ACCREDITED
TESTING LABORATORY
CERTIFICATE # 4821.01

BACL
Bay Area Compliance Labs Corp.

FCC PART 15.247
TEST REPORT

For

Nexvoo, Inc

1702 W Michigan St Indianapolis, IN 46222 USA

FCC ID: 2AW2G-N380

Report Type:	**Product Type:**
Original Report	NexFone N380

Report Number: RXM200909058-00B

Report Date: 2020-10-28

Reviewed By: Jimmy Xiao RF Engineer

Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen)
6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China
Tel: +86-755-33320018
Fax: +86-755-33320008
www.baclcorp.com.cn

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

BACL 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.

This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

GENERAL INFORMATION **4**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 4
OBJECTIVE 4
TEST METHODOLOGY 4
MEASUREMENT UNCERTAINTY 5
TEST FACILITY 5
SYSTEM TEST CONFIGURATION **6**
DESCRIPTION OF TEST CONFIGURATION 6
EUT EXERCISE SOFTWARE 6
SPECIAL ACCESSORIES 6
EQUIPMENT MODIFICATIONS 6
SUPPORT EQUIPMENT LIST AND DETAILS 6
EXTERNAL I/O CABLE 6
BLOCK DIAGRAM OF TEST SETUP 7
SUMMARY OF TEST RESULTS **8**
TEST EQUIPMENT LIST **9**
FCC §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE) **10**
APPLICABLE STANDARD 10
RESULT 10
FCC §15.203 – ANTENNA REQUIREMENT **11**
APPLICABLE STANDARD 11
ANTENNA CONNECTOR CONSTRUCTION 11
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS **12**
APPLICABLE STANDARD 12
EUT SETUP 12
EMI TEST RECEIVER SETUP 12
TEST PROCEDURE 12
CORRECTED FACTOR & MARGIN CALCULATION 13
TEST DATA 13
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS **18**
APPLICABLE STANDARD 18
EUT SETUP 18
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP 19
TEST PROCEDURE 19
CORRECTED AMPLITUDE & MARGIN CALCULATION 19
TEST DATA 19
FCC §15.247(a) (1)-CHANNEL SEPARATION TEST **27**
APPLICABLE STANDARD 27
TEST PROCEDURE 27
TEST DATA 27
FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH **28**
APPLICABLE STANDARD 28
TEST PROCEDURE 28
TEST DATA 28

FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST 29
APPLICABLE STANDARD 29
TEST PROCEDURE 29
TEST DATA 29
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME) 30
APPLICABLE STANDARD 30
TEST PROCEDURE 30
TEST DATA 30
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT 31
APPLICABLE STANDARD 31
TEST PROCEDURE 31
TEST DATA 31
FCC §15.247(d) - BAND EDGES TESTING 32
APPLICABLE STANDARD 32
TEST PROCEDURE 32
TEST DATA 32
APPENDIX 33
APPENDIXA: 20DBEMISSION BANDWIDTH 33
APPENDIXC: MAXIMUM CONDUCTED PEAK OUTPUT POWER 37
APPENDIXD: CARRIER FREQUENCY SEPARATION 41
APPENDIXE: TIME OF OCCUPANCY 43
APPENDIXF: NUMBER OF HOPPING CHANNELS 50
APPENDIXG:BAND EDGE MEASUREMENTS 52

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	NexFone N380
Tested Model	NexFone N380
Frequency Range	Bluetooth: 2402~2480MHz
Maximum conducted Peak output power	Bluetooth:10.45dBm
Modulation Technique	Bluetooth: GFSK, π/4-DQPSK, 8DPSK
Antenna Specification	FPC Antenna: 0dBi
Voltage Range	DC 5.0V from Adpter or DC 48V from POE
Date of Test	2020-10-07 to 2020-10-25
Sample number	RXM200909058-RF-S1(Assigned by BACL, Shenzhen)
Received date	2020-09-09
Sample/EUT Status	Good condition
Adapter information	Model: MX15Z-0502000VX Input: AC 100-240V, 50/60Hz, 0.4A Output: DC 5.0V, 2.0A

Objective

This test report is in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 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.

For Radiated Emissions testing, please refer to DA 00-705 Released March 30, 2000, Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.73dB
RF conducted test with spectrum		±1.6dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
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 Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, 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.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

EUT Exercise Software

"QRCT" software was use to the EUT tested and power level is 9.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	Latitude E5430	11429208685
Unknown	Earphone	Unknown	Earphone
Unknown	Headset	Unknown	Headset
SHENZHEN GOSPELL DIGITAL TECHNOLOGY CO.,LTD.	POE	G0720-480-050	N/A
Kingston	USB Disk	DTSE9G2 64G	DTSE9G2
HIKVISION	Router	DS-3WR03-E	10021642429

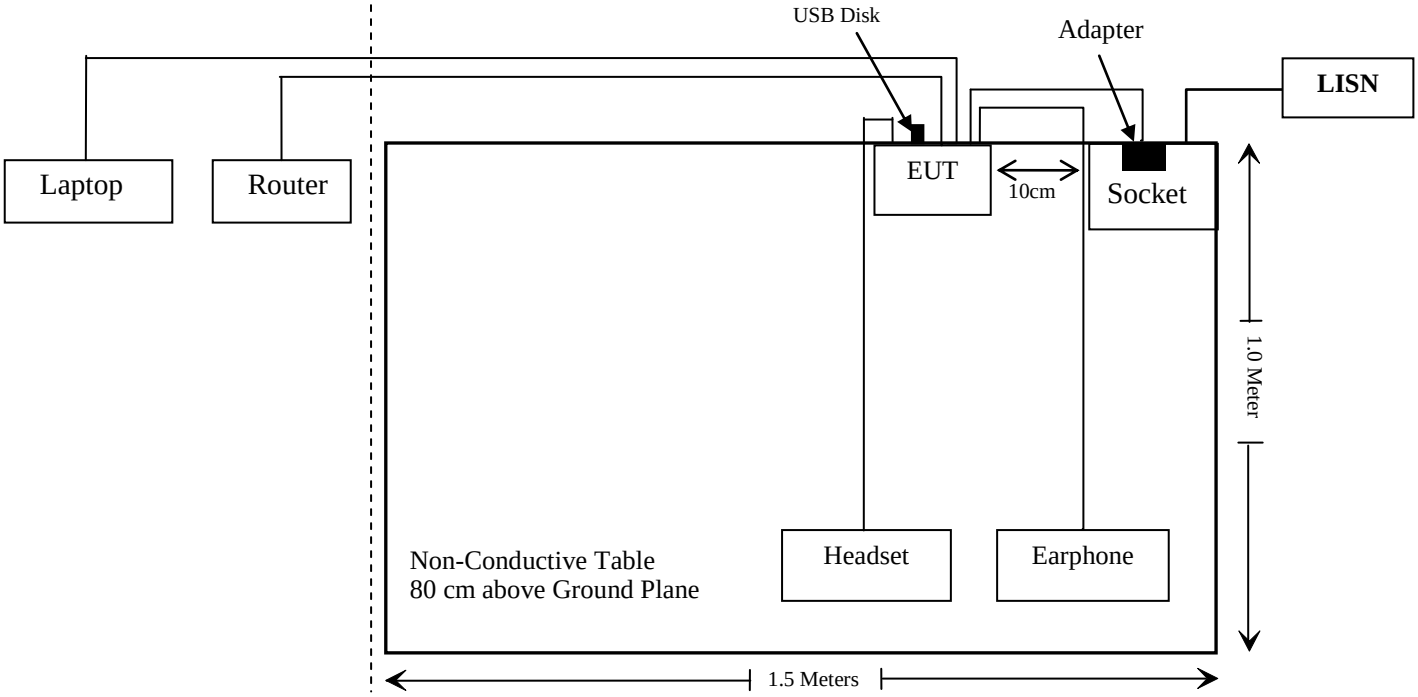
External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-shielding Un-Detachable AC Cable	1.0	Socket	LISN
Un-shielding Un-Detachable DC Cable	2.5	Adapter	EUT
Un-Shielding Detachable RJ45 Cable	10.0	EUT	Laptop
Un-Shielding Detachable RJ45 Cable	10.0	EUT	Router
Un-Shielding Detachable RJ45 Cable	1.0	EUT	POE
Un-shielding Detachable AC Cable	1.2	POE	LISN

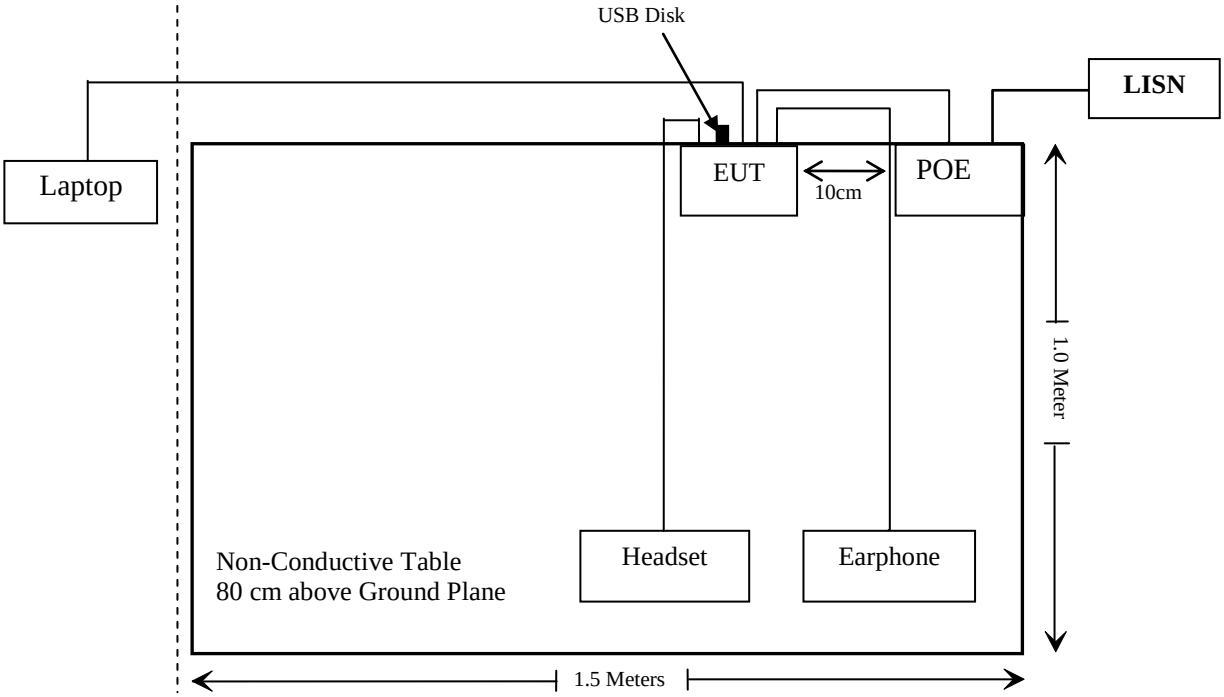
Block Diagram of Test Setup

For conducted emission:

1. Powered by adapter:



2. Powered by POE:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1091	Maximum Permissible Exposure(MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliance
§15.247(a)(1)	20 dB Emission Bandwidth	Compliance
§15.247(a)(1)	Channel Separation Test	Compliance
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliance
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliance
§15.247(b)(1)	Peak Output Power Measurement	Compliance
§15.247(d)	Band edges	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2020/08/04	2021/08/03
Rohde & Schwarz	LISN	ENV216	101613	2020/08/04	2021/08/03
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2019/11/29	2020/11/28
Unknow	CE Cable	CE Cable	UF A210B-1-0720-504504	2019/11/29	2020/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
Radiated Emission Test					
R&S	EMI Test Receiver	ESR3	102455	2020/08/04	2021/08/03
Sonoma instrument	Pre-amplifier	310 N	186238	2020/08/04	2021/08/03
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
Unknow	Cable 2	RF Cable 2	F-03-EM197	2019/11/29	2020/11/28
Unknow	Cable	Chamber Cable 1	F-03-EM236	2019/11/29	2020/11/28
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
Rohde & Schwarz	Spectrum Analyzer	FSV40-N	102259	2020/08/04	2021/08/03
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Quinstar	Amplifier	QLW-18405536-J0	15964001002	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unknow	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28
SNSD	Band Reject filter	BSF2402-2480MN-0898-001	2.4G filter	2020/04/20	2021/04/20
Ducommun Technolagies	Horn antenna	ARH-4223-02	1007726-02 1304	2017/12/06	2020/12/05
RF Conducted Test					
Tonscend Corporation	RF control Unit	JS0806-2	19D8060154	2020/08/04	2021/08/03
Rohde & Schwarz	Signal and Spectrum Analyzer	FSV40	101473	2020/08/04	2021/08/03
Unknow	RF Cable	Unknow	2301 276	2019/11/29	2020/11/28

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) 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) & §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.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (Minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Frequency (MHz)	Antenna Gain		Tune up conducted power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBi)	(numeric)	(dBm)	(mW)			
2402-2480	0	1	10.5	11.22	20	0.002	1

Note:
BT/BLE can’t transmit with the 2.4G Wi-Fi /5G Wi-Fi at the same time.

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

Result: Compliance

FCC §15.203 – 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.

Antenna Connector Construction

The EUT has one internal antenna arrangement, which was permanently attached and the antenna gain is 0 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

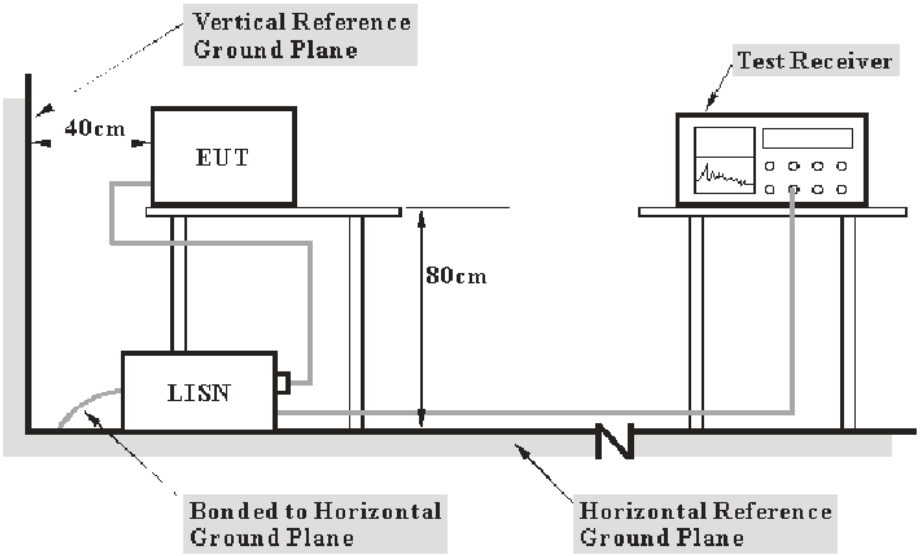
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

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.

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

During the conducted emission test, the device was connected to the outlet of the LISN.

