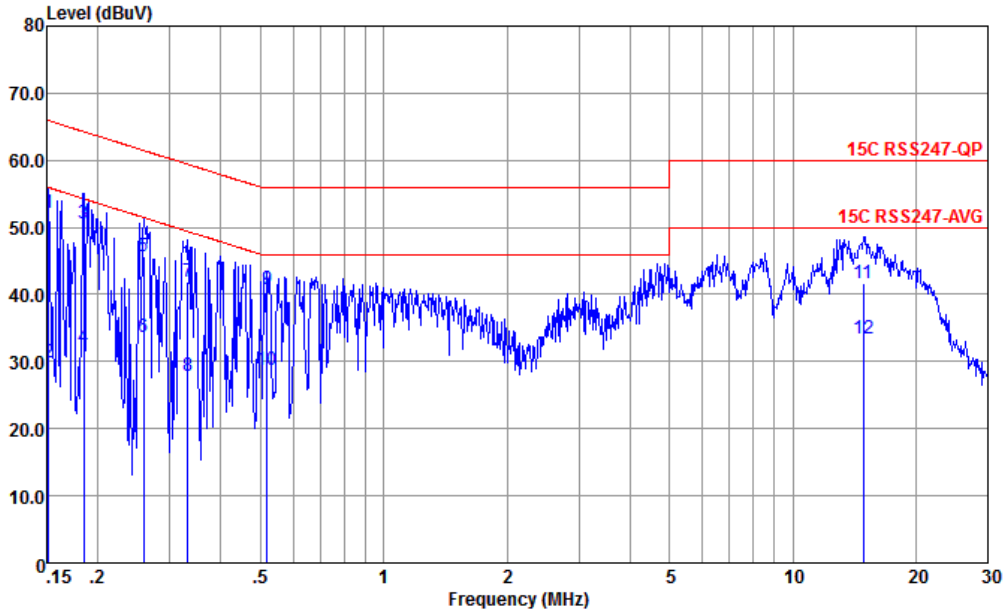


3DH1_Ant2_2480_1000~26500



Appendix B. AC Conducted Emission Test Results

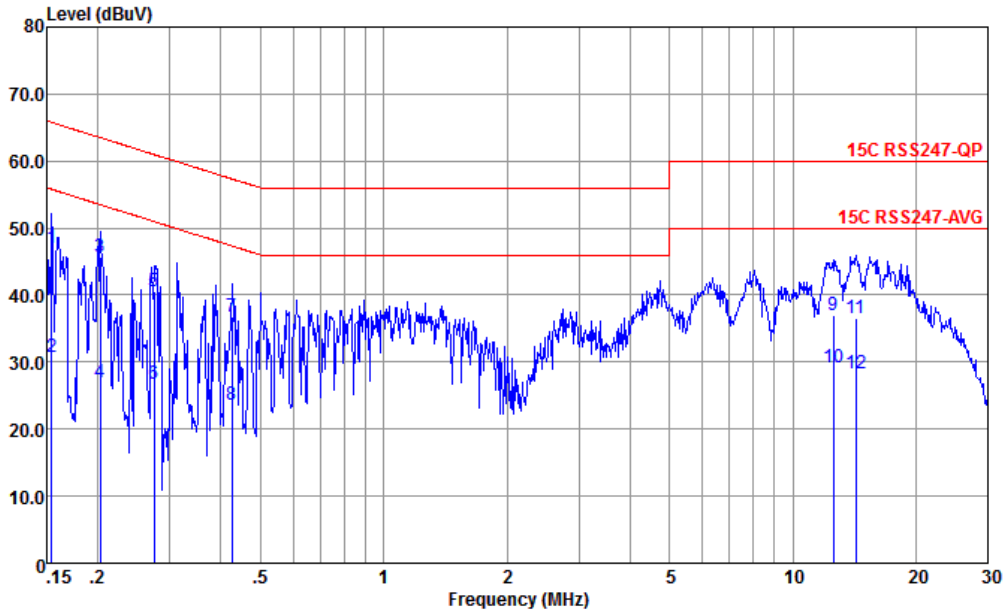
Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : 15C RSS247-QP LISN-060105-L 2023 LINE

