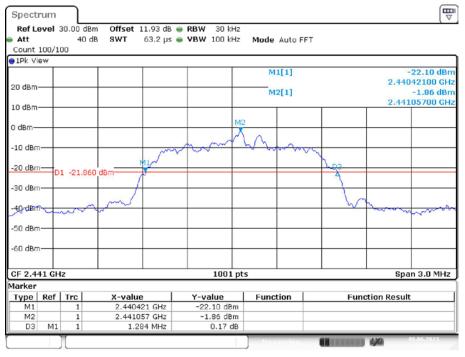
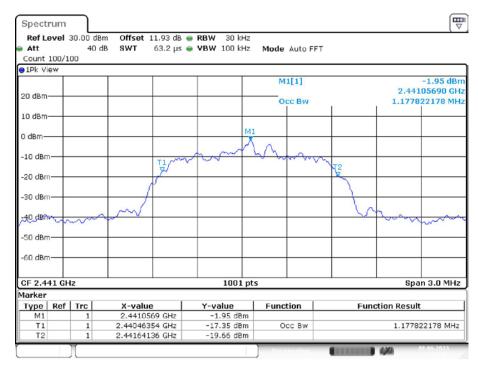
#### 20 dB EMISSION BANDWIDTH\_2DH5 \_Ant1\_2441



