3.5 Channel Separation

3.5.1 Limit

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

3.5.2 Test Peripherals

Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	Type-C Cable	AWM	E101344	0.9m,No Shielding
2	Adaptor	FUSHIGANG	AS1201A-0502000 USU	NA
3	Record PC	Lenovo	M4500T	NA
4	Control PC	Lenovo	M4500T	NA

### 3.5.3 Test Procedure

Test Method	
●Conducted Measurement	○Radiated Measurement
Test Channels	
●Lowest, Middle and Highest Channel	○ Lowest and Highest Channel
Environmental conditions	
●Normal	○Normal and Extreme
Note:●:Test ○:No Test	

a) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below. Spectrum analyser settings as following:

| RBW	100 kHz
VBW	300 kHz
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto

b) Set the EUT in transmitting mode, maxhold the channel.

c) Set the adjacent channel of the EUT and maxhold another trace.
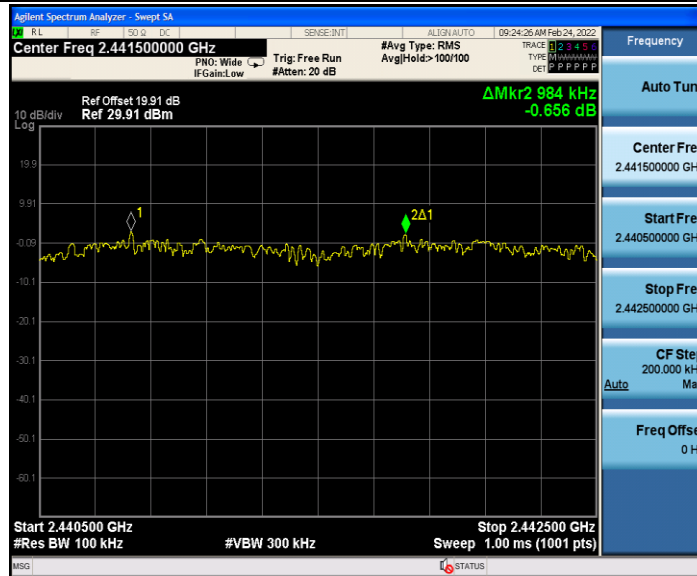
d) Measure the channel separation.

3.5.4 Test Setup
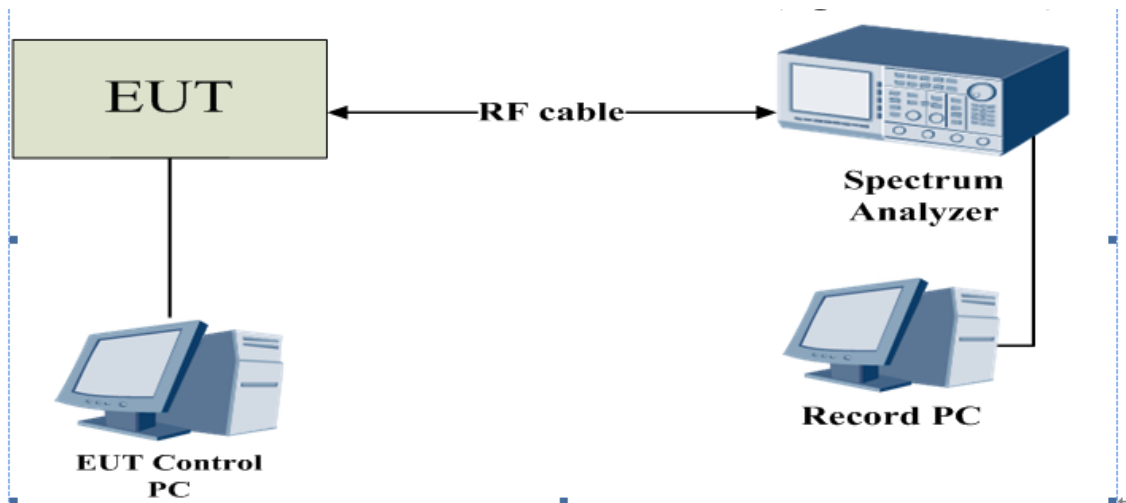
3.5.5 The Result

TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	1.022	≥0.630	PASS
2DH5	Ant1	Hop	1.006	≥0.838	PASS
3DH5	Ant1	Hop	0.984	≥0.846	PASS

DH5_Ant1_Hop

2DH5_Ant1_Hop

3DH5_Ant1_Hop

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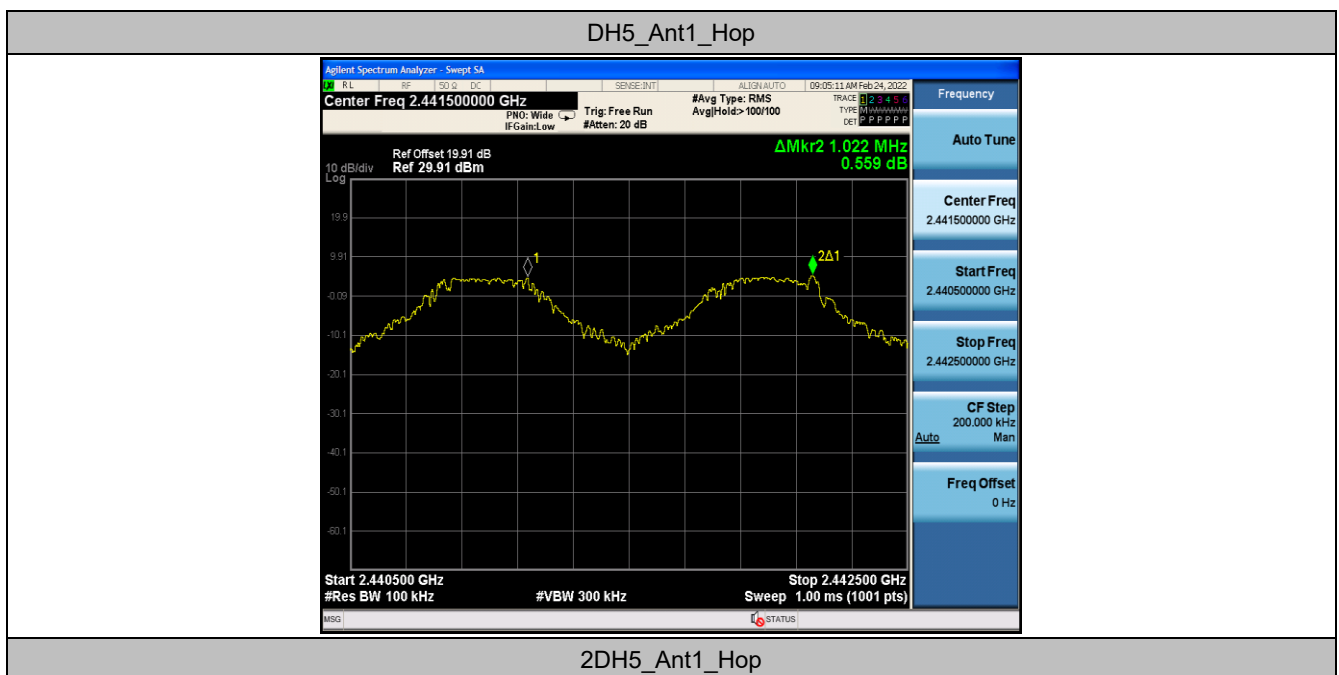
3.6 Quantity of hopping channel

3.6.1 Limit

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.

3.6.2 Test Peripherals

Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	Type-C Cable	AWM	E101344	0.9m,No Shielding
2	Adaptor	FUSHIGANG	AS1201A-0502000 USU	NA
3	Record PC	Lenovo	M4500T	NA
4	Control PC	Lenovo	M4500T	NA

3.6.3 Test Procedure

Test Method	
●Conducted Measurement	○Radiated Measurement
Test Channels	
○Lowest, Middle and Highest Channel	● Hopping Channel
Environmental conditions	
●Normal	○Normal and Extreme
Note:●:Test ○:No Test	

a) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below. Spectrum analyser settings as following:

| RBW	100 KHz
VBW	300 KHz
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto

b) Set the EUT in transmitting mode worked in channel hopping.

c) Set the span From 2400~2483.5MHz。

d) Allow trace to fully stabilize.