		Freq MHz	Level dBuV	Over Limit dB	Limit Line dBuV	Read Level dBuV	LISN Factor dB	Cable Loss dB	Remark
1		0.152	52.08	-13.83	65.91	41.60	0.05	10.43	QP
2		0.152	29.78	-26.13	55.91	19.30	0.05	10.43	Average
3	*	0.184	50.66	-13.62	64.28	40.20	0.04	10.42	QP
4		0.184	32.06	-22.22	54.28	21.60	0.04	10.42	Average
5		0.259	45.61	-15.86	61.47	35.19	0.04	10.38	QP
6		0.259	33.71	-17.76	51.47	23.29	0.04	10.38	Average
7		0.332	41.86	-17.54	59.40	31.50	0.03	10.33	QP
8		0.332	27.96	-21.44	49.40	17.60	0.03	10.33	Average
9		0.518	40.67	-15.33	56.00	30.50	-0.03	10.20	QP
10		0.518	28.77	-17.23	46.00	18.60	-0.03	10.20	Average
11		14.907	41.61	-18.39	60.00	30.50	-0.12	11.23	QP
12		14.907	33.41	-16.59	50.00	22.30	-0.12	11.23	Average

Test Engineer :	Amos Zhang	**Temperature :**	25.3~26.2℃
		Relative Humidity :	38~40%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO01-KS
Condition : 15C RSS247-QP LISN-060105-N 2023 NEUTRAL

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.154	47.07	-18.71	65.78	36.60	0.04	10.43	QP
2	0.154	30.77	-25.01	55.78	20.30	0.04	10.43	Average
3 *	0.203	45.66	-17.83	63.49	35.19	0.05	10.42	QP
4	0.203	27.06	-26.43	53.49	16.59	0.05	10.42	Average
5	0.274	40.54	-20.44	60.98	30.19	-0.02	10.37	QP
6	0.274	26.84	-24.14	50.98	16.49	-0.02	10.37	Average
7	0.426	36.81	-20.52	57.33	26.60	-0.06	10.27	QP
8	0.426	23.71	-23.62	47.33	13.50	-0.06	10.27	Average
9	12.582	37.09	-22.91	60.00	26.19	-0.14	11.04	QP
10	12.582	29.19	-20.81	50.00	18.29	-0.14	11.04	Average
11	14.288	36.57	-23.43	60.00	25.50	-0.11	11.18	QP
12	14.288	28.27	-21.73	50.00	17.20	-0.11	11.18	Average

Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

Appendix C. Radiated Spurious Emission Test Data

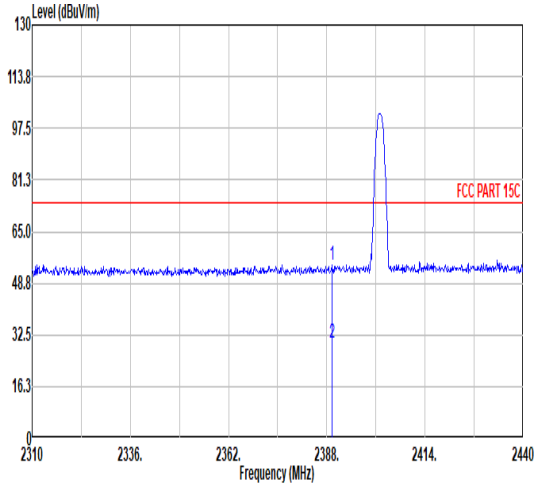
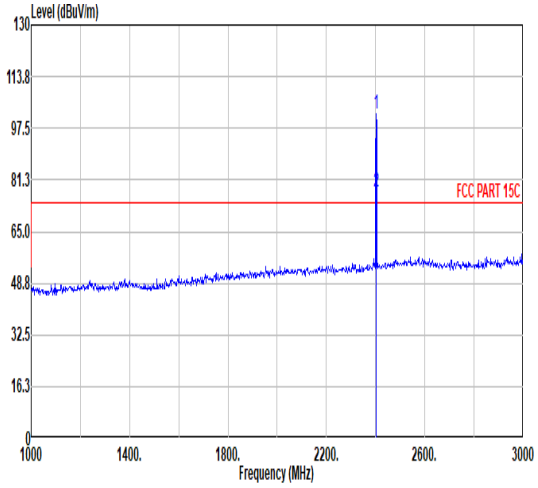
Test Engineer :	Ryan Xu	**Relative Humidity :**	41 ~ 42％
		Temperature :	22 ~ 23℃