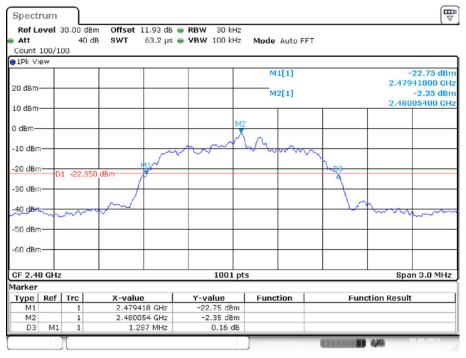
Date: 8.JUN.2023 11:49:57

## 99% OCCUPIED BANDWIDTH\_2DH5 \_Ant1\_2441



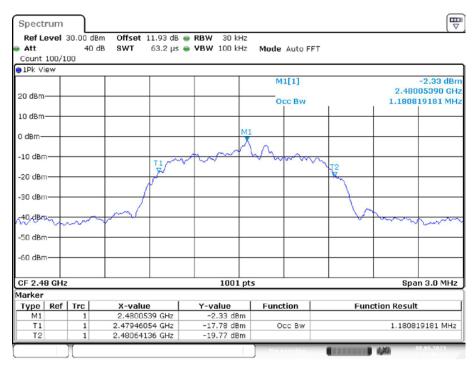
Date: 8.JUN.2023 11:50:02

## 20 dB EMISSION BANDWIDTH \_2DH5\_Ant1\_2480



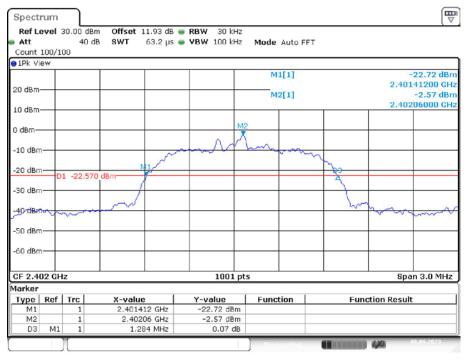
Date: 8.JUN.2023 11:50:21

## 99% OCCUPIED BANDWIDTH \_2DH5\_Ant1\_2480



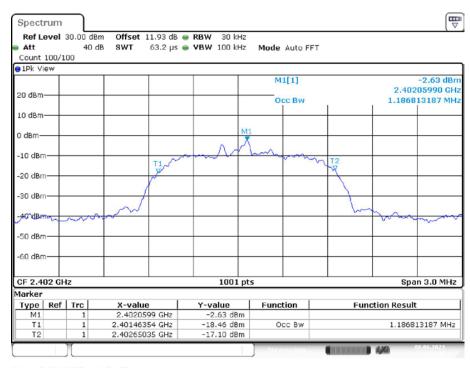
Date: 8.JUN.2023 11:50:26

## 20 dB EMISSION BANDWIDTH \_3DH5\_Ant1\_2402

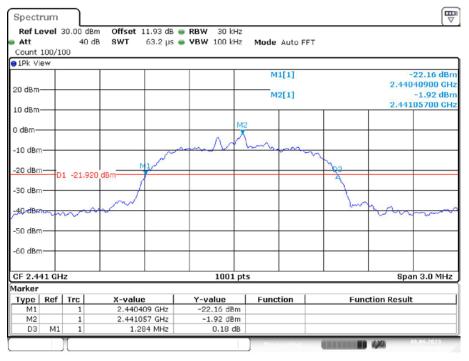


Date: 8.JUN.2023 11:50:59

## 99% OCCUPIED BANDWIDTH \_3DH5\_Ant1\_2402

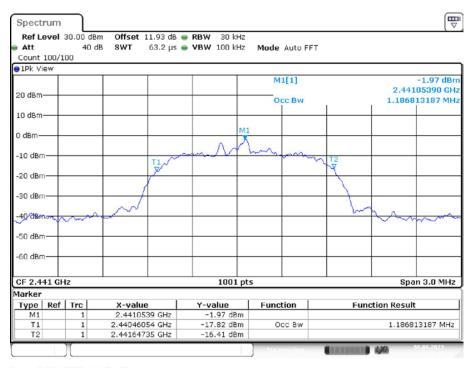


## 20 dB EMISSION BANDWIDTH \_3DH5\_Ant1\_2441



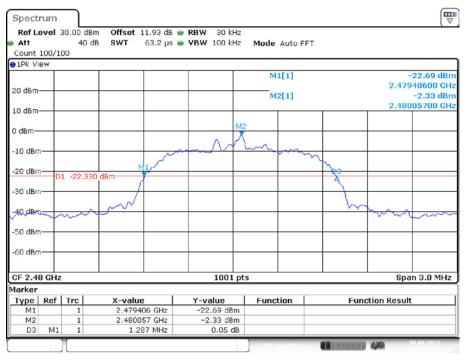
Date: 8.JUN.2023 11:51:38

## 99% OCCUPIED BANDWIDTH \_3DH5\_Ant1\_2441



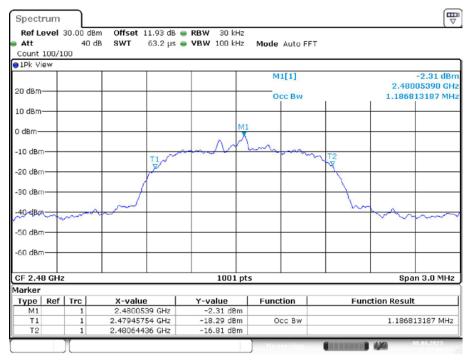
Date: 8.JUN.2023 11:51:44

## 20 dB EMISSION BANDWIDTH \_3DH5\_Ant1\_2480



Date: 8.JUN.2023 11:52:02

## 99% OCCUPIED BANDWIDTH \_3DH5\_Ant1\_2480



Date: 8.JUN.2023 11:52:08

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

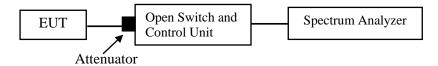
## **Applicable Standard**

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**

According to ANSI C63.10-2013, section 7.8.3

- 1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- 2. Set the EUT in hopping mode from first channel to last.
- 3. By using the max-hold function record the quantity of the channel.



#### **Test Data**

#### **Environmental Conditions**

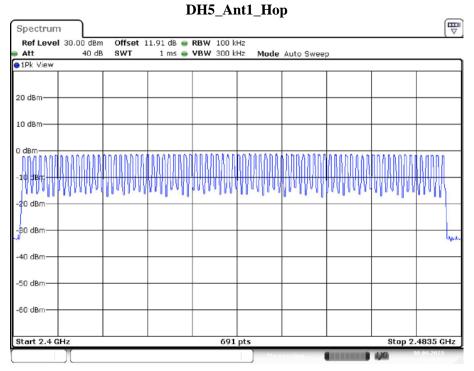
Temperature:	25℃	
Relative Humidity:	47%	
ATM Pressure:	101.0kPa	

The testing was performed by Matt Liang on 2023-06-08.

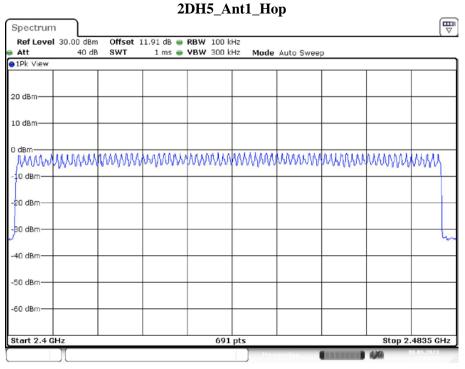
EUT operation mode: Transmitting

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

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



Date: 8.JUN.2023 11:54:57



Date: 8.JUN.2023 11:59:25

## 3DH5\_Ant1\_Hop Spectrum Ref Level 30.00 dBm Att 40 dB Mode Auto Sweep 1Pk View 20 dBm-10 dBmzww.y. 0 dBm 20 dBm--40 dBm -60 dBm-Stop 2.4835 GHz 691 pts Start 2.4 GHz

Date: 8.JUN.2023 13:05:36

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

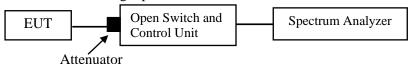
## **Applicable Standard**

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**

According to ANSI C63.10-2013, section 7.8.4

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



#### **Test Data**

## **Environmental Conditions**

Temperature:	25℃
Relative Humidity:	47%
ATM Pressure:	101.0kPa

The testing was performed by Matt Liang on 2023-06-08.