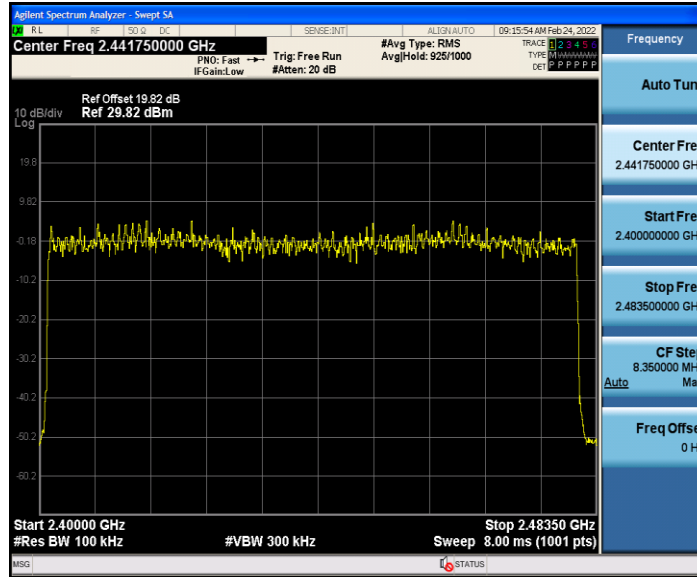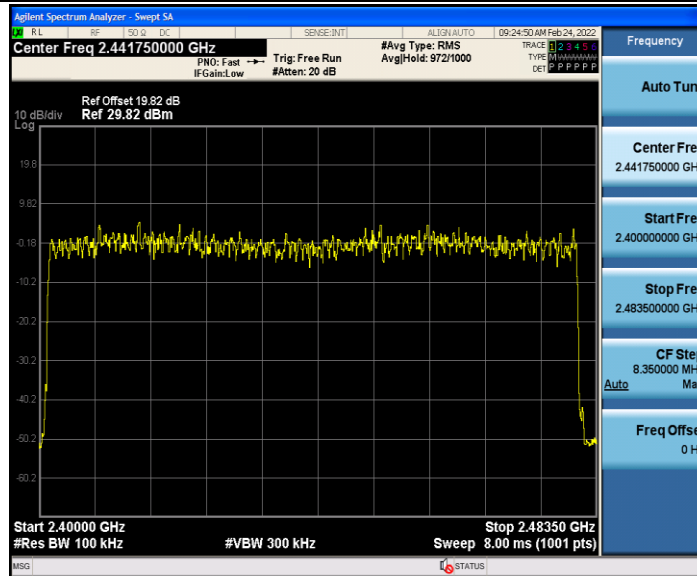e) By using the max-hold function record the quantity of the channel.

3.6.4 Test Setup
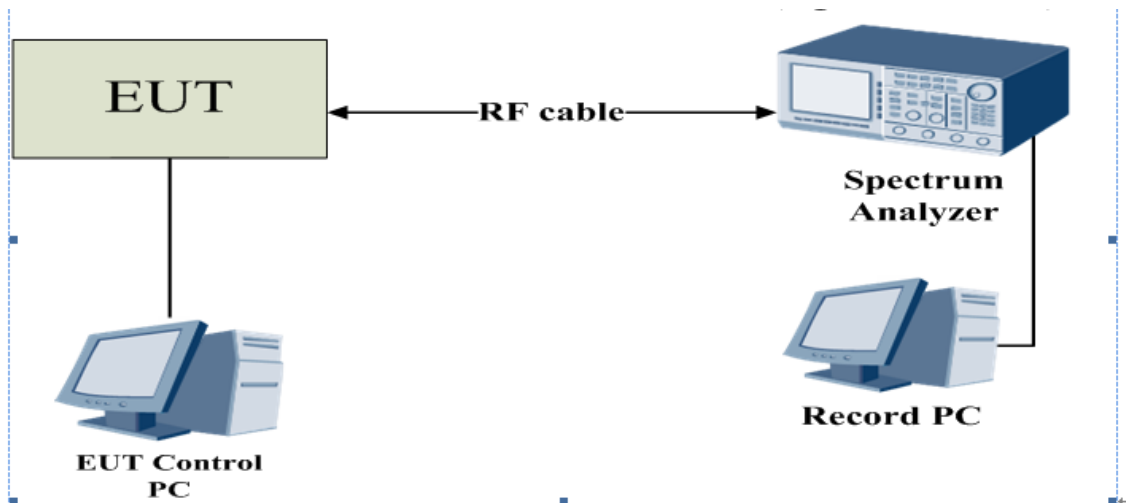
3.6.5 The Result

TestMode	Antenna	Channel	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

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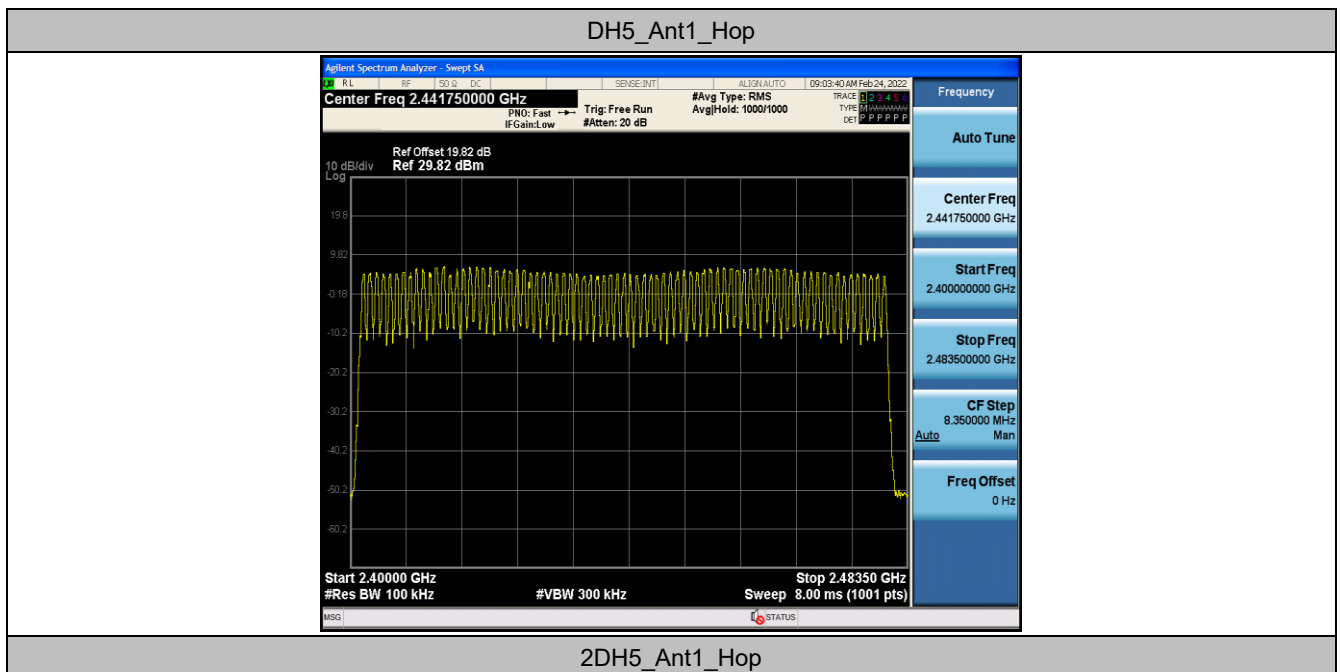
3.7 Time of Occupancy(Dwell Time)

3.7.1 Limit

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.