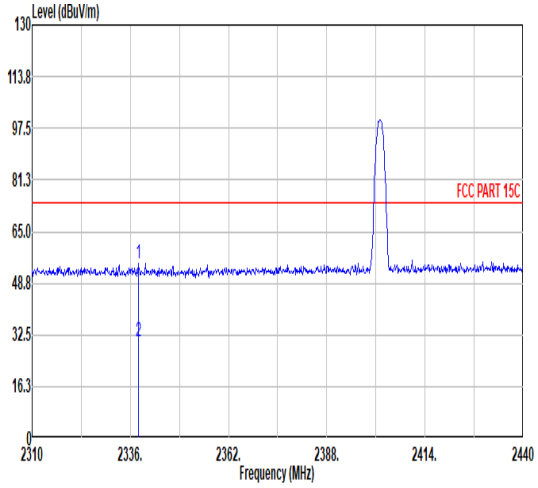
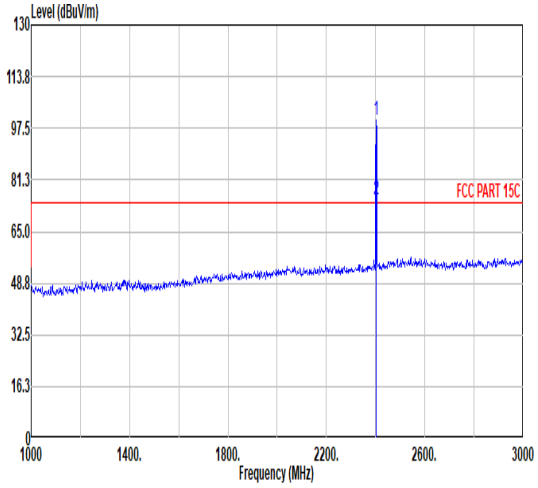
Radiated Spurious Emission Test Modes

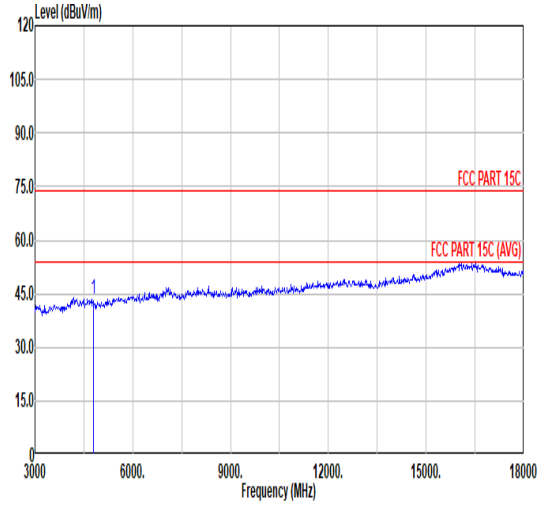
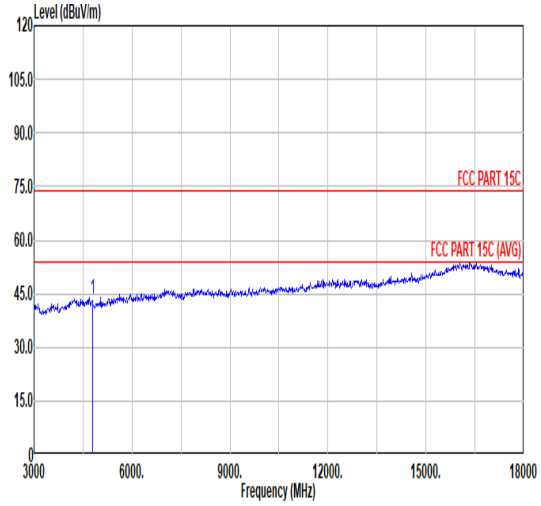
Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 1	2400-2483.5	2	Bluetooth BR_GFSK	00	2402	1Mbps	-	-
Mode 2	2400-2483.5	2	Bluetooth BR_GFSK	19	2440	1Mbps	-	-
Mode 3	2400-2483.5	2	Bluetooth BR_GFSK	78	2480	1Mbps	-	-

