



Appendix A

RF Test Data for 2.4G BT (Conducted Measurement)

Product Name: Star Night Light Projector

Trade Mark: N/A

Test Model: W2003

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	50%
ATM Pressure:	100.0 kPa
Test Engineer:	Ling. Zhu
Supervised by:	Libu



Appendix A.1: Maximum conducted output power

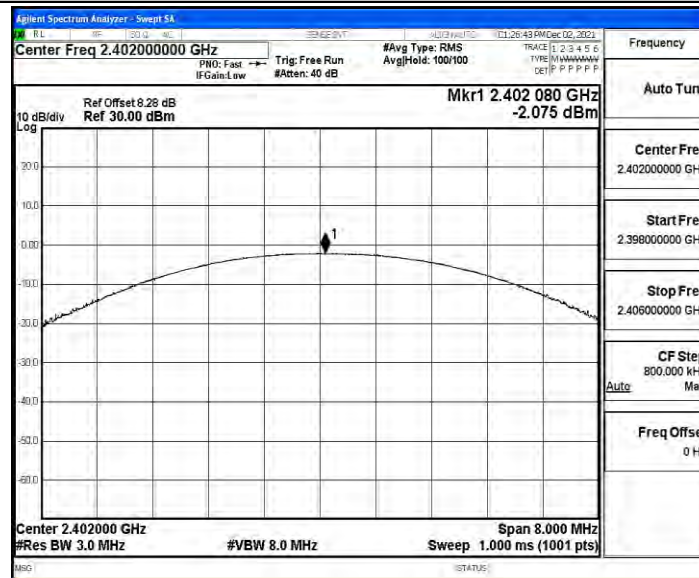
Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	-2.08	≤20.97	PASS
		2441	-0.93	≤20.97	PASS
		2480	0.1	≤20.97	PASS
2DH5	Ant1	2402	-1.43	≤20.97	PASS
		2441	-0.19	≤20.97	PASS
		2480	0.83	≤20.97	PASS
3DH5	Ant1	2402	-0.88	≤20.97	PASS
		2441	0.26	≤20.97	PASS
		2480	1.28	≤20.97	PASS

