TEST REPORT

Applicant Name :	Anhui Huami Information Technology Co.,Ltd.
Address(FCC) :	7/F,Building B2,Huami Global Innovation Center,No. 900, Wang jiang West Road, High-tech Zone,Hefei City Anhui Pilot Free Trade Zone, China
Address(IC) :	7/F,Building B2,Huami Global Innovation Center, No. 900, Wang jiang West Road, High-tech Zone, Pilot Free Trade Zone, Hefei Anhui China (Peoples Republic Of)
Factory1 Name	Cosonic Electroacoustic Technology Co., Ltd.
Factory1 Address:	No.151, Shipai Section, Dongyuan Avenue, Shipai Town Dongguan, Guangdong, China
Factory2 Name	COSONIC VIETNAM COMPANY LIMITED
Factory2 Address:	Lot C5-1, Ba Thien ll Industrial Park,Thien Ke Ward,Binh Xuyen District,Vinh Phuc Province,Vietnam
Report Number :	RA230529-30064E-RFB
FCC ID:	2AC8UA2211
IC:	21806-A2211

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 watch
Model No.:	A2211
Trade Mark:	AMAZFIT
Date Received:	2023-05-29
Date of Test:	2023-06-01 to 2023-06-05
Report Date:	2023-06-09

Test Result:	Pass*

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

Prepared and Checked By:

Dave Liang
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 "★".

Shenzhen Accurate Technology Co., Ltd. is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RA230529-30064E-RFB	Original Report	2023-06-09

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	Smart watch
Tested Model	A2211
HVIN	A2211
Frequency Range	Bluetooth:2402-2480MHz
Maximum Conducted Peak Output Power	Bluetooth: 9.53dBm
Modulation Technique	BDR(GFSK)/EDR(π/4-DQPSK)/EDR(8DPSK)
Antenna Specification*	-3.46dBi (It is provided by the applicant)
Voltage Range	DC 3.87V from battery or DC 5V from adapter
Sample serial number	RA230529-30064E-RF-S1 (CE&RE) RA230529-30064E-RF-S2 (RF Conducted Test) (Assigned by ATC, Shenzhen)
Sample/EUT Status	Good condition

Objective

This report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules and RSS-GEN Issue 5, February 2021 Amendment 2 and RSS-247, Issue 2, February 2017 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 Compliant Testing of Unlicensed Wireless Devices and RSS-GEN Issue 5, February 2021 Amendment 2 and RSS-247, Issue 2, February 2017.

And KDB 558074 D01 15.247 Meas Guidance v05r02.

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		2.74dB
Emissions, Radiated	30MHz - 1GHz	5.08dB
	1GHz - 18GHz	4.96dB
	18GHz - 26.5GHz	5.16dB
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.

79 channels are provided to testing:

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

EUT was tested with Channel 0, 39 and 78.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

Software “RTLBTAPP”* was used during testing and the Power level is Default * .

Support Equipment List and Details

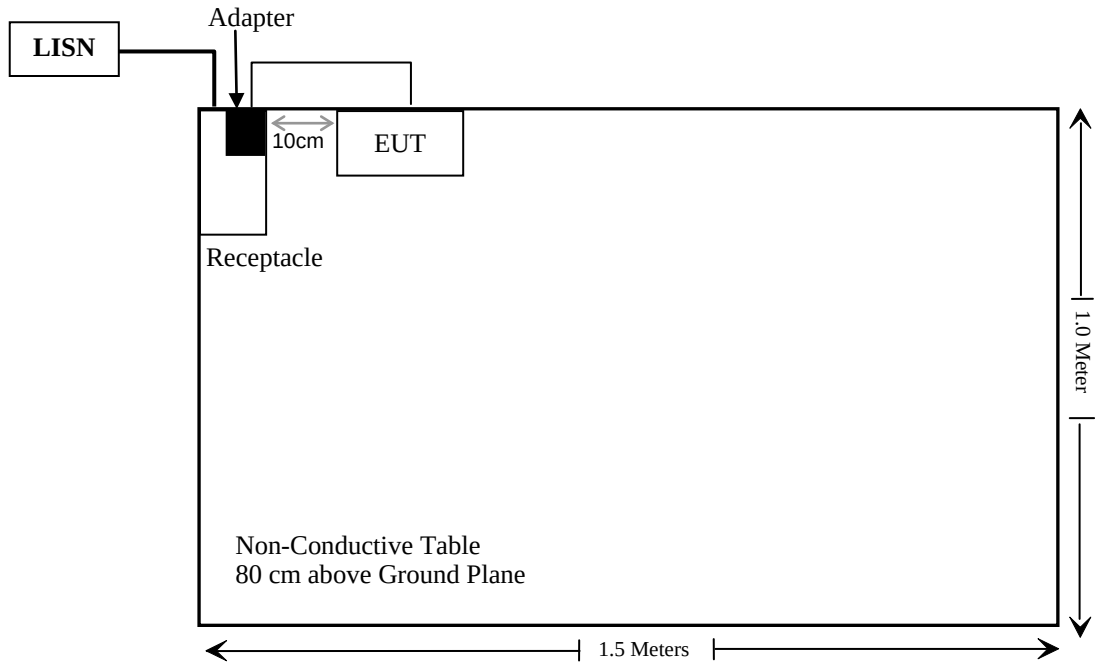
Manufacturer	Description	Model	Serial Number
Unknown	Adapter	Unknown	Unknown

External I/O Cable

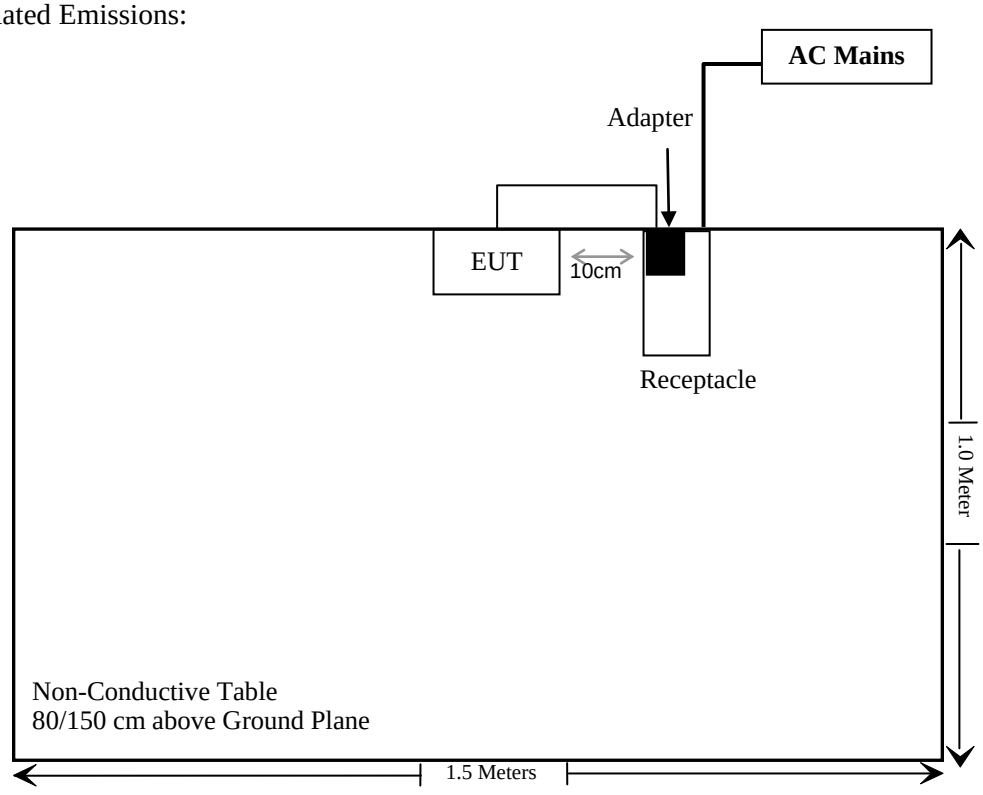
Cable Description	Length (m)	From Port	To
USB power cord	0.45	Adapter	EUT

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

FCC Rules	ISEDC Rules	Description of Test	Result
§1.1307 & §2.1093	RSS-102 §4	RF Exposure(SAR)	Compliant
§15.203	RSS-Gen §6.8	Antenna Requirement	Compliant
§15.207(a)	RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	RSS-247 § 5.5, RSS-GEN § 8.10	Radiated Emissions	Compliant
§15.247(a)(1)	RSS-247 § 5.1(a), RSS-GEN § 6.7	20 dB Emission Bandwidth & 99% Occupied Bandwidth	Compliant
§15.247(a)(1)	RSS-247 § 5.1 (b)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	RSS-247 § 5.1 (d)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	RSS-247 § 5.1(b) &§ 5.4(b)	Peak Output Power Measurement	Compliant
§15.247(d)	RSS-247 § 5.5	Band edges	Compliant

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions 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 191218 (V9)					
Radiated Emissions 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
Wainwright	High Pass Filter	WHKX3.6/18G-10SS	5	2022/11/25	2023/11/24
Wainwright	Band Reject Filter	WRCG2400/2485-2375/2510-60/11SS	10	2022/11/25	2023/11/24
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
Radiated Emission Test Software: e3191218 (V9)					
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2022/11/25	2023/11/24
Rohde & Schwarz	Open Switch and Control Unit	OSP120 + OSP-B157	101244 + 100866	2022/11/25	2023/11/24
WEINSCHEL	10dB Attenuator	5324	AU 3842	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.33	RF-03	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 §1.1307(b)&§2.1093-RF EXPOSURE

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliant, please refer to the SAR report:RA230529-30064E-20A

RSS-102 §4-RF EXPOSURE

Applicable Standard

According to RSS-102 § 4 table 3, SAR Limits for Devices Used by the General Public (Uncontrolled Environment)

Body Region	Average SAR (W/kg)	Averaging Time (minutes)[20]	Mass Average (g)
Whole Body	0.08	6	Whole Body
Localized Head, Neck and Trunk	1.6	6	1
Localized Limbs	4	6	10

Measurement Result: Compliant.

Please refer to SAR Report: RA230529-30064E-20B

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 and the maximum antenna gain is -3.46dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Antenna Type	Antenna Gain	Impedance
Integral	-3.46 dBi	50Ω

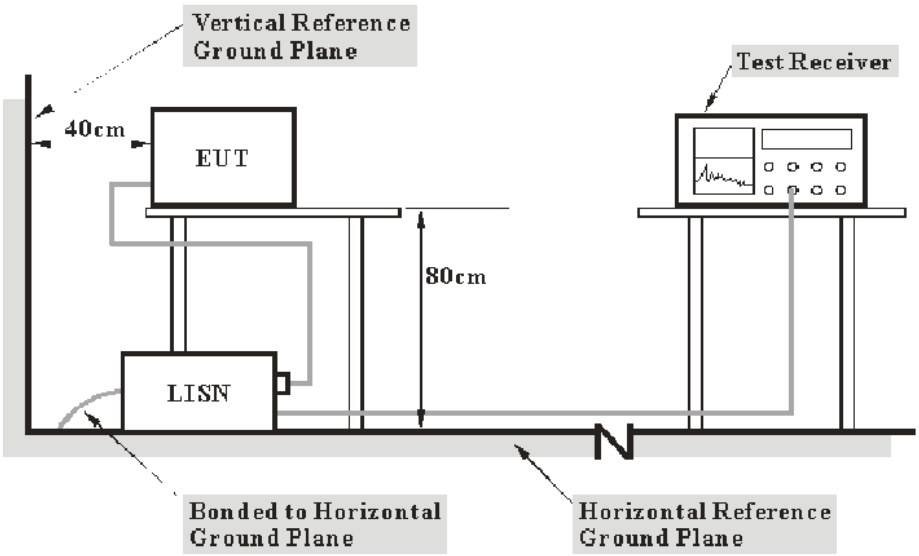
Result: Compliance

§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.

