TEST REPORT

Applicant Name :	Shenzhen Youmi Intelligent Technology Co., Ltd.
Address :	406-407 Jinqi Zhigu Building, 4/F, 1 Tangling Road, Nanshan District, Shenzhen City, China
Report Number :	RA230505-23860E-RFA
FCC ID:	2ATZ4-G5MECHA
IC:	26074-G5MECHA

Test Standard (s)

FCC PART 15.247; RSS-GEN ISSUE 5, FEBRUARY 2021 AMENDMENT 2; RSS-247, ISSUE 2, FEBRUARY 2017

Sample Description

Product Type:	Smart phone
Model No.:	G5 Mecha
Multiple Model(s) No.:	N/A
Trade Mark:	UMIDIGI
Date Received:	2023/05/05
Report Date:	2023/06/01

Test Result:	Pass*

* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Roger Ling
EMC Engineer

Approved By:

Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★ ".
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TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RA230505-23860E-RFA	Original Report	2023/06/01

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

HVIN	G2239U-UF-V3GH
FVIN	UMIDIGI_G5_Mecha_V1-0
Frequency Range	Bluetooth: 2402~2480MHz
Transmit Power	3.07dBm
Modulation Technique	Bluetooth: GFSK, π/4-DQPSK, 8DPSK
Antenna Specification*	1.76dBi (provided by the applicant)
Voltage Range	DC 3.87V from battery or DC 5V from adapter
Sample serial number	RE&CE: 25E7-1 RF: 25E7-2 (Assigned by ATC)
Sample/EUT Status	Good condition
Adapter 1 information	Model: HJ-0502000W2-US Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5V, 2A
Adapter 2 information	Model: HF-0502000U Input: AC 100-240V, 50/60Hz, 0.3A Output: DC 5.0V, 2A

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules and RSS-247, Issue 2, February 2017, RSS-GEN Issue 5, Feb. 2021Amendment 2 of the Innovation, Science and Economic Development Canada rules.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and RSS-247, Issue 2, February 2017, RSS-GEN Issue 5, Feb. 2021Amendment 2 of the Innovation, Science and Economic Development Canada rules.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF Frequency		$0.082*10^{-7}$
RF output power, conducted		0.71dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Audio Frequency Response		0.1dB
Low Pass Filter Response		1.2dB
Modulation Limiting		1%
Emissions, Radiated	9kHz - 30MHz	2.06dB
	30MHz - 1GHz	5.08dB
	1GHz - 18GHz	4.96dB
	18GHz - 26.5GHz	5.16dB
	26.5GHz - 40GHz	4.64dB
Temperature		1℃
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the Floor 1, KuMaKe Building, Dongzhou Community, Guangming Street, Guangming District, Shenzhen, Guangdong, China

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189.

Accredited by American Association for Laboratory Accreditation (A2LA). The Certificate Number is 4297.01

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0016. The Registration Number is 30241.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	40	2442
1	2403	41	2443
2	2404	42	2444
…	…	…	…
…	…	…	…
36	2438	75	2477
37	2439	76	2478
38	2440	77	2479
39	2441	78	2480

EUT was tested with Channel 0, 39 and 78.

EUT Exercise Software

EUT was test in engineering mode. and the power level is 7*. The power level was provided by the applicant.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

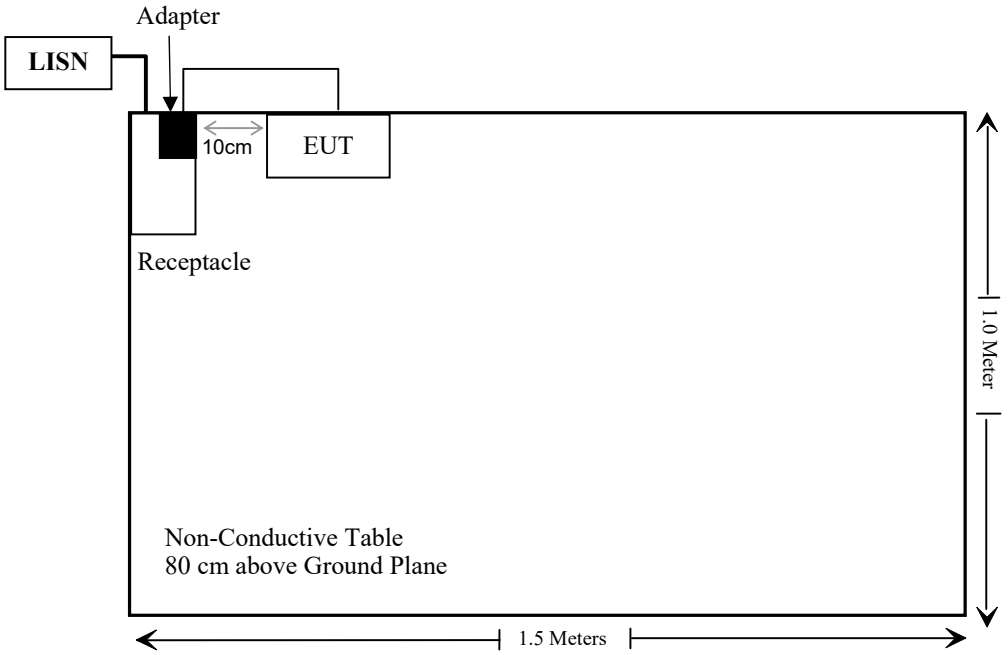
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

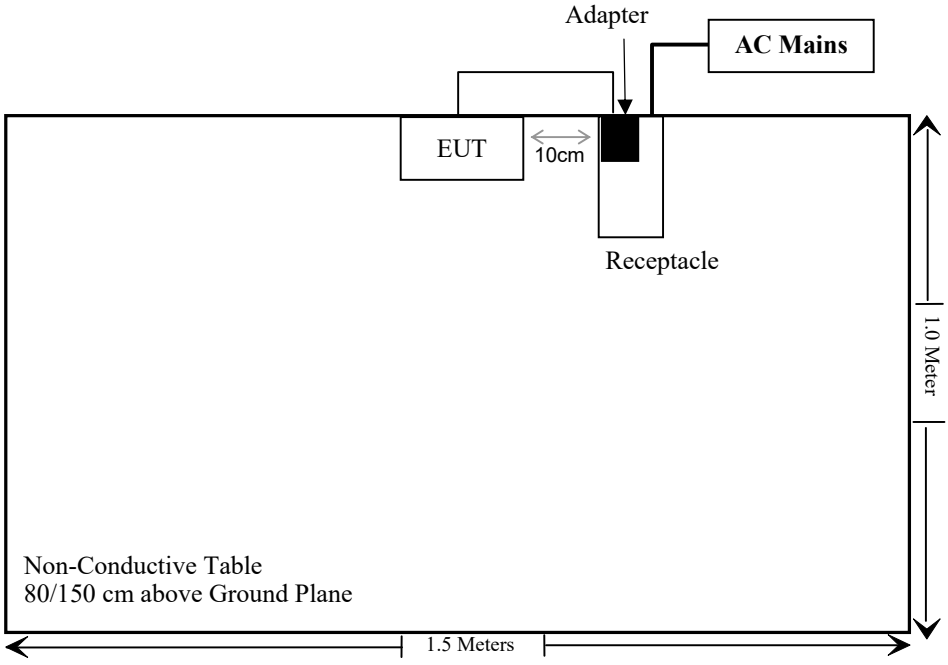
Cable Description	Length (m)	From Port	To
Un-shielding Detachable USB Cable	1.0	EUT	Adapter

Block Diagram of Test Setup

For conducted emission:



For Radiated Emissions:



Note: the support table edge was flush with the center of turntable

SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
FCC§15.247 (i), §1.1307 (b) (1) &§2.1093	RF Exposure	Compliant
RSS-102 § 2.5.1	Exemption Limits For Routine Evaluation-SAR evaluation	Compliant
FCC §15.203 RSS-Gen §6.8	Antenna Requirement	Compliant
FCC §15.207(a) RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §15.205, §15.209, §15.247(d) RSS-247 § 5.5, RSS-GEN § 8.10	Radiated Emissions	Compliant
FCC §15.247(a)(1) RSS-247 § 5.1(a), RSS-GEN § 6.7	20 dB Emission Bandwidth & 99% Occupied Bandwidth	Compliant
FCC §15.247(a)(1) RSS-247 § 5.1 (b)	Channel Separation Test	Compliant
FCC §15.247(a)(1)(iii) RSS-247 § 5.1 (d)	Time of Occupancy (Dwell Time)	Compliant
FCC §15.247(a)(1)(iii) RSS-247 § 5.1 (d)	Quantity of hopping channel Test	Compliant
FCC §15.247(b)(1) RSS-247 § 5.1(b) &§ 5.4(b)	Peak Output Power Measurement	Compliant
FCC §15.247(d) RSS-247 § 5.5	Band edges	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted emission test					
Rohde& Schwarz	EMI Test Receiver	ESCI	100784	2022/11/25	2023/11/24
Rohde & Schwarz	L.I.S.N.	ENV216	101314	2022/11/25	2023/11/24
Anritsu Corp	50 Coaxial Switch	MP59B	6100237248	2022/12/07	2023/12/06
Unknown	RF Coaxial Cable	No.17	N0350	2022/11/25	2023/11/24
Conducted Emission Test Software: e3 19821b (V9)					
Radiated emission test					
Rohde& Schwarz	Test Receiver	ESR	102725	2022/11/25	2023/11/24
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
SONOMA INSTRUMENT	Amplifier	310 N	186131	2022/11/08	2023/11/07
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2022/11/08	2023/11/07
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2022/11/08	2023/11/07
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-1067	2022/11/30	2025/11/29
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2022/12/26	2025/12/25
Radiated Emission Test Software: e3 19821b (V9)					
Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.11	N1000	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.12	N040	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.13	N300	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.14	N800	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.15	N600	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.16	N650	2022/11/25	2023/11/24
RF Conducted Test					
Rohde&Schwarz	Spectrum Analyzer	FSV-40	101590	2022/11/25	2023/11/24
Tonscend	RF Control Unit	JS0806-2	19G8060182	2022/10/24	2023/10/23
WEINSCHEL	10dB Attenuator	5324	AU 3842	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.31	RF-01	Each time	

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC§15.247 (i), §1.1307 (b)(1)&§2.1093 – RF EXPOSURE

Applicable Standard

According to FCC §2.1093 and §1.1307(b)(1), systems operating under the provisions of this sectionshall be operated in a manner that ensure that the public is not exposed to radio frequency energylevel in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:
[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where
1. f(GHz) is the RF channel transmit frequency in GHz.
2. Power and distance are rounded to the nearest mW and mm before calculation.
3. The result is rounded to one decimal place for comparison.
4. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test Exclusion.

Measurement Result

For worst case:

Mode	Frequency (MHz)	Max tune-up conducted power (dBm)	Max tune-up conducted power (mW)	Distance (mm)	Calculated value	Threshold (1-g SAR)	SAR Test Exclusion
BT	2402-2480	3.5	2.24	5	0.7	3.0	Yes

Result: No SAR test is required

RSS-102 § 2.5.1 –EXEMPTION LIMITS FOR ROUTINE EVALUATION-SAR EVALUATION

Applicable Standard

According to RSS-102 Issue 5§ (2.5.1), SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1.

Table 1: SAR evaluation – Exemption limits for routine evaluation based on frequency and separation distance[4,5]

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of ≤5 mm	At separation distance of 10 mm	At separation distance of 15 mm	At separation distance of 20 mm	At separation distance of 25 mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency (MHz)	Exemption Limits (mW)				
	At separation distance of 30 mm	At separation distance of 35 mm	At separation distance of 40 mm	At separation distance of 45 mm	At separation distance of ≥50 mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

4. The exemption limits in Table 1 are based on measurements and simulations of half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.
5. Transmitters operating between 0.003-10 MHz, meeting the exemption from routine SAR evaluation, shall demonstrate compliance to the instantaneous limits in Section 4.

Output power level shall be the higher of the maximum conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in Table 1 are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in Table 1, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required.

For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.

Test Result:

For worst case:

BLE:
The higher of the conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power:

(2480-2450)/(3500-2450)= (4-P)/(4-2)

The exemption limit of 2480MHz is P= 3.94mW

The maximum tune-up conducted power is 3.5dBm, The antenna gain is 1.76dBi, so the EIRP is 5.26dBm (3.36mW), which less than 3.94 mW@2480MHz exemption limit

So the stand-alone SAR evaluation can be exempted.

FCC §15.203 & RSS-GEN §6.8 – ANTENNA REQUIREMENT

Applicable Standard

According to FCC § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

According to FCC § 15.203, the applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For licence-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter [enter the device's ISED certification number] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.
Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

Antenna Connector Construction

The EUT has one internal antenna arrangement which was permanently attached for Bluetooth and the maximum antenna gain is 1.76dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Antenna Type	Antenna Gain	Impedance	Frequency Range
FPC	1.76dBi	50Ω	2.4~2.5GHz

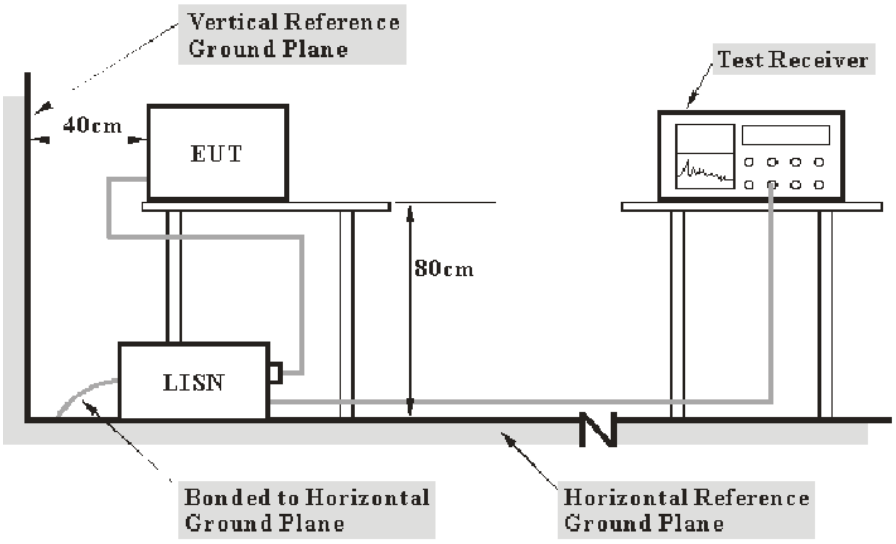
Result: Compliance

FCC §15.207 (a) & RSS-GEN § 8.8 – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a), RSS-GEN § 8.8

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with ANSI C63.10-2013. The related limit was specified in FCC Part 15.207 & RSS-Gen.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All final data was recorded in the Quasi-peak and average detection mode.

Transd Factor & Margin Calculation

The Transd factor is calculated by adding LISN VDF (Voltage Division Factor) and Cable Loss. The basic equation is as follows:

Transd Factor = LISN VDF + Cable Loss

The "**Over limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over limit of -7 dB means the emission is 7 dB below the limit. The equation for calculation is as follows:

Over Limit = Level – Limit
Level = Read Level + Factor

Test Data

Environmental Conditions

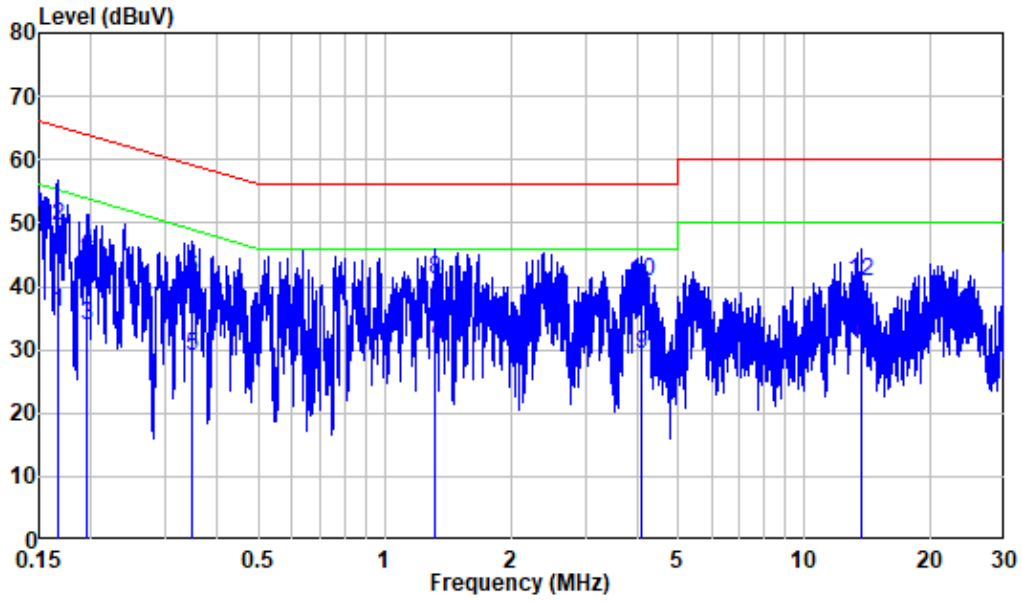
Temperature:	23 ℃
Relative Humidity:	49 %
ATM Pressure:	101.0 kPa

The testing was performed by Jerry Wu on 2023-05-19.