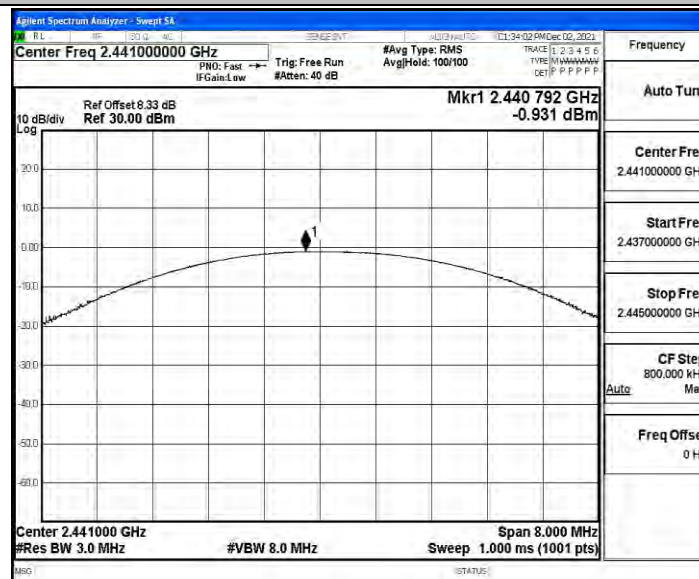


Test Graphs

DH5_Ant1_2402

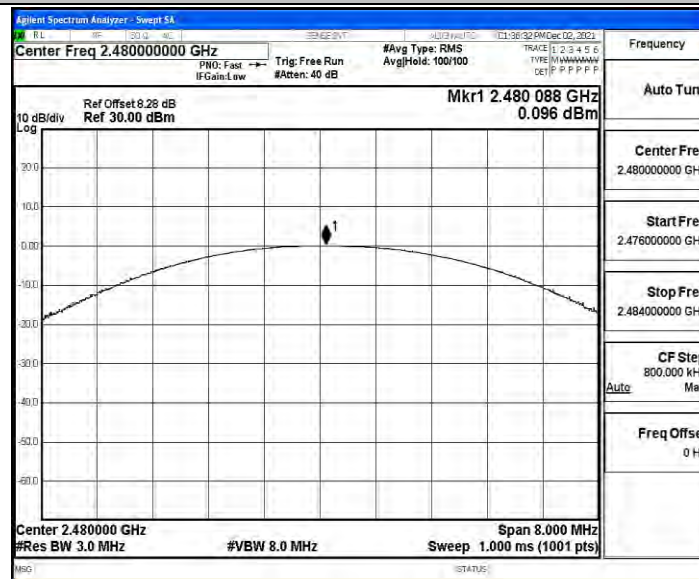


DH5_Ant1_2441

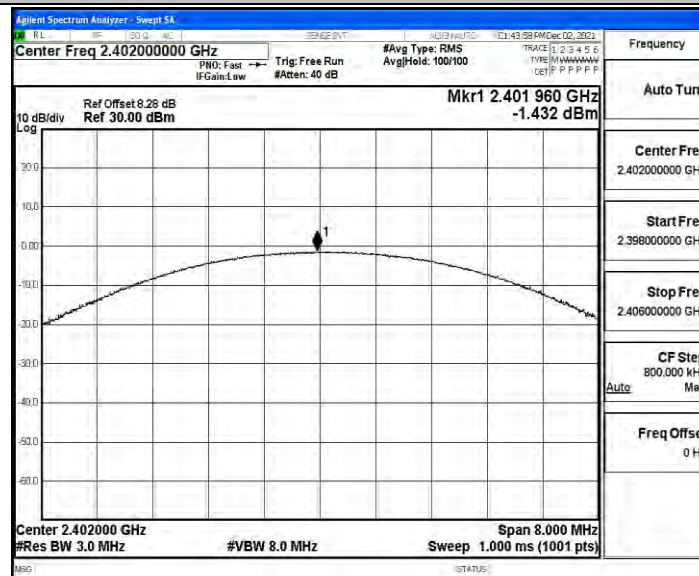




DH5_Ant1_2480

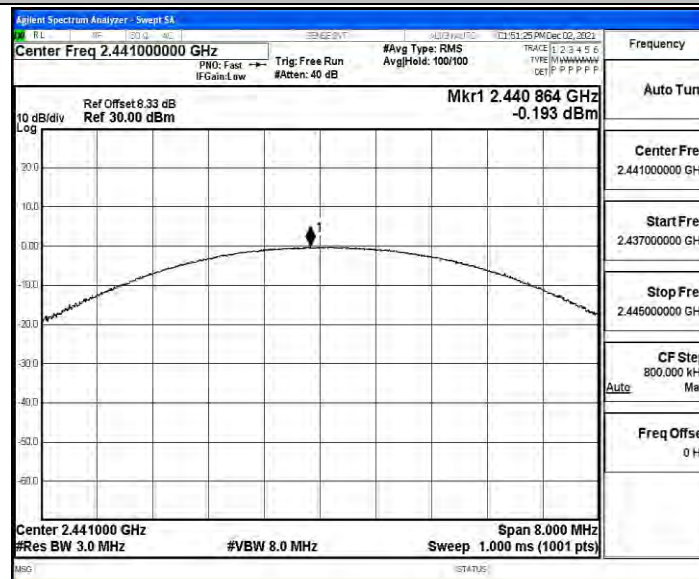


2DH5_Ant1_2402

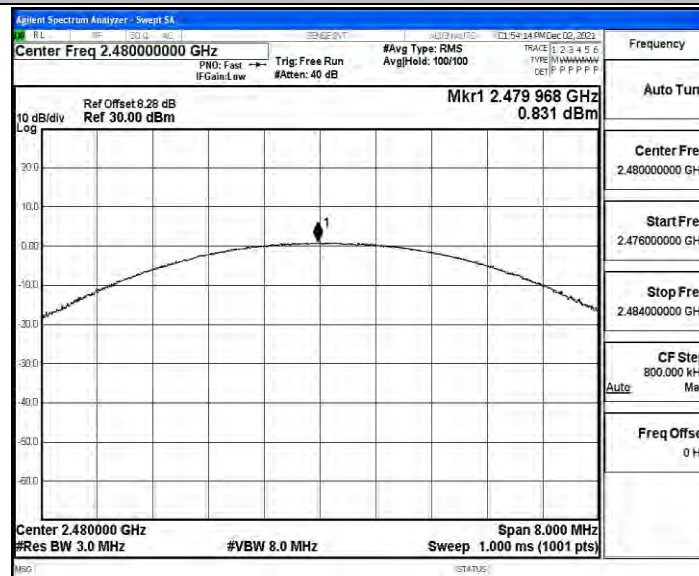




2DH5_Ant1_2441

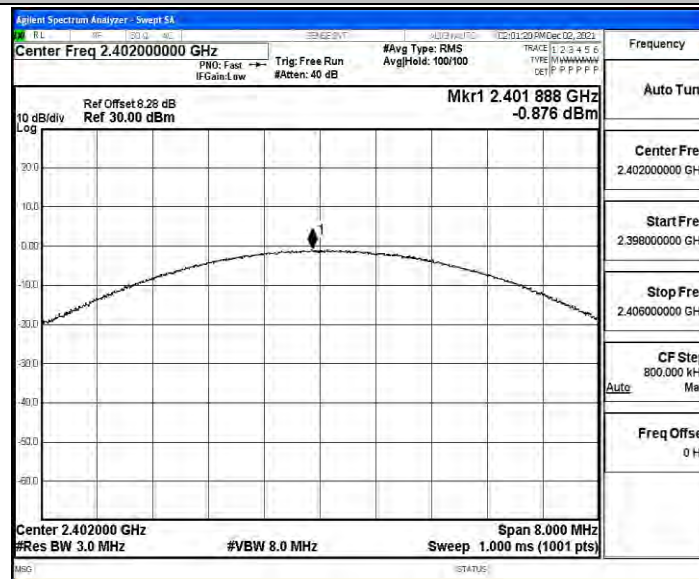


2DH5_Ant1_2480

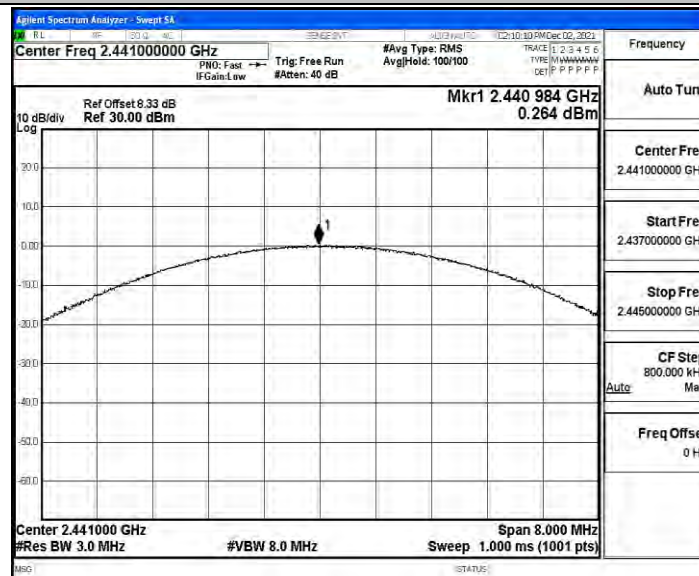




3DH5_Ant1_2402

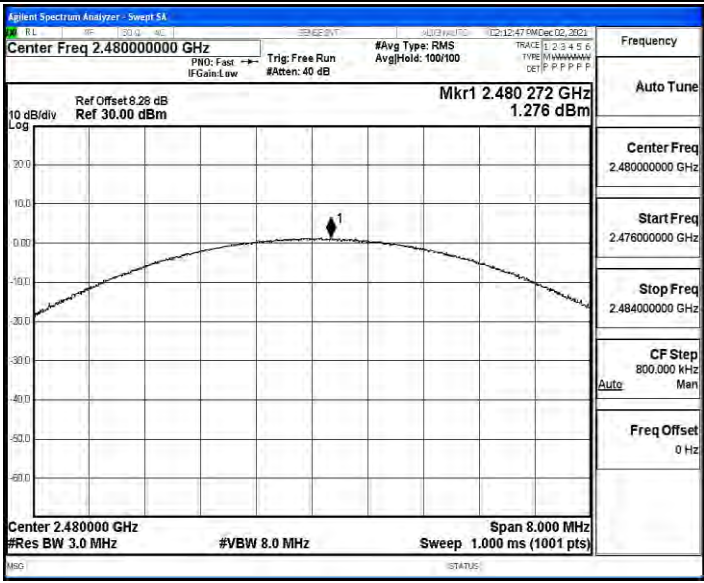


3DH5_Ant1_2441





3DH5_Ant1_2480





Appendix A.2.1: 20dB Emission Bandwidth

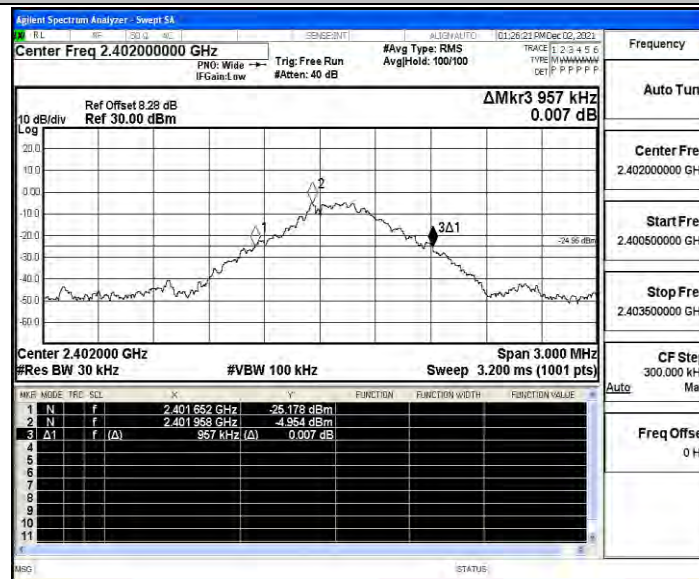
Test Result

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.957	2401.652	2402.609	---	PASS
		2441	0.954	2440.655	2441.609	---	PASS
		2480	0.957	2479.652	2480.609	---	PASS
2DH5	Ant1	2402	1.287	2401.481	2402.768	---	PASS
		2441	1.317	2440.457	2441.774	---	PASS
		2480	1.284	2479.484	2480.768	---	PASS
3DH5	Ant1	2402	1.296	2401.466	2402.762	---	PASS
		2441	1.290	2440.469	2441.759	---	PASS
		2480	1.311	2479.463	2480.774	---	PASS