Calculation

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

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

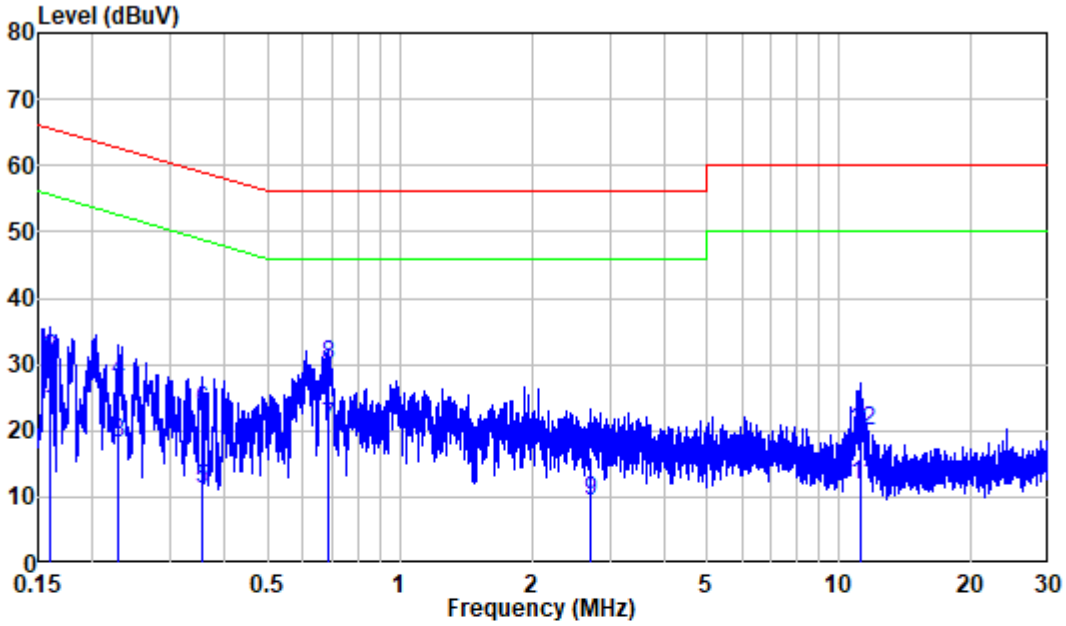
Environmental Conditions

Temperature:	25℃
Relative Humidity:	49%
ATM Pressure:	101.0 kPa

The testing was performed by Jerry Wu on 2023-06-02.

EUT operation mode: BT Transmitting (worst case 8DPSK low channel)

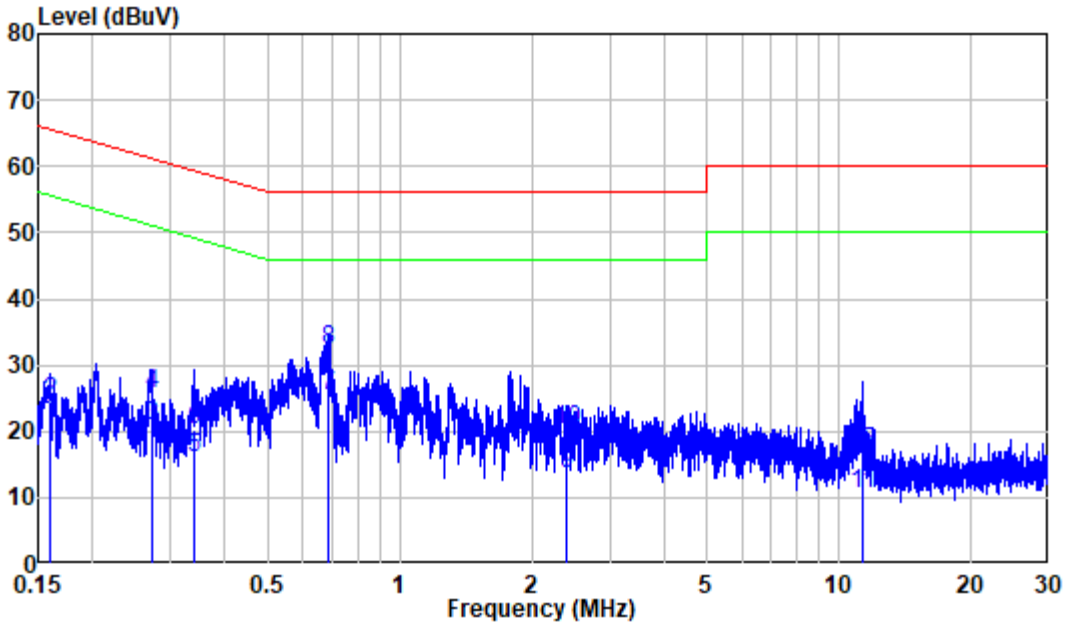
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : RA230529-30064E-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	0.159	10.36	12.57	22.93	55.50	-32.57	Average
2	0.159	10.36	20.52	30.88	65.50	-34.62	QP
3	0.228	10.33	7.78	18.11	52.52	-34.41	Average
4	0.228	10.33	17.04	27.37	62.52	-35.15	QP
5	0.353	10.45	0.60	11.05	48.88	-37.83	Average
6	0.353	10.45	12.54	22.99	58.88	-35.89	QP
7	0.689	10.67	9.74	20.41	46.00	-25.59	Average
8	0.689	10.67	19.22	29.89	56.00	-26.11	QP
9	2.716	10.46	-1.24	9.22	46.00	-36.78	Average
10	2.716	10.46	5.63	16.09	56.00	-39.91	QP
11	11.235	10.49	1.22	11.71	50.00	-38.29	Average
12	11.235	10.49	9.35	19.84	60.00	-40.16	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
Condition: Neutral
Job No. : RA230529-30064E-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	0.160	10.28	11.04	21.32	55.48	-34.16	Average
2	0.160	10.28	14.23	24.51	65.48	-40.97	QP
3	0.272	10.34	10.56	20.90	51.07	-30.17	Average
4	0.272	10.34	15.32	25.66	61.07	-35.41	QP
5	0.340	10.39	5.55	15.94	49.21	-33.27	Average
6	0.340	10.39	9.79	20.18	59.21	-39.03	QP
7	0.690	10.47	14.86	25.33	46.00	-20.67	Average
8	0.690	10.47	21.77	32.24	56.00	-23.76	QP
9	2.404	10.51	3.05	13.56	46.00	-32.44	Average
10	2.404	10.51	9.60	20.11	56.00	-35.89	QP
11	11.257	10.56	-0.13	10.43	50.00	-39.57	Average
12	11.257	10.56	6.48	17.04	60.00	-42.96	QP

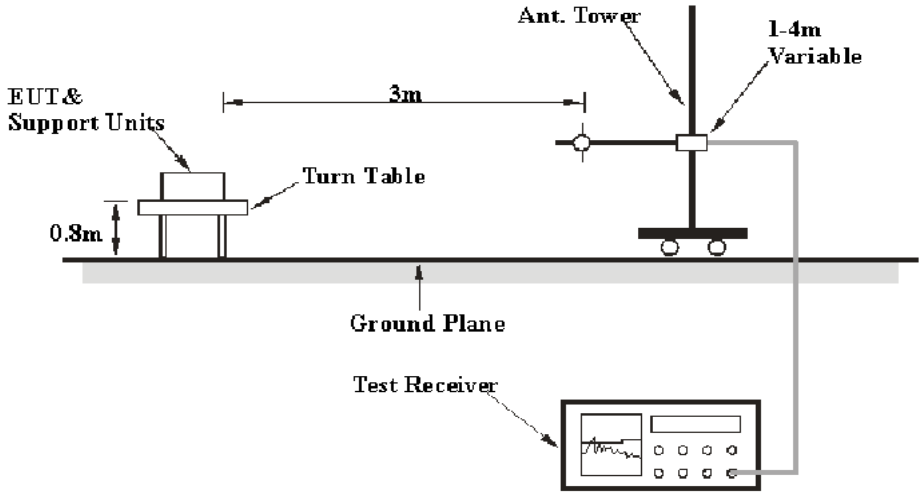
FCC §15.209, §15.205 & §15.247(d) & RSS-247§ 5.5 - SPURIOUS EMISSIONS

Applicable Standard

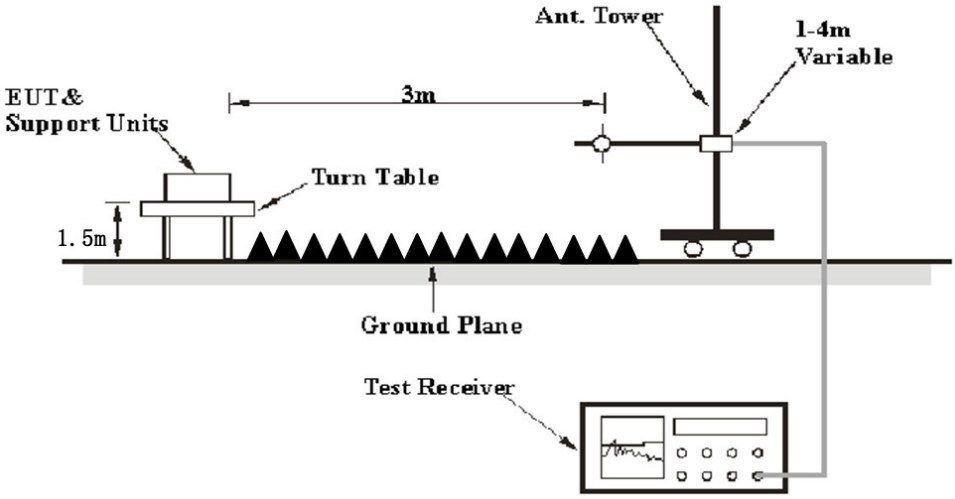
FCC §15.205; §15.209; §15.247(d); RSS-247§ 5.5; RSS-GEN § 8.10

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
	1 MHz	10 Hz	/	Average

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.

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

Over Limit/Margin = Level / Corrected Amplitude – Limit
Level / Corrected Amplitude = Read Level + Factor

Test Data

Environmental Conditions

Temperature:	24℃
Relative Humidity:	52-56 %
ATM Pressure:	101.0 kPa

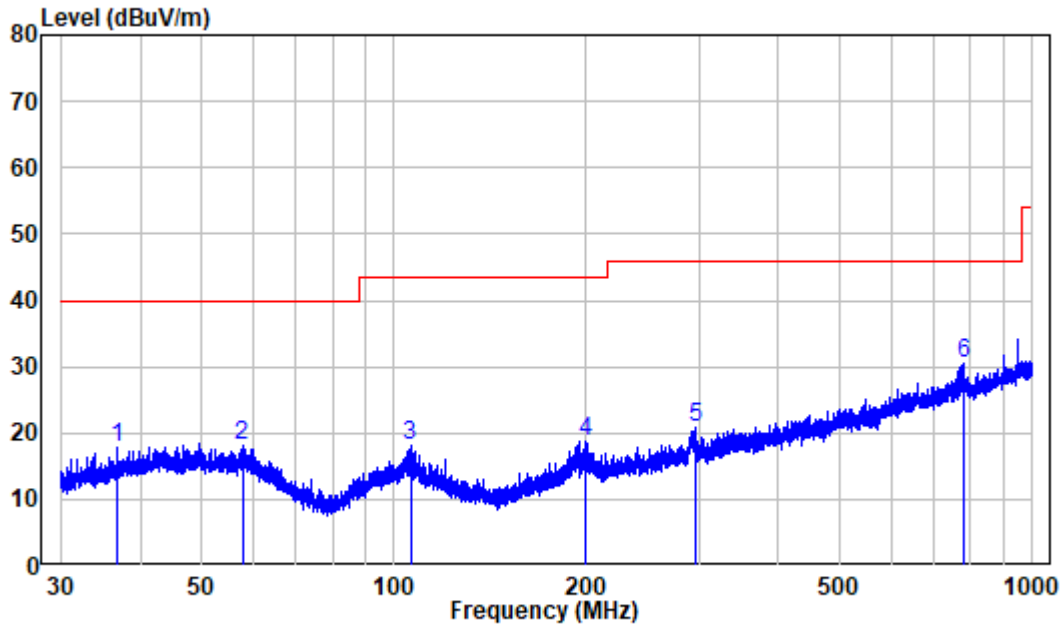
The Below 1G testing was performed by Jason Liu on 2023-06-05.
The Above 1G testing was performed by Jeef Hang on 2023-06-01.

