



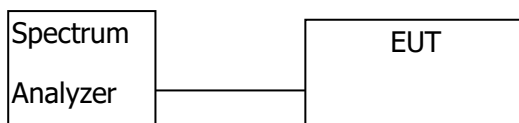
9 20 dB Bandwidth Measurement

Test Requirement : FCC CFR47 Part 15 Section 15.247

Test Method : ANSI C63.10:2013

9.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW =30kHz, VBW = 100kHz
- 3.Set up:



9.2 Test Result

TestMode	Antenna	Frequency[MHz]	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.993	2401.487	2402.480	---	---
DH5	Ant1	2441	1.017	2440.484	2441.501	---	---
DH5	Ant1	2480	0.987	2479.481	2480.468	---	---
2DH5	Ant1	2402	1.284	2401.373	2402.657	---	---
2DH5	Ant1	2441	1.293	2440.352	2441.645	---	---
2DH5	Ant1	2480	1.296	2479.343	2480.639	---	---
3DH5	Ant1	2402	1.272	2401.358	2402.630	---	---
3DH5	Ant1	2441	1.308	2440.325	2441.633	---	---
3DH5	Ant1	2480	1.284	2479.343	2480.627	---	---

DH5-Ant1-2402



DH5-Ant1-2441



DH5-Ant1-2480



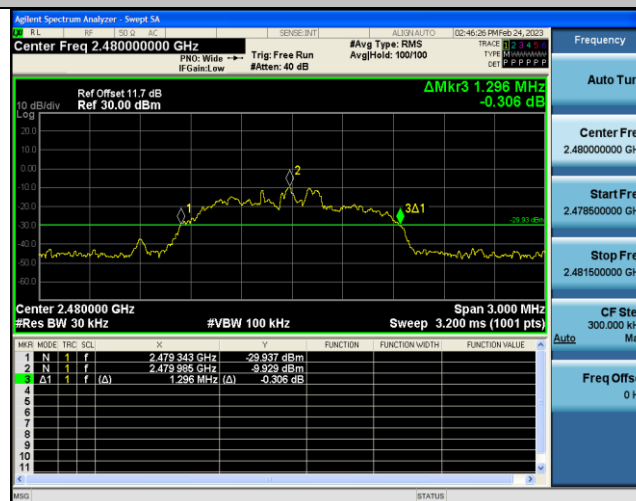
2DH5-Ant1-2402



2DH5-Ant1-2441



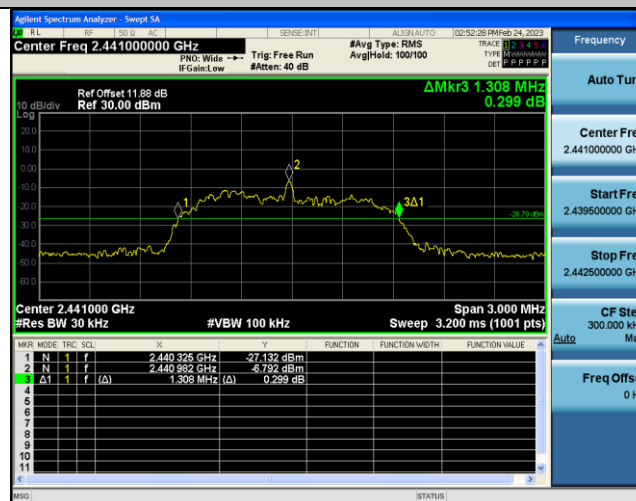
2DH5-Ant1-2480



3DH5-Ant1-2402



3DH5-Ant1-2441



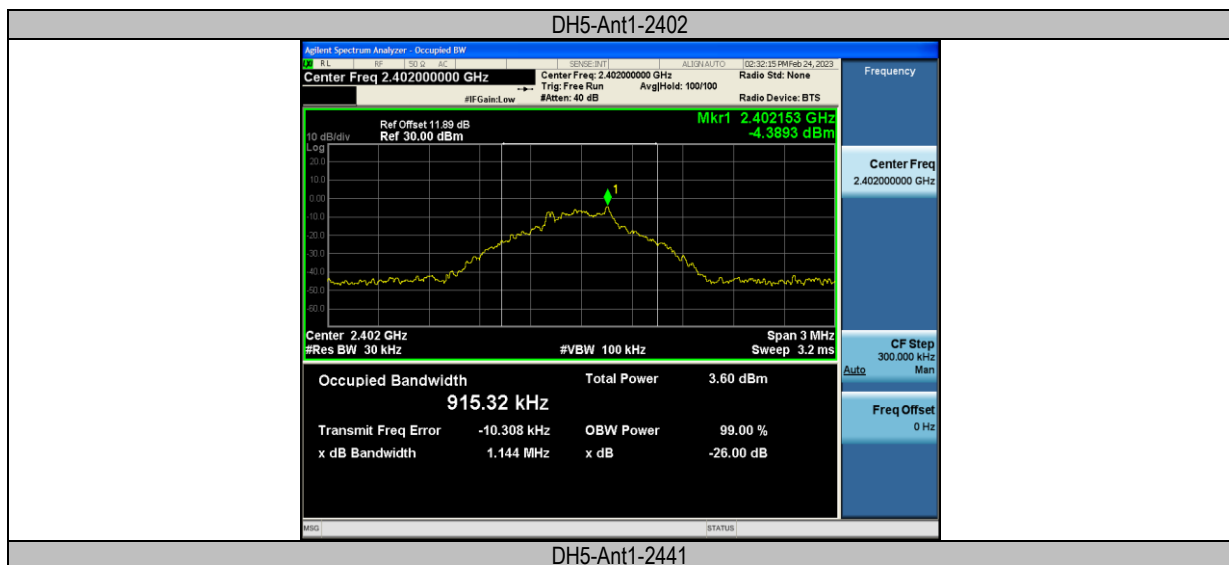
3DH5-Ant1-2480

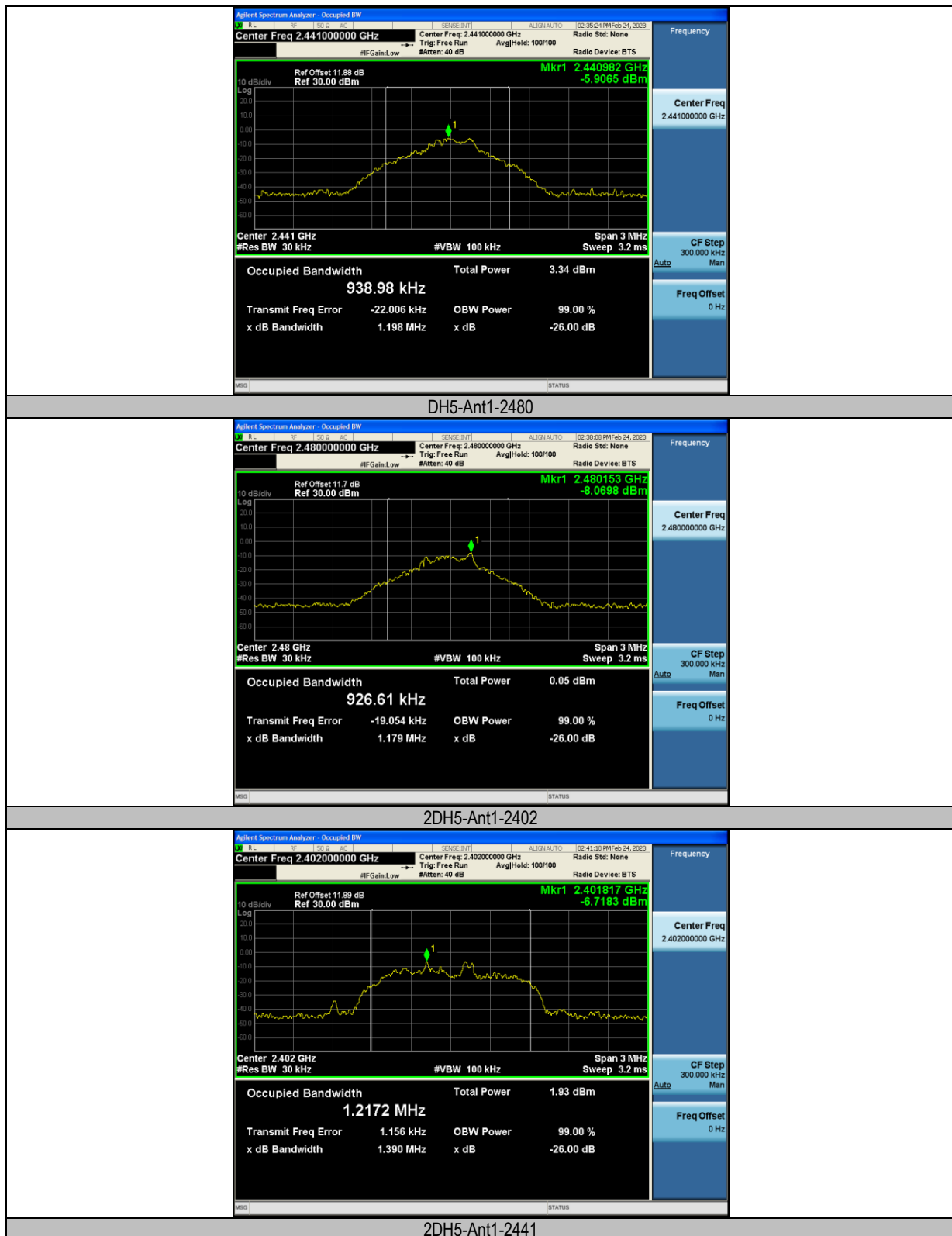


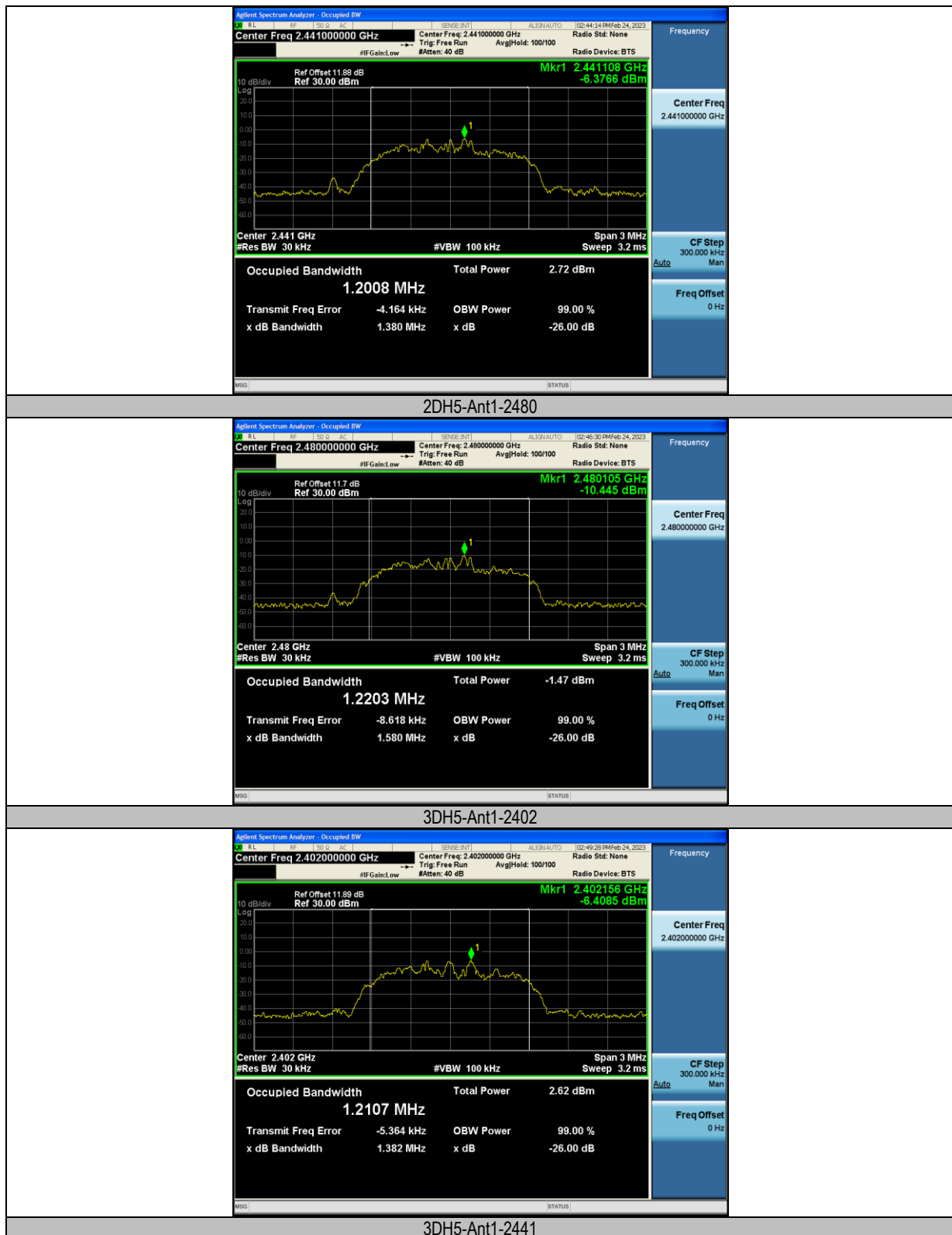
Report No.: PTC23021001602E-FC01

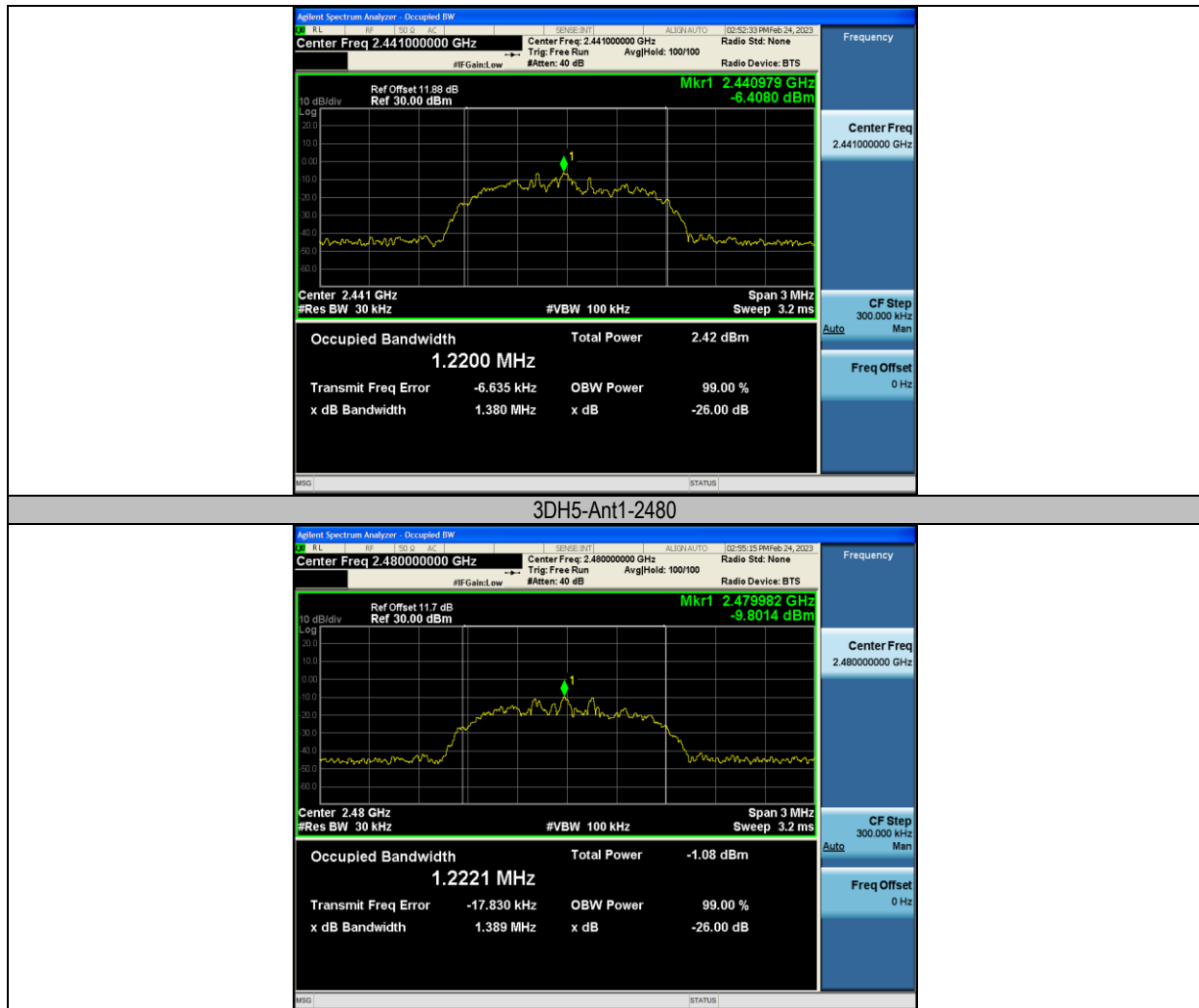


TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.91532	2401.5320	2402.4474	---	---
DH5	Ant1	2441	0.93898	2440.5085	2441.4475	---	---
DH5	Ant1	2480	0.92661	2479.5176	2480.4443	---	---
