



TEST REPORT

Applicant Name : Address : Zeeva International Limited Suite 1007B, 10th Floor, Exchange Tower, 33 Wang Chiu Road, Kowloon Bay, Hong Kong RA221110-53019E-RF 2ADM5-EP-0676

Report Number : FCC ID:

Test Standard (s) FCC PART 15.247

Sample Description

Product Type: Test Model: Trade Mark: S23 TRANSPARENT TWS EP-0676

BASS JAXX
2022-11-10
2022-11-17
2022-11-20

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

Pass*

Prepared and Checked By:

Roger, Ling

Test Result:

Roger.Ling EMC Engineer

Approved By:

Candy Li EMC Engineer

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

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Shenzhen Accurate Technology Co., Ltd.

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FCC-BT

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GENERAL INFORMATION

Product	S23 TRANSPARENT TWS
Tested Model	EP-0676
SKU	BLACK – 7535019; ORANGE - 7535020 PINK – 7535021; BLUE - 7535022
UPC	BLACK – 1922345150778; ORANGE - 1922345150785 PINK – 1922345150792; BLUE - 1922345150808
Frequency Range	2402~2480MHz
Maximum conducted Peak output power	-1.07dBm
Modulation Technique	BDR(GFSK)/EDR(1/4-DQPSK)/EDR(8DPSK)
Antenna Specification*	Internal Antenna: 0dBi(It is provided by the applicant)
Voltage Range	DC 3.7V from battery
Sample number	RA221110-53019E-RF-S1(RF Radiated Test) RA221110-53019E-RF-S2(RF Conducted Test) (Assigned by ATC, Shenzhen)
Sample/EUT Status	Good condition

Product Description for Equipment under Test (EUT)

Objective

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

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

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.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Char	nnel Bandwidth	5%
RF output pov	wer, conducted	0.73dB
Unwanted Emis	ssion, conducted	1.6dB
.	30MHz - 1GHz	4.28dB
Emissions, Radiated	1GHz - 18GHz	4.98dB
Rudiucu	18GHz - 26.5GHz	5.06dB
Temperature		1°C
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 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. 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 429 7.01.

Listed by Innovation, Science and Economic Development Canada (ISEDC), the Registration Number is 5077A.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in an engineering mode.

EUT Exercise Software

Software "BT_Tool V1.1.0"* was used during testing and the power level was Default Power level 5*.

Special Accessories

N/A.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

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

Block Diagram of Test Setup

	EUT	I.U Meter
Non-Conductive Table 80/150 cm above Ground Plane	1.5 Meters	

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
1.1307 (b) &§2.1093	RF EXPOSURE	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Not Applicable
§15.205, §15.209 & §15.247(d)	Radiated Emissions	Compliant
§15.247(a)(1)	20 dB Emission Bandwidth & 99% Occupied Bandwidth	Compliant
§15.247(a)(1)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	Time of Occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	Peak Output Power Measurement	Compliant
§15.247(d)	Band edges	Compliant

Not Applicable - The device is powered by battery when use Bluetooth.

Note: The right and left earbuds are identical, please refer to the Declaration letter for more detail, only the left earbud was full tested and reported.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
		Radiated Emiss	ions Test		
Rohde & Schwarz	Test Receiver	ESR	102725	2021/12/13	2022/12/12
Rohde & Schwarz	Spectrum Analyzer	FSV40	101949	2021/12/13	2022/12/12
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-184055 36-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	2020/01/05	2023/01/04
Schwarzbeck	HORN ANTENNA	BBHA9170	9170-359	2020/01/05	2023/01/04
Wainwright	High Pass Filter	WHKX3.6/18 G-10SS	5	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.10	N050	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.11	N1000	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.12	N040	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.13	N300	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.14	N800	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.15	N600	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.16	N650	2021/12/14	2022/12/13
	Radiated Emission Test Software: e3 19821b (V9)				
		RF Conducte			
Rohde & Schwarz	Spectrum Analyzer	FSV-40	101495	2021/12/13	2022/12/12
Rohde & Schwarz	Open Switch and Control Unit	OSP120 + OSP-B157	101244 + 100866	2021/12/13	2022/12/12
WEINSCHEL	10dB Attenuator	5324	AU 3842	2021/12/14	2022/12/13
Unknown	RF Coaxial Cable	No.33	RF-03	Each	time

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

FCC §1.1307 (b) & §2.1093 – RF EXPOSURE

Applicable Standard

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

According to KDB 447498 D04 Interim General RF Exposure Guidance v01, clause 2.1.2 – 1-mW test Exemption:

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

Test Result:

For worst case:

Mode	Frequency	Maximum Tune-up Conducted Power		1-mW test
	(MHz)	(dBm)	(mW)	Exemption
BDR/EDR	2402-2480	-1	0.79	Yes

Note: The tune-up power was declared by the applicant.

Result: Compliant.

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 on board 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: Compliant.

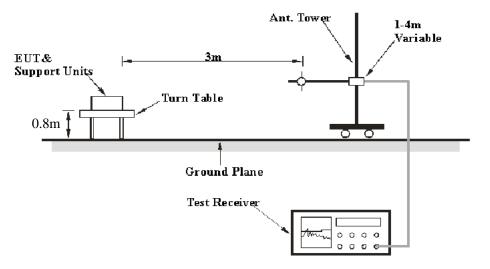
FCC §15.205, §15.209 & §15.247(d) - RADIATED EMISSIONS

Applicable Standard

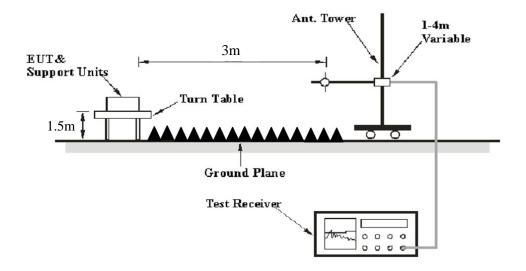
FCC §15.205; §15.209; §15.247(d)

EUT Setup

Below 1 GHz:



Above 1GHz:



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

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.

If the maximized peak measured value complies with the limit, then it is unnecessary to perform QP/Average measurement.

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

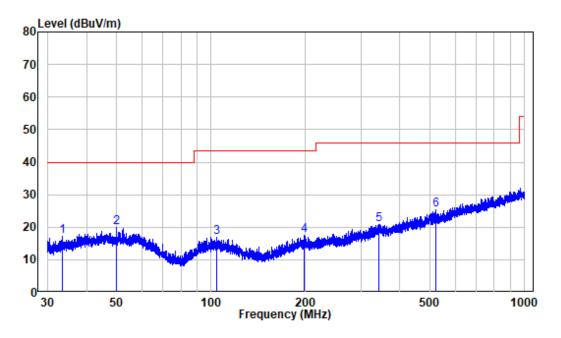
Temperature:	25 °C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by Jimi Zheng on 2022-11-17.