EUT operation mode: Transmitting

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

Test Mode	Antenna	Channel	Burst Width [ms]	Total Hops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Нор	0.408	320	0.131	≤0.4	PASS
DH3	Ant1	Нор	1.656	160	0.265	≤0.4	PASS
DH5	Ant1	Нор	2.898	110	0.319	≤0.4	PASS
2DH1	Ant1	Нор	0.418	330	0.138	≤0.4	PASS
2DH3	Ant1	Нор	1.663	130	0.216	≤0.4	PASS
2DH5	Ant1	Нор	2.902	120	0.348	≤0.4	PASS
3DH1	Ant1	Нор	0.420	320	0.134	≤0.4	PASS
3DH3	Ant1	Нор	1.661	170	0.282	≤0.4	PASS
3DH5	Ant1	Нор	2.905	120	0.349	≤0.4	PASS

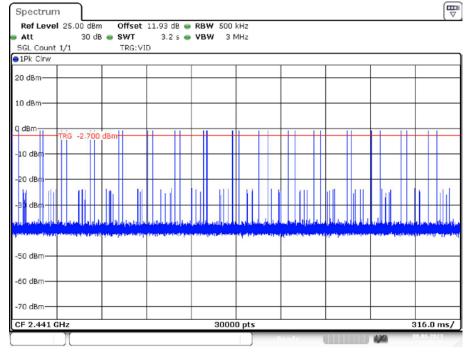
Note 1: A period time=0.4\*79=31.6(s), Result=Burst Width\*Total Hops

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 Spectrum Ref Level 25.00 dBm Offset 11.93 dB - RBW 1 MHz Att 30 dB 🌞 SWT 10 ms 🌞 VBW 3 MHz SGL Count 1/1 TRG: VID 1Pk Clrw M1[1] -16.69 dBn 20 dBm--3.50 µs D2[1] 15.43 dB 408.00 μs 10 dBm-0 dBm-TRG -2.700 dBm -10 dBm--20 dBm ng palapyakan kapisah palapya parapak pirapaji. Pilana pilabah persopaji palipali di perbanji bang pada pagpapak babbuah -60 dBm--70 dBm CF 2.441 GHz 8000 pts 1.0 ms/

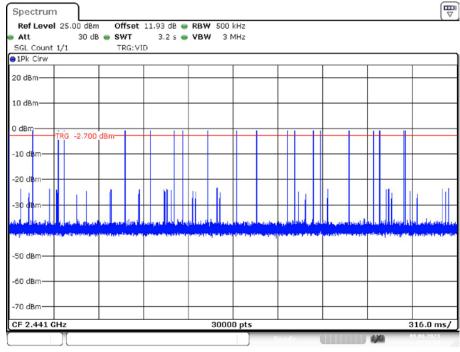
Date: 8.JUN.2023 13:19:24



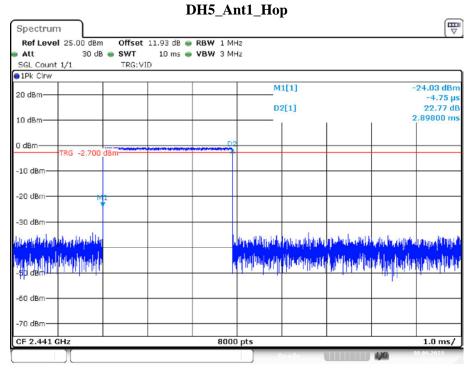
Date: 8.JUN.2023 13:19:29

#### DH3\_Ant1\_Hop Spectrum Ref Level 25.00 dBm Offset 11.93 dB - RBW 1 MHz Att 30 dB 🌞 SWT 10 ms 🌞 VBW 3 MHz SGL Count 1/1 TRG: VID 1Pk Clrw M1[1] -19.14 dBn 20 dBm--4.75 µ D2[1] 17.71 dB 1.65600 ms 10 dBm-0 dBm-TRG -2.700 d8m -10 dBm--20 dBm luk pitaria, as bulasia hobili saalak ira, <mark>oo qoga saasi aha qadabiira karqaan iriir qolib parab harpiind</mark> -60 dBm--70 dBm-CF 2.441 GHz 8000 pts 1.0 ms/