EUT operation mode: Transmitting (worst case is 8DPSK high channel)

For Adapter 1

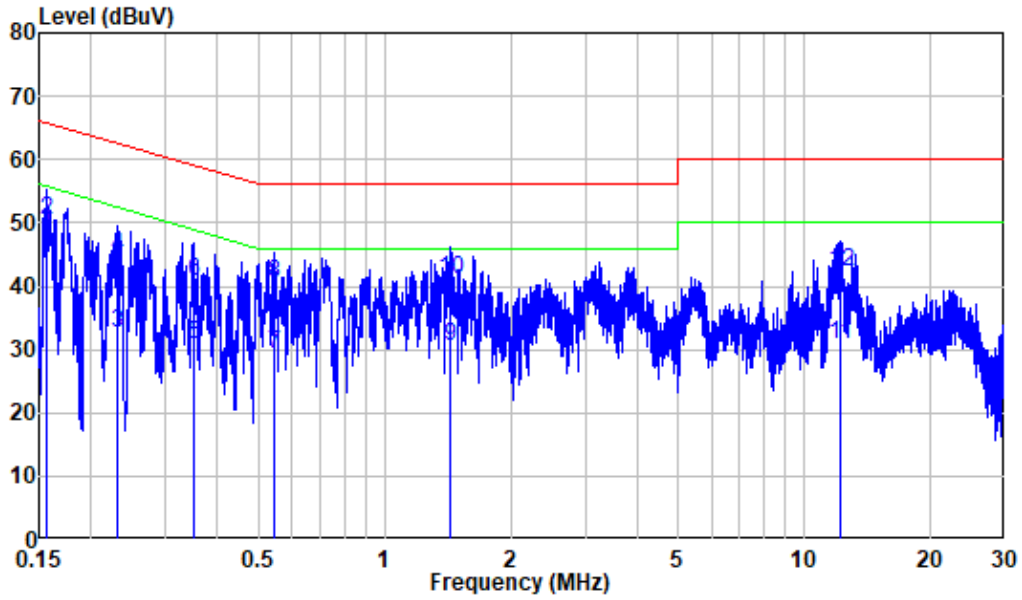
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : RA230505-23860E-RF
Mode : BT Transmitting
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.166	10.35	25.71	36.06	55.16	-19.10	Average
2	0.166	10.35	39.26	49.61	65.16	-15.55	QP
3	0.196	10.30	23.49	33.79	53.78	-19.99	Average
4	0.196	10.30	34.96	45.26	63.78	-18.52	QP
5	0.349	10.45	18.64	29.09	49.00	-19.91	Average
6	0.349	10.45	30.79	41.24	59.00	-17.76	QP
7	1.316	10.43	21.42	31.85	46.00	-14.15	Average
8	1.316	10.43	30.76	41.19	56.00	-14.81	QP
9	4.103	10.54	18.88	29.42	46.00	-16.58	Average
10	4.103	10.54	30.29	40.83	56.00	-15.17	QP
11	13.596	10.28	20.44	30.72	50.00	-19.28	Average
12	13.596	10.28	30.55	40.83	60.00	-19.17	QP

AC 120V/60 Hz, Neutral

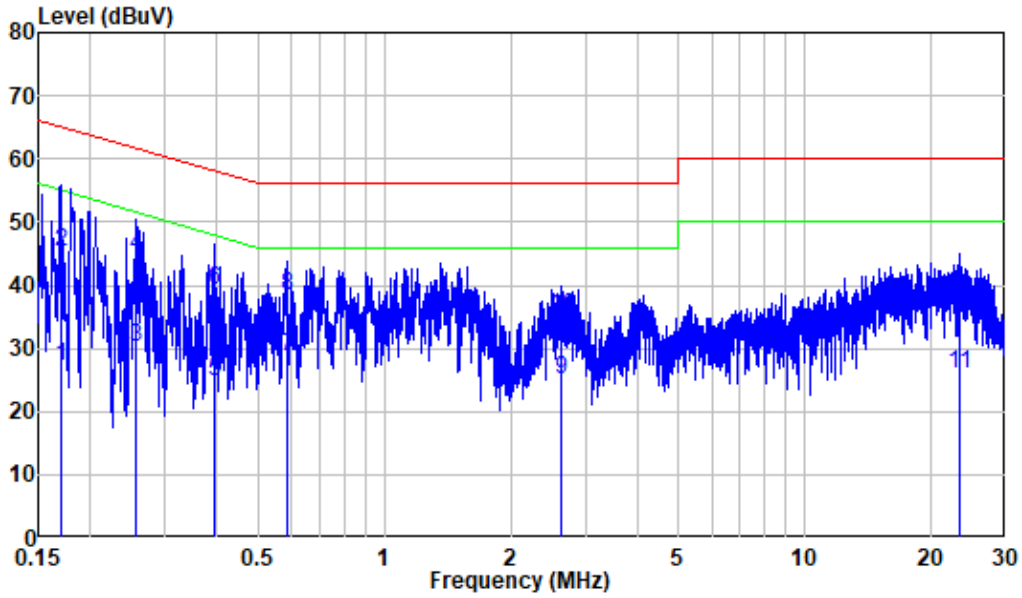


Site : Shielding Room
Condition: Neutral
Job No. : RA230505-23860E-RF
Mode : BT Transmitting
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.157	10.28	38.65	48.93	55.63	-6.70	Average
2	0.157	10.28	40.08	50.36	65.63	-15.27	QP
3	0.230	10.32	22.35	32.67	52.46	-19.79	Average
4	0.230	10.32	34.24	44.56	62.46	-17.90	QP
5	0.349	10.39	20.44	30.83	48.98	-18.15	Average
6	0.349	10.39	30.34	40.73	58.98	-18.25	QP
7	0.548	10.47	18.71	29.18	46.00	-16.82	Average
8	0.548	10.47	29.88	40.35	56.00	-15.65	QP
9	1.432	10.43	20.19	30.62	46.00	-15.38	Average
10	1.432	10.43	30.67	41.10	56.00	-14.90	QP
11	12.140	10.46	20.24	30.70	50.00	-19.30	Average
12	12.140	10.46	31.75	42.21	60.00	-17.79	QP

For Adapter 2

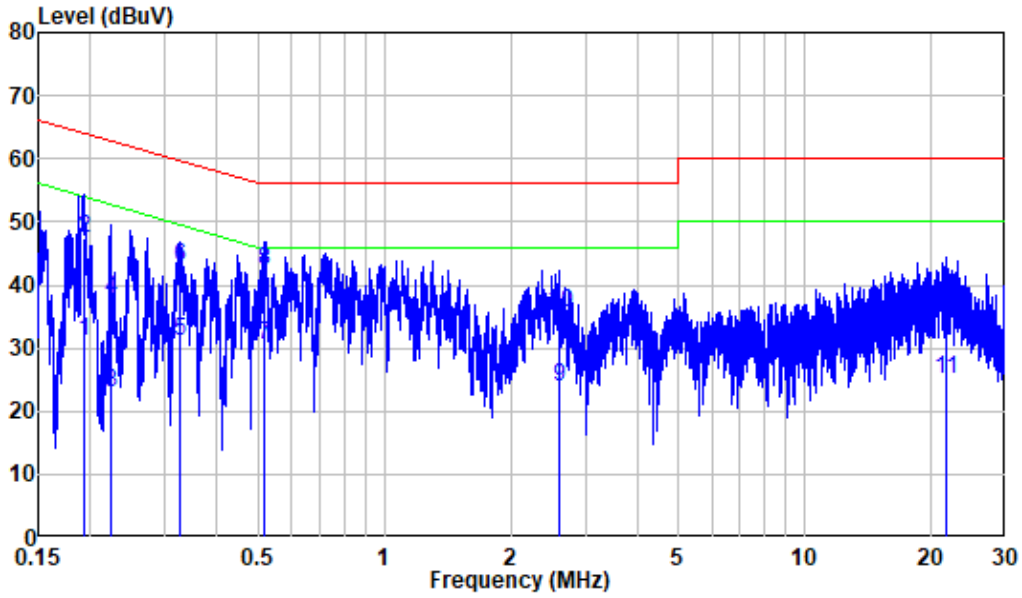
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : RA230505-23860E-RF
Mode : BT Transmitting
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.169	10.34	16.85	27.19	54.99	-27.80	Average
2	0.169	10.34	34.88	45.22	64.99	-19.77	QP
3	0.255	10.35	19.73	30.08	51.58	-21.50	Average
4	0.255	10.35	34.31	44.66	61.58	-16.92	QP
5	0.392	10.49	14.25	24.74	48.01	-23.27	Average
6	0.392	10.49	28.70	39.19	58.01	-18.82	QP
7	0.584	10.62	18.04	28.66	46.00	-17.34	Average
8	0.584	10.62	27.87	38.49	56.00	-17.51	QP
9	2.626	10.46	14.56	25.02	46.00	-20.98	Average
10	2.626	10.46	24.58	35.04	56.00	-20.96	QP
11	23.202	10.27	15.81	26.08	50.00	-23.92	Average
12	23.202	10.27	27.58	37.85	60.00	-22.15	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
Condition: Neutral
Job No. : RA230505-23860E-RF
Mode : BT Transmitting
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.192	10.29	20.77	31.06	53.95	-22.89	Average
2	0.192	10.29	36.98	47.27	63.95	-16.68	QP
3	0.223	10.30	12.57	22.87	52.72	-29.85	Average
4	0.223	10.30	27.31	37.61	62.72	-25.11	QP
5	0.327	10.37	20.58	30.95	49.53	-18.58	Average
6	0.327	10.37	32.59	42.96	59.53	-16.57	QP
7	0.518	10.47	20.11	30.58	46.00	-15.42	Average
8	0.518	10.47	31.87	42.34	56.00	-13.66	QP
9	2.610	10.52	13.38	23.90	46.00	-22.10	Average
10	2.610	10.52	24.98	35.50	56.00	-20.50	QP
11	21.672	10.23	14.80	25.03	50.00	-24.97	Average
12	21.672	10.23	26.70	36.93	60.00	-23.07	QP

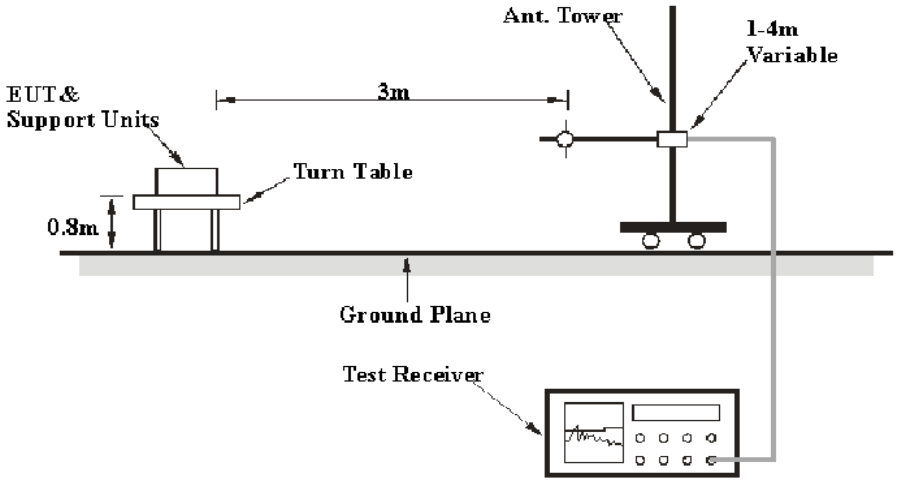
FCC §15.209, §15.205 & §15.247(D) & RSS-247§ 5.5 - SPURIOUS EMISSIONS

Applicable Standard

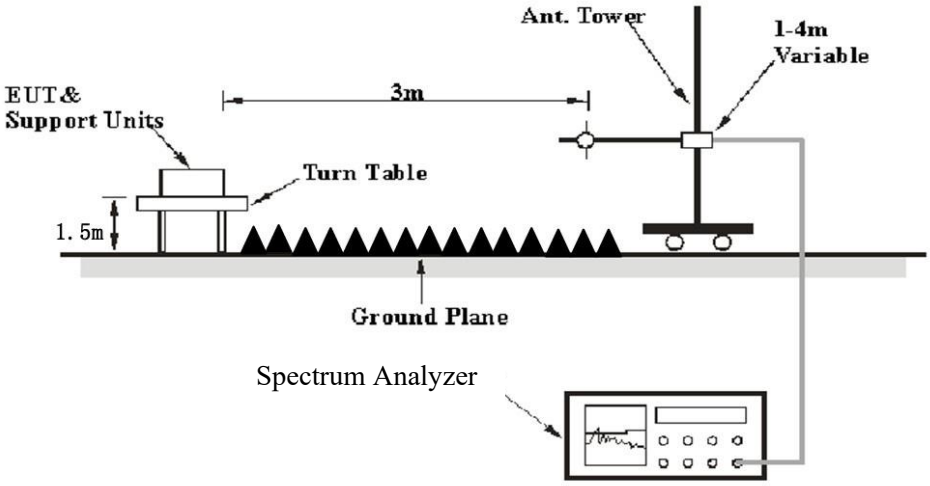
FCC §15.205; §15.209; §15.247(d); RSS-247§ 5.5; RSS-GEN § 8.10

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission performed in the 3 meters, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, FCC 15.247, RSS-247, RSS-Gen limits.

EMI Test Receiver & Spectrum Analyzer Setup

The EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK

For average measurement:

use the duty cycle factor correction factor method per 15.35(c).
Duty cycle=On time/100milliseconds, On time=N1*L1+N2*L2+…Nn-1*Ln-1+Nn*Ln,
where N1 is number of type 1 pulses, L1 is length of type 1 pulse, etc.
Average Emission Level=Peak Emission Level+20*log(Duty cycle)

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All final data was recorded in Quasi-peak detection mode for frequency range of 30 MHz -1 GHz and peak and Average detection modes for frequencies above 1 GHz.

Factor & Margin/Over Limit Calculation

The Factor is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain. The basic equation is as follows:

Factor = Antenna Factor + Cable Loss - Amplifier Gain

The "**Over Limit or Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a over limit/margin of -7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

Margin/Over Limit = Corrected Amplitude/Level-Limit
Corrected Amplitude/Level = Reading + Factor

Test Data

Environmental Conditions

Temperature:	23~25.5 ℃
Relative Humidity:	50~54 %
ATM Pressure:	101.0 kPa

The testing was performed by Jason Liu on 2023-05-19 for below 1GHz,and Jimi Zheng on 2023-05-09 for above 1GHz

EUT operation mode: Transmitting

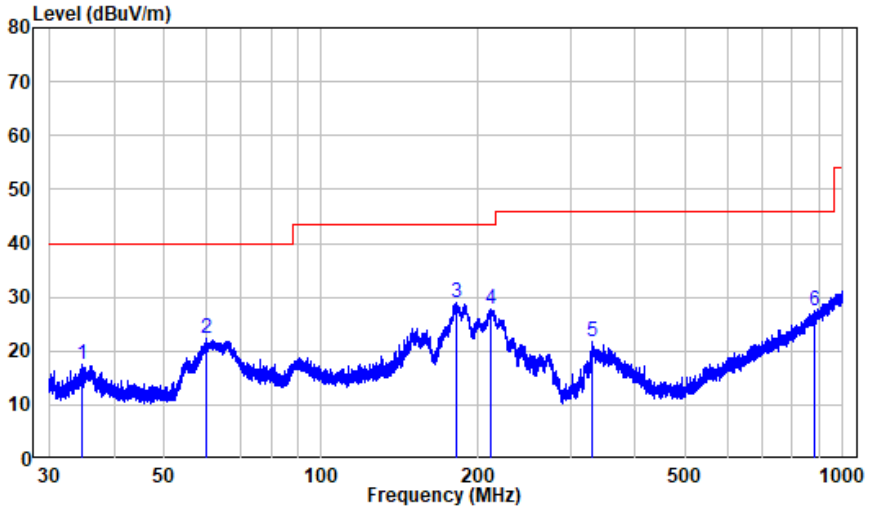
Note: Pre-scan in the X,Y and Z axes of orientation, the worst case X-axes of orientation was recorded.

Below 1GHz: *(worst case is 8DPSK high channel)*

Note: When the test result of Peak was below the limit of QP more than 6dB, just the peak value was recorded.