3.7.2 Test Peripherals

Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	Type-C Cable	AWM	E101344	0.9m,No Shielding
2	Adaptor	FUSHIGANG	AS1201A-0502000 USU	NA
3	Record PC	Lenovo	M4500T	NA
4	Control PC	Lenovo	M4500T	NA

3.7.3 Test Procedure

Test Method	
●Conducted Measurement	○Radiated Measurement
Test Channels	
○Lowest, Middle and Highest Channel	● Hopping Channel
Environmental conditions	
●Normal	○Normal and Extreme
Note:●:Test ○:No Test	

g) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below. Spectrum analyser settings as following:

RBW	1MHz
VBW	3MHz
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto

h) Set the EUT in transmitting mode worked in channel hopping.

i) Set the span to 0Hz.

j) Allow trace to fully stabilize.

k) Recorded the time of single pulses.

3.7.4 Test Setup
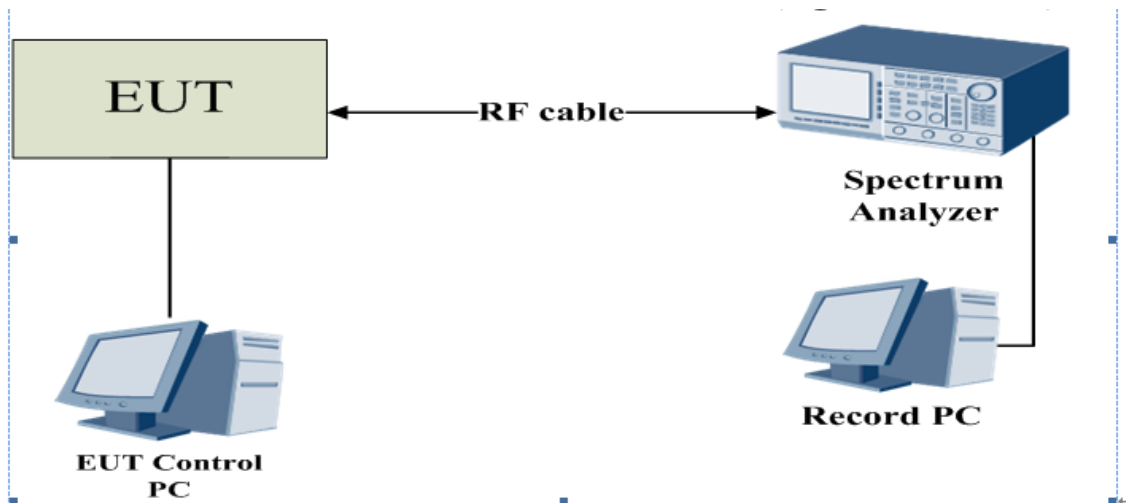
3.7.5 The Result

TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.38	320	0.122	≤0.4	PASS
DH3	Ant1	Hop	1.64	160	0.262	≤0.4	PASS
DH5	Ant1	Hop	2.88	130	0.375	≤0.4	PASS
2DH1	Ant1	Hop	0.39	330	0.127	≤0.4	PASS
2DH3	Ant1	Hop	1.64	195	0.320	≤0.4	PASS
2DH5	Ant1	Hop	2.89	115	0.332	≤0.4	PASS
3DH1	Ant1	Hop	0.39	320	0.123	≤0.4	PASS
3DH3	Ant1	Hop	1.64	189	0.310	≤0.4	PASS
3DH5	Ant1	Hop	2.89	110	0.318	≤0.4	PASS

Note 1: A period time=0.4s*79=31.6s, Result=BurstWidth*Totalhops

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

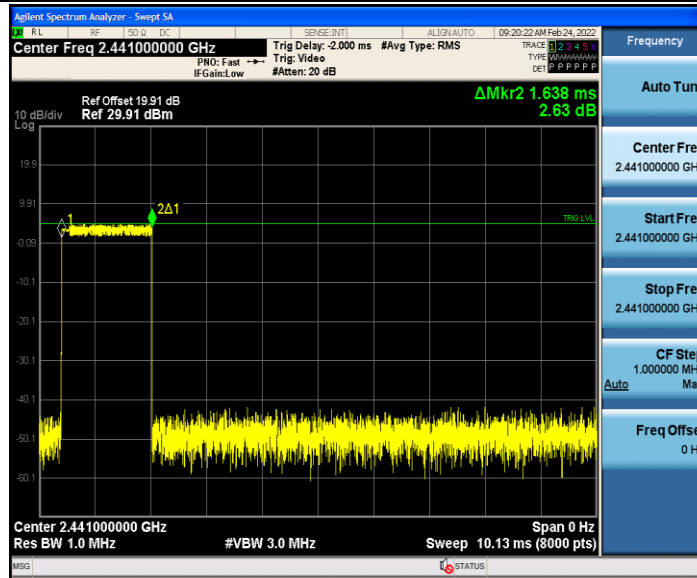Note 3: Hopping Number in 3.16s=Total of highest signals in 3.16s(Second high signals were other channel)
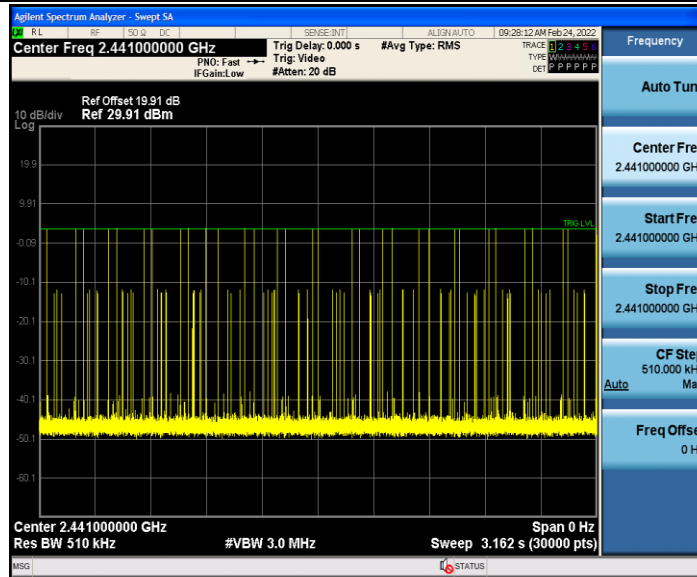
DH1_Ant1_Hop
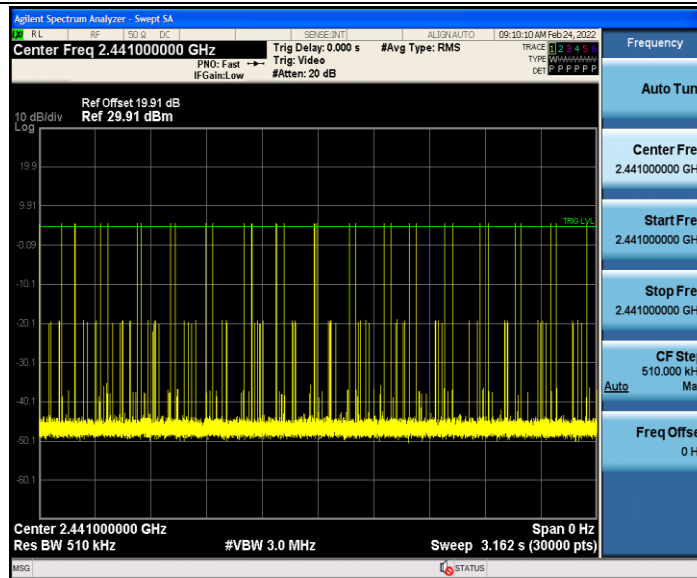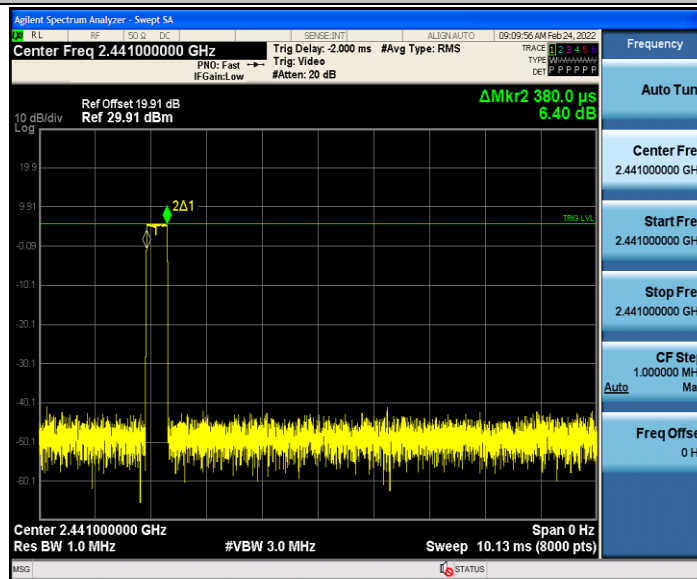
DH3_Ant1_Hop
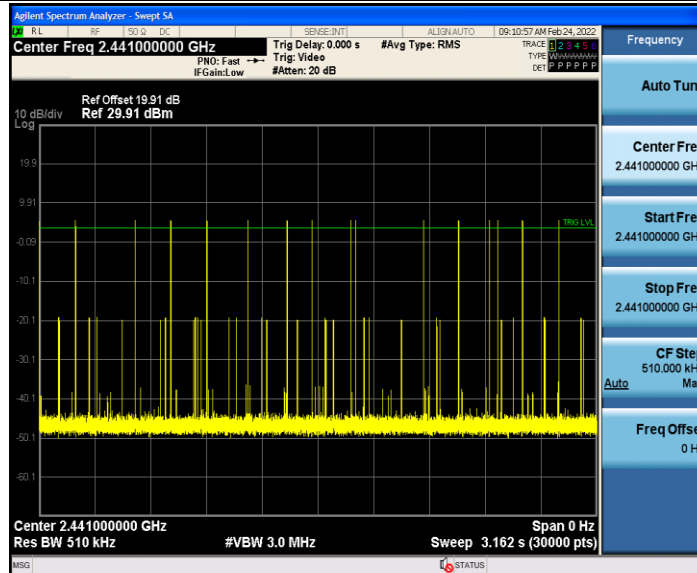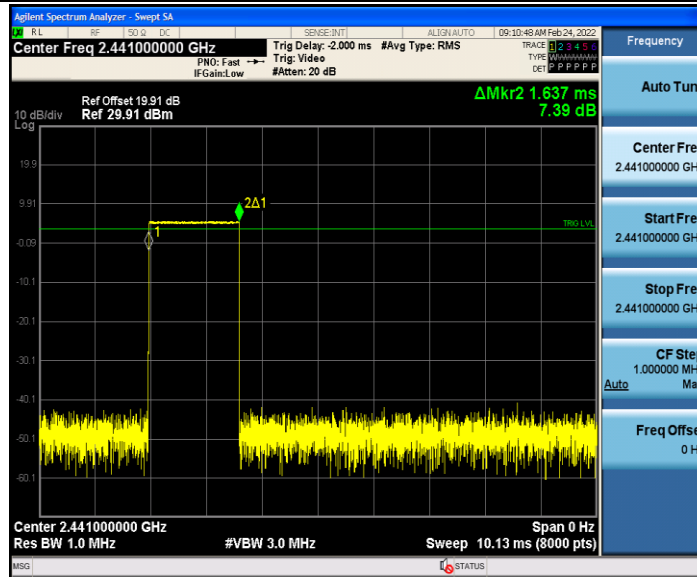
DH5_Ant1_Hop