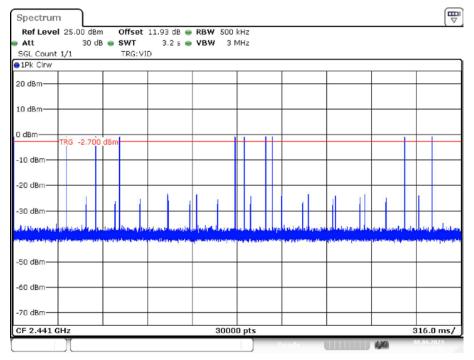
Date: 8.JUN.2023 13:19:53



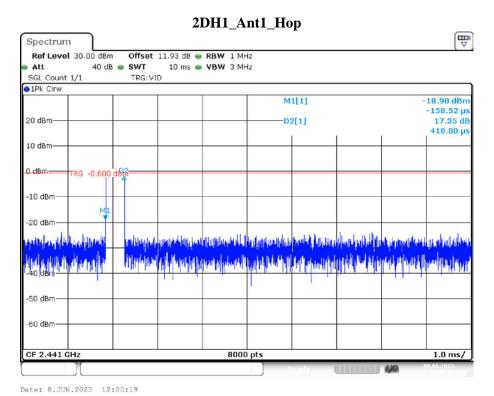
Date: 8.JUN.2023 13:19:58



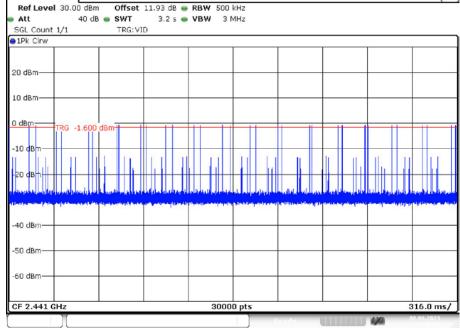
Date: 8.JUN.2023 13:20:50



Date: 8.JUN.2023 13:20:55



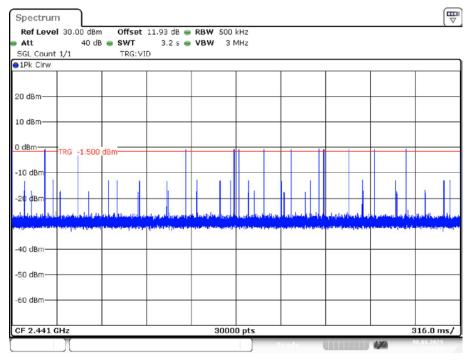




Date: 8.JUN.2023 12:00:30

#### 2DH3\_Ant1\_Hop Spectrum Ref Level 30.00 dBm Offset 11.93 dB 🖷 RBW 1 MHz 10 ms 🁄 **VBW** 3 MHz 40 dB 🌞 SWT Att TRG: VID SGL Count 1/1 1Pk Clrw -20.42 dBm M1[1] -158.52 µs 20 dBm-D2[1] 18.53 dB 1.66300 ms 10 dBm-0 dBm -10 dBm--20 dBm -50 dBm -60 dBm-8000 pts 1.0 ms/ CF 2.441 GHz

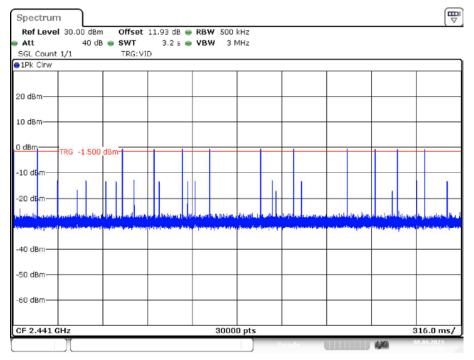
Date: 8.JUN.2023 12:00:53



Date: 8.JUN.2023 12:01:05

#### 2DH5\_Ant1\_Hop Spectrum Ref Level 30.00 dBm Offset 11.93 dB 🖷 RBW 1 MHz 10 ms 🁄 **VBW** 3 MHz 40 dB 🌞 SWT Att TRG: VID SGL Count 1/1 1Pk Clrw -16.74 dBm M1[1] -157.27 µs 20 dBm-D2[1] 14.89 dB 2.90200 ms 10 dBm-0 dBm -10 dBmmacidi Amara julish bilangan julipasa di tangka iskin -50 dBm -60 dBm 8000 pts CF 2.441 GHz 1.0 ms/