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

Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

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

Margin = Limit – Corrected Amplitude

Test Data

Environmental Conditions

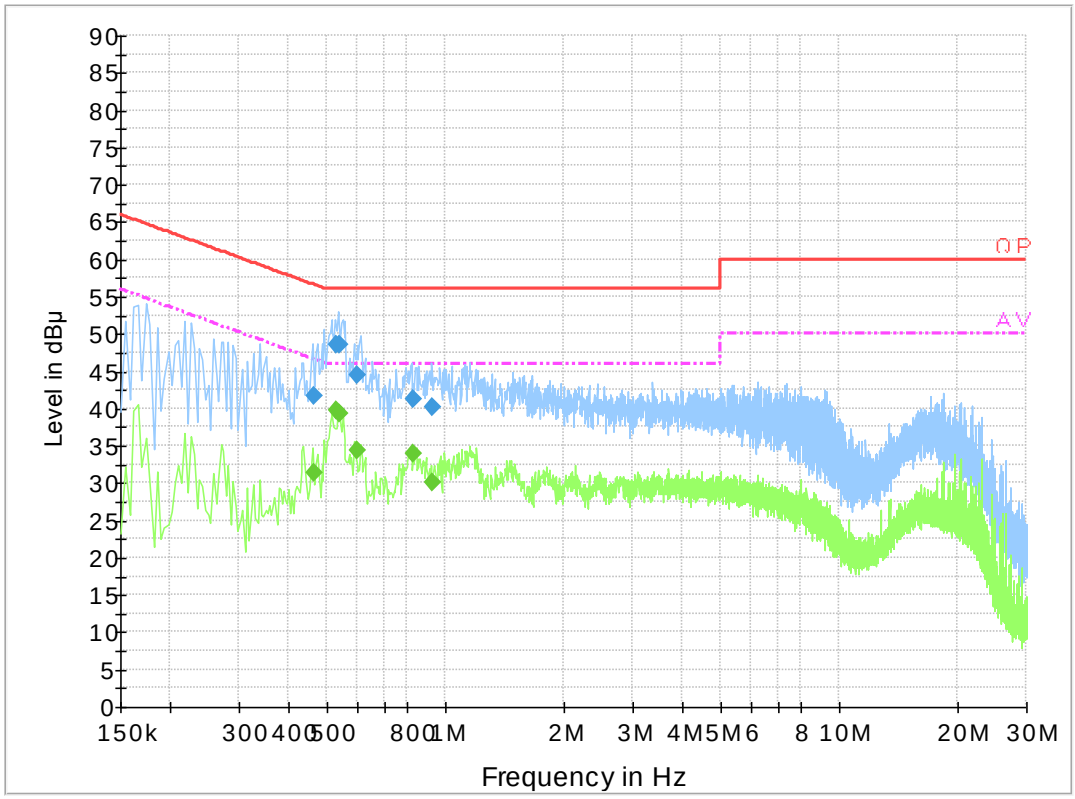
Temperature:	25 ℃
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li from 2020-10-09 to 2020-10-11.

EUT operation mode: Transmitting & charging (the worst case is 8DPSK Mode, Middle channel)

Powered by adpter:

AC 120V/60 Hz, Line



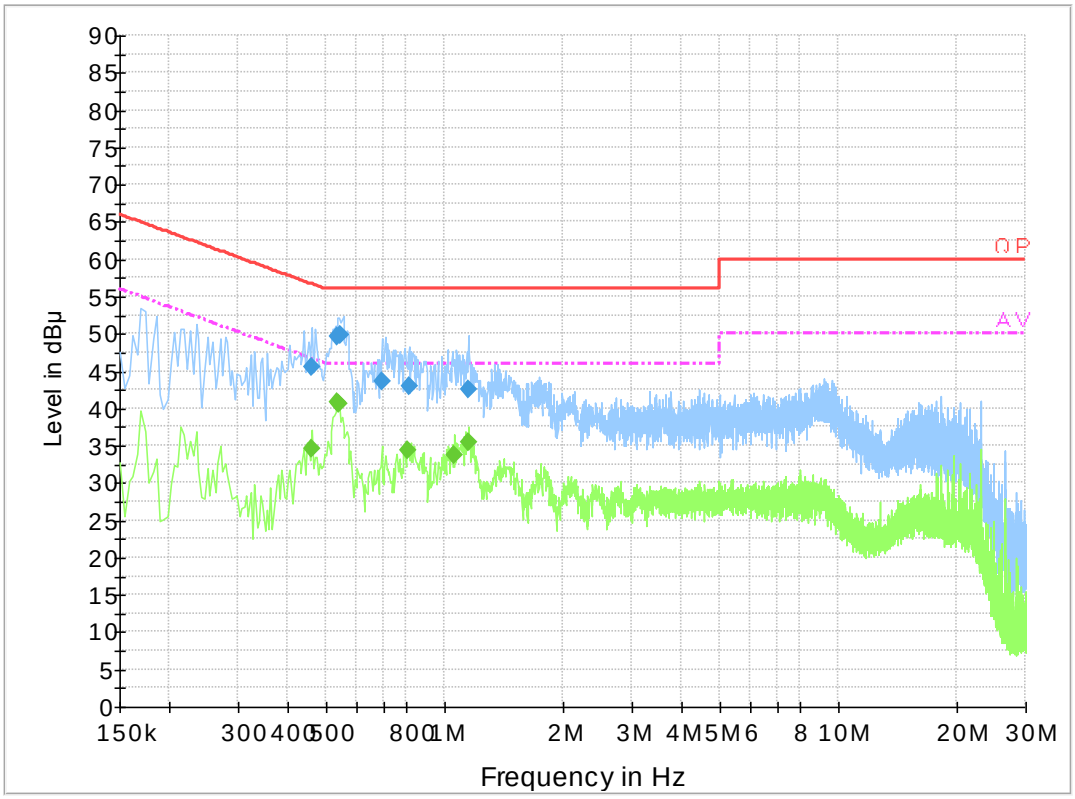
Final Result 1

Frequency (MHz)	QuasiPeak (dBµ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.466890	41.8	9.000	L1	19.8	14.8	56.6
0.529930	48.6	9.000	L1	19.8	7.4	56.0
0.541990	48.6	9.000	L1	19.8	7.4	56.0
0.600850	44.6	9.000	L1	19.8	11.4	56.0
0.833670	41.2	9.000	L1	19.8	14.8	56.0
0.928110	40.1	9.000	L1	19.8	15.9	56.0

Final Result 2

Frequency (MHz)	Average (dBµ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.466890	31.4	9.000	L1	19.8	15.2	46.6
0.529930	39.8	9.000	L1	19.8	6.2	46.0
0.541990	39.3	9.000	L1	19.8	6.7	46.0
0.600850	34.3	9.000	L1	19.8	11.7	46.0
0.833670	33.9	9.000	L1	19.8	12.1	46.0
0.928110	30.0	9.000	L1	19.8	16.0	46.0

AC 120V/60 Hz, Neutral:



Final Result 1

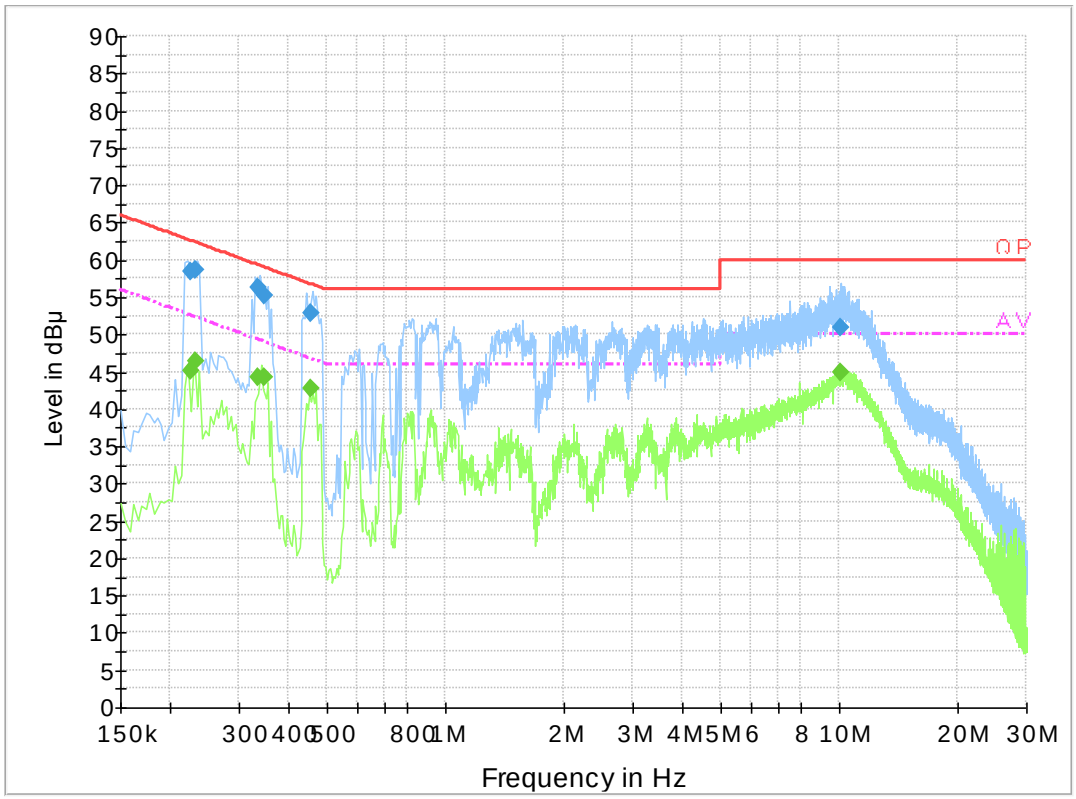
Frequency (MHz)	QuasiPeak (dBµ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.463070	45.4	9.000	N	19.8	11.2	56.6
0.537950	49.6	9.000	N	19.8	6.4	56.0
0.545690	49.9	9.000	N	19.8	6.1	56.0
0.699350	43.7	9.000	N	19.8	12.3	56.0
0.813790	43.0	9.000	N	19.8	13.0	56.0
1.152750	42.5	9.000	N	19.8	13.5	56.0

Final Result 2

Frequency (MHz)	Average (dBµ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.462000	34.6	9.000	N	19.8	12.1	46.7
0.534000	40.8	9.000	N	19.8	5.2	46.0
0.542000	40.6	9.000	N	19.8	5.4	46.0
0.806000	34.3	9.000	N	19.8	11.7	46.0
1.062000	33.6	9.000	N	19.8	12.4	46.0
1.150000	35.4	9.000	N	19.8	10.6	46.0

Powered by POE:

AC 120V/60 Hz, Line



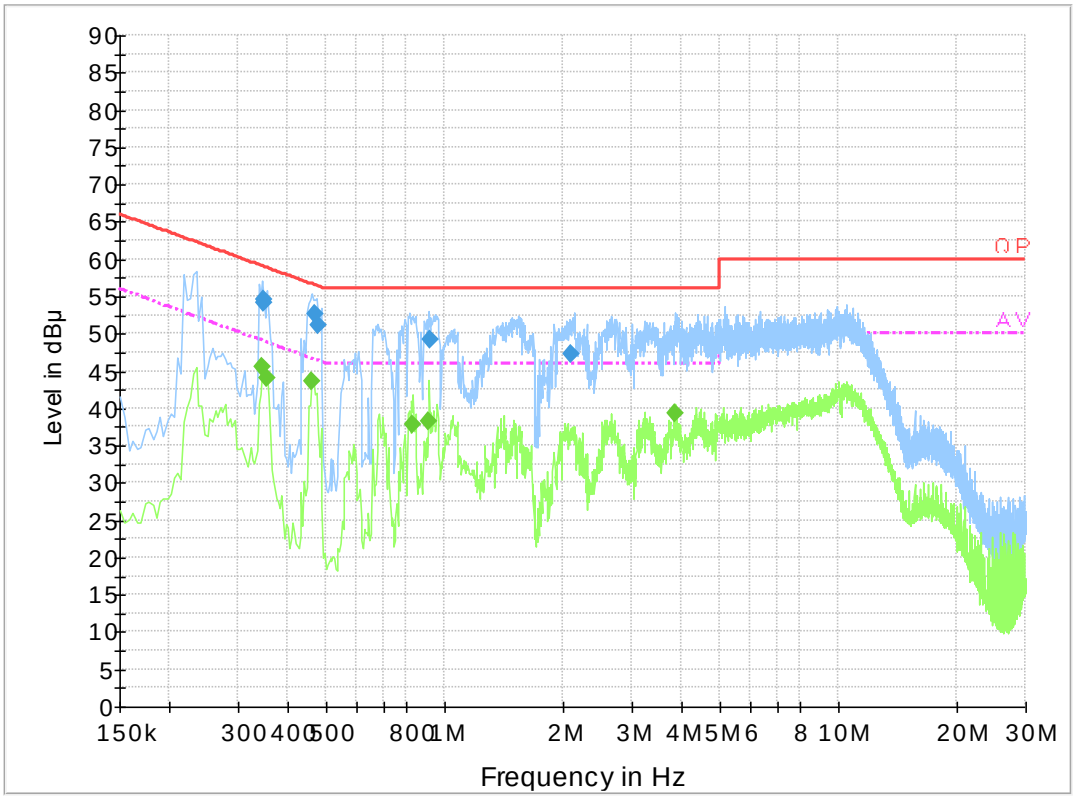
Final Result 1

Frequency (MHz)	QuasiPeak (dBµ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.226500	58.3	9.000	L1	19.8	4.3	62.6
0.233500	58.6	9.000	L1	19.8	3.7	62.3
0.336930	56.2	9.000	L1	19.8	3.1	59.3
0.348690	55.3	9.000	L1	19.9	3.7	59.0
0.455070	52.9	9.000	L1	19.8	3.9	56.8
10.118290	50.8	9.000	L1	20.0	9.2	60.0

Final Result 2

Frequency (MHz)	Average (dBµ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.226500	45.0	9.000	L1	19.8	7.6	52.6
0.233500	46.4	9.000	L1	19.8	5.9	52.3
0.336930	44.3	9.000	L1	19.8	5.0	49.3
0.348690	44.2	9.000	L1	19.9	4.8	49.0
0.455070	42.8	9.000	L1	19.8	4.0	46.8
10.118290	44.8	9.000	L1	20.0	5.2	50.0

AC 120V/60 Hz, Neutral:



Final Result 1

Frequency (MHz)	QuasiPeak (dBµ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.348690	54.5	9.000	N	19.9	4.5	59.0
0.348810	54.2	9.000	N	19.9	4.8	59.0
0.468930	52.6	9.000	N	19.8	3.9	56.5
0.478710	51.1	9.000	N	19.8	5.3	56.4
0.924290	49.2	9.000	N	19.8	6.8	56.0
2.109930	47.1	9.000	N	19.9	8.9	56.0

Final Result 2

Frequency (MHz)	Average (dBµ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµ V)
0.346000	45.6	9.000	N	19.8	3.5	49.1
0.354000	44.1	9.000	N	19.9	4.8	48.9
0.462000	43.5	9.000	N	19.8	3.2	46.7
0.834000	37.7	9.000	N	19.8	8.3	46.0
0.914000	38.2	9.000	N	19.7	7.8	46.0
3.850000	39.4	9.000	N	19.9	6.6	46.0

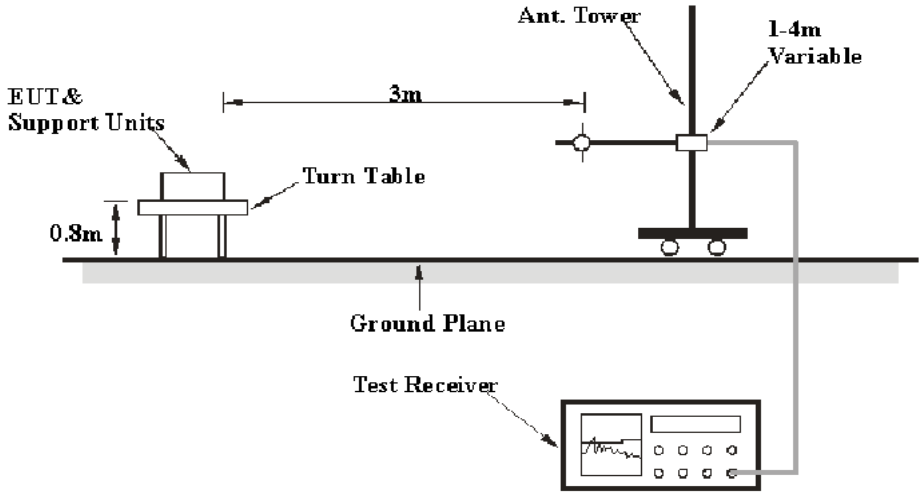
FCC §15.205, §15.209 & §15.247(d) – RADIATED EMISSIONS

Applicable Standard

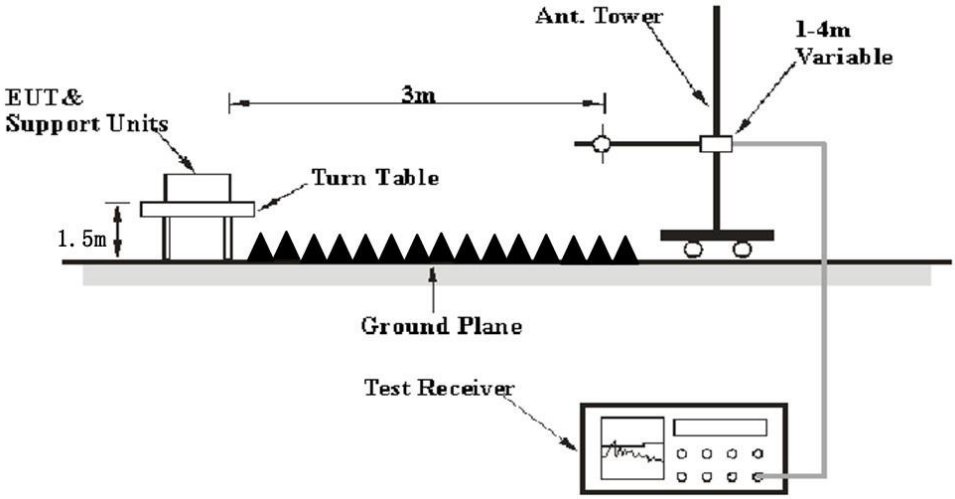
FCC §15.205; §15.209; §15.247(d)

EUT Setup

Below 1 GHz:



Above 1GHz:



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

EMI Test Receiver & Spectrum Analyzer Setup

During the radiated emission test, according to the DA 00-705 Released March 30, 2000, 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.