2DH5	Ant1	2402	1.2172	2401.3926	2402.6098	---	---
2DH5	Ant1	2441	1.2008	2440.3954	2441.5962	---	---
2DH5	Ant1	2480	1.2203	2479.3812	2480.6015	---	---
3DH5	Ant1	2402	1.2107	2401.3893	2402.6000	---	---
3DH5	Ant1	2441	1.2200	2440.3834	2441.6034	---	---
3DH5	Ant1	2480	1.2221	2479.3711	2480.5932	---	---









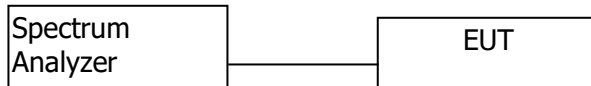


10 Maximum Peak Output Power

- Test Requirement : FCC CFR47 Part 15 Section 15.247
- Test Method : ANSI C63.10:2013
- Test Limit : Regulation 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 (30dBm). For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.
- Refer to the result "Number of Hopping Frequency" of this document. The 0.125watts (20.97 dBm) limit applies.

10.1 Test Procedure

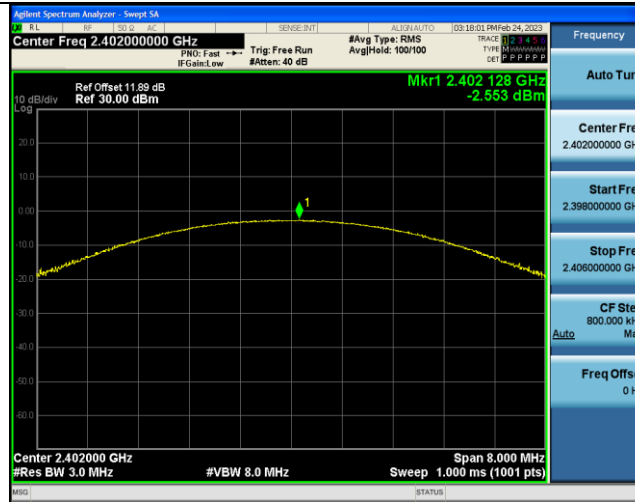
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyser: RBW = 3MHz. VBW = 8MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.
4. Set up:



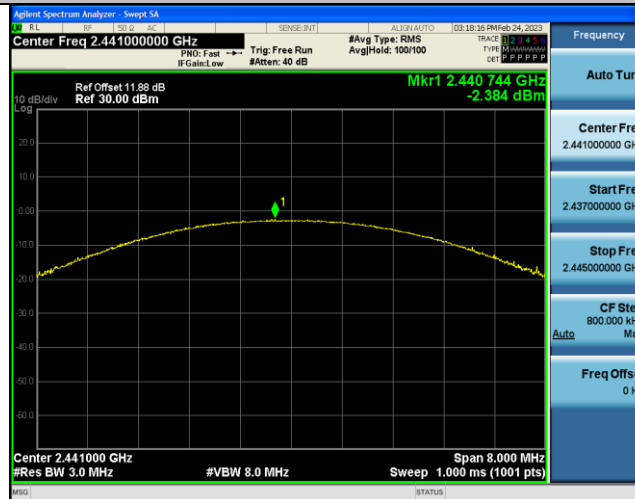
10.2 Test Result

Test Mode	Antenna	Frequency[MHz]	Conducted Peak Power[dBm]	Conducted Limit[dBm]	Verdict
DH5	Ant1	2402	-2.55	≤20.97	PASS
DH5	Ant1	2441	-2.38	≤20.97	PASS
DH5	Ant1	2480	-6.51	≤20.97	PASS
2DH5	Ant1	2402	-2.86	≤20.97	PASS
2DH5	Ant1	2441	-2.85	≤20.97	PASS
2DH5	Ant1	2480	-6.82	≤20.97	PASS
3DH5	Ant1	2402	-2.89	≤20.97	PASS
3DH5	Ant1	2441	-2.8	≤20.97	PASS
3DH5	Ant1	2480	-6.56	≤20.97	PASS