2DH1_Ant1_Hop

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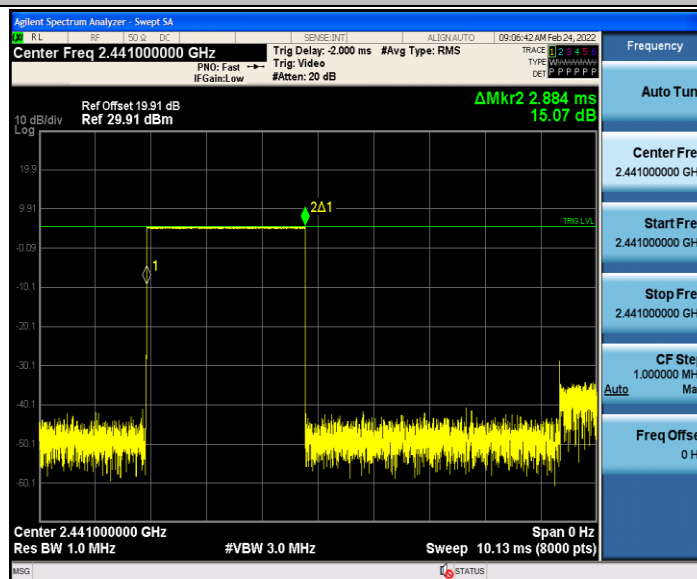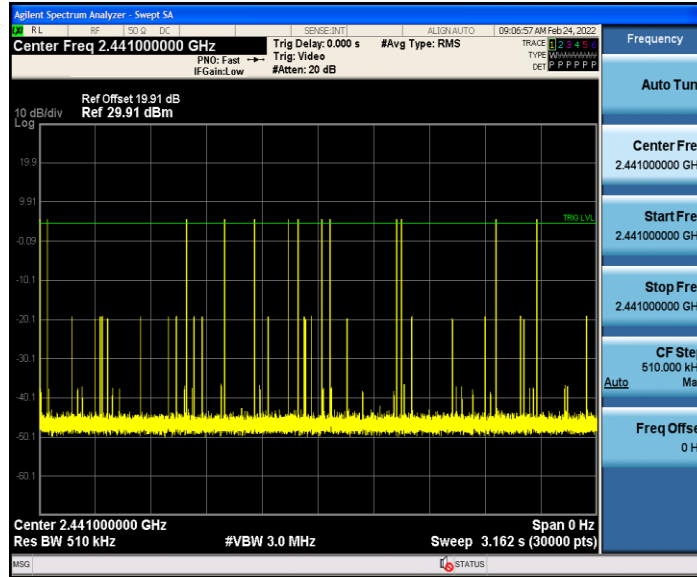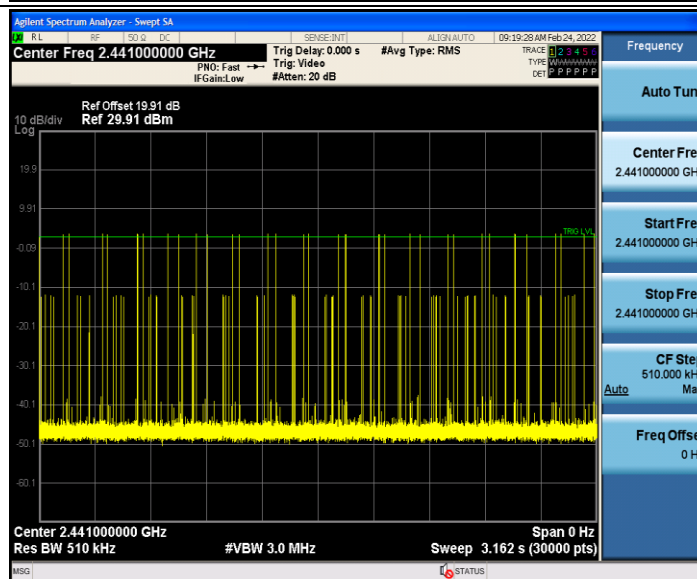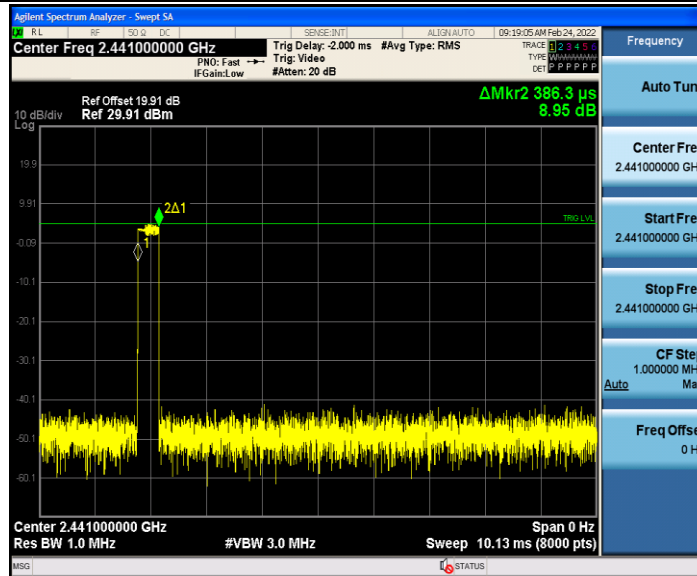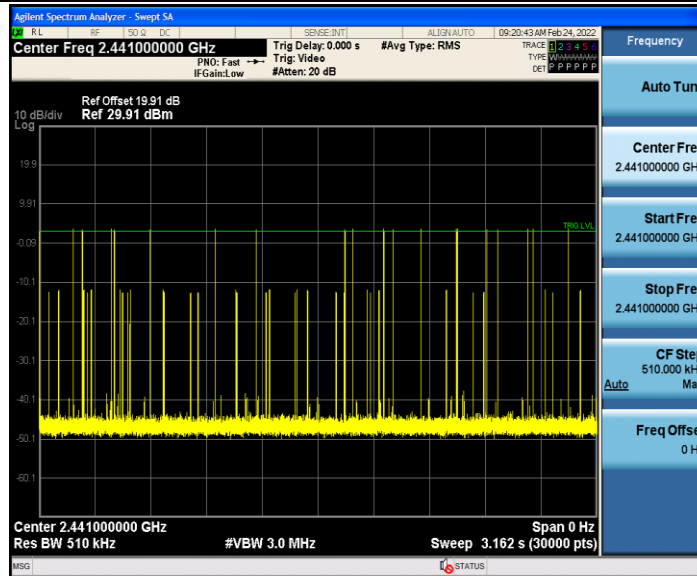
2DH3_Ant1_Hop