EUT operation mode: Transmitting (Pre-scan in the X, Y and Z axes of orientation, the worst case as setup photo was recorded)

Below 1GHz:

Worst case for 8DPSK, low Channel:

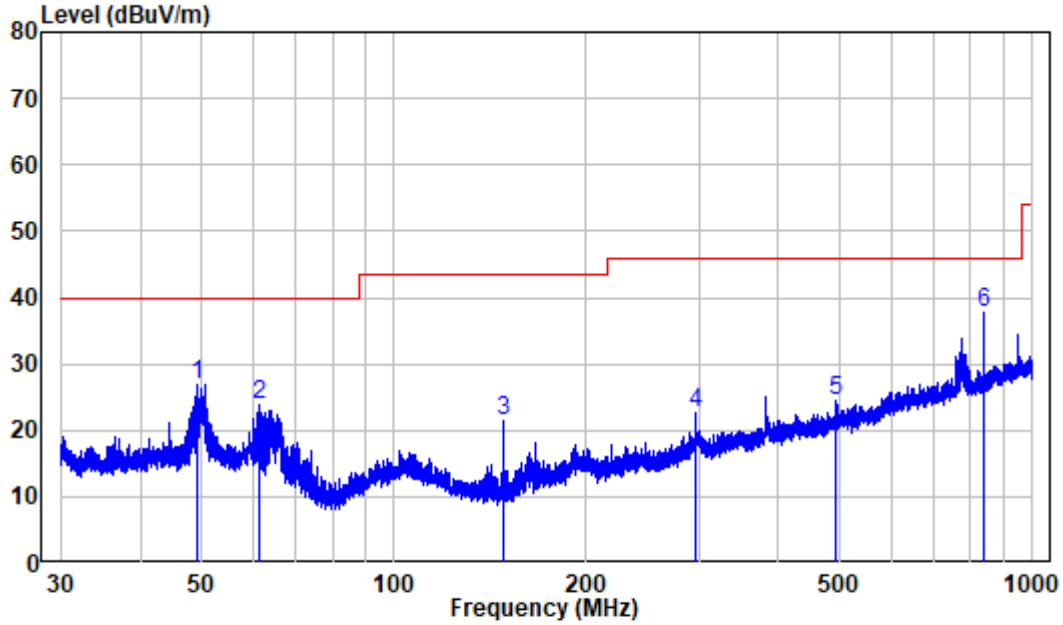
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : RA230529-30064E-RF
Test Mode: BT Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	36.911	-11.03	28.73	17.70	40.00	-22.30	Peak
2	57.796	-9.93	27.99	18.06	40.00	-21.94	Peak
3	106.013	-11.92	30.04	18.12	43.50	-25.38	Peak
4	198.762	-11.48	30.32	18.84	43.50	-24.66	Peak
5	296.834	-9.25	30.20	20.95	46.00	-25.05	Peak
6	780.633	0.07	30.48	30.55	46.00	-15.45	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : RA230529-30064E-RF
Test Mode: BT Transmitting

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	49.144	-9.95	36.90	26.95	40.00	-13.05	Peak
2	61.319	-11.16	35.08	23.92	40.00	-16.08	Peak
3	148.636	-15.35	36.69	21.34	43.50	-22.16	Peak
4	297.354	-9.25	31.98	22.73	46.00	-23.27	Peak
5	491.390	-4.61	29.00	24.39	46.00	-21.61	Peak
6	836.611	0.22	37.55	37.77	46.00	-8.23	Peak

Above 1GHz (worst case for 8DPSK):

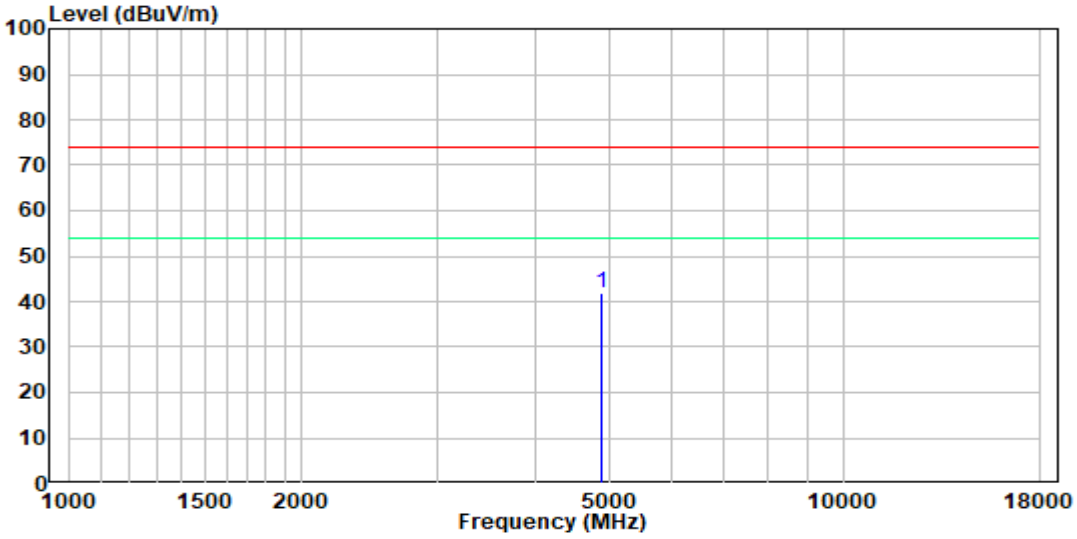
Frequency (MHz)	Receiver		Turntable Angle Degree	Rx Antenna		Factor (dB/m)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
	Reading (dBuV)	PK/Ave		Height (m)	Polar (H/V)				
Low Channel									
2310	48.38	PK	136	1.6	H	-10.36	38.02	74	-35.98
2310	49.77	PK	339	1.2	V	-10.36	39.41	74	-34.59
2390	51.06	PK	201	1.6	H	-10.71	40.35	74	-33.65
2390	60.74	PK	194	1.4	V	-10.71	50.03	74	-23.97
4804	49.11	PK	201	1.6	H	-6.11	43	74	-31
4804	48.51	PK	20	1.7	V	-6.11	42.4	74	-31.6
Middle Channel									
4882	47.94	PK	95	1.9	H	-5.9	42.04	74	-31.96
4882	50.17	PK	121	1.9	V	-5.9	44.27	74	-29.73
High Channel									
2483.5	49.05	PK	220	1.6	H	-10.55	38.5	74	-35.5
2483.5	47.57	PK	85	1.6	V	-10.55	37.02	74	-36.98
2500	47.32	PK	36	1.9	H	-10.42	36.9	74	-37.1
2500	47.04	PK	345	1.5	V	-10.42	36.62	74	-37.38
4960	49.06	PK	36	1.9	H	-5.47	43.59	74	-30.41
4960	48.94	PK	274	1.5	V	-5.47	43.47	74	-30.53

Note:
Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Factor + Reading
Margin = Corrected Amplitude – Limit
Average level= Peak level+ Duty Cycle Corrected Factor
The other spurious emission which is in the noise floor level was not recorded.
For above 1GHz, the test result of peak was 20dB below to the limit of peak, which can be compliant to the average limit, so just peak value was recorded.

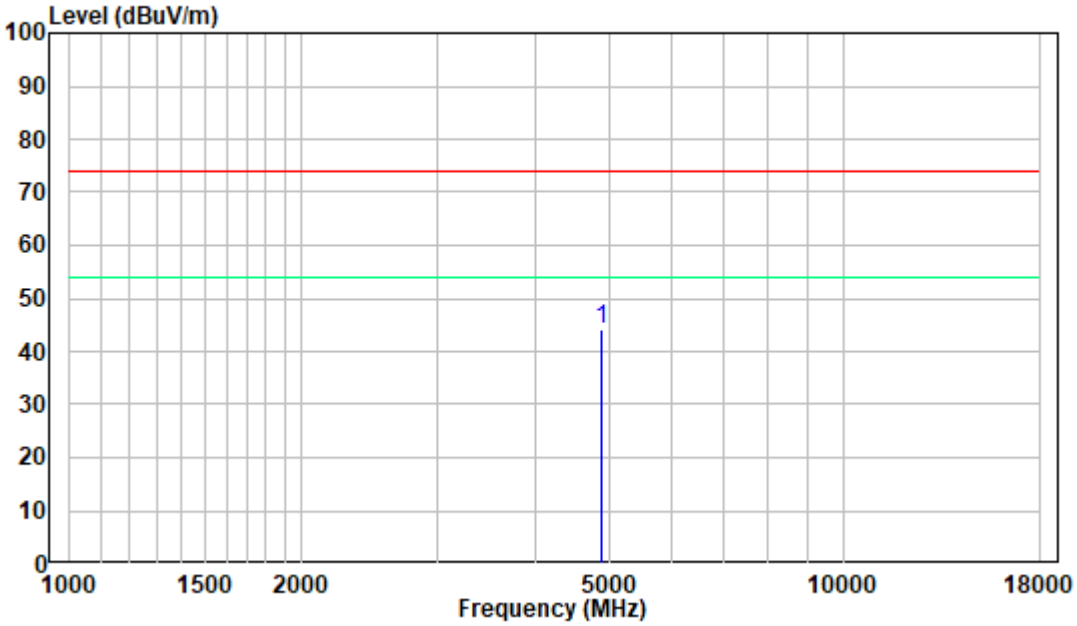
1 GHz - 18 GHz: (Pre-Scan plots)

Worst case for 8DPSK, Middle Channel:

Horizontal



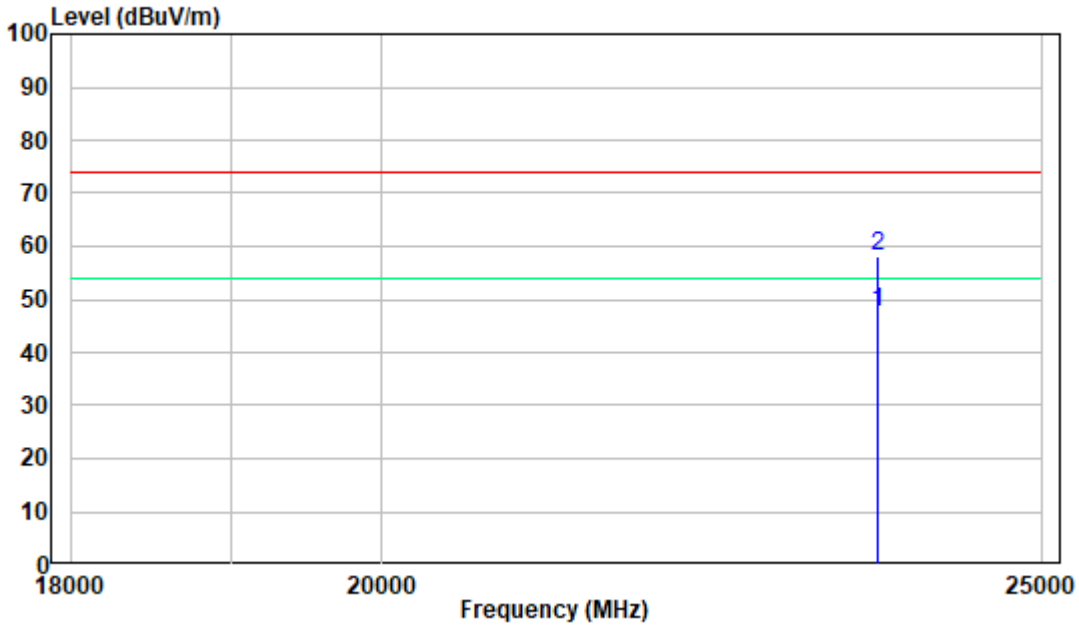
Vertical



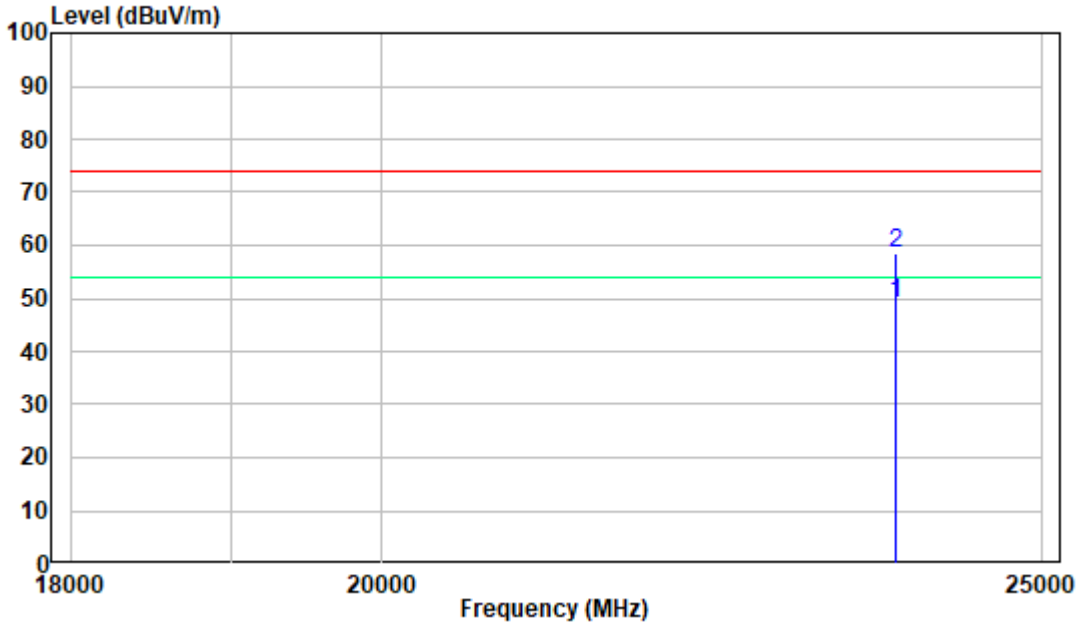
18-25GHz: (Pre-Scan plots)

Worst case for 8DPSK, 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.

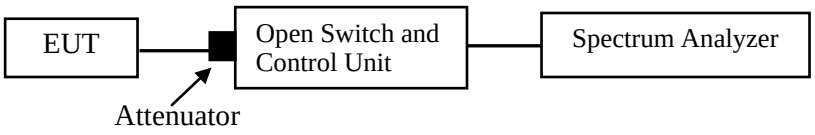
According to RSS-247 § 5.1 (b):

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

According to ANSI C63.10-2013, section 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:	25℃
Relative Humidity:	44%
ATM Pressure:	101.0 kPa

The testing was performed by Matt Liang on 2023-06-03.

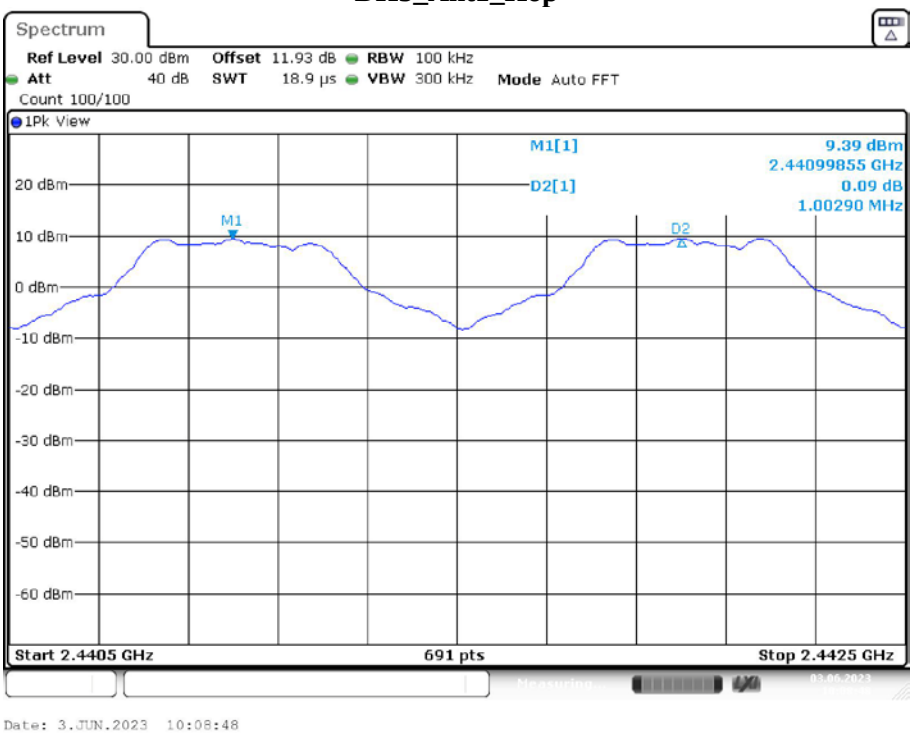
EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the below table and plots:

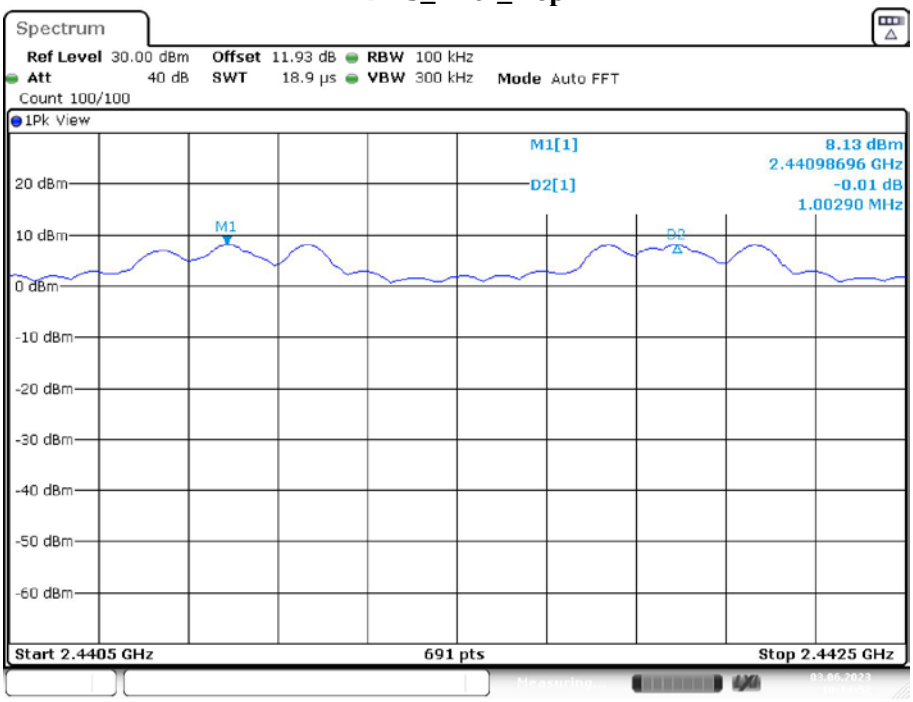
Test Mode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	1.003	≥0.640	PASS
2DH5	Ant1	Hop	1.003	≥0.913	PASS
3DH5	Ant1	Hop	1	≥0.900	PASS

Note: The limit = (2/3) * 20dB bandwidth

DH5_Ant1_Hop

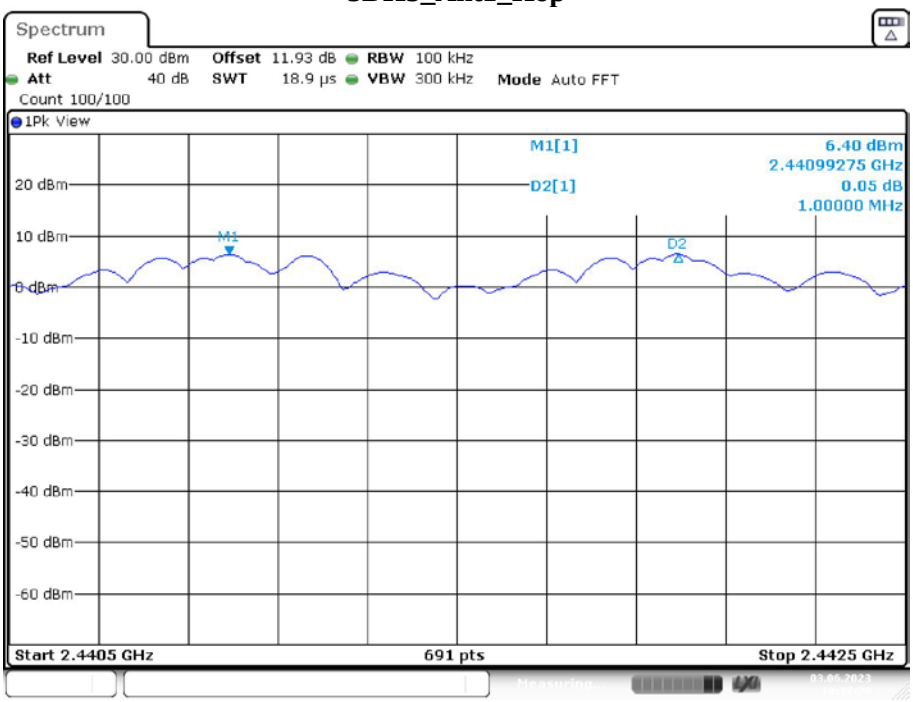


2DH5_Ant1_Hop



Date: 3.JUN.2023 10:13:52

3DH5_Ant1_Hop



Date: 3.JUN.2023 10:17:28

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

According to ANSI C63.10-2013, section 7.8.7 and section 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.

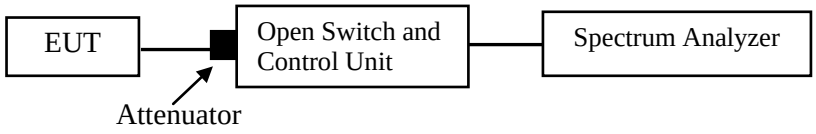
• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

• 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:	25℃
Relative Humidity:	45%
ATM Pressure:	101.0 kPa

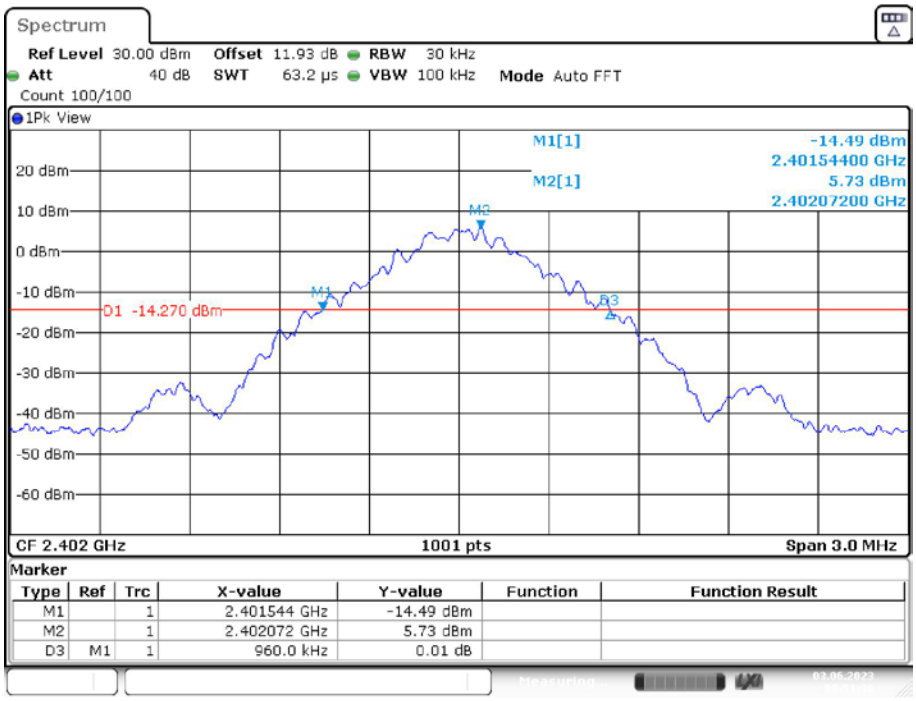
The testing was performed by Matt Liang on 2023-06-03..

