TEST REPORT

Applicant Name :	Polygroup Evergreen Limited
Address :	Unit 606, 6th Floor, Fairmont House, No.8 Cotton Tree Drive, Central, Hong Kong
Report Number:	RA230301-09498E-RFA
FCC ID:	2A62O-TBC005
IC	28592-TBC005

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:	Controller
Model No.:	TBC005-24V
Multiple Model(s) No.:	N/A
Trade Mark:	N/A
Date Received:	2023/03/01
Report Date:	2023/04/18

Test Result:	Pass*

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

Prepared and Checked By: **Approved By:**

Nick Fang
EMC Engineer

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 testresults are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RA230301-09498E-RFA	Original Report	2023-04-18

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

HVIN	TBC005-24V
FVIN	2.8.15
Frequency Range	Bluetooth: 2402-2480MHz
Maximum Conducted Peak Output Power	5.86 dBm
Modulation Technique	Bluetooth: GFSK, π/4-DQPSK, 8DPSK
Antenna Specification*	3.42dBi(It is provided by the applicant)
Voltage Range	DC24V from adapter
Sample serial number	23UK_2 for Conducted and Radiated Emissions 23UK_1 for RF Conducted Test (Assigned by ATC)
Sample/EUT Status	Good condition
Adapter information	Model: TS-48W24V Input: AC 120V, 60Hz, 0.83A Output: DC 24.0V, 2.0A

Note: EUT with two different model Lamp bead models (Light 1: TW-TBC005-1200; Light 2: TW-TBC005-1440), the radio part (control box are the same), the detail information please refer the attestation letter and EUT photo.

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		0.73dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.72dB
Emissions, Radiated	9kHz - 30MHz	2.66dB
	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz -26.5GHz	5.06dB
	26.5GHz-40GHz	4.72dB
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.

EUT Exercise Software

“EspRFTestTool.exe ” exercise software was used, Power level is 4. The software and power level was provided by the applicant.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Local Support Equipment List and Details

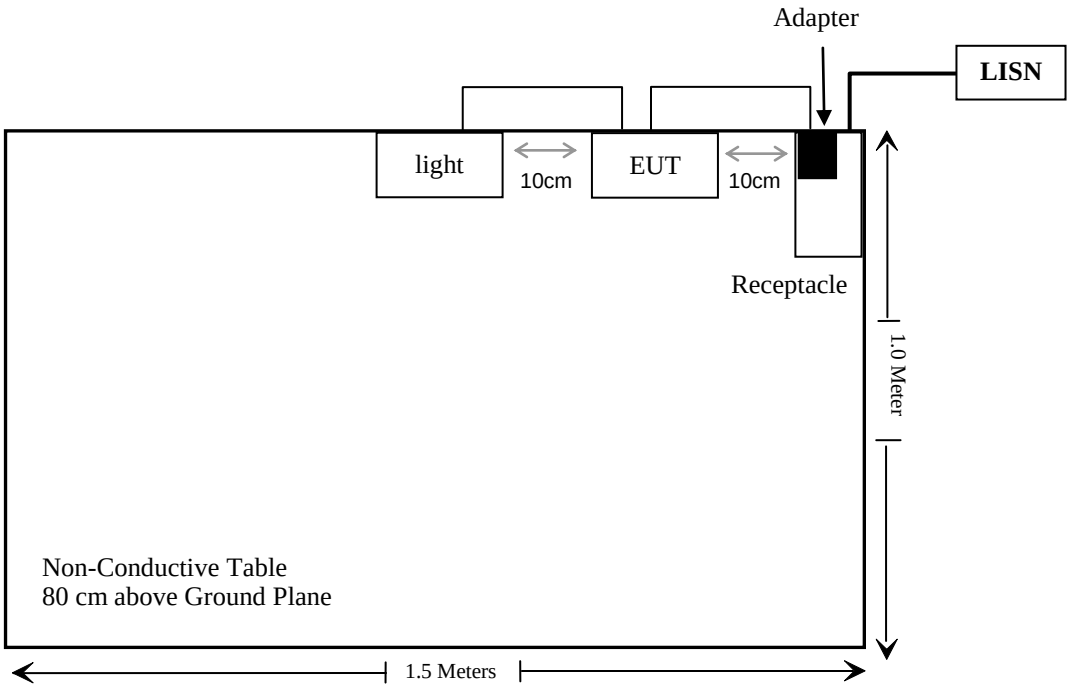
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

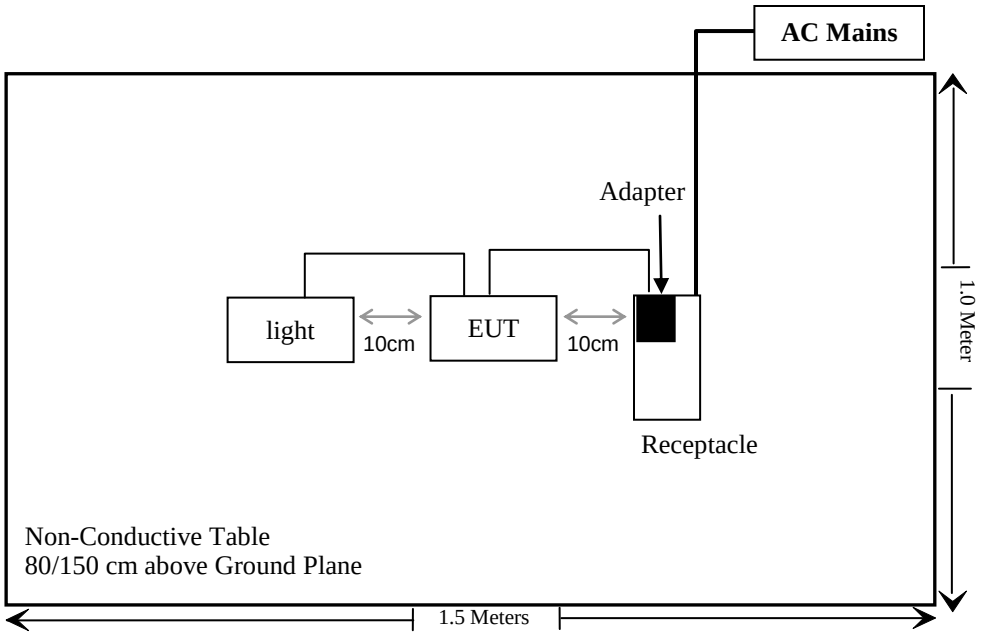
Cable Description	Length (m)	From Port	To
/	/	/	/

Block Diagram of Test Setup

For conducted emission:



For radiated emission:



SUMMARY OF TEST RESULTS

Rules	Description of Test	Result
FCC §15.247 (i) & §1.1307 (b) (3) & §2.1091	MPE-Based Exemption	Compliant
RSS-102 §2.5.2	Exemption Limits For Routine Evaluation-RF Exposure 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	20dBEmission 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 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 19821b (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
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

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
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
Unknown	RF Coaxial Cable	No.31	RF-01	Each time	
Agilent	Power Sensor	U2021XA	MY5425003	2023/02/25	2024/02/24

*** 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) (3) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247 (i) and subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

According to KDB 447498 D04 Interim General RF Exposure Guidance

MPE-Based Exemption:

General frequency and separation-distance dependent MPE-based effective radiated power(ERP) thresholds are in Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] to support an exemptionfrom further evaluation from 300 kHz through 100 GHz.

Table 1 to § 1.1307(b)(3)(i)(C) - Single RF Sources Subject to Routine Environmental Evaluation

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R^2.
1.34-30	3,450 R^2/f^2.
30-300	3.83 R^2.
300-1,500	0.0128 R^2f.
1,500-100,000	19.2R^2.

Ris the minimum separation distance in meters
f = frequency in MHz

For multiple RF sources: Multiple RF sources are exempt if:

in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation:

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

Result

Mode	Frequency (MHz)	Tune up conducted power	Antenna Gain		ERP		Evaluation Distance (m)	ERP Limit (W)
		(dBm)	(dBi)	(dBd)	(dBm)	(W)		
BT	2402-2480	6.0	3.42	1.27	7.27	0.005	0.2	0.768
BLE	2402-2480	4.0	3.42	1.27	5.27	0.003	0.2	0.768
2.4G Wi-Fi	2412-2462	17.0	3.42	1.27	18.27	0.067	0.2	0.768

Note: 1. The tune up conducted power and antenna gain was declared by the applicant.
2. The BT cannot transmit at the same time with the Wi-Fi
3. 0dBd=2.15dBi

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: Compliant.

RSS-102 §2.5.2 –EXEMPTION LIMITS FOR ROUTINE EVALUATION-RF EXPOSURE EVALUATION

Applicable Standard

According to RSS-102 §(2.5.2):

2.5.2 Exemption Limits for Routine Evaluation — RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $22.48/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

Calculated Data:

Mode	Frequency (MHz)	Maximum tune-up conducted power	Antenna Gain	Maximum tune-up EIRP		Evaluation Distance (cm)	Limit (W)
		(dBm)	(dBi)	(dBm)	(W)		
BT	2402-2480	6.0	3.42	9.42	0.009	20	2.68
BLE	2402-2480	4.0	3.42	7.42	0.006	20	2.68
2.4G Wi-Fi	2412-2462	17.0	3.42	20.42	0.110	20	2.68

Note: 1. The tune up conducted power and antenna gain was declared by the applicant.
2. The BT cannot transmit at the same time with the Wi-Fi

To maintain compliance with the ISED's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

Result: The RF Exposure 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 arrangementwhich was permanently attached and the maximum antenna gain is3.42dBi, fulfill the requirement of this section. Please refer to the EUT photos.

Antenna Type	Antenna Gain	Impedance	Frequency Range
PCB	3.42dBi	50Ω	2.4~2.5GHz

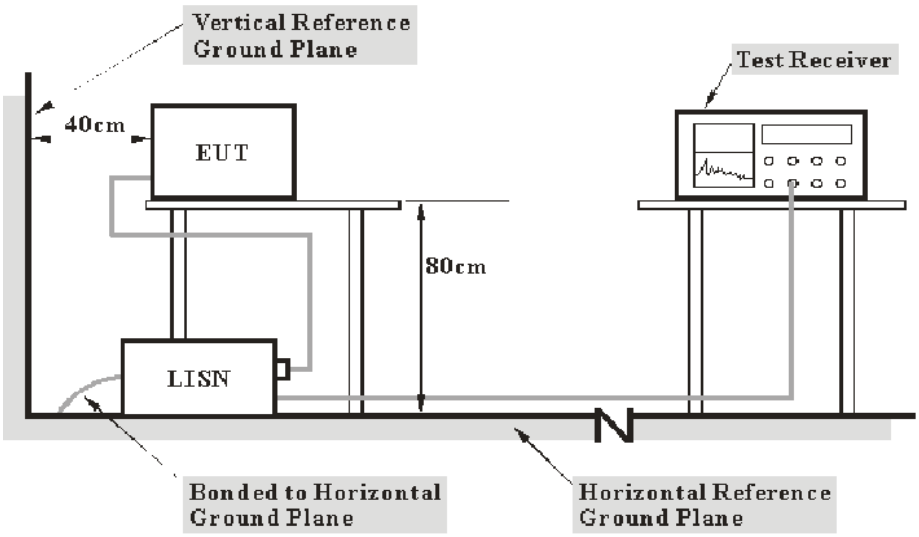
Result: Compliance

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.

Corrected Factor & Margin Calculation

The Transd factor is calculated by addingLISN 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 applicablelimit. For example, an Over limit of -7dB means the emission is 7 dB below the limit. The equation forcalculation is as follows:

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

Test Data

Environmental Conditions

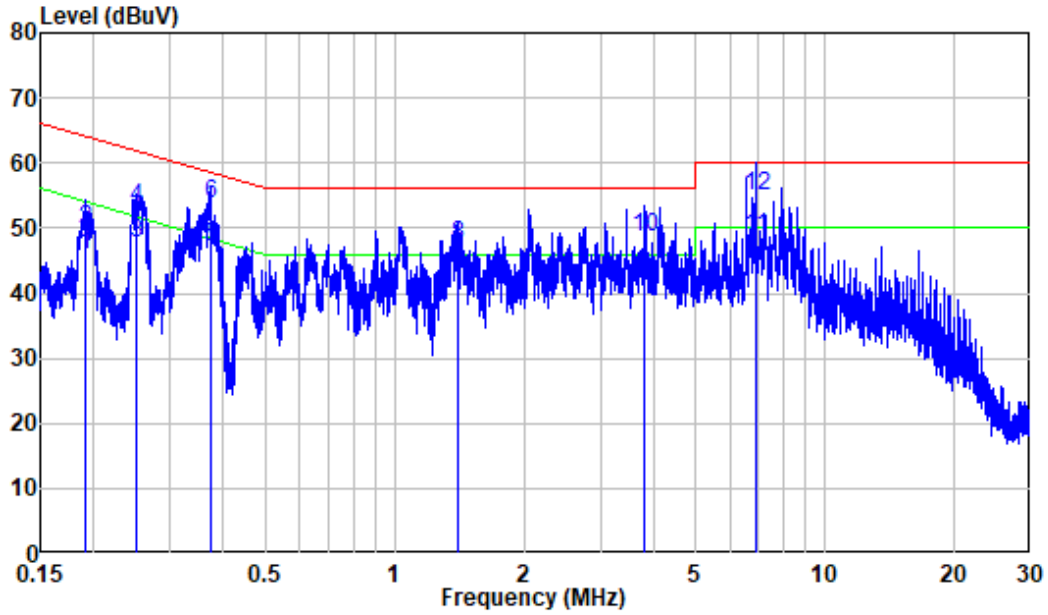
Temperature:	23C
Relative Humidity:	67%
ATM Pressure:	101.0 kPa

The testing was performed by Jerry on2023-04-11.

EUT operation mode: Transmitting(*the worst case is 8DPSK Mode, high channel*)

For light 1

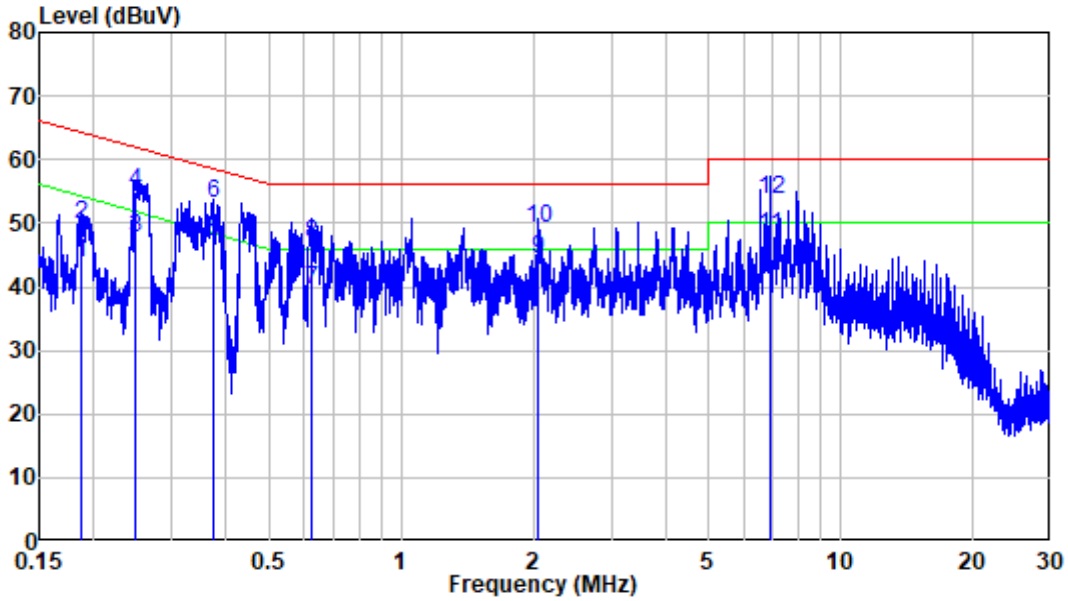
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : Light 1
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	10.10	35.78	45.88	53.97	-8.09	Average
2	0.192	10.10	39.85	49.95	63.97	-14.02	QP
3	0.251	10.10	37.59	47.69	51.71	-4.02	Average
4	0.251	10.10	42.91	53.01	61.71	-8.70	QP
5	0.373	10.10	36.91	47.01	48.44	-1.43	Average
6	0.373	10.10	43.51	53.61	58.44	-4.83	QP
7	1.399	10.26	32.31	42.57	46.00	-3.43	Average
8	1.399	10.26	37.05	47.31	56.00	-8.69	QP
9	3.804	10.53	32.11	42.64	46.00	-3.36	Average
10	3.804	10.53	38.22	48.75	56.00	-7.25	QP
11	6.914	11.25	37.27	48.52	50.00	-1.48	Average
12	6.914	11.25	43.76	55.01	60.00	-4.99	QP

AC 120V/60 Hz, Neutral

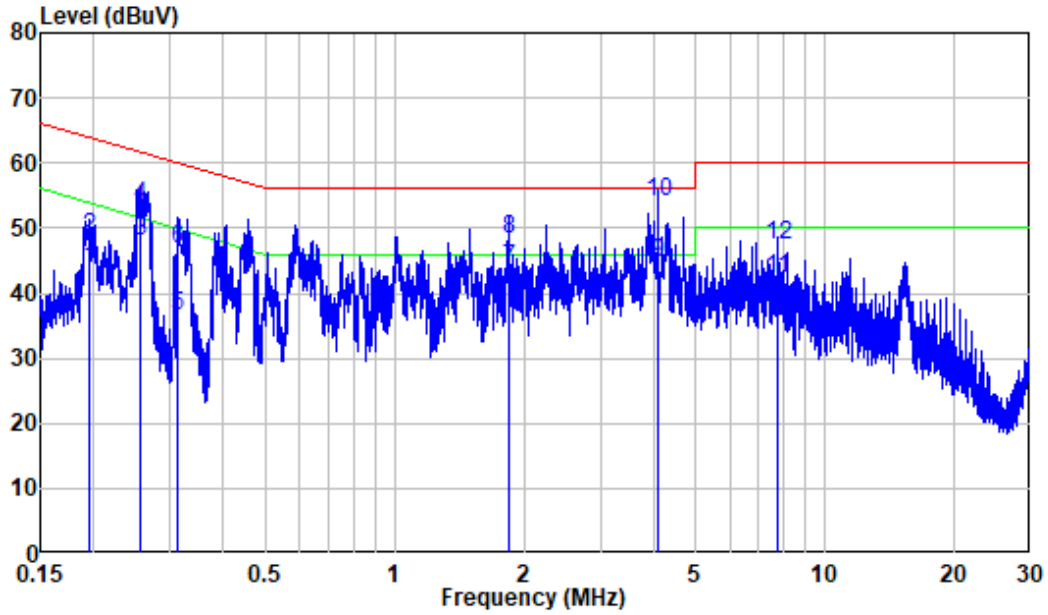


Site : Shielding Room
Condition: Neutral
Job No. : Light 1
Mode : BT Transmitting
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.187	10.30	33.40	43.70	54.16	-10.46	Average
2	0.187	10.30	39.48	49.78	64.16	-14.38	QP
3	0.248	10.32	37.44	47.76	51.81	-4.05	Average
4	0.248	10.32	44.64	54.96	61.81	-6.85	QP
5	0.373	10.37	36.83	47.20	48.44	-1.24	Average
6	0.373	10.37	42.72	53.09	58.44	-5.35	QP
7	0.624	10.08	29.42	39.50	46.00	-6.50	Average
8	0.624	10.08	36.66	46.74	56.00	-9.26	QP
9	2.050	10.03	34.33	44.36	46.00	-1.64	Average
10	2.050	10.03	39.08	49.11	56.00	-6.89	QP
11	6.914	11.15	36.95	48.10	50.00	-1.90	Average
12	6.914	11.15	42.50	53.65	60.00	-6.35	QP