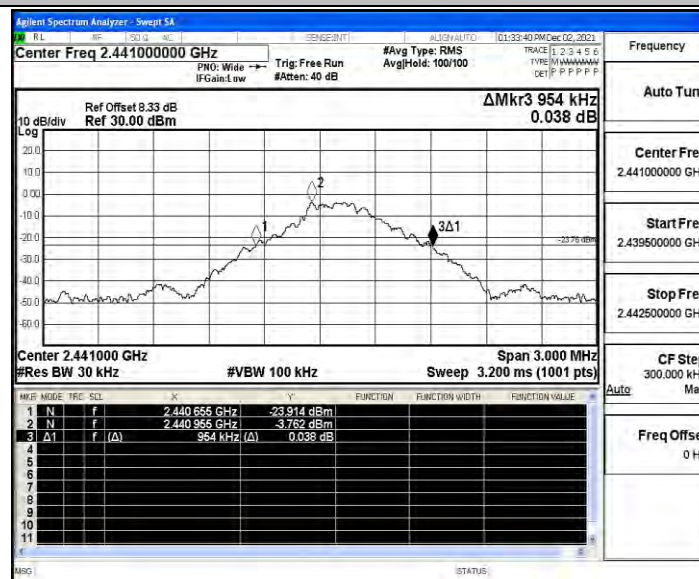


Test Graphs

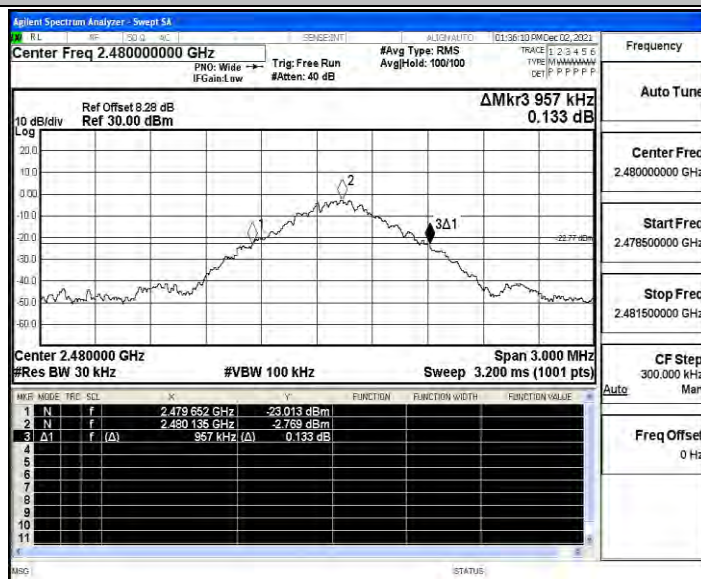
DH5_Ant1_2402



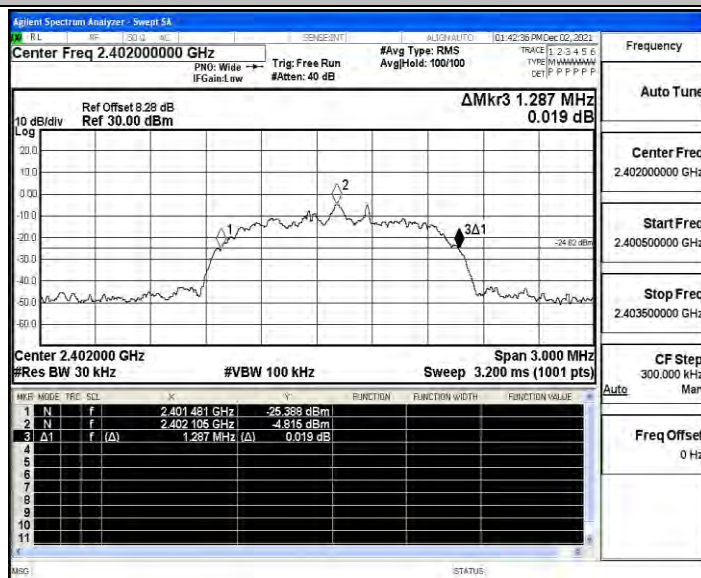
DH5_Ant1_2441



DH5 Ant1 2480

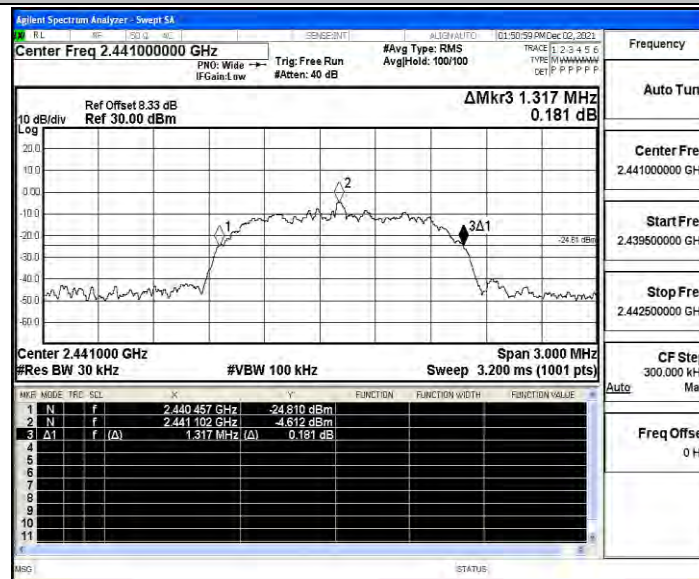


2DH5 Ant1 2402

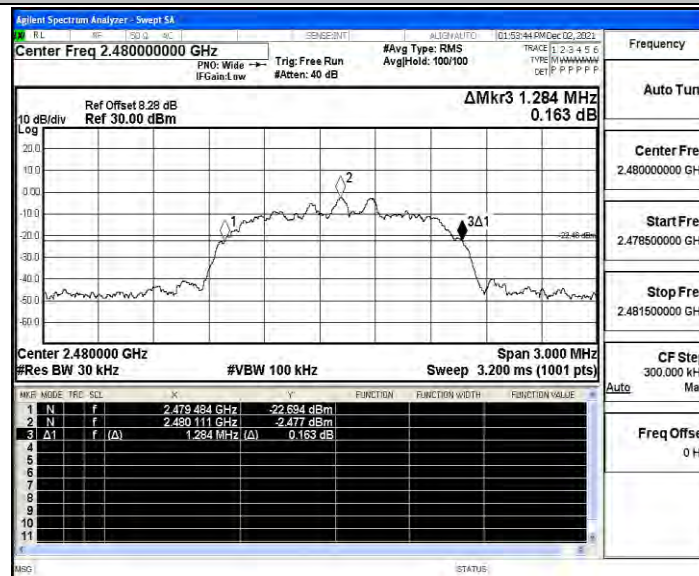




2DH5_Ant1_2441

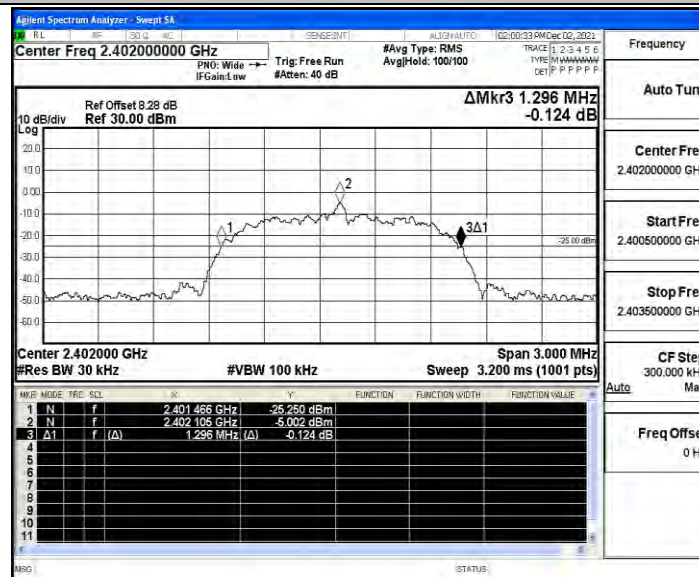


2DH5_Ant1_2480

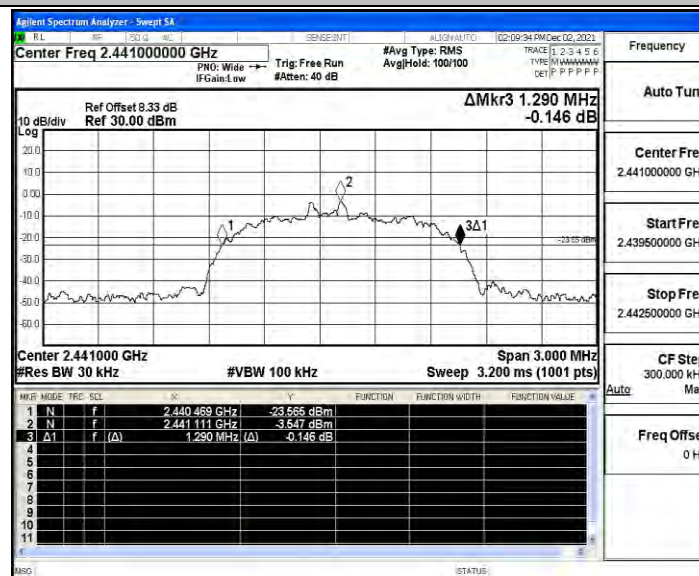




3DH5_Ant1_2402

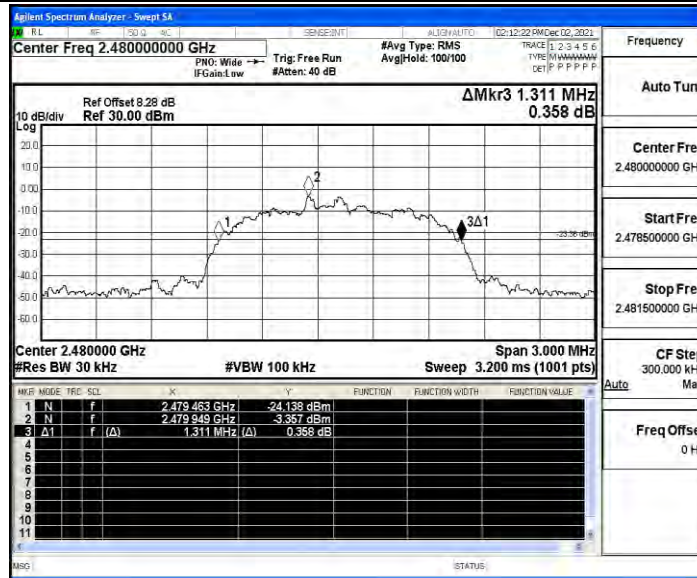


3DH5_Ant1_2441





3DH5_Ant1_2480





Appendix A.2.2: Occupied Channel Bandwidth

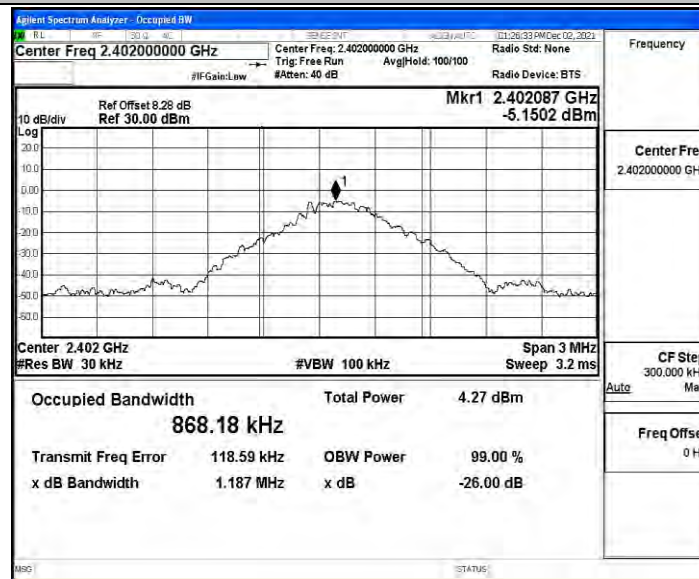
Test Result

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
DH5	Ant1	2402	0.86818	2401.685	2402.553	---	PASS
		2441	0.86204	2440.685	2441.547	---	PASS
		2480	0.85646	2479.690	2480.546	---	PASS
2DH5	Ant1	2402	1.1846	2401.521	2402.705	---	PASS
		2441	1.1917	2440.520	2441.712	---	PASS
		2480	1.1953	2479.522	2480.718	---	PASS
3DH5	Ant1	2402	1.1968	2401.515	2402.712	---	PASS
		2441	1.1912	2440.521	2441.712	---	PASS
		2480	1.1982	2479.515	2480.713	---	PASS



