



TEST REPORT

Applicant Name : Address : Zeeva International Limited Suite 1007B, 10th Floor, Exchange Tower, 33 Wang Chiu Road, Kowloon Bay, Hong Kong RA221129-57814E-RF 2ADM5-EP-0678-R

Report Number : FCC ID:

Test Standard (s) FCC PART 15.247

Sample Description

Product Type:	S23 IN EAR BEAN TWS
Test Model:	EP-0678B
Trade Mark:	N/A
Date Received:	2022-11-29
Date of Test:	2022-11-30
Report Date:	2022-12-05

Test Result:

Pass*

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

Prepared and Checked By:

Jeff Jiang 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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GENERAL INFORMATION

Product	S23 IN EAR BEAN TWS
Tested Model	EP-0678B
SKU	BLACK - 1922345200510, PINK - 1922345200527 WHITE – 7540016, BLUE - 7540017
UPC	BLACK - 1922345200510, PINK - 1922345200527 WHITE - 1922345200534, BLUE - 1922345200541
Frequency Range	2402~2480MHz
Maximum conducted Peak output power	-5.78dBm
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	RA221110-53018E-RF-S1(RF Radiated Test) RA221110-53018E-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.exe"* was used during testing and the power level was Default Power level 7*.

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.

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 Exemption
	(MHz)	(dBm)	(mW)	F
BDR/EDR	2402-2480	-5	0.32	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.

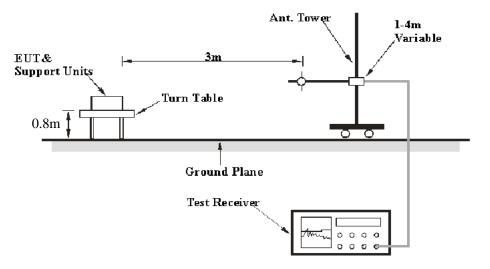
FCC §15.205, §15.209 & §15.247(d) - RADIATED EMISSIONS

Applicable Standard

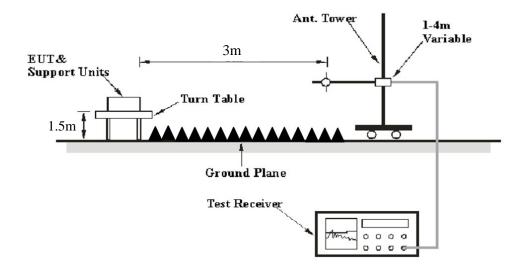
FCC §15.205; §15.209; §15.247(d)

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

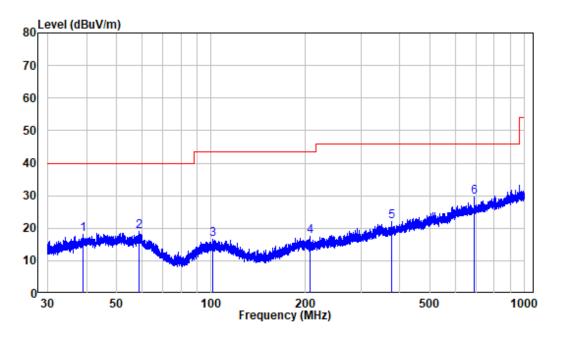
Temperature:	24 °C
Relative Humidity:	60 %
ATM Pressure:	101.0 kPa

The testing was performed by Jimi Zheng on 2022-11-30.

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)

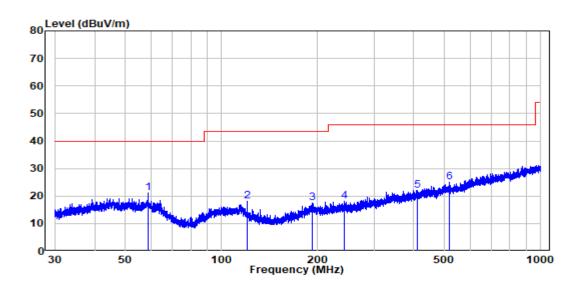
Below 1GHz: 8DPSK Middle Channel



Horizontal

Site :	chamber
Condition:	3m HORIZONTAL
Job No. :	RA221129-57814E-RF
Test Mode:	BT Transmitting

	Freq	Factor			Limit Line		Remark
-	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	38.956	-10.60	28.59	17.99	40.00	-22.01	Peak
2	58.819	-10.20	29.07	18.87	40.00	-21.13	Peak
3	101.289	-11.65	28.14	16.49	43.50	-27.01	Peak
4	207.032	-11.84	29.49	17.65	43.50	-25.85	Peak
5	376.433	-7.24	29.17	21.93	46.00	-24.07	Peak
6	692.290	-1.52	31.00	29.48	46.00	-16.52	Peak



Vertical

Site :	chamber
Condition:	3m VERTICAL
Job No. :	RA221129-57814E-RF
Test Mode:	BT Transmitting

	Freq	Factor			Limit Line		Remark
-	MHz	dB/m	dBuV	dBuV/m	dBuV/m	dB	
1	58.715	-10.17	31.17	21.00	40.00	-19.00	Peak
2	120.013	-13.53	31.61	18.08	43.50	-25.42	Peak
3	193.010	-11.28	28.71	17.43	43.50	-26.07	Peak
4	242.738	-10.74	28.79	18.05	46.00	-27.95	Peak
5	410.383	-6.32	28.29	21.97	46.00	-24.03	Peak
6	517.702	-4.28	29.30	25.02	46.00	-20.98	Peak

Above 1GHz (worst case for 8DPSK):

Frequency	Recei			Factor	Absolute Level	Limit	Margin		
(MHz)	Reading	PK/AV	Degree	Height	Polar	(dB / m)	(dBuV/m)	(dBuV/m)	(dB)
	(dBuV)		Degree	(m)	(H/V)		Ň,		
				Low Ch	annel				
2310	52.77	PK	208	1.5	Н	-7.23	45.54	74	-28.46
2310	53.85	PK	245	2.0	V	-7.23	46.62	74	-27.38
2390	53.72	PK	237	1.4	Н	-7.21	46.51	74	-27.49
2390	54.18	РК	209	1.2	V	-7.21	46.97	74	-27.03
4804	52.78	РК	54	1.5	Н	-3.52	49.26	74	-24.74
4804	53.95	РК	165	1.3	V	-3.52	50.43	74	-23.57
				Middle C	hannel				
4882	51.69	РК	78	1.2	Н	-3.37	48.32	74	-25.68
4882	52.06	РК	324	1.5	V	-3.37	48.69	74	-25.31
				High Ch	annel				
2483.5	52.61	РК	58	1.4	Н	-7.2	45.41	74	-28.59
2483.5	54.07	РК	33	1.1	V	-7.2	46.87	74	-27.13
2500	53.82	PK	214	1.9	Н	-7.18	46.64	74	-27.36
2500	54.6	PK	127	1.5	V	-7.18	47.42	74	-26.58
4960	53.17	РК	205	1.3	Н	-3.01	50.16	74	-23.84
4960	52.2	РК	164	1.9	V	-3.01	49.19	74	-24.81

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.

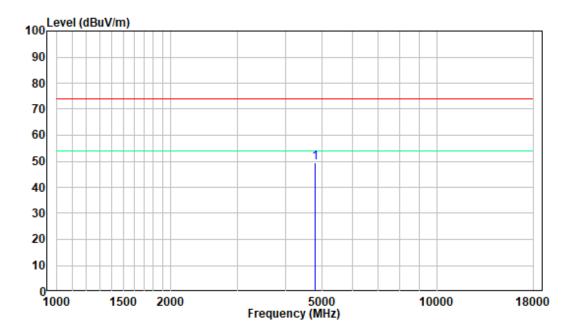
Shenzhen Accurate Technology Co., Ltd.