For light 2

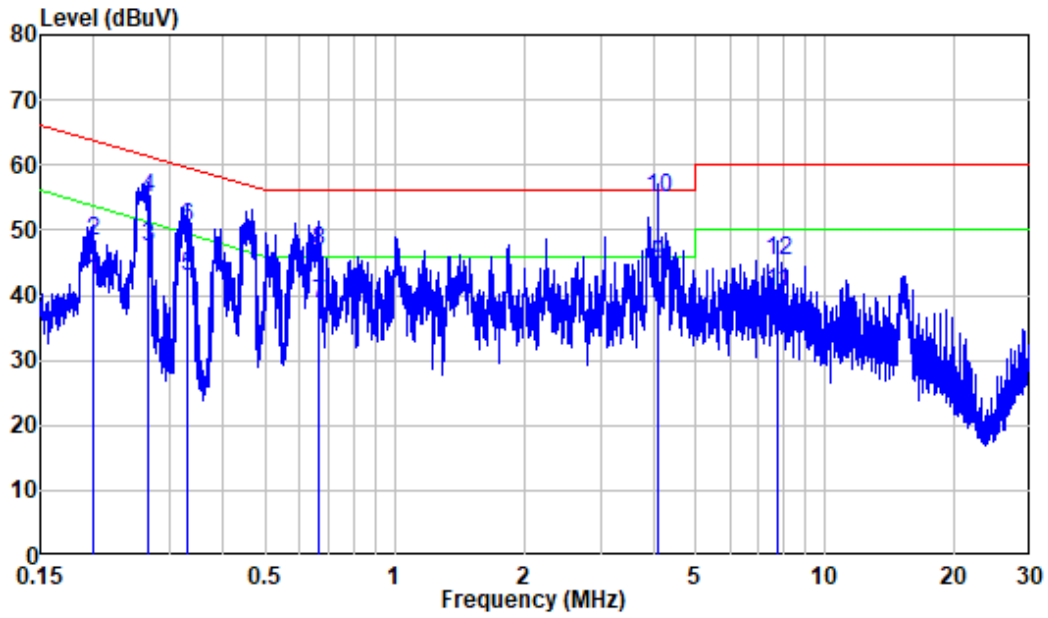
AC 120V/60 Hz, Line



Site : Shielding Room
Condition: Line
Job No. : Light 2
Mode : BT Transmitting
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.195	10.10	33.72	43.82	53.81	-9.99	Average
2	0.195	10.10	38.52	48.62	63.81	-15.19	QP
3	0.256	10.10	37.86	47.96	51.57	-3.61	Average
4	0.256	10.10	43.42	53.52	61.57	-8.05	QP
5	0.314	10.10	26.38	36.48	49.86	-13.38	Average
6	0.314	10.10	36.71	46.81	59.86	-13.05	QP
7	1.840	10.31	33.40	43.71	46.00	-2.29	Average
8	1.840	10.31	37.98	48.29	56.00	-7.71	QP
9	4.084	10.57	34.05	44.62	46.00	-1.38	Average
10	4.084	10.57	43.47	54.04	56.00	-1.96	QP
11	7.753	11.57	30.63	42.20	50.00	-7.80	Average
12	7.753	11.57	35.74	47.31	60.00	-12.69	QP

AC 120V/60 Hz, Neutral



Site : Shielding Room
Condition: Neutral
Job No. : Light 2
Mode : BT Transmitting
Power : AC 120V 60Hz

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dBuV	dBuV	dB	
1	0.199	10.30	31.84	42.14	53.65	-11.51	Average
2	0.199	10.30	37.95	48.25	63.65	-15.40	QP
3	0.266	10.33	37.19	47.52	51.24	-3.72	Average
4	0.266	10.33	44.56	54.89	61.24	-6.35	QP
5	0.331	10.35	32.55	42.90	49.44	-6.54	Average
6	0.331	10.35	40.11	50.46	59.44	-8.98	QP
7	0.667	9.98	28.79	38.77	46.00	-7.23	Average
8	0.667	9.98	36.85	46.83	56.00	-9.17	QP
9	4.087	10.37	34.44	44.81	46.00	-1.19	Average
10	4.087	10.37	44.46	54.83	56.00	-1.17	QP
11	7.753	11.47	28.95	40.42	50.00	-9.58	Average
12	7.753	11.47	33.91	45.38	60.00	-14.62	QP

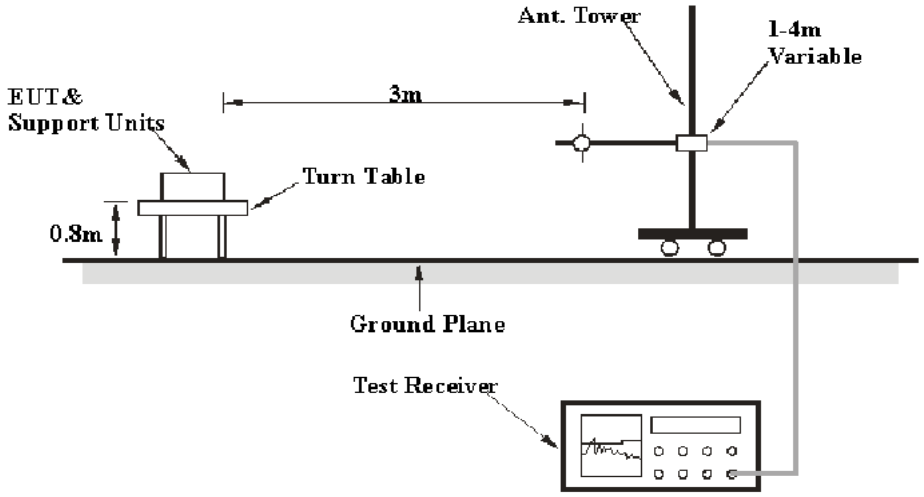
FCC §15.209, §15.205 & §15.247(d) &RSS-247§5.5 - SPURIOUS EMISSIONS

Applicable Standard

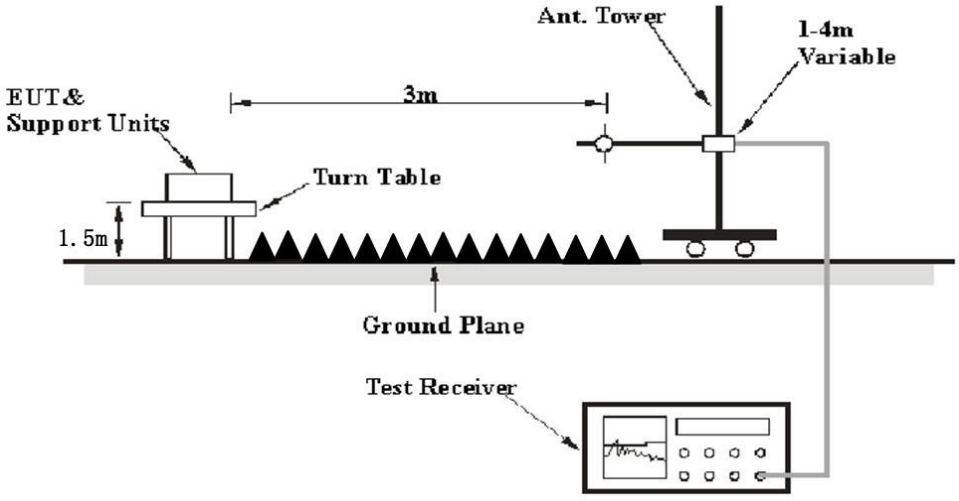
FCC §15.205; §15.209; §15.247(d); RSS-247§5.5; RSS-GEN §8.10

EUT Setup

Below 1 GHz:



Above 1GHz:



The radiated emission tests were performed in the 3meters test site, using the setup accordance with the ANSI C63.10-2013& RSS-Gen. The specification used was the FCC 15.209, and FCC 15.247/RSS-247 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 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:	24~25.5℃
Relative Humidity:	52~56%
ATM Pressure:	101.0 kPa

The testing was performed by Jaosn Liu on 2023-04-12 for below 1GHz, Jimi Zhengon 2023-04-12 for above 1GHz.

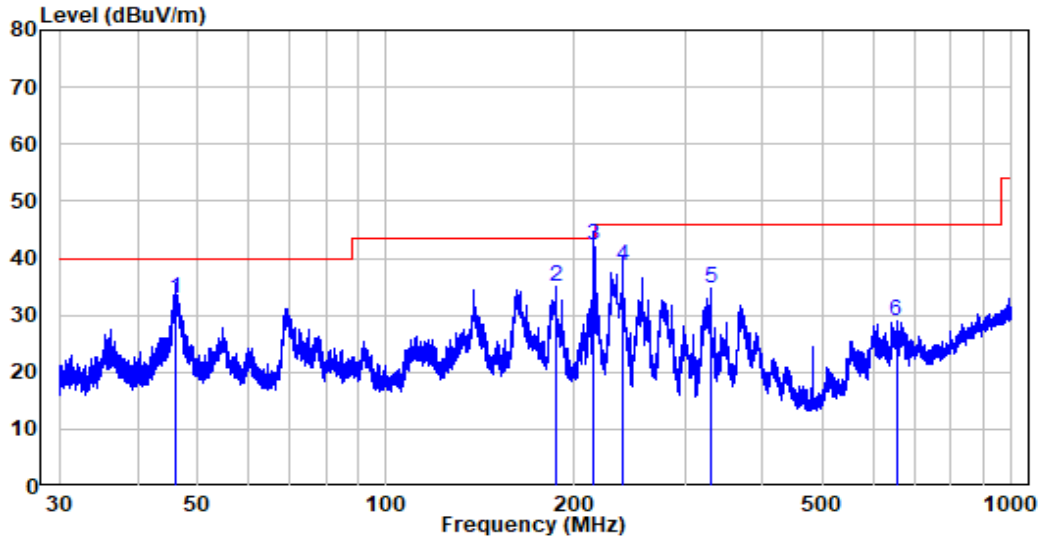
EUT operation mode: Transmitting (Pre-scan in the X,Y and Z axes of orientation, the worst case X-axes of orientation was recorded)

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

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

For light 1

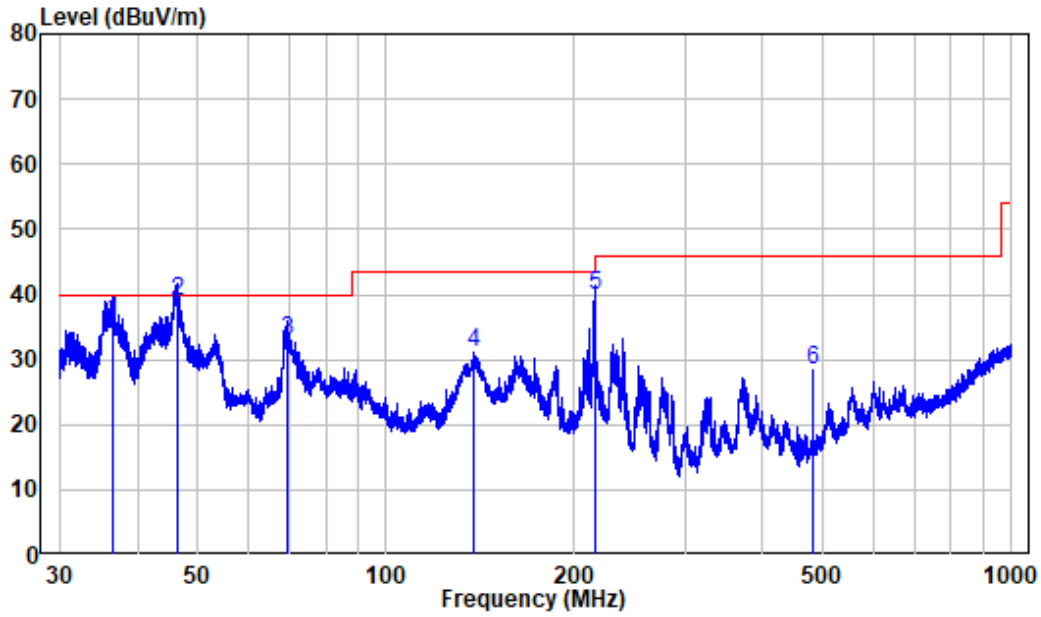
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : RA230301-09498E-RF
Test Mode: BT Transmitting
Note : EUT1

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	46.158	-14.29	47.06	32.77	40.00	-7.23	QP
2	187.096	-10.34	45.45	35.11	43.50	-8.39	Peak
3	214.797	-11.07	53.19	42.12	43.50	-1.38	QP
4	239.252	-11.89	50.47	38.58	46.00	-7.42	QP
5	329.906	-13.39	48.24	34.85	46.00	-11.15	Peak
6	654.232	-8.31	37.34	29.03	46.00	-16.97	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : RA230301-09498E-RF
Test Mode: BT Transmitting
Note : EUT1

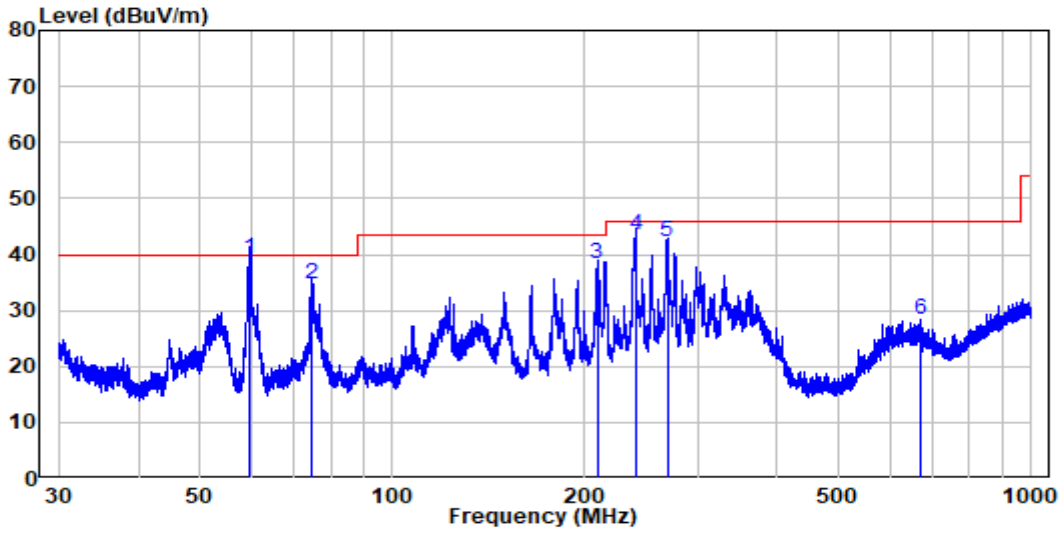
	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	36.541	-14.48	50.30	35.82	40.00	-4.18	QP
2	46.219	-14.29	53.10	38.81	40.00	-1.19	QP
3	69.692	-13.77	46.56	32.79	40.00	-7.21	QP
4	137.782	-10.56	41.71	31.15	43.50	-12.35	Peak
5	215.646	-11.10	50.80	39.70	43.50	-3.80	QP
6	480.107	-14.50	42.83	28.33	46.00	-17.67	Peak

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

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

For light 2

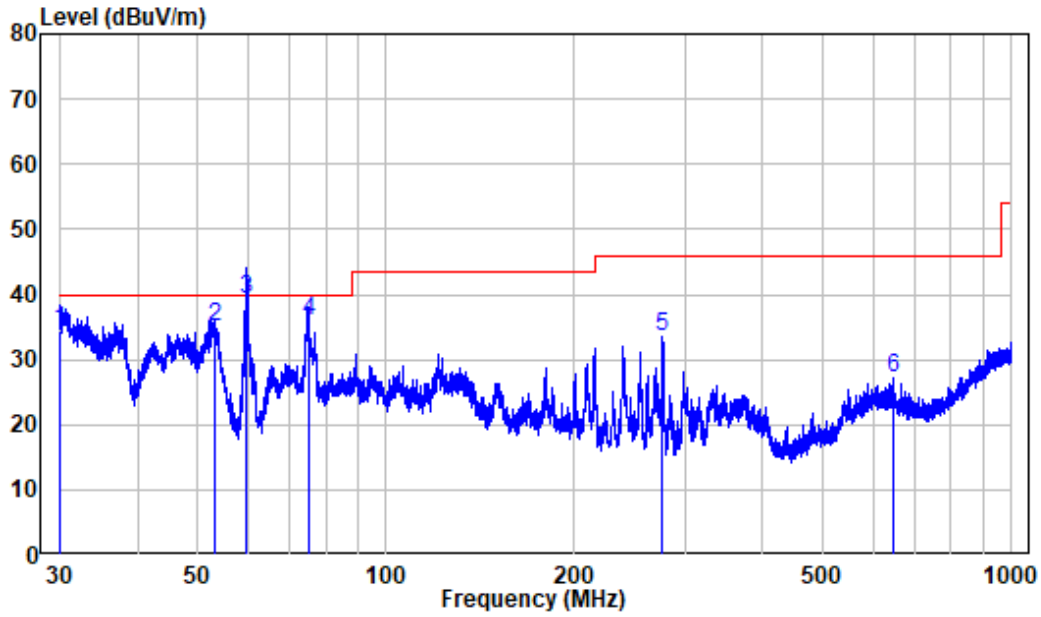
Horizontal



Site : chamber
Condition: 3m HORIZONTAL
Job No. : RA230301-09498E-RF
Test Mode: BT Transmitting
Note : EUT2