EUT operation mode: BT Transmitting

(Scan with GFSK, $\pi/4$ -DQPSK, 8DPSK mode at X axis, Y axis, Z axis, the worst case is 8DPSK Mode at X axis)

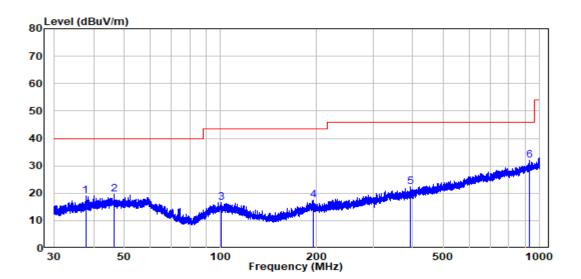
Below 1GHz: 8DPSK High Channel



Horizontal

Site :	chamber
Condition:	3m HORIZONTAL
Job No. :	RA221110-53019E-RF
Test Mode:	BT Transmitting

	Freq	Factor			Limit Line		Remark
	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	33.445	-11.94	29.04	17.10	40.00	-22.90	Peak
2	49.860	-9.92	29.74	19.82	40.00	-20.18	Peak
3	103.897	-11.73	28.78	17.05	43.50	-26.45	Peak
4	197.893	-11.54	28.93	17.39	43.50	-26.11	Peak
5	343.180	-7.29	28.14	20.85	46.00	-25.15	Peak
6	520.204	-4.29	29.53	25.24	46.00	-20.76	Peak



Vertical

Site :	chamber
Condition:	3m VERTICAL
Job No. :	RA221110-53019E-RF
Test Mode:	BT Transmitting

	Freq	Factor			Limit Line		Remark
-	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	37.746	-10.87	29.89	19.02	40.00	-20.98	Peak
2	46.340	-10.00	29.54	19.54	40.00	-20.46	Peak
3	100.361	-11.75	28.50	16.75	43.50	-26.75	Peak
4	194.709	-11.40	28.95	17.55	43.50	-25.95	Peak
5	392.095	-6.86	29.27	22.41	46.00	-23.59	Peak
6	930.638	1.74	30.19	31.93	46.00	-14.07	Peak

Above 1GHz (worst case for 8DPSK):

Frequency	Receiver		Turntable Angle Rx Antenna		Factor	Absolute Level	Limit	Margin		
(MHz)	Reading	PK/AV	Degree	Height	Polar	(dB / m)	(dBuV/m)	(dBuV/m)	(dB)	
	(dBuV)	ΓΛ/Αν	Degree	(m)	(H/V)		````			
	Low Channel									
2310	46.83	PK	299	1.8	Н	-7.23	39.60	74	-34.40	
2310	46.10	PK	212	1.8	V	-7.23	38.87	74	-35.13	
2390	50.06	PK	222	2.0	Н	-7.21	42.85	74	-31.15	
2390	53.06	PK	29	1.8	V	-7.21	45.85	74	-28.15	
4804	50.73	PK	279	2.0	Н	-3.52	47.21	74	-26.79	
4804	52.10	PK	293	1.2	V	-3.52	48.58	74	-25.42	
				Middle C	hannel					
4882	52.97	РК	206	1.5	Н	-3.37	49.60	74	-24.40	
4882	53.95	PK	266	1.3	V	-3.37	50.58	74	-23.42	
				High Ch	annel					
2483.5	60.22	РК	165	1.7	Н	-7.2	53.02	74	-20.98	
2483.5	49.53	РК	322	1.5	V	-7.2	42.33	74	-31.67	
2500	50.66	PK	2	2.0	Н	-7.18	43.48	74	-30.52	
2500	49.28	РК	174	1.7	V	-7.18	42.10	74	-31.90	
4960	53.90	PK	343	1.6	Н	-3.01	50.89	74	-23.11	
4960	54.21	PK	14	1.1	V	-3.01	51.20	74	-22.80	

Note:

Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Absolute Level (Corrected Amplitude) = Factor + Reading

Margin = Absolute Level – Limit

The other spurious emission which is in the noise floor level was not recorded.

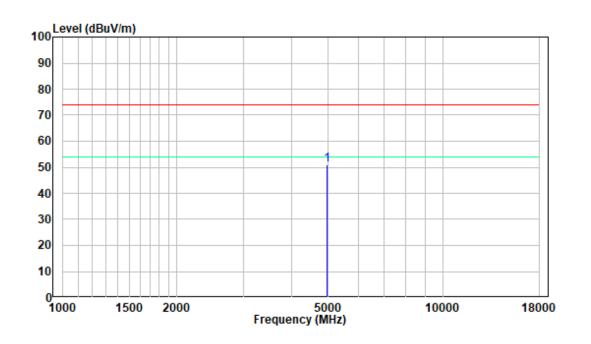
For above 1GHz, the test result of peak was 20dB below to the limit of peak, which can be compliant to the average limit, so just peak value was recorded.

Shenzhen Accurate Technology Co., Ltd.

Report No.: RA221110-53019E-RF

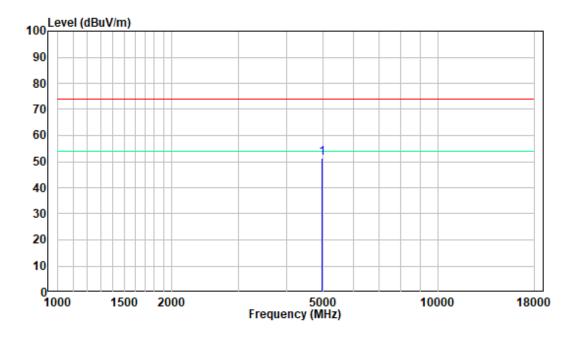
1 GHz - 18 GHz: (Pre-Scan plots)

Worst case for 8DPSK High Channel:



Horizontal





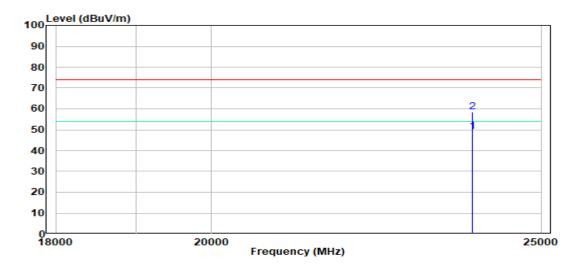
Version 11: 2021-11-09

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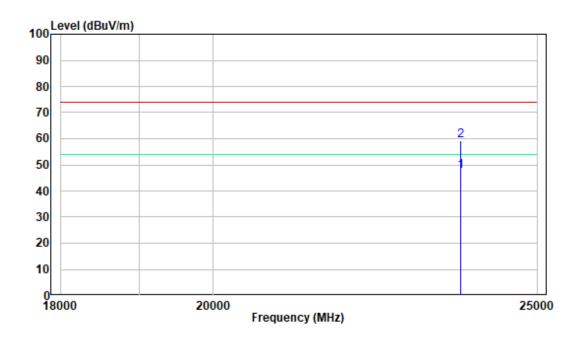
18-25GHz: (Pre-Scan plots)

Worst case for 8DPSK High Channel:

Horizontal



Vertical



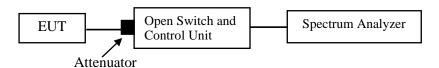
FCC §15.247(a) (1)-CHANNEL SEPATATION TEST

Applicable Standard

Frequency hopping systems 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, 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:	24 °C 48 %			
Relative Humidity:				
ATM Pressure:	101.0 kPa			

The testing was performed by Glenn Jiang on 2022-11-17.

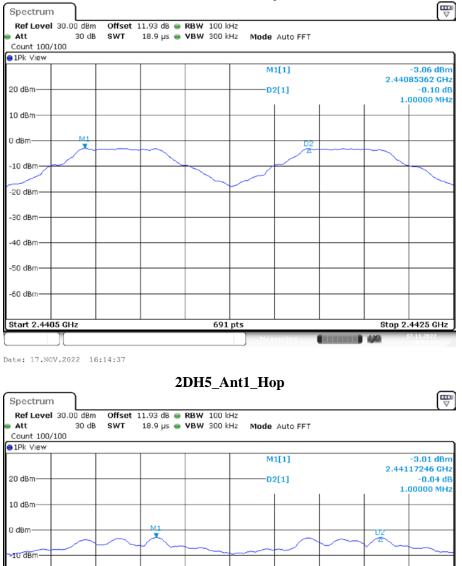
EUT operation mode: Transmitting

Test Result: Compliant.