Report No.: RA221129-57814E-RF

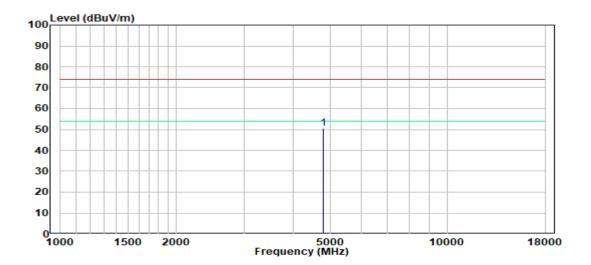
1 GHz - 18 GHz: (Pre-Scan plots)

Worst case for 8DPSK, Low Channel:





Vertical



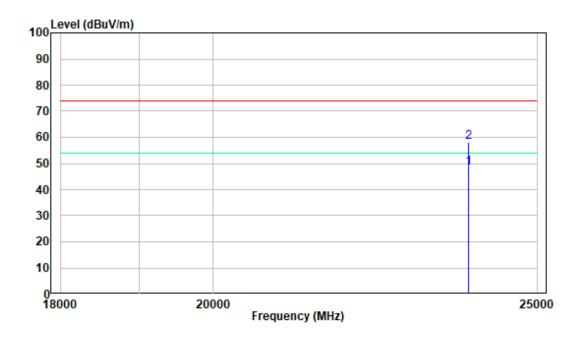
Shenzhen Accurate Technology Co., Ltd.

18-25GHz: (Pre-Scan plots)

Worst case for 8DPSK, Low Channel:

Horizontal

Vertical



Version 11: 2021-11-09

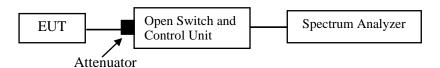
FCC §15.247(a) (1)-CHANNEL SEPARATION TEST

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:	23 °C	
Relative Humidity:	49 %	
ATM Pressure:	101.0 kPa	

The testing was performed by Glenn Jiang on 2022-11-30.

EUT operation mode: Transmitting

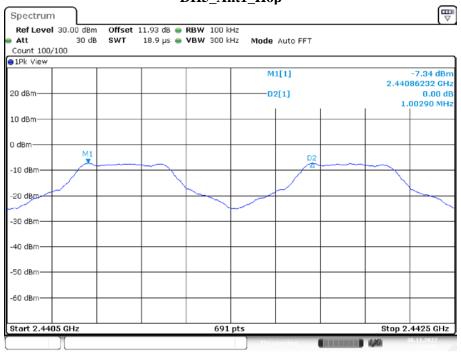
Test Result: Compliant.

Test Mode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Нор	1.003	>=0.636	PASS
2DH5	Ant1	Нор	1.003	>=0.881	PASS
3DH5	Ant1	Нор	1.003	>=0.870	PASS

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

Please refer to the below plots:

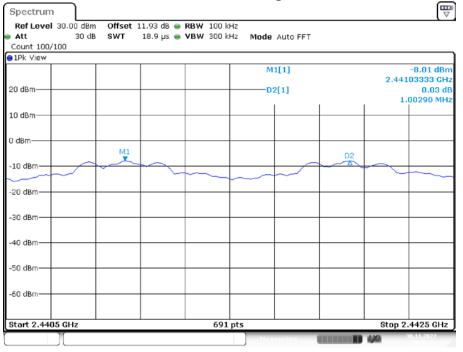
Shenzhen Accurate Technology Co., Ltd.



DH5_Ant1_Hop

Date: 30.NOV.2022 10:34:07

2DH5_Ant1_Hop



Date: 30.NOV.2022 10:45:23

Shenzhen Accurate Technology Co., Ltd.

	• • • • • • • • • • •	- 1	_
Spectrum			
Ref Level 30.00 dBm	Offset 11.93 dB 👄 RBW 100	<hz< th=""><th></th></hz<>	
Att 30 dB	SWT 18.9 µs 👄 VBW 300 🖡	Hz Mode Auto FFT	
Count 100/100			
1Pk View			
		M1[1]	-7.88 dBn
20 dBm		00[1]	2.44118116 GH
20 UBIII		D2[1]	0.05 dE 1.00290 MH
10 dBm			
0 dBm			
	M1		D2
-10 dBm			
~			
-20 dBm			
-30 dBm			
-40 dBm			
- to doin			
-50 dBm			
-50 dBm			
-60 dBm			
Start 2.4405 GHz	691	l pts	Stop 2.4425 GHz
Π (Measuring	
			1100010

3DH5_Ant1_Hop

Date: 30.NOV.2022 11:00:11

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.

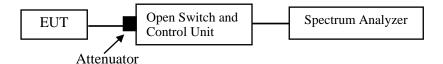
• The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.

• 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:	23 °C
Relative Humidity:	49 %
ATM Pressure:	101.0 kPa

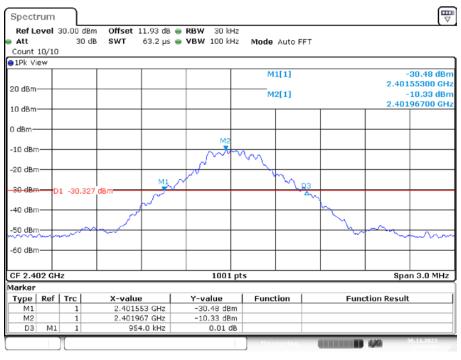
The testing was performed by Glenn Jiang on 2022-11-30.

EUT operation mode: Transmitting

Test Result: Compliant.

Test Mode	Antenna	Channel	20db EBW[MHz]	99% OCCUPIED BANDWIDTH[MHz]	Verdict
		2402	0.954	0.845	PASS
DH5	Ant1	2441	0.954	0.875	PASS
		2480	0.954	0.863	PASS
	2DH5 Ant1	2402	1.319	1.160	PASS
2DH5		2441	1.317	1.196	PASS
		2480	1.322	1.160	PASS
		2402	1.302	1.175	PASS
3DH5 An	Ant1	2441	1.305	1.190	PASS
		2480	1.302	1.175	PASS

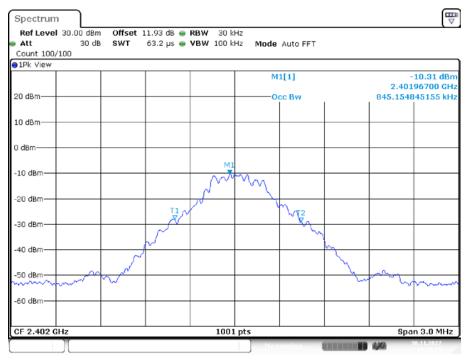
Please refer to the below plots:



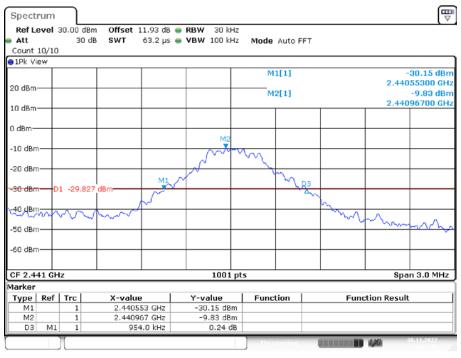
20 dB EMISSION BANDWIDTH_DH5_Ant1_2402

Date: 30.NOV.2022 10:20:08





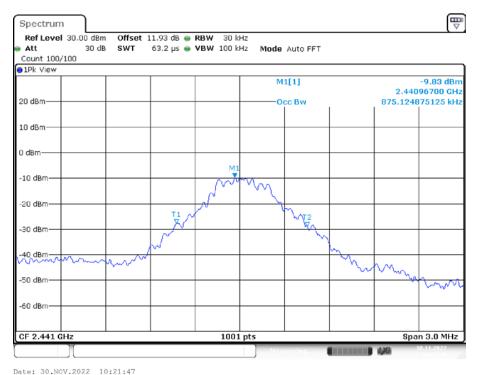
Date: 30.NOV.2022 10:20:25

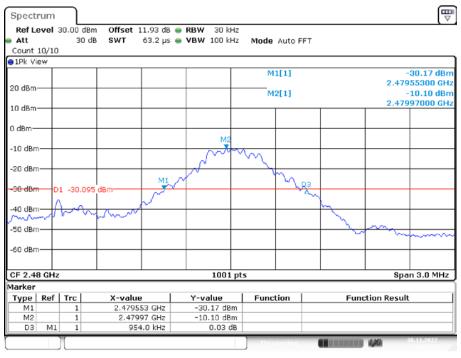


20 dB EMISSION BANDWIDTH_DH5 _Ant1_2441

Date: 30.NOV.2022 10:21:30

99% OCCUPIED BANDWIDTH_DH5 _Ant1_2441

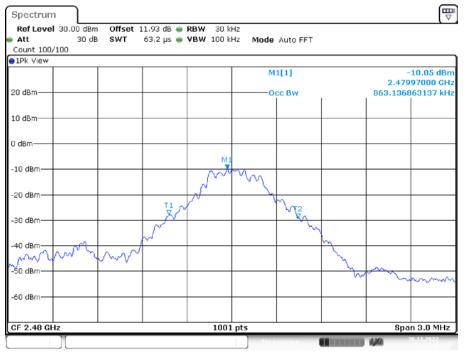




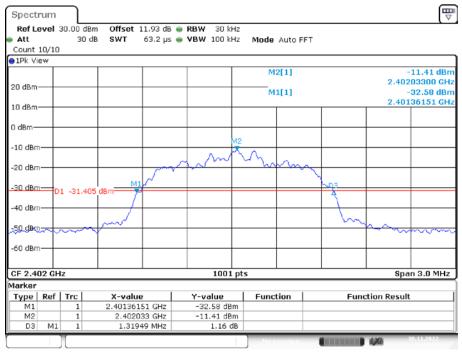
20 dB EMISSION BANDWIDTH_DH5 _Ant1_2480

Date: 30.NOV.2022 10:22:24





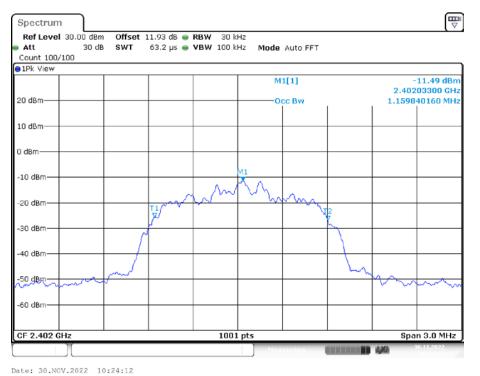
Date: 30.NOV.2022 10:22:41

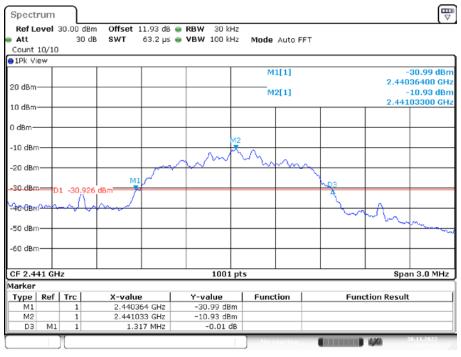


20 dB EMISSION BANDWIDTH_2DH5 _Ant1_2402

Date: 30.NOV.2022 10:23:55



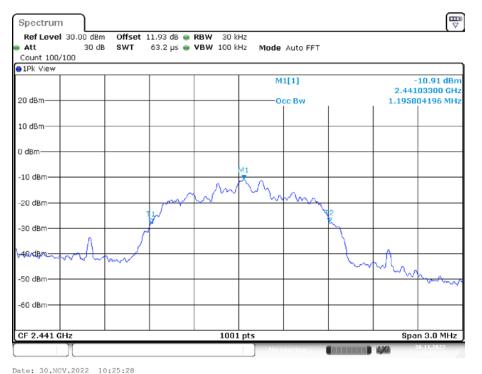


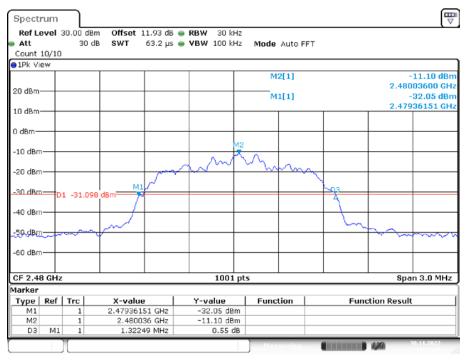


20 dB EMISSION BANDWIDTH_2DH5 _Ant1_2441

Date: 30.NOV.2022 10:25:11







20 dB EMISSION BANDWIDTH _2DH5_Ant1_2480

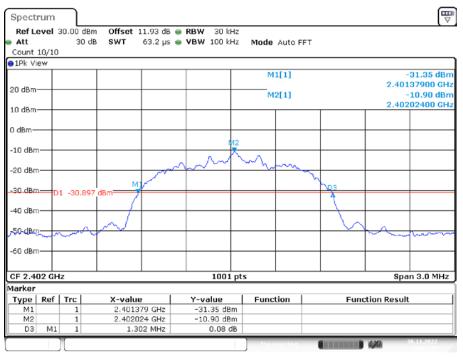
Date: 30.NOV.2022 10:26:20

99% OCCUPIED BANDWIDTH _2DH5_Ant1_2480



Date: 30.NOV.2022 10:26:37

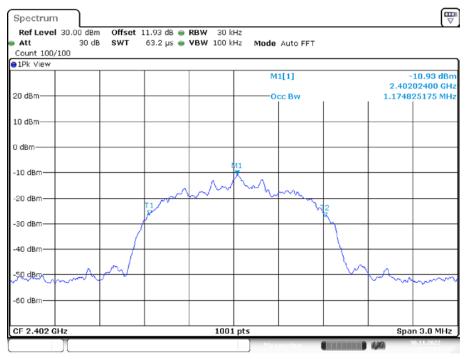
Version 11: 2021-11-09



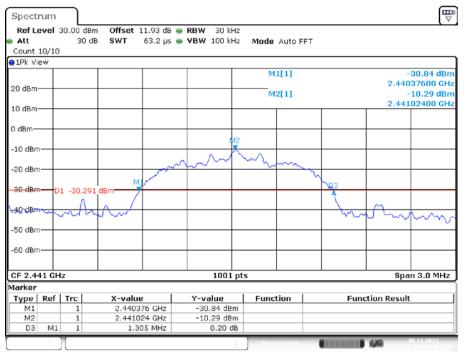
20 dB EMISSION BANDWIDTH_3DH5_Ant1_2402

Date: 30.NOV.2022 10:27:37





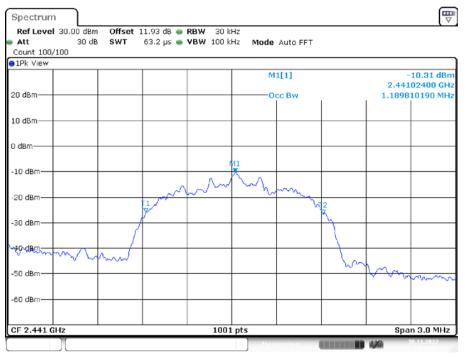
Date: 30.NOV.2022 10:27:54



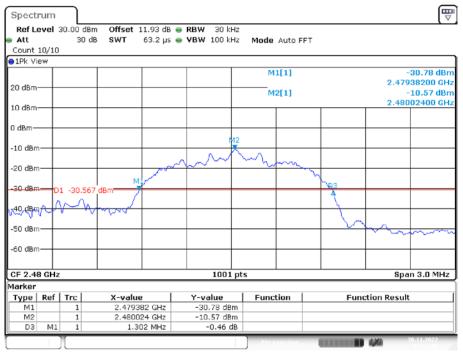
20 dB EMISSION BANDWIDTH_3DH5_Ant1_2441

Date: 30.NOV.2022 10:30:49





Date: 30.NOV.2022 10:31:06



20 dB EMISSION BANDWIDTH_3DH5_Ant1_2480

Date: 30.NOV.2022 10:31:50





Date: 30.NOV.2022 10:32:07

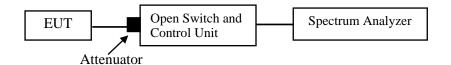
FCC §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST

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:	23 °C
Relative Humidity:	49 %
ATM Pressure:	101.0 kPa

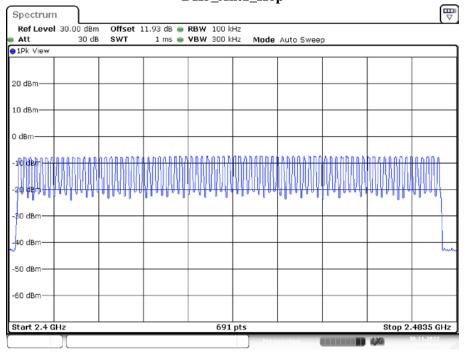
The testing was performed by Glenn Jiang on 2022-11-30.

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

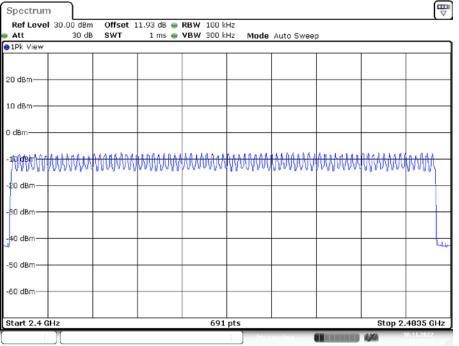
Please refer to the below plots:



DH5_Ant1_Hop

Date: 30.NOV.2022 10:35:31

2DH5_Ant1_Hop



Date: 30.NOV.2022 10:47:12

Shenzhen Accurate Technology Co., Ltd.