For Adapter 1

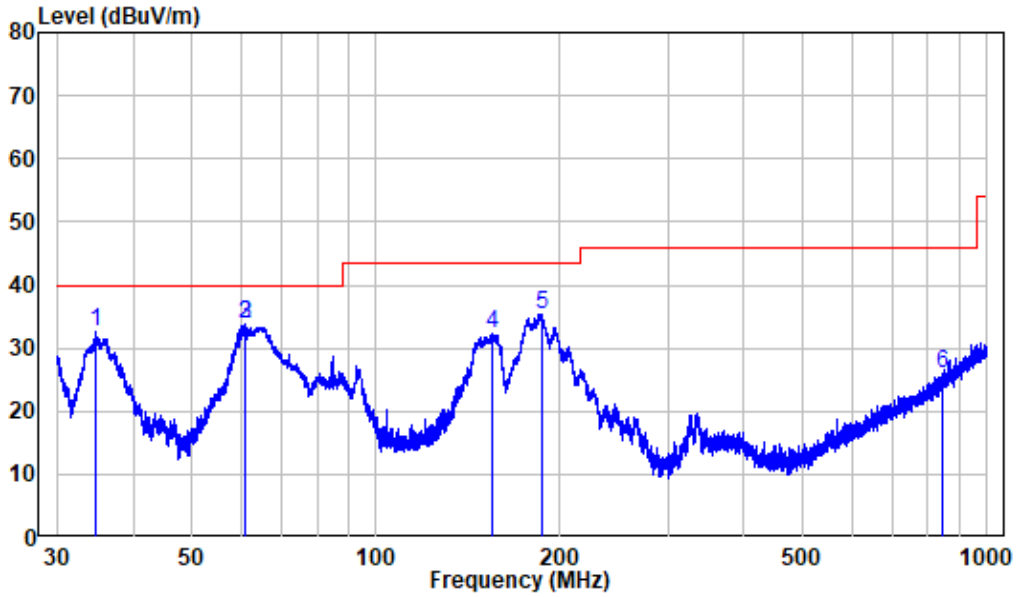
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : RA230505-23860E-RF
Test Mode: BT Transmitting
Note : HJ-0502000W2-US

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	34.791	-14.44	32.05	17.61	40.00	-22.39	Peak
2	60.016	-13.82	36.15	22.33	40.00	-17.67	Peak
3	181.602	-10.34	39.34	29.00	43.50	-14.50	Peak
4	211.249	-10.98	38.82	27.84	43.50	-15.66	Peak
5	331.355	-13.29	34.95	21.66	46.00	-24.34	Peak
6	882.953	-1.29	28.80	27.51	46.00	-18.49	Peak

Vertical

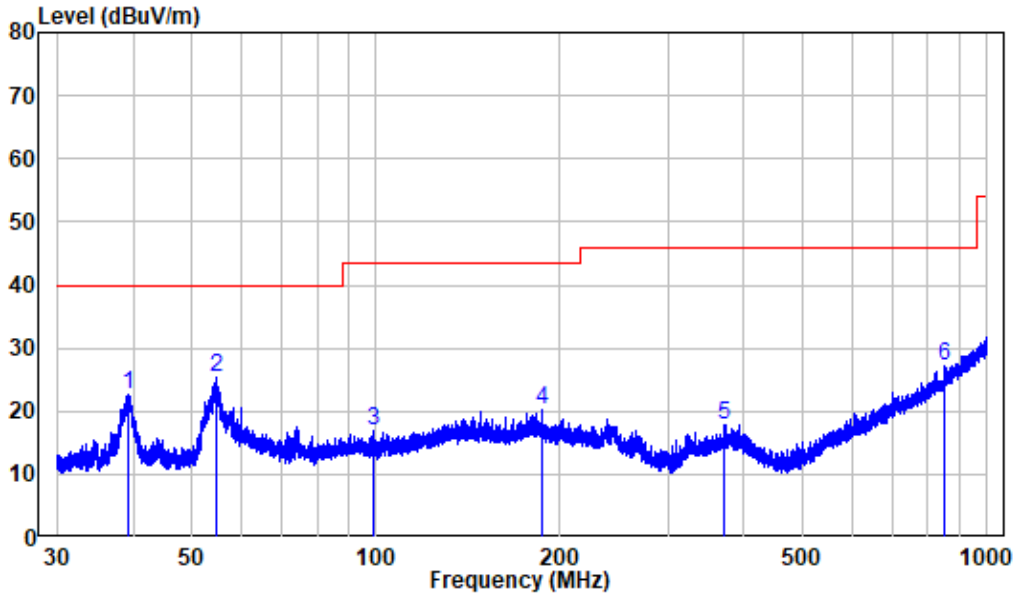


Site : chamber
Condition: 3m VERTICAL
Job No. : RA230505-23860E-RF
Test Mode: BT Transmitting
Note : HJ-0502000W2-US

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	34.821	-14.44	47.13	32.69	40.00	-7.31	Peak
2	60.944	-13.83	47.76	33.93	40.00	-6.07	Peak
3	60.944	-13.83	47.76	33.93	40.00	-6.07	Peak
4	154.888	-10.33	42.55	32.22	43.50	-11.28	Peak
5	186.278	-10.35	45.79	35.44	43.50	-8.06	Peak
6	846.200	-2.90	28.91	26.01	46.00	-19.99	Peak

For Adapter 2

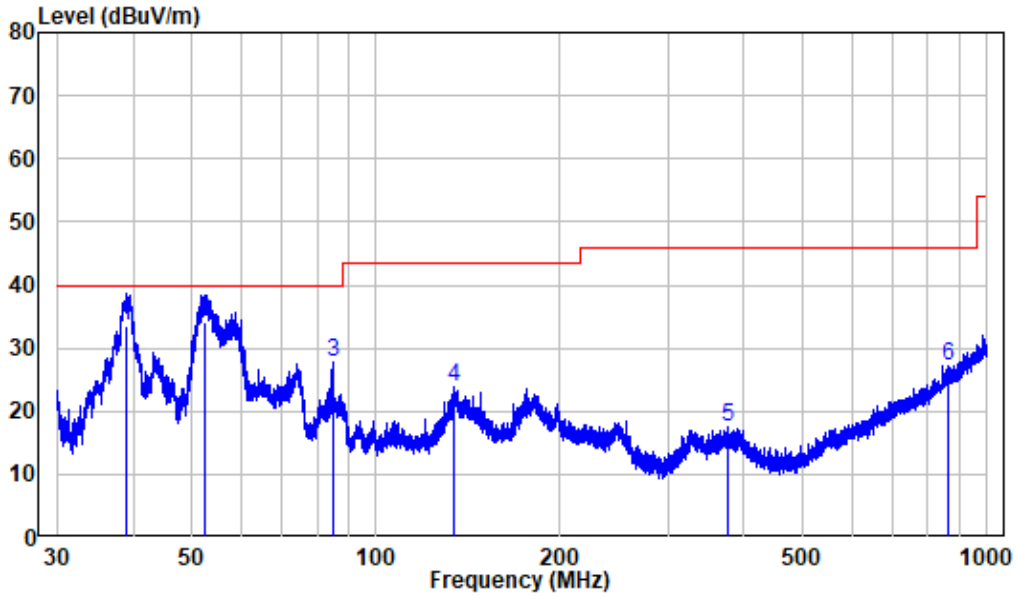
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : RA230505-23860E-RF
Test Mode: BT Transmitting
Note : HF-0502000U

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	39.213	-14.37	36.92	22.55	40.00	-17.45	Peak
2	54.763	-14.13	39.35	25.22	40.00	-14.78	Peak
3	98.789	-12.10	29.06	16.96	43.50	-26.54	Peak
4	186.278	-10.35	30.45	20.10	43.50	-23.40	Peak
5	370.865	-11.20	29.03	17.83	46.00	-28.17	Peak
6	853.651	-2.38	29.58	27.20	46.00	-18.80	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : RA230505-23860E-RF
Test Mode: BT Transmitting
Note : HF-0502000U

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	38.905	-14.39	47.91	33.52	40.00	-6.48	QP
2	52.529	-14.22	48.30	34.08	40.00	-5.92	QP
3	84.776	-12.83	40.48	27.65	40.00	-12.35	Peak
4	134.029	-10.57	34.50	23.93	43.50	-19.57	Peak
5	376.103	-11.17	28.62	17.45	46.00	-28.55	Peak
6	862.300	-1.95	29.15	27.20	46.00	-18.80	Peak

Above 1GHz: (worst case for 8DPSK and Adapter 1)

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
Low Channel 2402MHz									
2354.45	67.68	PK	333	2	H	-10.78	56.90	74	-17.10
2358.36	67.89	PK	155	1.6	V	-10.77	57.12	74	-16.88
2390	65.43	PK	59	1.1	H	-10.70	54.73	74	-19.27
2390	65.59	PK	158	1.1	V	-10.70	54.89	74	-19.11
4804	61.58	PK	322	2.3	H	-6.11	55.47	74	-18.53
4804	62.53	PK	98	2.3	V	-6.11	56.42	74	-17.58
Middle Channel 2441MHz									
4882	62.23	PK	146	2.3	H	-5.90	56.33	74	-17.67
4882	63.12	PK	281	2.3	V	-5.90	57.22	74	-16.78
High Channel 2480MHz									
2483.5	66.38	PK	228	2.3	H	-10.55	55.83	74	-18.17
2483.5	66.59	PK	214	2	V	-10.55	56.04	74	-17.96
2485.96	69.23	PK	249	1.1	H	-10.53	58.70	74	-15.30
2484.87	69.43	PK	217	1.5	V	-10.54	58.89	74	-15.11
4960	61.09	PK	186	2.3	H	-5.47	55.62	74	-18.38
4960	61.98	PK	313	2.3	V	-5.47	56.51	74	-17.49

Field Strength of Average							
Frequency (MHz)	Peak Measurement @3m (dBμV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Ampitude (dBμV/m)	FCC Part 15.247		
					Limit (dBμV/m)	Margin (dB)	Comment
Low Channel 2402MHz							
2354.45	56.90	H	-24.73	32.17	54	-21.83	Bandedge
2358.36	57.12	V	-24.73	32.39	54	-21.61	Bandedge
2390	54.73	H	-24.73	30.00	54	-24.00	Bandedge
2390	54.89	V	-24.73	30.16	54	-23.84	Bandedge
4804	55.47	H	-24.73	30.74	54	-23.26	Harmonic
4804	56.42	V	-24.73	31.69	54	-22.31	Harmonic
Middle Channel 2441MHz							
4882	56.33	H	-24.73	31.60	54	-22.40	Harmonic
4882	57.22	V	-24.73	32.49	54	-21.51	Harmonic
High Channel 2480MHz							
2483.5	55.83	H	-24.73	31.10	54	-22.90	Bandedge
2483.5	56.04	V	-24.73	31.31	54	-22.69	Bandedge
2485.96	58.70	H	-24.73	33.97	54	-20.03	Bandedge
2484.87	58.89	V	-24.73	34.16	54	-19.84	Bandedge
4960	55.62	H	-24.73	30.89	54	-23.11	Harmonic
4960	56.51	V	-24.73	31.78	54	-22.22	Harmonic

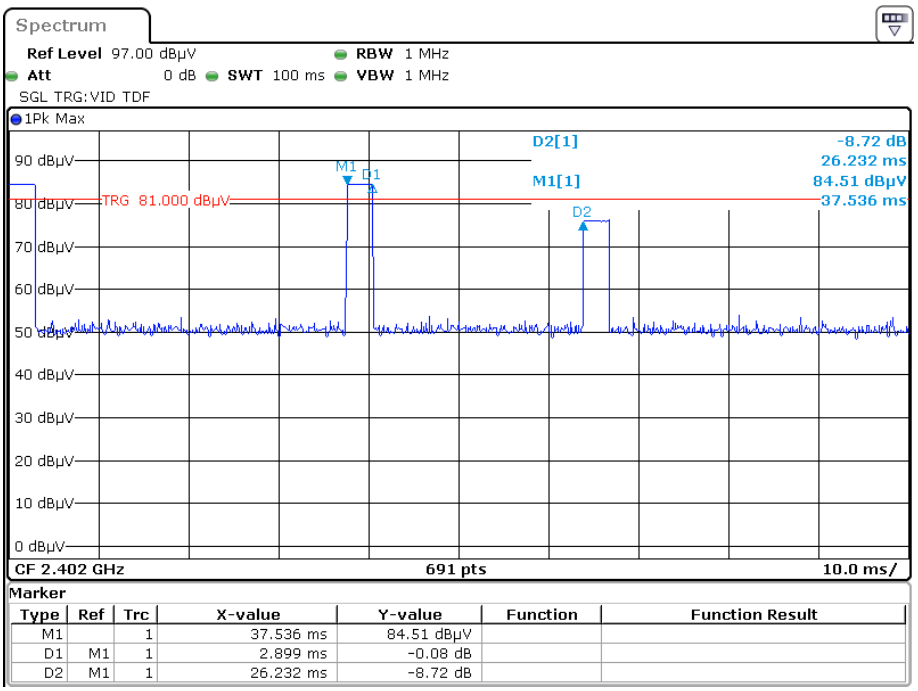
Note:

Absolute Level = Corrected Factor + Reading
Margin = Corrected. Amplitude - Limit
Average level= Peak level+ Duty Cycle Corrected Factor
The other spurious emission which is 20dB to the limit or in the noise floor level was not recorded.

Worst case duty cycle:

Duty Cycle = Ton/100ms = 2.899*2/100=0.05798
Duty Cycle Corrected Factor = 20lg (Duty Cycle) = 20lg0.05798 = -24.73

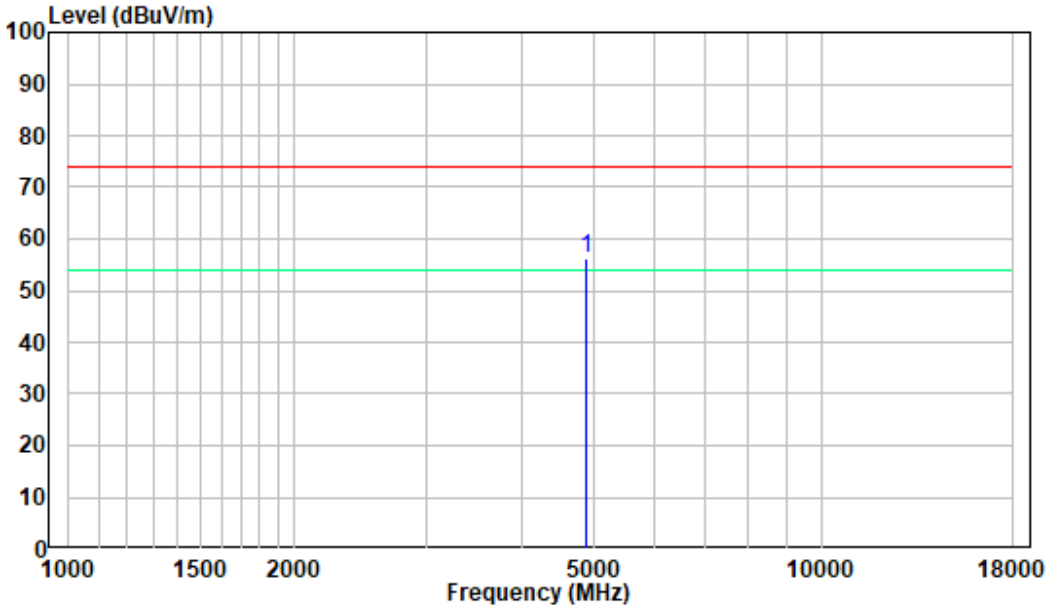
Duty Cycle



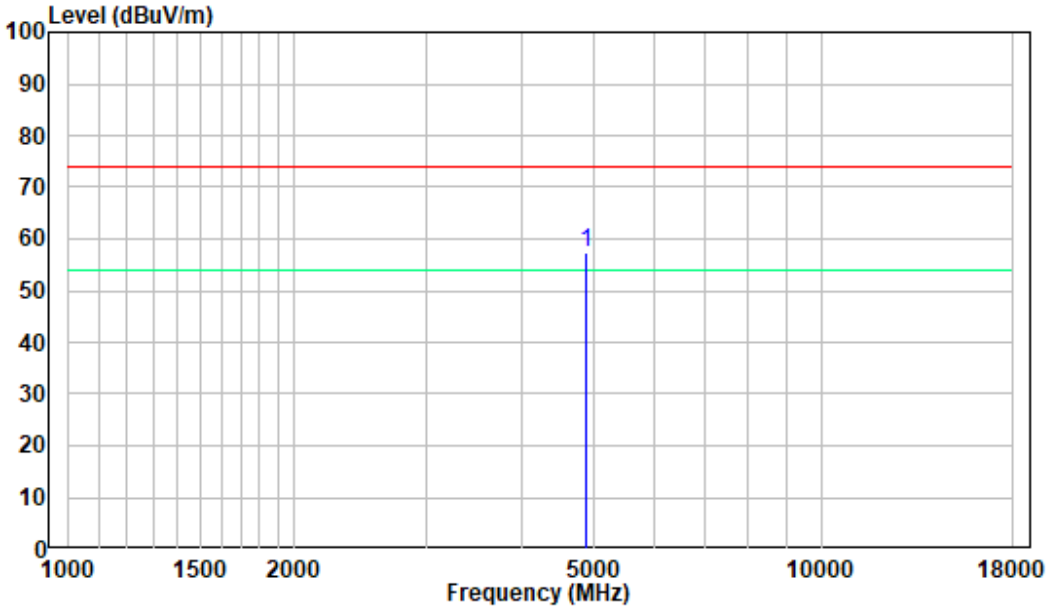
1 GHz - 18 GHz: (Pre-Scan plots)