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

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

Margin = Limit – Corrected Amplitude

Test Data

Environmental Conditions

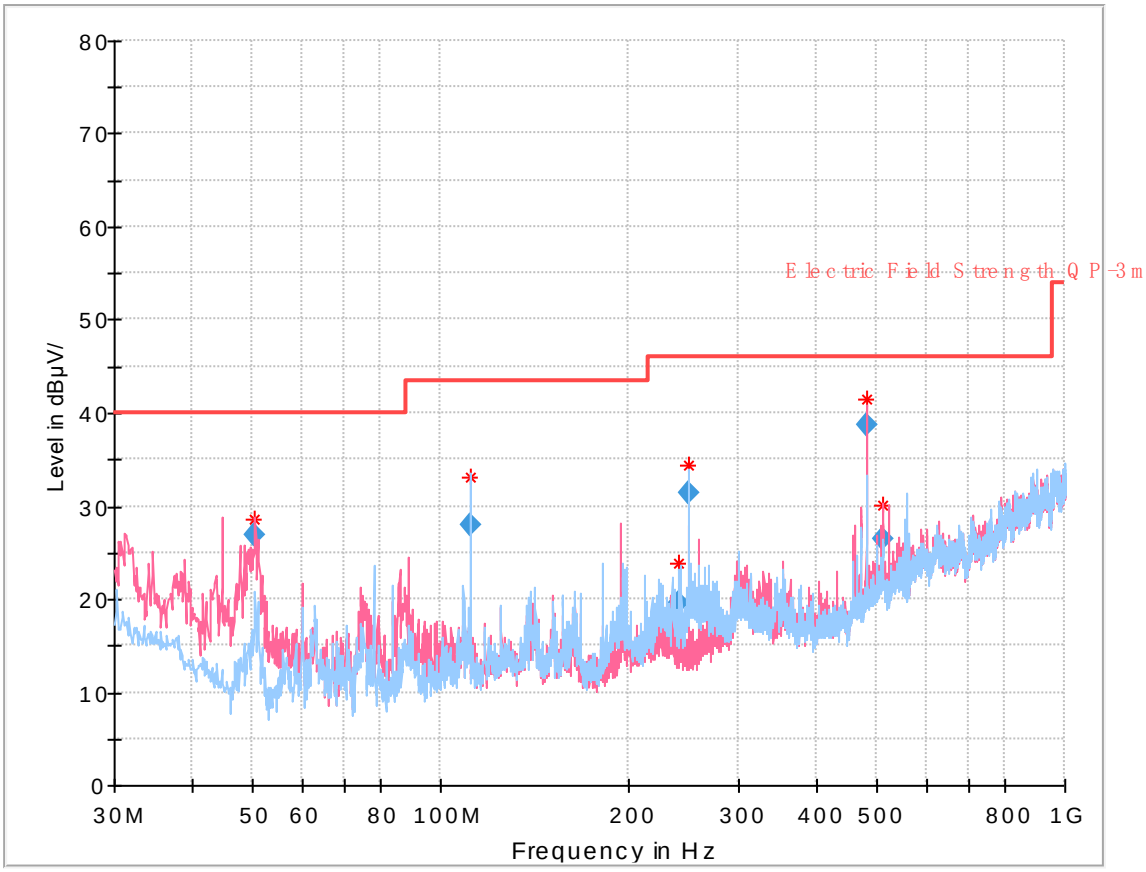
Temperature:	28.1~29 ℃
Relative Humidity:	48~56 %
ATM Pressure:	101.0 kPa

The testing was performed by Holland Yang on 2020-10-07 for below 1GHz and Leven Gan on 2020-10-07 for above 1GHz.

EUT operation mode: Transmitting

Powered by POE:

30 MHz~1 GHz:

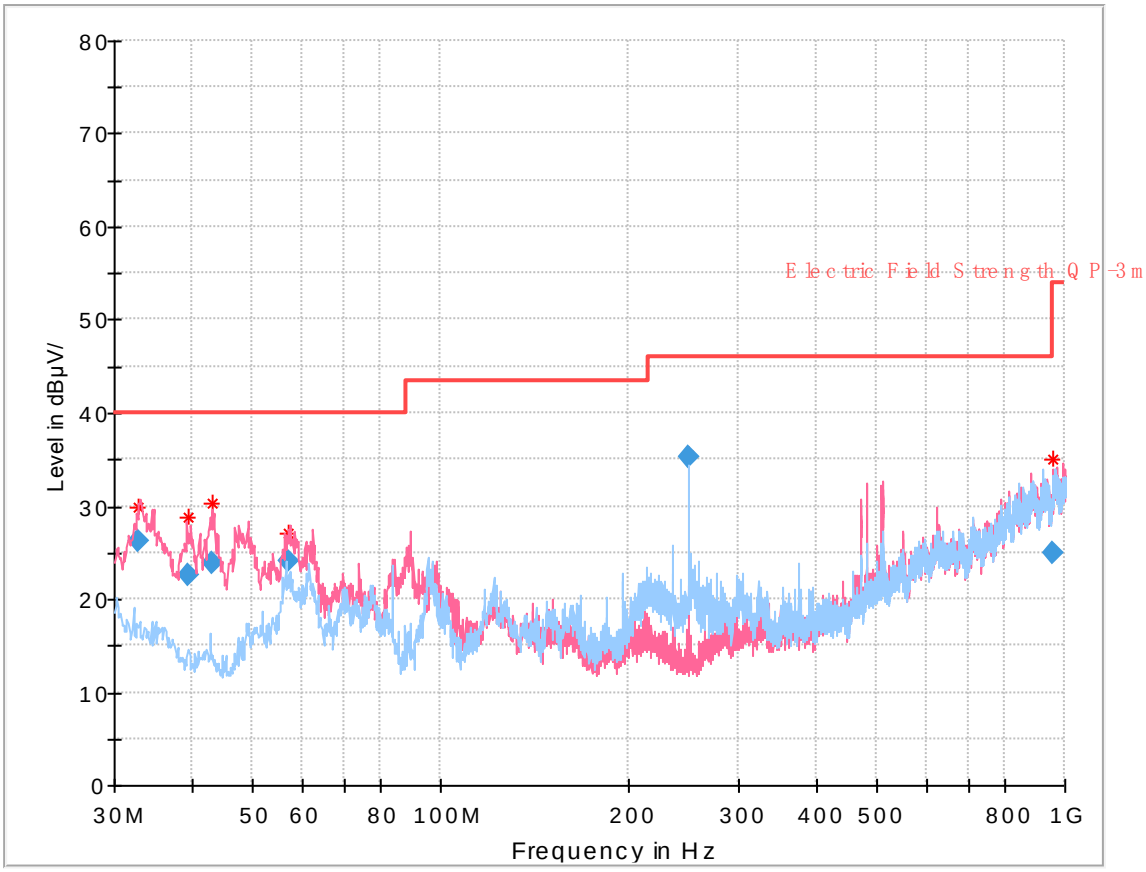


Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
50.426000	26.86	40.00	13.14	104.0	V	120.0	-19.7
111.468125	28.01	43.50	15.49	274.0	H	255.0	-15.3
240.005850	19.66	46.00	26.34	135.0	H	217.0	-14.0
250.005125	31.37	46.00	14.63	118.0	H	257.0	-14.1
480.009625	38.79	46.00	7.21	103.0	V	106.0	-6.4
510.010250	26.44	46.00	19.56	111.0	V	219.0	-5.0

Powered by Adapter:

30 MHz~1 GHz:



Final_Result

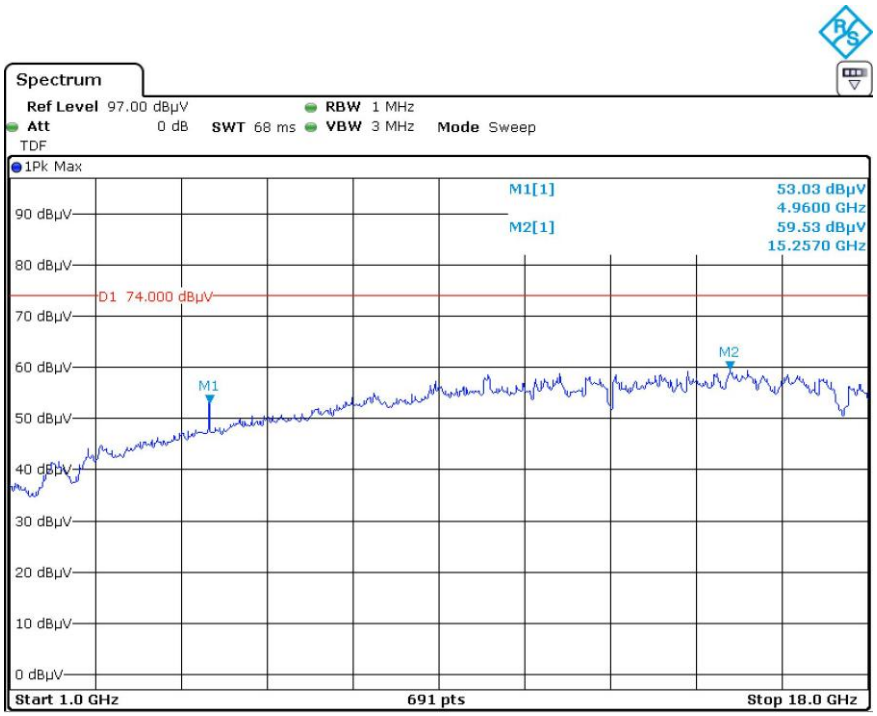
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
32.867125	26.19	40.00	13.81	102.0	V	302.0	-9.3
39.446750	22.68	40.00	17.32	111.0	V	176.0	-13.4
43.044500	23.94	40.00	16.06	109.0	V	95.0	-15.9
57.123500	24.02	40.00	15.98	109.0	V	351.0	-20.0
249.998500	35.23	46.00	10.77	118.0	H	114.0	-14.1
957.515000	25.03	46.00	20.97	401.0	V	175.0	5.2

1 GHz - 25 GHz: (*Scan with GFSK, π/4-DQPSK, 8DPSK mode, the worst case is 8DPSK Mode*)

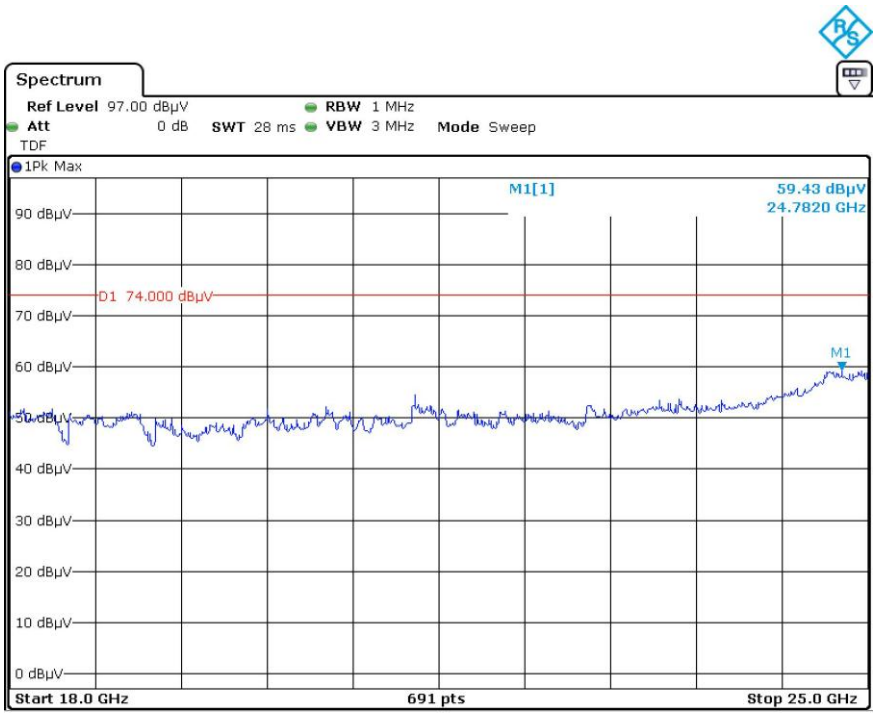
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H/V)				
Low Channel (2402 MHz)									
2388.47	28.34	PK	360	1.5	H	31.87	60.21	74	13.80
2388.47	14.19	Ave.	360	1.5	H	31.87	46.06	54	7.94
2484.53	28.45	PK	117	1.0	H	32.13	60.58	74	13.42
2484.53	14.23	Ave.	117	1.0	H	32.13	46.36	54	7.64
4804.00	46.84	PK	350	2.2	H	6.28	53.12	74	20.88
4804.00	33.42	Ave.	350	2.2	H	6.28	39.70	54	14.30
Middle Channel (2441 MHz)									
4882.00	47.12	PK	243	1.1	H	6.76	53.88	74	20.12
4882.00	34.03	Ave.	243	1.1	H	6.76	40.79	54	13.21
High Channel (2480 MHz)									
2387.66	28.47	PK	54	2.0	H	31.87	60.34	74	13.66
2387.66	14.29	Ave.	54	2.0	H	31.87	46.16	54	7.84
2484.29	28.55	PK	36	2.0	H	32.13	60.68	74	13.32
2484.29	14.38	Ave.	36	2.0	H	32.13	46.51	54	7.49
4960.00	47.75	PK	164	2.4	H	6.80	54.55	74	19.45
4960.00	34.78	Ave.	164	2.4	H	6.80	41.58	54	12.42

Note:
Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor
Corrected Amplitude = Corrected Factor + Reading
Margin = Limit - Corrected. Amplitude
The other spurious emission which is 20dB to the limit was not recorded.