Test Graphs

DH5_Ant1_2402

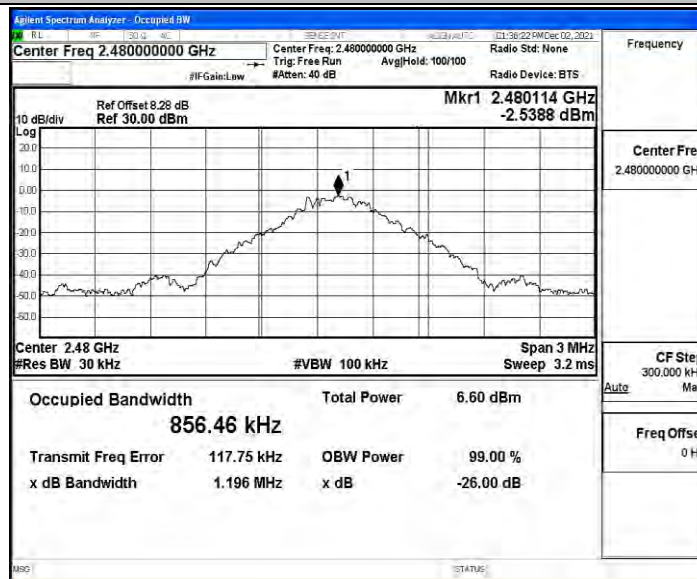


DH5_Ant1_2441

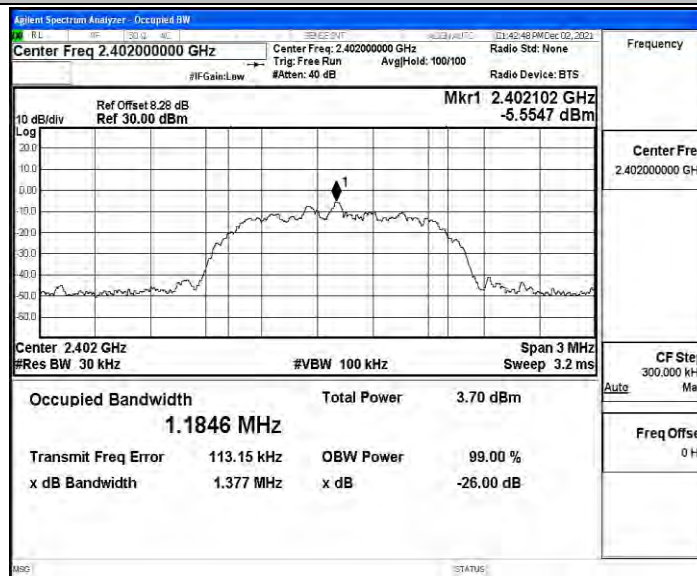




DH5_Ant1_2480

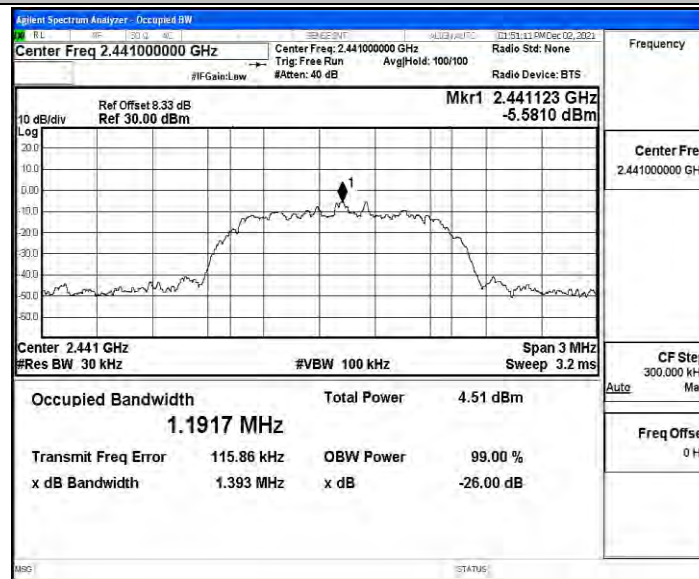


2DH5_Ant1_2402





2DH5_Ant1_2441

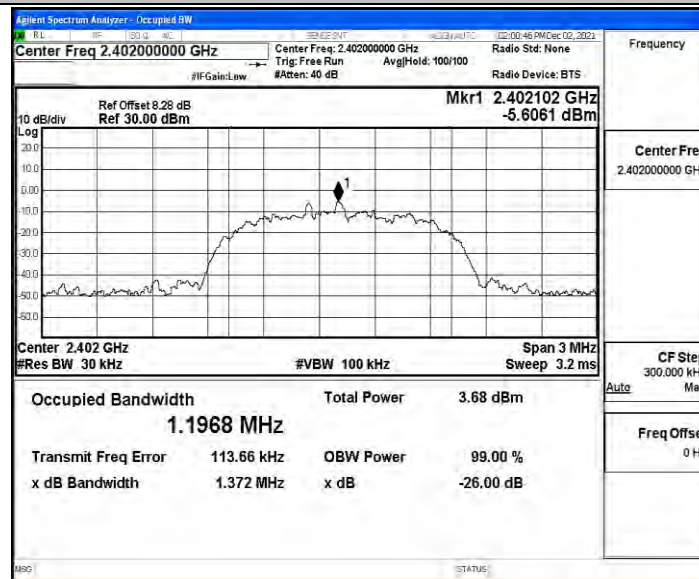


2DH5_Ant1_2480

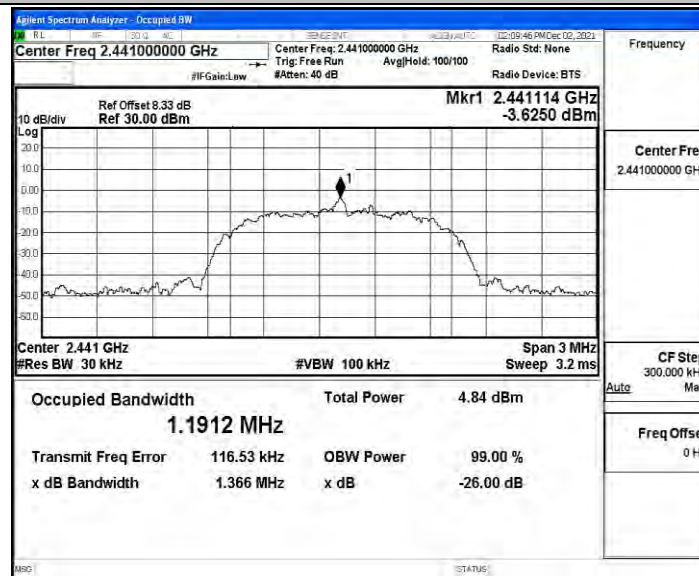




3DH5_Ant1_2402

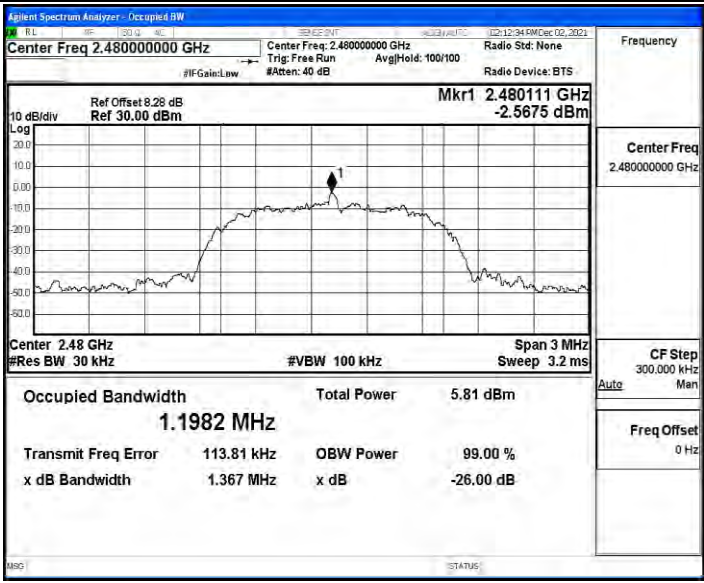


3DH5_Ant1_2441





3DH5_Ant1_2480





Appendix A.3: Carrier frequency separation

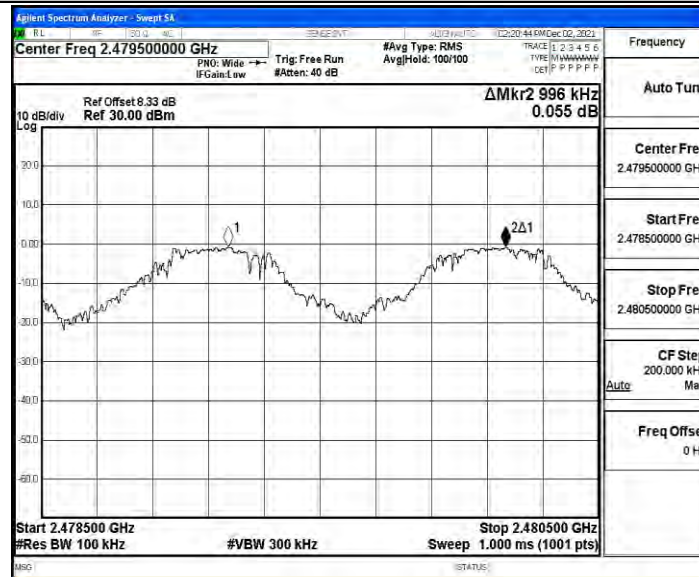
Test Result

TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	0.996	≥ 0.638	PASS
2DH5	Ant1	Hop	1.012	≥ 0.878	PASS
3DH5	Ant1	Hop	0.898	≥ 0.874	PASS