Middle channel

Horizontal



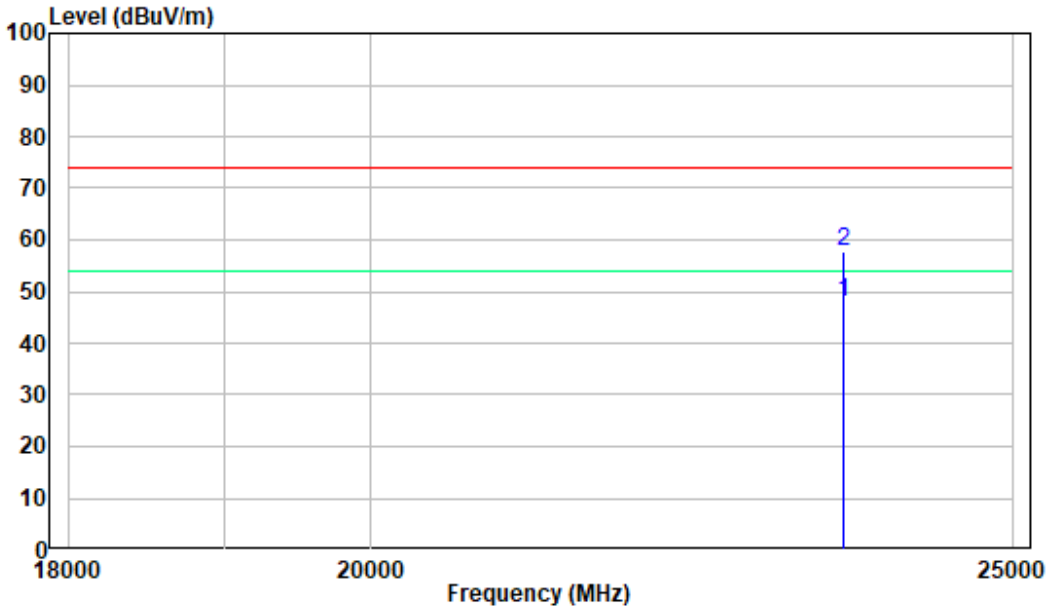
Vertical



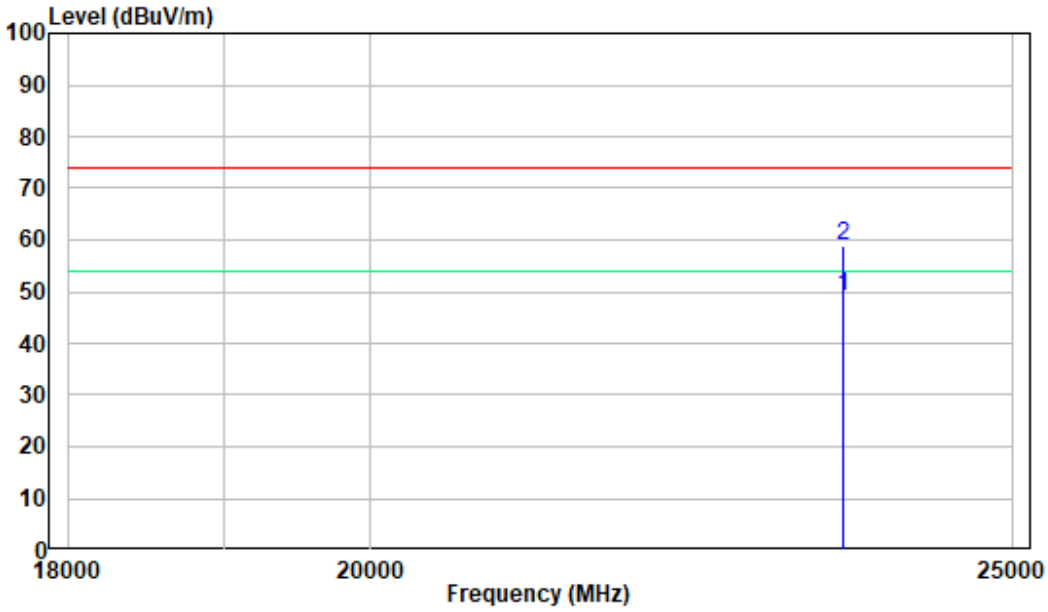
18-25GHz: (Pre-Scan plots)

Middle channel

Horizontal



Vertical



FCC §15.247(a) (1) & RSS-247 § 5.1 (b) -CHANNEL SEPARATION TEST

Applicable Standard

According to FCC §15.247(a) (1):

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, 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 provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

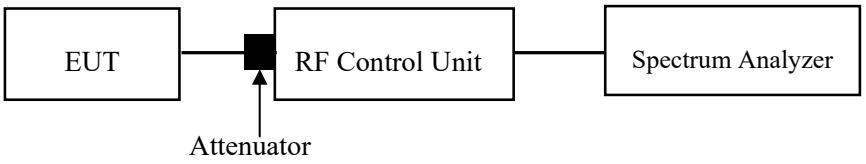
According to RSS-247 § 5.1 (b):

Frequency hopping systems (FHSs) shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the -20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz 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, provided that the systems operate with an output power no greater than 0.125 W. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.2

1. Set the EUT in transmitting mode, max hold the channel.
2. Set the adjacent channel of the EUT and max hold another trace.
3. Measure the channel separation.



Test Data

Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	45 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Huang on 2023-05-31.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(a) (1) & RSS-247 § 5.1 (a), RSS-GEN § 6.7 – 20 dB EMISSION BANDWIDTH & 99% OCCUPIED BANDWIDTH

Applicable Standard

According to FCC §15.247(a) (1):

Alternatively, 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, provided the systems operate with an output power no greater than 125 mW.

According to RSS-247 § 5.1 (a), RSS-GEN § 6.7:

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the "20 dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated 20 dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.7 & Clause 6.9.2

The following conditions shall be observed for measuring the occupied bandwidth and 20 dB bandwidth:

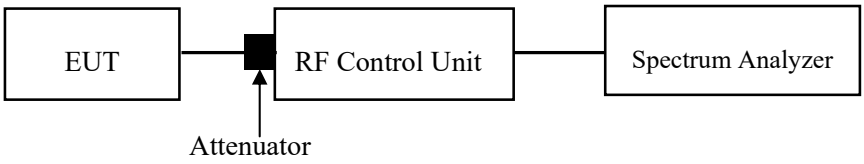
• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

• The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / 20 dB bandwidth if the device is not transmitting continuously.

• The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / 20 dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.
For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).



Test Data

Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	45 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Huang from 2023-05-31 to 2023-06-01.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix

FCC §15.247(a) (1) (iii) & RSS-247 § 5.1 (d) - QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

According to FCC §15.247(a) (1) (iii):

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

According to RSS-247 § 5.1 (d):

Frequency hopping systems (FHSS) operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

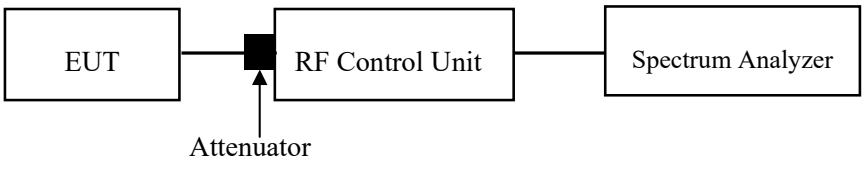
Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.3

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Set the EUT in hopping mode from first channel to last.

3. By using the max-hold function record the quantity of the channel.



Test Data

Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	45 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Huang on 2023-05-31.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(a) (1) (iii) & RSS-247 § 5.1 (d) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

According to FCC §15.247(a) (1) (iii):

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

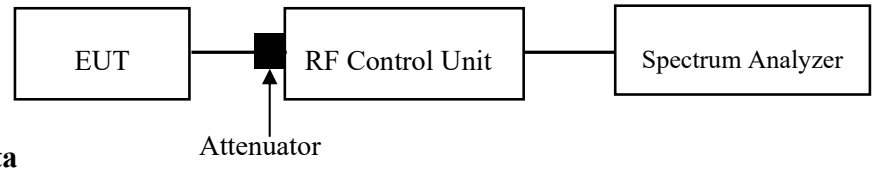
According to RSS-247 § 5.1 (d):

Frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. 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. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.4

1. The EUT was worked in channel hopping.
2. Set the RBW to: 1MHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 0Hz.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Recorded the time of single pulses



Test Data

Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	45 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Huang on 2023-05-31.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(b) (1) & RSS-247§ 5.1(b) &§ 5.4(b) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to FCC §15.247(b) (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. And for all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

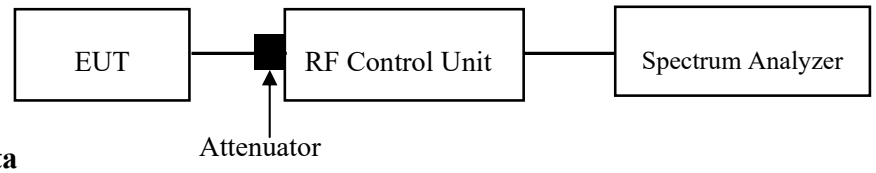
According to RSS-247§ 5.1(b) &§ 5.4(b):

For frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W (see Section 5.4(e) for exceptions).

Frequency hopping systems (FHSs) shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the -20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz 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, provided that the systems operate with an output power no greater than 0.125 W.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.5
1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to one test equipment.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	45 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Huang on 2023-05-31.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(d) & RSS-247 § 5.5 - BAND EDGES TESTING

Applicable Standard

According to FCC §15.247(d).

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

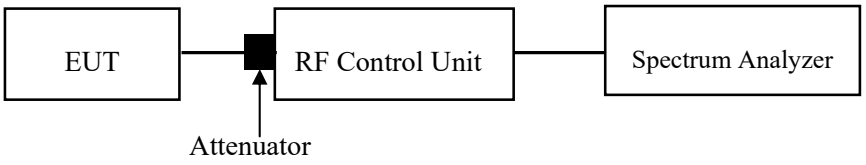
According to RSS-247 § 5.5.

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(e), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.6 & Clause 6.10

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.



Test Data

Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	45 %
ATM Pressure:	101.0 kPa

The testing was performed by Jacob Huang from 2023-05-31 to 2023-06-01.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

APPENDIX

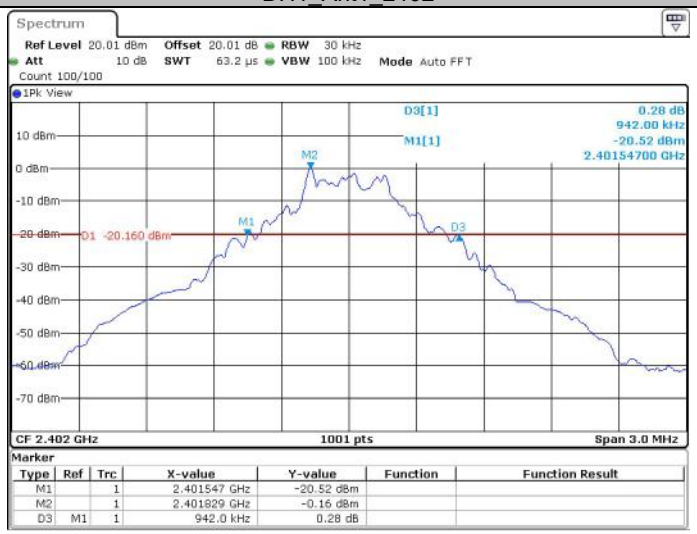
Appendix A: 20dB Emission Bandwidth

Test Result

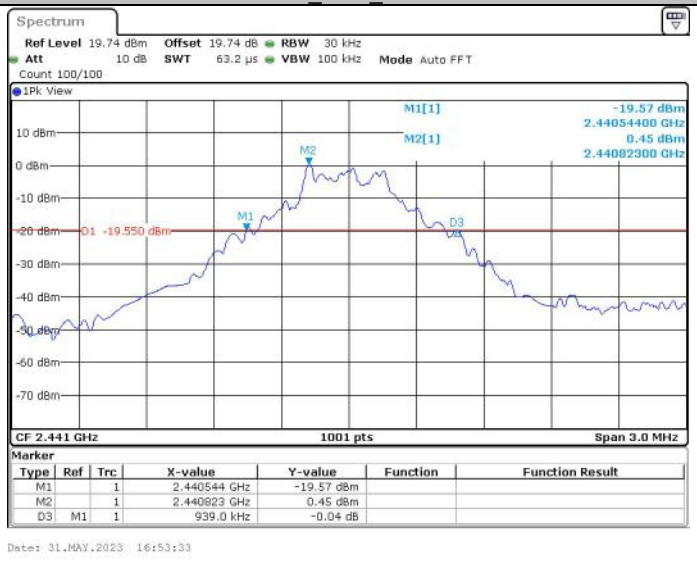
Test Mode	Antenna	Channel	20db EBW[MHz]	Limit[MHz]	Verdict
DH1	Ant1	2402	0.94	---	---
		2441	0.94	---	---
		2480	0.94	---	---
2DH1	Ant1	2402	1.28	---	---
		2441	1.28	---	---
		2480	1.28	---	---
3DH1	Ant1	2402	1.26	---	---
		2441	1.26	---	---
		2480	1.26	---	---