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the below table and plots:

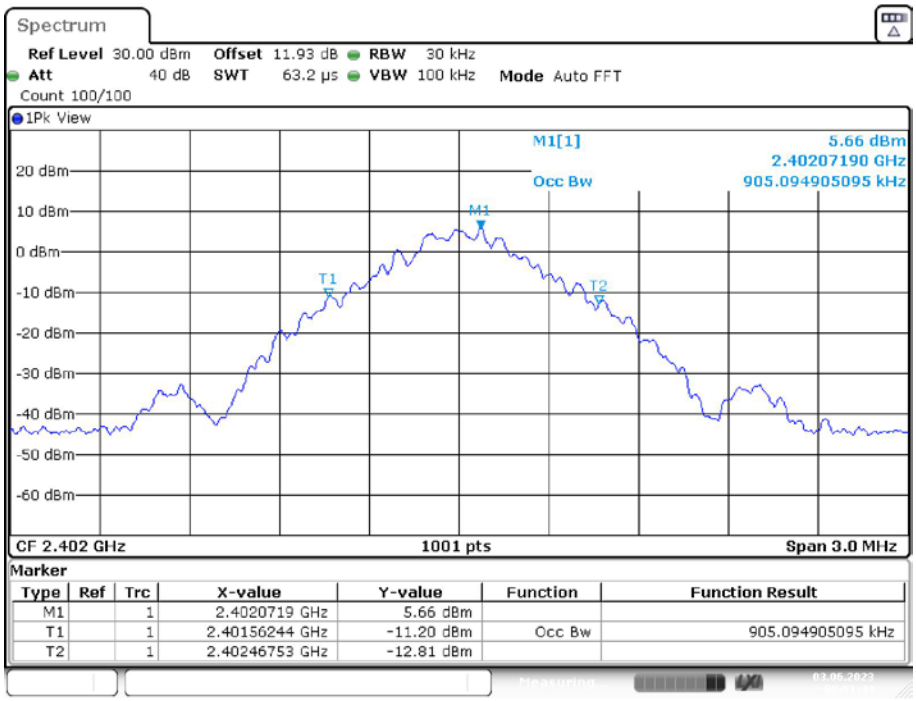
Test Mode	Antenna	Channel	20db EBW[MHz]	OCB [MHz]	Verdict
DH5	Ant1	2402	0.96	0.905	PASS
		2441	0.94	0.902	PASS
		2480	0.96	0.905	PASS
2DH5	Ant1	2402	1.37	1.202	PASS
		2441	1.37	1.199	PASS
		2480	1.37	1.199	PASS
3DH5	Ant1	2402	1.35	1.205	PASS
		2441	1.34	1.202	PASS
		2480	1.35	1.202	PASS