Pre-scan with high channel Peak
Horizontal

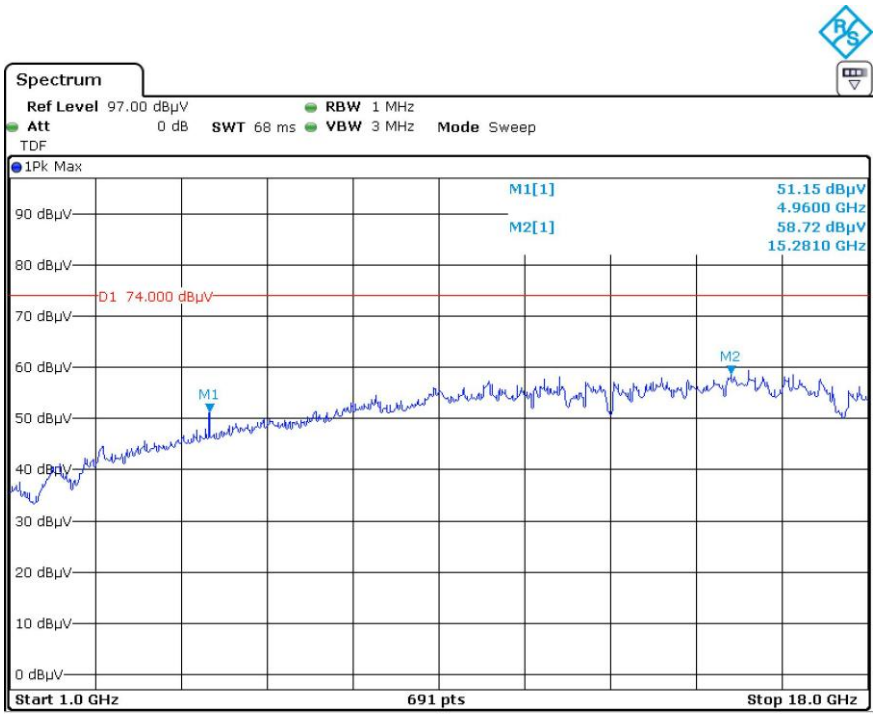


Date: 7.OCT.2020 18:49:14

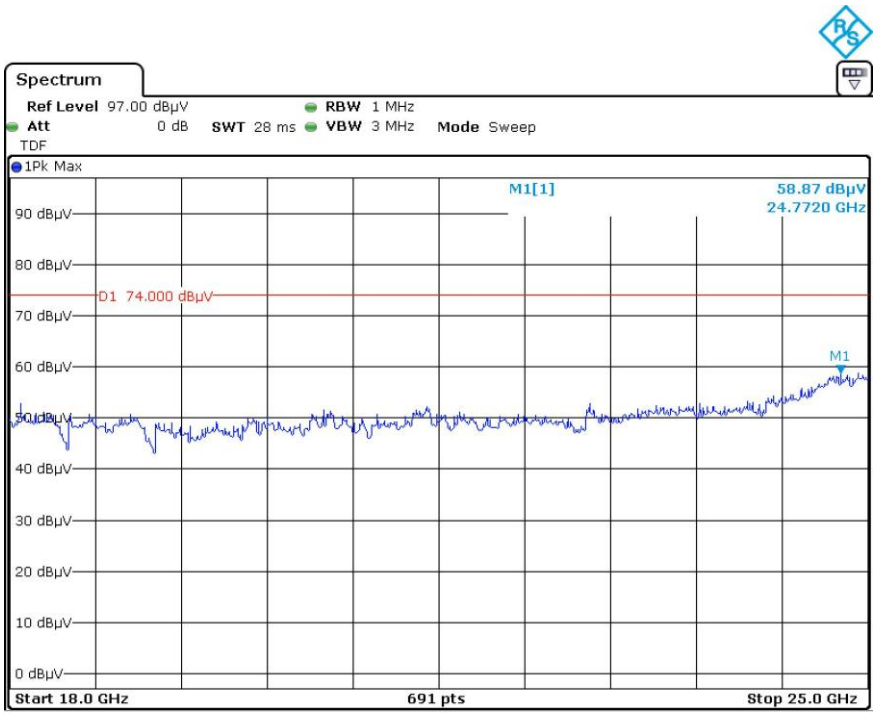


Date: 7.OCT.2020 19:33:50

Vertical

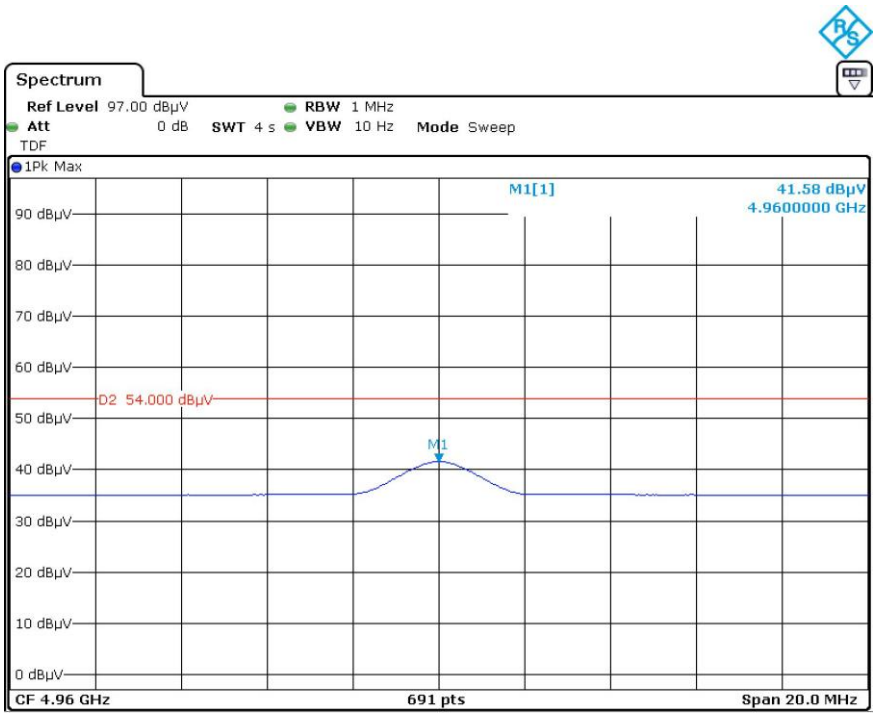


Date: 7.OCT.2020 18:57:59

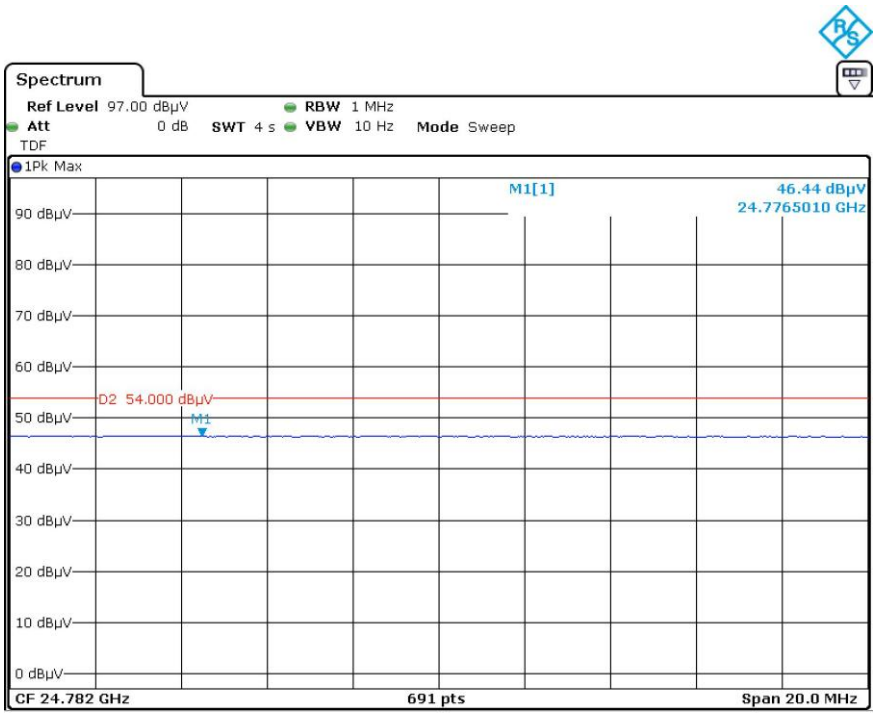


Date: 7.OCT.2020 19:40:34

Pre-scan for Average
Horizontal

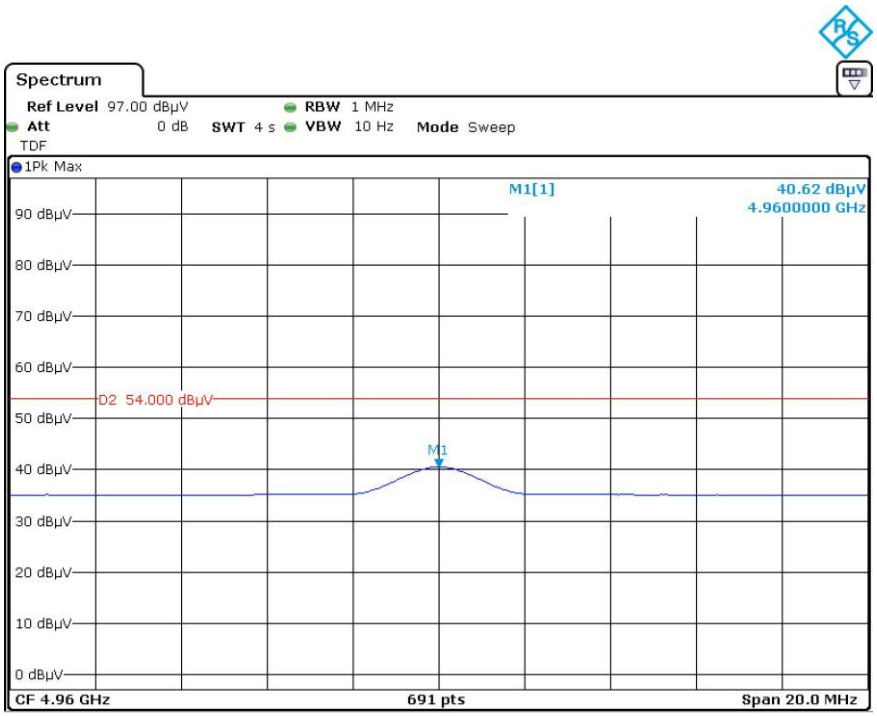


Date: 7.OCT.2020 18:52:54

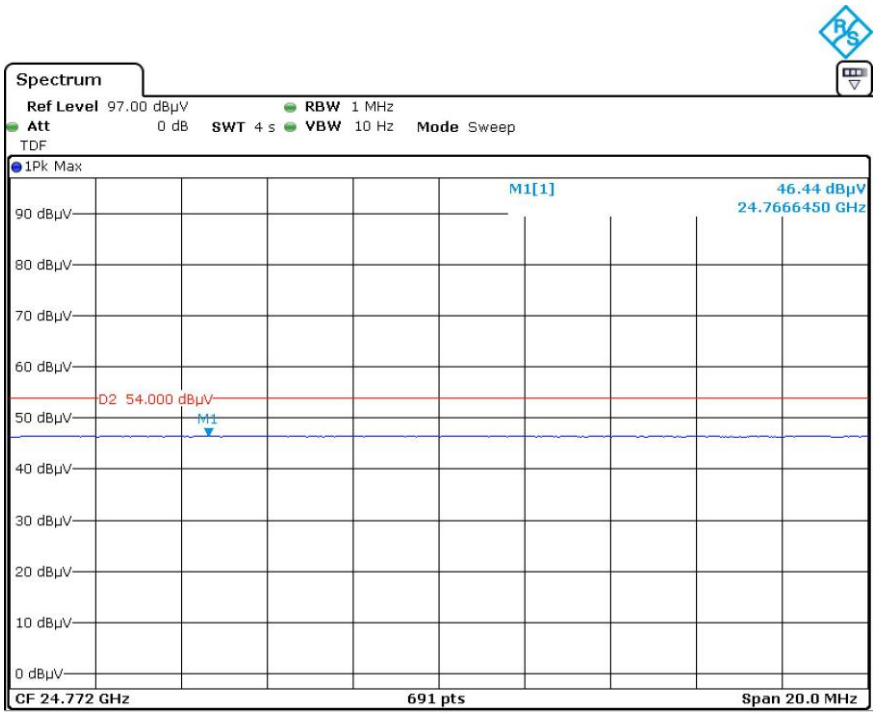


Date: 7.OCT.2020 19:37:11

Vertical



Date: 7.OCT.2020 19:01:41



Date: 7.OCT.2020 19:44:56

FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

Applicable Standard

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.

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Hailey Yang from 2020-10-14 to 2020-10-15.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH

Applicable Standard

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.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Hailey Yang from 2020-10-14 to 2020-10-15.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

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.

Test Procedure

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:	26 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Hailey Yang from 2020-10-14 to 2020-10-15.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

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.

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Hailey Yang from 2020-10-14 to 2020-10-15.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §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.

Test Procedure

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:	26 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Hailey Yang from 2020-10-14 to 2020-10-15.

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

FCC §15.247(d) - BAND EDGES TESTING

Applicable Standard

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)).

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Hailey Yang on 2020-10-25

EUT operation mode: Transmitting

Test Result: Compliant. Please refer to the Appendix.

APPENDIX

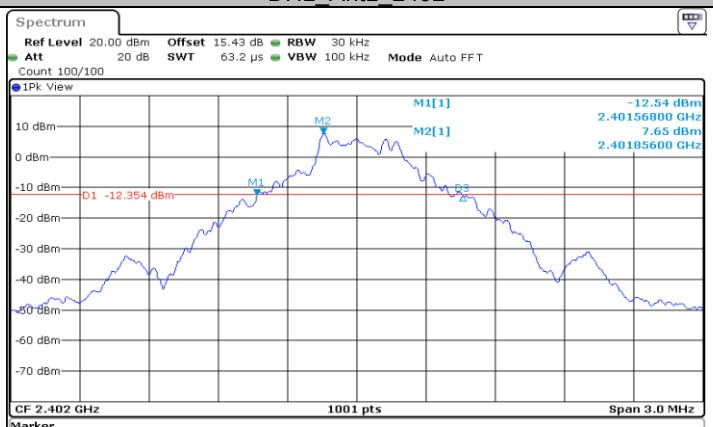
AppendixA: 20dBEmission Bandwidth

Test Result

TestMode	Antenna	Channel	20db EBW[MHz]	Limit[MHz]	Verdict
DH1	Ant1	2402	0.891	---	PASS
		2441	0.951	---	PASS
		2480	0.891	---	PASS
2DH1	Ant1	2402	1.242	---	PASS
		2441	1.236	---	PASS
		2480	1.227	---	PASS
3DH1	Ant1	2402	1.239	---	PASS
		2441	1.242	---	PASS
		2480	1.239	---	PASS

Test Graphs

DH1_Ant1_2402

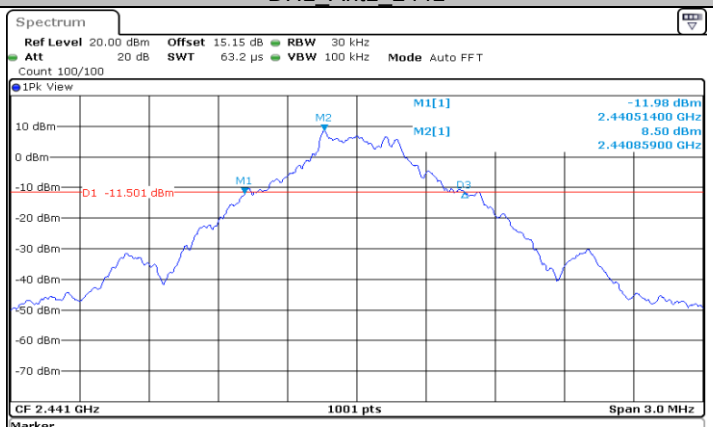


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401568 GHz	-12.54 dBm		
M2		1	2.401856 GHz	7.65 dBm		
D3	M1	1	891.0 kHz	-0.08 dB		

Date: 14.OCT.2020 21:58:49

DH1_Ant1_2441

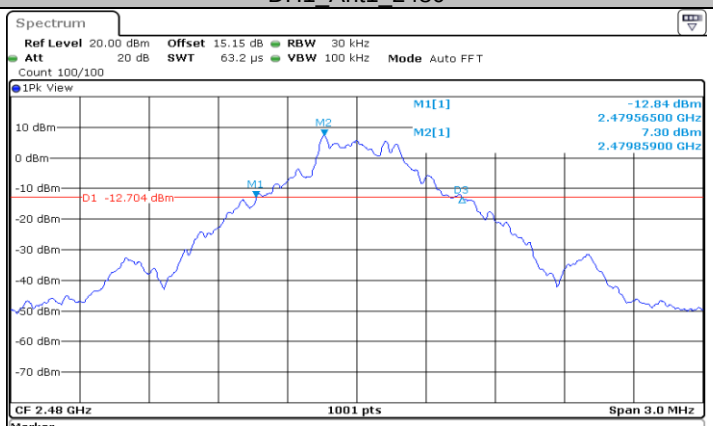


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.440514 GHz	-11.98 dBm		
M2		1	2.440859 GHz	8.50 dBm		
D3	M1	1	951.0 kHz	0.38 dB		

Date: 15.OCT.2020 01:23:28

DH1_Ant1_2480

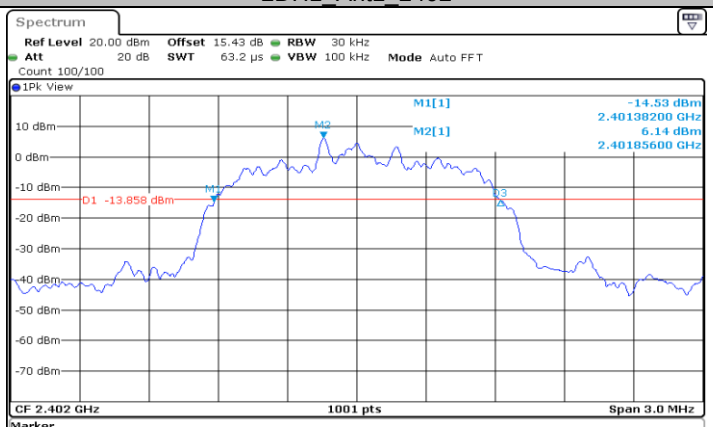


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479565 GHz	-12.84 dBm		
M2		1	2.479859 GHz	7.30 dBm		
D3	M1	1	891.0 kHz	0.03 dB		