Test Mode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Нор	1	>=0.716	PASS
2DH5	Ant1	Нор	1	>=0.904	PASS
3DH5	Ant1	Нор	1	>=0.866	PASS

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

Please refer to the below plots:



DH5_Ant1_Hop

Date: 17.NOV.2022 16:23:24

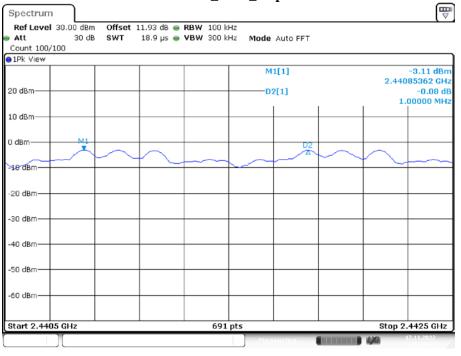
Start 2.4405 GHz

-20 dBm -30 dBm -40 dBm -50 dBm -60 dBm

691 pts

Stop 2.4425 GHz

Shenzhen Accurate Technology Co., Ltd.



3DH5_Ant1_Hop

Date: 17.NOV.2022 16:34:14

FCC §15.247(a) (1) – 20 dB EMISSION BANDWIDTH & 99% OCCUPIED 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

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.

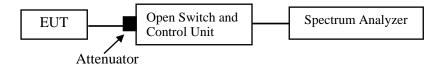
• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

• 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 °C				
Relative Humidity:	48 %				
ATM Pressure:	101.0 kPa				

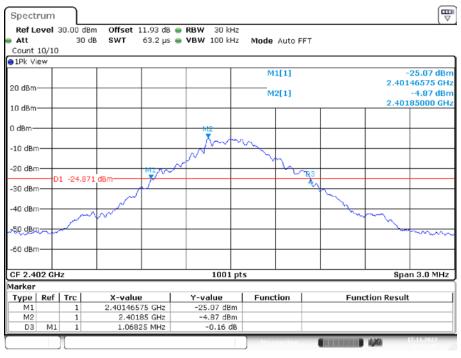
The testing was performed by Glenn Jiang on 2022-11-17.

EUT operation mode: Transmitting

Test Result: Compliant.

Test Mode	Antenna	Channel	20db EBW[MHz]	99% OCCUPIED BANDWIDTH[MHz]	Verdict
		2402	1.068	0.959	PASS
DH5	Ant1	2441	1.064	0.971	PASS
		2480	1.074	0.983	PASS
	Ant1	2402	1.341	1.229	PASS
2DH5		2441	1.344	1.244	PASS
		2480	1.356	1.253	PASS
		2402	1.299	1.22	PASS
3DH5	Ant1	2441	1.293	1.226	PASS
		2480	1.293	1.226	PASS

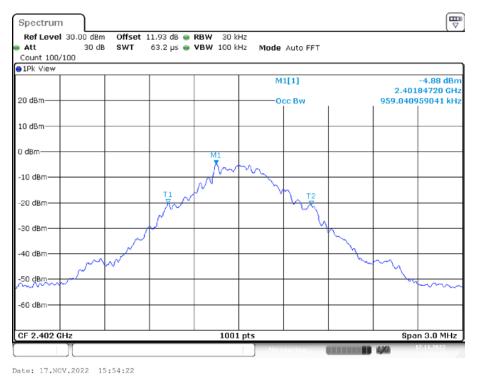
Please refer to the below plots:



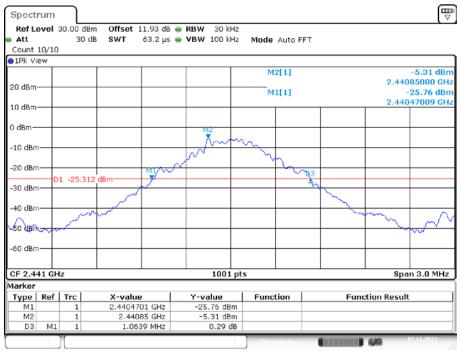
20 dB EMISSION BANDWIDTH_DH5_Ant1_2402

Date: 17.NOV.2022 15:54:05





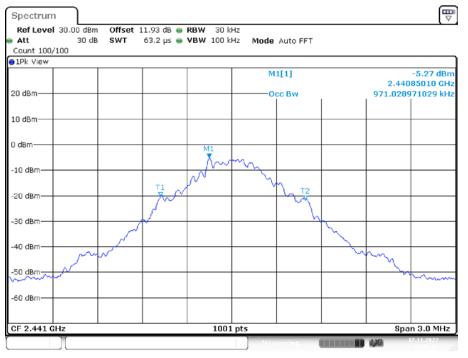
Version 11: 2021-11-09



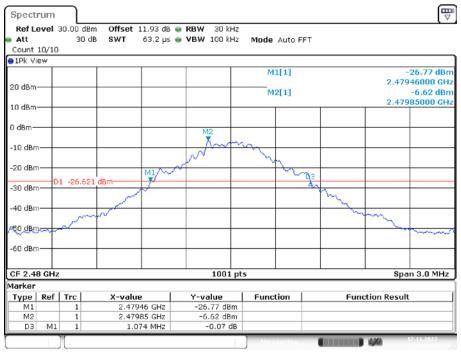
20 dB EMISSION BANDWIDTH_DH5 _Ant1_2441

Date: 17.NOV.2022 15:55:50





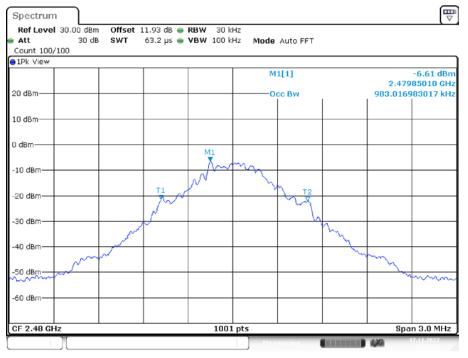
Date: 17.NOV.2022 15:56:07



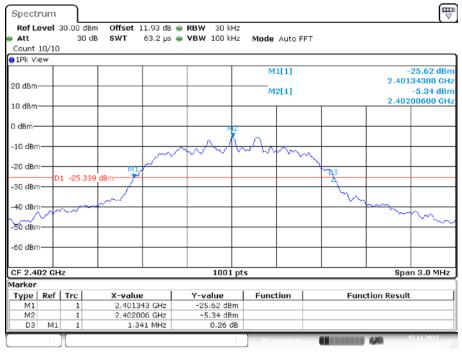
20 dB EMISSION BANDWIDTH_DH5 _Ant1_2480

Date: 17.NOV.2022 15:57:14





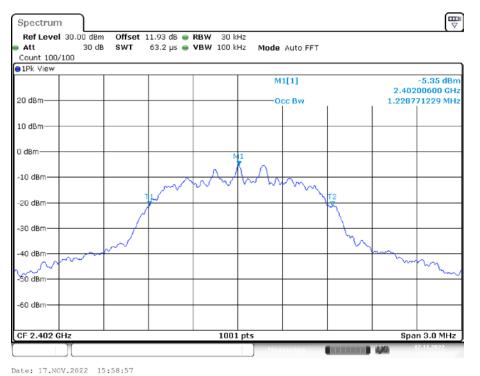
Date: 17.NOV.2022 15:57:31

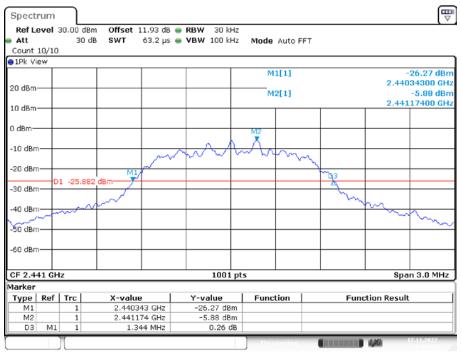


20 dB EMISSION BANDWIDTH_2DH5 _Ant1_2402

Date: 17.NOV.2022 15:58:41



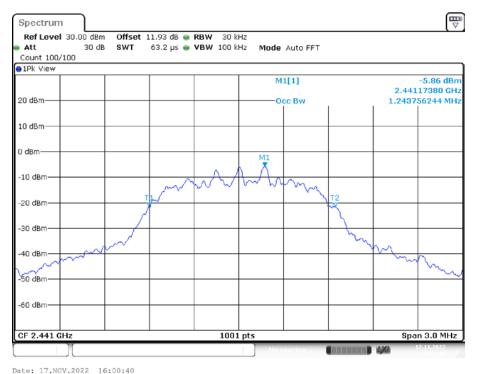


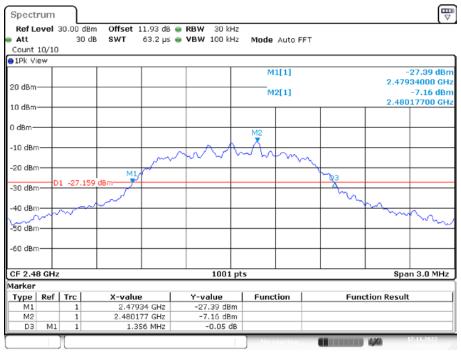


20 dB EMISSION BANDWIDTH_2DH5 _Ant1_2441

Date: 17.NOV.2022 16:00:23



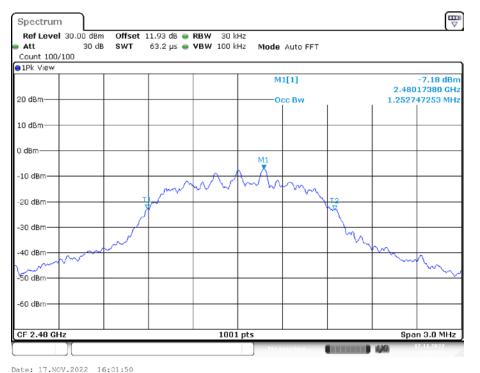


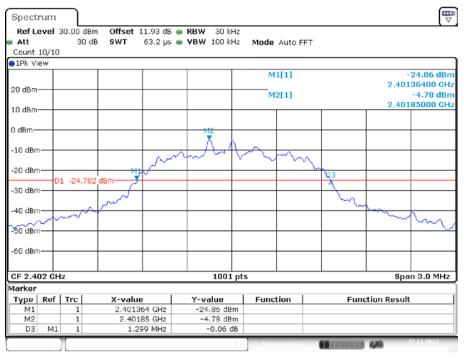


20 dB EMISSION BANDWIDTH _2DH5_Ant1_2480

Date: 17.NOV.2022 16:01:33



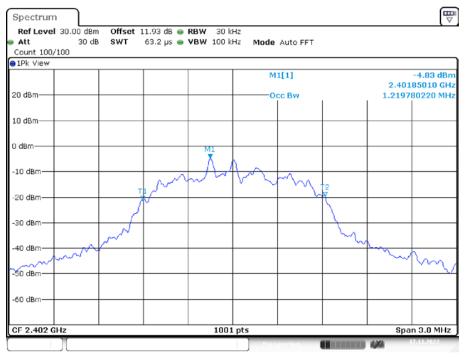




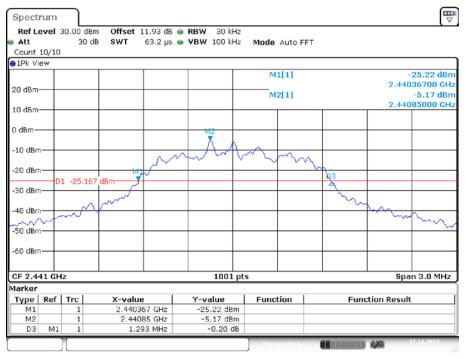
20 dB EMISSION BANDWIDTH_3DH5_Ant1_2402

Date: 17.NOV.2022 16:04:36





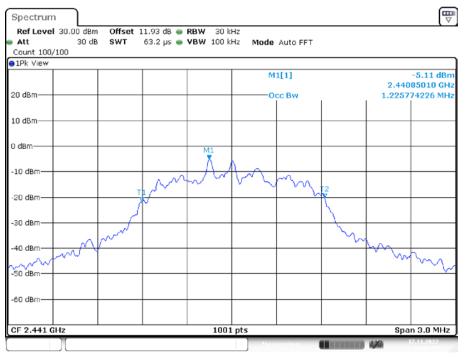
Date: 17.NOV.2022 16:04:54



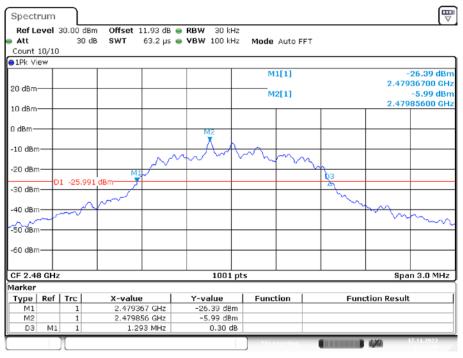
20 dB EMISSION BANDWIDTH_3DH5_Ant1_2441

Date: 17.NOV.2022 16:06:40





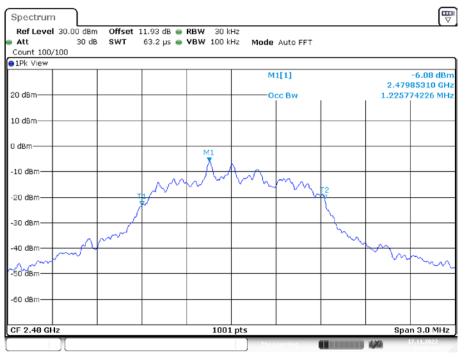
Date: 17.NOV.2022 16:06:57



20 dB EMISSION BANDWIDTH_3DH5_Ant1_2480

Date: 17.NOV.2022 16:11:41





Date: 17.NOV.2022 16:12:11

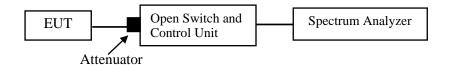
FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST

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:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

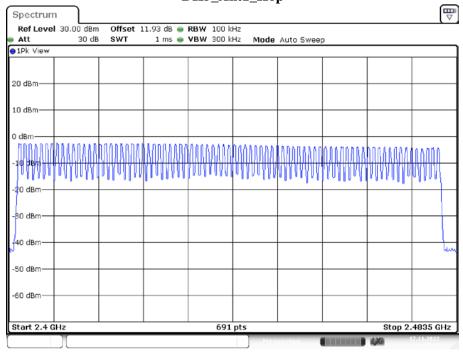
The testing was performed by Glenn Jiang on 2022-11-17.

EUT operation mode: Transmitting

Test Result: Compliant.

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

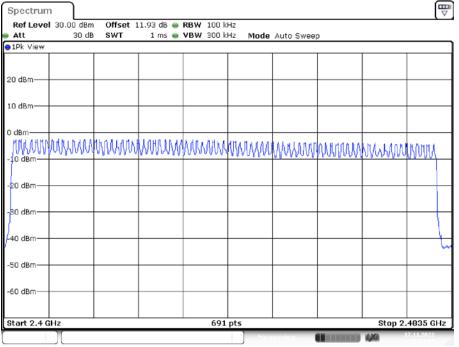
Please refer to the below plots:



DH5_Ant1_Hop

Date: 17.NOV.2022 16:15:19

2DH5_Ant1_Hop



Date: 17.NOV.2022 16:24:13

Shenzhen Accurate Technology Co., Ltd.