Test Graphs

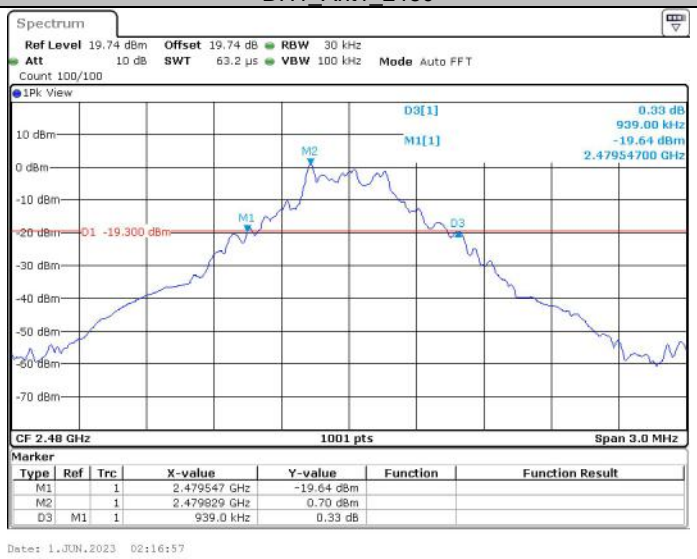
DH1_Ant1_2402



DH1_Ant1_2441

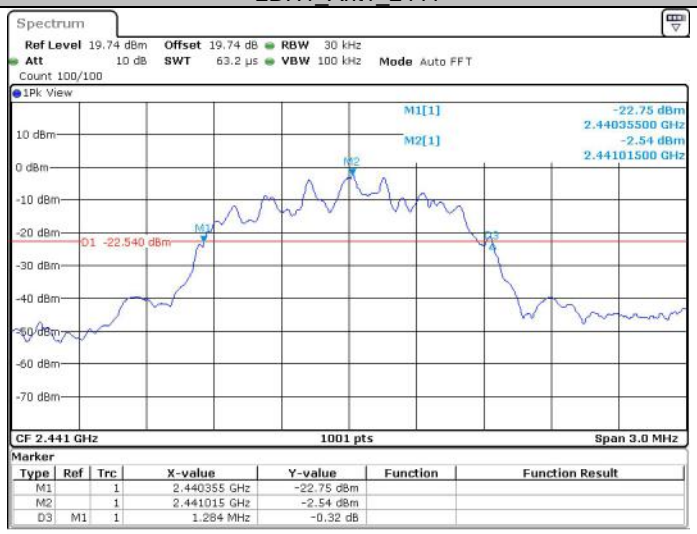


DH1_Ant1_2480

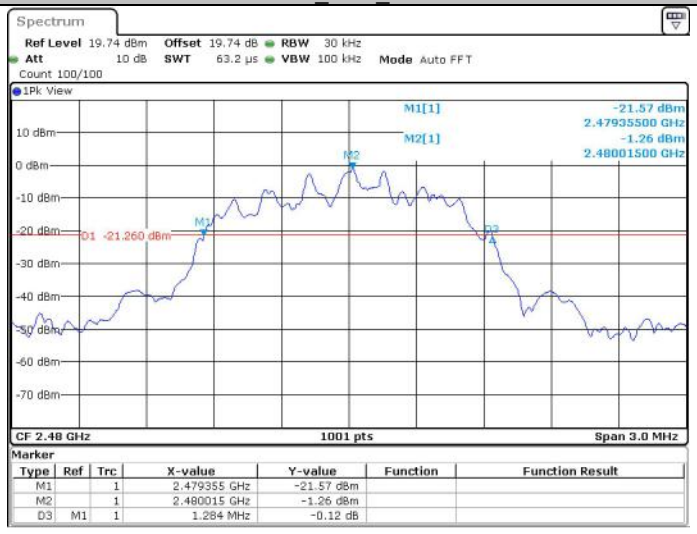


2DH1_Ant1_2402

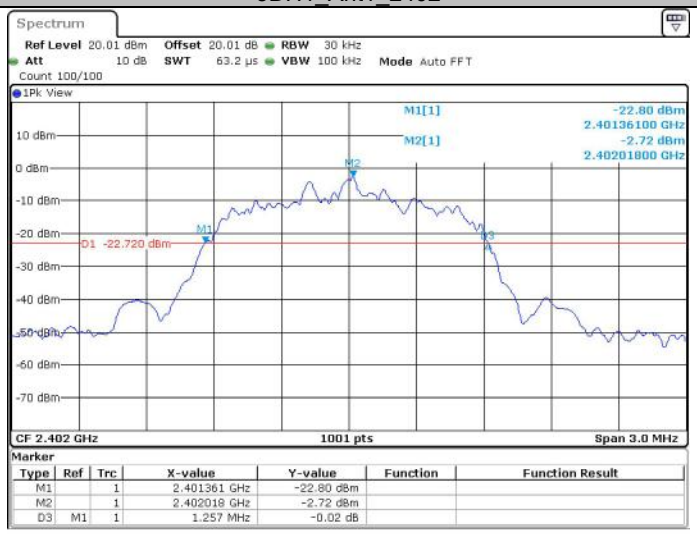
2DH1_Ant1_2441



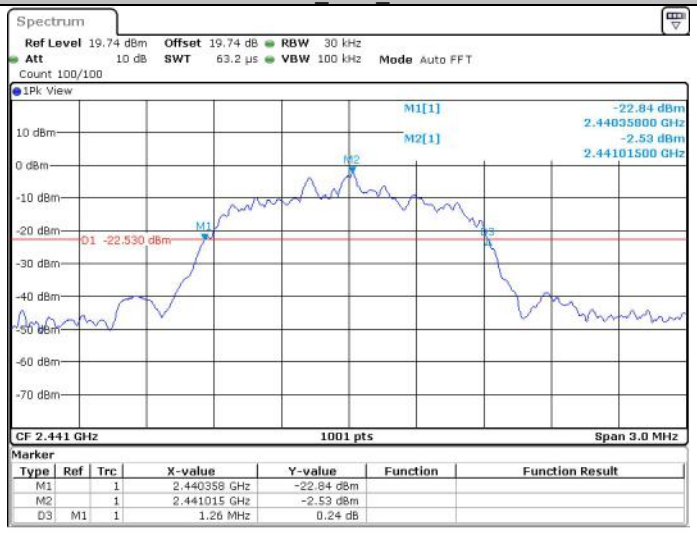
2DH1_Ant1_2480



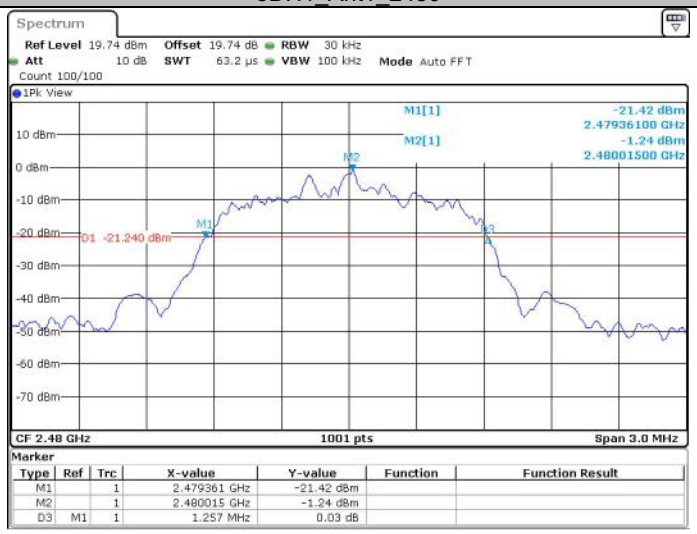
3DH1_Ant1_2402



3DH1_Ant1_2441



3DH1_Ant1_2480



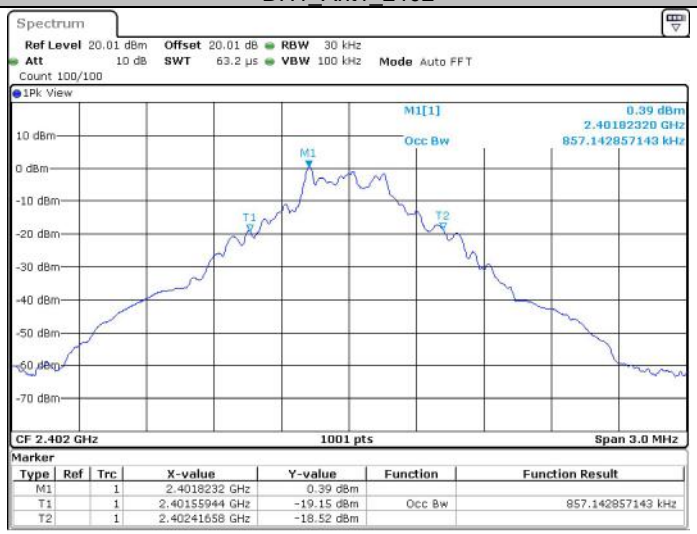
Appendix B: Occupied Channel Bandwidth

Test Result

Test Mode	Antenna	Channel	OCB [MHz]	Limit[MHz]	Verdict
DH1	Ant1	2402	0.857	---	---
		2441	0.860	---	---
		2480	0.860	---	---
2DH1	Ant1	2402	1.148	---	---
		2441	1.148	---	---
		2480	1.148	---	---
3DH1	Ant1	2402	1.160	---	---
		2441	1.160	---	---
		2480	1.160	---	---

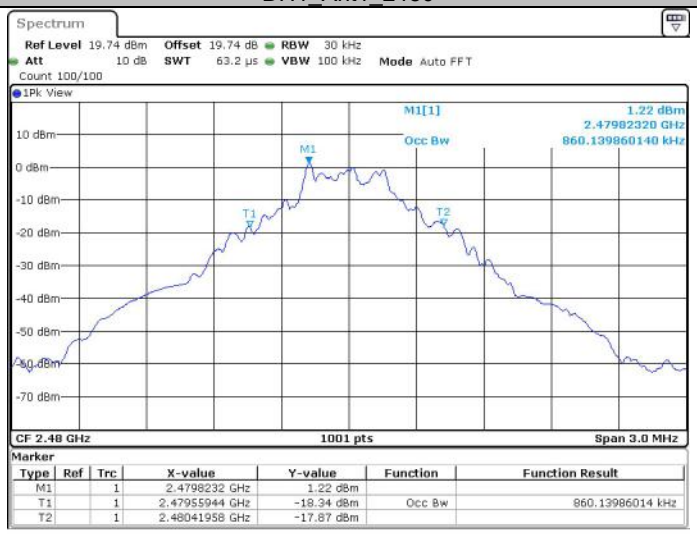
Test Graphs

DH1_Ant1_2402



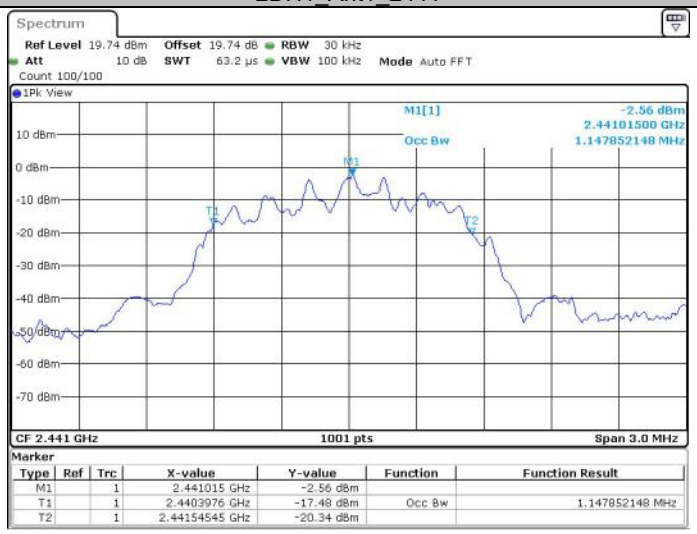
DH1_Ant1_2441

DH1_Ant1_2480



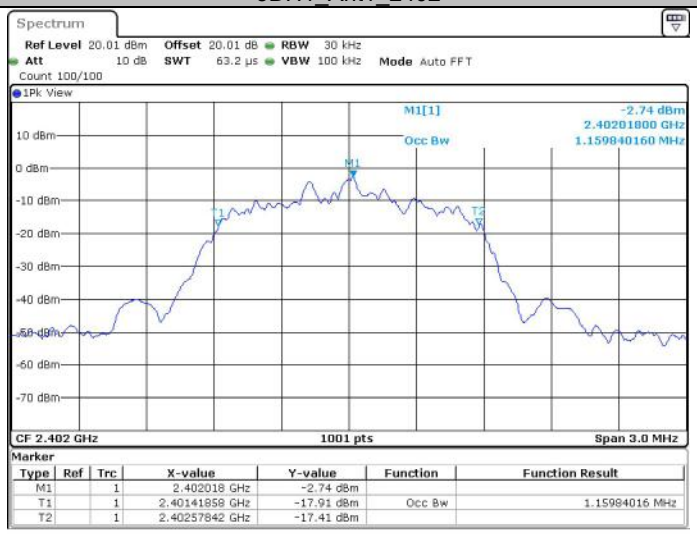
2DH1_Ant1_2402

2DH1_Ant1_2441

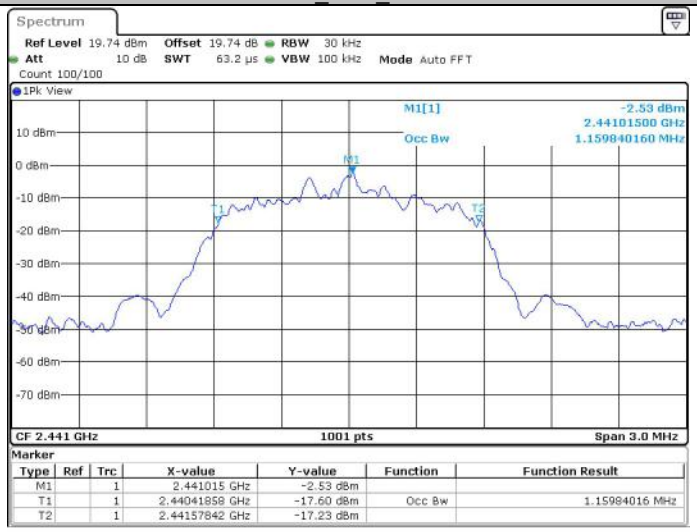


2DH1_Ant1_2480

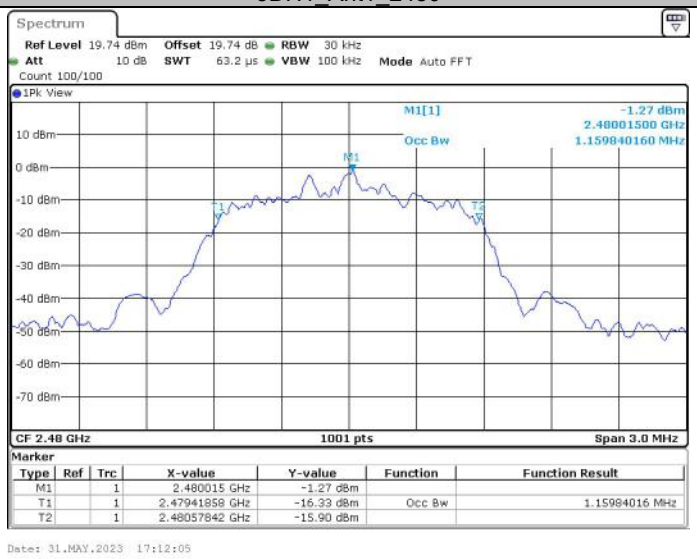
3DH1_Ant1_2402



3DH1_Ant1_2441



3DH1_Ant1_2480



Appendix C: Maximum conducted Peak output power

Test Result

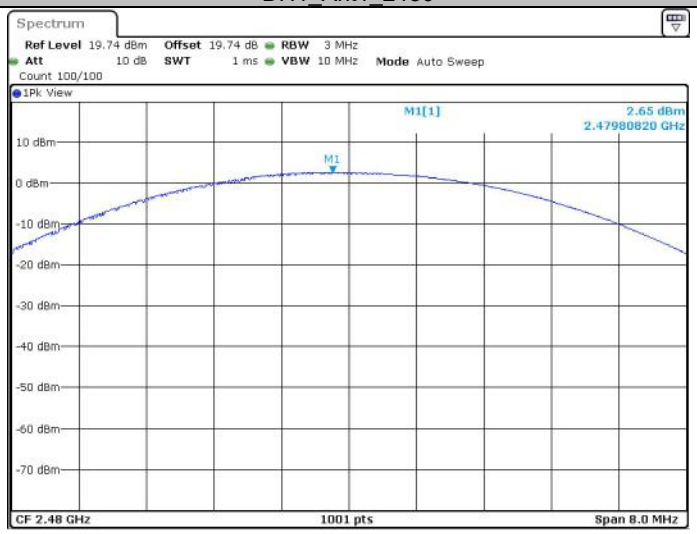
Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH1	Ant1	2402	1.77	≤20.97	PASS
		2441	1.90	≤20.97	PASS
		2480	2.65	≤20.97	PASS
2DH1	Ant1	2402	1.18	≤20.97	PASS
		2441	1.36	≤20.97	PASS
		2480	2.66	≤20.97	PASS
3DH1	Ant1	2402	1.70	≤20.97	PASS
		2441	1.81	≤20.97	PASS
		2480	**3.07**	≤20.97	PASS
Note: antenna gain=1.76dBi, maximum EIRP=4.83dBm<36dBm					