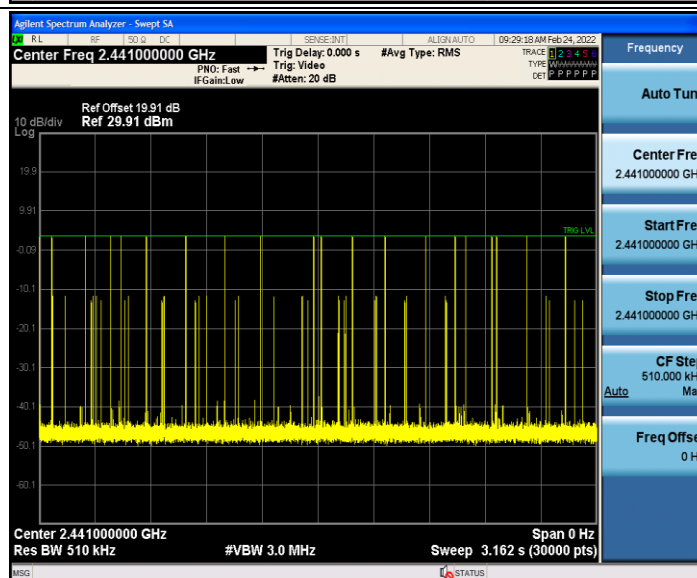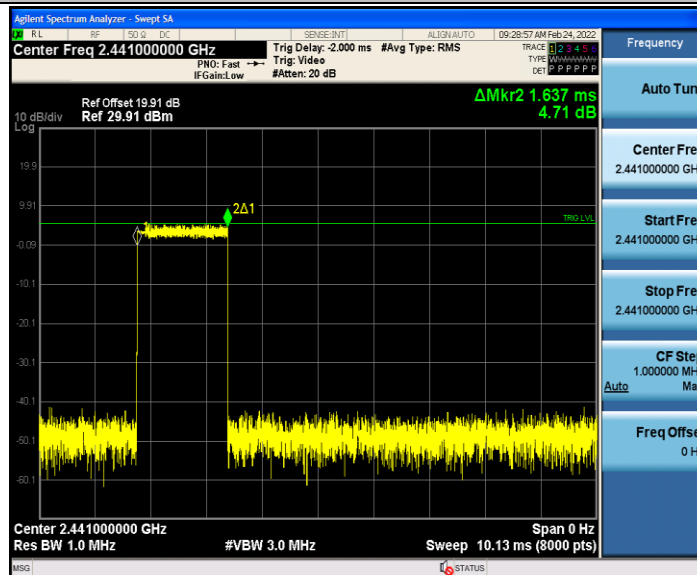| 2DH5_Ant1_Hop |
|---|

3DH1_Ant1_Hop
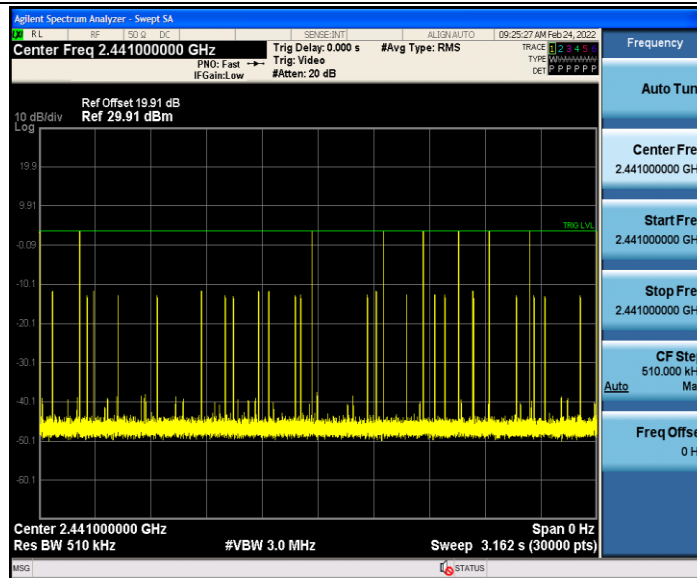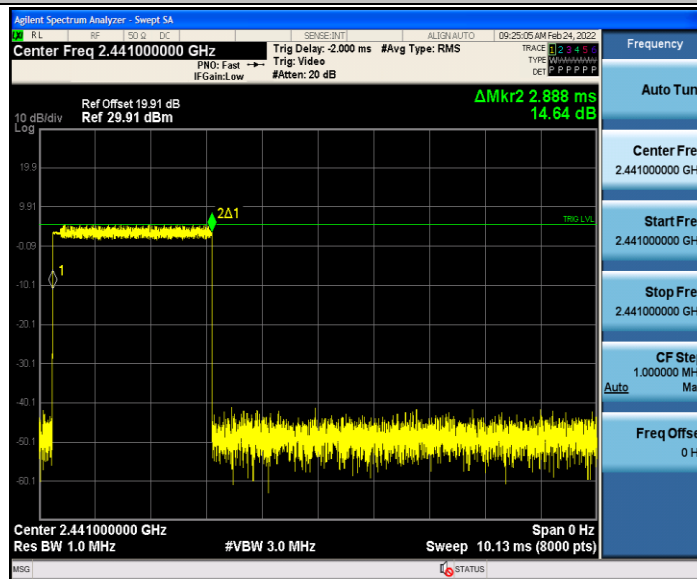