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	59.780	-13.83	53.00	39.17	40.00	-0.83	QP
2	74.821	-13.44	48.20	34.76	40.00	-5.24	QP
3	209.038	-10.91	49.10	38.19	43.50	-5.31	QP
4	239.882	-11.91	55.30	43.39	46.00	-2.61	QP
5	269.074	-14.52	56.80	42.28	46.00	-3.72	QP
6	672.255	-7.73	36.02	28.29	46.00	-17.71	Peak

Vertical



Site : chamber
Condition: 3m VERTICAL
Job No. : RA230301-09498E-RF
Test Mode: BT Transmitting
Note : EUT2

	Freq	Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	30.000	-14.30	48.60	34.30	40.00	-5.70	QP
2	53.225	-14.16	49.20	35.04	40.00	-4.96	QP
3	59.806	-13.83	53.10	39.27	40.00	-0.73	QP
4	75.083	-13.43	49.30	35.87	40.00	-4.13	QP
5	276.851	-15.10	48.60	33.50	46.00	-12.50	Peak
6	646.252	-8.62	35.78	27.16	46.00	-18.84	Peak

Above 1GHz: (worst case for 8DPSK, 3DH5, with Light 2 device)

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Factor (dB/m)	Absolute Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/Ave		Height (m)	Polar (H/V)				
Low Channel 2402MHz									
2387.86	68.00	PK	347	1.1	H	-10.71	57.29	74	-16.71
2375.45	67.89	PK	166	1.9	V	-10.73	57.16	74	-16.84
2390	65.52	PK	357	2.2	H	-10.70	54.82	74	-19.18
2390	65.38	PK	177	2	V	-10.70	54.68	74	-19.32
4804	61.04	PK	329	2.3	H	-6.11	54.93	74	-19.07
4804	61.33	PK	144	2.3	V	-6.11	55.22	74	-18.78
Middle Channel 2441MHz									
4882	60.80	PK	124	1.9	H	-5.90	54.90	74	-19.10
4882	61.03	PK	136	1.9	V	-5.90	55.13	74	-18.87
High Channel2480MHz									
2483.5	66.63	PK	266	2.4	H	-10.55	56.08	74	-17.92
2483.5	66.49	PK	358	1.5	V	-10.55	55.94	74	-18.06
2487.28	69.11	PK	119	2.3	H	-10.52	58.59	74	-15.41
2484.83	68.96	PK	172	2.5	V	-10.54	58.42	74	-15.58
4960	60.27	PK	67	1.3	H	-5.47	54.80	74	-19.20
4960	60.53	PK	246	1.3	V	-5.47	55.06	74	-18.94

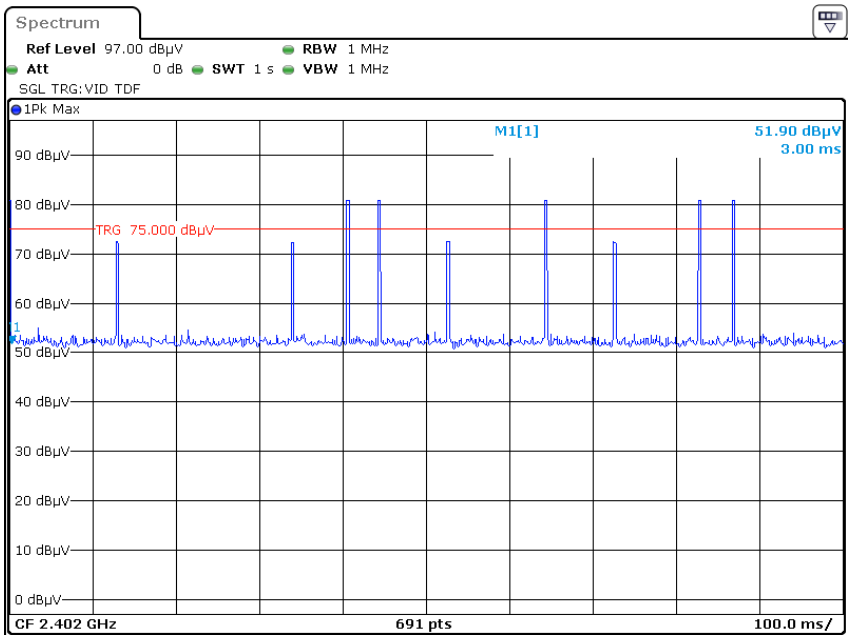
Field Strength of Average							
Frequency (MHz)	Peak Measurement @3m (dBμV/m)	Polar (H/V)	Duty Cycle Correction Factor (dB)	Corrected Ampitude (dBμV/m)	FCC Part 15.247		
					Limit (dBμV/m)	Margin (dB)	Comment
Low Channel 2402MHz							
2387.86	57.29	H	-24.73	32.56	54	-21.44	Bandedge
2375.45	57.16	V	-24.73	32.43	54	-21.57	Bandedge
2390	54.82	H	-24.73	30.09	54	-23.91	Bandedge
2390	54.68	V	-24.73	29.95	54	-24.05	Bandedge
4804	54.93	H	-24.73	30.20	54	-23.80	Harmonic
4804	55.22	V	-24.73	30.49	54	-23.51	Harmonic
Middle Channel 2441MHz							
4882	54.90	H	-24.73	30.17	54	-23.83	Harmonic
4882	55.13	V	-24.73	30.40	54	-23.60	Harmonic
High Channel2480MHz							
2483.5	56.08	H	-24.73	31.35	54	-22.65	Bandedge
2483.5	55.94	V	-24.73	31.21	54	-22.79	Bandedge
2487.28	58.59	H	-24.73	33.86	54	-20.14	Bandedge
2484.83	58.42	V	-24.73	33.69	54	-20.31	Bandedge
4960	54.80	H	-24.73	30.07	54	-23.93	Harmonic
4960	55.06	V	-24.73	30.33	54	-23.67	Harmonic

Note:

AbsoluteLevel = Corrected Factor + Reading
Margin = Corrected. Amplitude - Limit
Average level= Peak level+ Duty Cycle Corrected Factor
For fundamental, the peak value compliance with the limit of Average.

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

Pulse information



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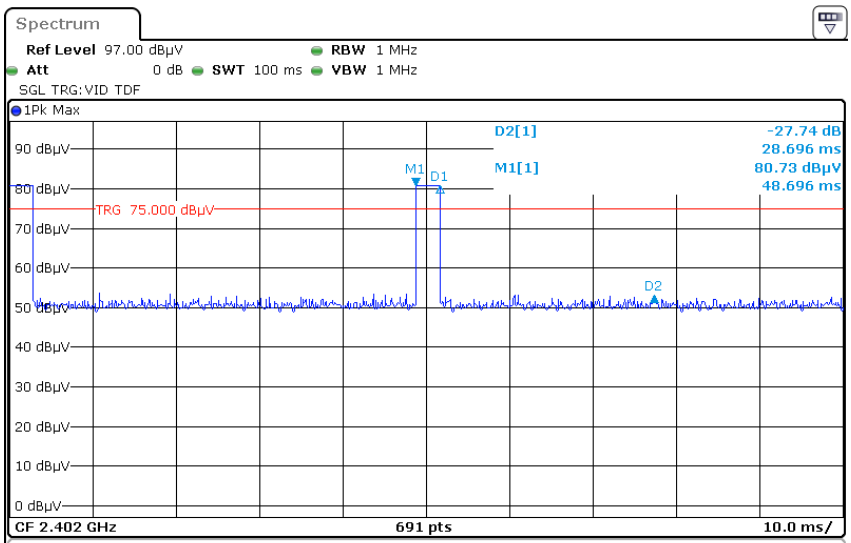
Maximum Pulse number in 100ms: 2； Pulse length: 2.899ms



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	48.696 ms	80.73 dBµV		
D1	M1	1	2.899 ms	0.06 dB		
D2	M1	1	28.696 ms	-27.74 dB		

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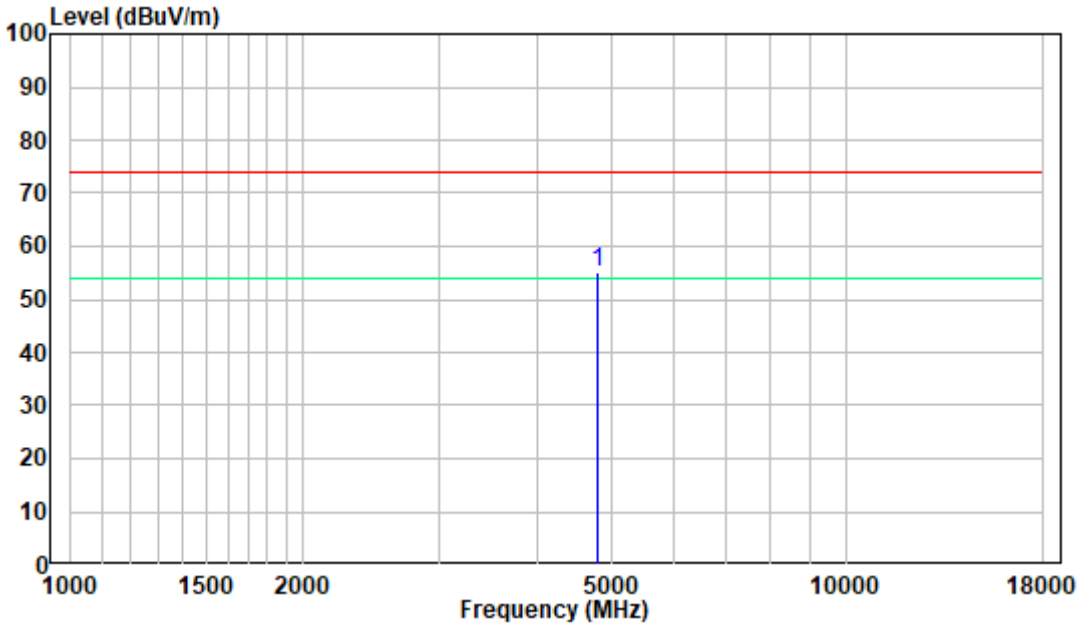
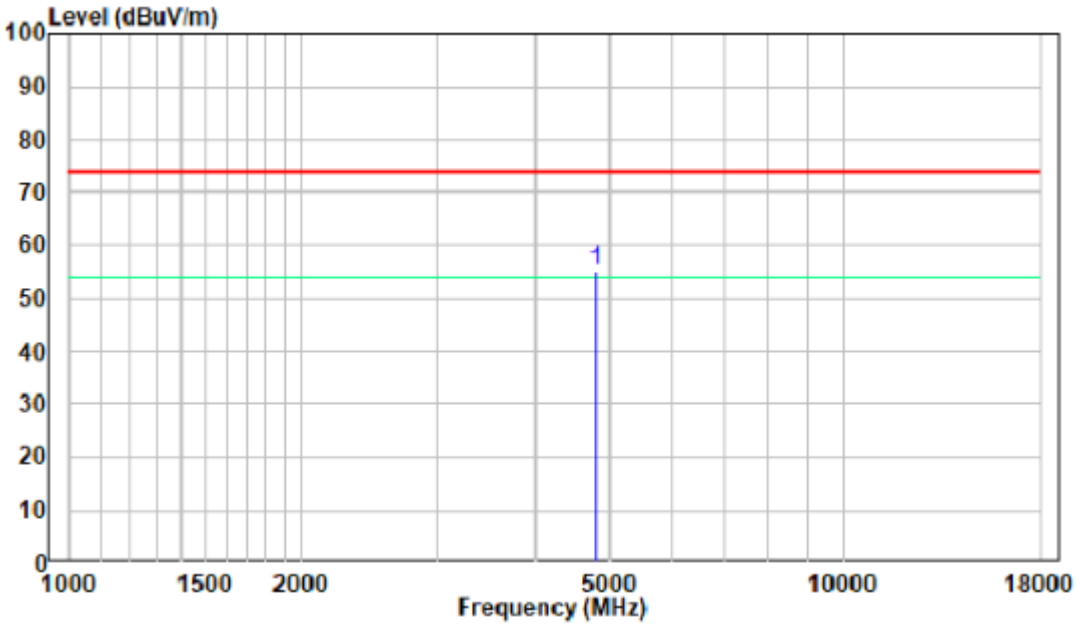
1 GHz - 18 GHz: (Pre-Scan plots)

Low channel

Horizontal



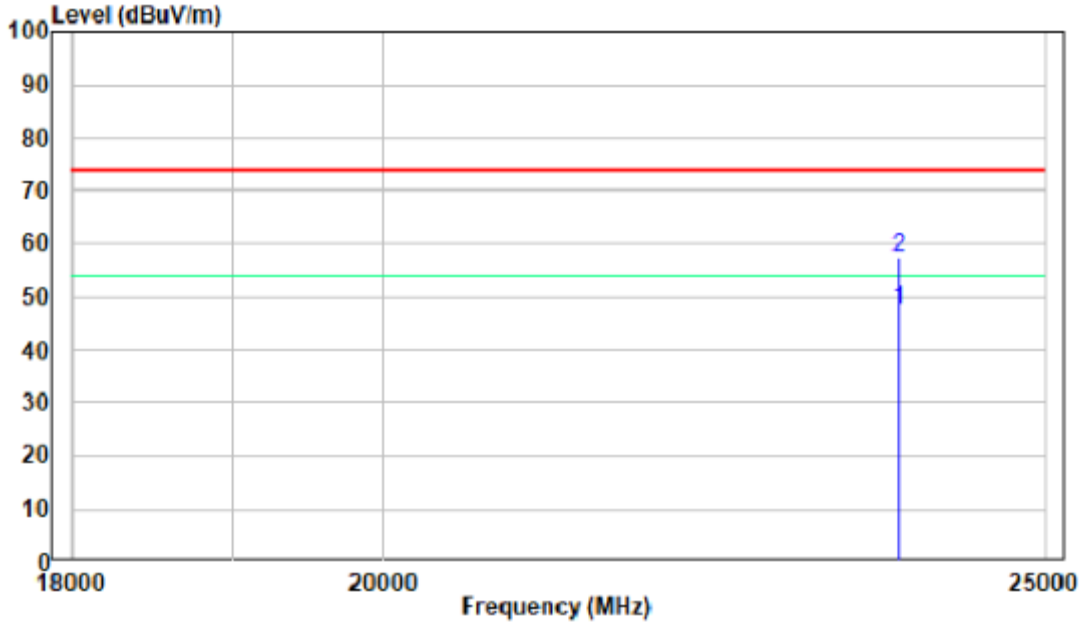
Vertical



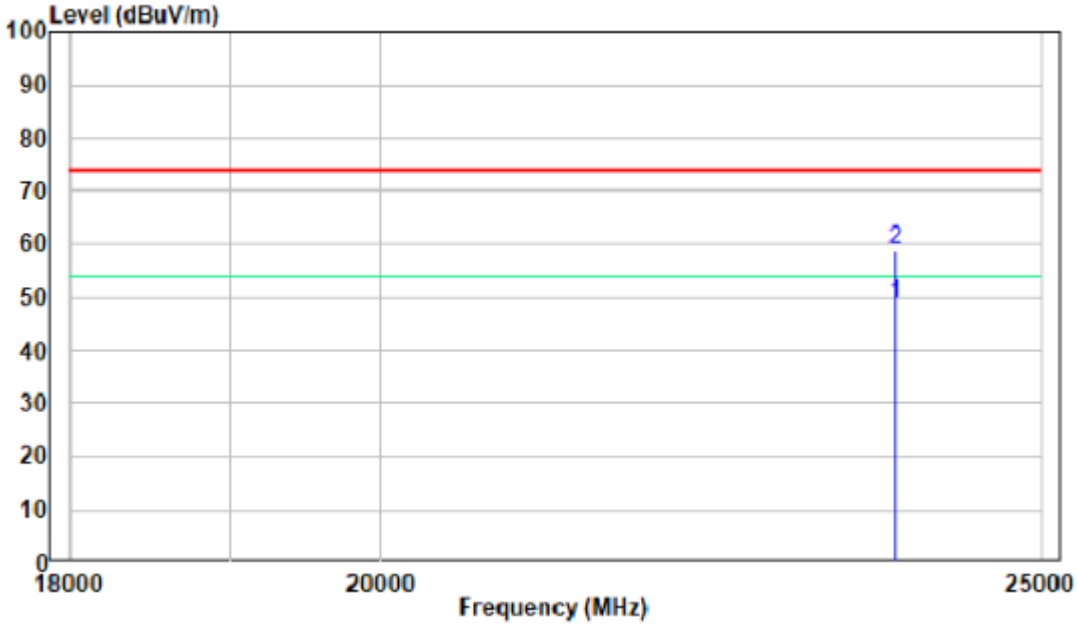
18-25GHz: (Pre-Scan plots)

Low 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.

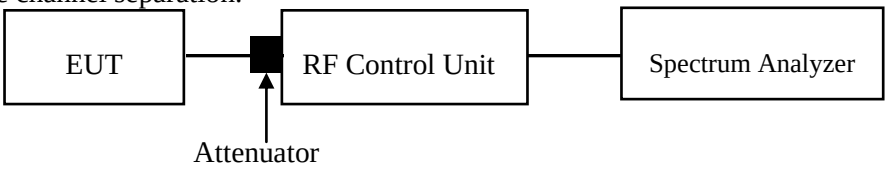
According to RSS-247 §5.1 (b):

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

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



Test Data

Environmental Conditions

Temperature:	24~27℃
Relative Humidity:	52~55%
ATM Pressure:	101.0 kPa

The testing was performed by Nick Fang on 2023-04-12.
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 –20dBEMISSION 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:

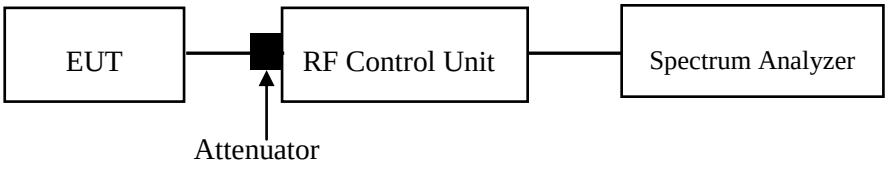
• The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

• 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:	24~27℃
Relative Humidity:	52~55%
ATM Pressure:	101.0 kPa

The testing was performed by Nick Fang on 2023-04-12.