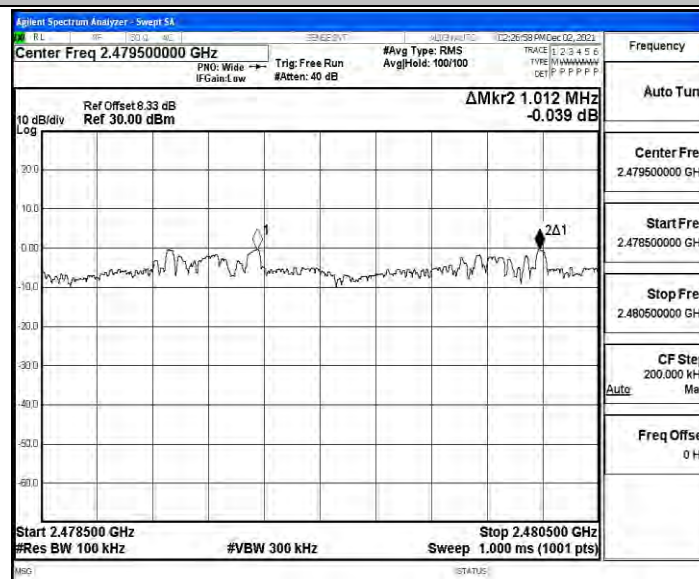


Test Graphs

DH5_Ant1_Hop

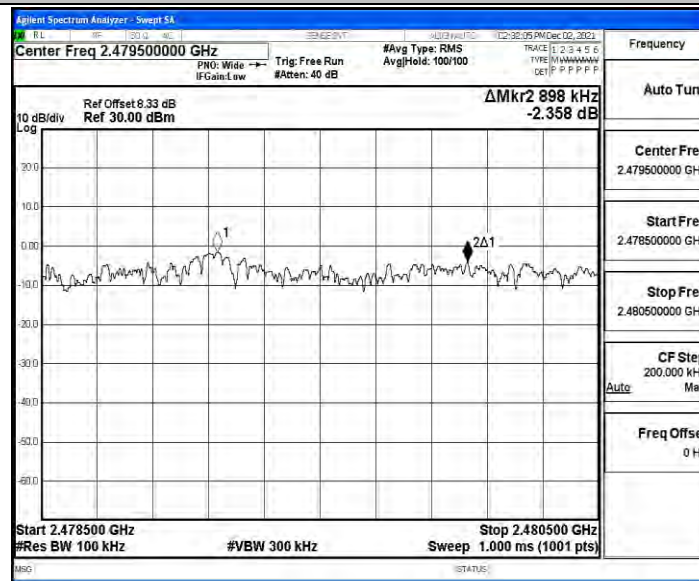


2DH5_Ant1_Hop





3DH5_Ant1_Hop

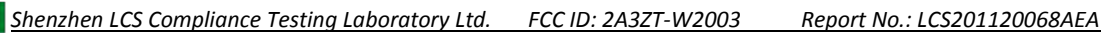




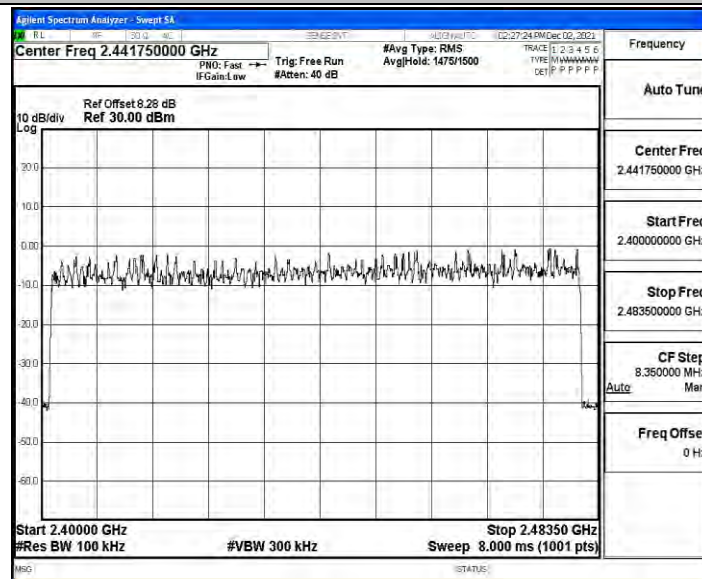
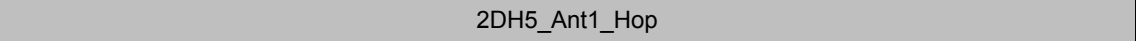
Appendix A.4: Number of hopping channels

Test 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

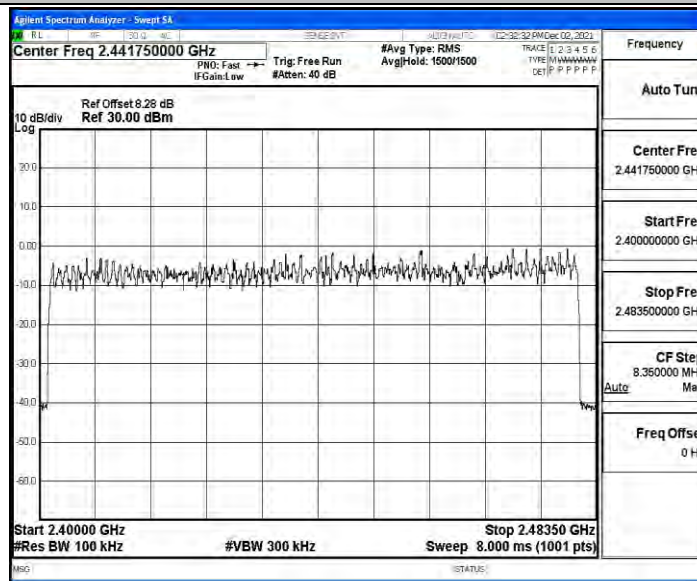


DH5_Ant1_Hop





3DH5_Ant1_Hop





Appendix A.5.1: Duty Cycle

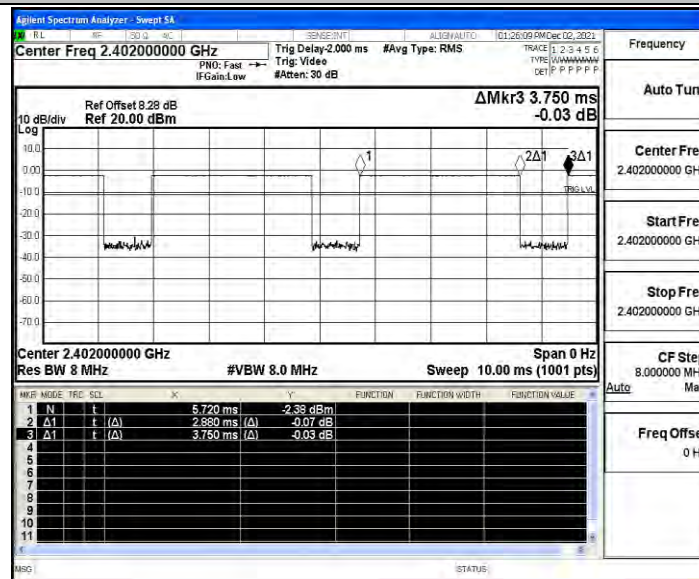
Test Result

TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	Limit	Verdict
DH5	Ant1	2402	2.88	3.75	0.7680	76.80	1.15	---	PASS
		2441	2.89	3.75	0.7707	77.07	1.13	---	PASS
		2480	2.88	3.75	0.7680	76.80	1.15	---	PASS
2DH5	Ant1	2402	2.89	3.75	0.7707	77.07	1.13	---	PASS
		2441	2.89	3.75	0.7707	77.07	1.13	---	PASS
		2480	2.88	3.74	0.7701	77.01	1.13	---	PASS
3DH5	Ant1	2402	2.89	3.75	0.7707	77.07	1.13	---	PASS
		2441	2.89	3.75	0.7707	77.07	1.13	---	PASS
		2480	2.89	3.75	0.7707	77.07	1.13	---	PASS