Test Graphs

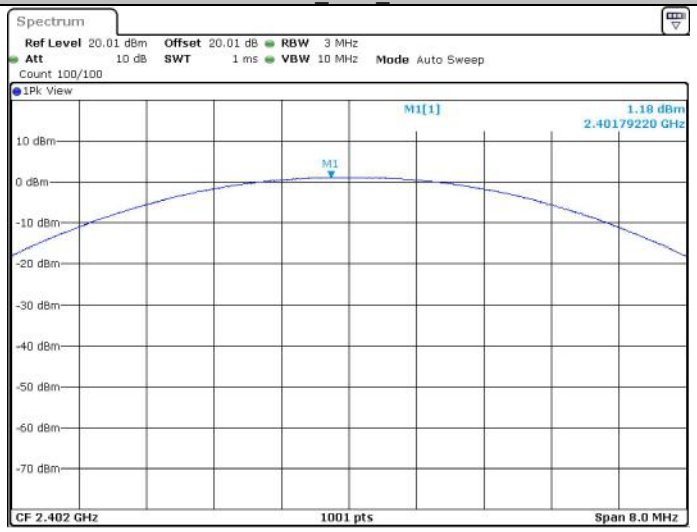
DH1_Ant1_2402

DH1_Ant1_2441

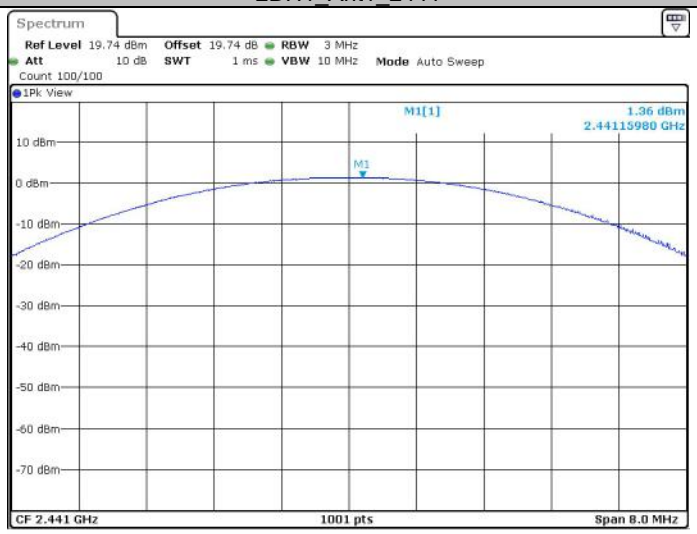
DH1_Ant1_2480



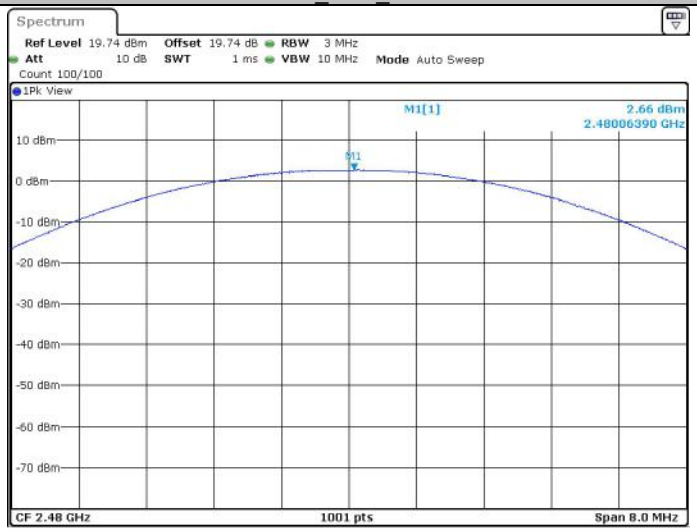
2DH1_Ant1_2402



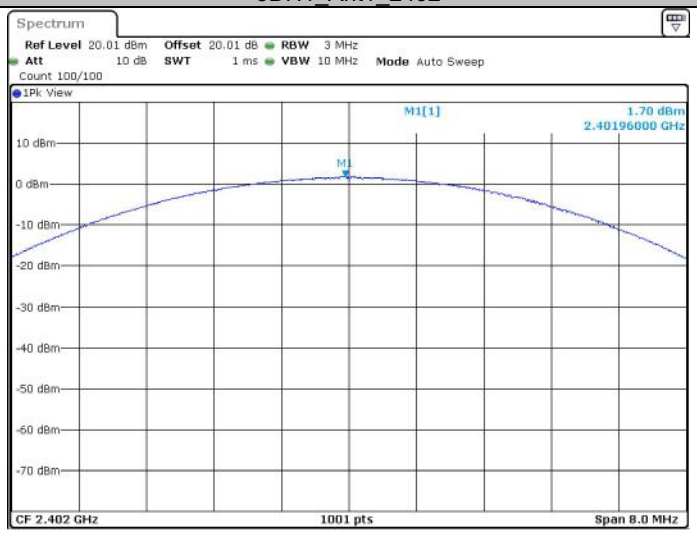
2DH1_Ant1_2441



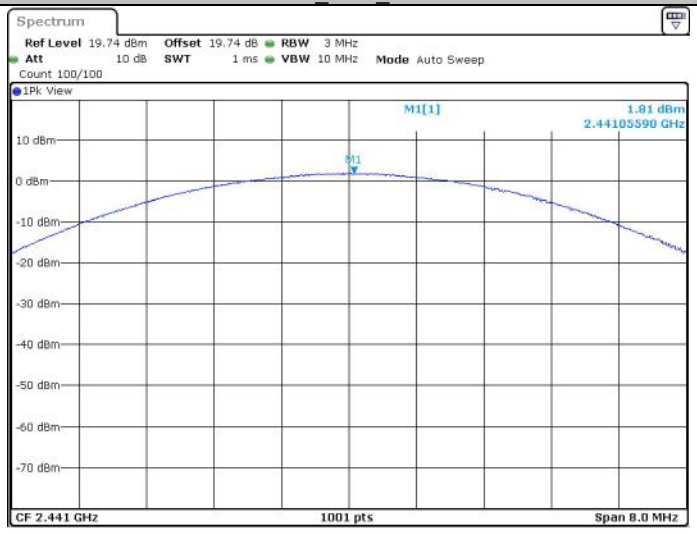
2DH1_Ant1_2480



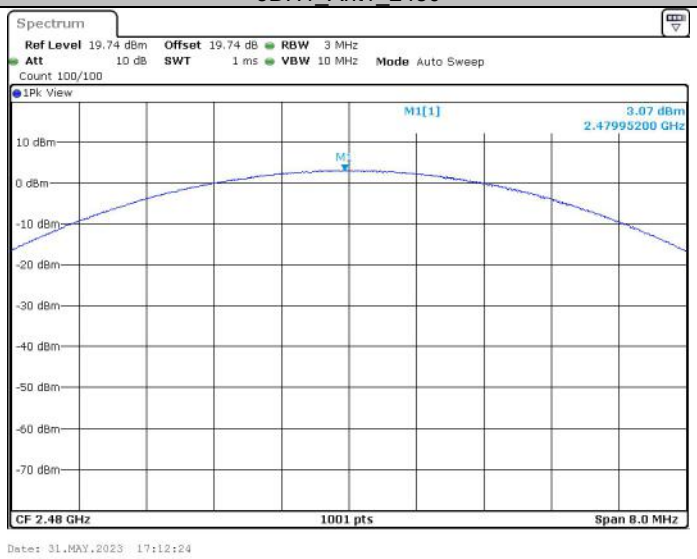
3DH1_Ant1_2402



3DH1_Ant1_2441



3DH1_Ant1_2480



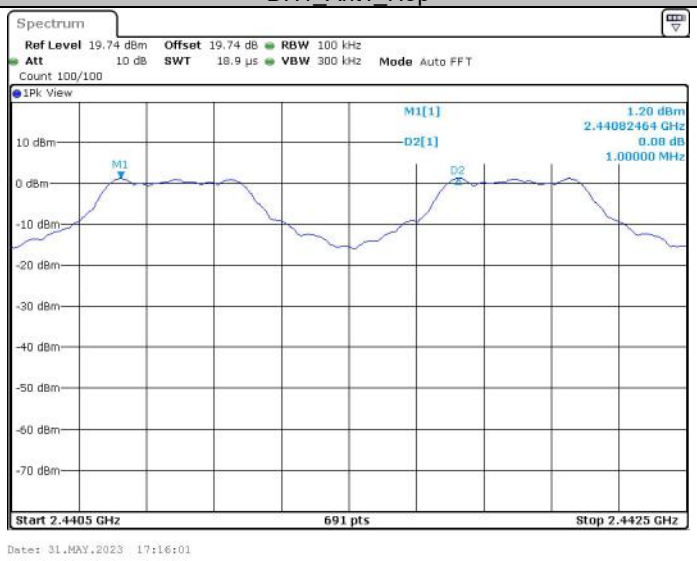
Appendix D: Carrier frequency separation

Test Result

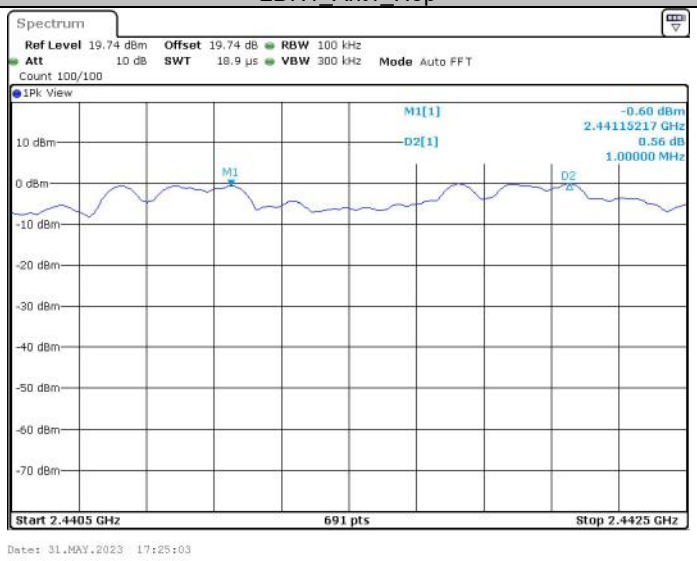
Test Mode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH1	Ant1	Hop	1	≥0.627	PASS
2DH1	Ant1	Hop	1	≥0.853	PASS
3DH1	Ant1	Hop	1.003	≥0.840	PASS

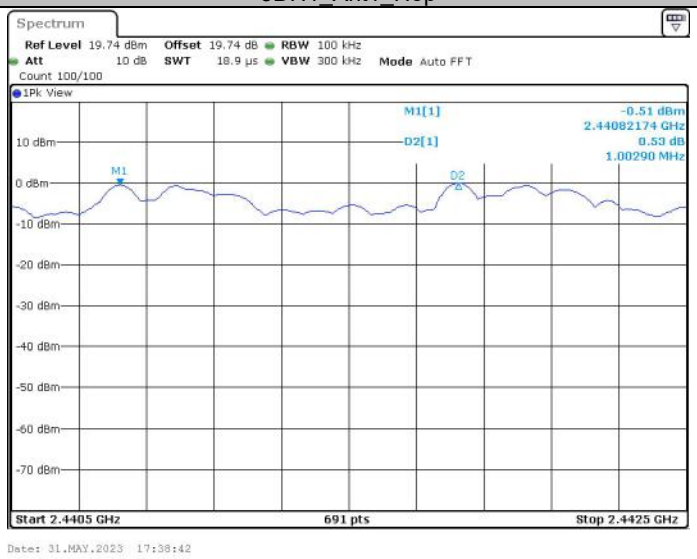
Test Graphs

DH1_Ant1_Hop



2DH1_Ant1_Hop



3DH1_Ant1_Hop


Appendix E: Time of occupancy

Test Result

Test Mode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.40	320	0.128	≤0.4	PASS
DH3	Ant1	Hop	1.65	170	0.281	≤0.4	PASS
DH5	Ant1	Hop	2.89	130	0.376	≤0.4	PASS
2DH1	Ant1	Hop	0.39	330	0.129	≤0.4	PASS
2DH3	Ant1	Hop	1.64	160	0.262	≤0.4	PASS
2DH5	Ant1	Hop	2.88	120	0.346	≤0.4	PASS
3DH1	Ant1	Hop	0.39	320	0.125	≤0.4	PASS
3DH3	Ant1	Hop	1.64	160	0.262	≤0.4	PASS
3DH5	Ant1	Hop	2.88	110	0.317	≤0.4	PASS

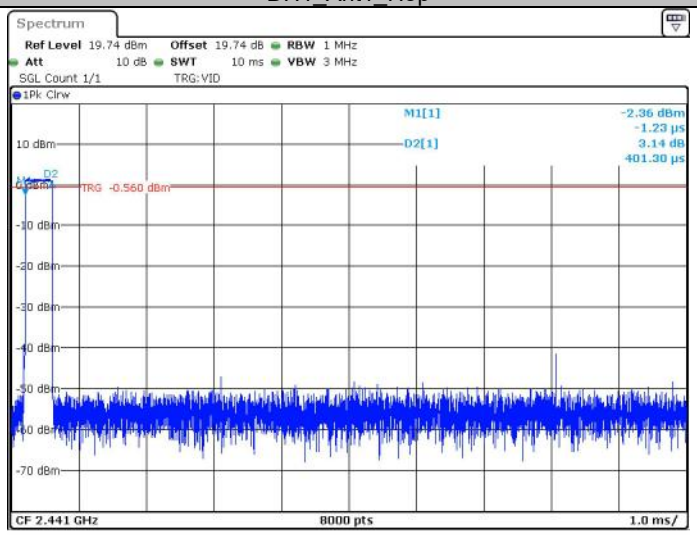
Note 1: A period time=0.4*79=31.6(S), Result=BurstWidth*Totalhops

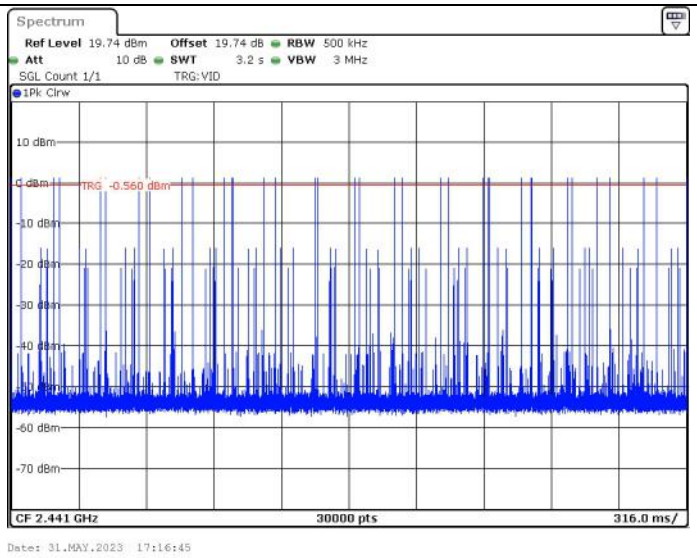
Note 2: Totalhops=Hopping Number in 3.16s*10

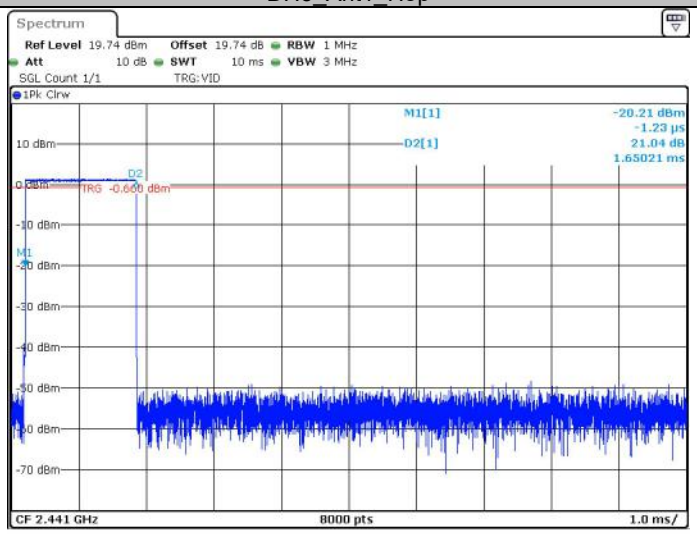
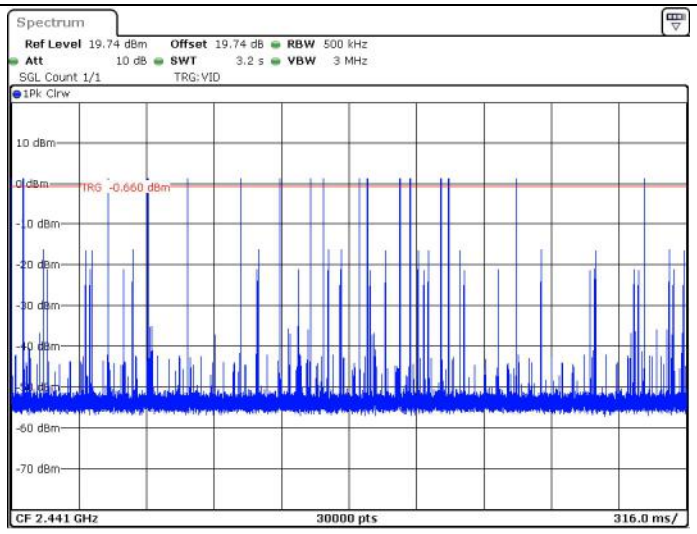
Note 3: Hopping Number in 3.16s=Total of highest signals in 3.16s(Second high signals were other channel)

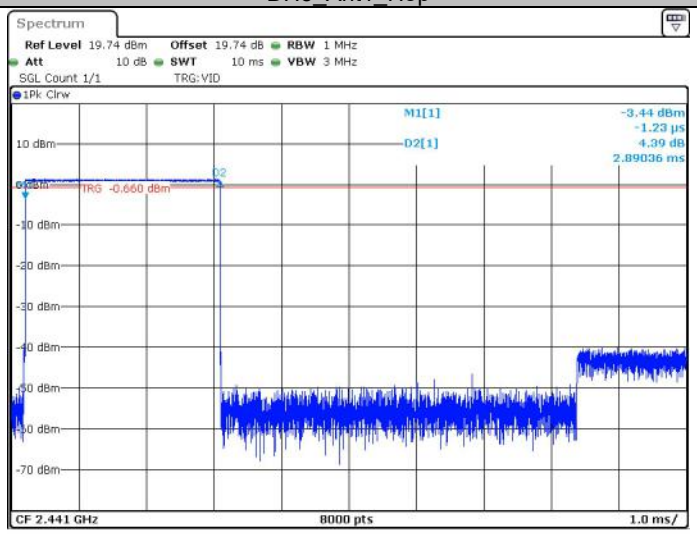
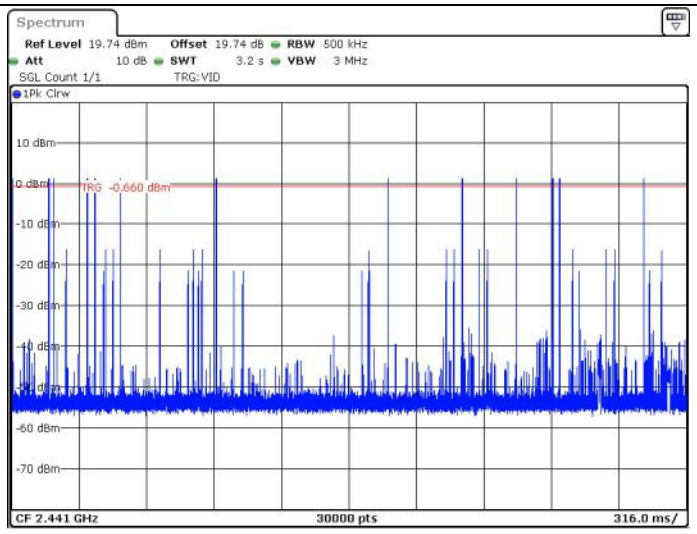
Test Graphs

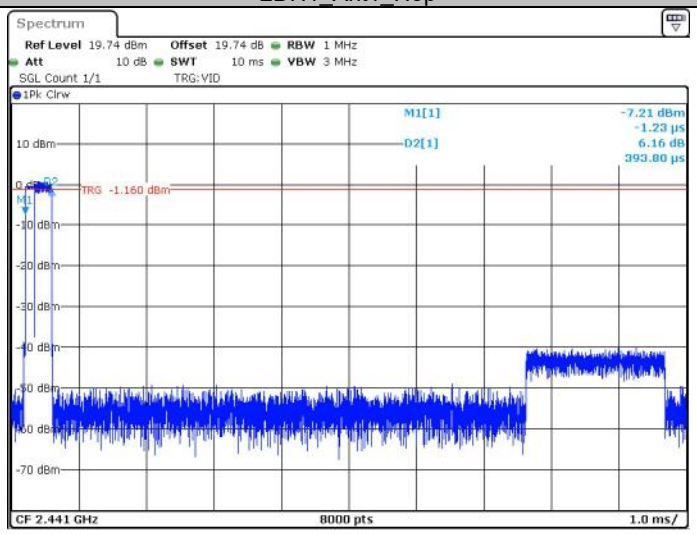
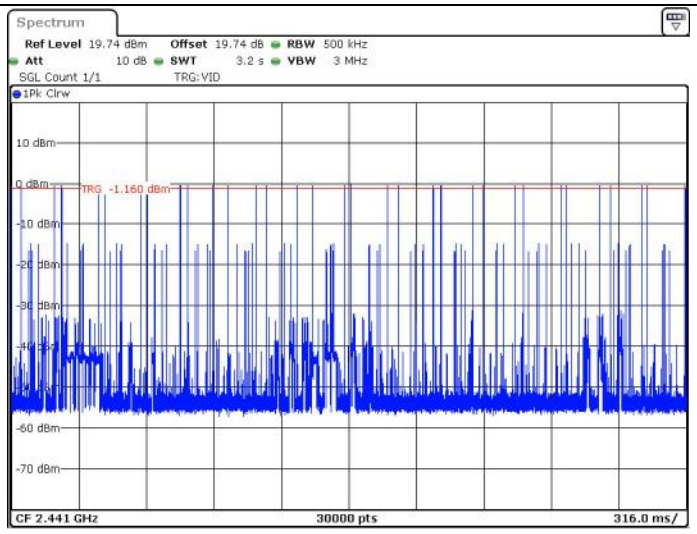
DH1_Ant1_Hop