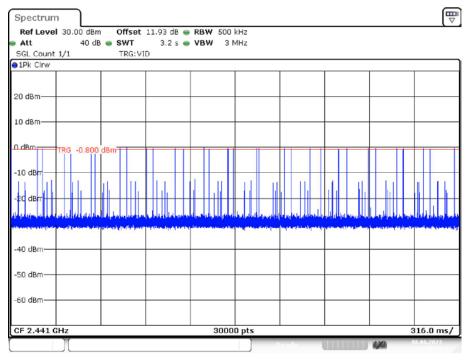
Date: 8.JUN.2023 11:59:39



Date: 8.JUN.2023 11:59:50

#### 3DH1\_Ant1\_Hop Spectrum Ref Level 30.00 dBm Offset 11.93 dB 🖷 RBW 1 MHz 10 ms 🁄 **VBW** 3 MHz 40 dB 🌞 SWT Att TRG: VID SGL Count 1/1 1Pk Clrw -17.33 dBm M1[1] -181.02 µs 20 dBm-D2[1] 16.12 dB 420.00 µs 10 dBm-TRG 0.200 dBn -10 dBm--50 dBm -60 dBm-8000 pts CF 2.441 GHz 1.0 ms/

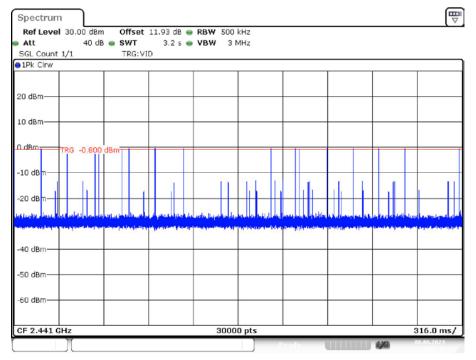
Date: 8.JUN.2023 13:06:28



Date: 8.JUN.2023 13:06:39

#### 3DH3\_Ant1\_Hop Spectrum Ref Level 30.00 dBm Offset 11.93 dB 🖷 RBW 1 MHz 10 ms 🁄 **VBW** 3 MHz 40 dB 🌞 SWT Att TRG: VID SGL Count 1/1 1Pk Clrw -17.80 dBm M1[1] -206.03 µs 20 dBm-D2[1] 16.67 dB 1.66100 ms 10 dBm-TRG 0.200 dBm -10 dBm--20 dBm 40 dBm -50 dBm -60 dBm-8000 pts CF 2.441 GHz 1.0 ms/

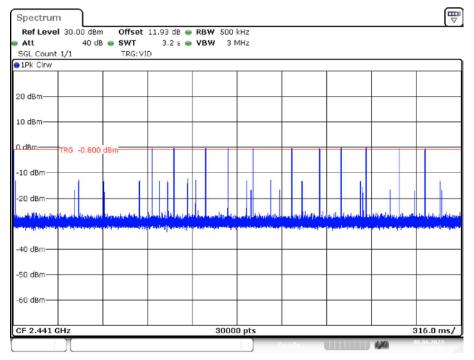
Date: 8.JUN.2023 13:07:03



Date: 8.JUN.2023 13:07:14

#### 3DH5\_Ant1\_Hop Spectrum Ref Level 30.00 dBm Offset 11.93 dB 🖷 RBW 1 MHz 10 ms 🁄 **VBW** 3 MHz 40 dB 🌞 SWT Att TRG: VID SGL Count 1/1 1Pk Clrw -17.08 dBm M1[1] -181.02 µs 20 dBm-D2[1] 15.95 dB 2.90500 ms 10 dBm-TRG 0.200 dBm -10 dBm -50 dBm -60 dBm 8000 pts CF 2.441 GHz 1.0 ms/

Date: 8.JUN.2023 13:05:50



Date: 8.JUN.2023 13:06:01

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

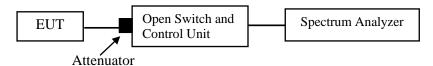
## **Applicable Standard**

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**

According to ANSI C63.10-2013, section 7.8.5

- 1. Place the EUT on a bench and set in TX 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:	25℃	
Relative Humidity:	47%	
ATM Pressure:	101.0kPa	

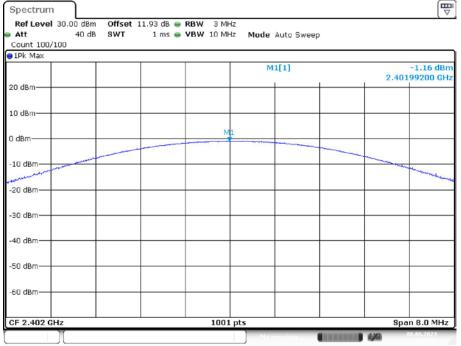
The testing was performed by Matt Liang on 2023-06-08.