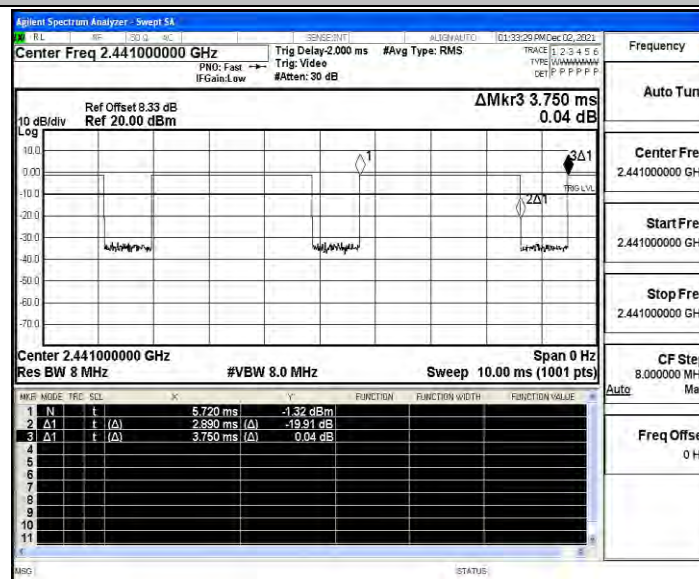


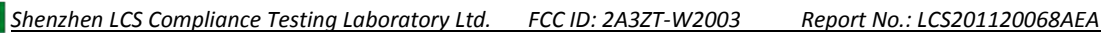
Test Graphs

DH5_Ant1_2402

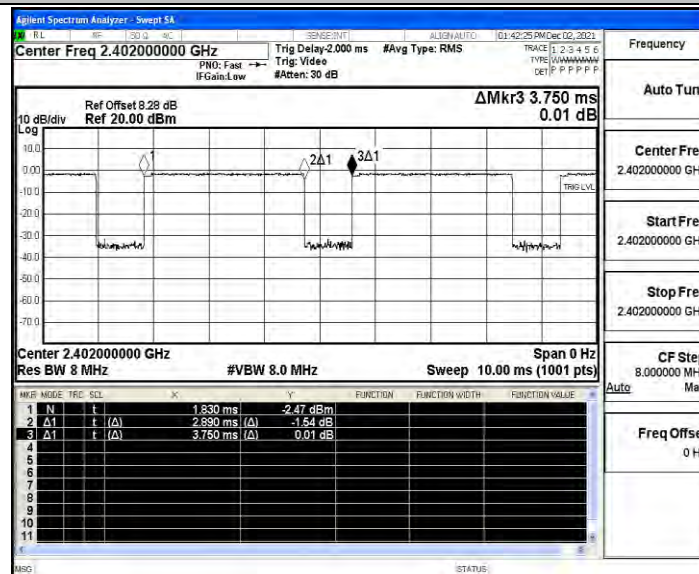


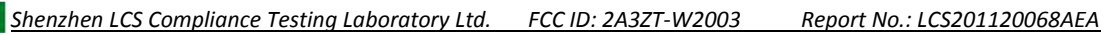
DH5_Ant1_2441



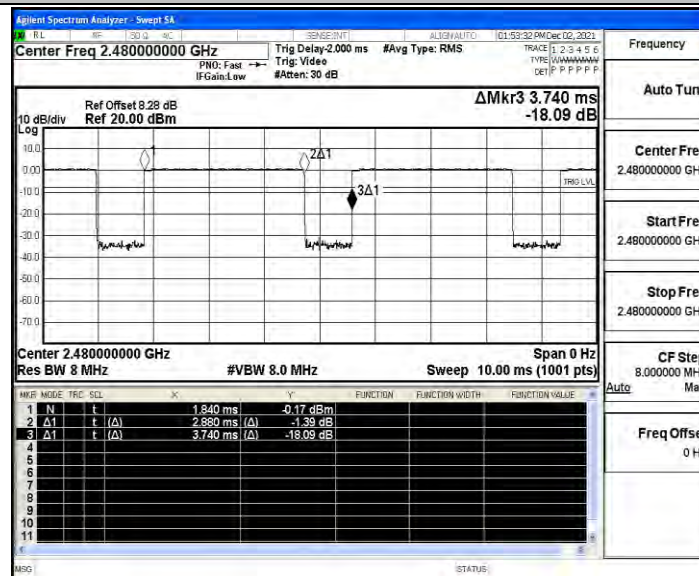


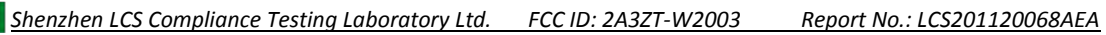
2DH5_Ant1_2402



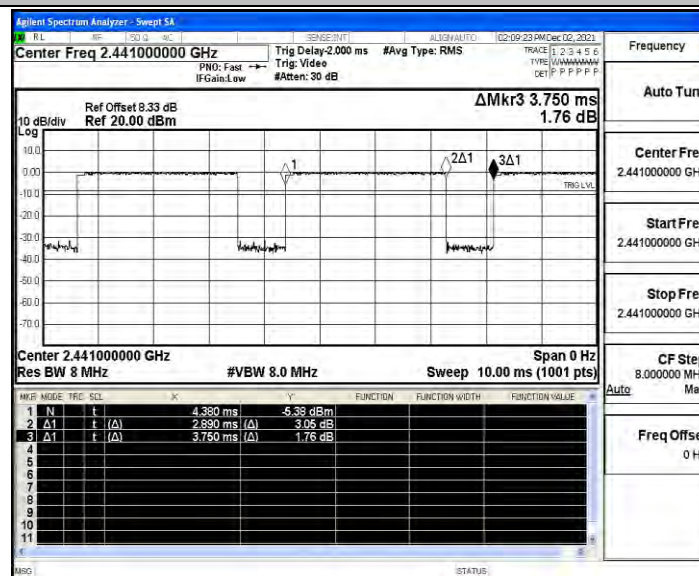


2DH5_Ant1_2480





3DH5_Ant1_2441



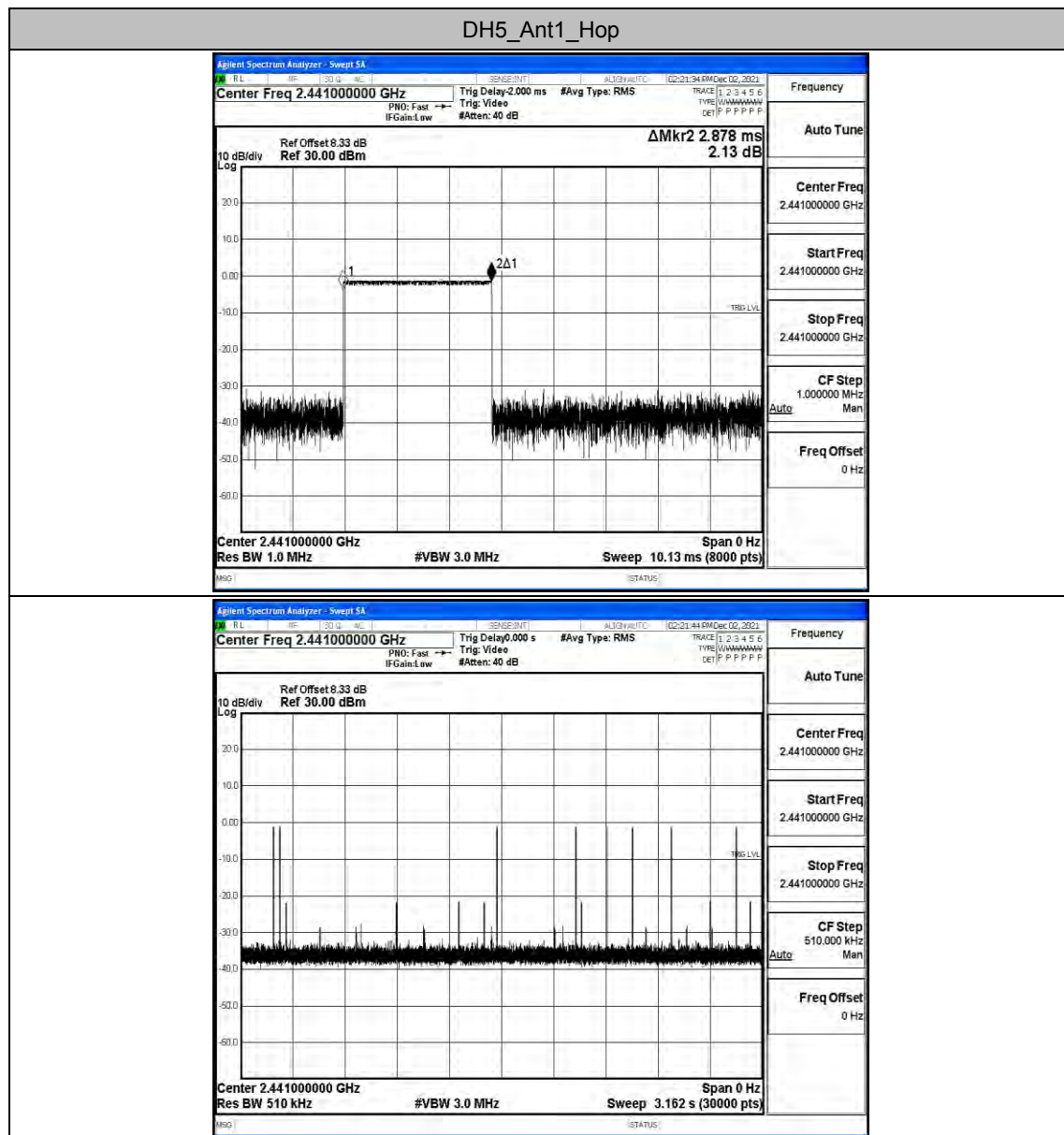


Appendix A.5.2: Time of occupancy

Test Result

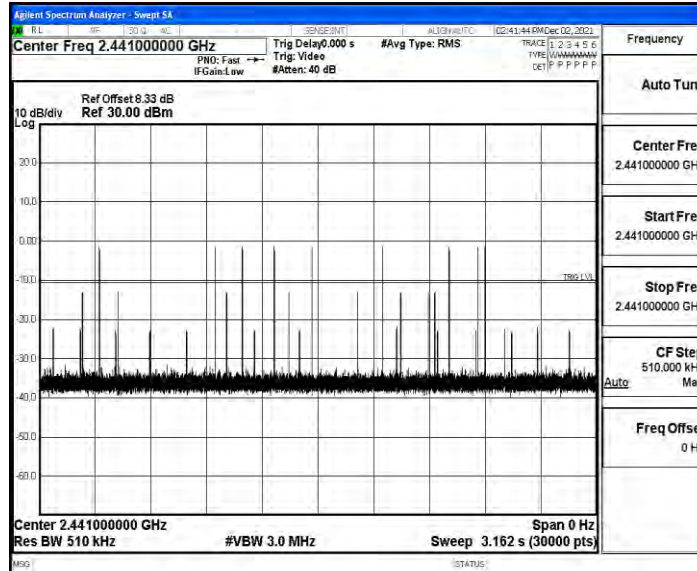
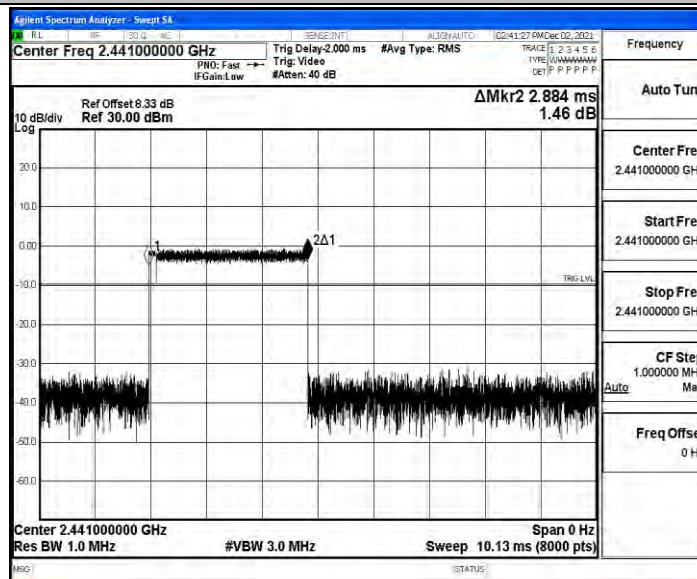
TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant1	Hop	2.88	90	0.259	≤0.4	PASS
2DH5	Ant1	Hop	2.88	100	0.288	≤0.4	PASS
3DH5	Ant1	Hop	2.89	120	0.346	≤0.4	PASS