20 dB EMISSION BANDWIDTH_DH5_Ant1_2402



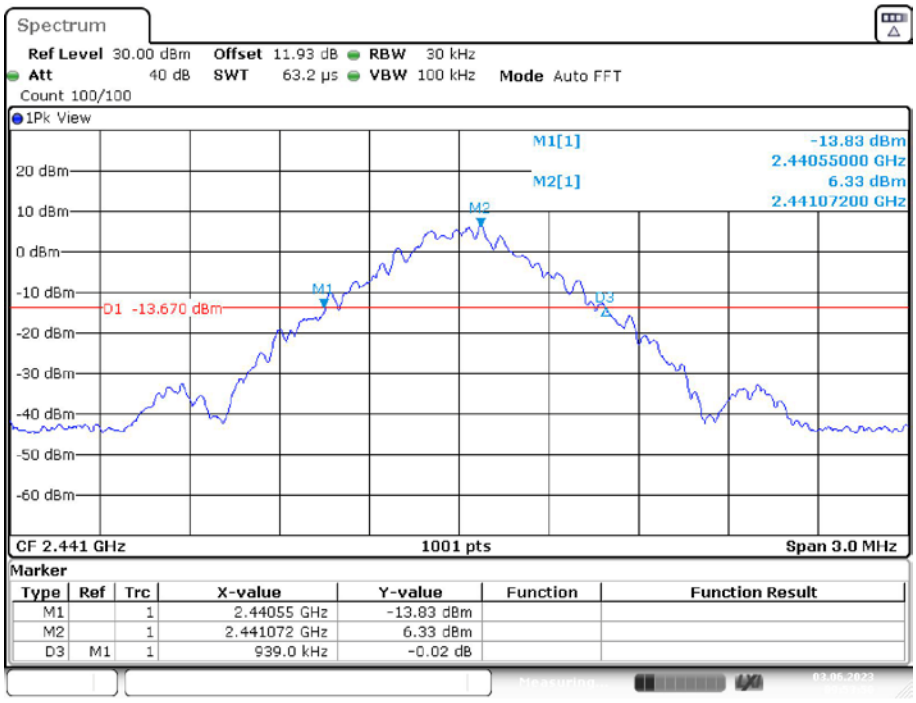
Date: 3.JUN.2023 09:51:38

99% OCCUPIED BANDWIDTH_DH5 _Ant1_2402



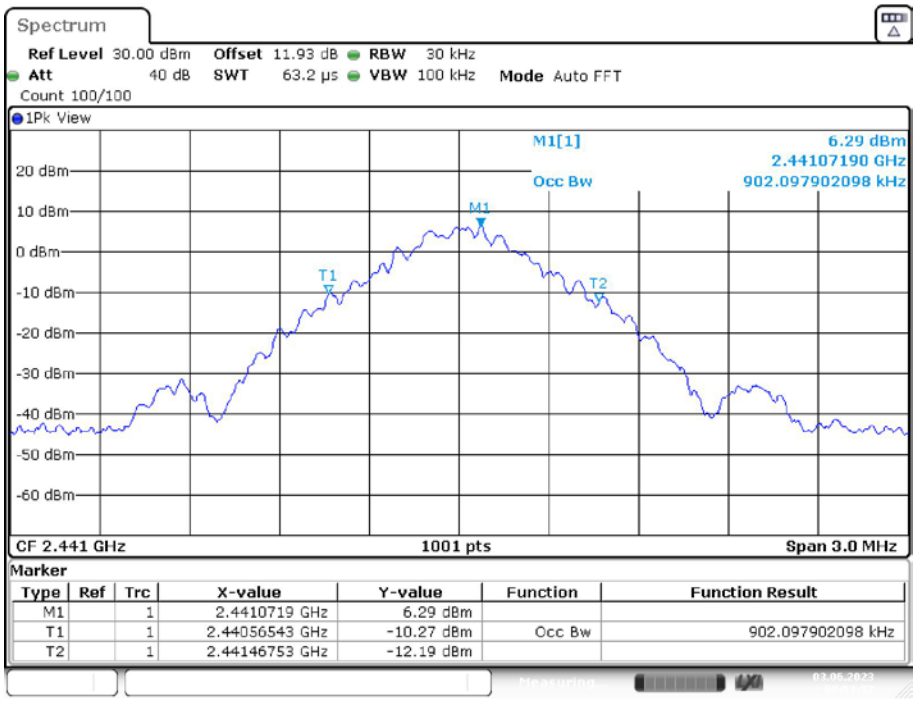
Date: 3.JUN.2023 09:51:43

20 dB EMISSION BANDWIDTH_DH5 _Ant1_2441



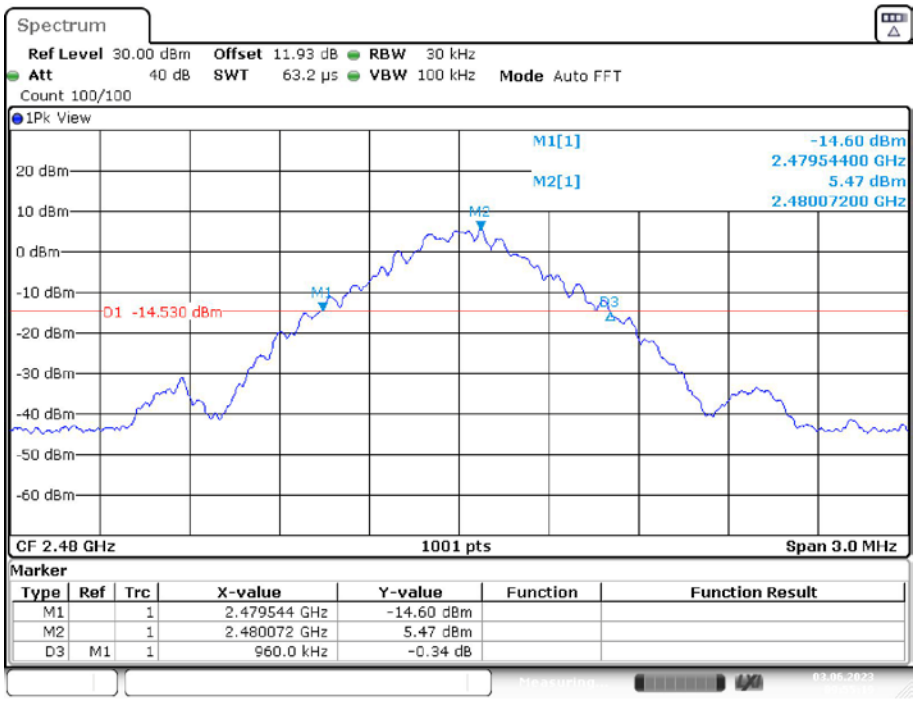
Date: 3.JUN.2023 09:53:50

99% OCCUPIED BANDWIDTH_DH5 _Ant1_2441



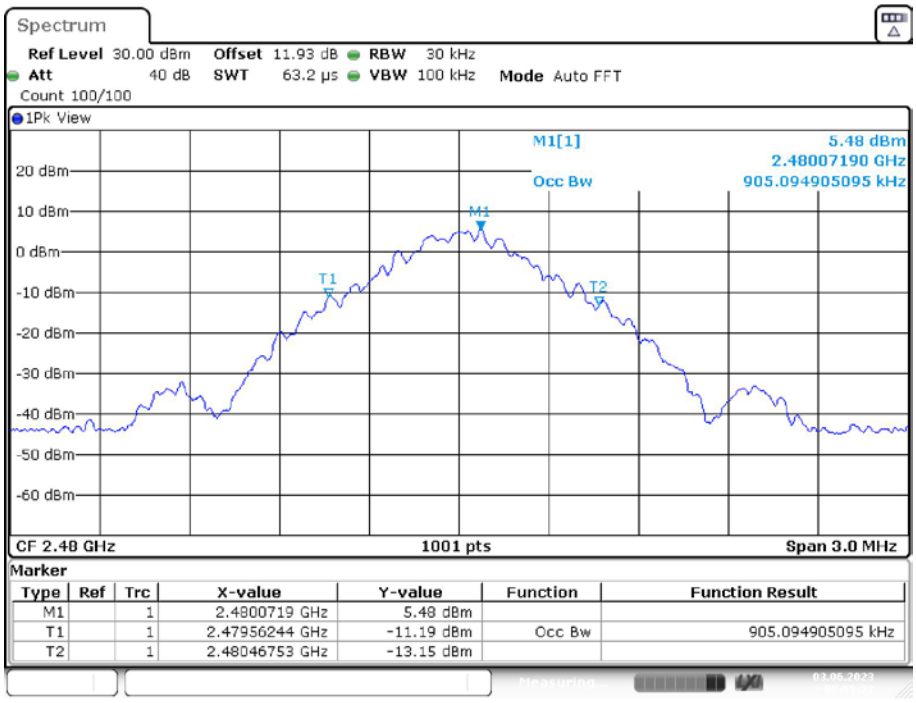
Date: 3.JUN.2023 09:53:57

20 dB EMISSION BANDWIDTH_DH5 _Ant1_2480



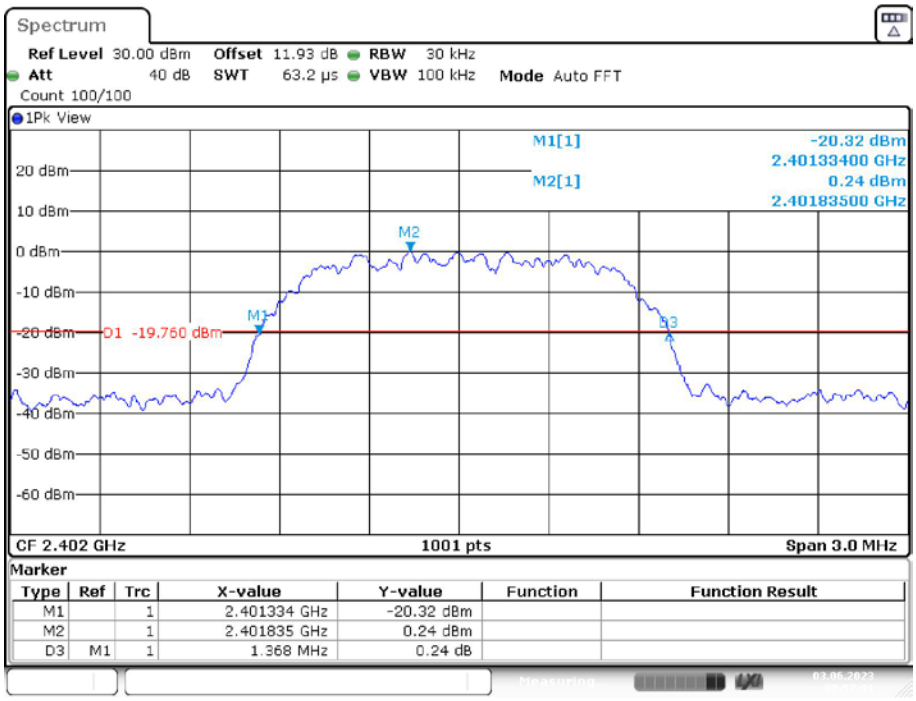
Date: 3.JUN.2023 09:55:18

99% OCCUPIED BANDWIDTH_DH5 _Ant1_2480



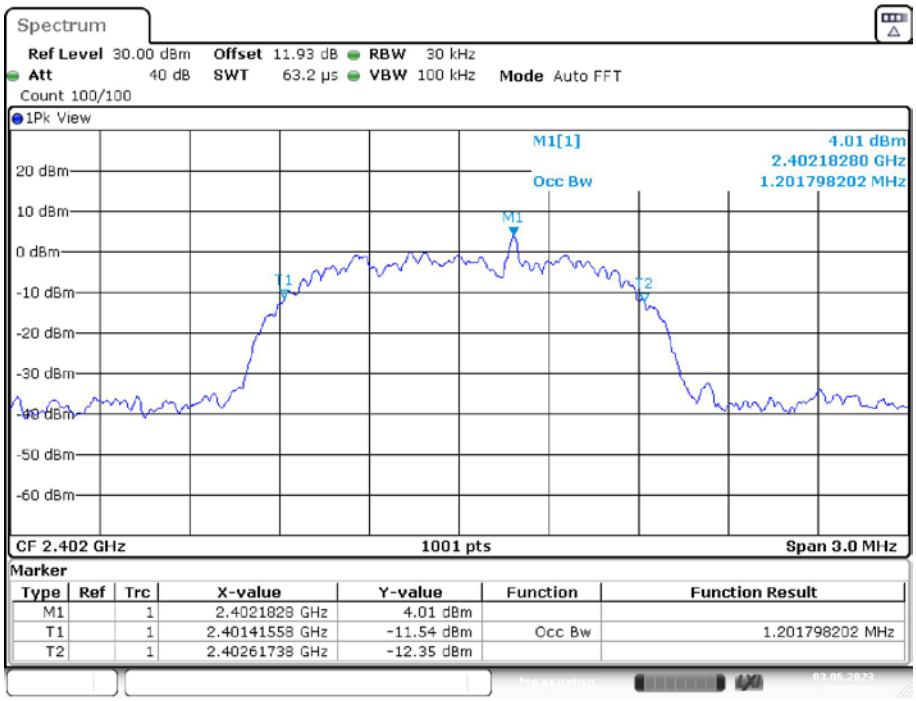
Date: 3.JUN.2023 09:55:27

20 dB EMISSION BANDWIDTH_2DH5 _Ant1_2402



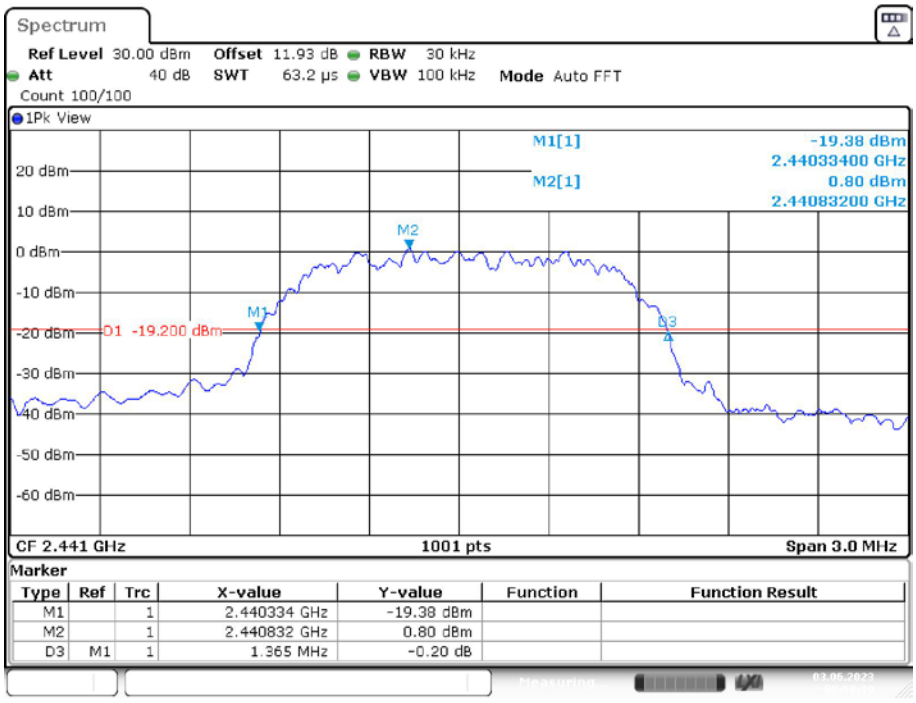
Date: 3.JUN.2023 09:57:01

99% OCCUPIED BANDWIDTH_2DH5 _Ant1_2402



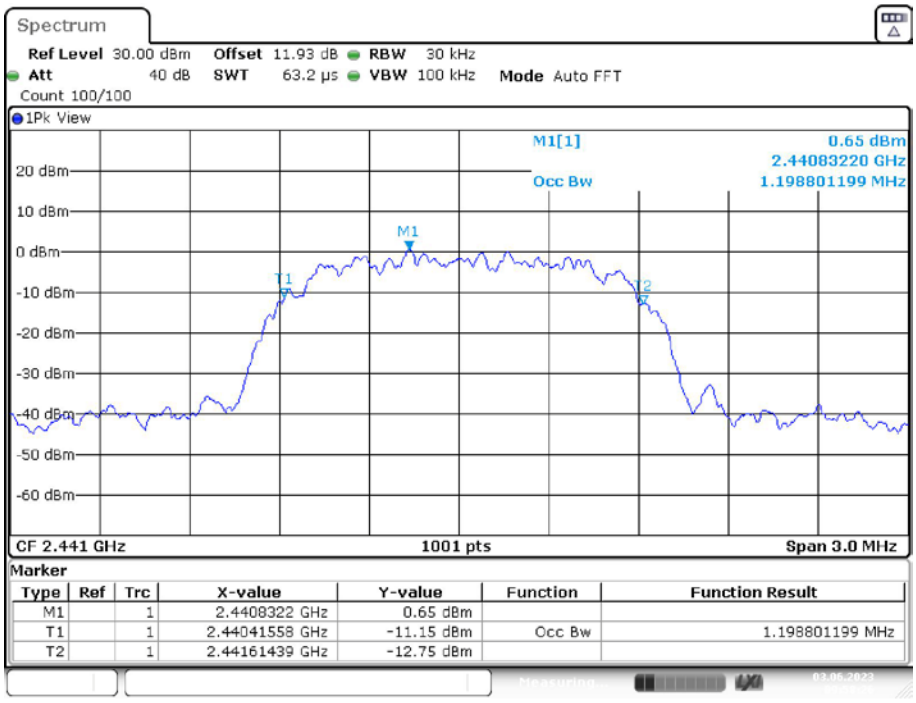
Date: 3.JUN.2023 09:57:08