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.

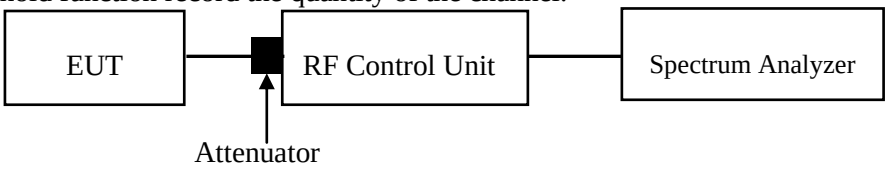
Test Procedure

Test Method: ANSI C63.10-2013 Clause 7.8.3

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

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

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



Test Data

Environmental Conditions

Temperature:	24~27℃
Relative Humidity:	52~55%
ATM Pressure:	101.0 kPa

The testing was performed by Nick Fang on 2023-04-12.

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.

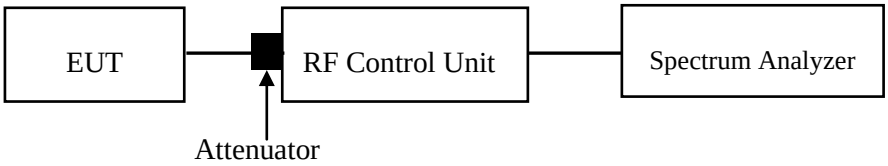
According to RSS-247 §5.1 (d):

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

The EUT was worked in channel hopping.
Set the RBW to: 1MHz.
Set the VBW ≥ 3×RBW.
Set the span to 0Hz.
Detector = peak.
Sweep time = auto couple.
Trace mode = max hold.
Allow trace to fully stabilize.



Test Data

Environmental Conditions

Temperature:	24~27℃
Relative Humidity:	52~55%
ATM Pressure:	101.0 kPa

The testing was performed by Nick Fang on 2023-04-12.

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):

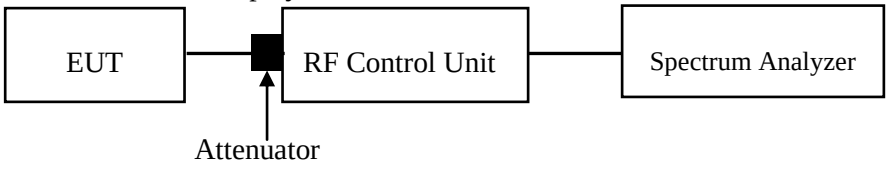
For frequency hopping systems (FHSs) operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels. 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:	24~27℃
Relative Humidity:	52~55%
ATM Pressure:	101.0 kPa

The testing was performed by Nick Fang on 2023-04-12.

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)).

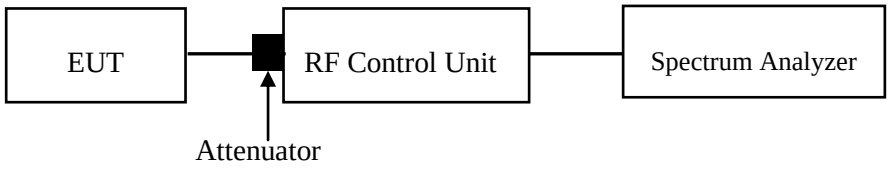
According to RSS-247 §5.5.

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 the100 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

Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
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.
Set RBW of spectrum analyzer to 100 kHz with a convenient frequency spanincluding 100kHz bandwidth from band edge.
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.
Repeat above procedures until all measured frequencies were complete.



Test Data

Environmental Conditions

Temperature:	24~27℃
Relative Humidity:	52~55%
ATM Pressure:	101.0 kPa

The testing was performed by Nick Fang on 2023-04-12.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

APPENDIX

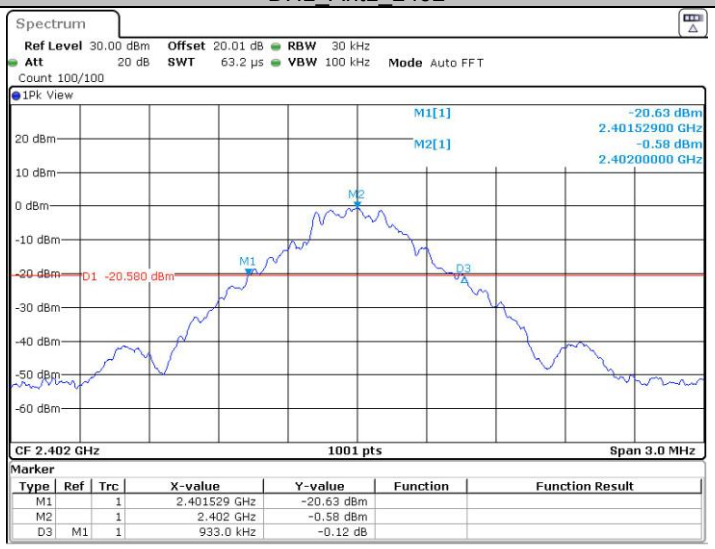
Appendix A: 20dB Emission Bandwidth

Test Result

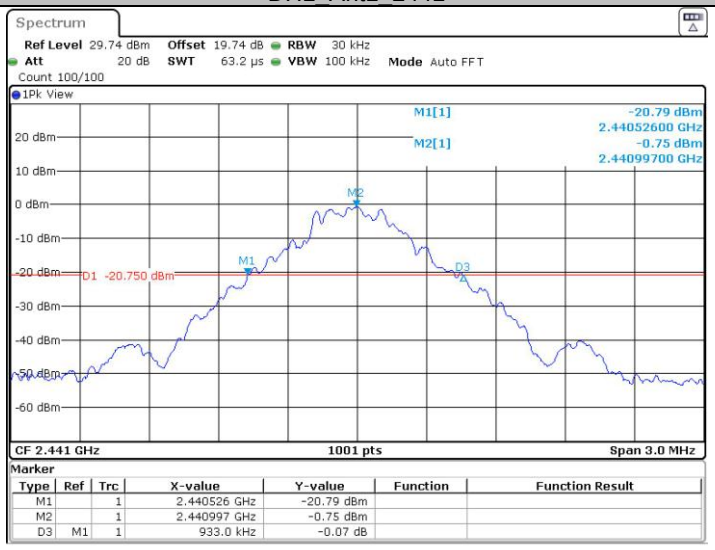
Test Mode	Antenna	Frequency[MHz]	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH1	Ant1	2402	0.93	2401.53	2402.46	---	---
		2441	0.93	2440.53	2441.46	---	---
		2480	0.93	2479.53	2480.46	---	---
2DH1	Ant1	2402	1.27	2401.35	2402.62	---	---
		2441	1.28	2440.35	2441.63	---	---
		2480	1.30	2479.33	2480.62	---	---
3DH1	Ant1	2402	1.28	2401.35	2402.62	---	---
		2441	1.28	2440.35	2441.62	---	---
		2480	1.28	2479.35	2480.62	---	---

Test Graphs

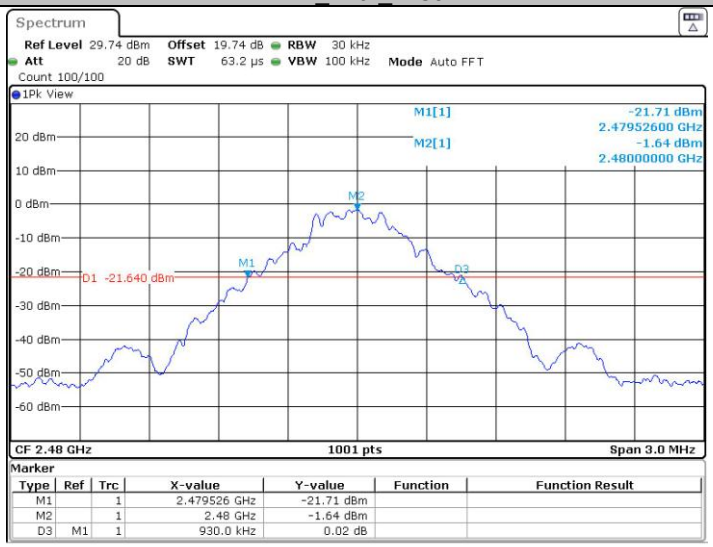
DH1_Ant1_2402



DH1_Ant1_2441

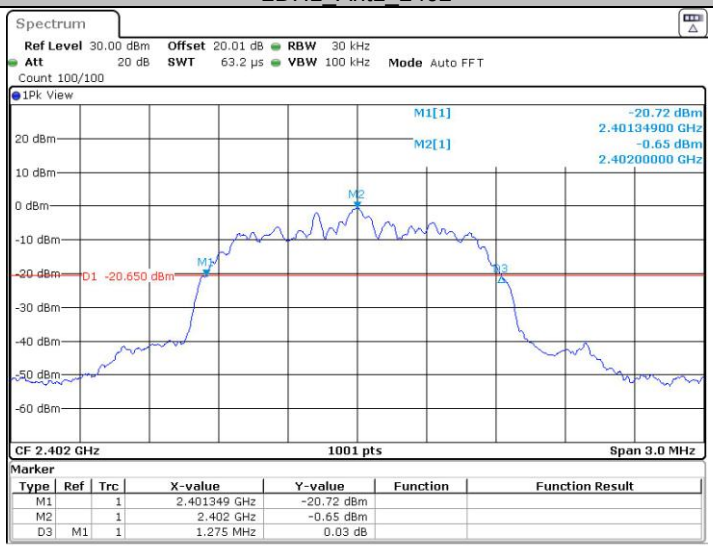


DH1_Ant1_2480



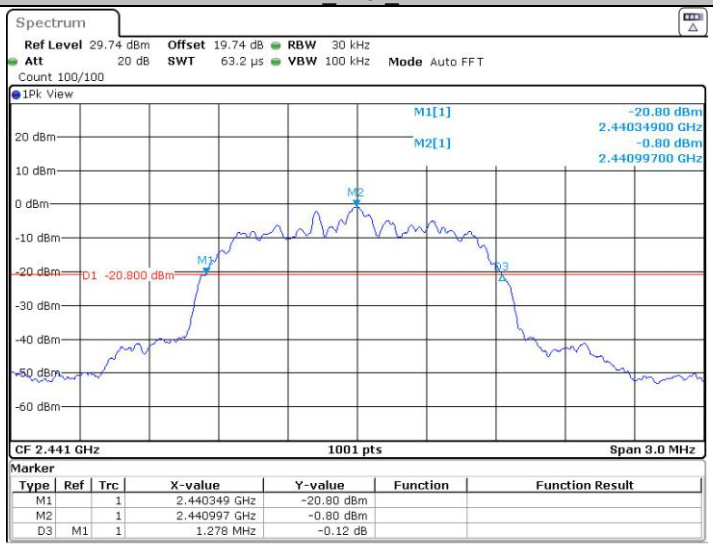
Date: 12.APR.2023 01:03:35

2DH1_Ant1_2402

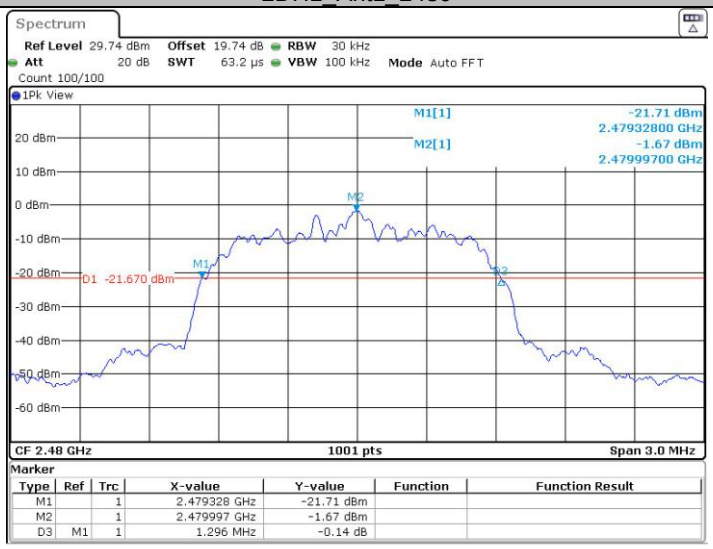


Date: 12.APR.2023 01:07:06

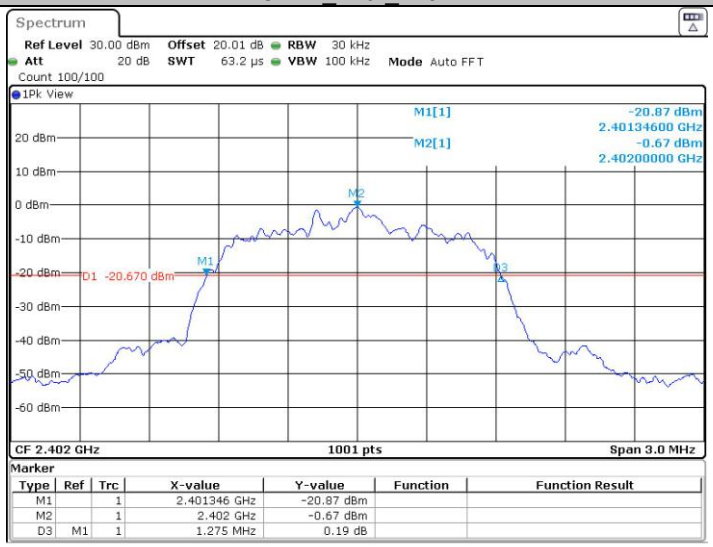
2DH1_Ant1_2441



2DH1_Ant1_2480



3DH1_Ant1_2402



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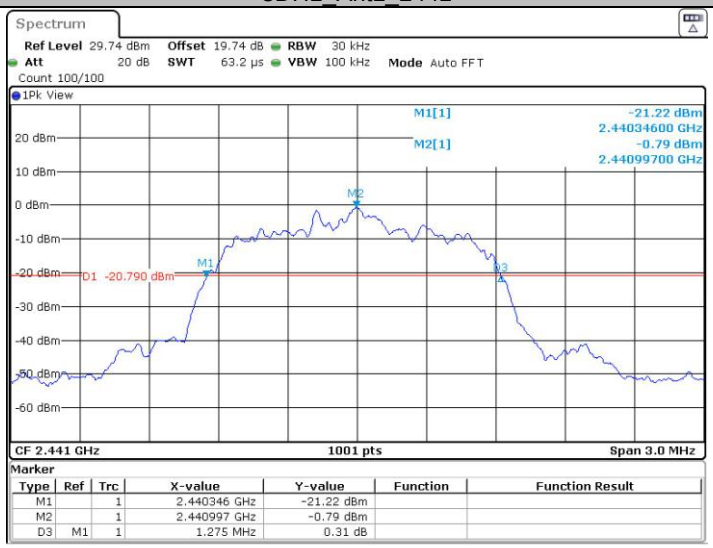
3DH1_Ant1_2441



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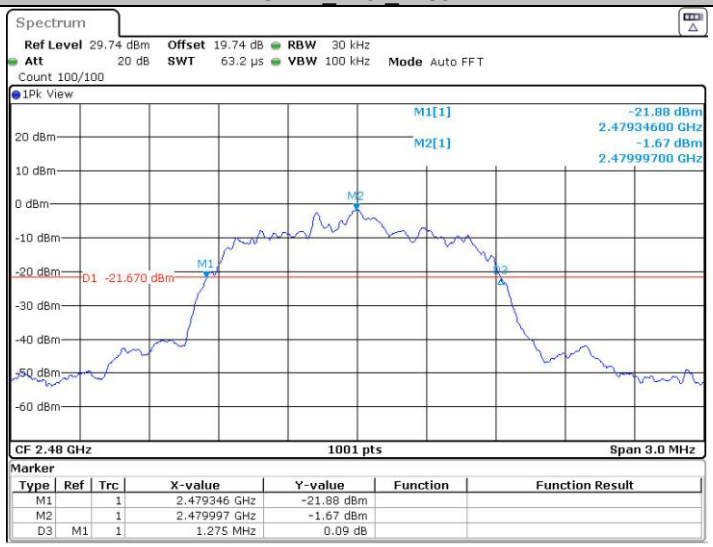
3DH1_Ant1_2480



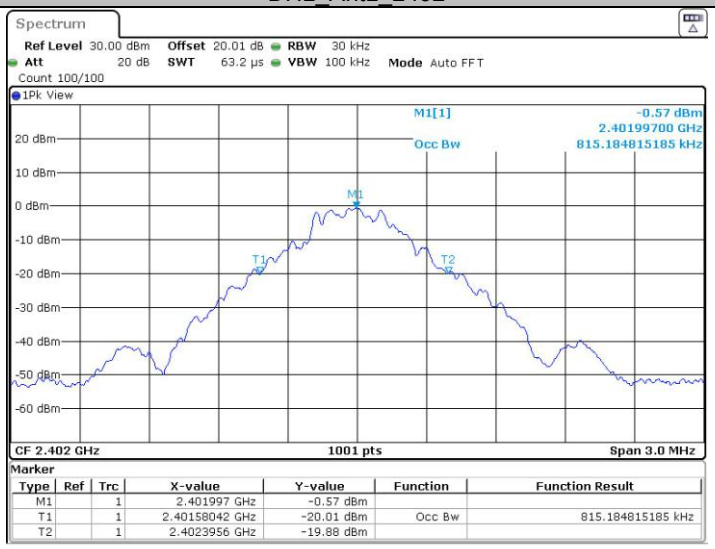
Appendix B: Occupied Channel Bandwidth

Test Result

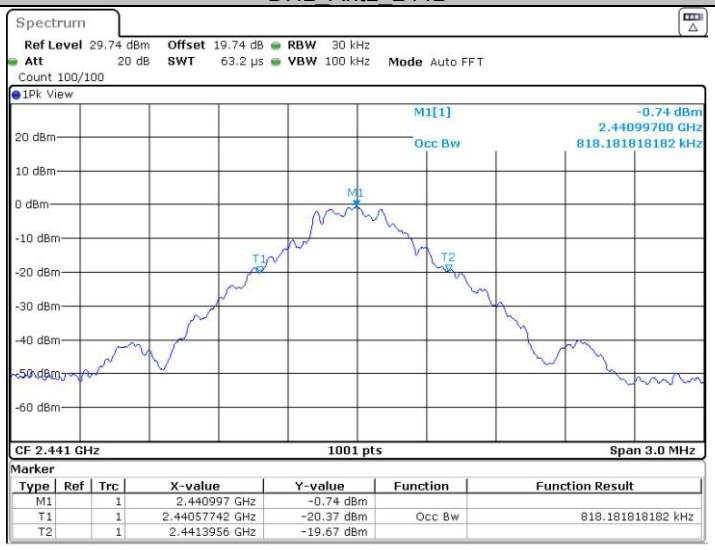
TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH1	Ant1	2402	0.815	2401.580	2402.396	---	---
		2441	0.818	2440.577	2441.396	---	---
		2480	0.815	2479.580	2480.396	---	---
2DH1	Ant1	2402	1.172	2401.395	2402.566	---	---
		2441	1.172	2440.395	2441.566	---	---
		2480	1.172	2479.395	2480.566	---	---
3DH1	Ant1	2402	1.16	2401.416	2402.575	---	---
		2441	1.16	2440.416	2441.575	---	---
		2480	1.16	2479.416	2480.575	---	---