Date: 14.OCT.2020 22:00:00

2DH1_Ant1_2402

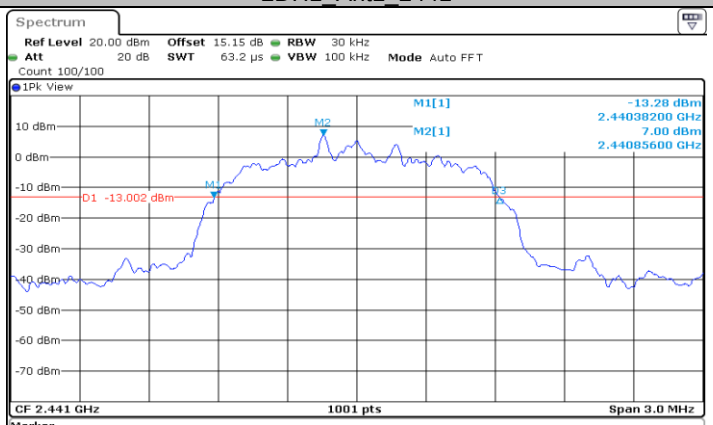


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401382 GHz	-14.53 dBm		
M2		1	2.401856 GHz	6.14 dBm		
D3	M1	1	1.242 MHz	0.50 dB		

Date: 15.OCT.2020 01:24:38

2DH1_Ant1_2441

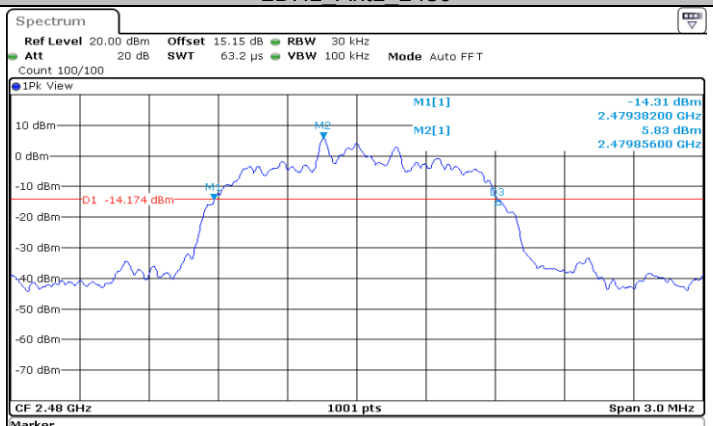


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.440382 GHz	-13.28 dBm		
M2		1	2.440856 GHz	7.00 dBm		
D3	M1	1	1.236 MHz	0.07 dB		

Date: 14.OCT.2020 22:01:21

2DH1_Ant1_2480

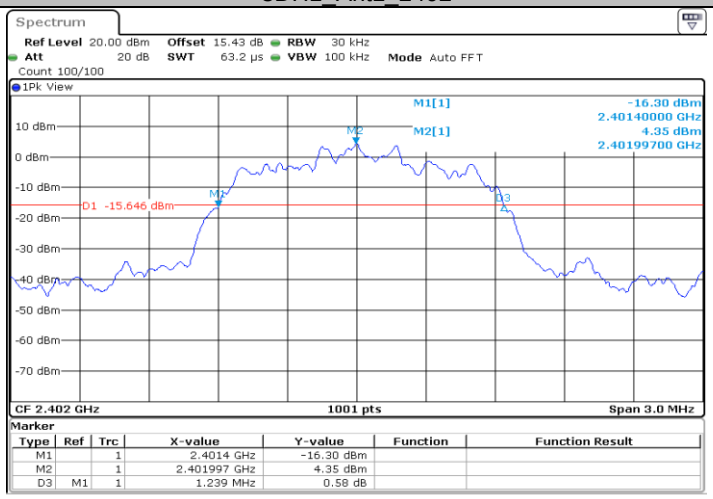


Marker

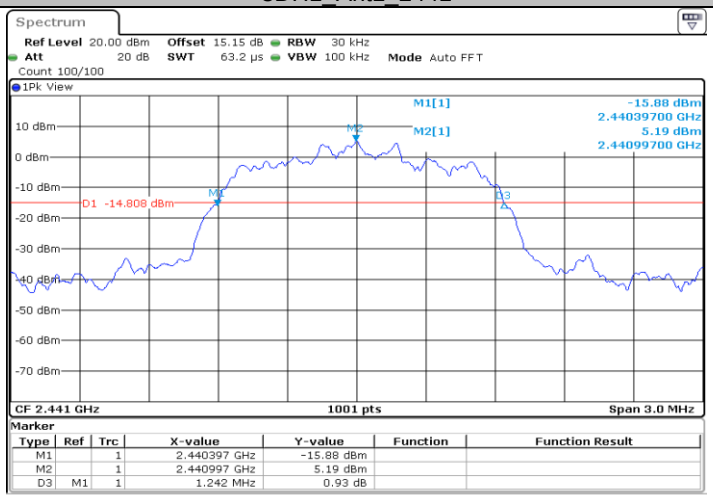
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479382 GHz	-14.31 dBm		
M2		1	2.479856 GHz	5.83 dBm		
D3	M1	1	1.227 MHz	0.09 dB		

Date: 14.OCT.2020 22:01:52

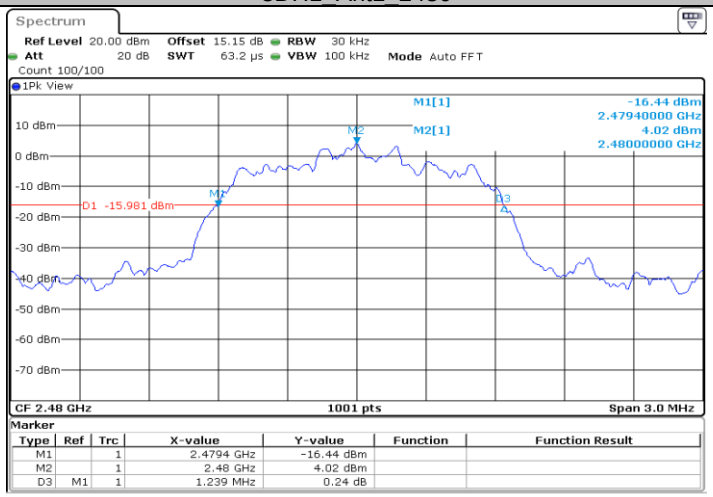
3DH1_Ant1_2402



3DH1_Ant1_2441



3DH1_Ant1_2480



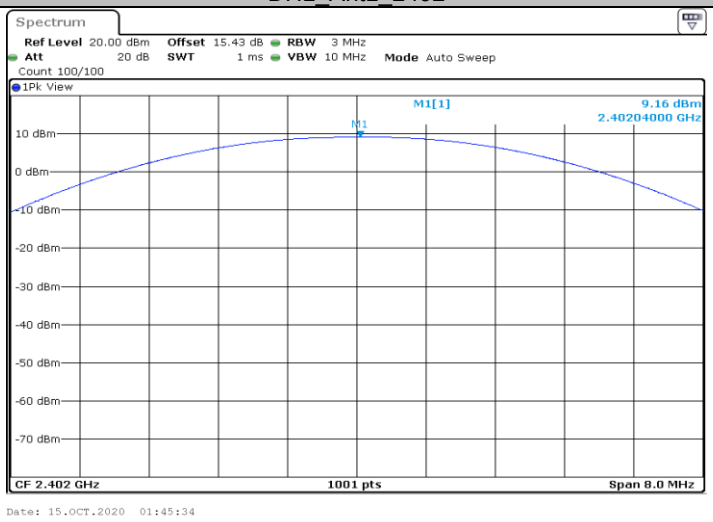
AppendixC: Maximum conducted Peak output power

Test Result

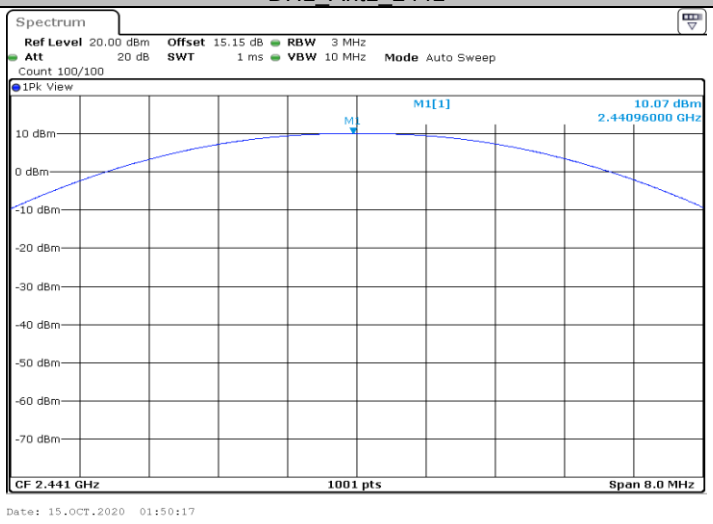
Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH1	Ant1	2402	9.16	<=20.97	PASS
		2441	10.07	<=20.97	PASS
		2480	8.81	<=20.97	PASS
2DH1	Ant1	2402	9.20	<=20.97	PASS
		2441	10.09	<=20.97	PASS
		2480	8.84	<=20.97	PASS
3DH1	Ant1	2402	9.58	<=20.97	PASS
		2441	10.45	<=20.97	PASS
		2480	9.16	<=20.97	PASS