Test Graphs

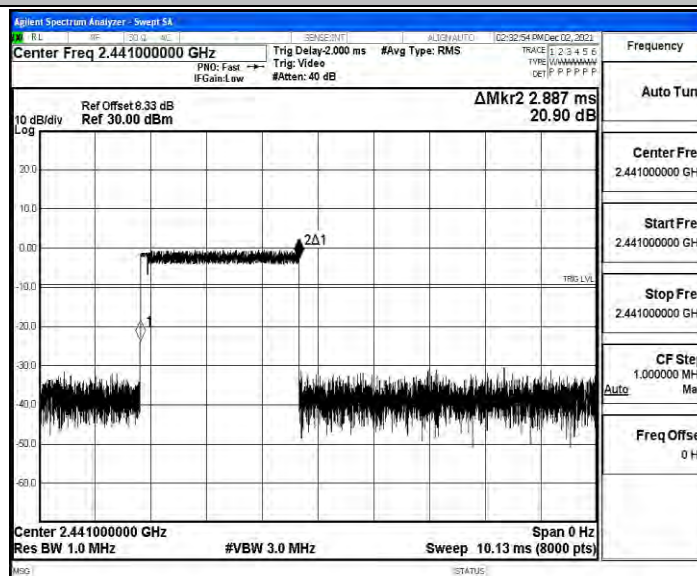


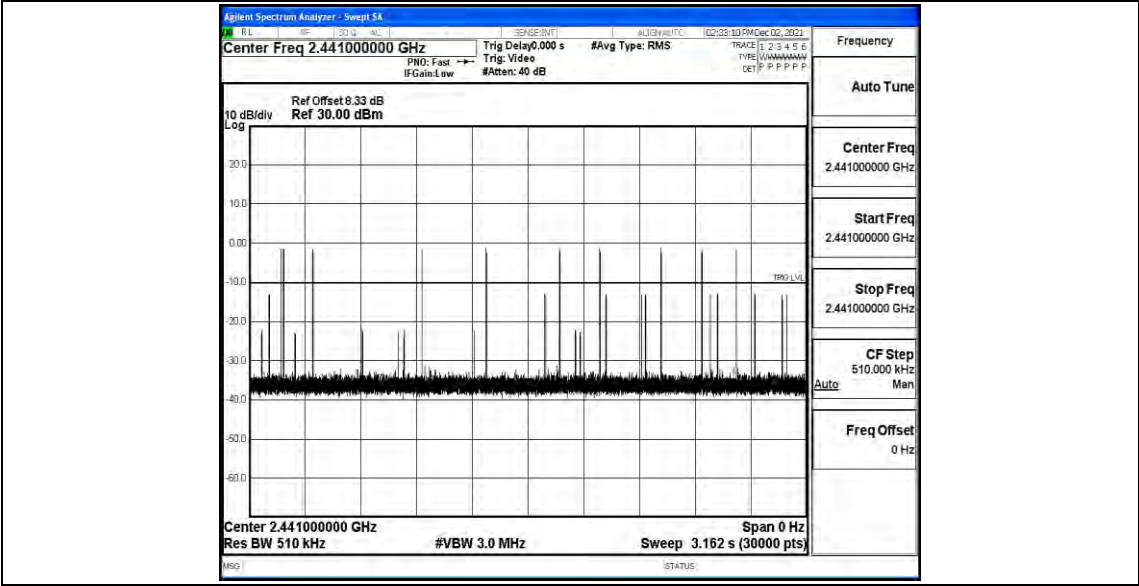


2DH5_Ant1_Hop



3DH5_Ant1_Hop







Appendix A.6: Band edge measurements

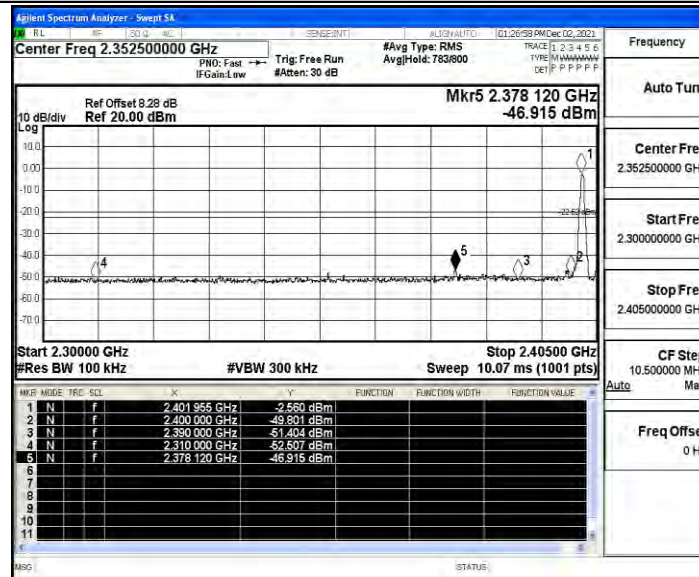
Test Result

TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	-2.62	-46.92	≤ -22.62	PASS
		High	2480	-0.25	-43.74	≤ -20.25	PASS
		Low	Hop_2402	-3.40	-47.38	≤ -23.4	PASS
		High	Hop_2480	-0.79	-45.6	≤ -20.79	PASS
2DH5	Ant1	Low	2402	-2.62	-46.52	≤ -22.62	PASS
		High	2480	-0.33	-43.69	≤ -20.33	PASS
		Low	Hop_2402	-3.34	-49.1	≤ -23.34	PASS
		High	Hop_2480	-0.79	-47.09	≤ -20.79	PASS
3DH5	Ant1	Low	2402	-2.68	-47.61	≤ -22.68	PASS
		High	2480	-0.30	-44.39	≤ -20.3	PASS
		Low	Hop_2402	-2.89	-49.34	≤ -22.89	PASS
		High	Hop_2480	-1.10	-47.55	≤ -21.1	PASS