			•		5_ A	IIUI.		'P'			_
Spectrum											
Ref Level Att	30.00 dBm 30 dB		11.93 dB 👄 1 ms 👄		100 kH						
1Pk View	30 ae	SWI	i ms 🖷	VBW	300 KM	12 [vioae	Auto Swee	p		
1PK VIEW											
20 dBm											
LO dBm											
) dBm											
MIMM	uwunn	MUMU	uuuu	mm	MUL	M	WW	ותגגתתגאוו	NUUUN	መስለአኒስስለ	наны
0 dBm				<u> </u>				9-20-4-2-2-4		1000000000	540046
20 dBm-+				+							
30 dBm											
											}
· I											I 1
40 dBm —				-							 {
50 dBm											
60 dBm —											
Start 2.4 GH	lz				691	pts				Stop 2	.4835 GHz
	1						Mea	suring		430	17.11.2022
										-	

3DH5_Ant1_Hop

Date: 17.NOV.2022 16:35:38

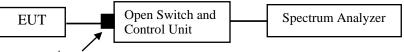
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

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 \geq 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



Attenuator

Test Data

Environmental Conditions

Temperature:	24 °C		
Relative Humidity:	48 %		
ATM Pressure:	101.0 kPa		

The testing was performed by Glenn Jiang on 2022-11-17.

EUT operation mode: Transmitting

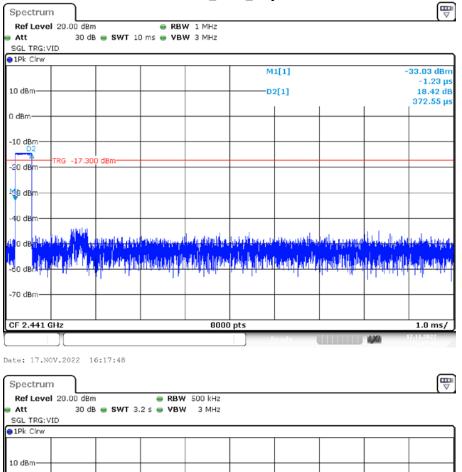
Test Result: Compliant.

Test Mode	Antenna	Channel	Burst Width [ms]	Total Hops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Нор	0.37	320	0.118	<=0.4	PASS
DH3	Ant1	Нор	1.62	160	0.259	<=0.4	PASS
DH5	Ant1	Нор	2.86	130	0.372	<=0.4	PASS
2DH1	Ant1	Нор	0.38	330	0.125	<=0.4	PASS
2DH3	Ant1	Нор	1.63	180	0.293	<=0.4	PASS
2DH5	Ant1	Нор	2.87	110	0.316	<=0.4	PASS
3DH1	Ant1	Нор	0.38	320	0.122	<=0.4	PASS
3DH3	Ant1	Нор	1.63	170	0.277	<=0.4	PASS
3DH5	Ant1	Нор	2.87	120	0.344	<=0.4	PASS

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

Note 2: Total Hops =Hopping Number in 3.16s*10

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



DH1_Ant1_Hop

Date: 17.NOV.2022 16:17:53

-17

dBr

н

0 dBm—

-20 dBn -30 dBn

-60 dBm-

CF 2.441 GHz

Version 11: 2021-11-09

30000 pts

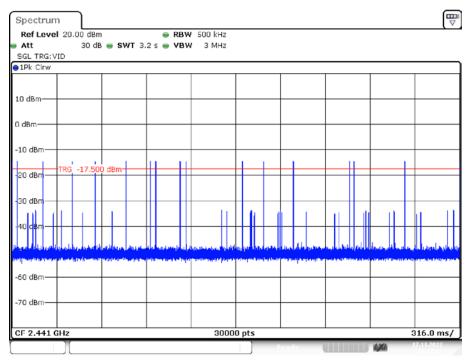
316.0 ms/

LXI

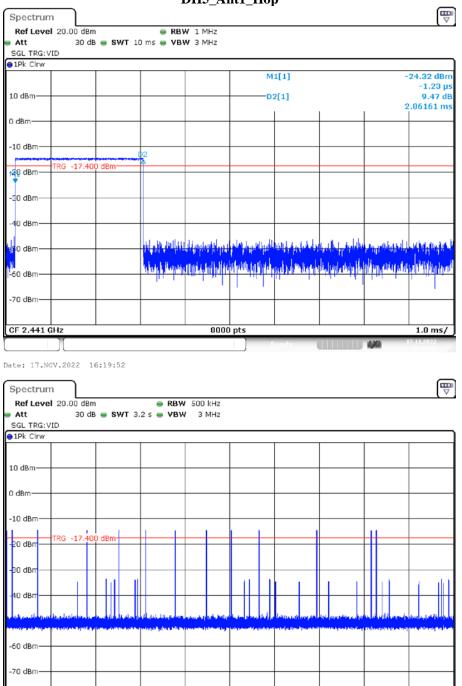
SGL TRG:VID 1Pk Cirw								
				м	1[1]		-	16.65 dBn 25 n
0 dBm				D	2[1]		. 1	1.77 di 1.62020 m
dBm								
10 dBm 11 10 dBm 17RG	-17.500 dBm							
0 dBm								
0 dBm								
0 dBm	i function and the	ahterahanatihe	and the second	Alitheoly	and a state of the	http://www.	<mark>alad</mark> hilang	the share of the
	lite new shile and	hili bi de parkt	that maked	Reported al.	na koliny na kili,	internet	ollow Addull	hala la harad
0 dBm			1.1.1.1.1	10.1	r "I			1.4.2
50 dBm	1.6.1						1	1