Ref Level Att	30.00 dBm 30 dB		11.93 dB 👄 1 ms 🖷				Mode	Auto Swee;	2			
1Pk View	50 GD		1 115	1011	000 K	12	Houe	7010 21166	,			
20 dBm												
10 dBm												
) dBm												
AAAAAAAA	hunn	www	www	MW	MM	₩₩	AAAA	wwww	MHMM	mmm	www	
20 dBm												
30 dBm												
40 dBm												h
50 dBm												
60 dBm												
Start 2.4 GH	-lz				691	pts				Stop 2.	.4835 GI	Hz

3DH5_Ant1_Hop

Date: 30.NOV.2022 11:02:23

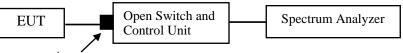
FCC §15.247(a) (1) (iii) - TIME OF OCCUPANCY (DWELL TIME)

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:	23 °C
Relative Humidity:	49 %
ATM Pressure:	101.0 kPa

The testing was performed by Glenn Jiang on 2022-11-30.

EUT operation mode: Transmitting

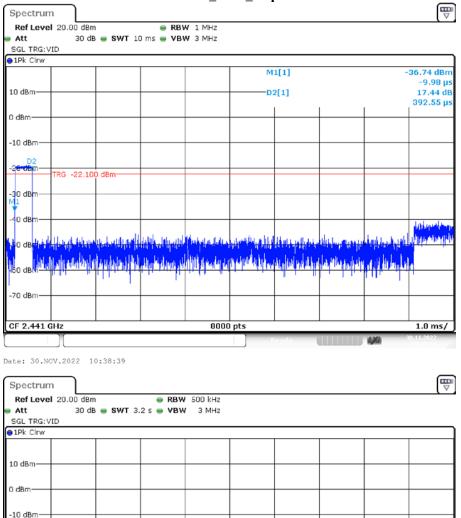
Test Result: Compliant.

Test Mode	Antenna	Channel	Burst Width [ms]	Total Hops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Нор	0.39	330	0.129	<=0.4	PASS
DH3	Ant1	Нор	1.64	150	0.246	<=0.4	PASS
DH5	Ant1	Нор	2.88	120	0.346	<=0.4	PASS
2DH1	Ant1	Нор	0.40	330	0.132	<=0.4	PASS
2DH3	Ant1	Нор	1.65	150	0.248	<=0.4	PASS
2DH5	Ant1	Нор	2.89	120	0.347	<=0.4	PASS
3DH1	Ant1	Нор	0.41	330	0.135	<=0.4	PASS
3DH3	Ant1	Нор	1.65	150	0.248	<=0.4	PASS
3DH5	Ant1	Нор	2.89	110	0.318	<=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: 30.NOV.2022 10:38:44

-22.100 dBm

-20 dBm

-30 dBr -40 dBr

-60 dBm-

CF 2.441 GHz

1 L

30000 pts

h and

316.0 ms/

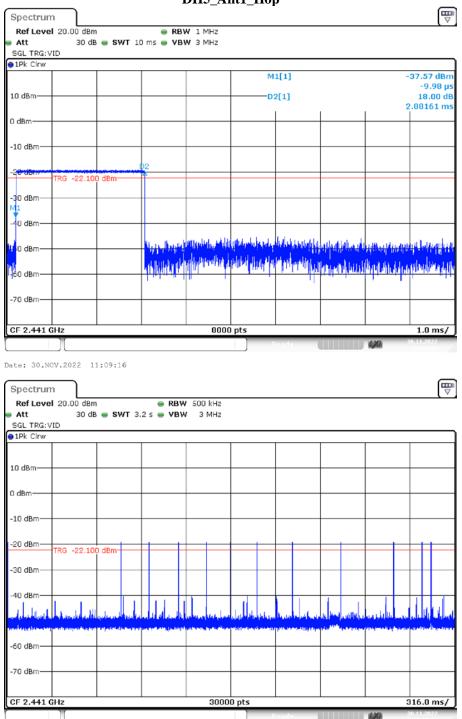
100

1Pk Clrw								
				м	1[1]		-	37.51 dBn -9.98 μ
l0 dBm				D	2[1]			-9.98 µ
							1	.64146 m
) dBm								
10 dBm		_						
0.0	<u>D</u> 2							
TRG	-22.200 dBm							
30 dBm								
1								
40 dBm								
		and and state		da an ta sua	and a kinete	and to the		المراجعة الم
60 dBm	lin i fillt a fa	at fillen so en de la	aliste also a			11 P. 1		the class of the late
60 dBm	Min Wards	Na Jipana pak	hi da ali kala Ni i	dan din dia 64	de and an de	patrick and the last	a biling on a	e ^{pro} litika, kan
	- ip i :	'I 'I			· ·	i a di s	1 1 1 1	P
70 dBm								
CF 2.441 GHz			8000)				1.0 ms/