EUT operation mode: Transmitting

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

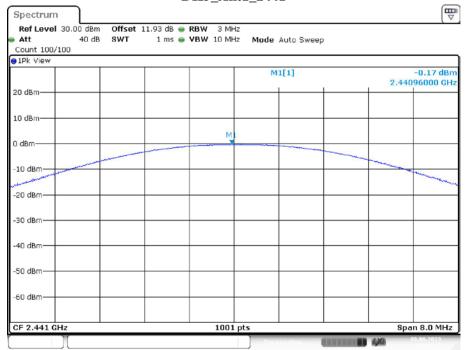
Test Mode	Antenna	Channel	Conducted Peak Output Power [dBm]	Limit[dBm]	Verdict
DH5		2402	-1.16	≤20.97	PASS
	Ant1	2441	-0.17	≤20.97	PASS
		2480	-0.65	≤20.97	PASS
2DH5 Ant1	Ant1	2402	1.59	≤20.97	PASS
		2441	2.31	≤20.97	PASS
		2480	1.61	≤20.97	PASS
3DH5	Ant1	2402	2.31	≤20.97	PASS
		2441	3.02	≤20.97	PASS
		2480	2.35	≤20.97	PASS

## DH5\_Ant1\_2402



Date: 8.JUN.2023 13:08:59

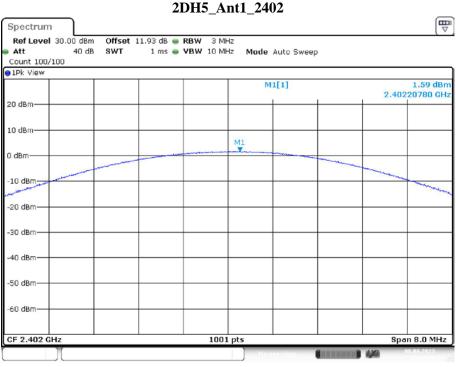
## DH5\_Ant1\_2441



Date: 8.JUN.2023 13:09:17

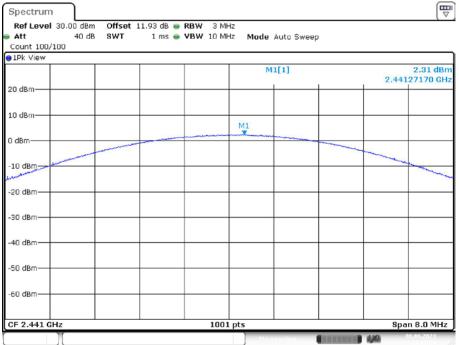
## DH5\_Ant1\_2480 Spectrum Ref Level 30.00 dBm Offset 11.93 dB • RBW 3 MHz 1 ms VBW 10 MHz Mode Auto Sweep Count 100/100 ●1Pk View -0.65 dBm 2.48014390 GHz M1[1] 20 dBm-10 dBm-0 dBm--10 dBm -20 dBm -30 dBm--40 dBm -50 dBm--60 dBm-Span 8.0 MHz CF 2.48 GHz 1001 pts

Date: 8.JUN.2023 13:09:46



Date: 8.JUN.2023 13:10:58

## 2DH5\_Ant1\_2441



Date: 8.JUN.2023 13:11:21

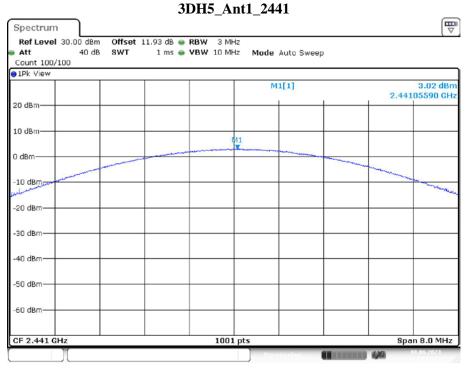
## 2DH5\_Ant1\_2480



Date: 8.JUN.2023 13:11:40

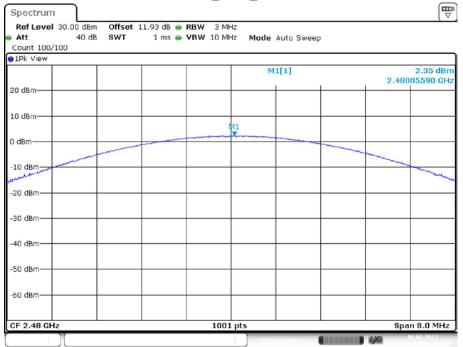
#### 3DH5\_Ant1\_2402 Spectrum Ref Level 30.00 dBm Offset 11.93 dB • RBW 3 MHz 1 ms VBW 10 MHz 40 dB SWT Mode Auto Sweep Att Count 100/100 1Pk View M1[1] 2.31 dBm 2.40216780 GHz 20 dBm-10 dBm-0 dBm -10 dBm--20 dBm 40 dBm -50 dBm--60 dBm-Span 8.0 MHz CF 2.402 GHz 1001 pts