TIRT-TRF/FCC01-2(E):2021A0
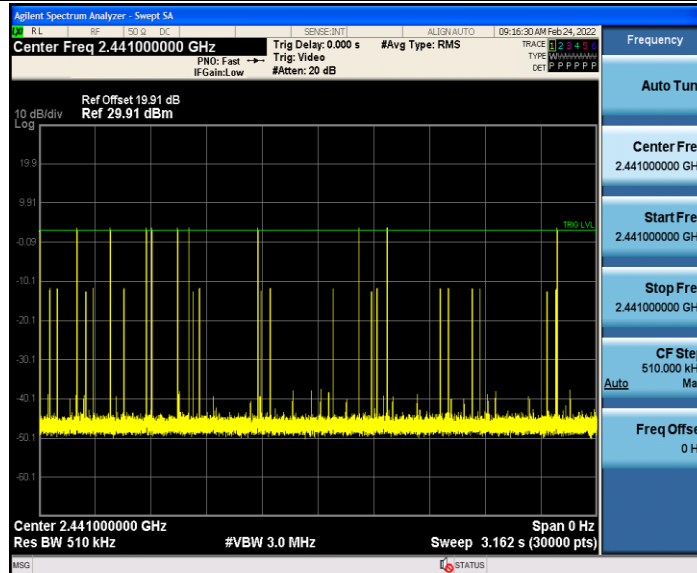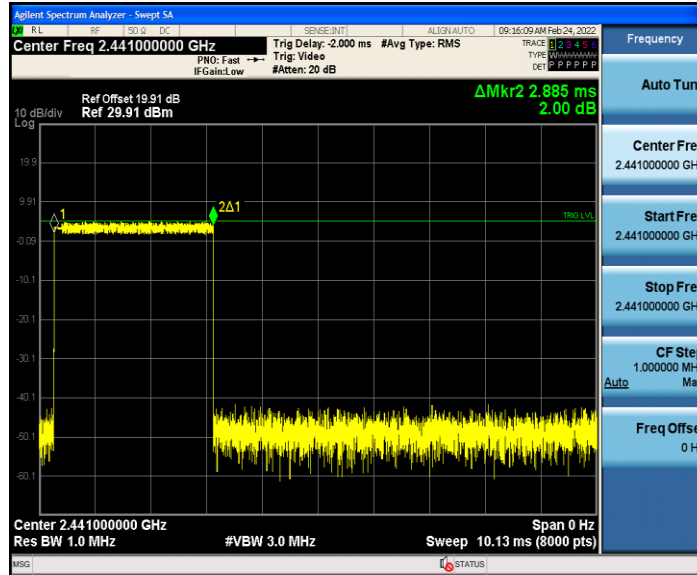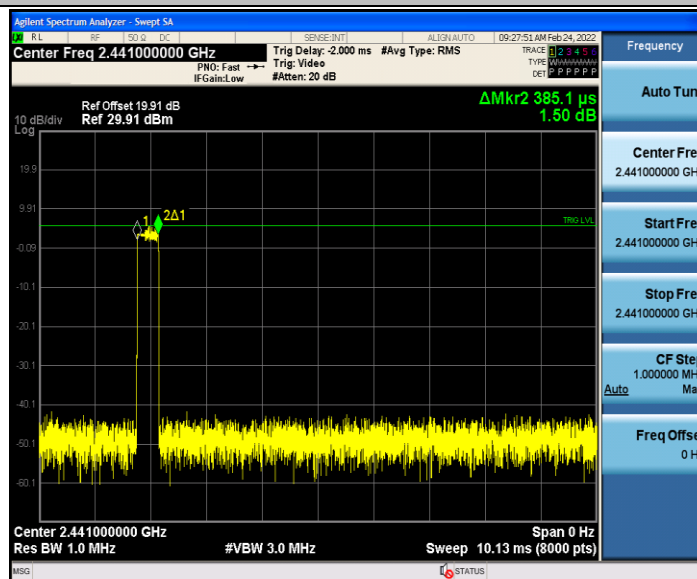
3DH3_Ant1_Hop

3DH5_Ant1_Hop

3.8 Band Edge

3.8.1 Limit

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)).

3.8.2 Test Peripherals

Support Equipment				
No.	Equipment	Brand Name	Model Name	Remarks
1	Type-C Cable	AWM	E101344	0.9m,No Shielding
2	Adaptor	FUSHIGANG	AS1201A-0502000 USU	NA
3	Record PC	Lenovo	M4500T	NA
4	Control PC	Lenovo	M4500T	NA

3.8.3 Test Procedure

Test Method	
●Conducted Measurement	○Radiated Measurement
Test Channels	
●Lowest, Middle and Highest Channel	○ Lowest and Highest Channel
Environmental conditions	
●Normal	○Normal and Extreme
Note:●:Test　　○:No Test	

a) The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below. Spectrum analyser settings as following:

RBW	100 kHz
VBW	300 kHz
Detector Mode	Peak
Trace Mode	Max Hold
Sweep Time	Auto

b) Set the EUT in transmitting mode, maxhold the channel.

c) 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.

d) Repeat above procedures until all measured frequencies were complete.

3.8.4 Test Setup
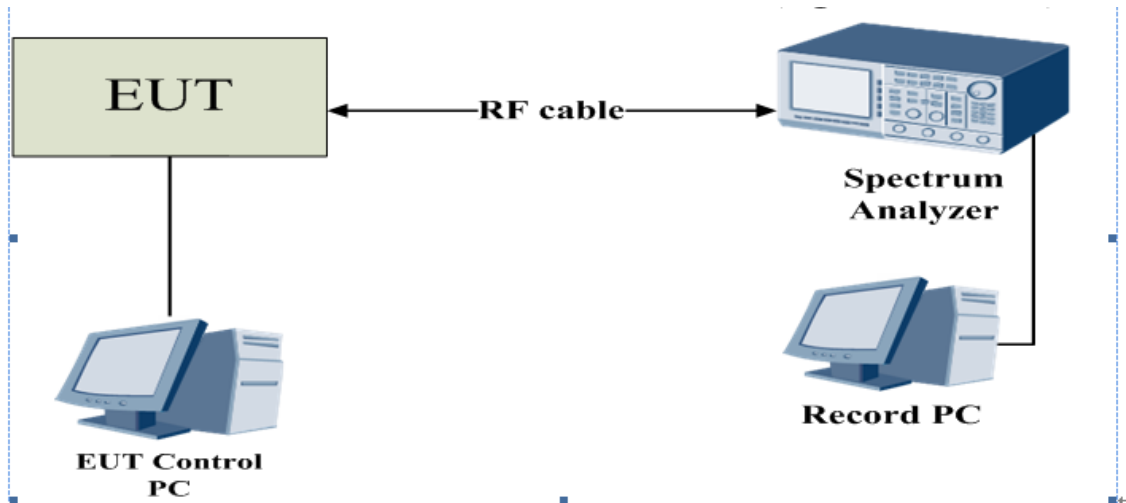
3.8.5 The Result

TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	5.37	-49.28	≤-14.63	PASS
		High	2480	5.13	-49.01	≤-14.88	PASS
		Low	Hop_2402	4.92	-49.1	≤-15.08	PASS
		High	Hop_2480	5.02	-49.88	≤-14.98	PASS
2DH5	Ant1	Low	2402	3.67	-49.6	≤-16.33	PASS
		High	2480	3.51	-48.53	≤-16.49	PASS
		Low	Hop_2402	3.47	-48.9	≤-16.53	PASS
		High	Hop_2480	1.49	-49.86	≤-18.51	PASS
3DH5	Ant1	Low	2402	3.42	-50	≤-16.58	PASS
		High	2480	3.53	-48.55	≤-16.47	PASS
		Low	Hop_2402	0.42	-50.02	≤-19.58	PASS
		High	Hop_2480	3.37	-49.68	≤-16.64	PASS