DH3_Ant1_Hop

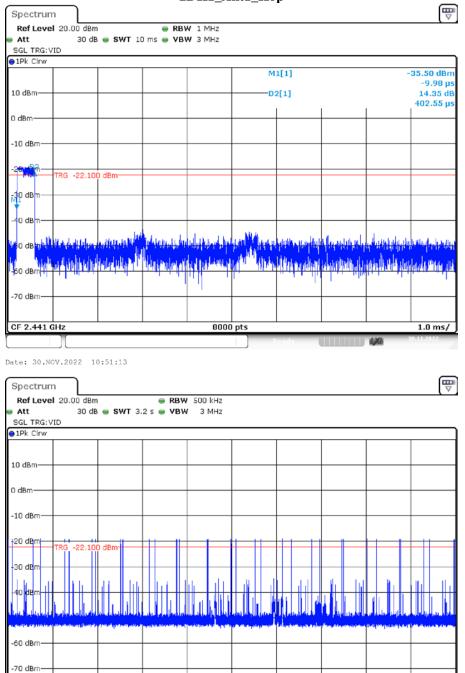
Spectrum Ref Level 20.00 dBm RBW 500 kHz Att SGL TRG: VID 30 dB 🖷 SWT 3.2 s 🖶 VBW 3 MHz ●1Pk Clrw 10 dBm-0 dBm· -10 dBm -20 dBm--22.200 dBm TRG -30 dBm 40 dBm والعالم يعلقه والتاريل المساول الع y)) الل ht. -60 dBm--70 dBm-30000 pts CF 2.441 GHz 316.0 ms/ 1,20

Date: 30.NOV.2022 10:37:27



DH5_Ant1_Hop

Date: 30.NOV.2022 11:09:22



2DH1_Ant1_Hop

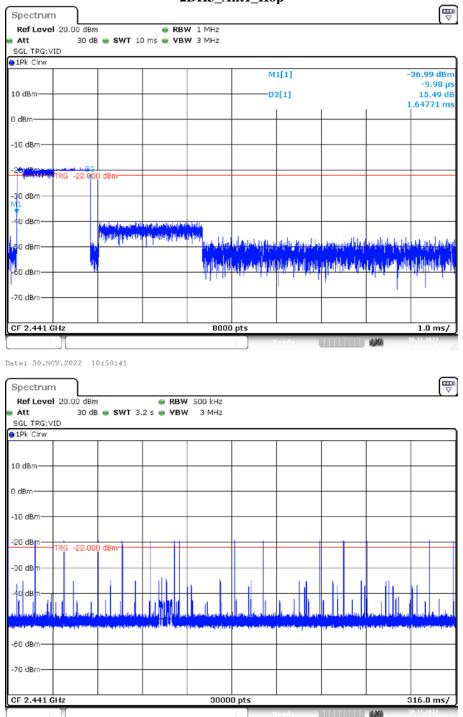
Date: 30.NOV.2022 10:51:18

CF 2.441 GHz

30000 pts

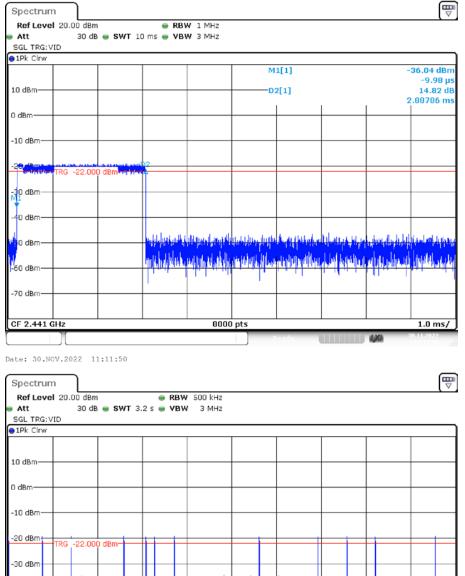
316.0 ms/

LXI



2DH3_Ant1_Hop

Date: 30.NOV.2022 10:50:46



2DH5_Ant1_Hop

Date: 30.NOV.2022 11:11:55

40 d<mark>B</mark>r

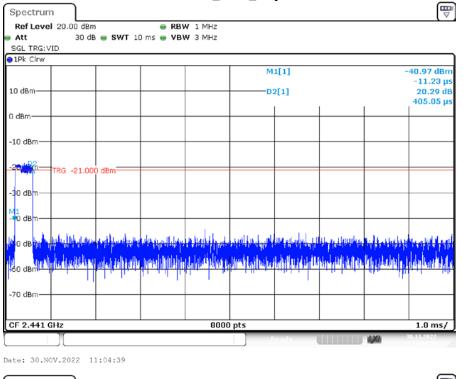
-60 dBm-

CF 2.441 GHz

30000 pts

316.0 ms/

LXI



3DH1_Ant1_Hop

Spectrum				
Ref Level 20.00 dBm	RBW 500 kHz			
	WT 3.2 s 👄 VBW 3 MHz			
SGL TRG: VID				
●1Pk Clrw				
10 dBm				
0 dBm				
-10 dBm				
-20 dBm TRG -21.000 dBm				
TRG -21.000 dBm				
-30 dBm				
-40 #Bm				
		U.S. Disabili Mahallar Madi	الجامع التباط الإلبة العاتب الختير	Alight Alight And Alight Alight
and databased by the standard from the base		Allerty with all parts the parts of the second states of	Mindhawa a Mindhwasa a Ronadh, aminda	- Level and the second s
-60 dBm				
-70 dBm				
CF 2.441 GHz	3000	0 pts		316.0 ms/
		Ready	4,40	30.11.2022

Date: 30.NOV.2022 11:04:45

				M	1[1]		-	-9.98 μ
LO dBm				D	2[1]			15.51 di
					1	1	1	L.64771 m:
) dBm								
10 dBm								
OR HER CALIFORNIA BULLE	21.600 dBm							
TRG -	21.600 dBm							
30 dBm								
1								
40 dBm								
	. The contractor	aladia.d	II.	Las Lat.		diaatara		In the second second
50 dBm		i, din in al di			Jull de la deserver	and the second second		a da dirida
60 dBm	istration in the second se	dandhaditar	n dhi ar h	della didda	ddiadh dhia	Aldan di Antoni	d his la daibai	d ha dhi ka da
oo usin		1	1	- 1 - 1 - 1	nt de l	1.6.1.16	d to de	1.1.1.1.1.
70 dBm								
F 2.441 GHz			8000	Ints				1.0 ms/
			0000				420	210 11157