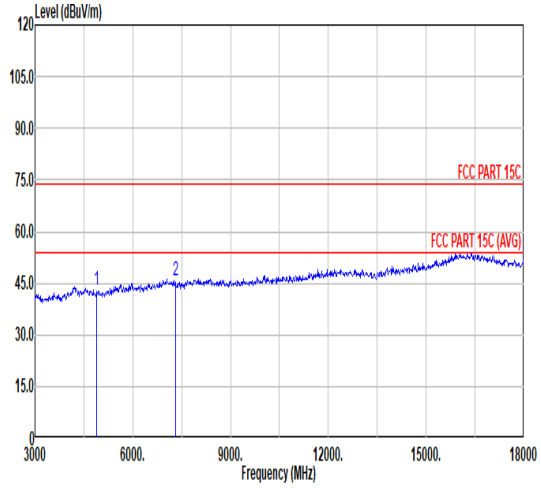
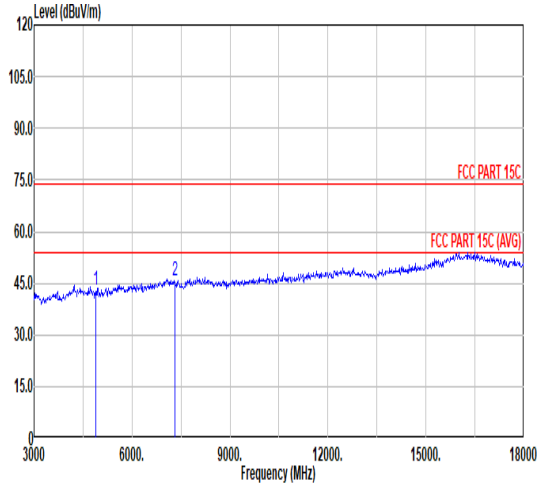
Summary of each worse mode

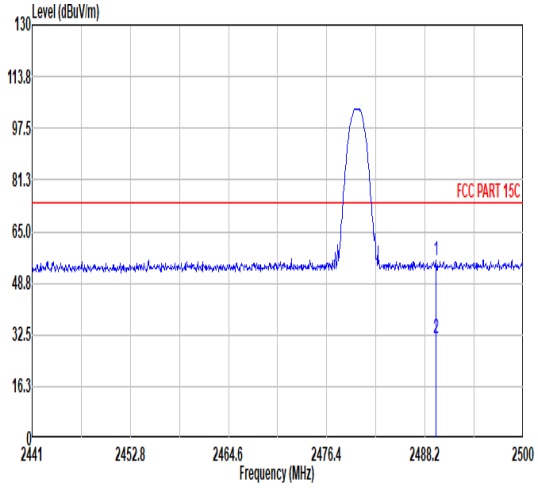
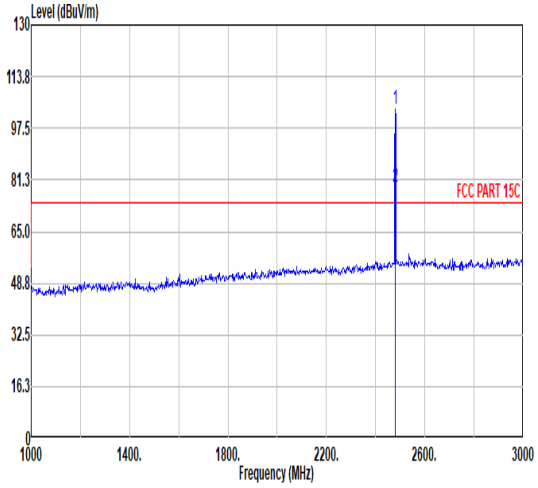
Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	Remark
1	Bluetooth BR_GFSK	00	2338.08	54.97	74.00	-19.03	V	PEAK	Pass	Band Edge
	Bluetooth BR_GFSK	00	4804.00	43.55	74.00	-30.45	V	PEAK	Pass	Harmonic
2	Bluetooth BR_GFSK	19	-	-	-	-	-	-	-	Band Edge
	Bluetooth BR_GFSK	19	7320.00	45.60	74.00	-28.40	H	PEAK	Pass	Harmonic
3	Bluetooth BR_GFSK	78	2490.62	56.06	74.00	-17.94	V	PEAK	Pass	Band Edge
	Bluetooth BR_GFSK	78	7440.00	45.53	74.00	-28.47	H	PEAK	Pass	Harmonic
3	Bluetooth BR_GFSK	78	58.13	33.76	40.00	-6.24	V	PEAK	Pass	LF