Test Graphs

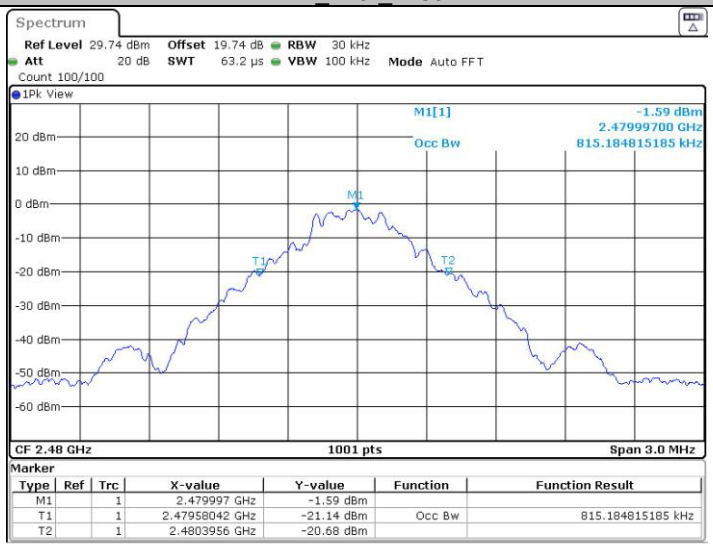
DH1_Ant1_2402



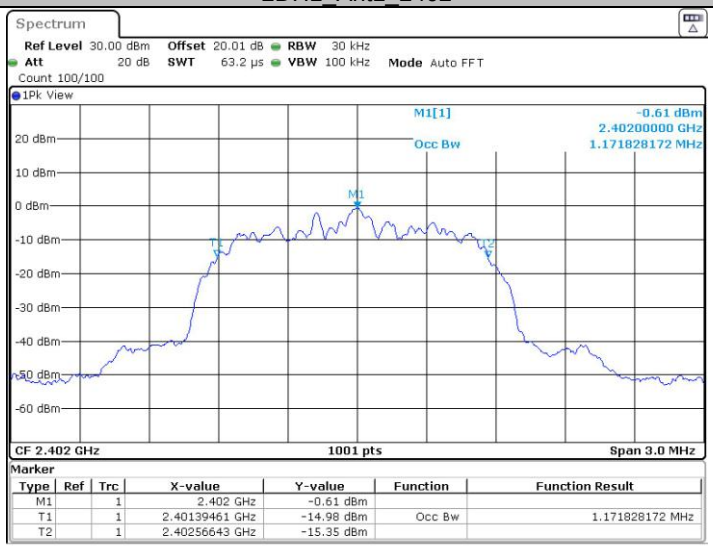
DH1_Ant1_2441



DH1_Ant1_2480

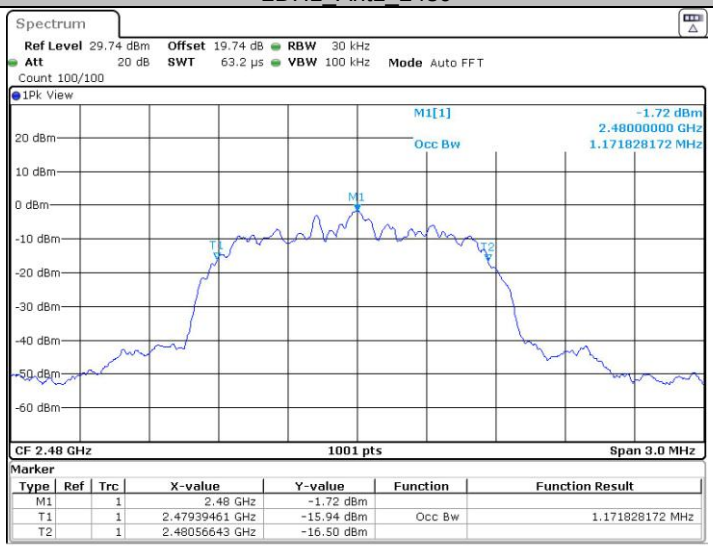


2DH1_Ant1_2402

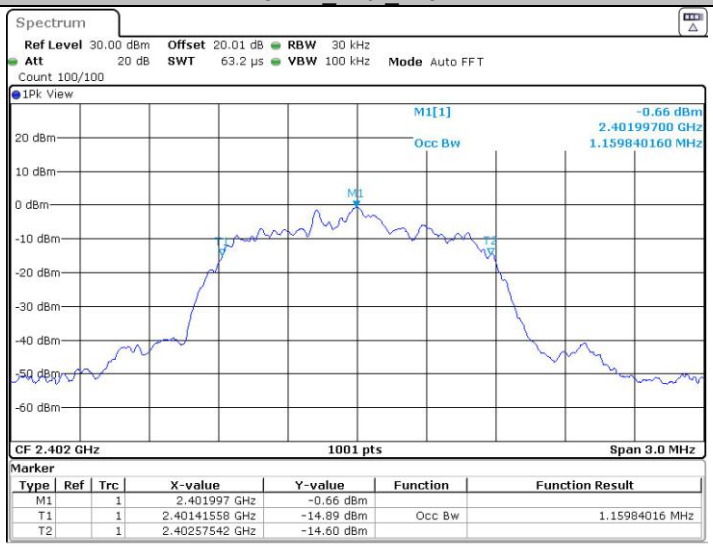


2DH1_Ant1_2441

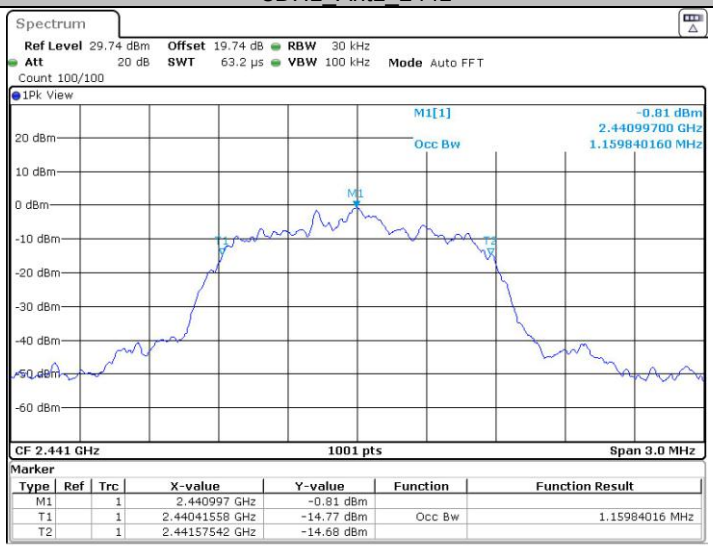
2DH1_Ant1_2480



3DH1_Ant1_2402



3DH1_Ant1_2441



3DH1_Ant1_2480

Appendix C: Maximum conducted output power

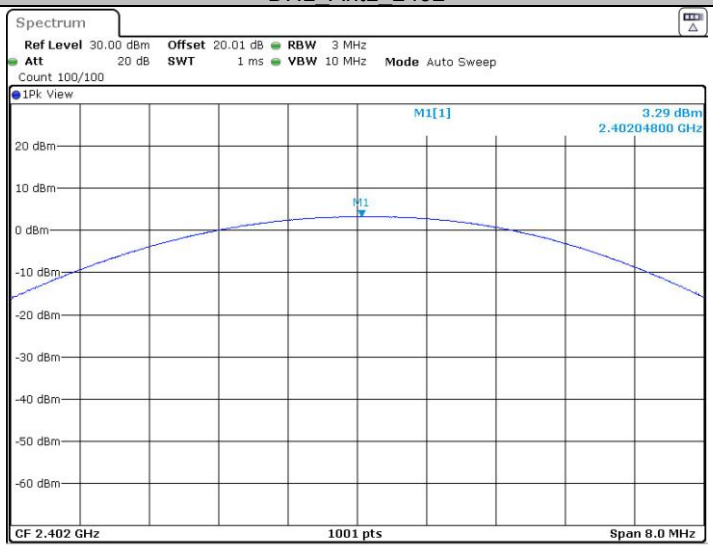
Test Result Peak

Test Mode	Antenna	Frequency[MHz]	Conducted Peak Powert[dBm]	FCC Conducted Limit[dBm]	Verdict
DH1	Ant1	2402	3.29	≤20.97	PASS
		2441	3.31	≤20.97	PASS
		2480	2.57	≤20.97	PASS
2DH1	Ant1	2402	5.4	≤20.97	PASS
		2441	5.45	≤20.97	PASS
		2480	4.7	≤20.97	PASS
3DH1	Ant1	2402	5.81	≤20.97	PASS
		2441	5.86	≤20.97	PASS
		2480	5.17	≤20.97	PASS

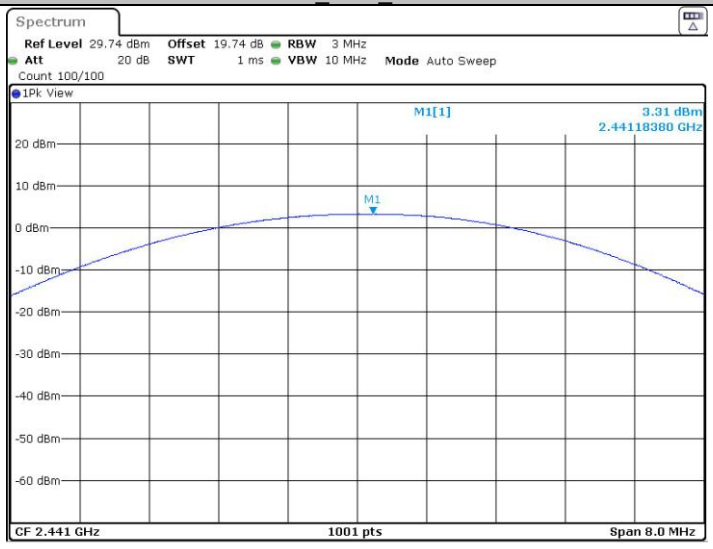
Note: Antenna Gain is 3.42 dBi, the max. EIRP is 9.28 dBm, the RSS-247 limit is 36dBm