3DH3_Ant1_Hop

 Spectrum
 RBW 500 kHz

 Att 30 dB SWT 3.2 s
 VBW 3 MHz

 ScL TRG: VID

 IPR Cirw

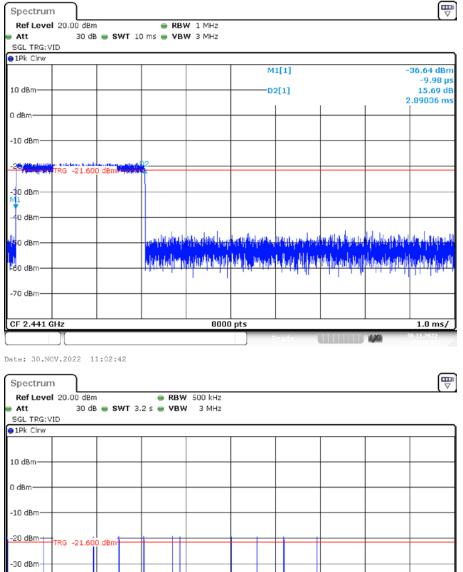
 0 dBm

 10 dBm

 -0 dBm

 -20 dBm

Date: 30.NOV.2022 11:03:19



3DH5_Ant1_Hop

Date: 30.NOV.2022 11:02:47

40 dBm

-60 dBm-

CF 2.441 GHz

30000 pts

316.0 ms/

100

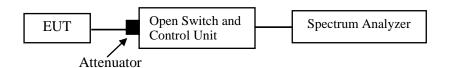
FCC §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

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:	23 °C
Relative Humidity:	49 %
ATM Pressure:	101.0 kPa

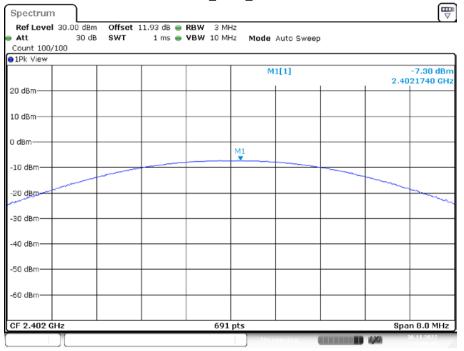
The testing was performed by Glenn Jiang on 2022-11-30.

EUT operation mode: Transmitting

Test Result: Compliant.

Test Mode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
		2402	-7.30	<=20.97	PASS
DH5	Ant1	2441	-6.33	<=20.97	PASS
		2480	-6.94	<=20.97	PASS
		2402	-6.74	<=20.97	PASS
2DH5	Ant1	2441	-6.25	<=20.97	PASS
		2480	-6.31	<=20.97	PASS
		2402	-6.30	<=20.97	PASS
3DH5	Ant1	2441	-5.78	<=20.97	PASS
		2480	-5.96	<=20.97	PASS

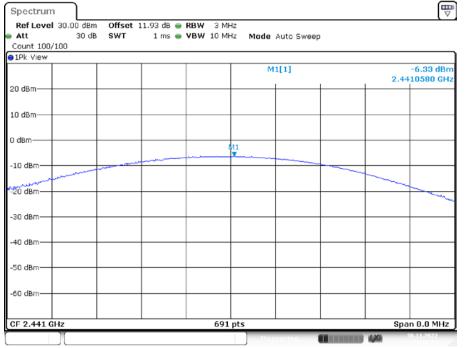
Please refer to the below plots:



DH5_Ant1_2402

Date: 30.NOV.2022 11:06:07

DH5_Ant1_2441



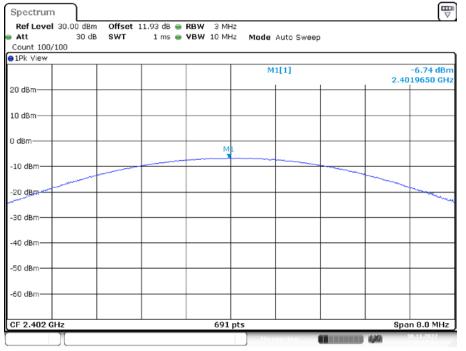
Date: 30.NOV.2022 11:06:24

Spectrum							
	dBm Offset 30 dB SWT	11.93 dB 👄 1 ms 👄	RBW 3 MH VBW 10 MH		Auto Sweep		
Count 100/100 1Pk View						 	
				М	1[1]		-6.94 dBr
20 dBm							
10 dBm							
D dBm				M1			
-10 dBm	_			M1			
-20 dBm		_					
-30 dBm							
-40 dBm							
-50 dBm							
-60 dBm		-					
CF 2.48 GHz			691	pts		Spa	n 8.0 MHz
				Mea	suring	4/0	30.11.2022

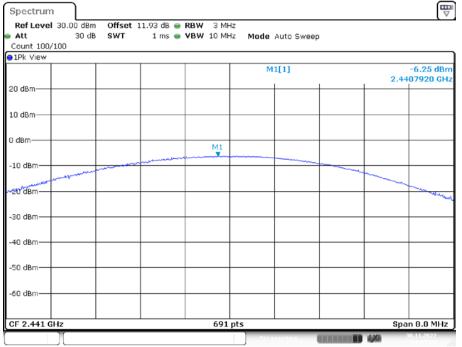
DH5_Ant1_2480

Date: 30.NOV.2022 11:06:40

2DH5_Ant1_2402



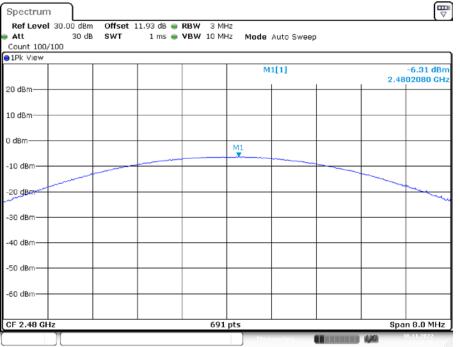
Date: 30.NOV.2022 11:07:01



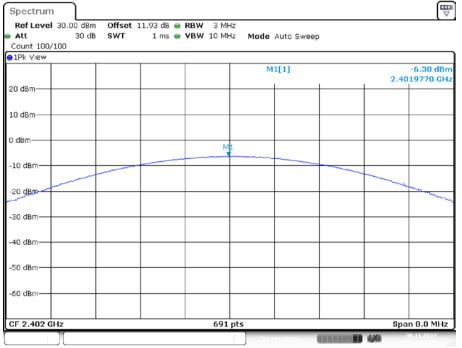
2DH5_Ant1_2441

Date: 30.NOV.2022 11:07:21





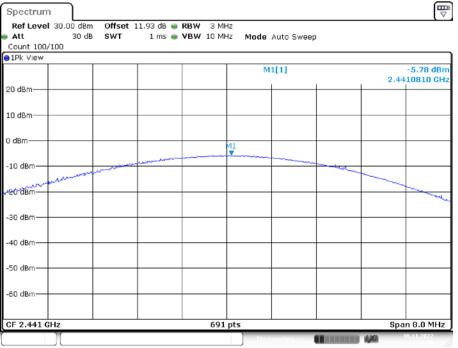
Date: 30.NOV.2022 11:07:36



3DH5_Ant1_2402

Date: 30.NOV.2022 11:07:55

3DH5_Ant1_2441



Date: 30.NOV.2022 11:08:09

Spectrum							
Ref Level 30 Att Count 100/100	30 dB	11.93 dB 👄 1 ms 👄	RBW 3 MH VBW 10 MH		Auto Sweep		
1Pk View							
				М	1[1]		-5.96 dBm 99880 GHz
20 dBm							
10 dBm		 					
) dBm			M	L			
10 dBm		 					
-20 dBm							
-30 dBm							
40 dBm							
50 dBm							
-60 dBm							
CF 2.48 GHz			691	pts		Spa	n 8.0 MHz
				Mee	suring	4/4	0.11.2022

3DH5_Ant1_2480

Date: 30.NOV.2022 11:08:29

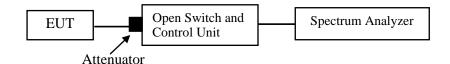
FCC §15.247(d) - BAND EDGES TESTING

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:	23 °C
Relative Humidity:	49 %
ATM Pressure:	101.0 kPa

The testing was performed by Glenn Jiang on 2022-11-30.