Test Graphs

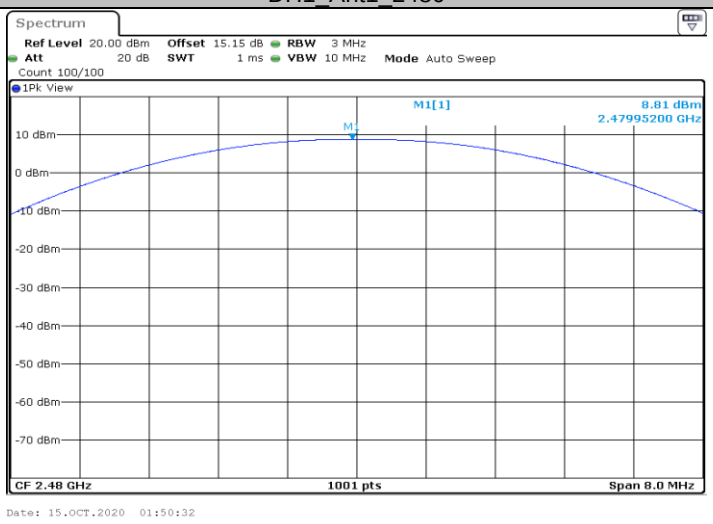
DH1_Ant1_2402



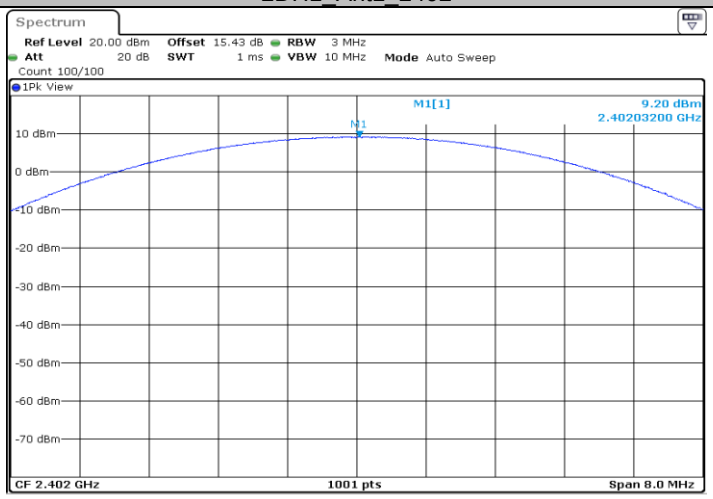
DH1_Ant1_2441



DH1_Ant1_2480

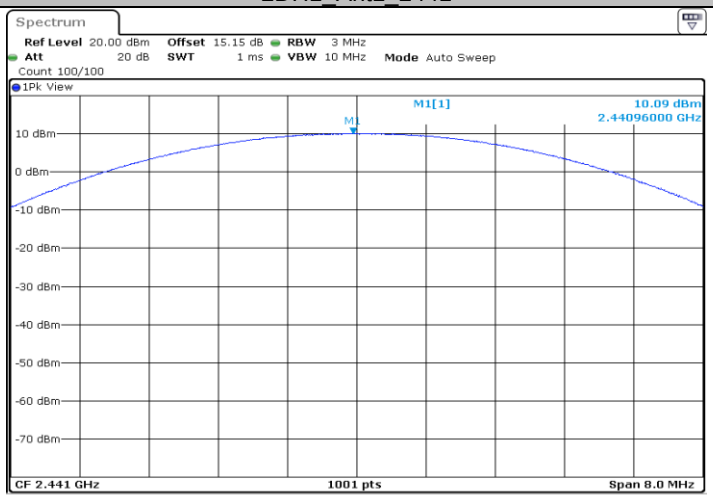


2DH1_Ant1_2402



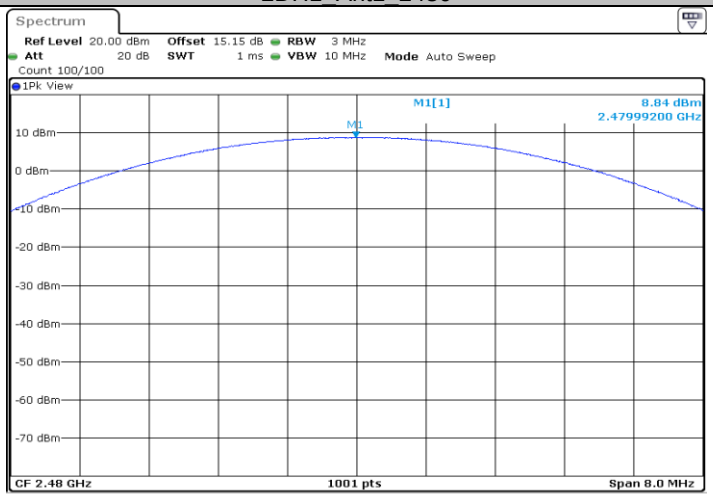
Date: 15.OCT.2020 01:50:56

2DH1_Ant1_2441



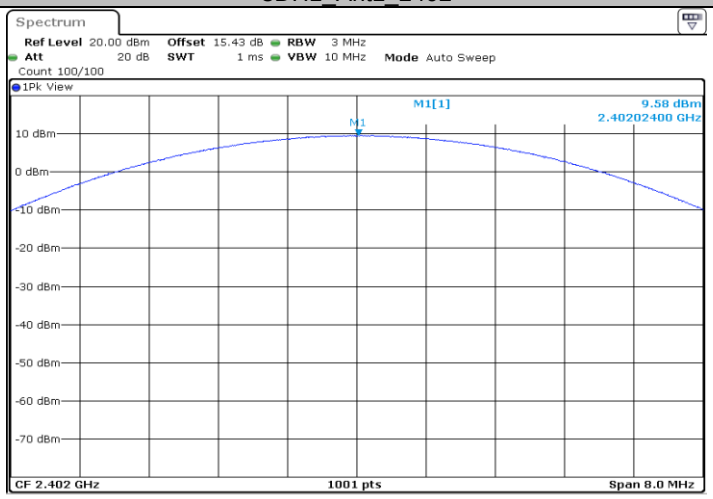
Date: 15.OCT.2020 01:51:16

2DH1_Ant1_2480

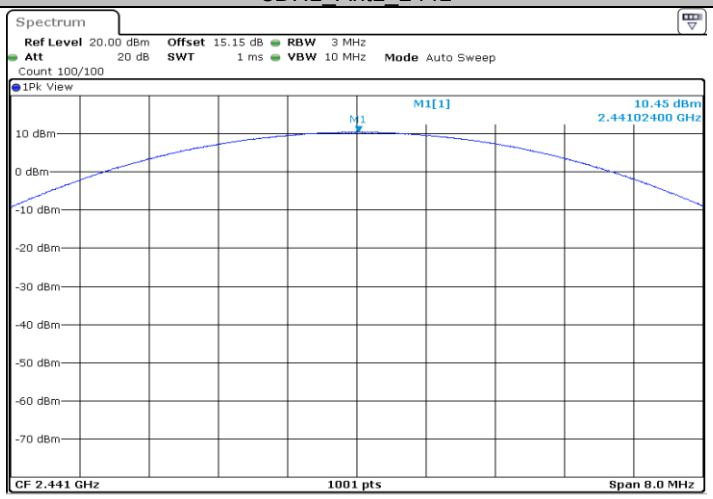


Date: 15.OCT.2020 01:51:39

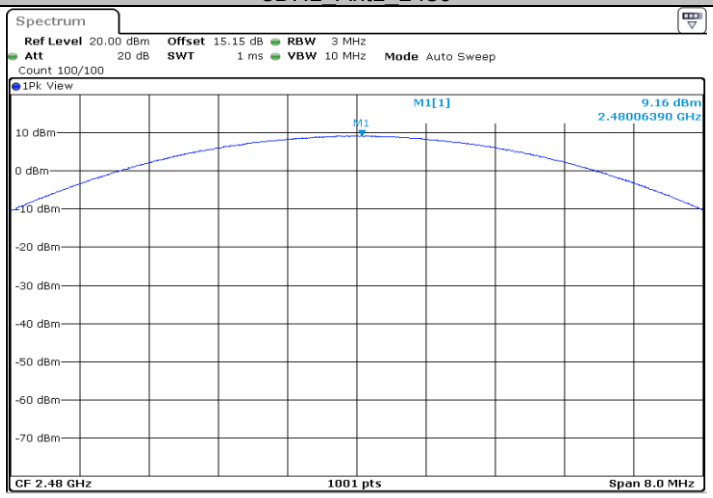
3DH1_Ant1_2402



3DH1_Ant1_2441



3DH1_Ant1_2480



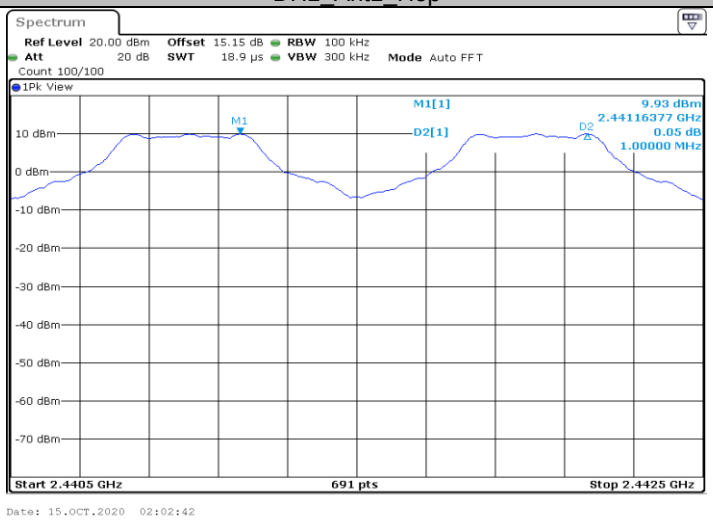
AppendixD: Carrier frequency separation

Test Result

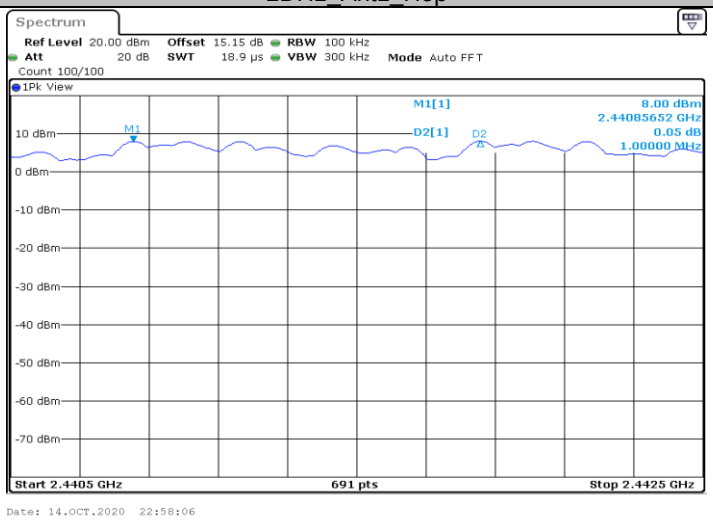
TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH1	Ant1	Hop	1	>=0.634	PASS
2DH1	Ant1	Hop	1	>=0.824	PASS
3DH1	Ant1	Hop	1	>=0.828	PASS

Test Graphs

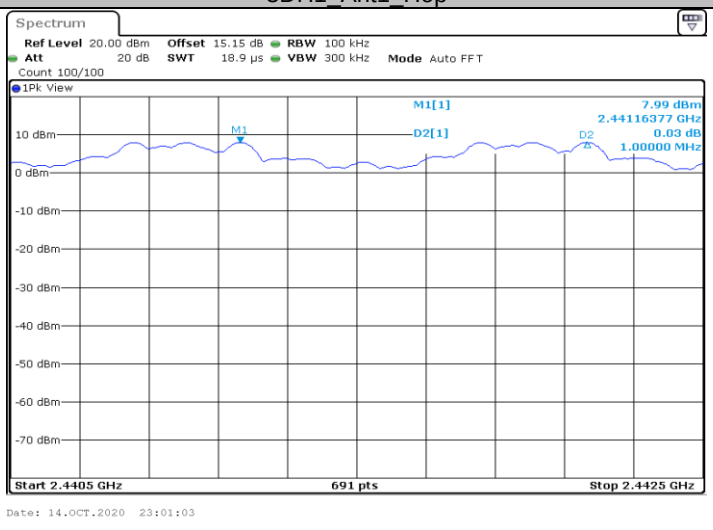
DH1_Ant1_Hop



2DH1_Ant1_Hop



3DH1_Ant1_Hop



AppendixE: Time of occupancy

Test Result

Test Mode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.38	320	0.121	<=0.4	PASS
DH3	Ant1	Hop	1.63	90	0.146	<=0.4	PASS
DH5	Ant1	Hop	2.87	110	0.315	<=0.4	PASS
2DH1	Ant1	Hop	0.38	320	0.123	<=0.4	PASS
2DH3	Ant1	Hop	1.63	150	0.244	<=0.4	PASS
2DH5	Ant1	Hop	2.36	140	0.331	<=0.4	PASS
3DH1	Ant1	Hop	0.38	320	0.123	<=0.4	PASS
3DH3	Ant1	Hop	1.63	90	0.146	<=0.4	PASS
3DH5	Ant1	Hop	2.87	100	0.287	<=0.4	PASS

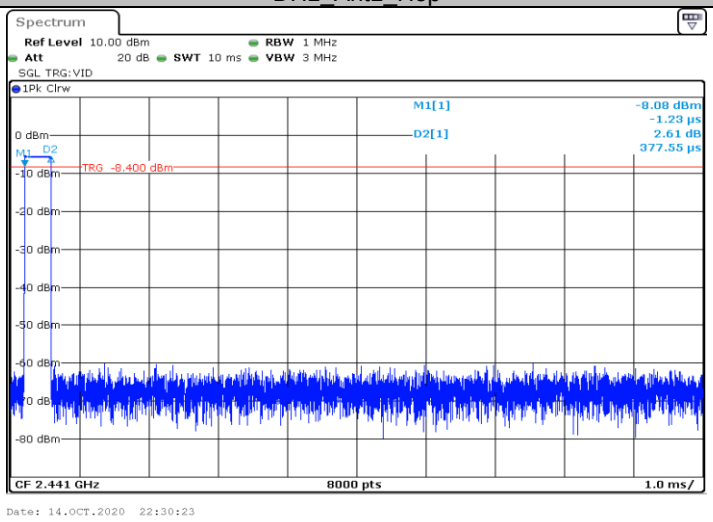
Note 1：A period time=0.4*79=31.6(S), Result=Burst Width*Total hops

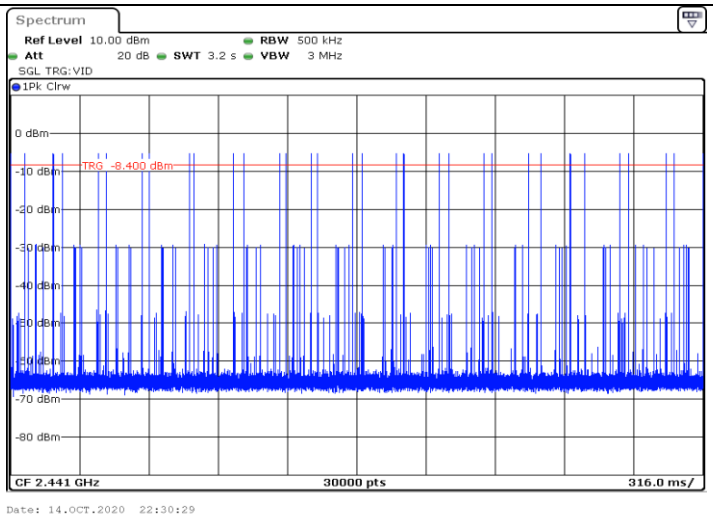
Note 2: Totalhops=Hopping Number in 3.16s*10

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

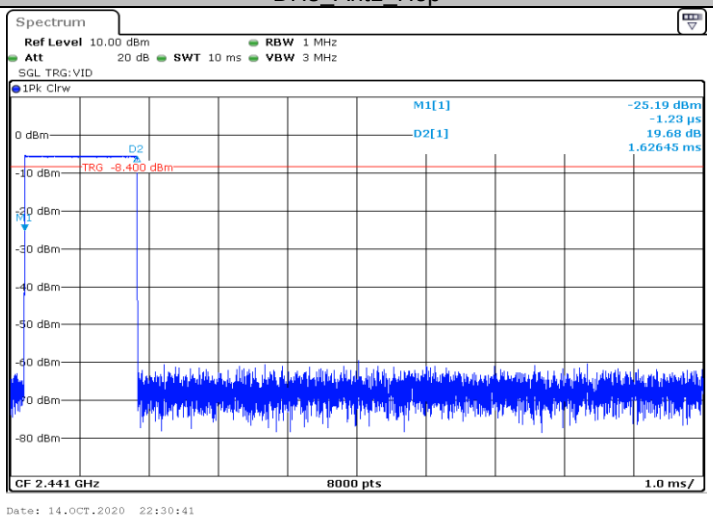
Test Graphs

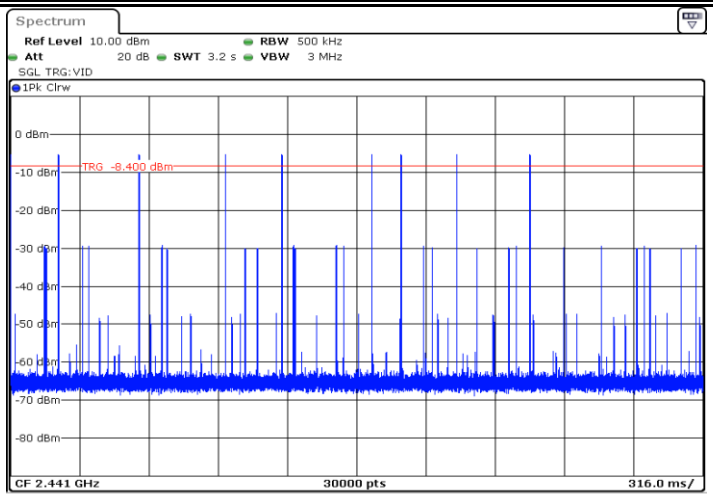
DH1_Ant1_Hop



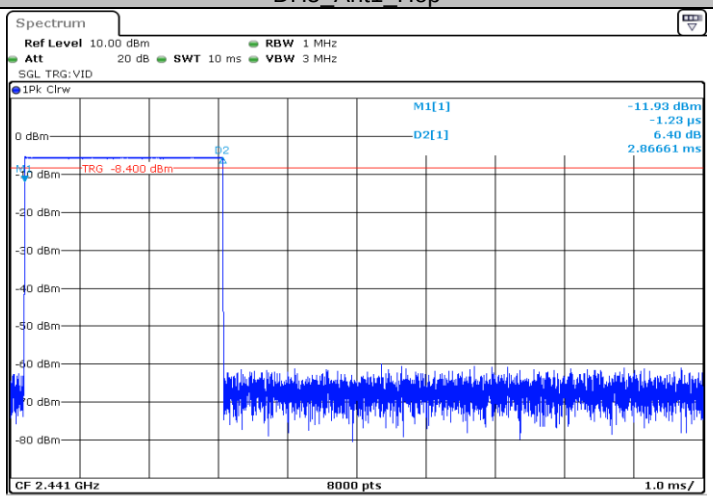


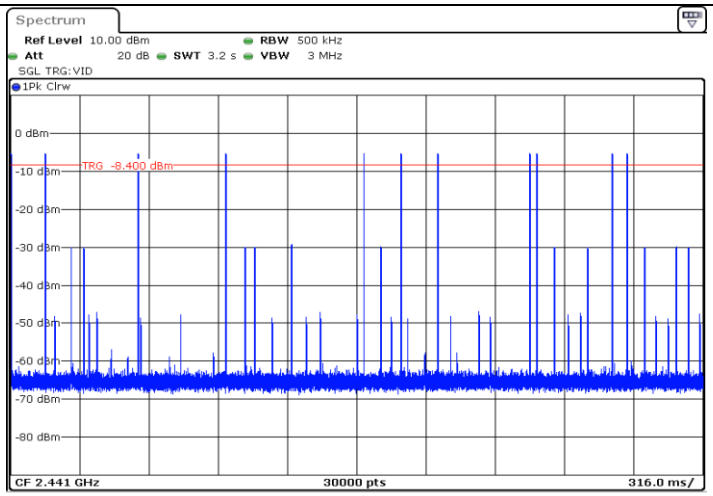
DH3_Ant1_Hop



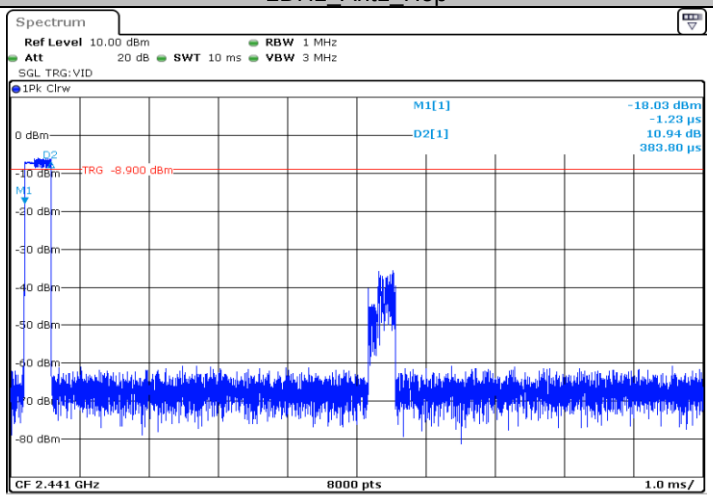

Spectrum
Ref Level 10.00 dBm RBW 500 kHz
Att 20 dB SWT 3.2 s VBW 3 MHz
SGL TRG:VID
1Pk Clrw
TRG -8.400 dBm
CF 2.441 GHz 30000 pts 316.0 ms/
Date: 14.OCT.2020 22:30:47

DH5_Ant1_Hop

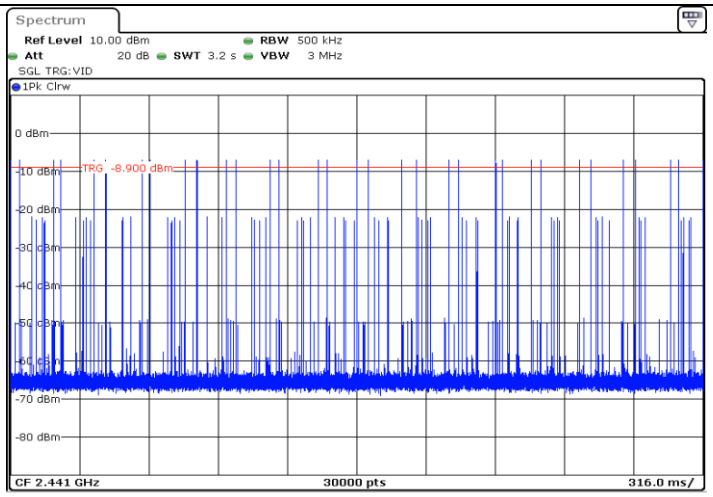

Spectrum
Ref Level 10.00 dBm RBW 1 MHz
Att 20 dB SWT 10 ms VBW 3 MHz
SGL TRG:VID
1Pk Clrw
M1[1] -11.93 dBm
-1.23 µs
D2[1] 6.40 dB
2.86661 ms
D2
TRG -8.400 dBm
CF 2.441 GHz 8000 pts 1.0 ms/
Date: 15.OCT.2020 01:26:32