DH5_Ant1_Low_2402
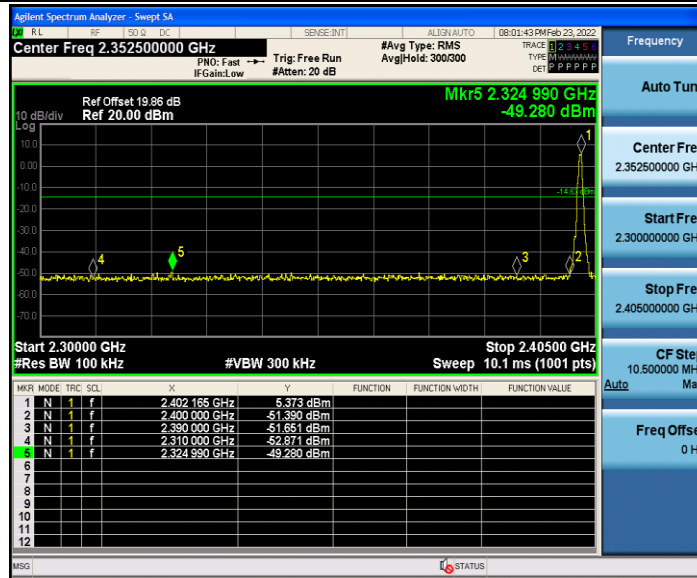
DH5_Ant1_High_2480
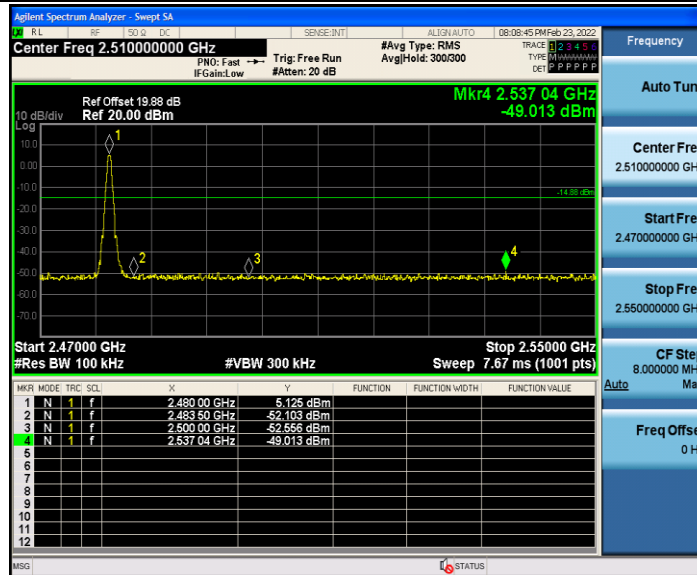
DH5_Ant1_Low_Hop_2402

DH5_Ant1_High_Hop_2480

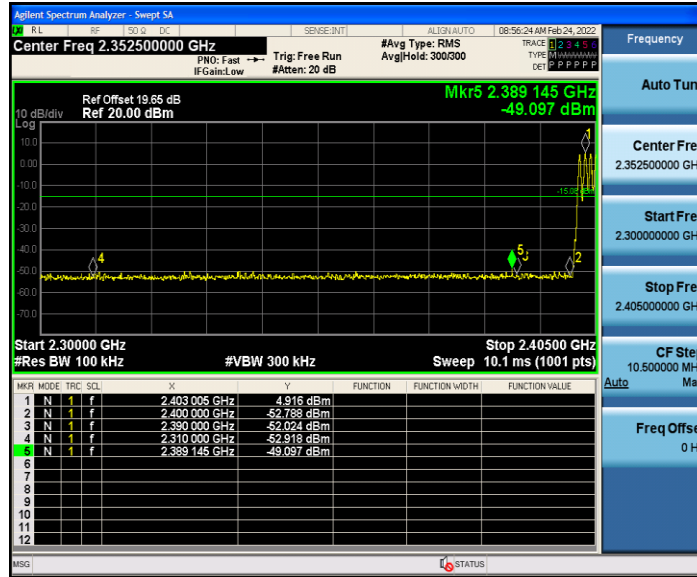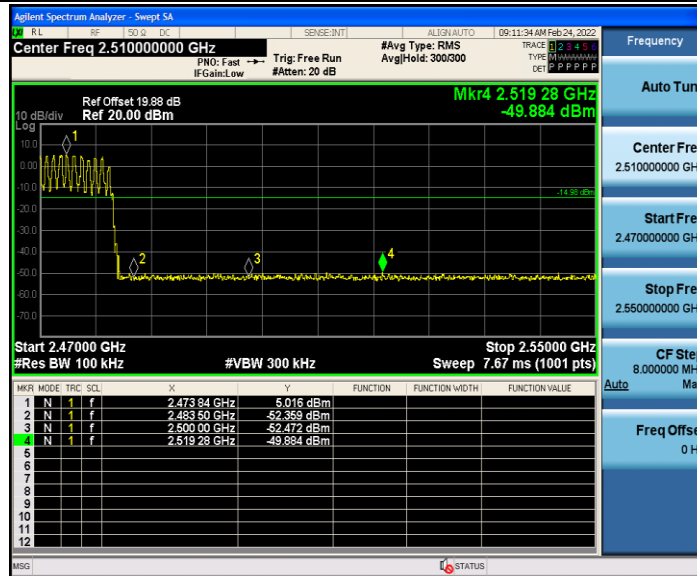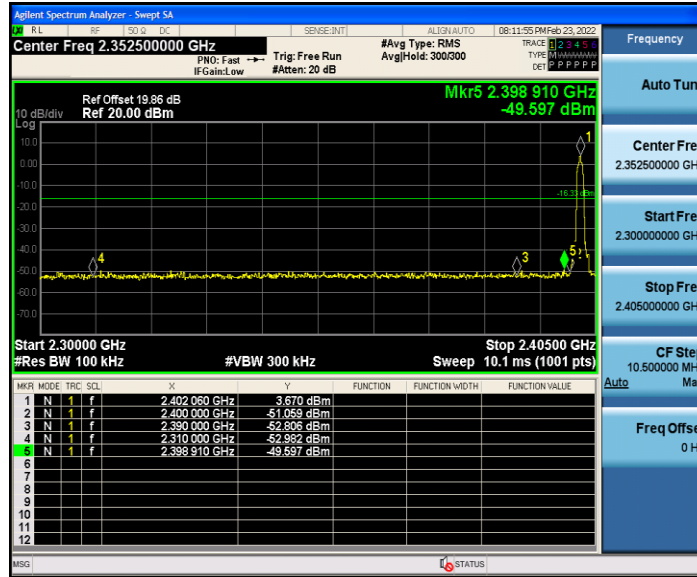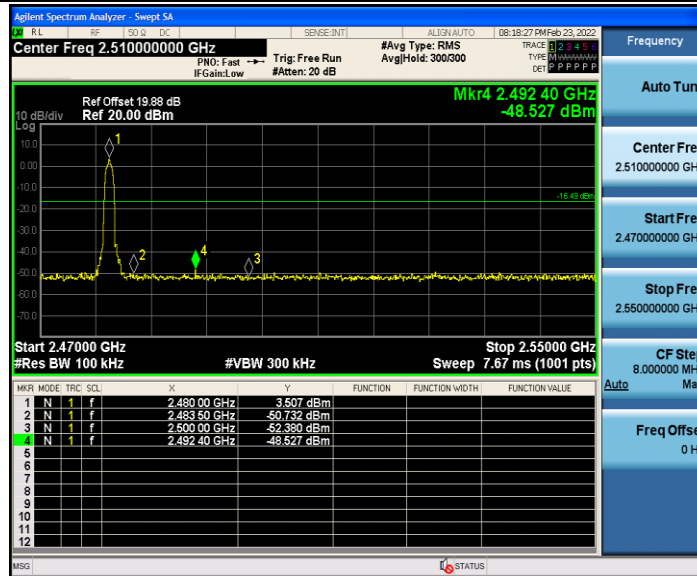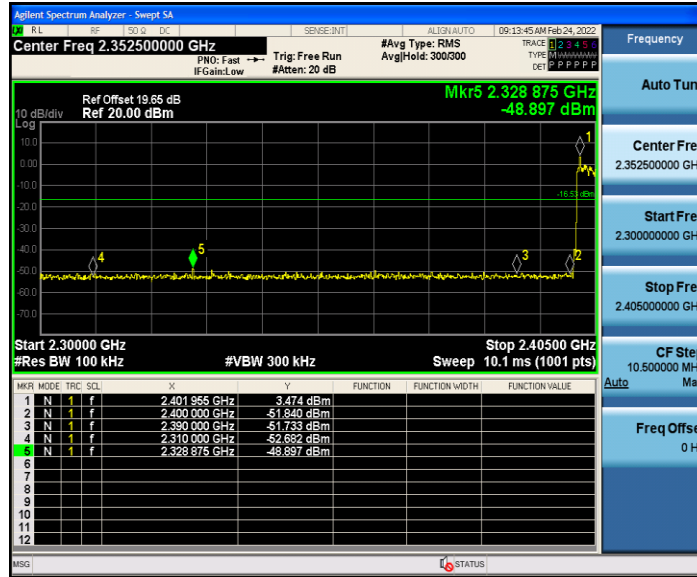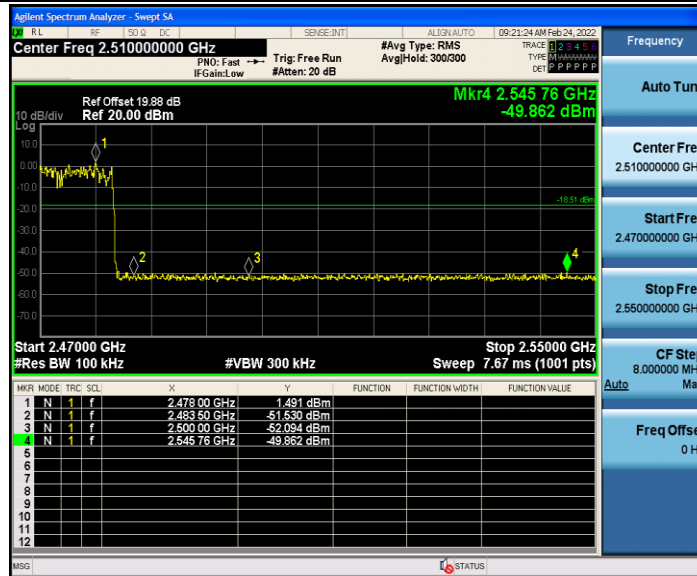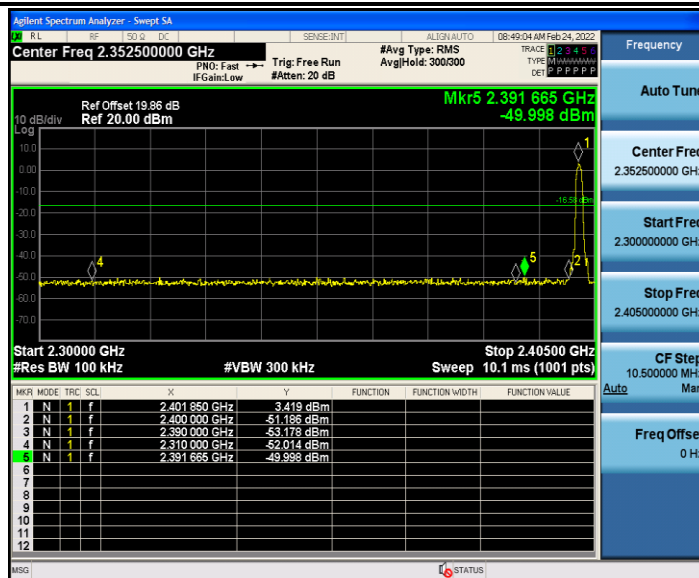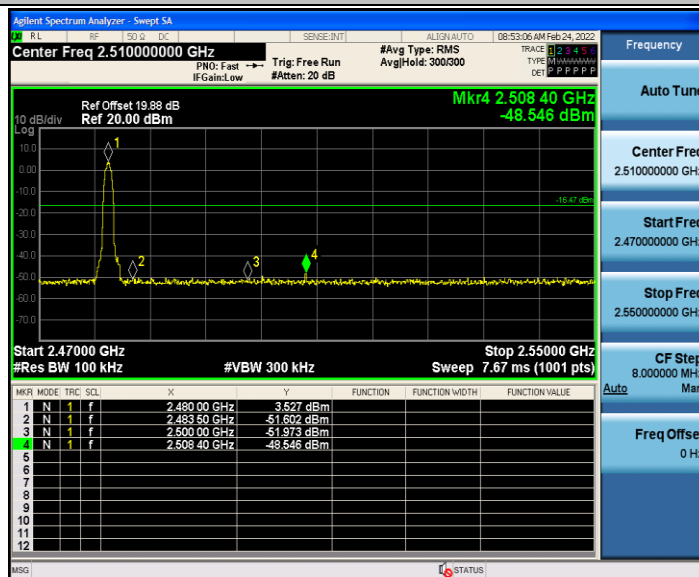2DH5_Ant1_Low_2402