Date: 8.JUN.2023 13:12:02



Date: 8.JUN.2023 13:12:21

## 3DH5\_Ant1\_2480



Date: 8.JUN.2023 13:12:39

## FCC §15.247(d) - BAND EDGES TESTING

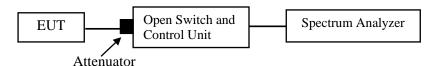
#### **Applicable Standard**

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**

According to ANSI C63.10-2013, section 7.8.6 and section 6.10

- 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 TX 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**

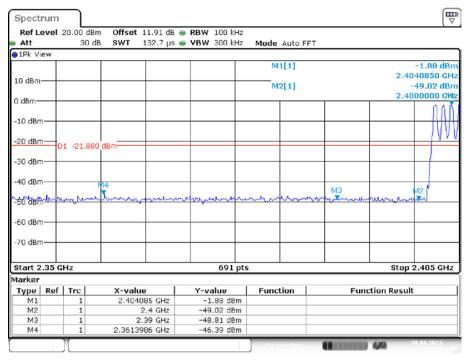
Temperature:	25°C	
Relative Humidity:	47%	
ATM Pressure:	101.0kPa	

The testing was performed by Matt Liang on 2023-06-08.

EUT operation mode: Transmitting

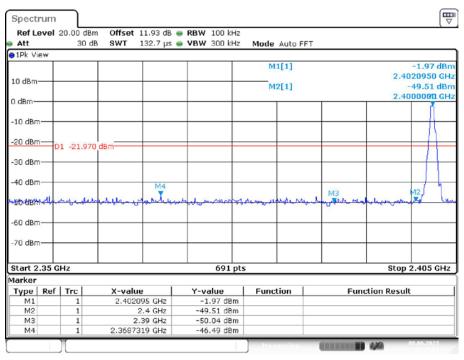
**Test Result:** Compliant. Please refer to the below plots:

## DH5: Band Edge-Left Side Hopping



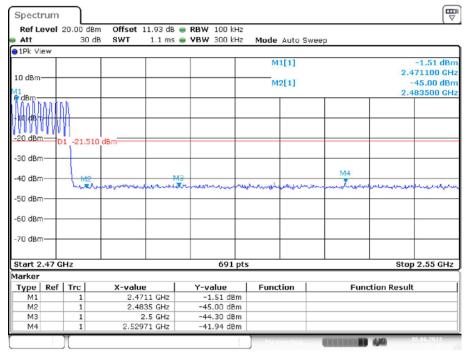
Date: 8.JUN.2023 11:53:27

## **Single**



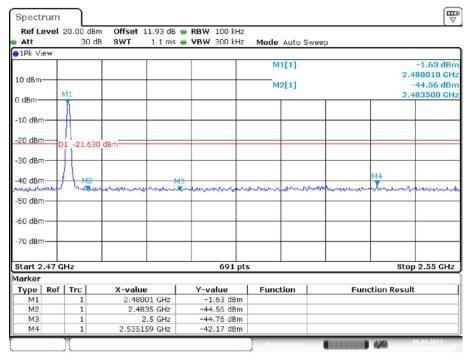
Date: 8.JUN.2023 11:47:57

# DH5: Band Edge- Right Side Hopping

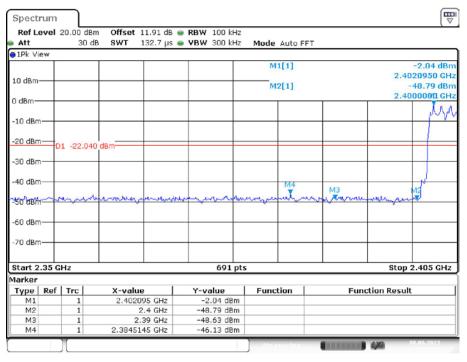


Date: 8.JUN.2023 11:57:06

## Single

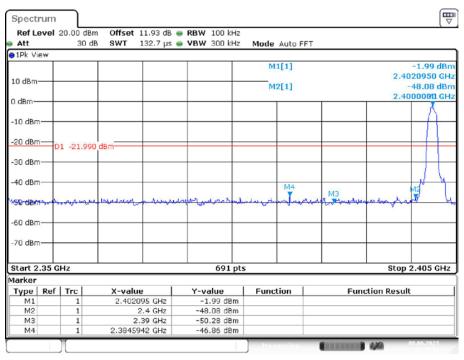


## 2DH5: Band Edge-Left Side Hopping



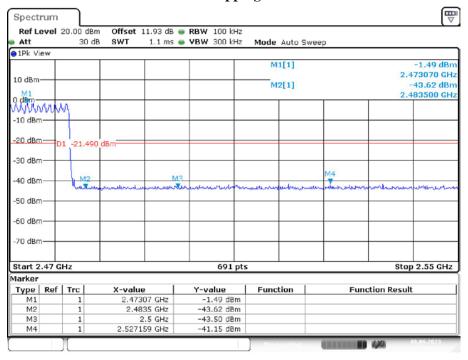
Date: 8.JUN.2023 11:58:08

## Single



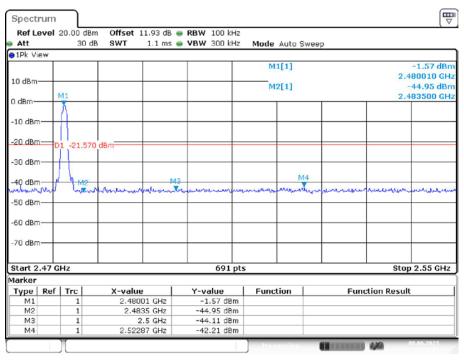
Date: 8.JUN.2023 11:49:38

# 2DH5: Band Edge- Right Side Hopping



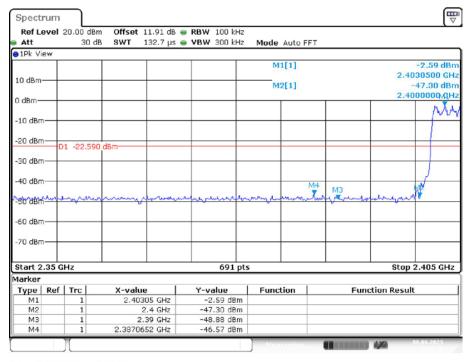
Date: 8.JUN.2023 13:03:19

## Single



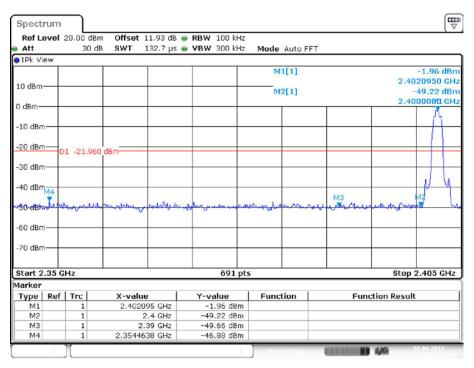
Date: 8.JUN.2023 11:50:35

## 3DH5: Band Edge-Left Side Hopping



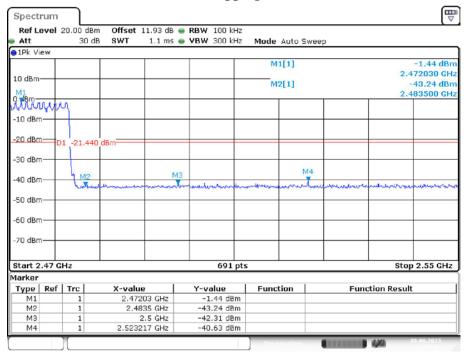
Date: 8.JUN.2023 13:04:17

## Single



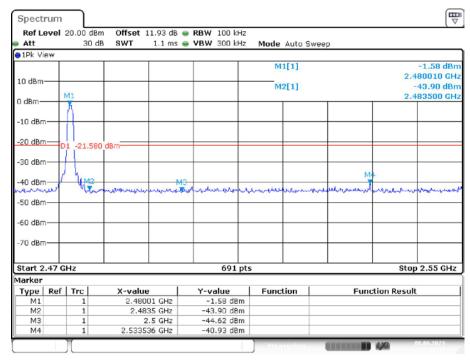
Date: 8.JUN.2023 11:51:14

# 3DH5: Band Edge- Right Side Hopping



Date: 8.JUN.2023 13:08:03

## Single



Date: 8.JUN.2023 11:52:17

## \*\*\*\*\* END OF REPORT \*\*\*\*\*