Spectrum
Ref Level 10.00 dBm RBW 500 kHz
Att 20 dB SWT 3.2 s VBW 3 MHz
SGL TRG:VID
1Pk Clrw
TRG -8.400 dBm
CF 2.441 GHz 30000 pts 316.0 ms/
Date: 15.OCT.2020 01:26:38

2DH1_Ant1_Hop

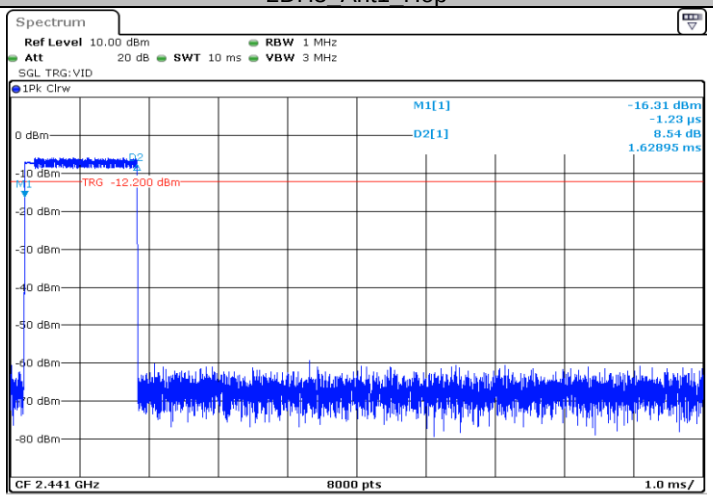


Date: 14.OCT.2020 22:59:26

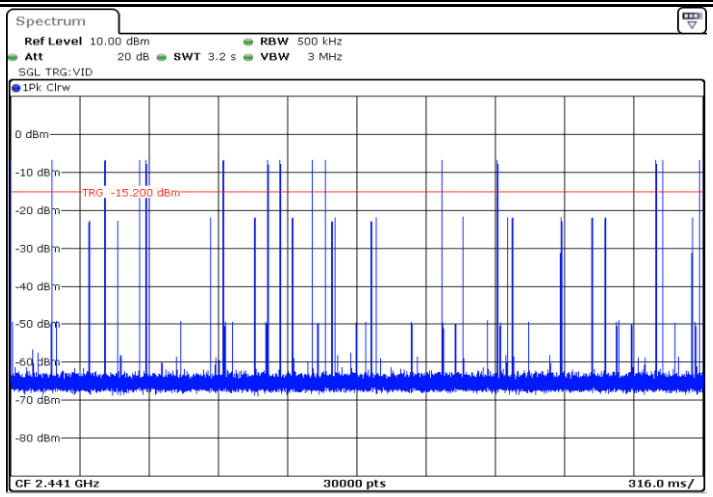


Date: 14.OCT.2020 22:59:31

2DH3_Ant1_Hop

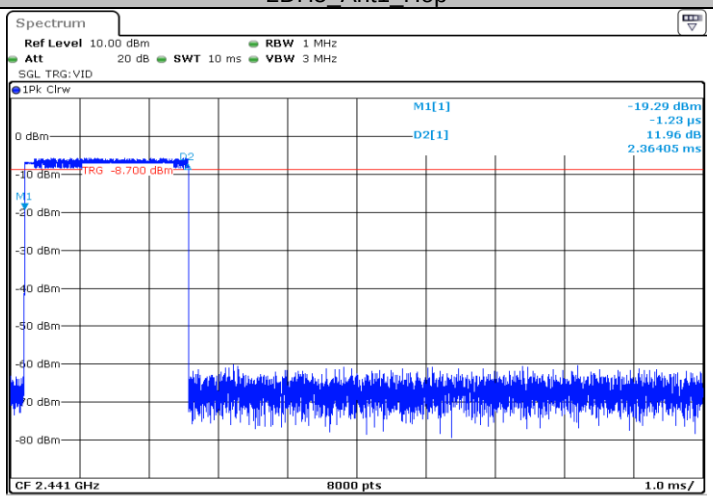


Date: 14.OCT.2020 22:59:41

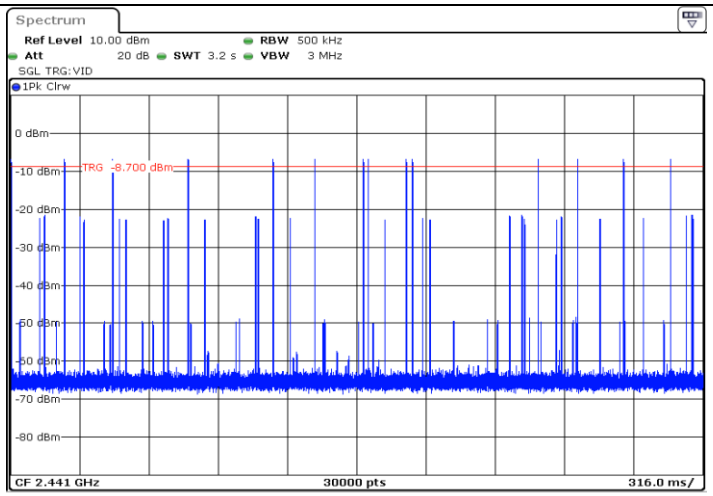


Date: 14.OCT.2020 22:59:47

2DH5_Ant1_Hop

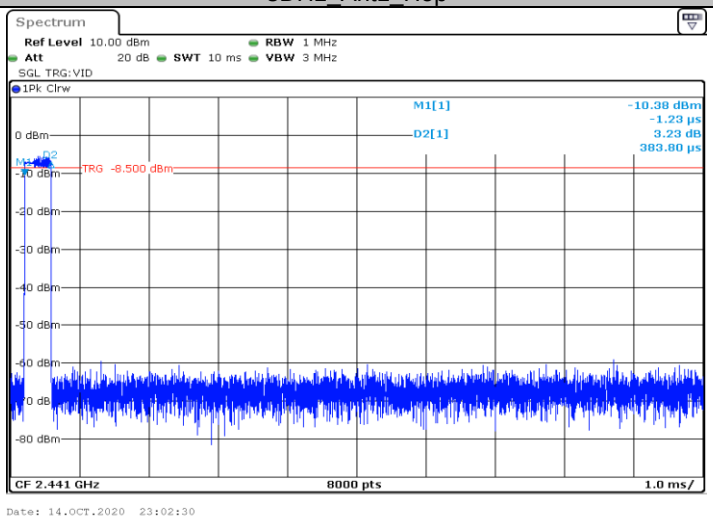


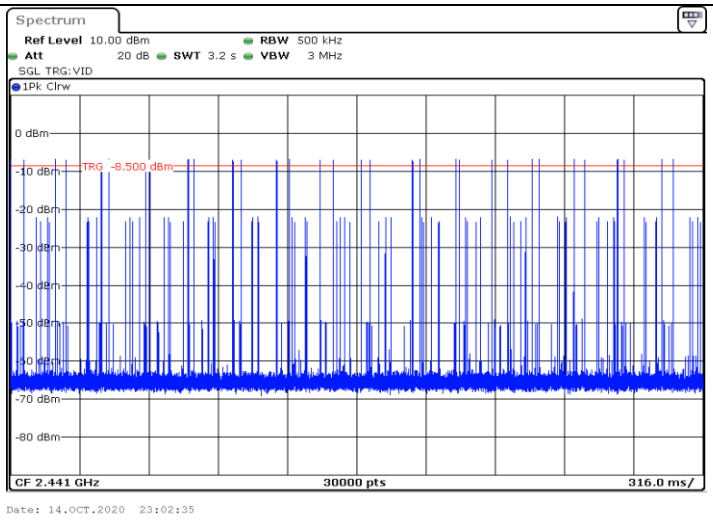
Date: 15.OCT.2020 02:04:42



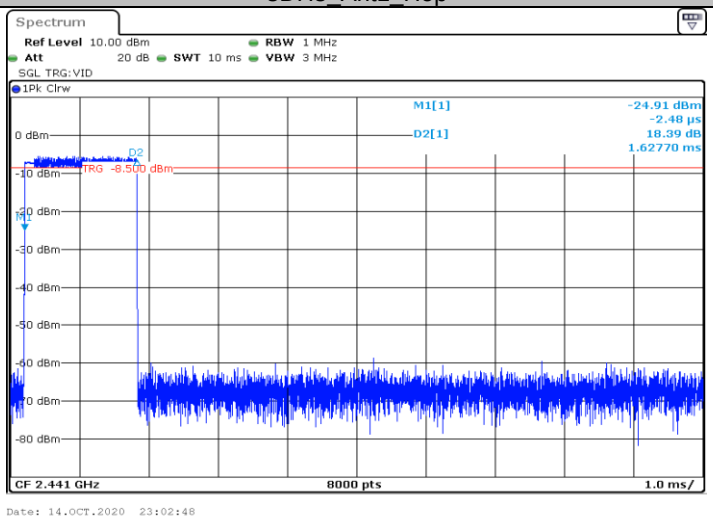
Date: 15.OCT.2020 02:04:48

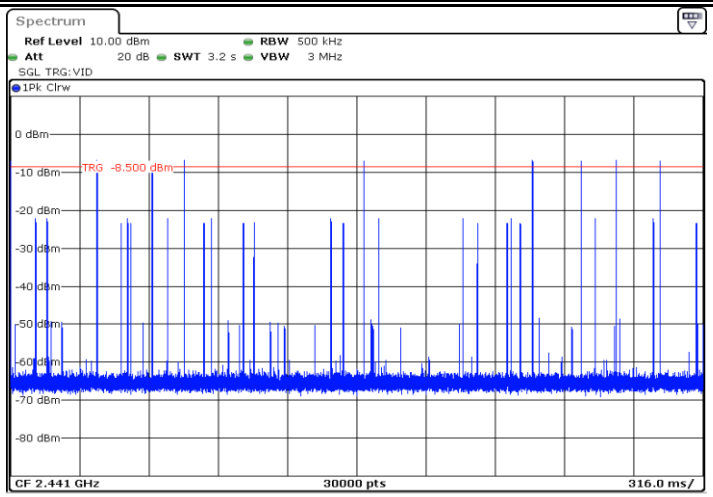
3DH1_Ant1_Hop



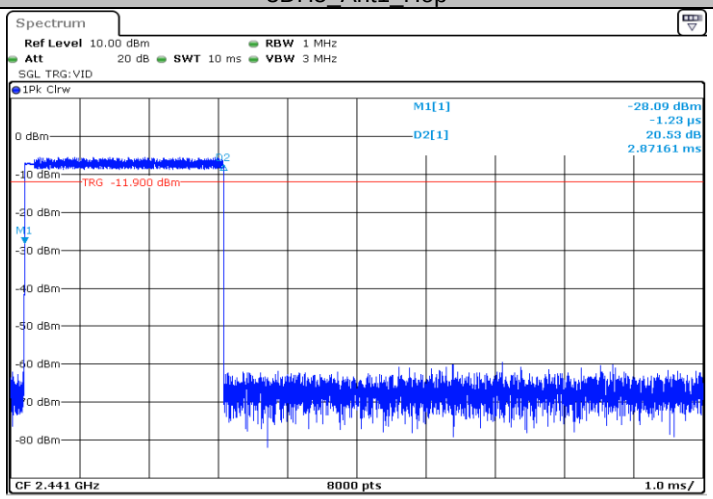


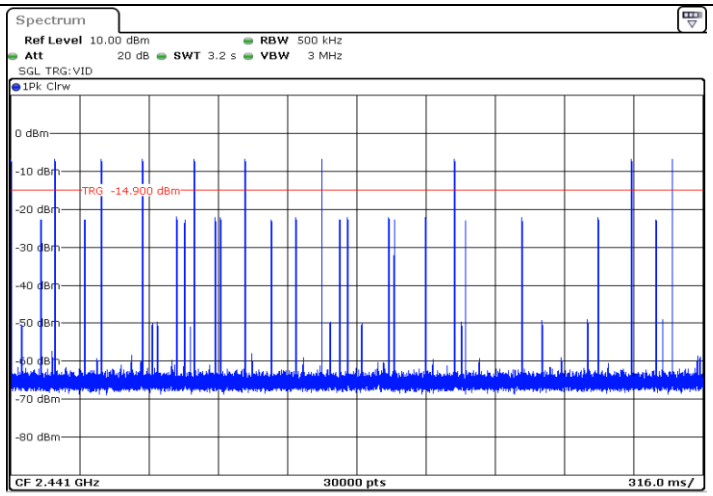
3DH3_Ant1_Hop





3DH5_Ant1_Hop





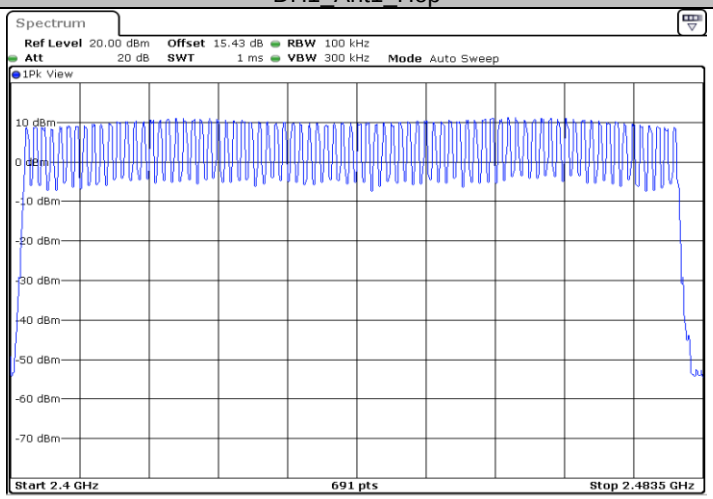
AppendixF: Number of hopping channels

Test Result

TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH1	Ant1	Hop	79	>=15	PASS
2DH1	Ant1	Hop	79	>=15	PASS
3DH1	Ant1	Hop	79	>=15	PASS