Test Graphs

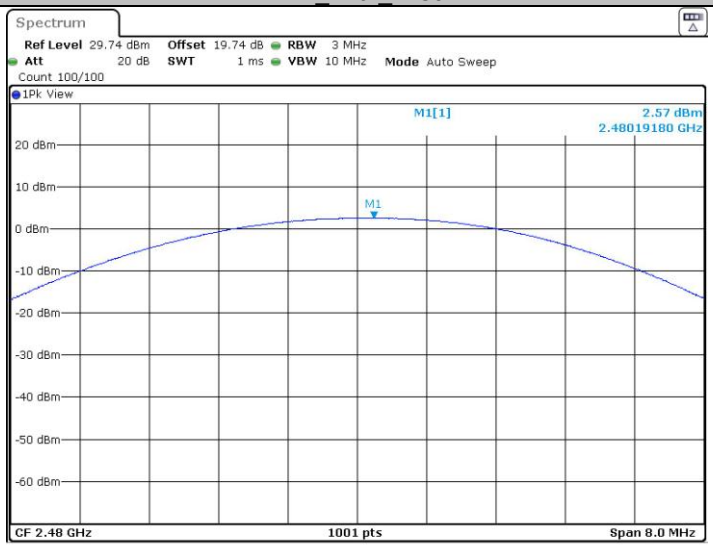
DH1_Ant1_2402



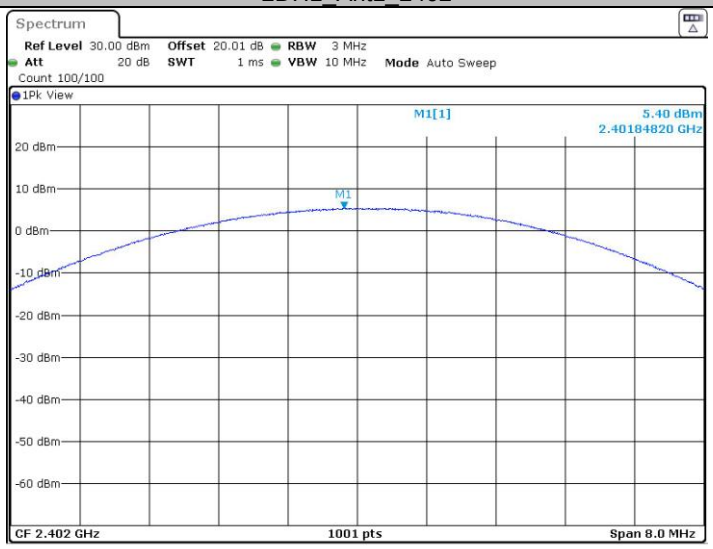
DH1_Ant1_2441



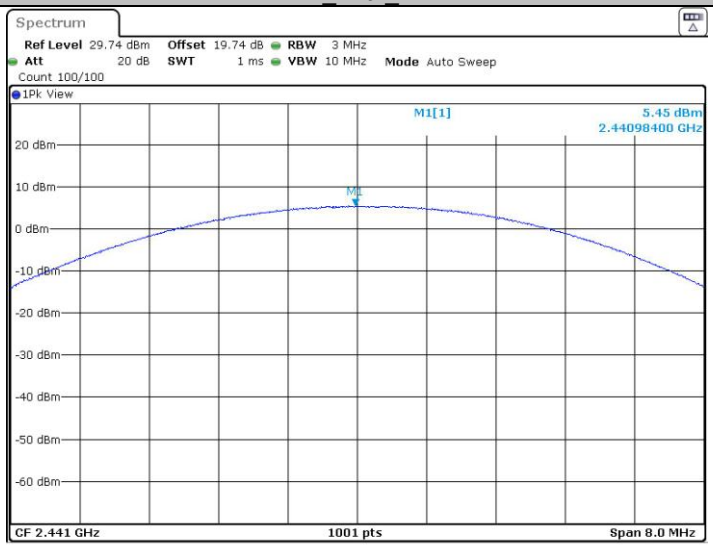
DH1_Ant1_2480



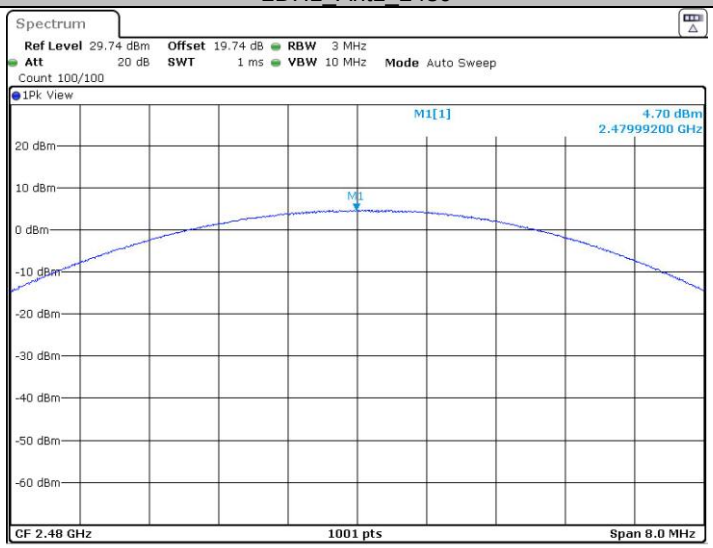
2DH1_Ant1_2402



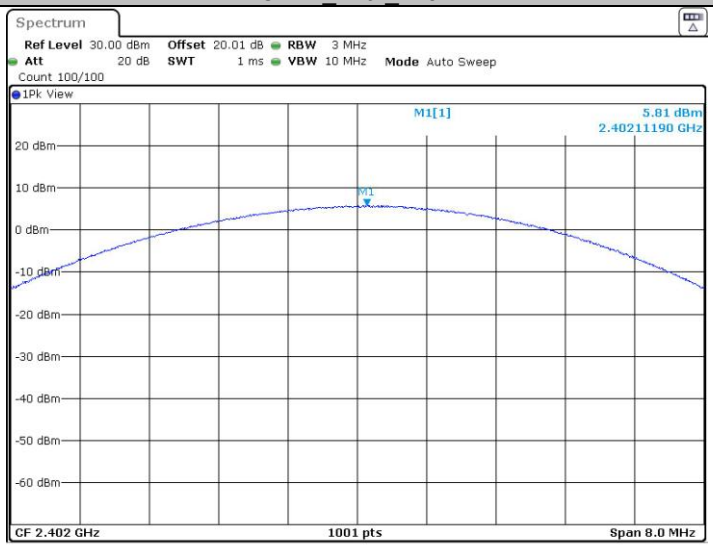
2DH1_Ant1_2441



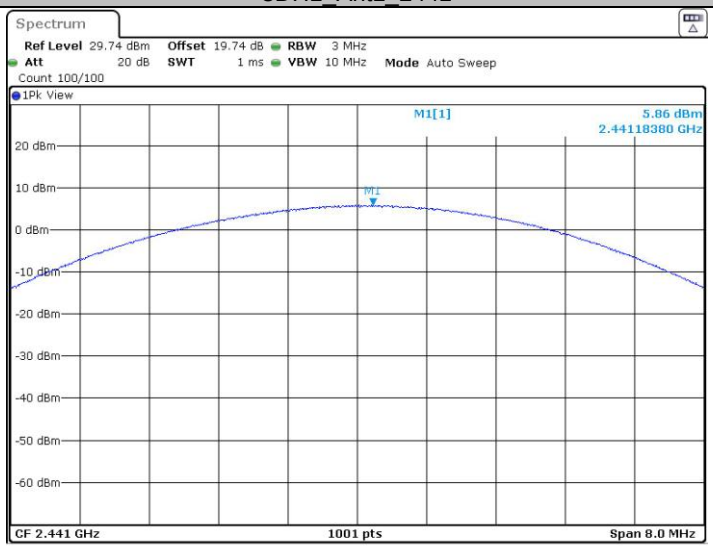
2DH1_Ant1_2480



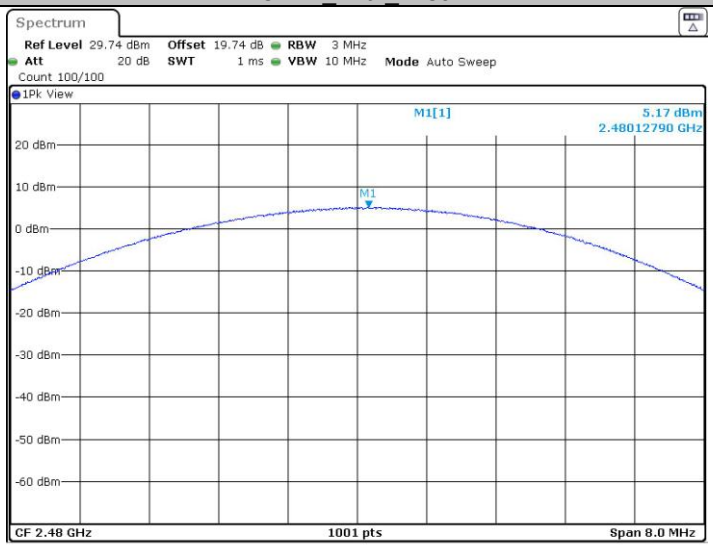
3DH1_Ant1_2402



3DH1_Ant1_2441



3DH1_Ant1_2480



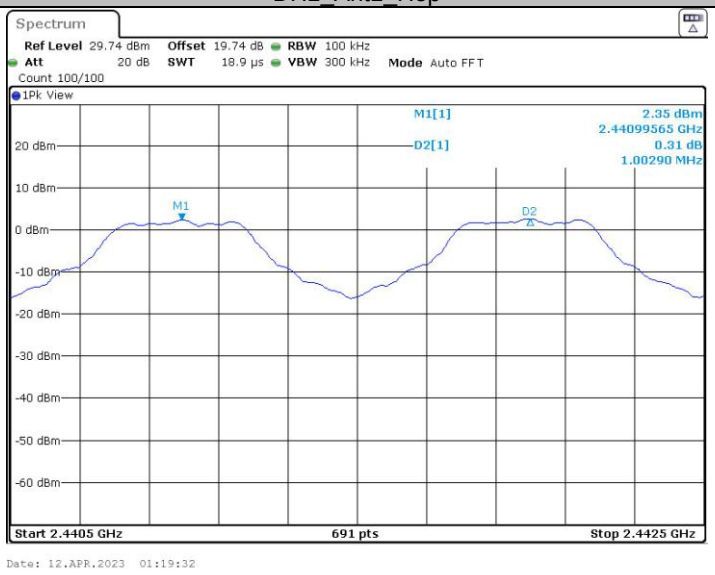
Appendix D: Carrier frequency separation

Test Result

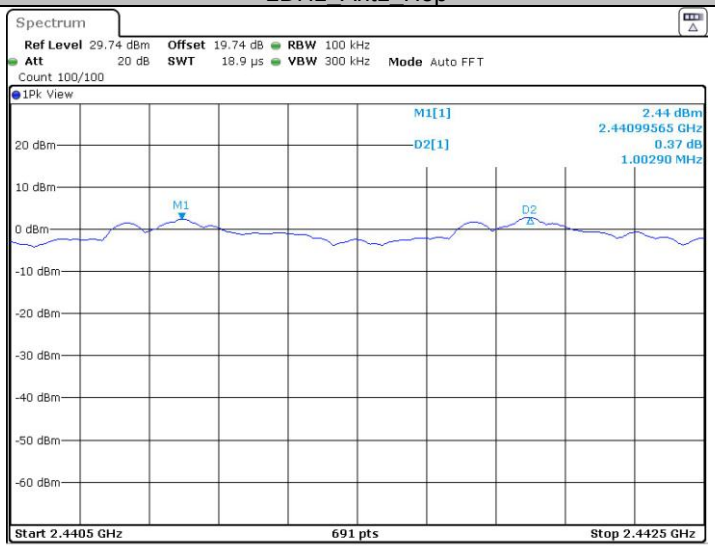
TestMode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
DH1	Ant1	Hop	1.003	≥0.620	PASS
2DH1	Ant1	Hop	1.003	≥0.867	PASS
3DH1	Ant1	Hop	1	≥0.853	PASS

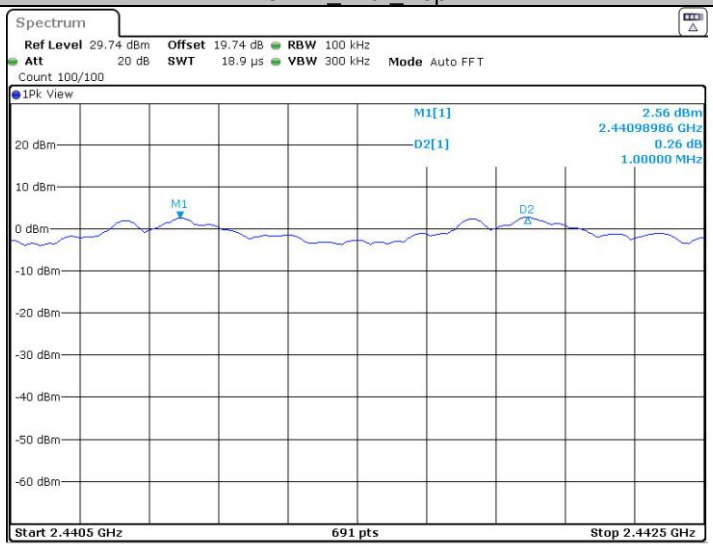
Test Graphs

DH1_Ant1_Hop



2DH1_Ant1_Hop



3DH1_Ant1_Hop


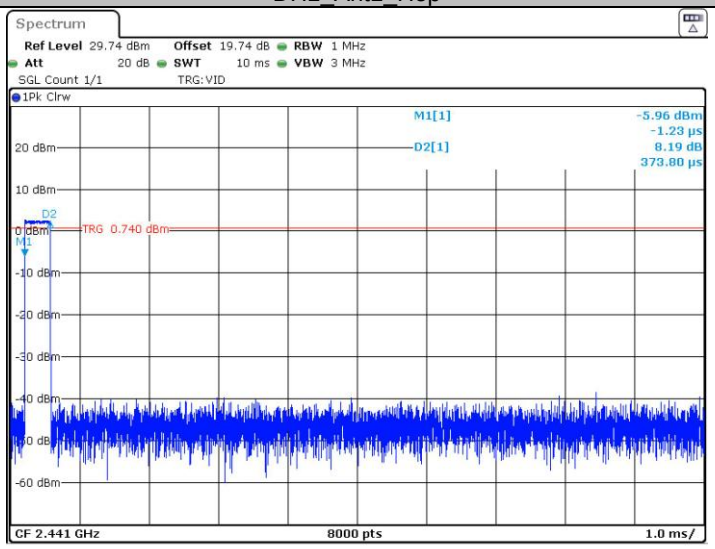
Appendix E: Time of occupancy

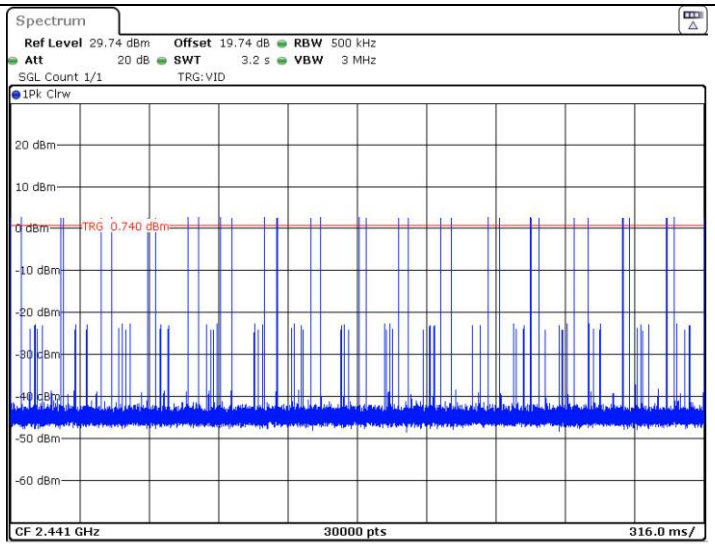
Test Result

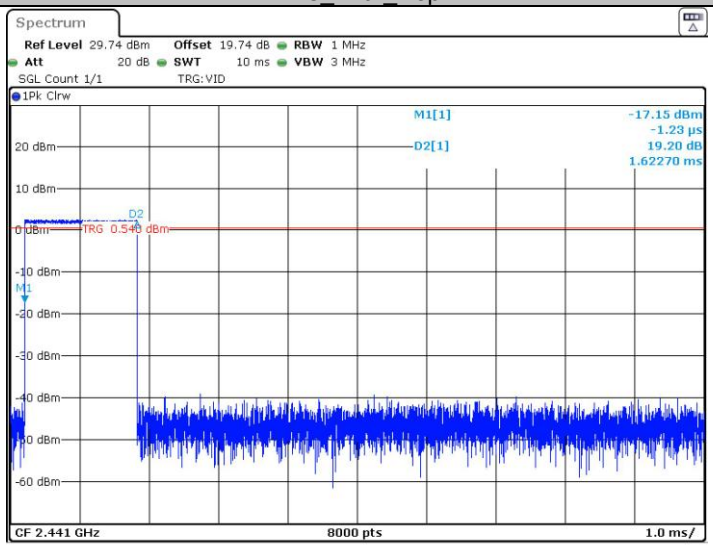
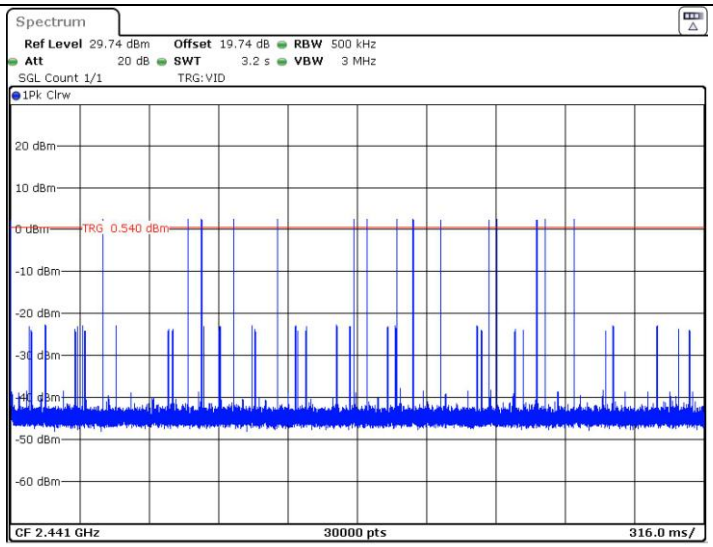
TestMode	Antenna	Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.37	330	0.123	≤0.4	PASS
DH3	Ant1	Hop	1.62	160	0.26	≤0.4	PASS
DH5	Ant1	Hop	2.86	120	0.344	≤0.4	PASS
2DH1	Ant1	Hop	0.39	320	0.123	≤0.4	PASS
2DH3	Ant1	Hop	1.63	170	0.277	≤0.4	PASS
2DH5	Ant1	Hop	2.87	110	0.316	≤0.4	PASS
3DH1	Ant1	Hop	0.39	320	0.123	≤0.4	PASS
3DH3	Ant1	Hop	1.63	150	0.244	≤0.4	PASS
3DH5	Ant1	Hop	2.87	130	0.373	≤0.4	PASS

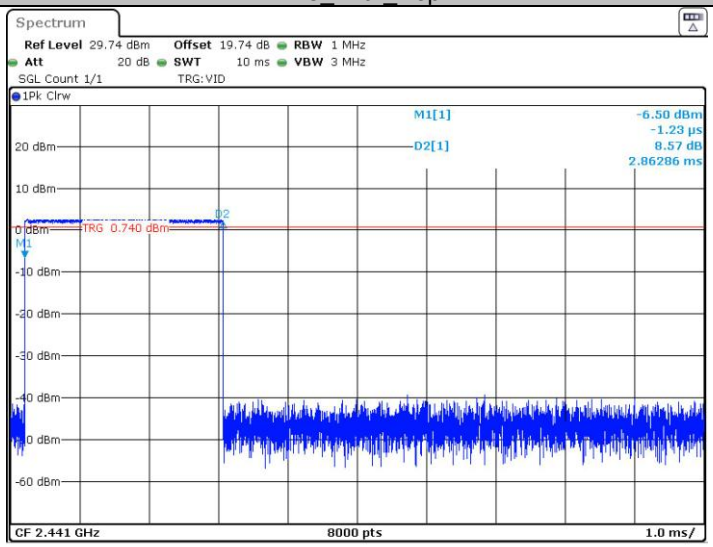
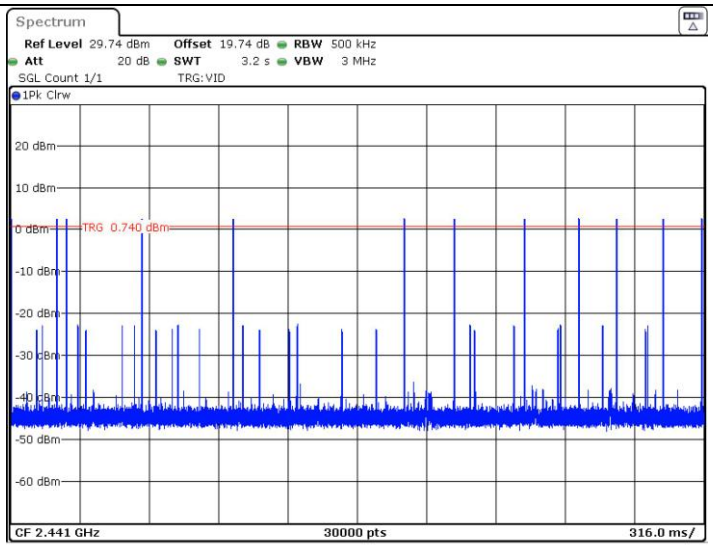
Test Graphs

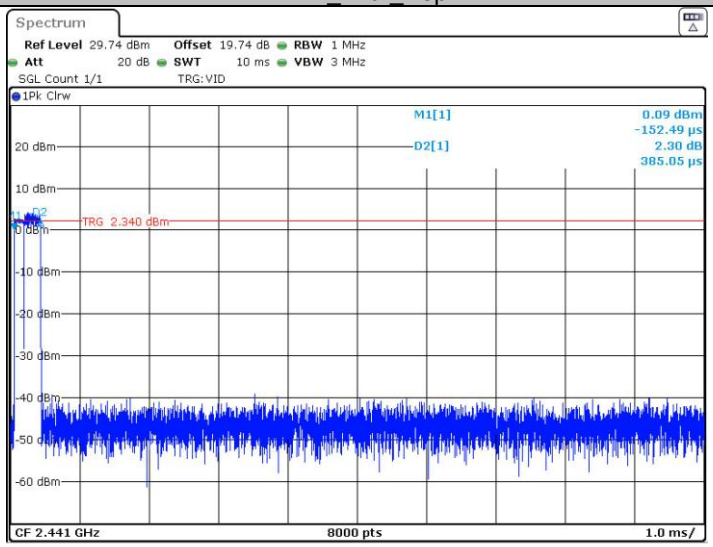
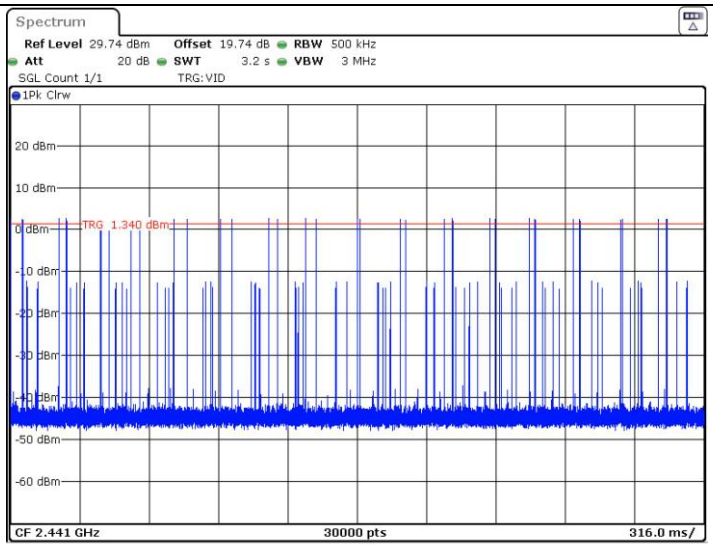
DH1_Ant1_Hop

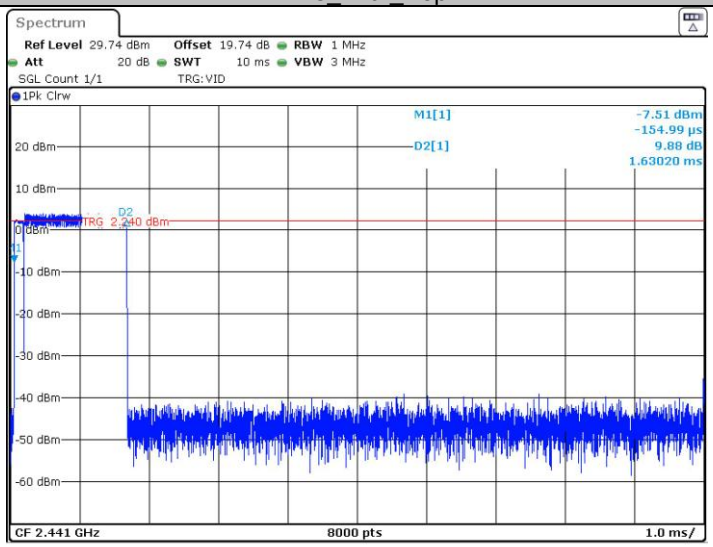
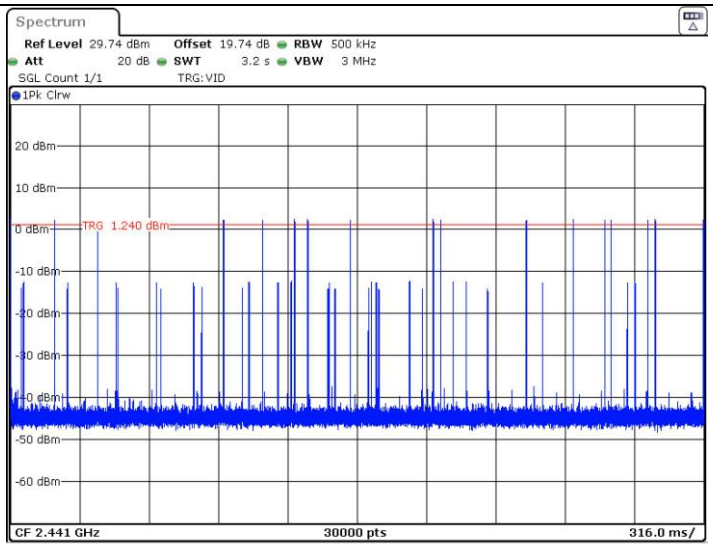