EUT operation mode: Transmitting

Test Result: Compliant

Please refer to the below plots:

DH5: Band Edge-Left Side Hopping

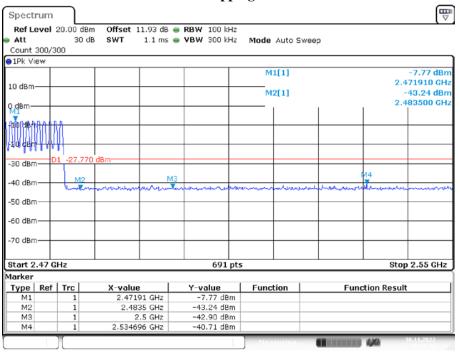
Spectrum						
Ref Level			👄 RBW 100 kHz			
Att	30 0	‼B SWT 246.5µs	😑 VBW 300 kHz	Mode Auto P	FT	
Count 300/3	100					
1Pk View						
				M1[1]		-7.88 dBr
10 dBm						2.403860 GH
				M2[1]		-49.34 dBr
) dBm —					1	2.400000 GH
-10 dBm						
-20 dBm						1
-30 dBm - C	1 -27.88	0 dBm				
-40 dBm —			101-			
So abm	A dola la co	- manuthan	mannen	u Longer Land	where where white	M3 M2
-StildBm						
.60 dBm						
oo abiii						
-70 dBm						
Start 2.3 GH	17		691 pt			Stop 2.405 GHz
larker	12		091 pt	,		3(0) 2.103 012
	Trc	X-value	Y-value	Function	Euro	ction Result
Type Ref M1	1	2.40386 GHz	-7.88 dBm	Function	Fun	COULT Result
M2	1	2.4 GHz	-49.34 dBm			
M3	1	2.39 GHz	-48.84 dBm			
M4	1	2.341239 GHz	-45.22 dBm			
	11)	CONTRACTOR OF STREET,	10.11.2022

Date: 30.NOV.2022 10:33:26

Single

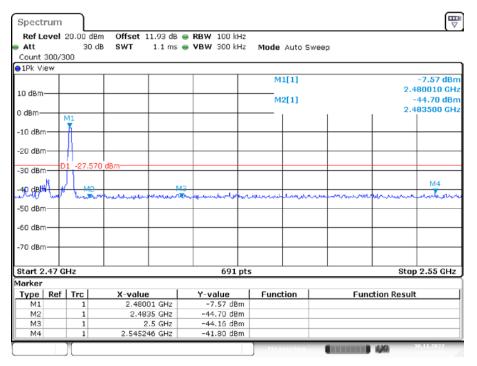
Spectrum Ref Level	20.00.49	··· Offcot 11	02 d0 4	• RBW 100 kHz				
Att	20.00 dBi 30 d			• VBW 300 kHz	Mode tute			
Count 300/3		5 SWI 24	o.sµs e	VBW 300 KHZ	MODE AUTO P			
1Pk View	300							
IPK VIEW								0.01.10
I					M1[1]			-8.21 dBn
10 dBm —		++			M2[1]			02040 GH: 48.79 dBn
I					M2[1]			48.79 aBh 00000 GH
D dBm						1	1 2.4	M1
								Ţ
-10 dBm								
-20 dBm								
-20 UBIII								L ()
								1 11
30 dBm	1 -28.21	0 dBm						
-30 dBm	01 -28.21	D dBm						
-30 dBm)1 -28.21	D dBm		1012				
-40 dBm				M4			M3	ма
-40 dBm			henriade	•	American	٥ دوبن وطام عاملة الي		Ma
-40 dBm			lenced	•	Mountain the interaction water	۵ مورد <mark>و</mark> کام کا دو اور کارو		Ma
-40 dBm			hannada	•	Marin Balance	ى مەيد چەكەر. 11 ئەلىرىكى م		M2 M2
-40 dBm			hinnada	•	April 1991	ى دىن چەكەر. تارىلىرىكى م		M2 M2
-40 dBm			hintigd	•	Madain Perlandy at	to cayong matter and we have the owned		M2 M2
-40 dBm			hintigda	•	hand a log and a second se	D-DG-phq-Hol-Chyel		M2 M3 4
-40 dBm	ha, Mati New Si		henrisch	•		b.cor., ala, He.l.Ch., d	all and a the second states of	M3
-40 dBm -50 dBm -60 dBm -70 dBm	ha, Mati New Si		hintigda	allon and the res		ىلى «ئايىر يەرىيە ھەرىيە ھە مەرىيە ھەرىيە	all and a the second states of	
-40 dBm -50 dBm -60 dBm -70 dBm Start 2.3 GH	ha, Mat, Asura 12		hinstaada	allon and the res			all and a the second states of	2.405 GHz
40 dBm 50 dBm 60 dBm 70 dBm 51 dBm 51 dBm 51 art 2.3 GH 1arker	ha, Mati New Si	a ann gar na sha an		691 pt	s		Stop 2	2.405 GHz
40 dBm 40 dBm 50 dBm 50 dBm 70 dBm 51 art 2.3 GH 1 arker Type Ref	la, Маţ∆ььон 1z Trc	م بسکیر بیار بار مراجع کار میلی بار X-value 2.40204		691 pt	s		Stop 2	2.405 GHz
40 dBm 40 dBm 50 dBm 50 dBm 70 dBm 70 dBm 5tart 2.3 GH 1arker M1	Hz Hz	ана фалоси и х-value 2.40204 2.4	+ GHz	691 pt -8.21 dBm	s		Stop 2	2.405 GHz

Date: 30.NOV.2022 10:20:41



DH5: Band Edge- Right Side Hopping

Date: 30.NOV.2022 10:39:32



Single

Date: 30.NOV.2022 10:22:56

Version 11: 2021-11-09

2DH5: Band Edge-Left Side Hopping

Spectrun	L						7
Ref Leve				RBW 100 kHz			
Att Count 300	-	0 dB SWT	246.5 µs (VBW 300 kHz	Mode Auto I	FFT	
1Pk View	300						
TEK VIEW					M1[1]		-8.62 dBr
					MILLI		2.402040 GH
10 dBm					M2[1]		-47.38 dBr
D dBm							2.400000 GH
J abm-						1	M1
-10 dBm			_				T
							M
20 dBm							
		620 dBm					
30 dBm	DI -28	020 aBm					
-40 dBm				MA			
				1			M3 M2
-50 dBm	-		mymouth	Junior	alma more range	money	Many and a second
-60 dBm							
-70 dBm							
Start 2.3 C	Hz			691 pt	s		Stop 2.405 GHz
larker					1		
	f Trc	X-va		Y-value	Function	Fi Fi	unction Result
M1 M2	1	2.4	0204 GHz 2.4 GHz	-8.62 dBm -47.38 dBm			
M2 M3	1		2.4 GHz 2.39 GHz	-47.38 dBm			
M4	1		2152 GHz	-44.21 dBm			