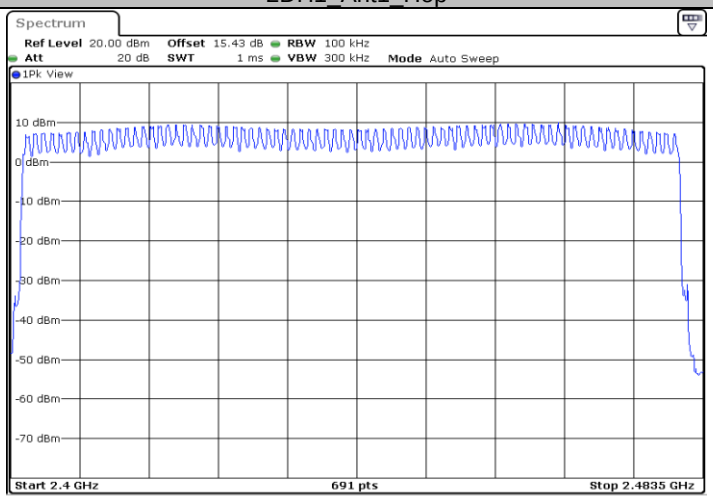
Test Graphs

DH1_Ant1_Hop



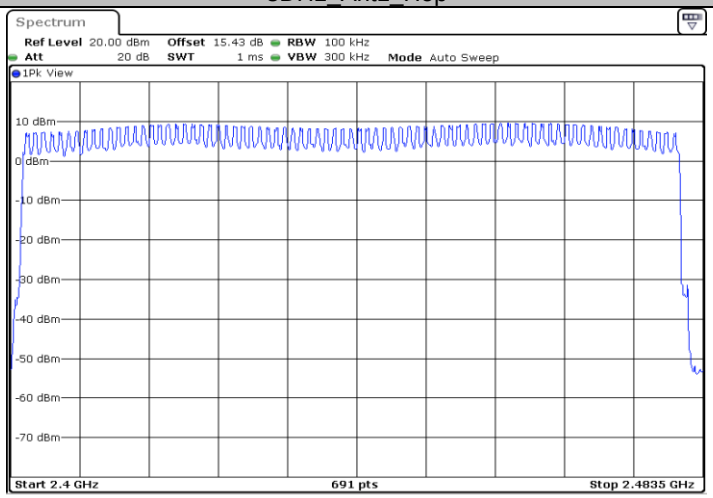
Date: 14.OCT.2020 22:30:11

2DH1_Ant1_Hop



Date: 14.OCT.2020 22:59:14

3DH1_Ant1_Hop

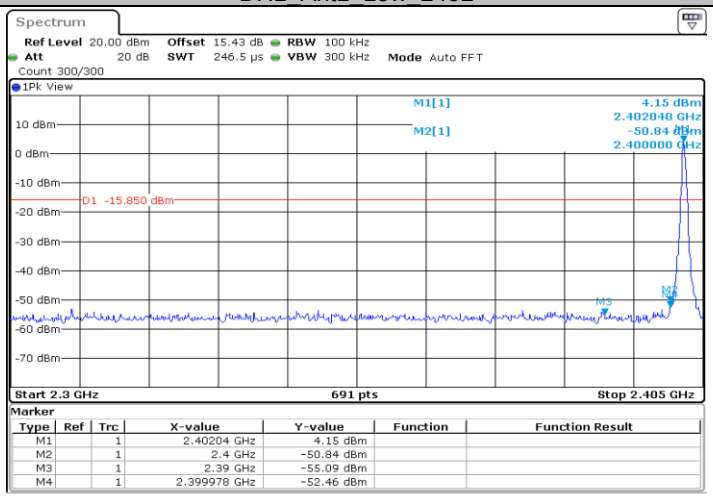


Date: 14.OCT.2020 23:02:18

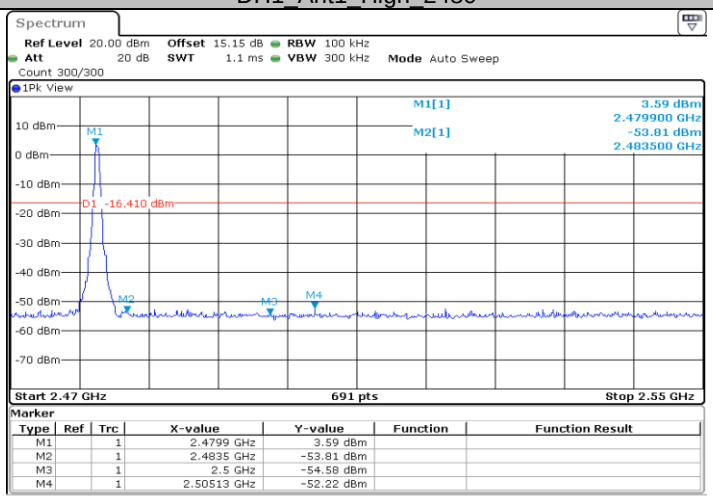
AppendixG:Band edge measurements

Test Graphs

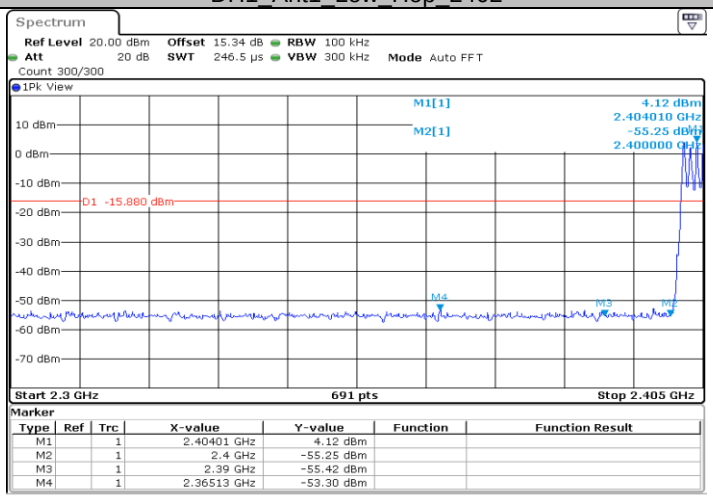
DH1_Ant1_Low_2402



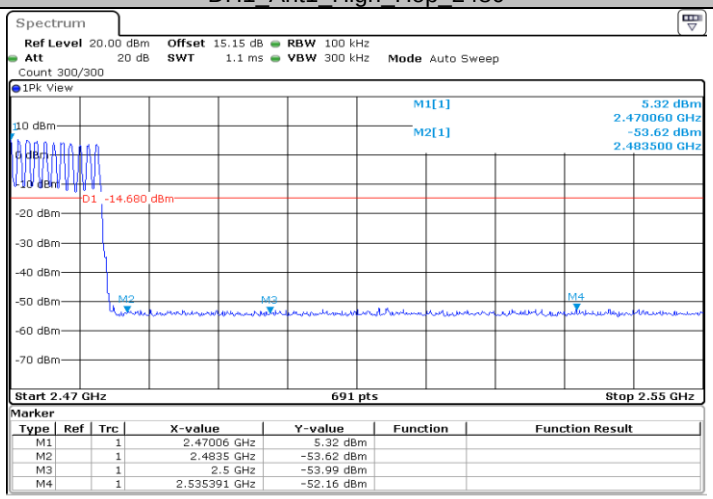
DH1_Ant1_High_2480



DH1_Ant1_Low_Hop_2402



DH1_Ant1_High_Hop_2480

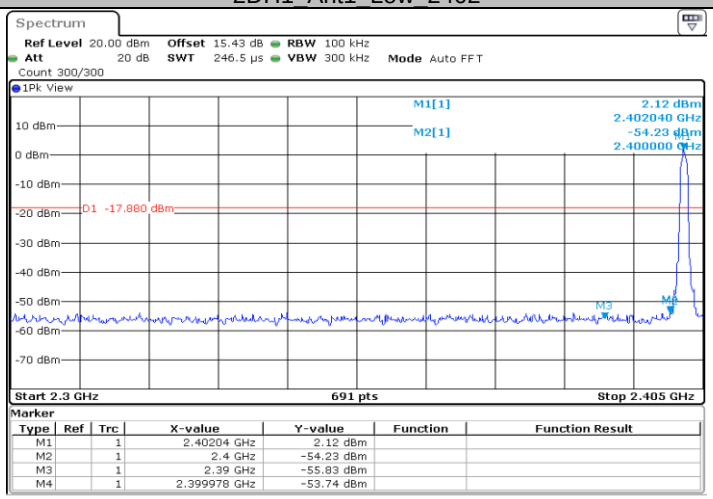


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47006 GHz	5.32 dBm		
M2		1	2.4835 GHz	-53.62 dBm		
M3		1	2.5 GHz	-53.99 dBm		
M4		1	2.535391 GHz	-52.16 dBm		

Date: 25.OCT.2020 18:26:40

2DH1_Ant1_Low_2402

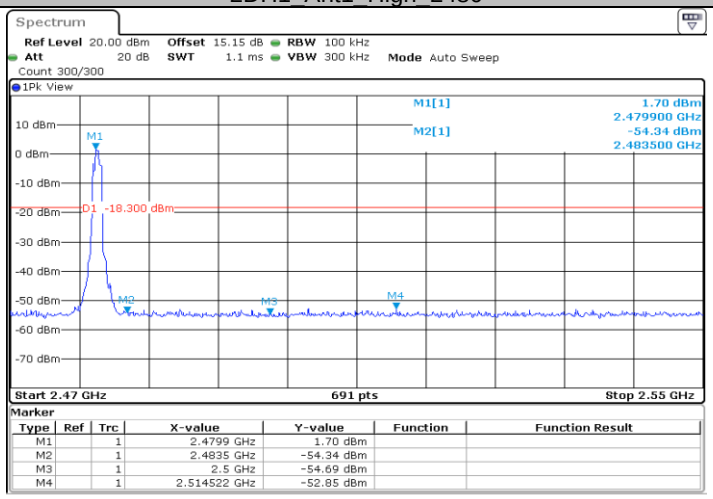


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40204 GHz	2.12 dBm		
M2		1	2.4 GHz	-54.23 dBm		
M3		1	2.39 GHz	-55.83 dBm		
M4		1	2.399978 GHz	-53.74 dBm		

Date: 25.OCT.2020 18:00:44

2DH1_Ant1_High_2480

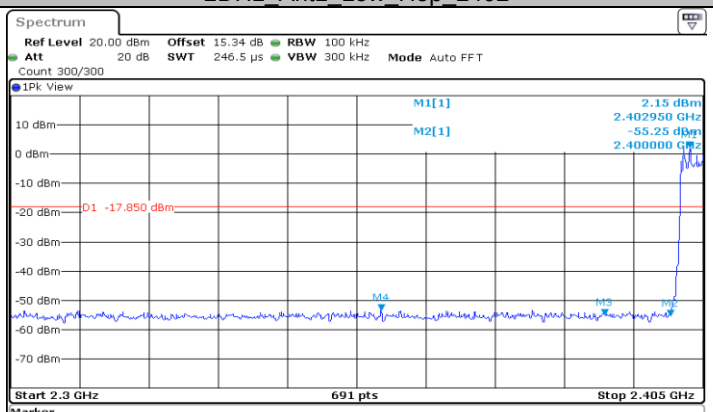


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4799 GHz	1.70 dBm		
M2		1	2.4835 GHz	-54.34 dBm		
M3		1	2.5 GHz	-54.69 dBm		
M4		1	2.514522 GHz	-52.85 dBm		

Date: 25.OCT.2020 17:52:20

2DH1_Ant1_Low_Hop_2402

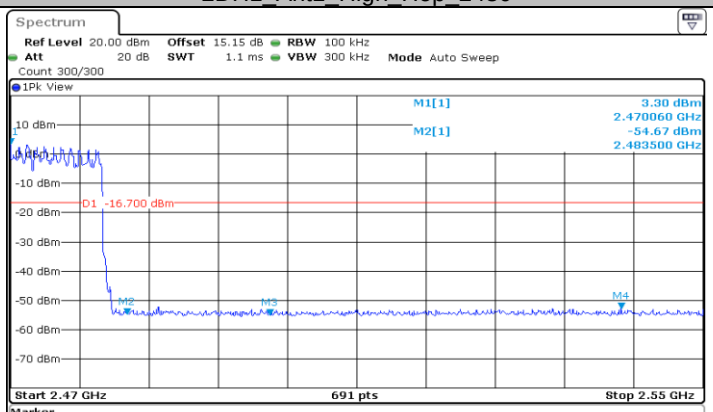


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40295 GHz	2.15 dBm		
M2		1	2.4 GHz	-55.25 dBm		
M3		1	2.39 GHz	-55.03 dBm		
M4		1	2.356152 GHz	-53.28 dBm		

Date: 25.OCT.2020 18:24:15

2DH1_Ant1_High_Hop_2480

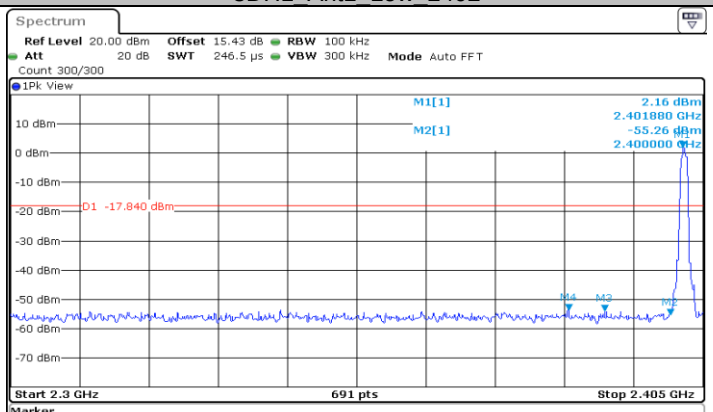


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47006 GHz	3.30 dBm		
M2		1	2.4835 GHz	-54.67 dBm		
M3		1	2.5 GHz	-54.95 dBm		
M4		1	2.540493 GHz	-52.90 dBm		

Date: 25.OCT.2020 18:24:34

3DH1_Ant1_Low_2402

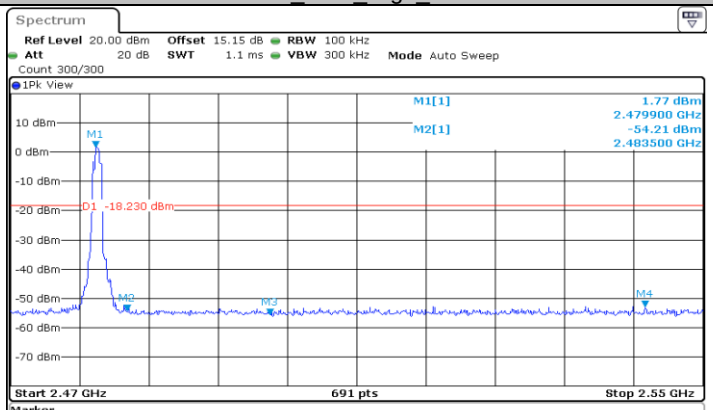


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40188 GHz	2.16 dBm		
M2		1	2.4 GHz	-55.26 dBm		
M3		1	2.39 GHz	-53.98 dBm		
M4		1	2.384609 GHz	-53.77 dBm		

Date: 25.OCT.2020 18:02:02

3DH1_Ant1_High_2480

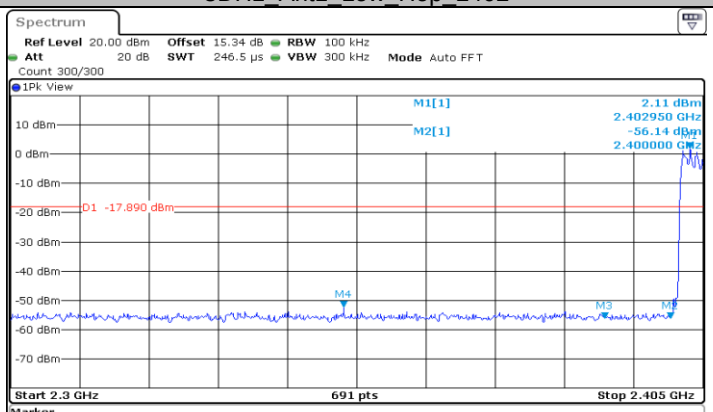


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4799 GHz	1.77 dBm		
M2		1	2.4835 GHz	-54.21 dBm		
M3		1	2.5 GHz	-55.62 dBm		
M4		1	2.543275 GHz	-52.79 dBm		

Date: 25.OCT.2020 17:53:56

3DH1_Ant1_Low_Hop_2402

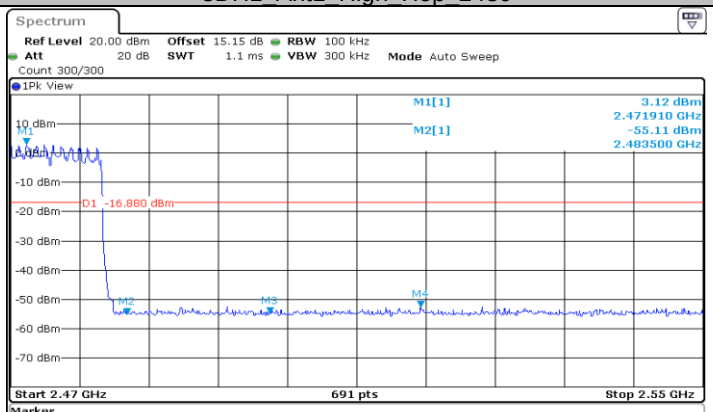


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.40295 GHz	2.11 dBm		
M2		1	2.4 GHz	-56.14 dBm		
M3		1	2.39 GHz	-56.28 dBm		
M4		1	2.350522 GHz	-52.39 dBm		

Date: 25.OCT.2020 18:27:27

3DH1_Ant1_High_Hop_2480



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.47191 GHz	3.12 dBm		
M2		1	2.4835 GHz	-55.11 dBm		
M3		1	2.5 GHz	-54.89 dBm		
M4		1	2.51742 GHz	-52.54 dBm		

Date: 25.OCT.2020 18:27:41

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