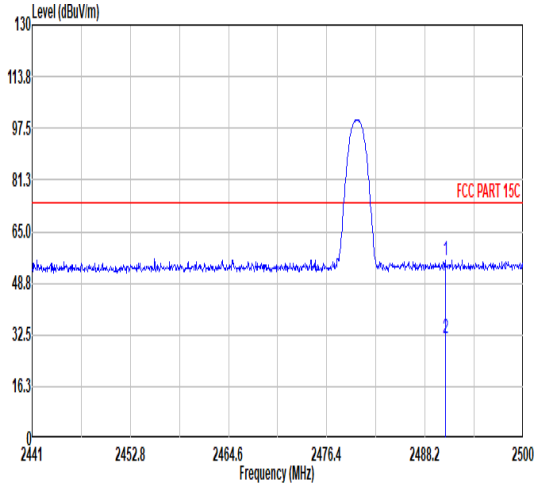
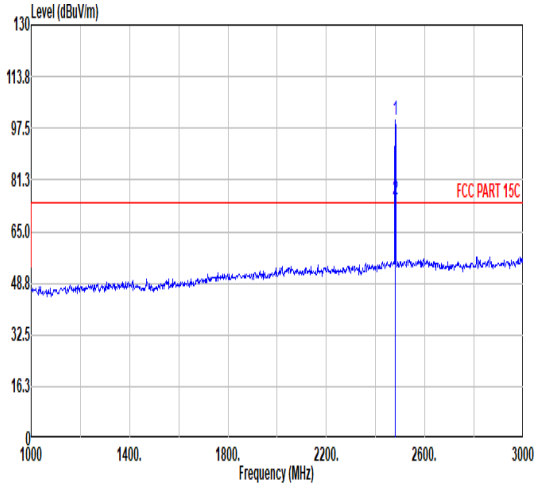
Mode	1	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH00_2402MHz	
ANT	2	
Pol.	Horizontal	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2389.30 54.52 74.00 -19.48 42.73 32.05 6.60 32.86 6.00 137 233 PEAK 2 2389.30 29.73 54.00 -24.27 17.94 32.05 6.60 32.86 6.00 137 233 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2402.00 102.15 ------ ------ 90.16 32.21 6.62 32.84 6.00 137 233 PEAK 2 2402.00 77.36 ------ ------ 65.37 32.21 6.62 32.84 6.00 137 233 AVERAGE