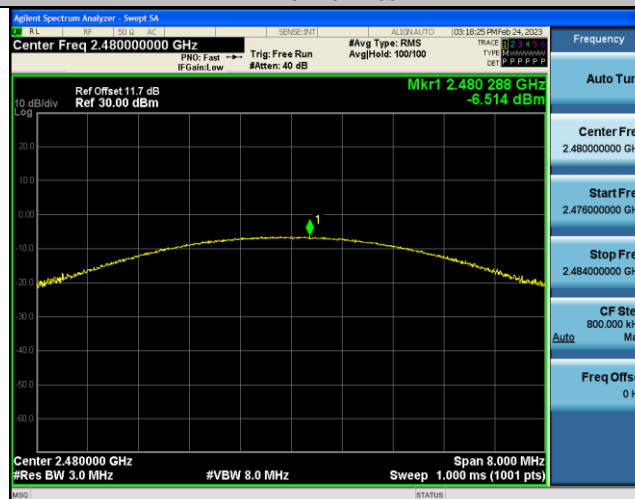
DH5-Ant1-2402



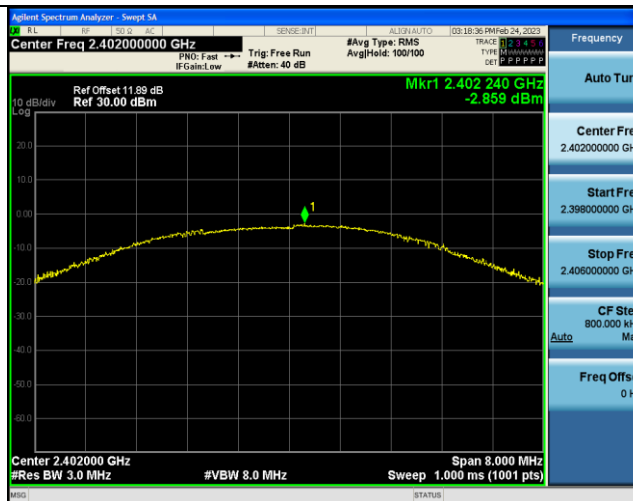
DH5-Ant1-2441



DH5-Ant1-2480



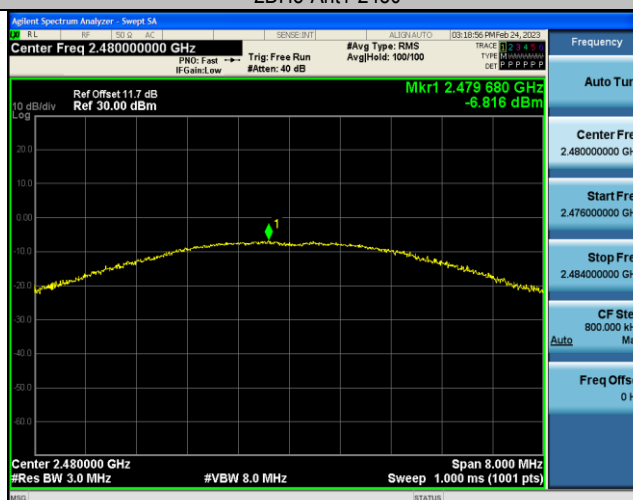
2DH5-Ant1-2402



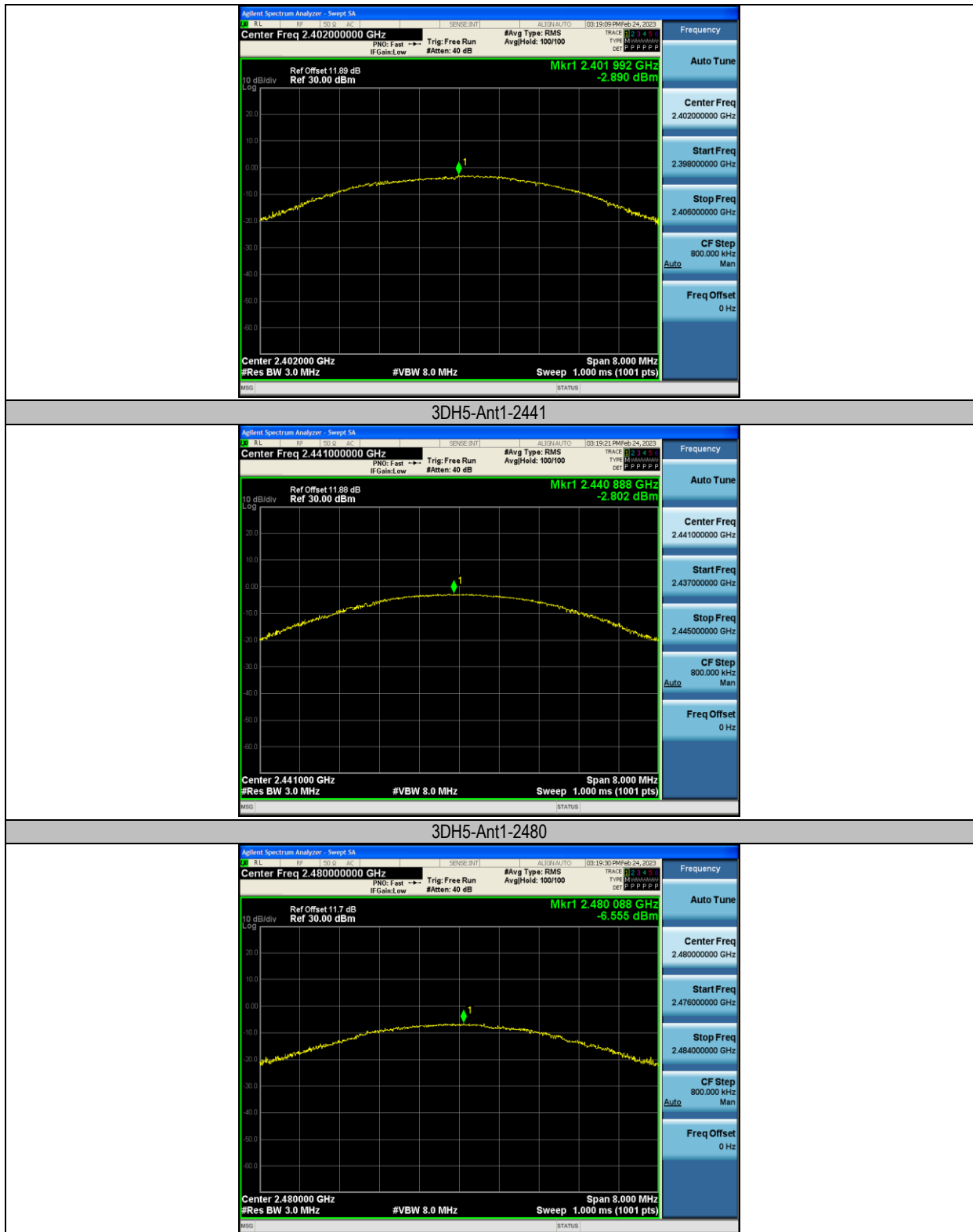
2DH5-Ant1-2441



2DH5-Ant1-2480



3DH5-Ant1-2402



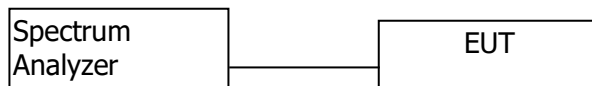


11 Hopping Channel Separation

Test Requirement	: FCC CFR47 Part 15 Section 15.247
Test Method	: ANSI C63.10:2013
Test Limit	: Regulation 15.247(a)(1) 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 2400-2483.5MHz 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 1W.
Test Mode	: Hopping