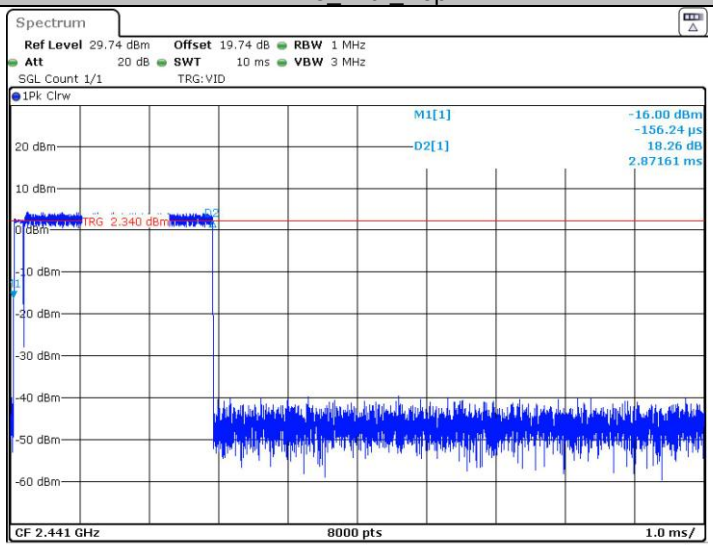
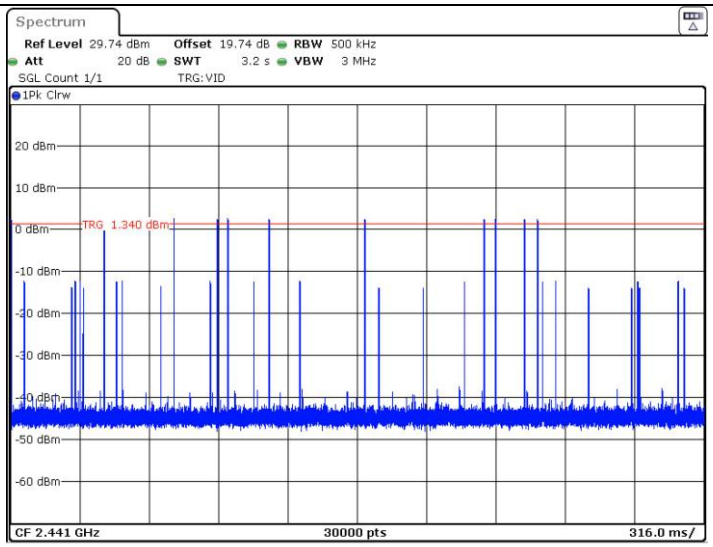


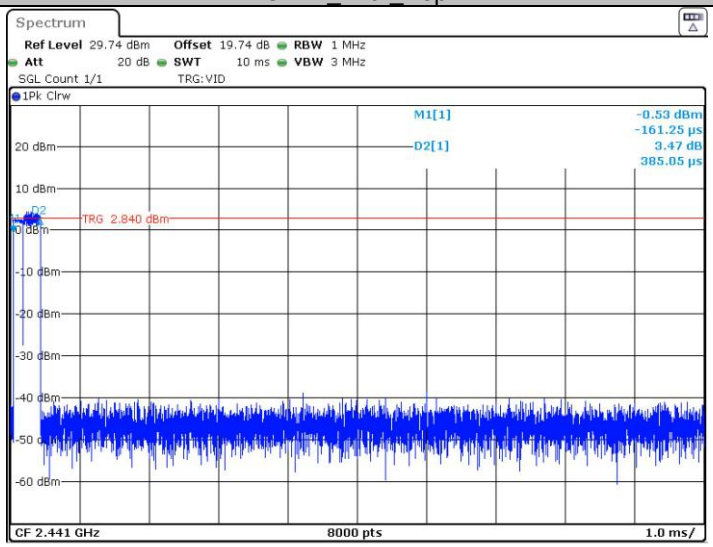
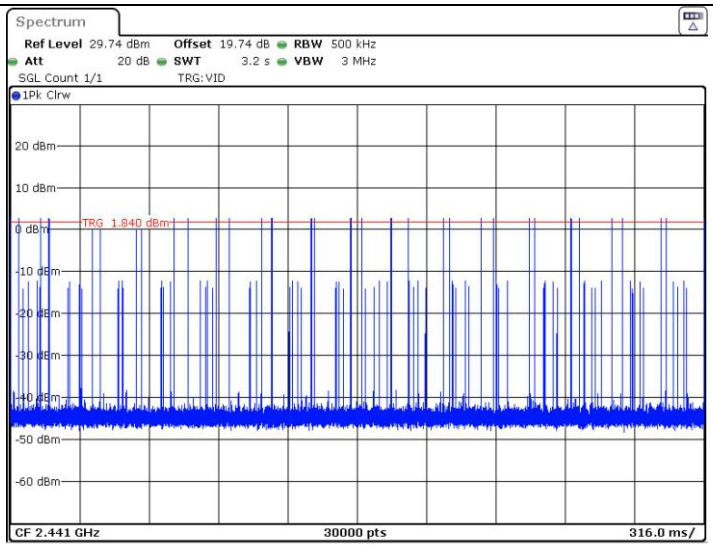
DH3_Ant1_Hop
 Spectrum Ref Level 29.74 dBm Offset 19.74 dB RBW 1 MHz Att 20 dB SWT 10 ms VBW 3 MHz SGL Count 1/1 TRG:VID 1Pk Clrw M1[1] -17.15 dBm -1.23 µs D2[1] 19.20 dB 1.62270 ms 20 dBm 10 dBm D2 0 dBm TRG 0.540 dBm -10 dBm M1 -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm CF 2.441 GHz 8000 pts 1.0 ms/ Date: 12.APR.2023 01:20:06
 Spectrum Ref Level 29.74 dBm Offset 19.74 dB RBW 500 kHz Att 20 dB SWT 3.2 s VBW 3 MHz SGL Count 1/1 TRG:VID 1Pk Clrw 20 dBm 10 dBm 0 dBm TRG 0.540 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm CF 2.441 GHz 30000 pts 316.0 ms/ Date: 12.APR.2023 01:20:11

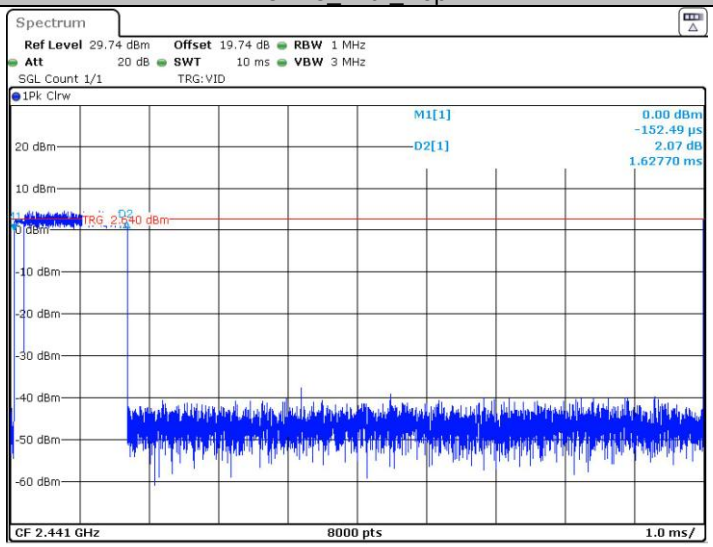
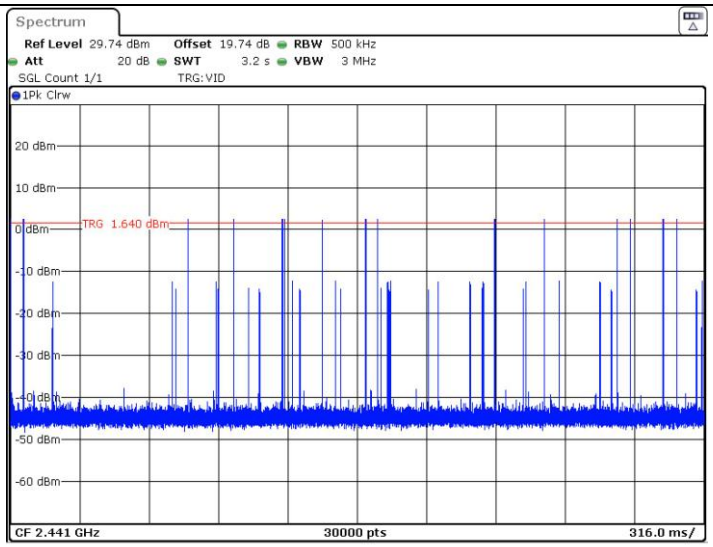
DH5_Ant1_Hop
 Spectrum Ref Level 29.74 dBm Offset 19.74 dB RBW 1 MHz Att 20 dB SWT 10 ms VBW 3 MHz SGL Count 1/1 TRG:VID 1Pk Clrw M1[1] -6.50 dBm -1.23 µs D2[1] 8.57 dB 2.86286 ms 20 dBm 10 dBm 0 dBm TRG 0.740 dBm D2 M1 -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm CF 2.441 GHz 8000 pts 1.0 ms/ Date: 12.APR.2023 01:21:24
 Spectrum Ref Level 29.74 dBm Offset 19.74 dB RBW 500 kHz Att 20 dB SWT 3.2 s VBW 3 MHz SGL Count 1/1 TRG:VID 1Pk Clrw 20 dBm 10 dBm 0 dBm TRG 0.740 dBm -10 dBm -20 dBm -30 dBm -40 dBm -50 dBm -60 dBm CF 2.441 GHz 30000 pts 316.0 ms/ Date: 12.APR.2023 01:21:30

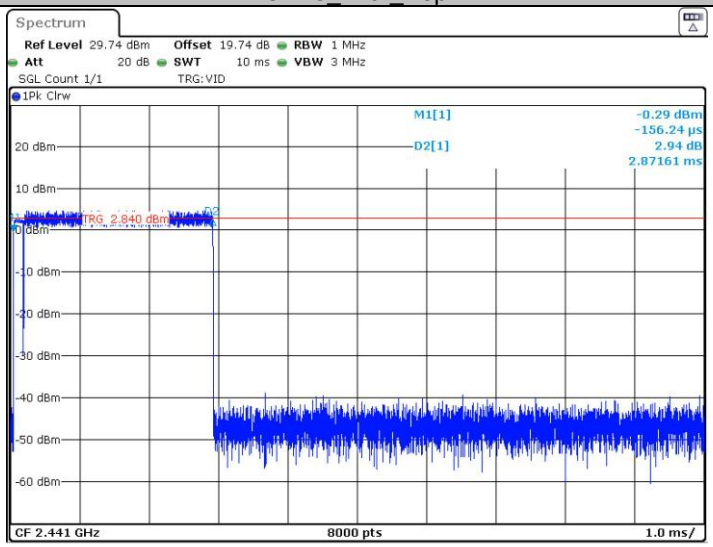
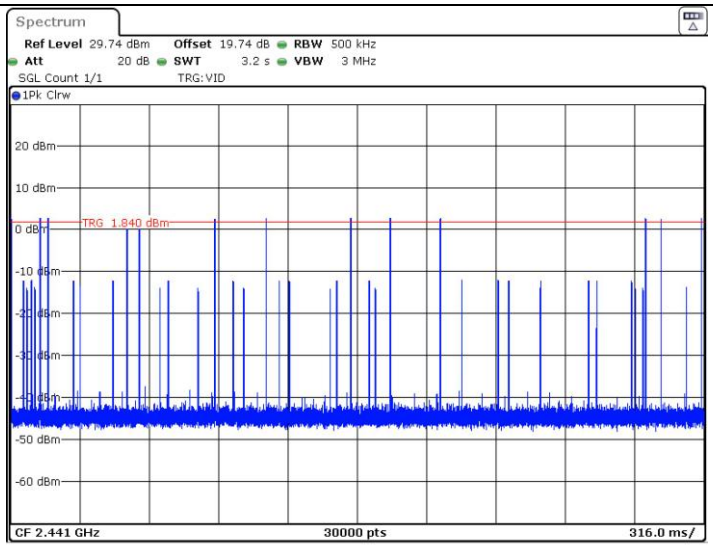
2DH1_Ant1_Hop



2DH3_Ant1_Hop



2DH5_Ant1_Hop



3DH1_Ant1_Hop



3DH3_Ant1_Hop



3DH5_Ant1_Hop



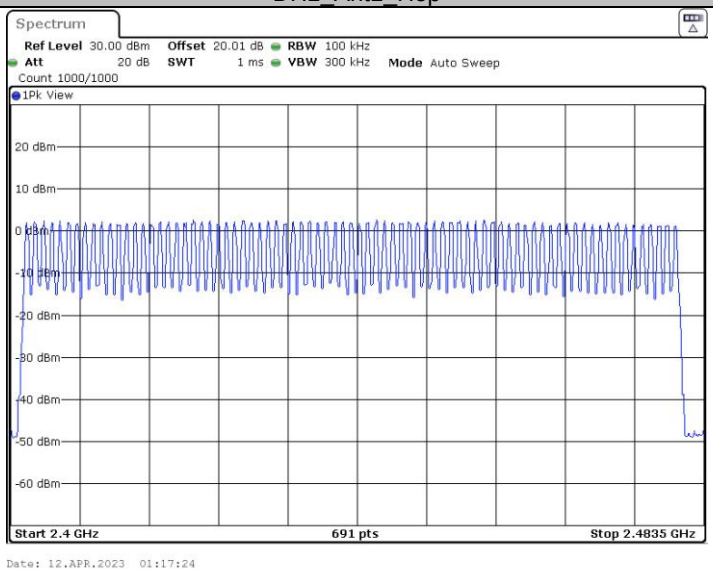
Appendix F: Number of hopping channels

Test Result

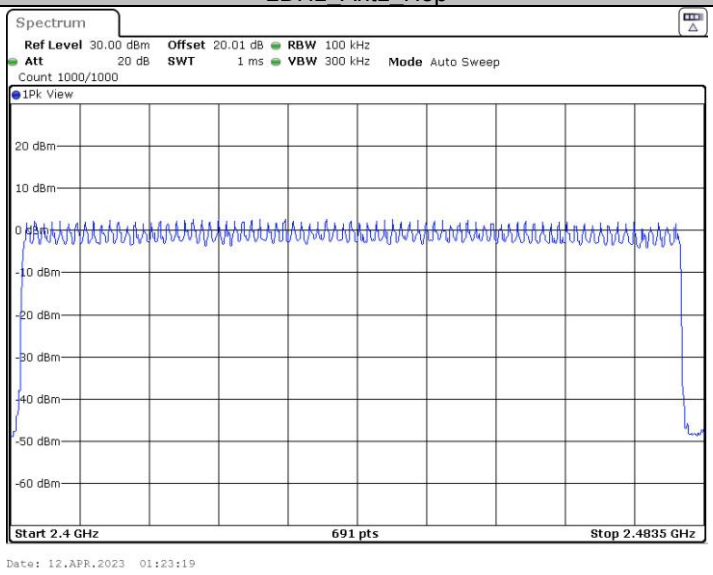
Test Mode	Antenna	Frequency[MHz]	Result[Num]	Limit[Num]	Verdict
DH1	Ant1	Hop	79	≥15	PASS
2DH1	Ant1	Hop	79	≥15	PASS
3DH1	Ant1	Hop	79	≥15	PASS