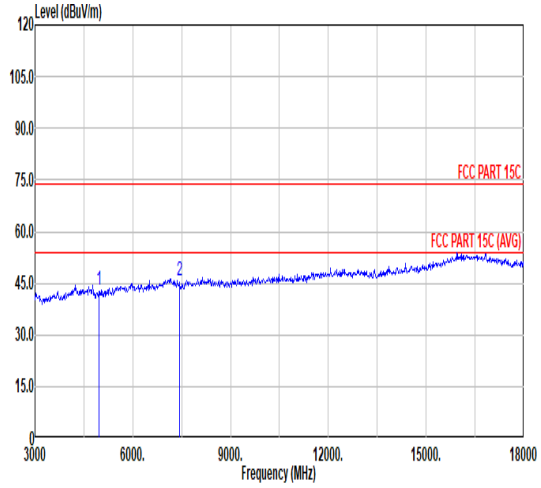
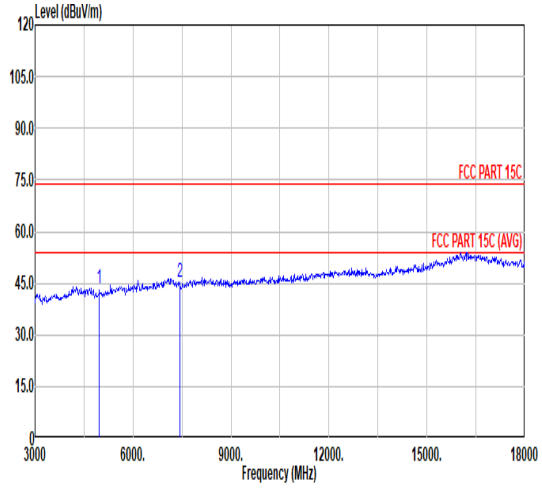
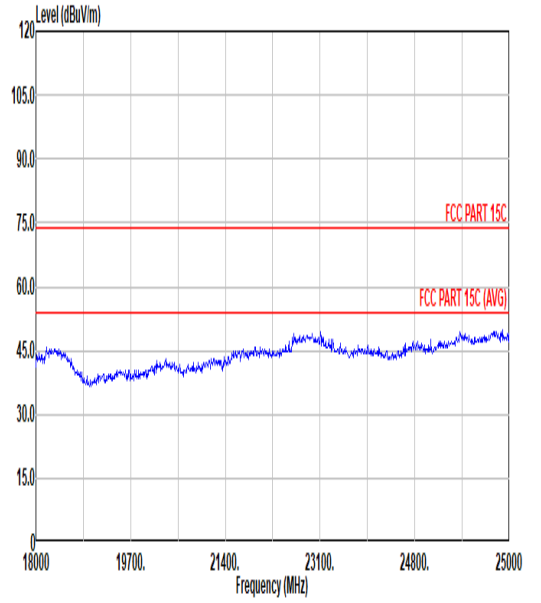
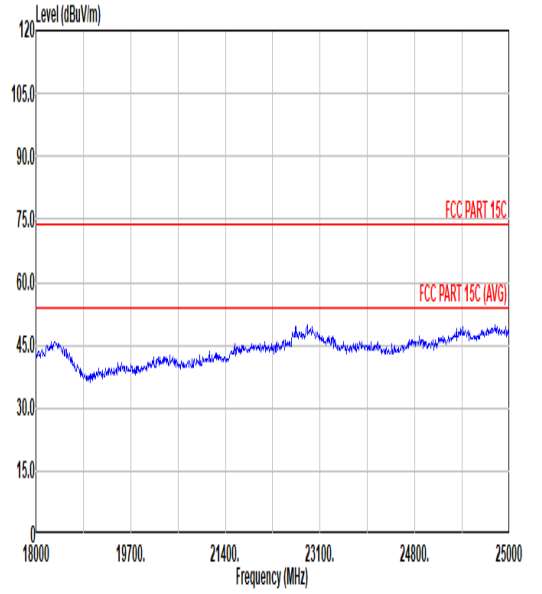
Mode	1	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH00_2402MHz	
ANT	2	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2338.08 54.97 74.00 -19.03 43.79 31.60 6.52 32.94 6.00 386 171 PEAK 2 2338.08 30.18 54.00 -23.82 19.00 31.60 6.52 32.94 6.00 386 171 AVERAGE	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2402.00 100.02 ------ ------ 88.03 32.21 6.62 32.84 6.00 386 171 PEAK 2 2402.00 75.23 ------ ------ 63.24 32.21 6.62 32.84 6.00 386 171 AVERAGE

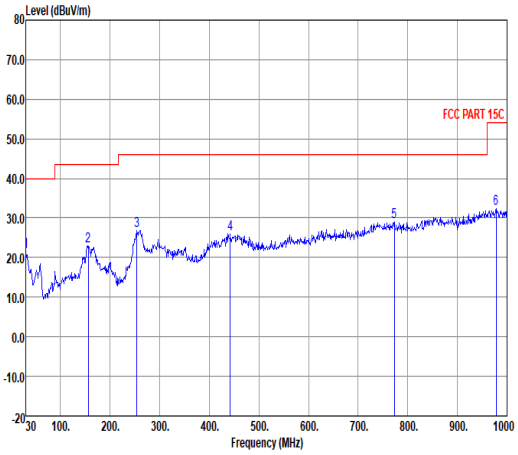
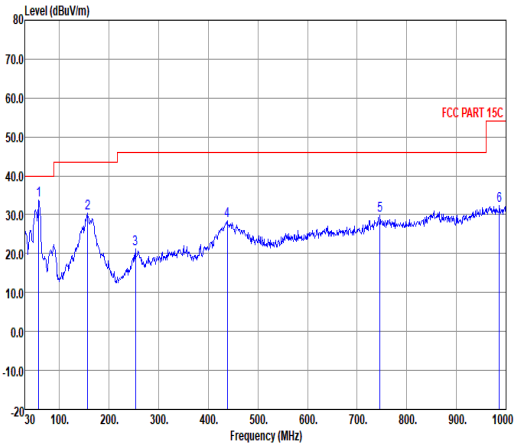
Mode	1	
	Harmonic	
	2400-2483.5_Bluetooth BR_GFSK_CH00_2402MHz	
ANT	2	
Pol.	Horizontal	Vertical
Peak Avg	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4804.00 43.42 74.00 -30.58 60.70 34.20 9.44 60.92 0.00 --- --- PEAK	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4804.00 43.55 74.00 -30.45 60.83 34.20 9.44 60.92 0.00 --- --- PEAK