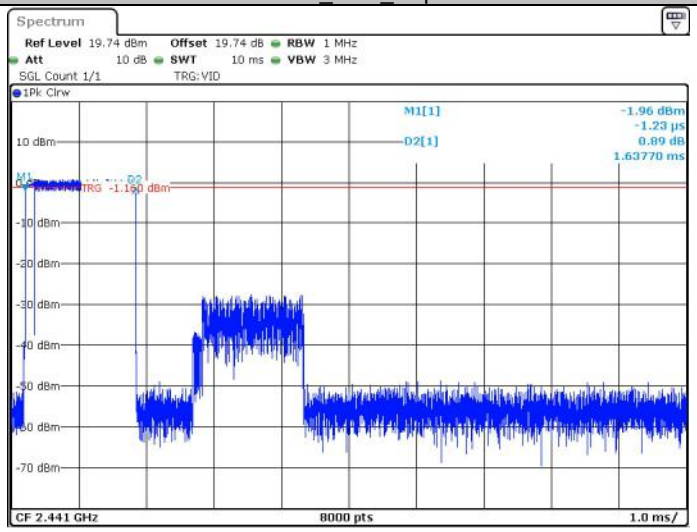
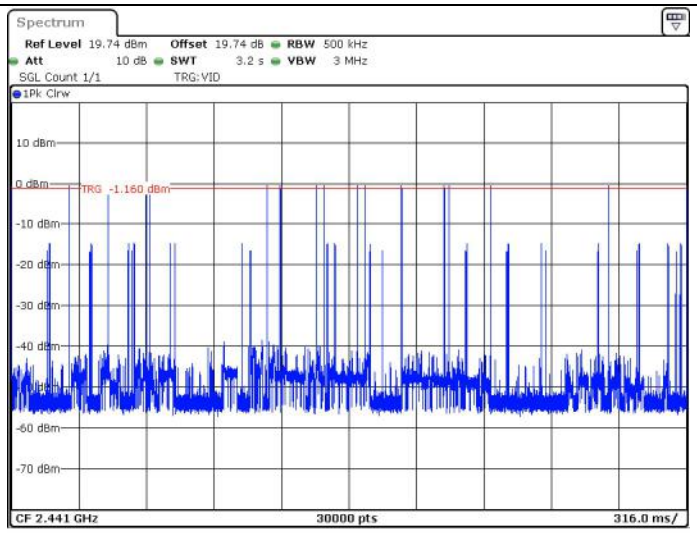


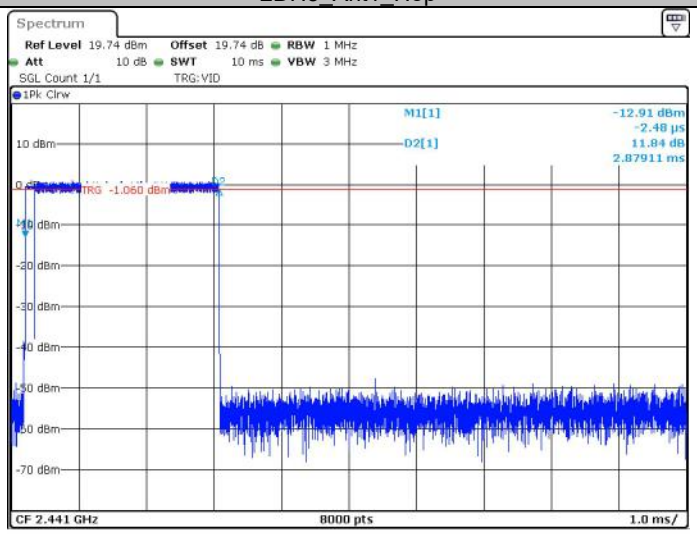
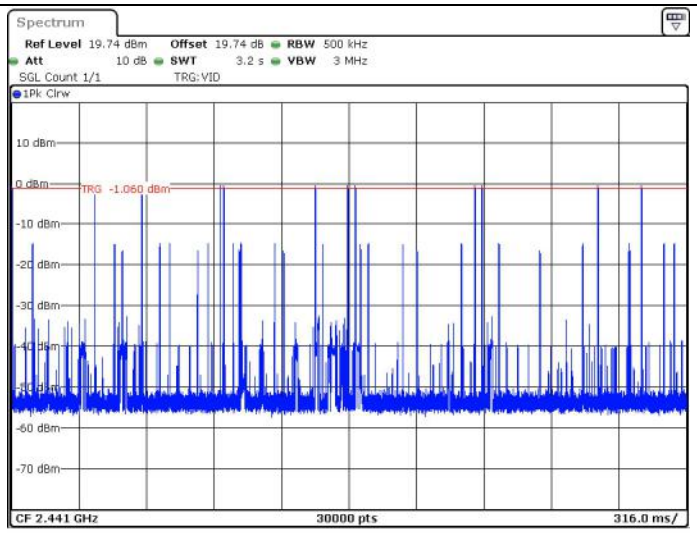


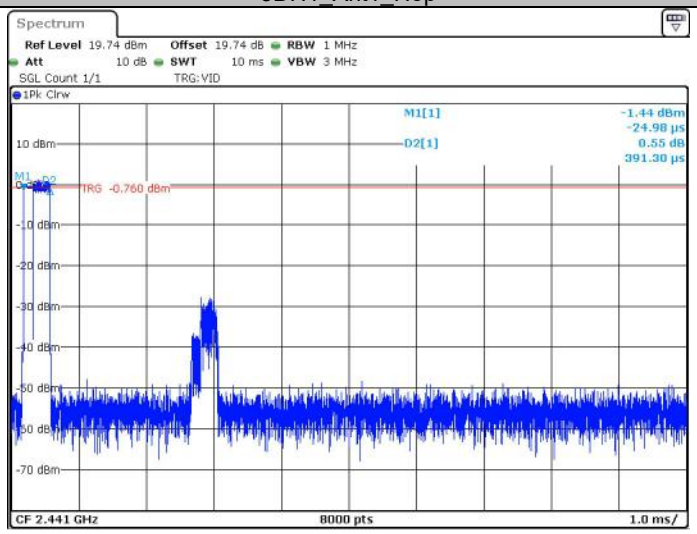
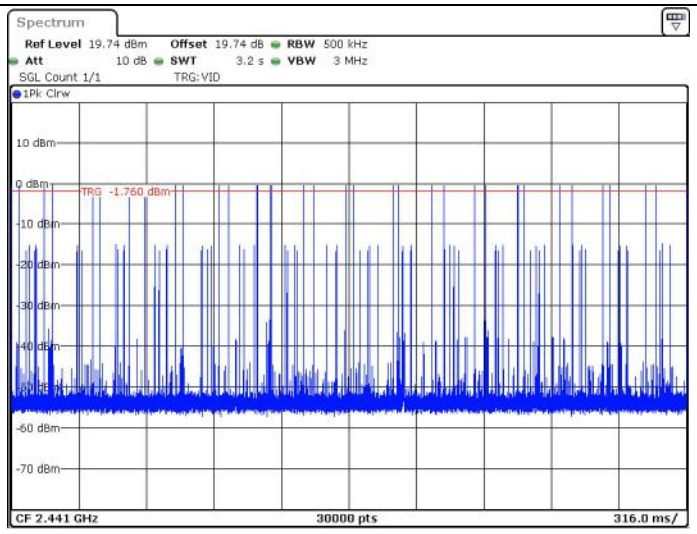
DH3_Ant1_Hop
 Spectrum Ref Level 19.74 dBm Offset 19.74 dB RBW 1 MHz Att 10 dB SWT 10 ms VBW 3 MHz SGL Count 1/1 TRG:VID 1Pk Clrw M1[1] -20.21 dBm -1.23 µs D2[1] 21.04 dB 1.65021 ms D2 TRG -0.660 dBm M1 CF 2.441 GHz 8000 pts 1.0 ms/ Date: 31.MAY.2023 17:19:09
 Spectrum Ref Level 19.74 dBm Offset 19.74 dB RBW 500 kHz Att 10 dB SWT 3.2 s VBW 3 MHz SGL Count 1/1 TRG:VID 1Pk Clrw TRG -0.660 dBm CF 2.441 GHz 30000 pts 316.0 ms/ Date: 31.MAY.2023 17:19:14

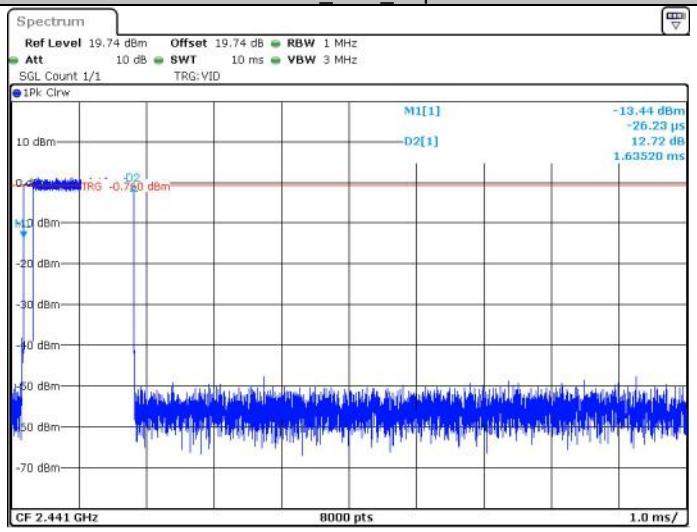
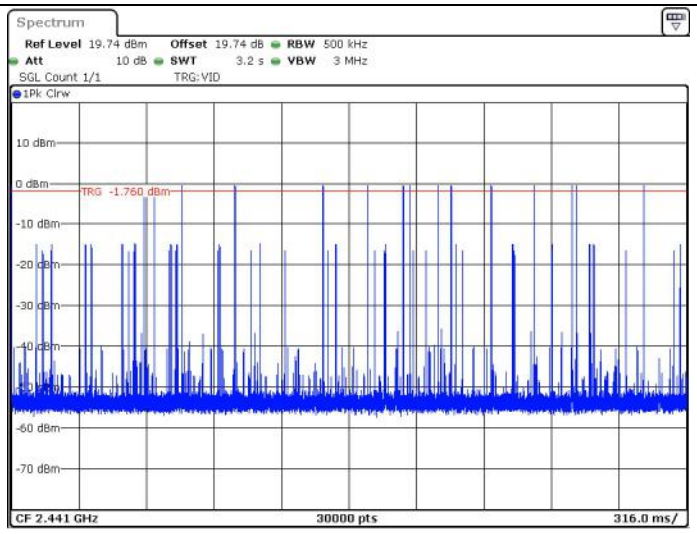
DH5_Ant1_Hop
 Spectrum Ref Level 19.74 dBm Offset 19.74 dB RBW 1 MHz Att 10 dB SWT 10 ms VBW 3 MHz SGL Count 1/1 TRG:VID 1Pk Clrw M1[1] -3.44 dBm -1.23 µs D2[1] 4.39 dB 2.89036 ms TRG -0.660 dBm CF 2.441 GHz 8000 pts 1.0 ms/ Date: 31.MAY.2023 17:20:07
 Spectrum Ref Level 19.74 dBm Offset 19.74 dB RBW 500 kHz Att 10 dB SWT 3.2 s VBW 3 MHz SGL Count 1/1 TRG:VID 1Pk Clrw TRG -0.660 dBm CF 2.441 GHz 30000 pts 316.0 ms/ Date: 31.MAY.2023 17:20:13

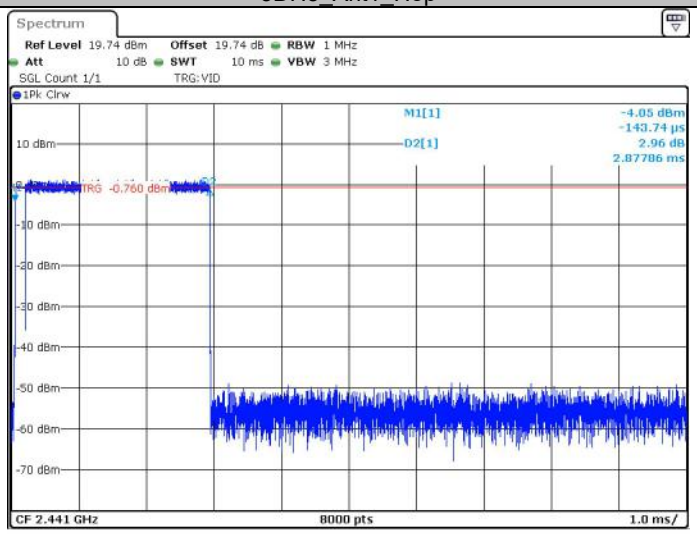
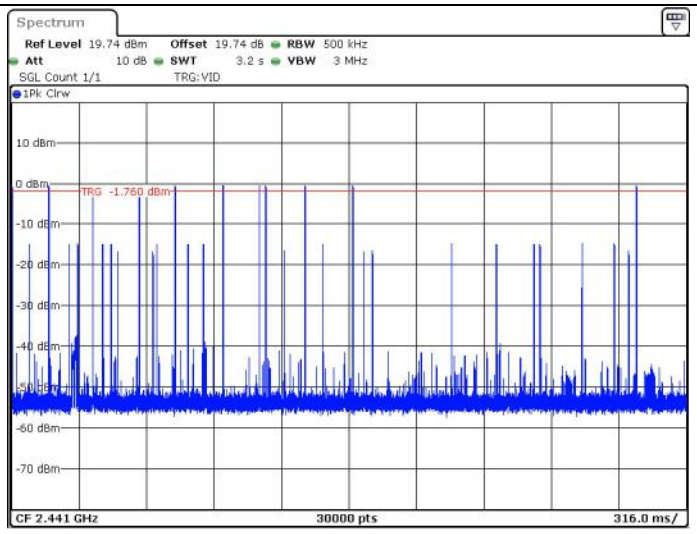
2DH1_Ant1_Hop



2DH3_Ant1_Hop



2DH5_Ant1_Hop



3DH1_Ant1_Hop



3DH3_Ant1_Hop



3DH5_Ant1_Hop



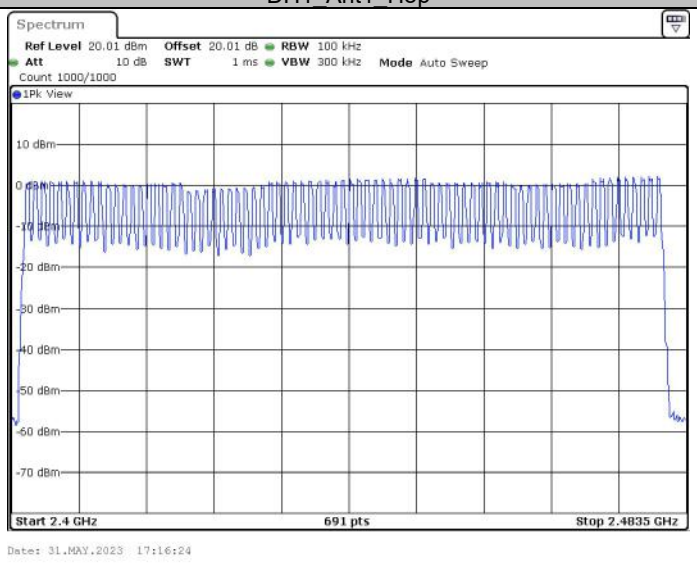
Appendix F: Number of hopping channels

Test Result

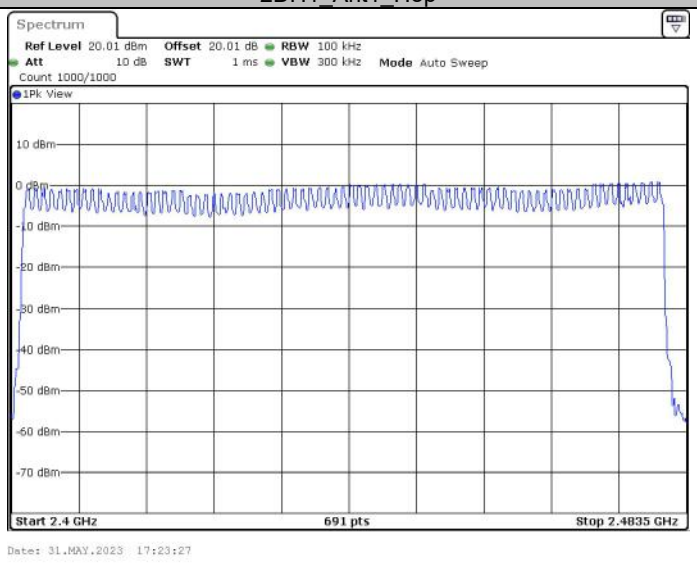
Test Mode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH1	Ant1	Hop	79	≥15	PASS
2DH1	Ant1	Hop	79	≥15	PASS
3DH1	Ant1	Hop	79	≥15	PASS