11.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30KHz. VBW = 100KHz, Span = 2.0MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.
4. Set up:





11.2 Test Result

TestMode	Antenna	Frequency[MHz]	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	1	≥ 0.678	PASS
2DH5	Ant1	Hop	0.964	≥ 0.864	PASS
3DH5	Ant1	Hop	1.012	≥ 0.872	PASS





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12 Number of Hopping Frequency

Test Requirement : FCC CFR47 Part 15 Section 15.247
Test Method : ANSI C63.10:2013
Test Limit : Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode : Hopping(GFSK)

12.1 Test Procedure

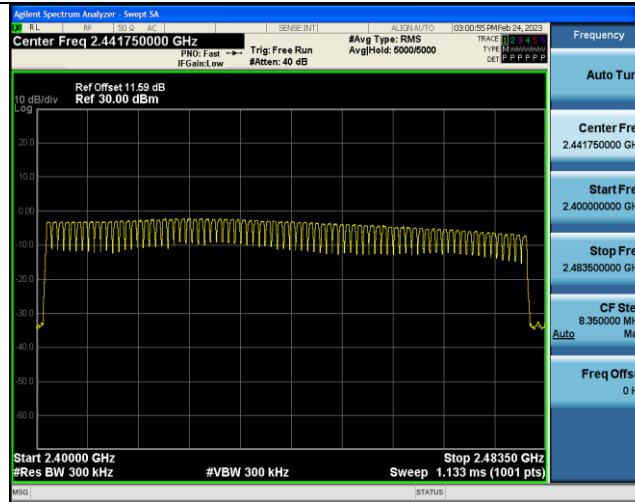
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100KHz. VBW = 300KHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.
4. Set the spectrum analyzer: Start Frequency = 2.4GHz, Stop Frequency = 2.483GHz. Sweep=auto;
5. Set up:



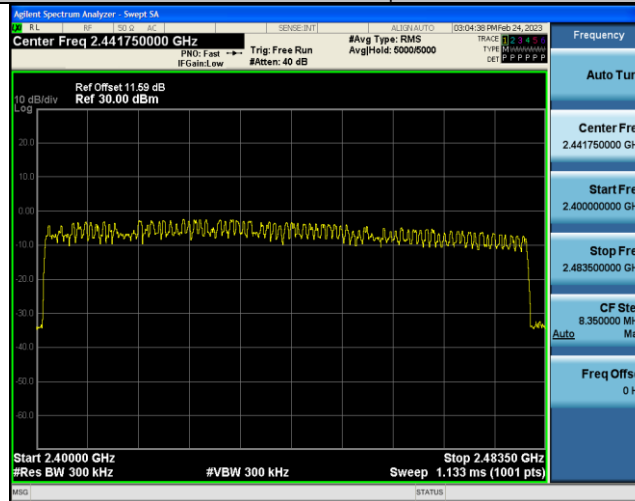
12.2 Test Result

TestMode	Antenna	Frequency[MHz]	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	≥15	PASS
2DH5	Ant1	Hop	79	≥15	PASS
3DH5	Ant1	Hop	79	≥15	PASS

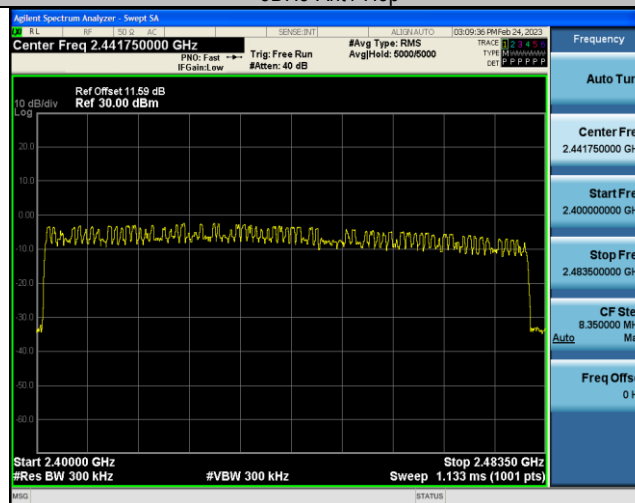
DH5-Ant1-Hop



2DH5-Ant1-Hop



3DH5-Ant1-Hop



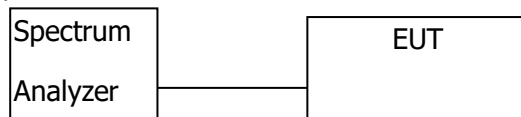


13 Dwell Time

Test Requirement	: FCC CFR47 Part 15 Section 15.247
Test Method	: ANSI C63.10:2013
Test Limit	: Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.
Test Mode	: The worst case($\pi/4$ -DQPSK) was recorded