Mode	2	
	Harmonic	
	2400-2483.5_Bluetooth BR_GFSK_CH19_2440MHz	
ANT	2	
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 4880.00 43.14 74.00 -30.86 60.27 34.20 9.53 60.86 0.00 --- --- PEAK 2 7320.00 45.60 74.00 -28.40 58.58 35.68 11.69 60.35 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 4880.00 43.08 74.00 -30.92 60.21 34.20 9.53 60.86 0.00 --- --- PEAK 2 7320.00 45.56 74.00 -28.44 58.54 35.68 11.69 60.35 0.00 --- --- PEAK

Mode	3	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH78_2480MHz	
ANT	2	
Pol.	Horizontal	Fundamental
Peak	 Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2489.50 56.00 74.00 -18.00 43.05 32.82 6.74 32.61 6.00 104 225 PEAK 2 2489.50 31.21 54.00 -22.79 18.26 32.82 6.74 32.61 6.00 104 225 AVERAGE	 Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2480.00 103.72 ------ ------ 90.88 32.74 6.73 32.63 6.00 104 225 PEAK 2 2480.00 78.93 ------ ------ 66.09 32.74 6.73 32.63 6.00 104 225 AVERAGE

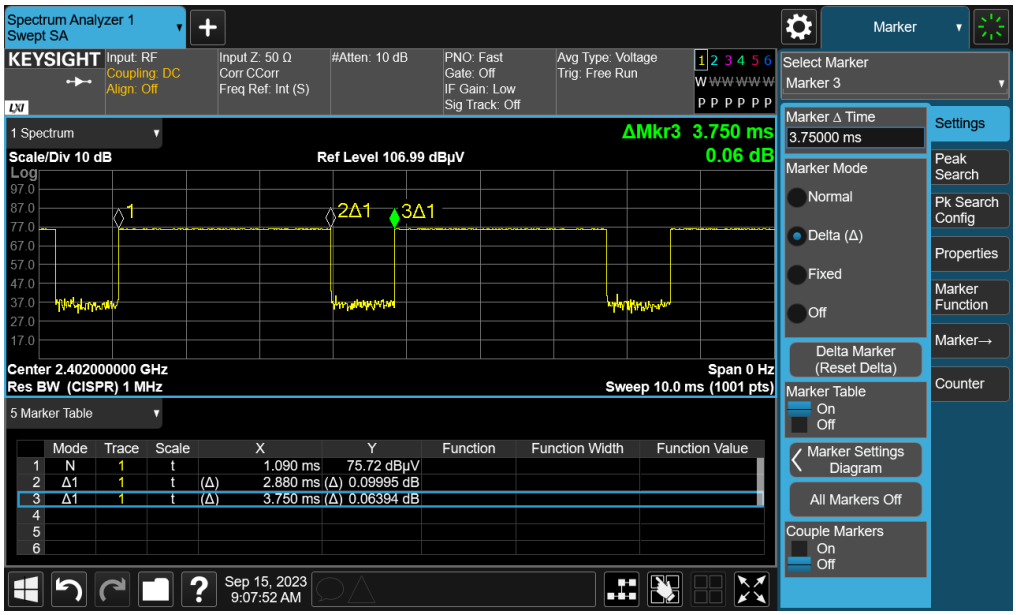
Mode	3	
	Band Edge	
	2400-2483.5_Bluetooth BR_GFSK_CH78_2480MHz	
ANT	2	
Pol.	Vertical	Fundamental
Peak	 Freq Level Limit Line Margin Read Level Ant Factor Cable Loss Preamp Factor Aux Factor APos TPos Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2490.62 56.06 74.00 -17.94 43.11 32.82 6.74 32.61 6.00 365 122 PEAK 2 2490.62 31.27 54.00 -22.73 18.32 32.82 6.74 32.61 6.00 365 122 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 2480.00 100.05 ------ ------ 87.21 32.74 6.73 32.63 6.00 365 122 PEAK 2 2480.00 75.26 ------ ------ 62.42 32.74 6.73 32.63 6.00 365 122 AVERAGE

Mode	3	
	Harmonic	
	2400-2483.5_Bluetooth BR_GFSK_CH78_2480MHz	
ANT	2	
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 43.00 74.00 -31.00 60.01 34.18 9.61 60.80 0.00 --- --- PEAK 2 7440.00 45.53 74.00 -28.47 58.68 35.70 11.77 60.62 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 43.30 74.00 -30.70 60.31 34.18 9.61 60.80 0.00 --- --- PEAK 2 7440.00 45.26 74.00 -28.74 58.41 35.70 11.77 60.62 0.00 --- --- PEAK
		