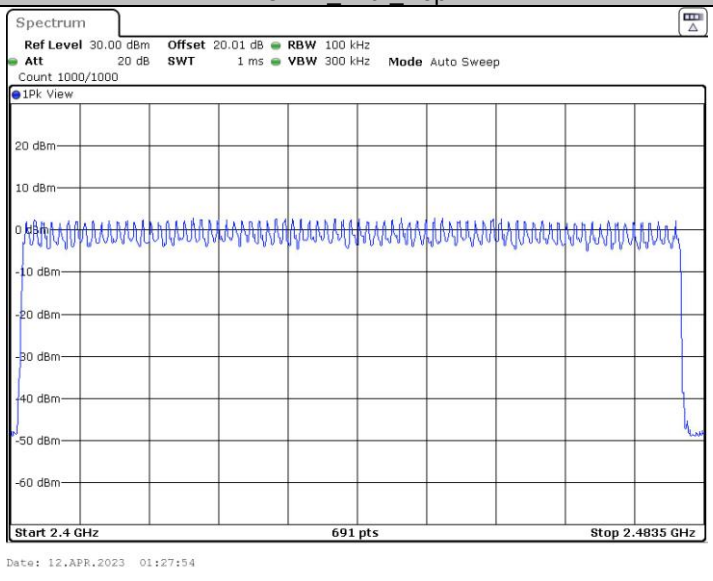
Test Graphs

DH1_Ant1_Hop



2DH1_Ant1_Hop

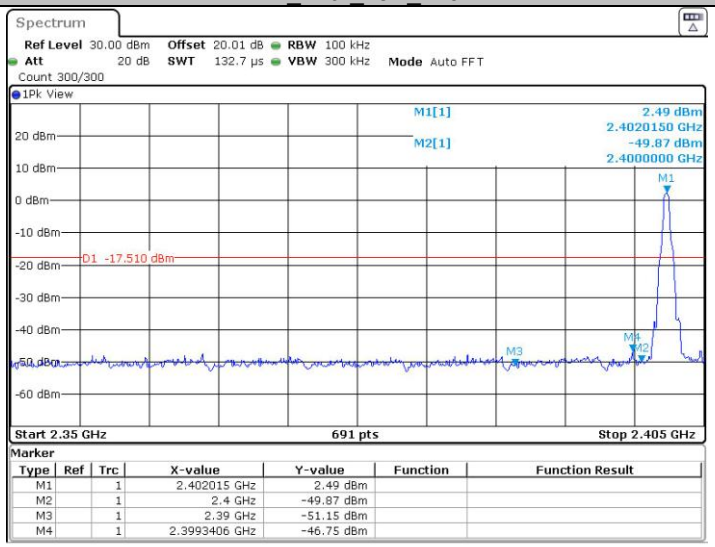


3DH1_Ant1_Hop


Appendix G: Band edge measurements

Test Graphs

DH1_Ant1_Low_2402

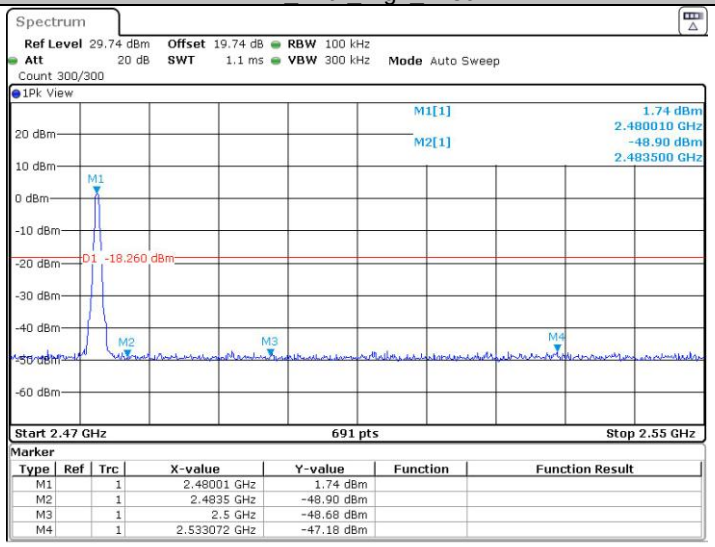


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402015 GHz	2.49 dBm		
M2		1	2.4 GHz	-49.87 dBm		
M3		1	2.39 GHz	-51.15 dBm		
M4		1	2.3993406 GHz	-46.75 dBm		

Date: 12.APR.2023 01:01:36

DH1_Ant1_High_2480

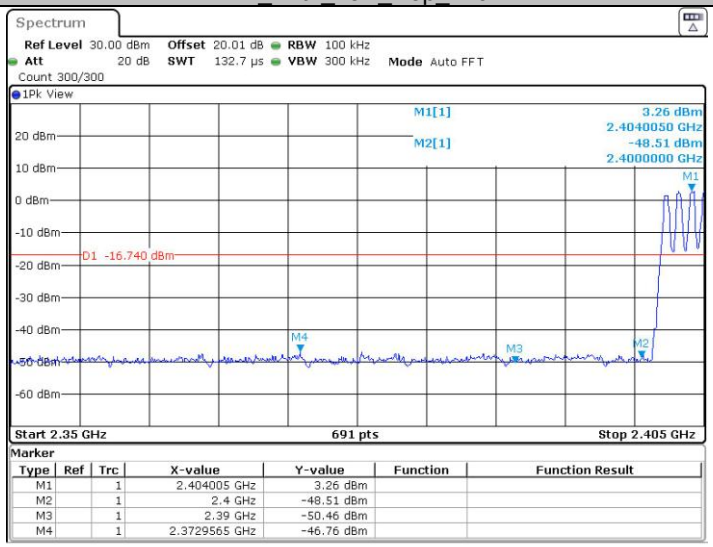


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48001 GHz	1.74 dBm		
M2		1	2.4835 GHz	-48.90 dBm		
M3		1	2.5 GHz	-48.68 dBm		
M4		1	2.533072 GHz	-47.18 dBm		

Date: 12.APR.2023 01:03:56

DH1_Ant1_Low_Hop_2402

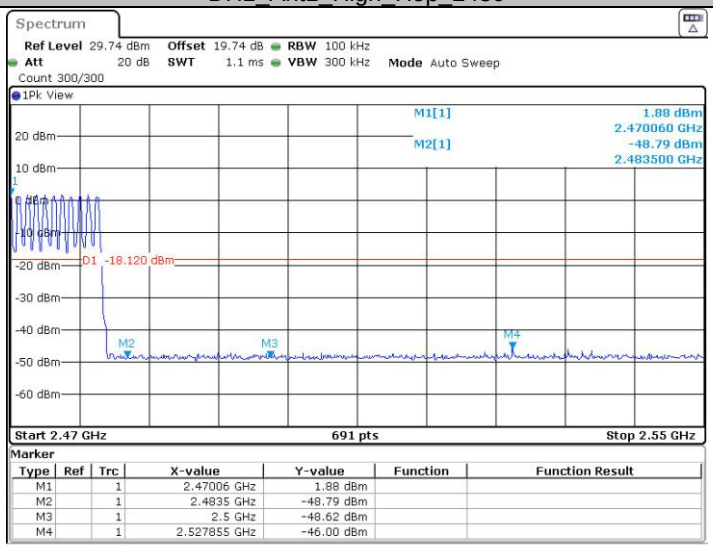


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.404005 GHz	3.26 dBm		
M2		1	2.4 GHz	-48.51 dBm		
M3		1	2.39 GHz	-50.46 dBm		
M4		1	2.3729565 GHz	-46.76 dBm		

Date: 12.APR.2023 01:16:37

DH1_Ant1_High_Hop_2480

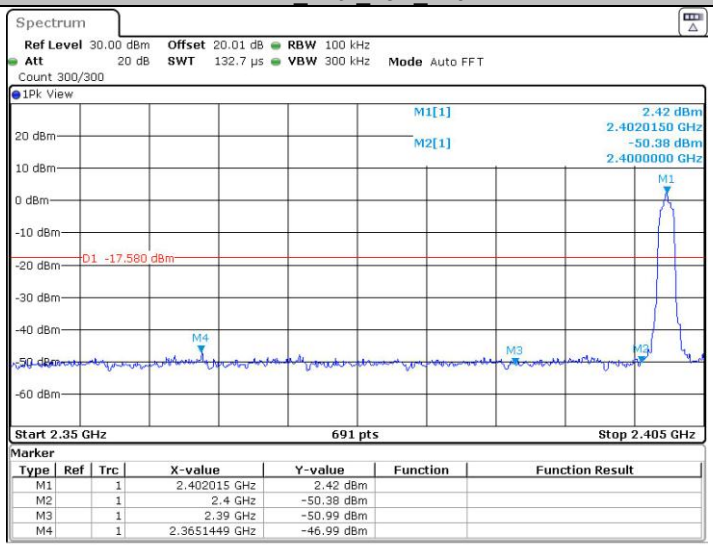


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47006 GHz	1.88 dBm		
M2		1	2.4835 GHz	-48.79 dBm		
M3		1	2.5 GHz	-48.62 dBm		
M4		1	2.527855 GHz	-46.00 dBm		

Date: 12.APR.2023 01:18:42

2DH1_Ant1_Low_2402

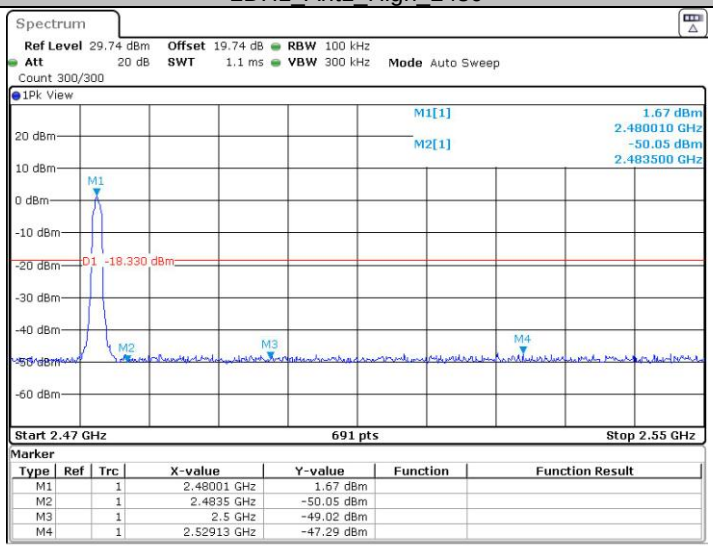


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402015 GHz	2.42 dBm		
M2		1	2.4 GHz	-50.38 dBm		
M3		1	2.39 GHz	-50.99 dBm		
M4		1	2.3651449 GHz	-46.99 dBm		

Date: 12.APR.2023 01:07:26

2DH1_Ant1_High_2480

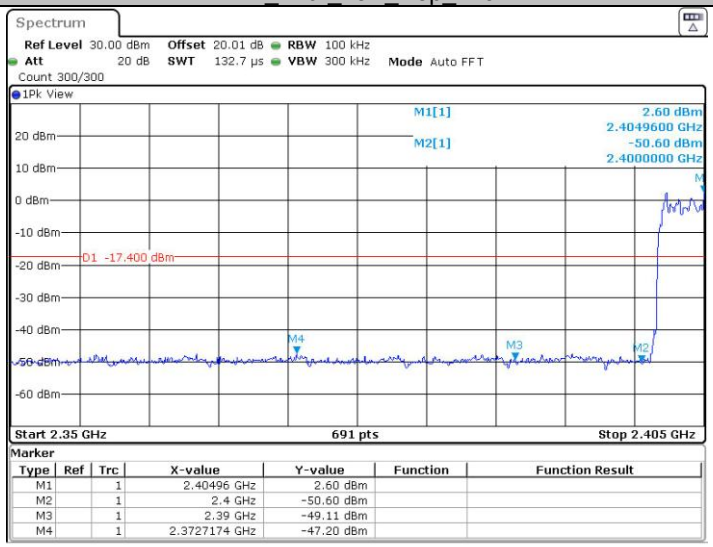


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48001 GHz	1.67 dBm		
M2		1	2.4835 GHz	-50.05 dBm		
M3		1	2.5 GHz	-49.02 dBm		
M4		1	2.52913 GHz	-47.29 dBm		

Date: 12.APR.2023 01:09:22

2DH1_Ant1_Low_Hop_2402

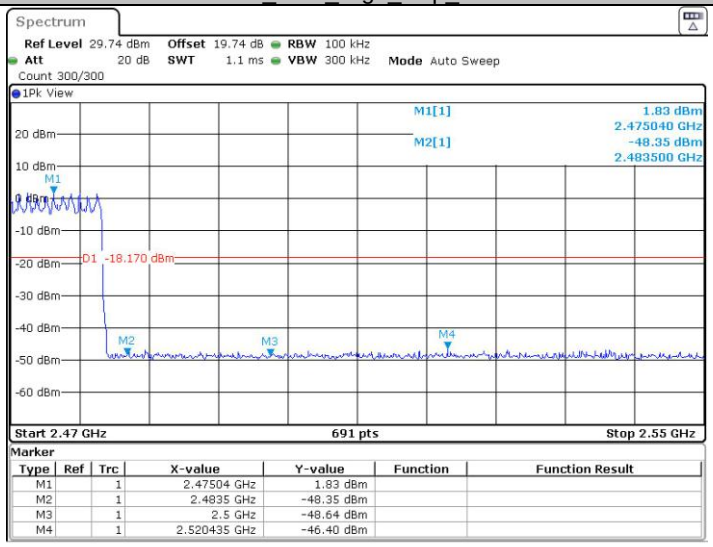


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40496 GHz	2.60 dBm		
M2		1	2.4 GHz	-50.60 dBm		
M3		1	2.39 GHz	-49.11 dBm		
M4		1	2.3727174 GHz	-47.20 dBm		

Date: 12.APR.2023 01:22:28

2DH1_Ant1_High_Hop_2480

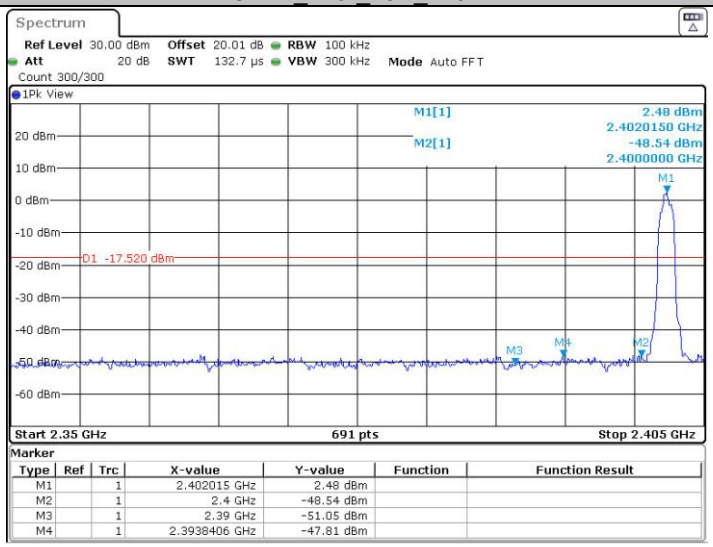


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47504 GHz	1.83 dBm		
M2		1	2.4835 GHz	-48.35 dBm		
M3		1	2.5 GHz	-48.64 dBm		
M4		1	2.520435 GHz	-46.40 dBm		

Date: 12.APR.2023 01:24:06

3DH1_Ant1_Low_2402

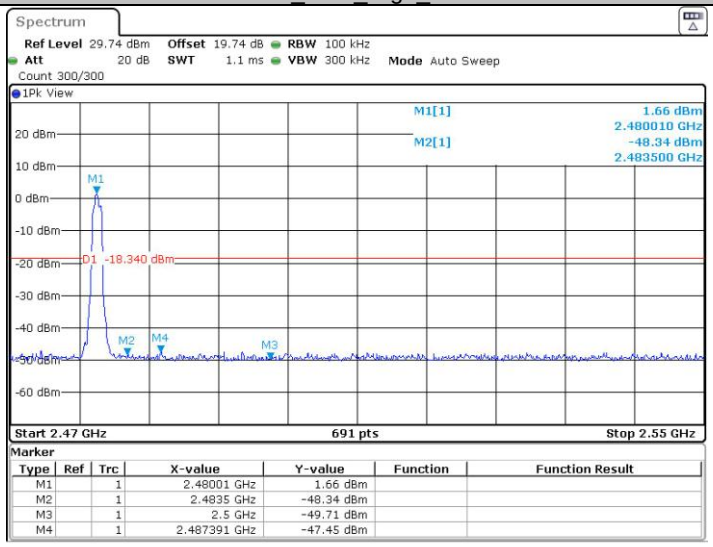


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402015 GHz	2.48 dBm		
M2		1	2.4 GHz	-48.54 dBm		
M3		1	2.39 GHz	-51.05 dBm		
M4		1	2.3938406 GHz	-47.81 dBm		

Date: 12.APR.2023 01:10:30

3DH1_Ant1_High_2480

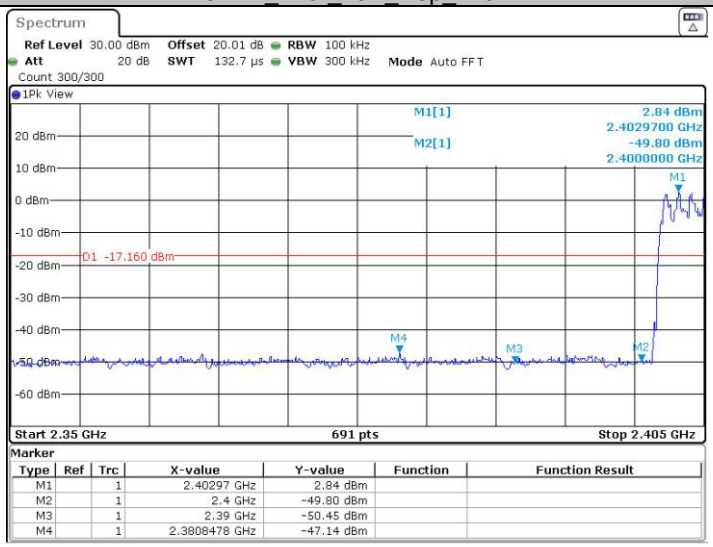


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.48001 GHz	1.66 dBm		
M2		1	2.4835 GHz	-48.34 dBm		
M3		1	2.5 GHz	-49.71 dBm		
M4		1	2.487391 GHz	-47.45 dBm		

Date: 12.APR.2023 01:15:02

3DH1_Ant1_Low_Hop_2402

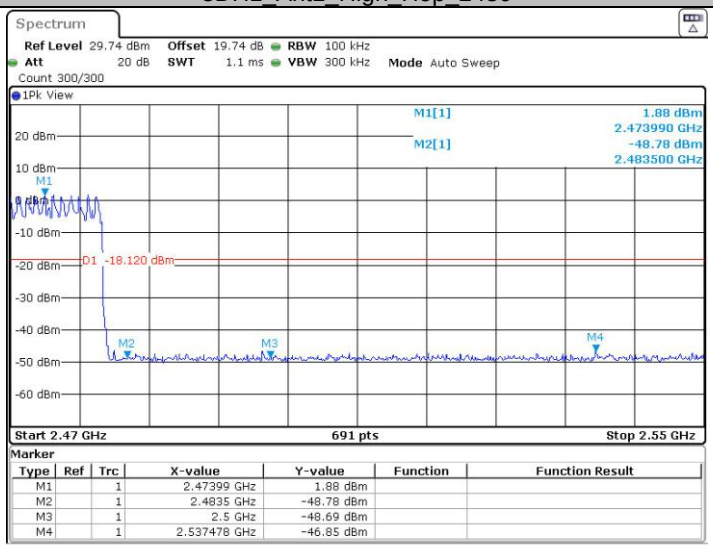


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40297 GHz	2.84 dBm		
M2		1	2.4 GHz	-49.80 dBm		
M3		1	2.39 GHz	-50.45 dBm		
M4		1	2.3808478 GHz	-47.14 dBm		

Date: 12.APR.2023 01:26:59

3DH1_Ant1_High_Hop_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47399 GHz	1.88 dBm		
M2		1	2.4835 GHz	-48.78 dBm		
M3		1	2.5 GHz	-48.69 dBm		
M4		1	2.537478 GHz	-46.85 dBm		

Date: 12.APR.2023 01:28:38

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