Date: 30.NOV.2022 10:44:33

Single

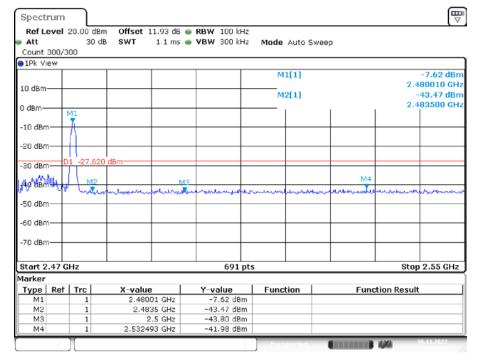
Ref Lo Att	evel	20.00 dB 30 c			 RBW 100 kHz VBW 300 kHz 		FFT	
Count	300/3	00					• •	
1Pk Vi	ew							
						M1[1]		-8.73 dBr
10 dBm·								2.402040 GH
to upin						M2[1]		-49.28 dBr
0 dBm—								2.400000 GH
			1 1					M1
10 dBm	·-+-		++					
			1 1					
-20 dBm	1		++					
20 dB-		1 -28.73						
30 dBm		2 2000						
-40 dBm								
TO GDI	·		1 1		M4			M3 M2
St dBr	han a	Jetos and	لمعمد الدعمة المعمد	فالبكلات	mound	and the participation of the second s	المعدمي محمد معالم	a stan out the all and a stand of the stand
			1 1					
-60 dBm	∩ - +-		+ +					
			1 1					
-70 dBrr	` +		+ +					
Start 2	.3 G⊦	lz			691 pt	s		Stop 2.405 GHz
1arker								
Type	Ref	Trc	X-value		Y-value	Function	Fu	nction Result
M1		1	2.4020	4 GHz	-8.73 dBm			
M2		1		1 GHz	-49.28 dBm			
M3		1		9 GHz	-49.96 dBm			
M4		1	2.349304		-46.07 dBm			

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2DH5: Band Edge- Right Side Hopping

Spectrum							₩ ▽
Ref Level				RBW 100 kHz			
Att	-	DdB SWT	1.1 ms (VBW 300 kHz	Mode Auto S	Sweep	
Count 300/3 1Pk View	300						
DIPK VIEW							
					M1[1]		-7.89 dBn 2.476080 GH
10 dBm —		_			M2[1]		-42.86 dBn
					112[1]		2.483500 GH
0 dBm M1							
RIP/HAMAIA	4						
10000000	201						
-20 dBm —	_						
	1 -27	890 dBm					
-30 dBm —	<u>,</u>	d so d sin					
-40 dBm		2	M	3			N14
	her	len manne	mund	and the second of the second	- Common weather	wern wern the second	alement and a second
-50 dBm			_				
-60 dBm —							
-70 dBm							
Start 2.47 (GHZ			691 pt	5		Stop 2.55 GHz
larker	1 - 1						
	Trc	X-valu		Y-value	Function	Fun	ction Result
M1 M2	1	2.47608 GHz 2.4835 GHz		-7.89 dBm -42.86 dBm			
M3	1	2.4835 GHz 2.5 GHz		-42.60 dBm			
M4	1		348 GHz	-41.08 dBm			
	7)	-	20.11.2022

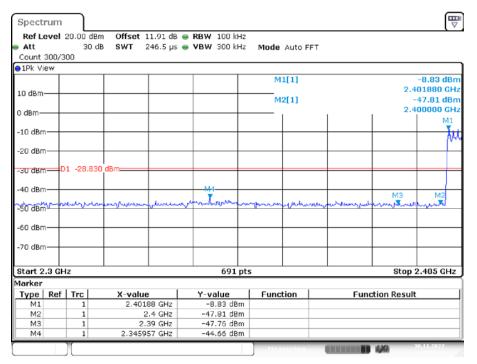
Date: 30.NOV.2022 10:52:29



Single

Date: 30.NOV.2022 10:26:52

3DH5: Band Edge-Left Side Hopping



Date: 30.NOV.2022 10:54:11

Single

Ref Lev	im Ind oo		Offeet	11.00.40	RBW 100 kHz			V	
Att	ei 20	оо авт 30 dB			RBW 100 kHz VBW 300 kHz	Mode tute			
Count 30	0/200		SWI	240.5 µs (• VBW 300 KHZ	MODE AUTO P			
1Pk Viev									
JIPK VIEV	• 			1		M1[1]		-8.87 dBr	
						MILI		2.402040 GH	
10 dBm				<u> </u>		M2[1]		-49.33 dBr	
					[MZ[1]			2.400000 GHz	
0 dBm—	+						1	M1	
-10 dBm-								VII VII	
-10 ubm-									
-20 dBm-									
20 0.0111									
30 dBm-	D1	-28.870	dBm						
-40 dBm-	+				M				
					mayannet		And have been	M3 M2	
90 dBm	ALC: NO.	AND ALL AND A		aline a sugar	1		and the second	and the second and the second and the second and the second second second second second second second second se	
-60 dBm-									
-00 ubin-									
-70 dBm-									
/ C GDIII									
Start 2.3					691 pt			Stop 2.405 GHz	
	GHZ				691 pt	5		SCOP 2.403 GHZ	
1arker				1					
	Type Ref Trc		X-value		Y-value	Function	Fu	nction Result	
M1 M2		1 2.40204 GHz 1 2.4 GHz			-8.87 dBm -49.33 dBm				
M2 M3		1	2.4 GHz 2.39 GHz		-49.33 dBm				
					-46.83 dBm				
M4		1	2.3540	22 GHz					

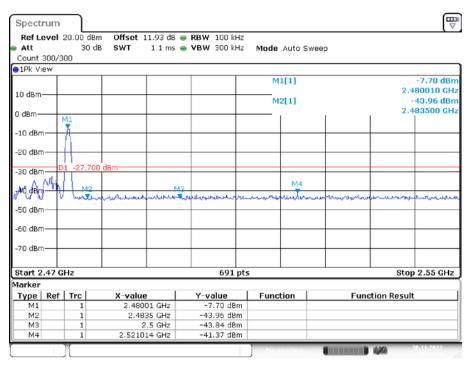
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3DH5: Band Edge- Right Side Hopping

Spectrum									
Ref Level Att Count 300/3	30			RBW 100 kH VBW 300 kH		Auto S	Sweep	X	
1Pk View									
		M1[1]				1[1]	-7.58 dBn 2.470060 GH		
10 dBm		+ +			M	2[1]		-43.62 dBn	
0 dBm						2[1]		2.483500 GH	
hathan l th	ħЛ								
	1								
-20 dBm									
-30 dBm	01 -27.5	80 dBm							
			мэ				14		
-40 dBm			retrient		بمسر ولعسين		monterior	munior marine marine and	
-50 dBm									
oo abiii									
-60 dBm									
-70 dBm									
-/0 ubiii									
 Start 2.47 (211-2			691	te			Stop 2.55 GHz	
arker	3112			091				30p 2.33 GH2	
	Trc X-value		1	Y-value	Func	tion	Function Result		
M1	1	2.47006	5 GHz	-7.58 dBr					
M2	1	2.4835 GHz		-43.62 dBr					
M3	1		5 GHz	-42.44 dBr					
M4	1	2.52658	s GH2	-41.28 dBr		_			
					Mea				

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Single



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

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