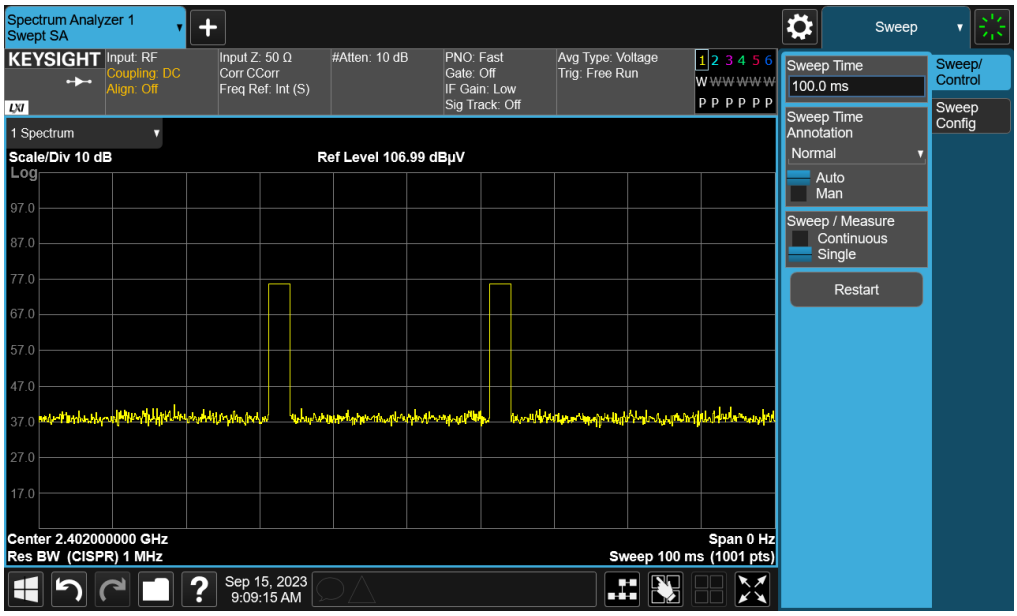
Mode	3	
	LF	
	2400-2483.5_Bluetooth BR_GFSK_CH78_2480MHz	
ANT	2	
Pol.	Horizontal	Vertical
Peak QP	 Freq Level Over Limit Limit Line Read Level Cable Loss Antenna Factor Preamp Factor A/Pos T/Pos Remark MHz dBuV/m dB dBuV/m dBuV dB dB/m dB cm deg 1 30.00 21.37 -18.63 40.00 28.11 0.45 25.10 32.29 --- --- Peak 2 156.10 23.00 -20.50 43.50 36.76 1.67 16.74 32.17 --- --- Peak 3 254.07 26.91 -19.09 46.00 37.36 2.15 19.57 32.17 --- --- Peak 4 442.25 26.05 -19.95 46.00 32.75 2.84 22.92 32.46 --- --- Peak 5 773.02 29.01 -16.99 46.00 29.17 3.76 28.20 32.12 --- --- Peak 6 977.69 32.27 -21.73 54.00 27.96 4.22 30.78 30.69 --- --- Peak	 Freq Level Over Limit Limit Line Read Level Cable Loss Antenna Factor Preamp Factor A/Pos T/Pos Remark MHz dBuV/m dB dBuV/m dBuV dB dB/m dB cm deg 1 58.13 33.76 -6.24 40.00 53.02 0.82 12.40 32.48 --- --- Peak 2 157.07 30.30 -13.20 43.50 44.11 1.68 16.68 32.17 --- --- Peak 3 253.10 21.10 -24.90 46.00 31.69 2.15 19.43 32.17 --- --- Peak 4 438.37 28.48 -17.52 46.00 35.28 2.82 22.82 32.44 --- --- Peak 5 745.86 29.83 -16.17 46.00 30.23 3.69 28.08 32.17 --- --- Peak 6 986.42 32.24 -21.76 54.00 27.89 4.24 30.71 30.60 --- --- Peak

Appendix D. Duty Cycle Plots

DH5 on time (One Pulse) Plot on Channel 39



DH5 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.