DH3_Ant1_Hop

Date: 17.NOV.2022 16:17:17



Date: 17.NOV.2022 16:17:23



DH5_Ant1_Hop

Date: 17.NOV.2022 16:19:58

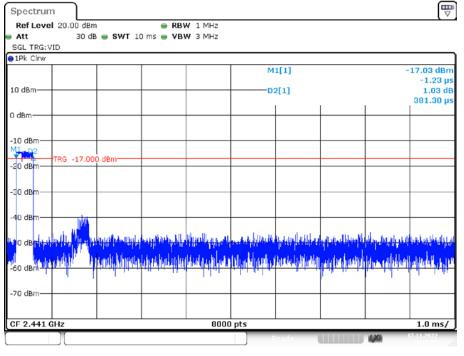
CF 2.441 GHz

Version 11: 2021-11-09

30000 pts

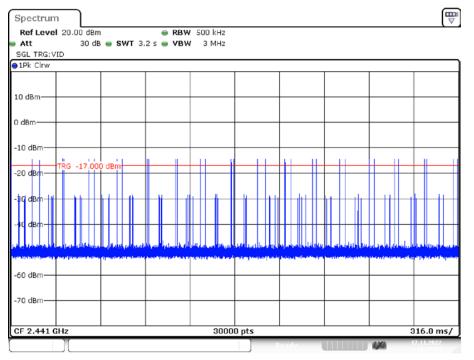
316.0 ms/

LXI

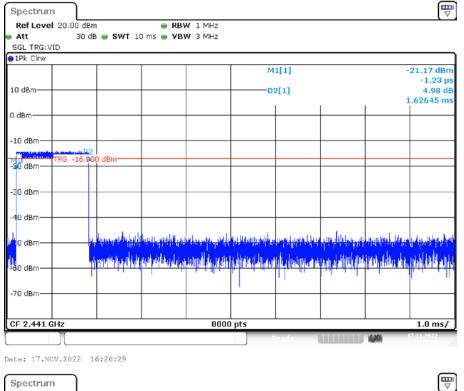


2DH1_Ant1_Hop

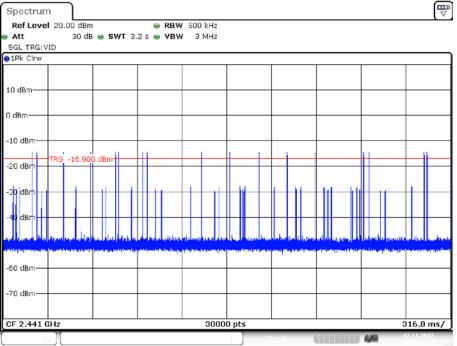
Date: 17.NOV.2022 16:26:57



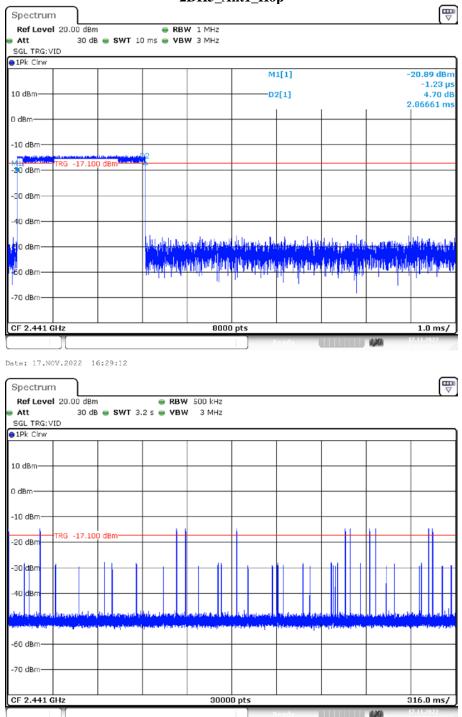
Date: 17.NOV.2022 16:27:02



2DH3_Ant1_Hop

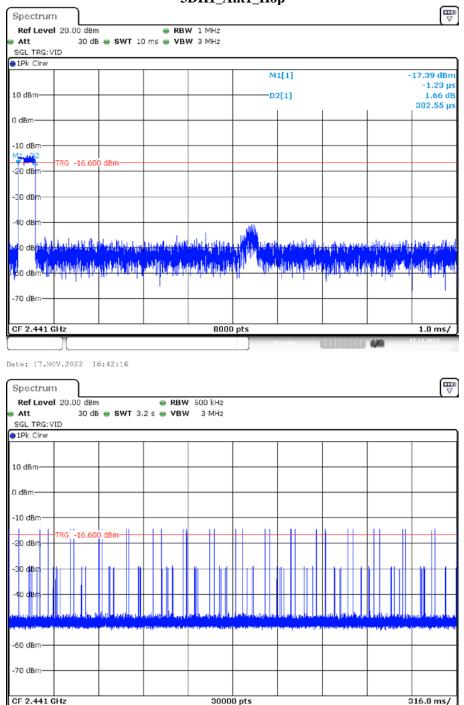


Date: 17.NOV.2022 16:26:34



2DH5_Ant1_Hop

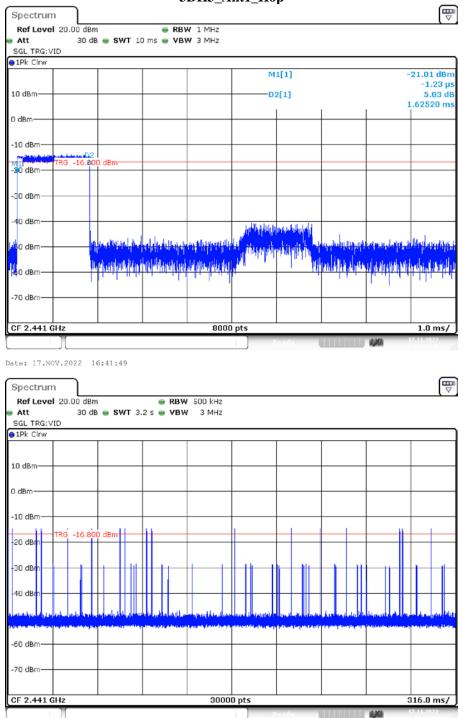
Date: 17.NOV.2022 16:29:18



3DH1_Ant1_Hop

Date: 17.NOV.2022 16:42:22

LXI



3DH3_Ant1_Hop

Date: 17.NOV.2022 16:41:54

SGL TRG:VID 1Pk Cirw								
				м	1[1]		-	-16.89 dBn -1.23 μ
LO dBm		_		D	2[1]			0.89 di
					1	1	2	2.86786 m
) dBm								
10 dBm								
11	مريون المراجع مان المراجع و الم	<u></u>						
20 dBm	-16.600 dBm							
30 dBm								
40 dBm								
		and to make		مار العراق	while dealers	nutter as a	1	and the
50 dBm		a nimit hit had a sh	and and little	bill a bildedine	liter territer and the state of the		, upper provide a segur	and a state of the
		n n juliki ka di	aldMallain	es a de la de la decidad	di Kada di Katika di	the late	ide the state of the	an I A Man I I
60 dBm		- 1- 14 H		1111	1.1.1.1		1. 1.4.1	1 1 1 1
70 dBm			-					
F 2.441 GHz			8000					1.0 ms/
:F 2.441 GHZ			8000	pts				1.0 ms/
					(eady		4,40	

3DH5_Ant1_Hop

 Spectrum
 Ref Level 20.00 d8m
 RBW 500 kHz

 Att
 30 d8
 SWT 3.2 s
 VBW 3 MHz

 SGL TRG: VID
 Image: Superstand state of the state

Date: 17.NOV.2022 16:44:21

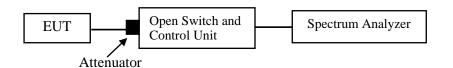
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

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:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

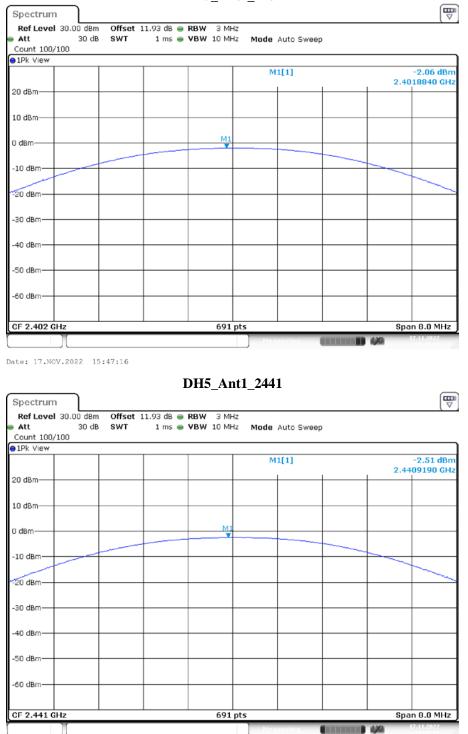
The testing was performed by Glenn Jiang on 2022-11-17.

EUT operation mode: Transmitting

Test Result: Compliant.