20 dB EMISSION BANDWIDTH_2DH5 _Ant1_2441



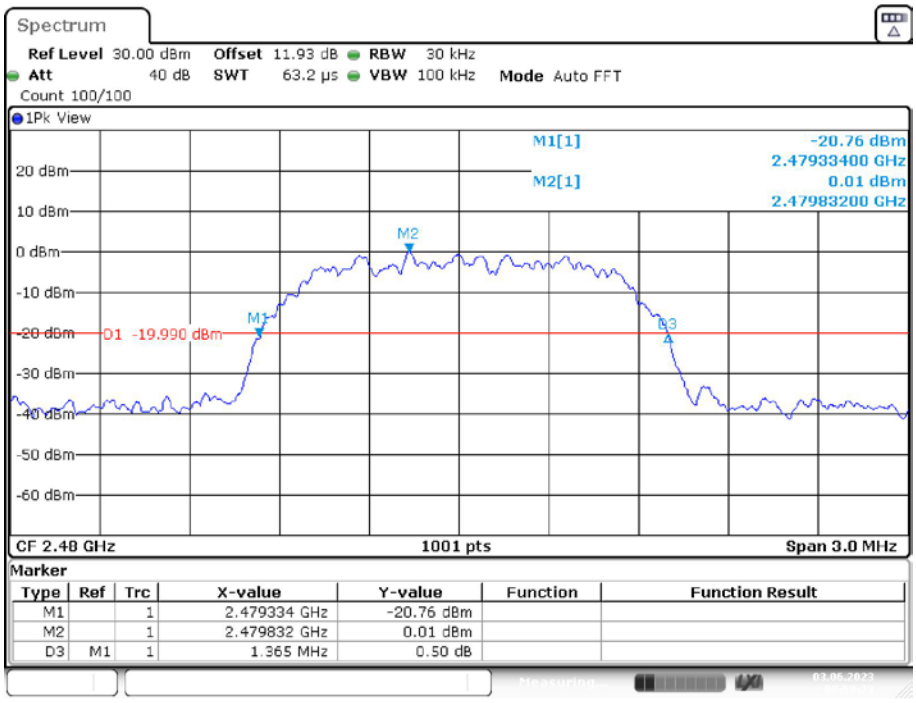
Date: 3.JUN.2023 09:58:19

99% OCCUPIED BANDWIDTH_2DH5 _Ant1_2441



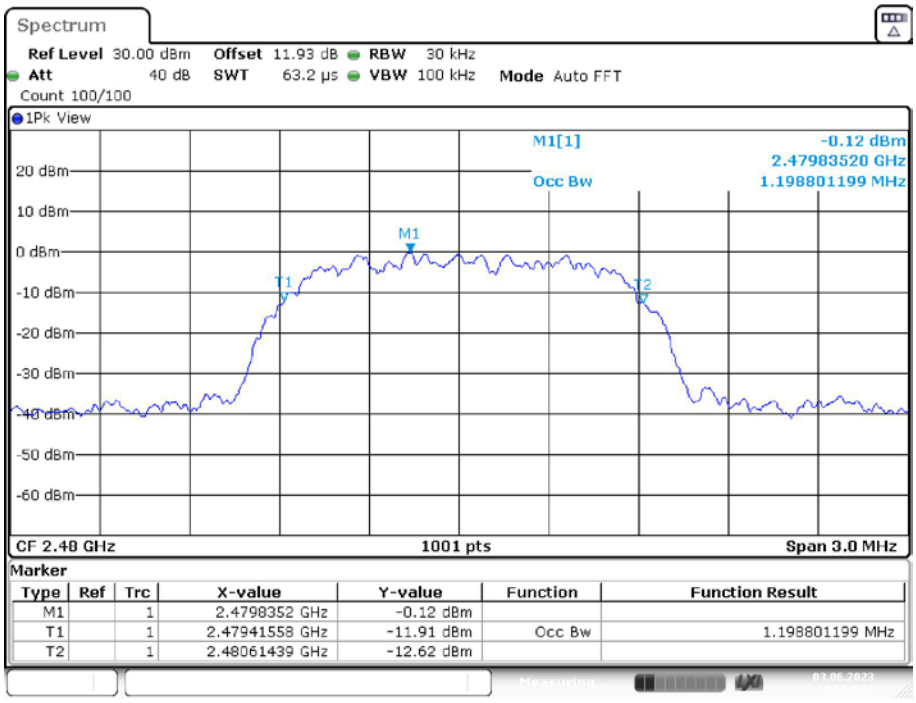
Date: 3.JUN.2023 09:58:26

20 dB EMISSION BANDWIDTH _2DH5_Ant1_2480



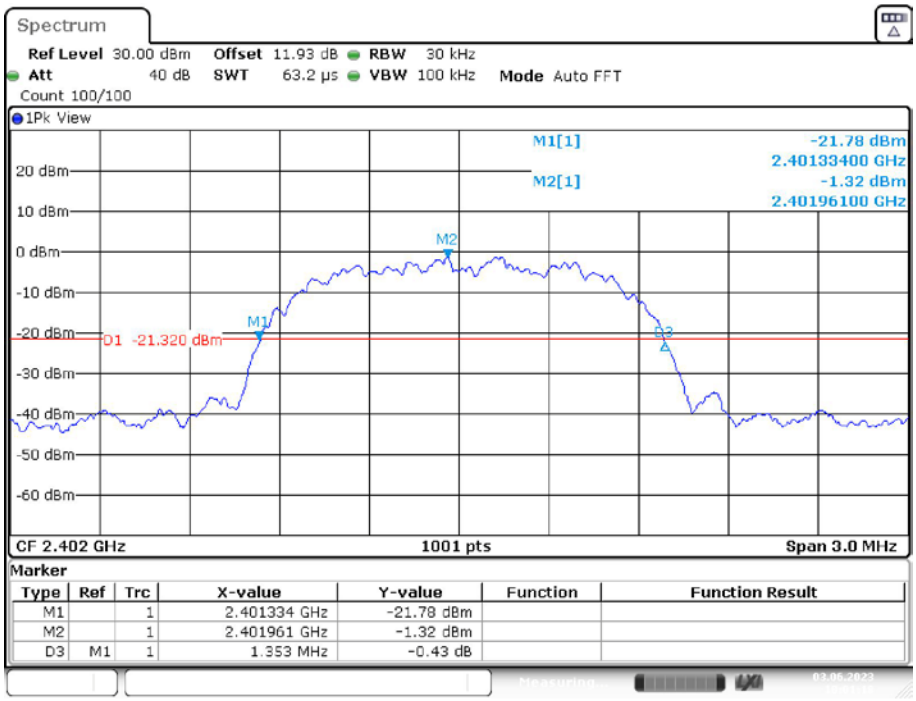
Date: 3.JUN.2023 09:59:23

99% OCCUPIED BANDWIDTH _2DH5_Ant1_2480



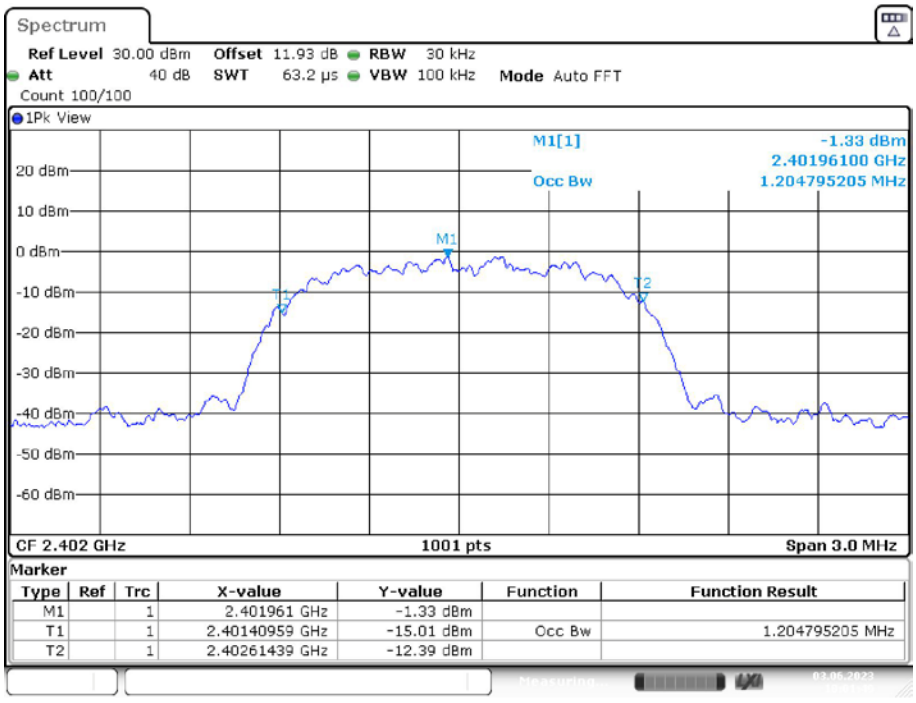
Date: 3.JUN.2023 09:59:38

20 dB EMISSION BANDWIDTH _3DH5_Ant1_2402



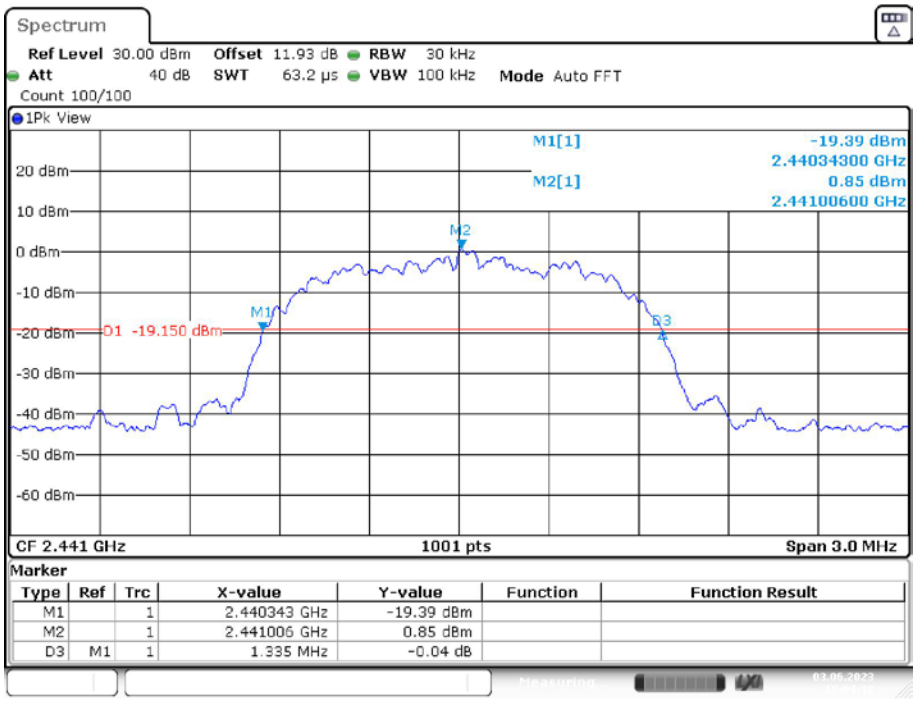
Date: 3.JUN.2023 10:01:18

99% OCCUPIED BANDWIDTH _3DH5_Ant1_2402



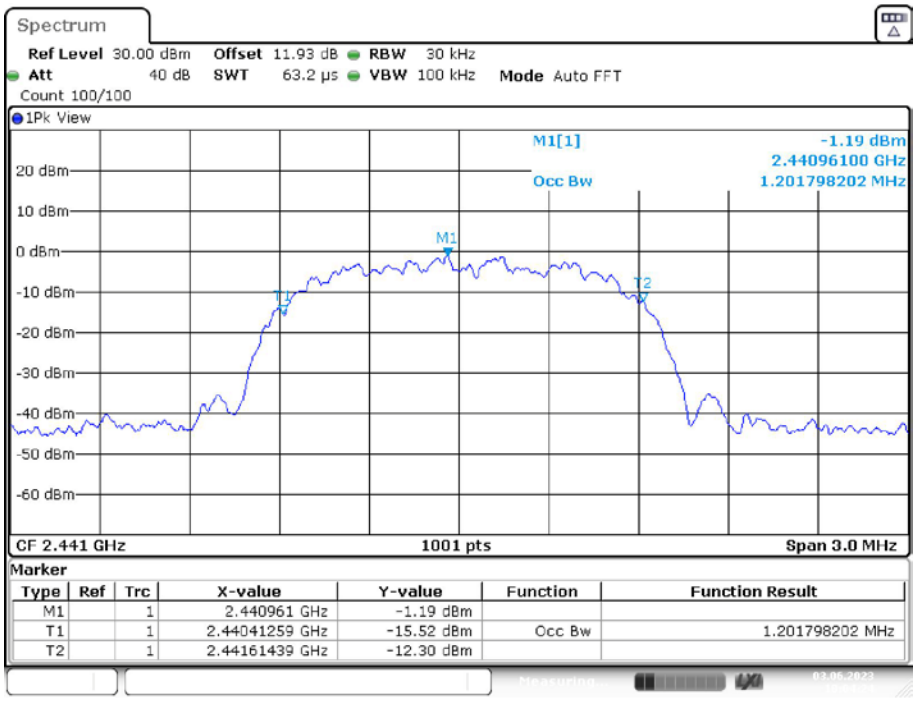
Date: 3.JUN.2023 10:01:49

20 dB EMISSION BANDWIDTH _3DH5_Ant1_2441



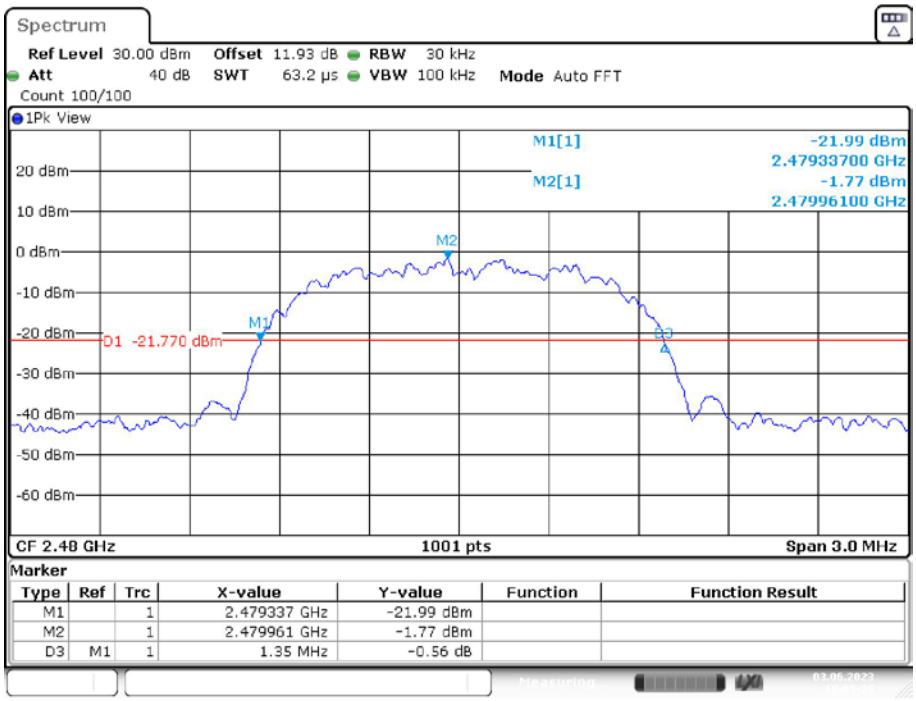
Date: 3.JUN.2023 10:04:18

99% OCCUPIED BANDWIDTH _3DH5_Ant1_2441



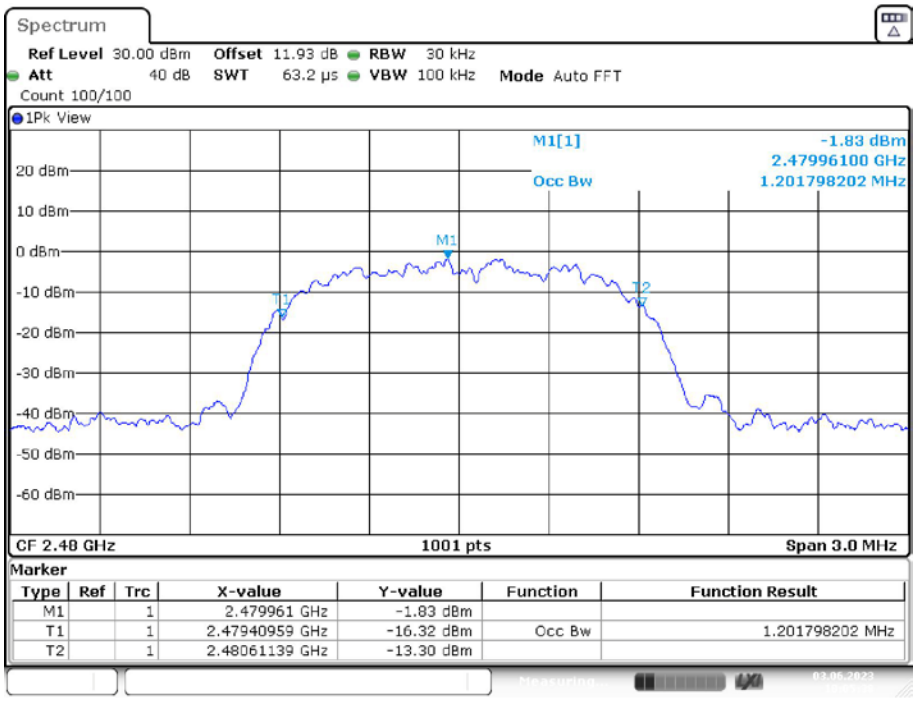
Date: 3.JUN.2023 10:04:23