Test Graphs

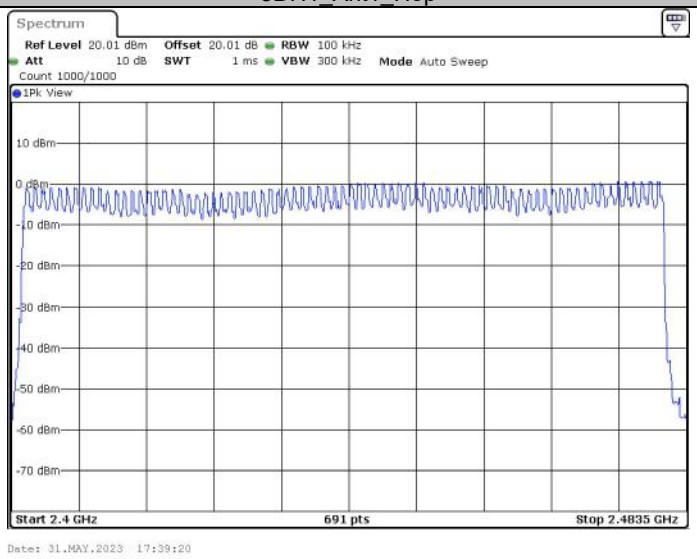
DH1_Ant1_Hop



2DH1_Ant1_Hop



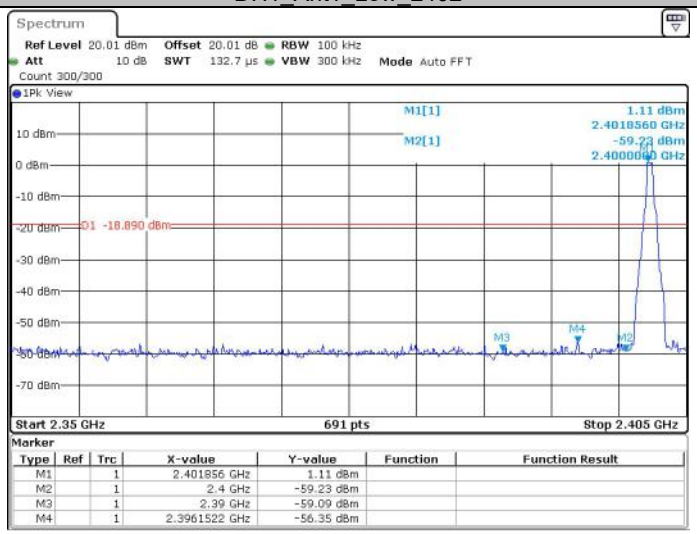
3DH1_Ant1_Hop



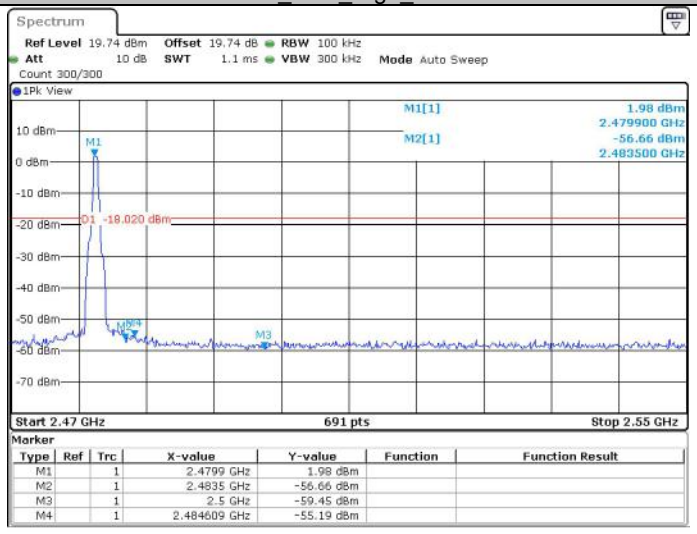
Appendix G: Band edge measurements

Test Graphs

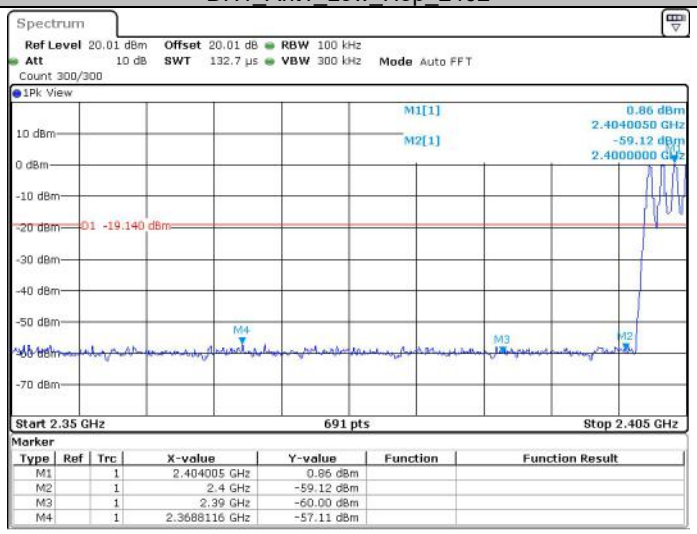
DH1_Ant1_Low_2402



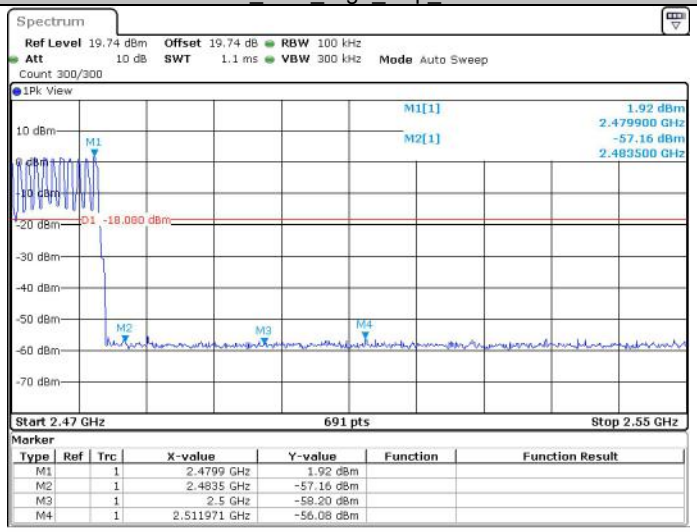
DH1_Ant1_High_2480



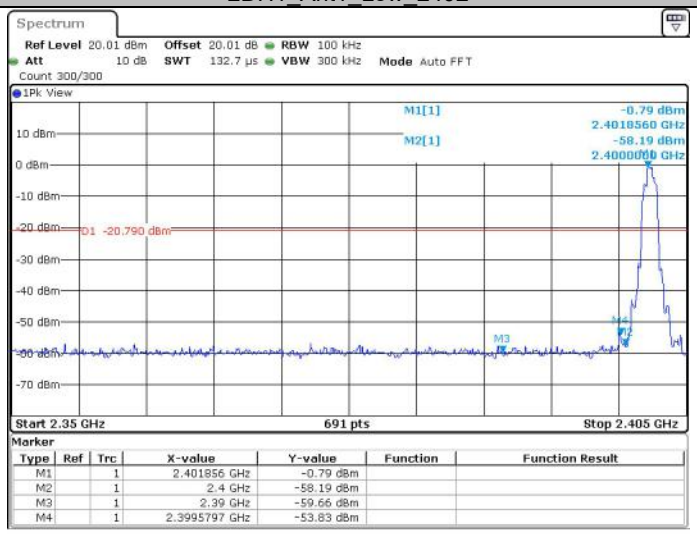
DH1_Ant1_Low_Hop_2402



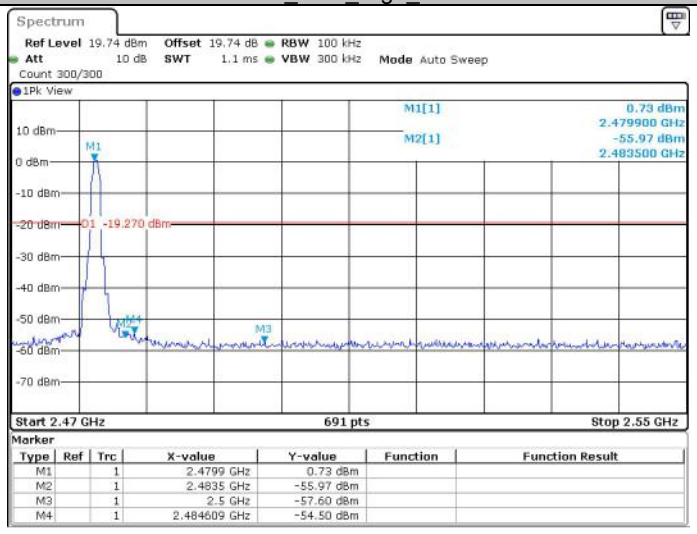
DH1_Ant1_High_Hop_2480



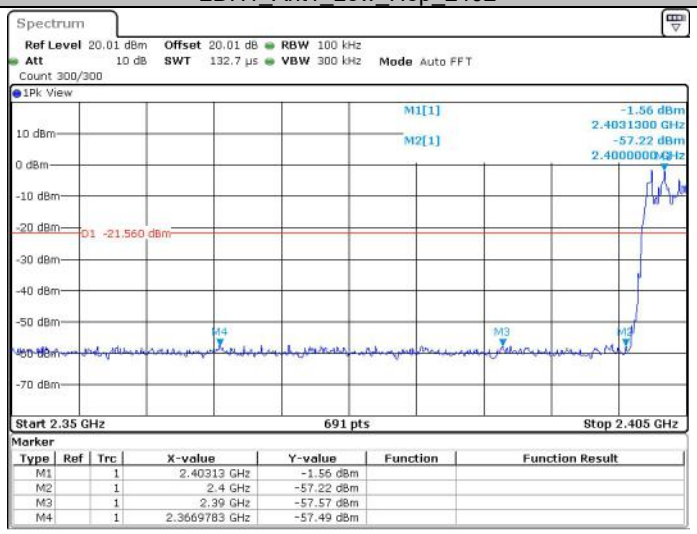
2DH1_Ant1_Low_2402



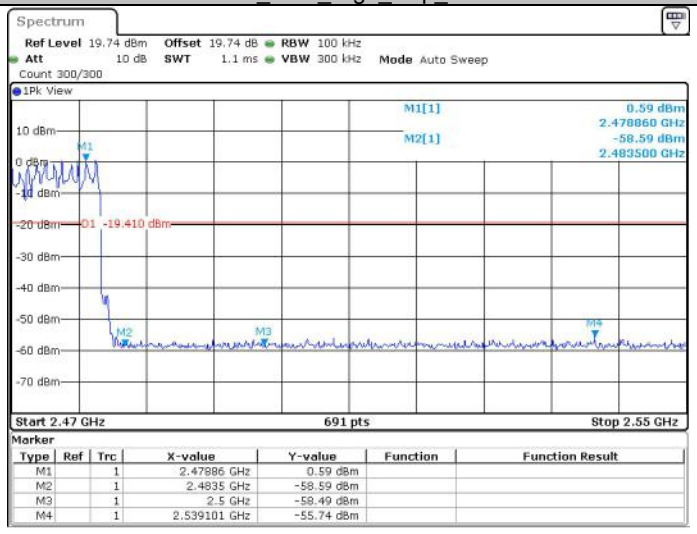
2DH1_Ant1_High_2480



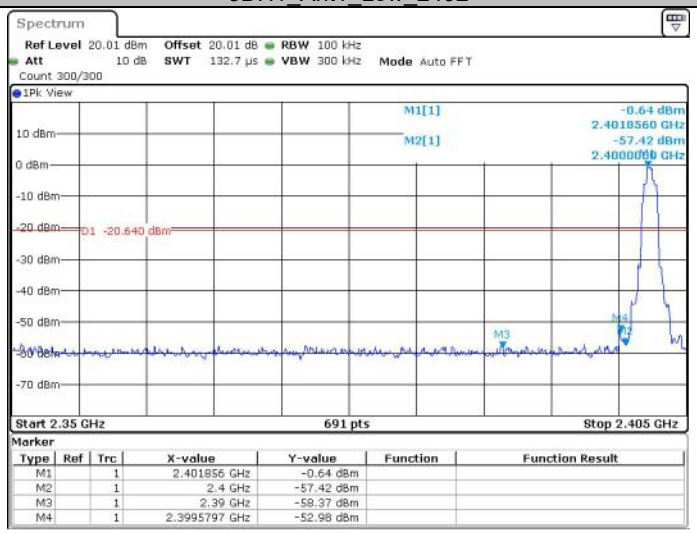
2DH1_Ant1_Low_Hop_2402



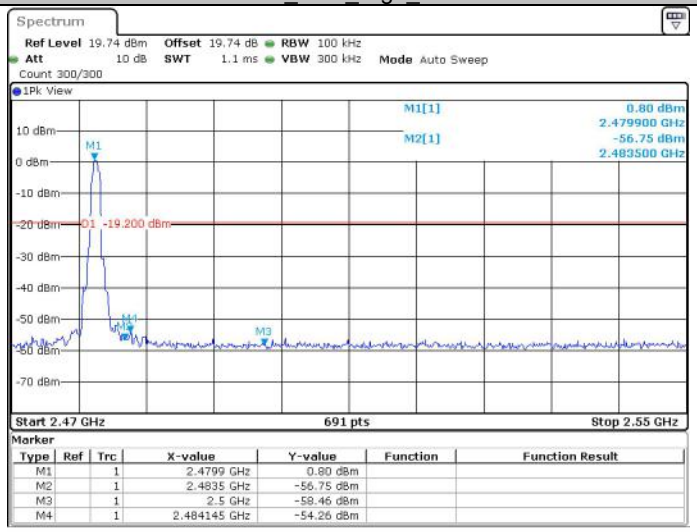
2DH1_Ant1_High_Hop_2480



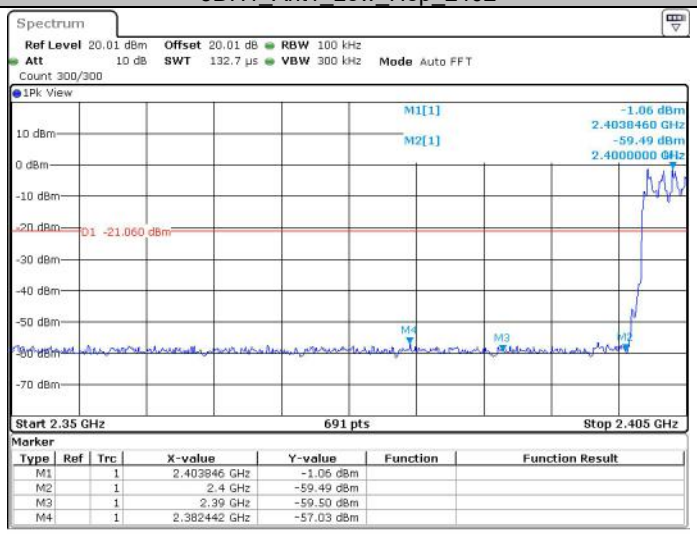
3DH1_Ant1_Low_2402



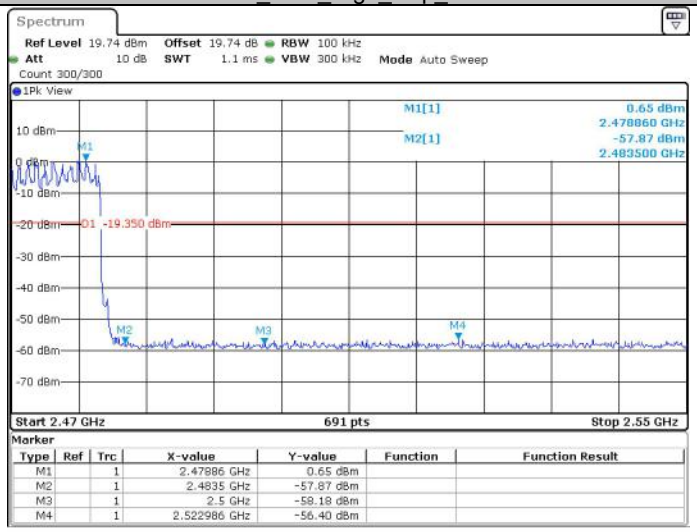
3DH1_Ant1_High_2480



3DH1_Ant1_Low_Hop_2402



3DH1_Ant1_High_Hop_2480



******* END OF REPORT *******