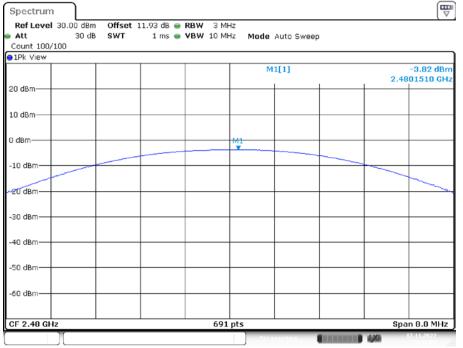
Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
		2402	-2.06	<=20.97	PASS
DH5	Ant1	2441	-2.51	<=20.97	PASS
		2480	-3.82	<=20.97	PASS
	Ant1	2402	-1.38	<=20.97	PASS
2DH5		2441	-1.81	<=20.97	PASS
		2480	-3.14	<=20.97	PASS
		2402	-1.07	<=20.97	PASS
3DH5	Ant1	2441	-1.43	<=20.97	PASS
		2480	-2.65	<=20.97	PASS

Please refer to the below plots:



DH5_Ant1_2402

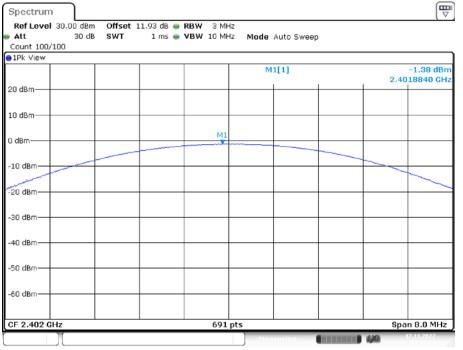
Date: 17.NOV.2022 15:47:33



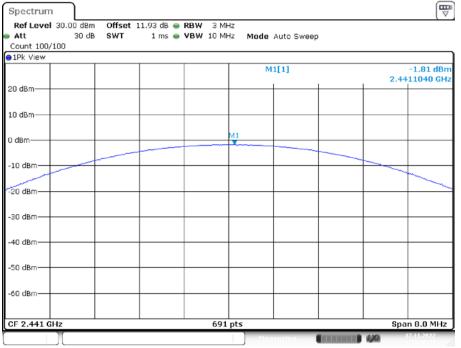
DH5_Ant1_2480

Date: 17.NOV.2022 15:48:03

2DH5_Ant1_2402



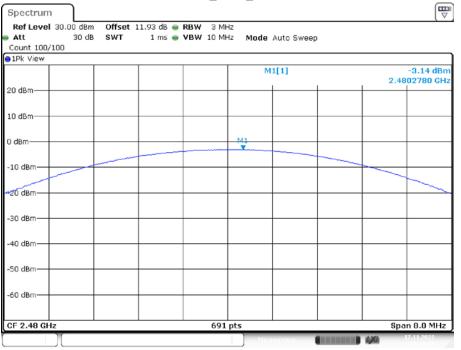
Date: 17.NOV.2022 15:48:22



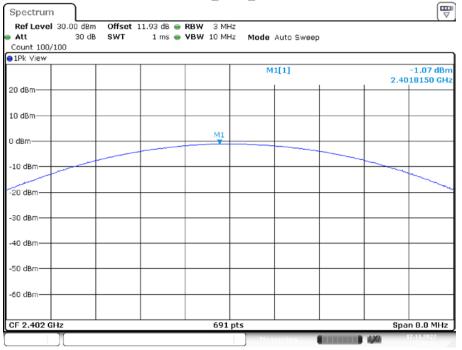
2DH5_Ant1_2441

Date: 17.NOV.2022 15:48:37

2DH5_Ant1_2480



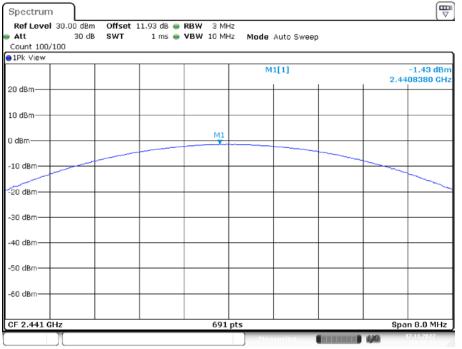
Date: 17.NOV.2022 15:49:50



3DH5_Ant1_2402

Date: 17.NOV.2022 15:50:13

3DH5_Ant1_2441



Date: 17.NOV.2022 15:50:34

20 dBm	65 dBm 170 GHz
Count 100/100	
20 dBm	
20 dBm	
10 dBm	
0 dBm	
-10 dBm	
20 dBm	
-30 dBm-	
-40 dBm	
-50 d8m-	
-60 dBm	
CF 2.49 GHz 691 pts Span 8.	0 MU-2
Gr 2.40 Gr 2.4	2022

3DH5_Ant1_2480

Date: 17.NOV.2022 15:50:47

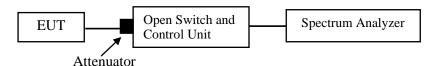
FCC §15.247(d) - BAND EDGES TESTING

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:	24 °C
Relative Humidity:	48 %
ATM Pressure:	101.0 kPa

The testing was performed by Glenn Jiang on 2022-11-17.

EUT operation mode: Transmitting

Test Result: Compliant

Please refer to the below plots:

DH5: Band Edge-Left Side Hopping

Spectrum									
Ref Level				RBW 100 kHz					
Att		dB SWT 246	.5 µs 👄 '	VBW 300 kHz	Mode	Auto F	FΤ		
Count 300/	300								
1Pk View									
					M	1[1]			-2.74 dBn
10 dBm									2.403100 GH
					M	2[1]			-49.65 dBn
0 dBm									2.400000 0#1
									- U
-10 dBm		+ +							- Mi
-20 dBm									1
-20 aBM-	D1 -22.7	40 dBm							
-30 dBm									
00 00.00									
-40 dBm				1914					
		monumen	1.01. 10		B.A.A				M3 M2
SO aBm	www	mm	Man Mar		~ Mana	of mound	moning	Anner	wanth hall and
I									
-60 dBm									
-70 dBm									
-/ 0 ubiii									
Start 2.3 G				601					01
	HZ			691 p	LS				Stop 2.405 GHz
larker	1 - 1				1 -				
	Trc	X-value	0112	Y-value	Func	tion		Function	Result
M1 M2	1	2.4031 2.4		-2.74 dBm -49.65 dBm					
M2 M3	1	2.4		-49.65 dBm					
M4	1	2.349609		-45.63 dBm					
	1				-	_			12 11 2022

Date: 17.NOV.2022 16:13:11

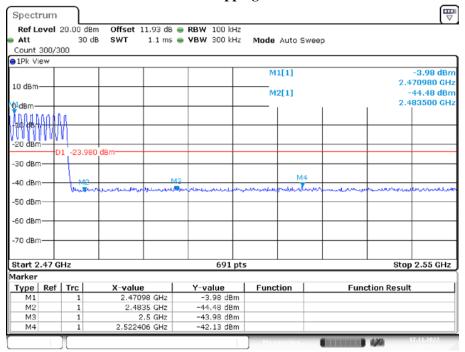
Single

Spectrum									T)
Ref Level				BW 100 kHz					
Att	30 0	ib SWT 246	.5 µs 🖷 V	BW 300 kHz	Mode	Auto Fl	FT		
Count 300/3	00								
1Pk View									
I					M	1[1]			-2.78 dBr
LO dBm									2.401880 GH
I					M	2[1]			-48.12 dBr
) dBm		+ +				I	1	1	2.400000161
									1
10 dBm									
20 dBm									
	1 -22.78	0 dBm							
30 dBm —									
-40 dBm		+	M4						
National Arrestory of the		porta di se di secono	T	inter a contra				M	3
se asm	and the set	mana	the prover		Particult	- Maria		1.2016 ADM	o www.
60 dBm									
70 dBm									
tart 2.3 GF	17			691 pt	·c				top 2.405 GHz
larker				0,110					(op 21100 driz
	Trc	X-value	1	Y-value	Func	tion		Function Re	sult
M1	1	2.40188		-2.78 dBm	runc			unction R	53410
M2	1	2.4		-48.12 dBm					
M3	1	2.39		-49.67 dBm					
M4	1	2.33713	GHz	-46.62 dBm					
	7)				17 11 2022

Date: 17.NOV.2022 15:54:37

Version 11: 2021-11-09

DH5: Band Edge- Right Side Hopping



Date: 17.NOV.2022 16:18:21

Spectrum Ref Level 20.00 dBm Offset 11.93 dB 👄 RBW 100 kHz Att 30 dB SWT 1.1 ms 👄 VBW 300 kHz Mode Auto Sweep Count 300/300 ●1Pk View M1[1] 4.52 dBn 2.480010 GHz 10 dBm M2[1] -43.69 dBm 2.483500 GHz 0 dBm -10 dBm -20 dBm -24.520 dBm -30 dBm мз 40 dBr A AN men mound -50 dBm -60 dBr -70 dBm Start 2.47 GHz 691 pts Stop 2.55 GHz Marker -4.52 dBm Function Result Type Ref Trc X-value Function 2.48001 GHz M1 1 M2 2.4835 GHz -43.69 dBm 1 МЗ 2.5 GHz -42.10 dBm M4 1 2.518696 GHz -41.31 dBm