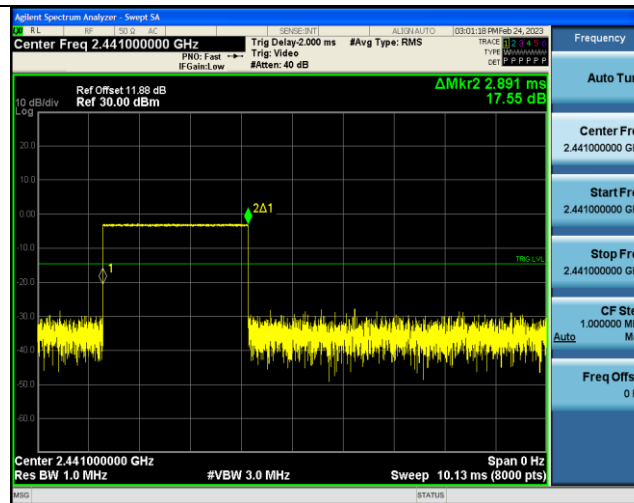
13.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set spectrum analyzer span = 0. Centred on a hopping channel;
3. Set RBW = 1MHz and VBW = 3MHz. Sweep = as necessary to capture the entire dwell time per hopping channel. Set the EUT for DH5, DH3 and DH1 packet transmitting.
4. Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).
5. Set up:

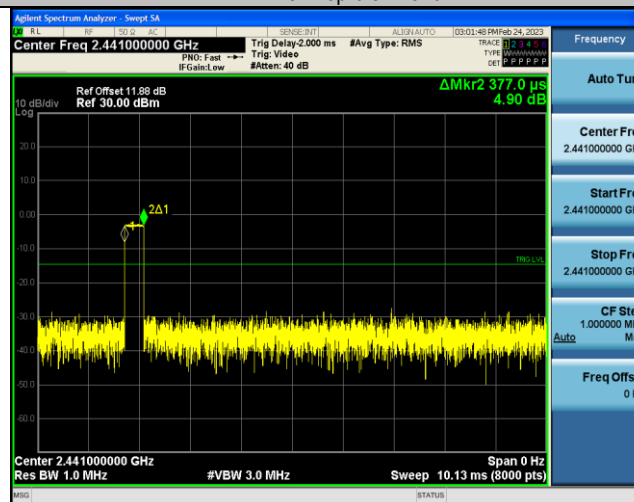


13.2 Test Result

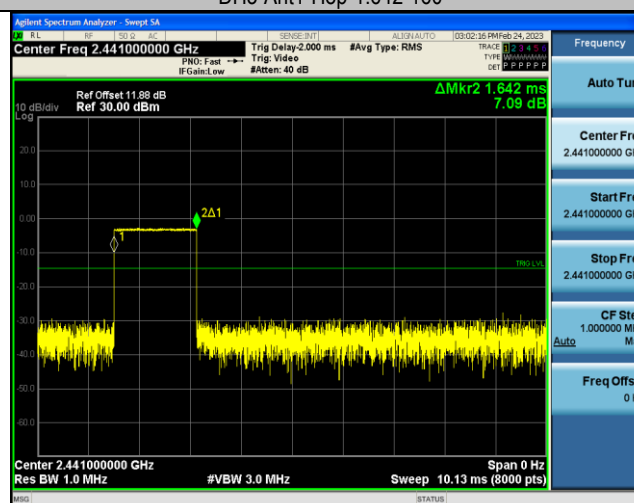
TestMode	Antenna	Frequency[MHz]	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant1	Hop	2.891	106.67	0.308	≤0.4	PASS
DH1	Ant1	Hop	0.377	320	0.121	≤0.4	PASS
DH3	Ant1	Hop	1.642	160	0.263	≤0.4	PASS
2DH5	Ant1	Hop	2.885	106.67	0.308	≤0.4	PASS
2DH1	Ant1	Hop	0.386	320	0.124	≤0.4	PASS
2DH3	Ant1	Hop	1.638	160	0.262	≤0.4	PASS
3DH5	Ant1	Hop	2.887	106.67	0.308	≤0.4	PASS
3DH1	Ant1	Hop	0.385	320	0.123	≤0.4	PASS
3DH3	Ant1	Hop	1.635	160	0.262	≤0.4	PASS