20 dB EMISSION BANDWIDTH _3DH5_Ant1_2480



Date: 3.JUN.2023 10:05:24

99% OCCUPIED BANDWIDTH _3DH5_Ant1_2480



Date: 3.JUN.2023 10:05:38

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.

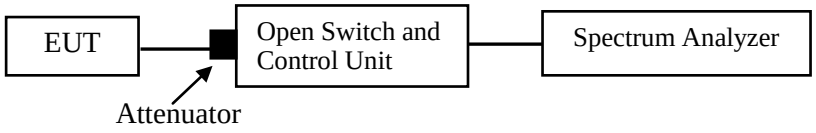
Test Procedure

According to ANSI C63.10-2013, section 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:	25 ℃
Relative Humidity:	44 %
ATM Pressure:	101.0 kPa

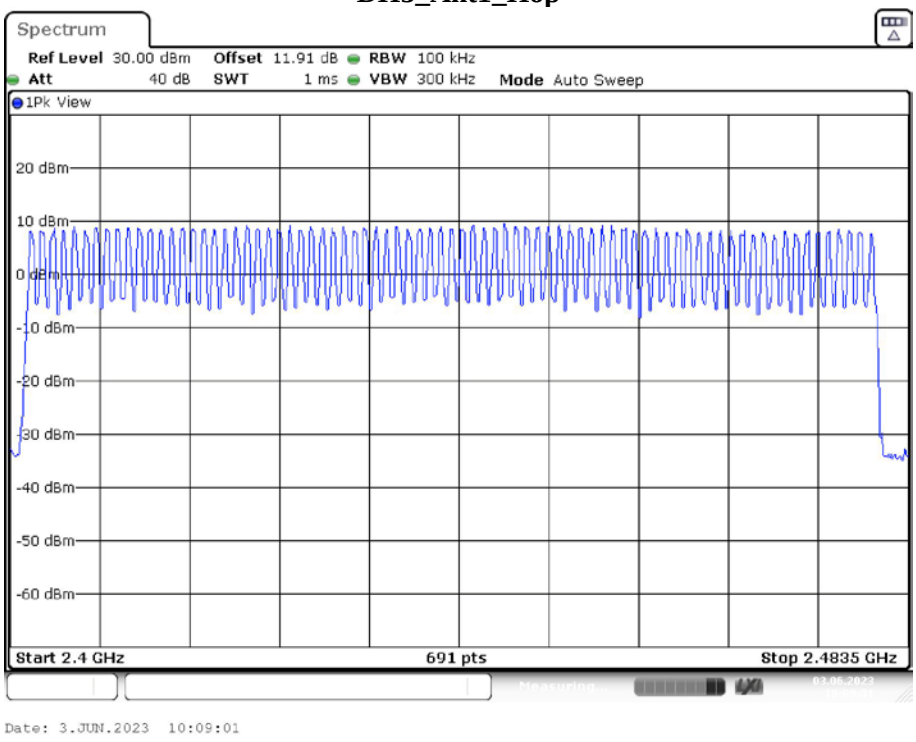
The testing was performed by Matt Liang on 2023-06-03.

EUT operation mode: Transmitting

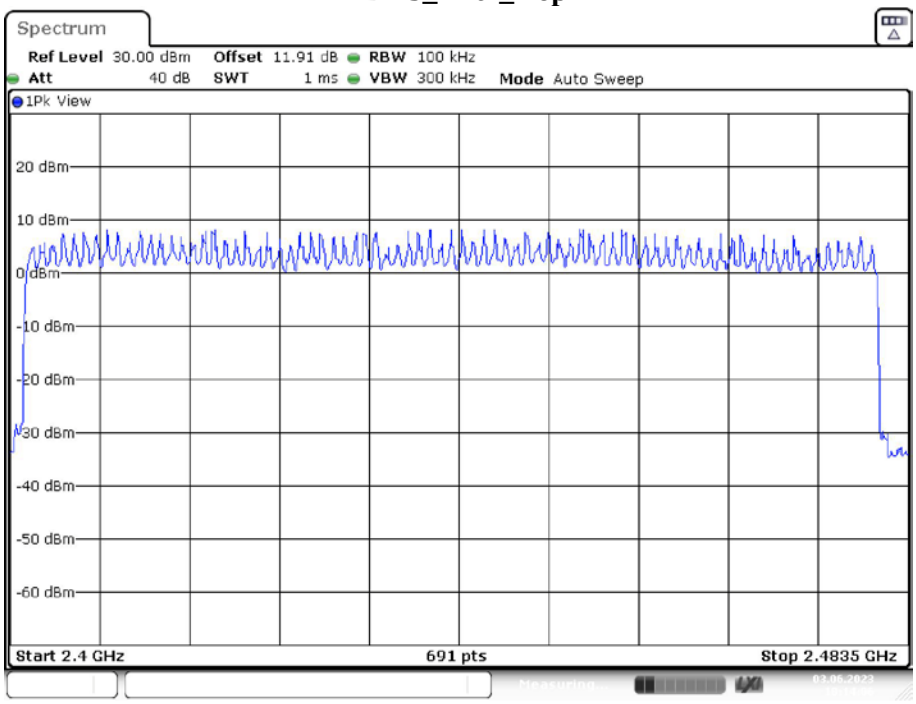
Test Result: Compliant. Please refer to the below table and plots:

Test Mode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	>=15	PASS
2DH5	Ant1	Hop	79	>=15	PASS
3DH5	Ant1	Hop	79	>=15	PASS

DH5_Ant1_Hop

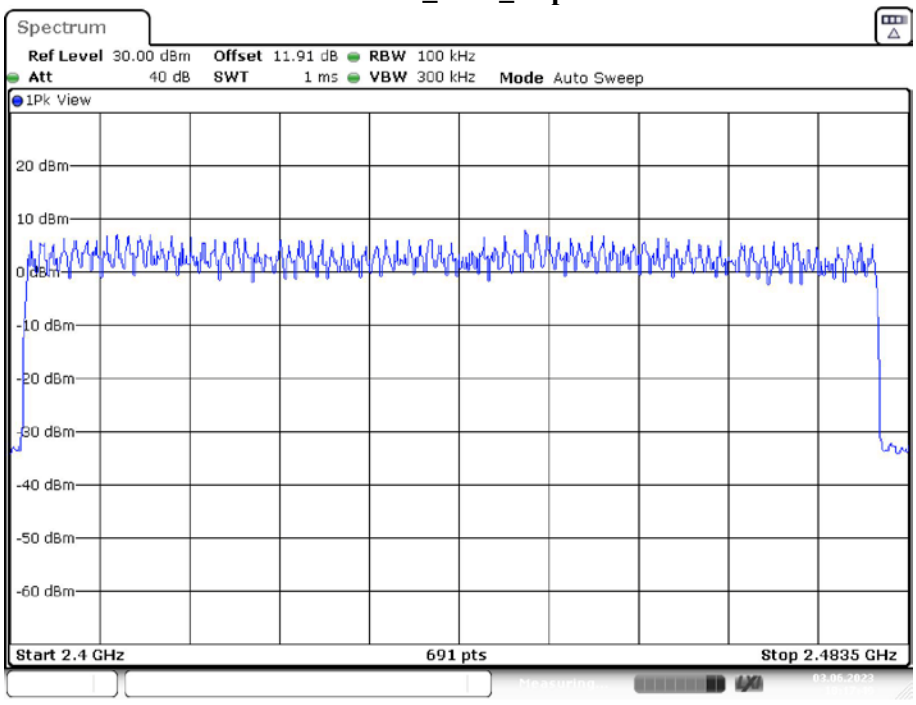


2DH5_Ant1_Hop



Date: 3.JUN.2023 10:14:06

3DH5_Ant1_Hop



Date: 3.JUN.2023 10:17:49