Single

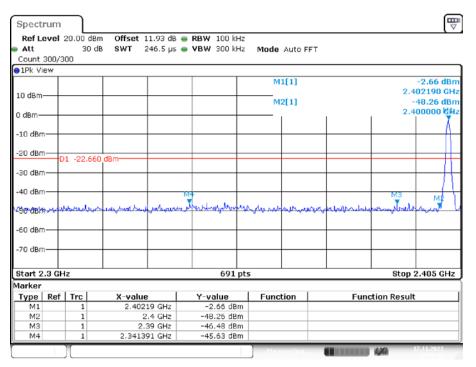
Date: 17.NOV.2022 15:57:46

2DH5: Band Edge-Left Side Hopping

Spect	um												
	evel	20.00					100 kHz						
Att) dB	SWT	246.5 µs	VBW	300 kHz	Mode	Auto F	FT			
Count		00											
∎1Pk Vi	BW												
								M	1[1]				-2.63 dBr
10 dBm-	+				<u> </u>				0111				404160 GH
								M	2[1]				-46.86 dBr 400000 GH
0 dBm—	+					-			1	1		1 2.	400000 GM
-10 dBm													I M
•10 GRU													
20 dBm	\rightarrow												
20 000	P	1 -22.6	530 dBr	n									
30 dBm	+		_		<u> </u>								+
-40 dBm			-				1914					M3	M
ann	سريس		mare	وموسيعصم	mero	ur m	werden	num	mark	waynes	بمسليمية	my	Inperio
-S0 dBm	*+											1	
-60 dBm													
-co ubii													
-70 dBm	\rightarrow		_										
Start 2	2 CL	1					691 pts					Ston	2.405 GHz
larker	.ə GF	12					091 hts	,				atup	2.403 GHZ
	n - 6				- 1		-1	Fund		1			
Type M1	Ret	Trc 1		X-valu	e 16 GHz		alue 2.63 dBm	Fund	tion		Fun	ction Resu	t
M2		1			2.4 GHz		2.03 dBm 6.86 dBm						
M3		1			.39 GHz		8.24 dBm						
M4		1			804 GHz		5.87 dBm						
		11						-	_				17 11 2022

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Single



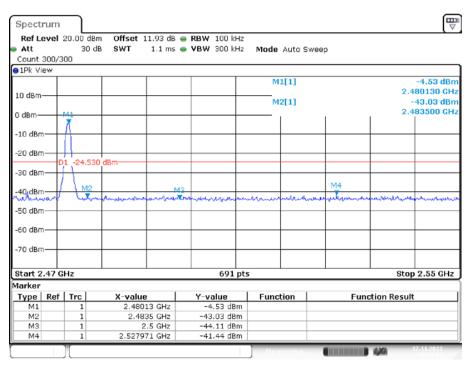
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2DH5: Band Edge- Right Side Hopping

Spectrum						
Ref Level Att Count 300/3	30		 RBW 100 kHz VBW 300 kHz 	Mode Auto S	weep	,
1Pk View						
10 dBm				M1[1]		-3.88 dBn 2.472950 GH
0 dêh				M2[1]		-42.64 dBn 2.483500 GH
PAN ANNA	ų.					
-20 dBm	01 -23.8	80 dBm				
-30 dBm			M4			
-40 dBm	M2		M3	menter	un market war	- marken and the marked an
-50 dBm						
60 dBm						
-70 dBm						
Start 2.47 0	GHz		691 pts	;	l	Stop 2.55 GHz
1arker						
	Trc	X-value	Y-value	Function	Fun	ction Result
M1	1	2.47295 GHz	-3.88 dBm			
M2 M3	1	2.4835 GHz	-42.64 dBm			
M3 M4	1	2.5 GHz 2.506174 GHz	-42.72 dBm -40.97 dBm			
	1			Measuring.		17.11.2022

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Single



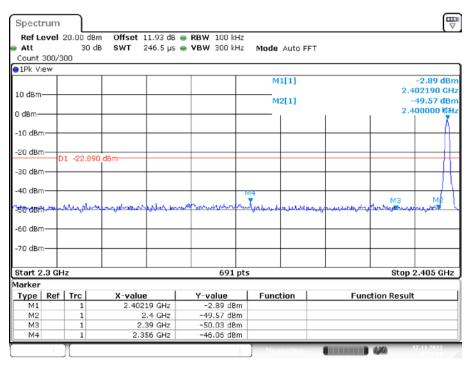
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3DH5: Band Edge-Left Side Hopping

Spectru	um .)									
	/el 20.0				RBW 100 kH						
Att		30 dB	SWT 2	246.5 µs	😑 VBW 300 kH	iz Mo	de Auto F	FT			
Count 3											
1Pk Viev	* <u>. </u>										
							M1[1]				-2.65 dBr
10 dBm—	+				_		-				02950 GH
							M2[1]				48.74 dBn
0 dBm	+							1	1	2.4	00000 44
											L M
-10 dBm-											
-20 dBm-											
-20 ubiii-	D1 -2	2.650	dBm								
-30 dBm-	_										
-40 dBm-				M4							
man	man	Manu	بالاستنقام وسع	Nam	a manual a	mana.	manne	may amon	una	M3	M2
-50 dBm-	-							~~~			
-60 dBm-											
-00 ubiii-											
-70 dBm-											
, e abiii											
Start 2.3	2 GHz				691	nts				Stop 2	2.405 GHz
darker					071	,(5				00007	
	Ref Tro	1	X-value	. 1	Y-value	L EI	unction		Functio	on Result	
M1		1		95 GHz	-2.65 dBr						
M2		1		.4 GHz	-48.74 dBi						
MЗ		1	2.	39 GHz	-48.91 dBr	n					
M4		1	2.3	35 GHz	-43.77 dB	n					
										MA	7.11.2022

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Single



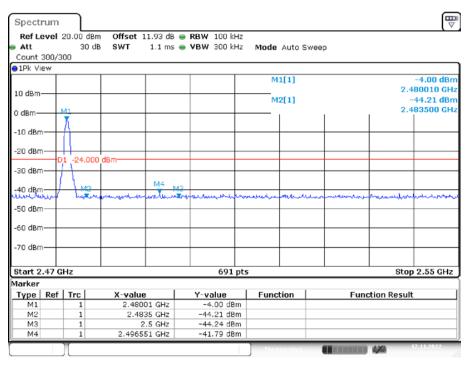
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3DH5: Band Edge- Right Side Hopping

Spectrum						E ⊽
Ref Level Att Count 300/3	30		iB 👄 RBW 100 kHz ns 👄 VBW 300 kHz		Sweep	
1Pk View						
				M1[1]		-4.05 dBn 2.470870 GH
10 dBm				M2[1]		-43.80 dBn
				M2[1]		2.483500 GH
	Д					
-20 dBm	1 -24.05	50_dBm				
-30 dBm	\leftarrow					
-40 dBm	M2		M3	ang	have a marine should	M4
50 dBm						
60 dBm						
-70 dBm						
Start 2.47 G	Hz		691 p	ts		Stop 2.55 GHz
1arker						
	Trc	X-value	Y-value	Function	Fur	nction Result
M1	1	2.47087 GH				
M2 M3	1	2.4835 GHz				
M3 M4	1	2.5 GHz 2.540261 GHz				
	1			Measuring		17.11.2022

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Single



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

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