2DH5_Ant1_High_2480
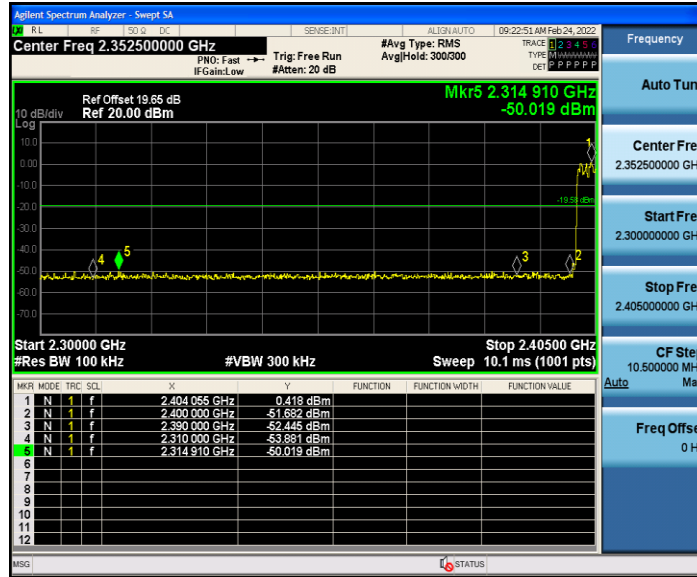

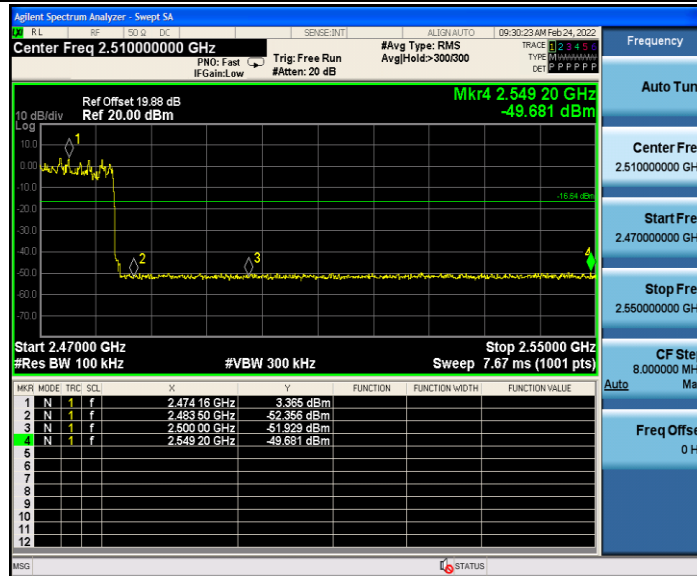2DH5_Ant1_Low_Hop_2402

2DH5_Ant1_High_Hop_2480

3DH5_Ant1_Low_2402

3DH5_Ant1_High_2480

3DH5_Ant1_Low_Hop_2402

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3DH5_Ant1_High_Hop_2480

（END OF REPORT）