DH1-Ant1-Hop-0.377-320



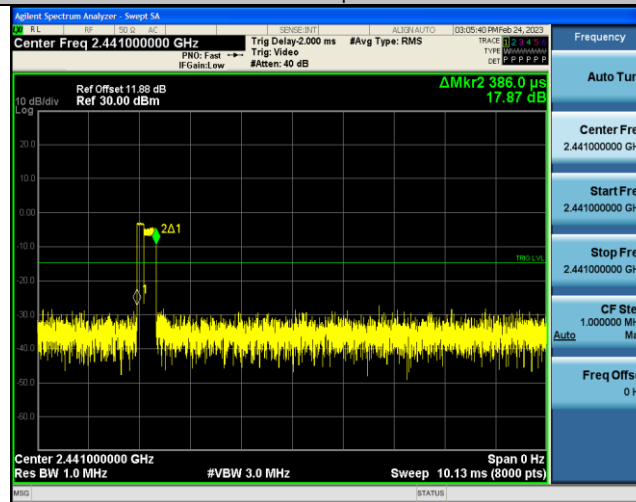
DH3-Ant1-Hop-1.642-160



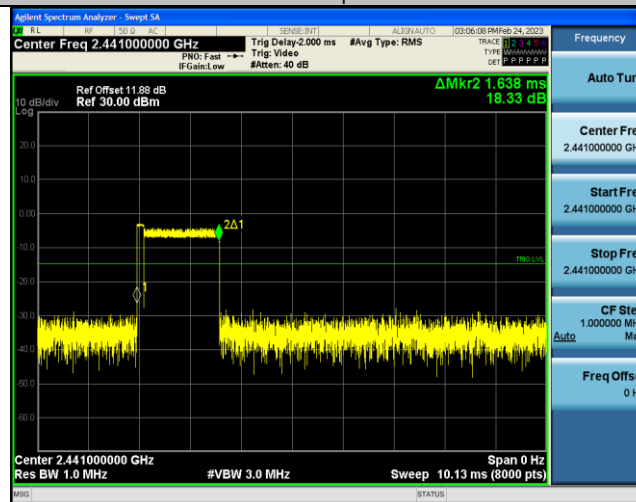
2DH5-Ant1-Hop-2.885-106.67



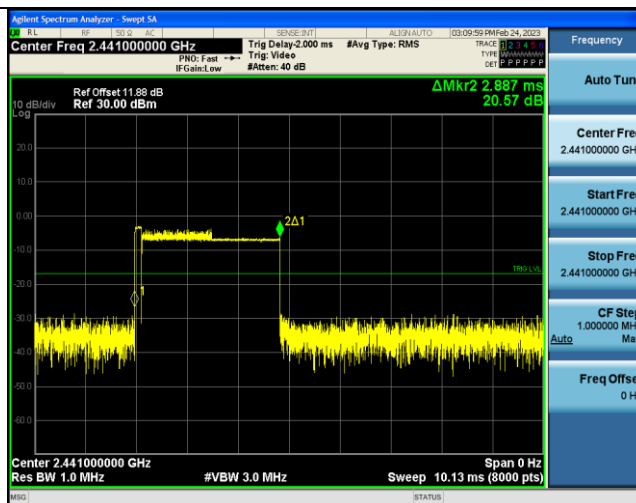
2DH1-Ant1-Hop-0.386-320



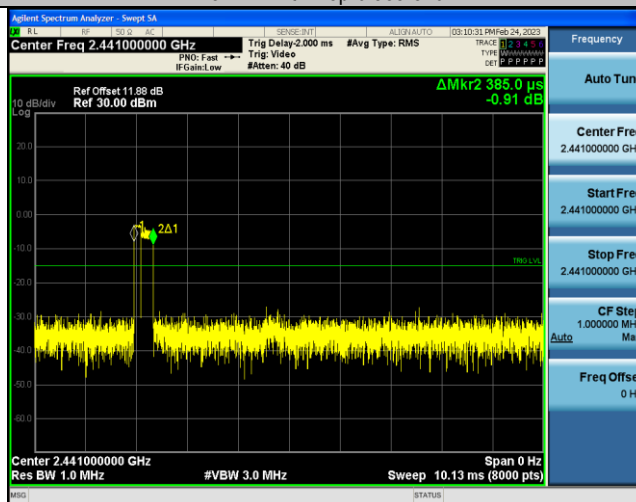
2DH3-Ant1-Hop-1.638-160



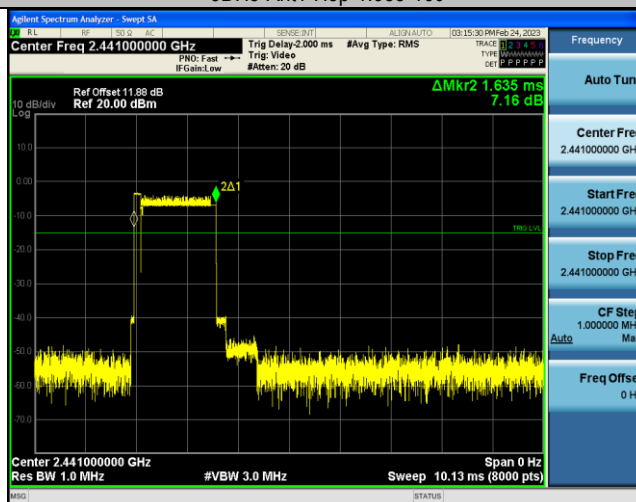
3DH5-Ant1-Hop-2.887-106.67



3DH1-Ant1-Hop-0.385-320



3DH3-Ant1-Hop-1.635-160





14 Antenna Requirement

14.1 Antenna Requirement

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

14.2 Result

The EUT'S antenna, permanent attached antenna, is Fpcb Antenna. The antenna's gain is 2.87dBi and meets the requirement.

15 TEST PHOTOS

Conduction Emissions



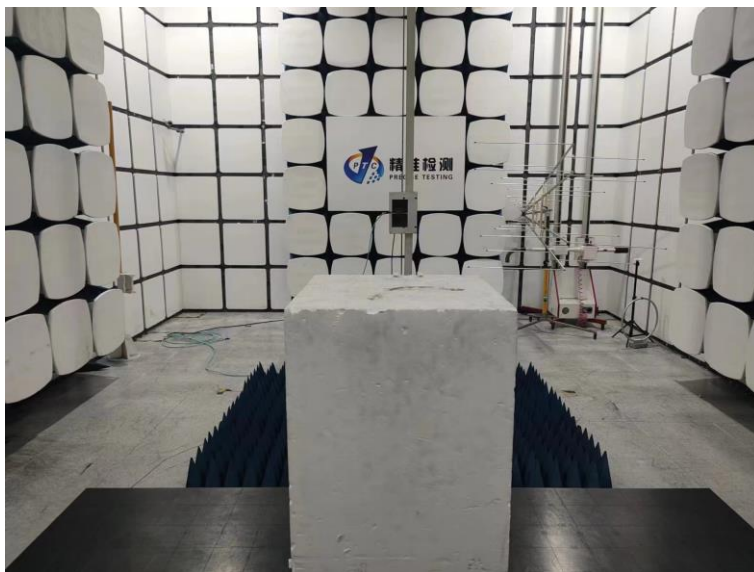
Radiated Spurious Emissions
Test Frequency From 30MHz-1000MHz



Test Frequency above 1G



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16 EUT PHOTOS

Reference EUT Photos

*****THE END REPORT*****