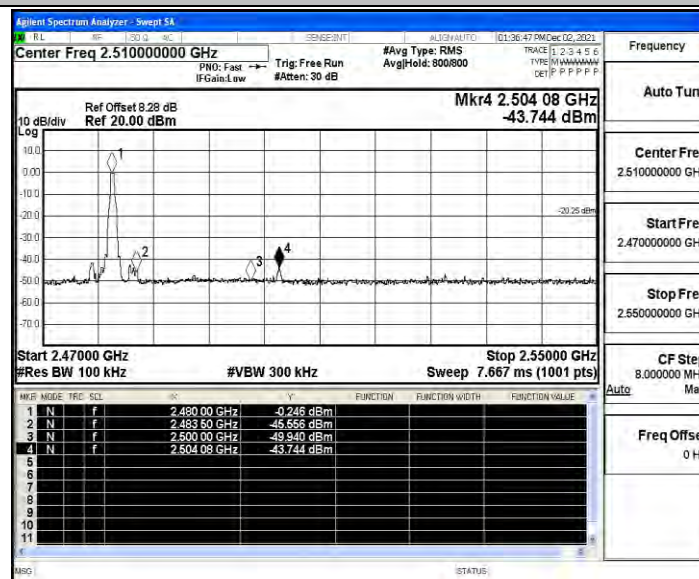


Test Graphs

DH5_Ant1_Low_2402

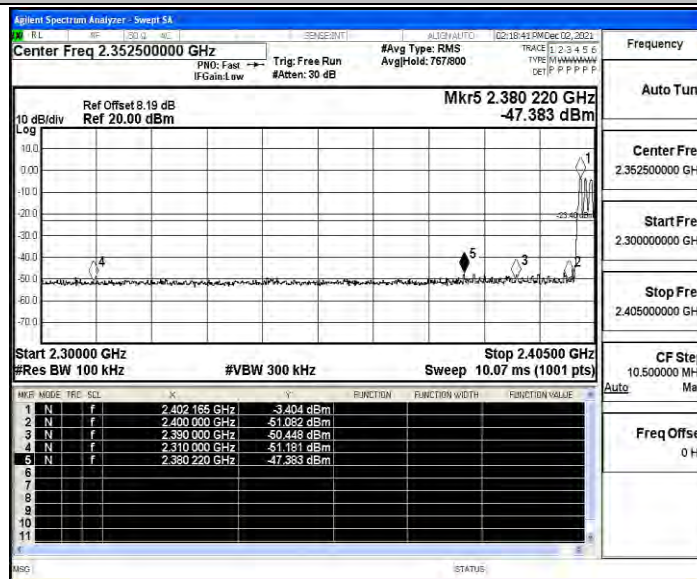


DH5_Ant1_High_2480

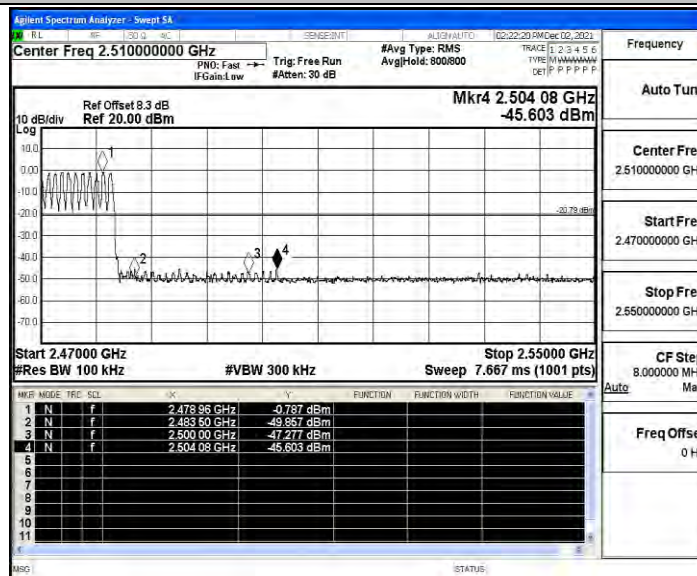




DH5_Ant1_Low_Hop_2402

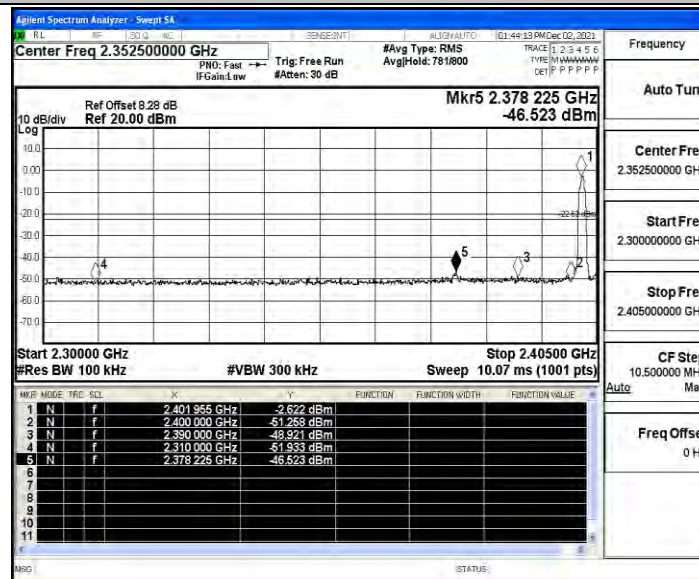


DH5_Ant1_High_Hop_2480

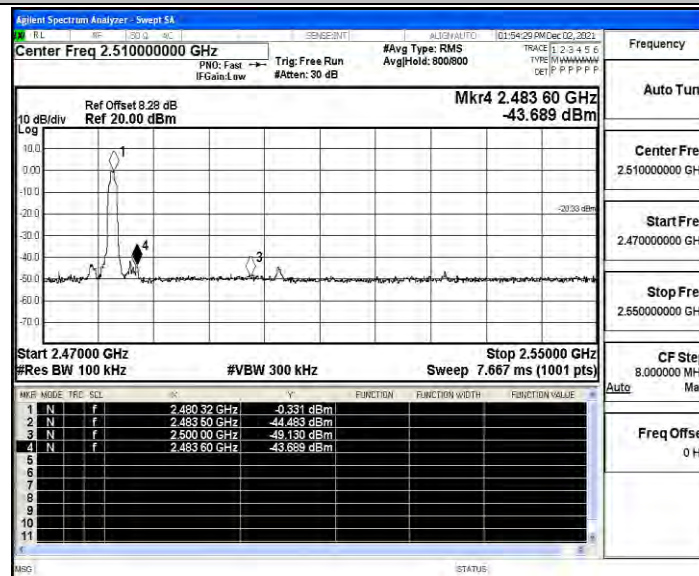




2DH5_Ant1_Low_2402

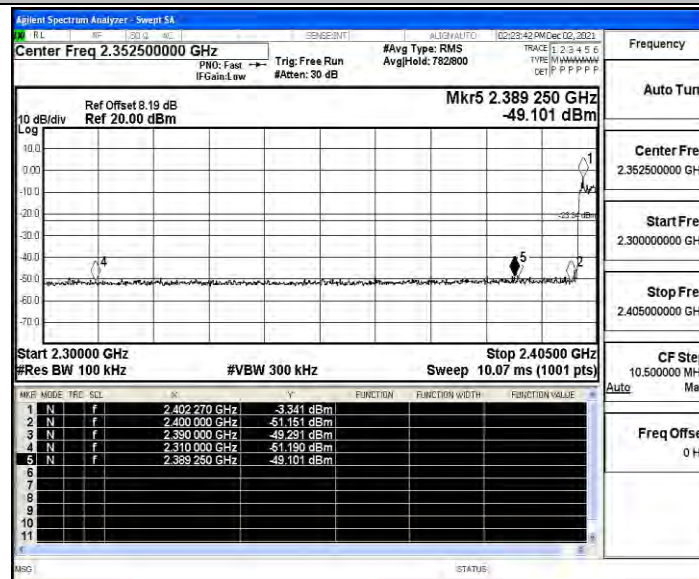


2DH5_Ant1_High_2480

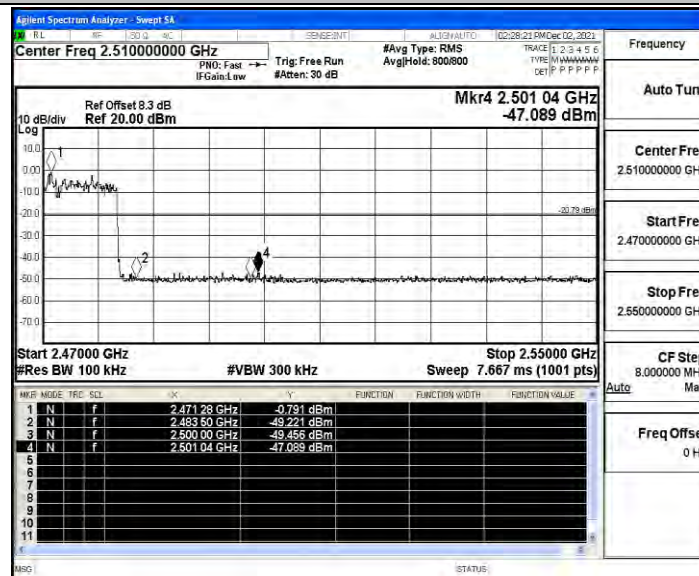




2DH5_Ant1_Low_Hop_2402

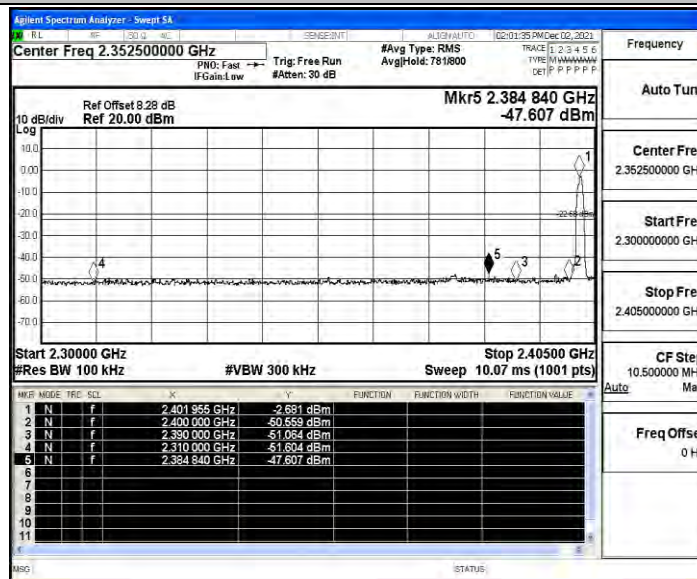


2DH5_Ant1_High_Hop_2480

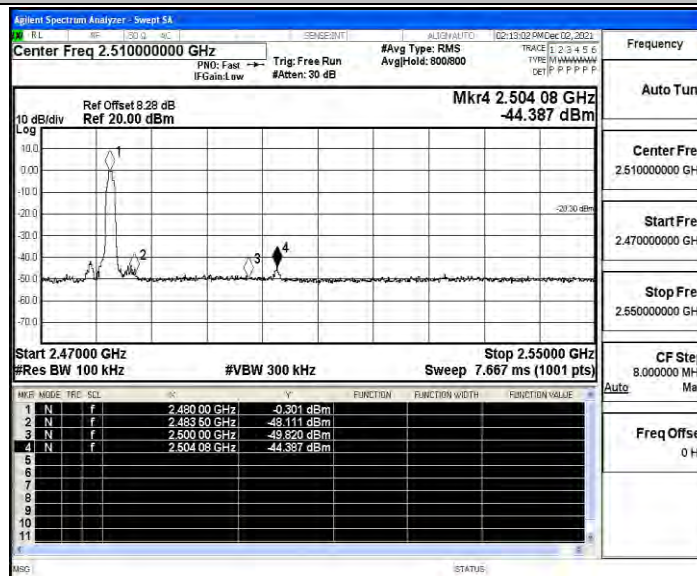




3DH5_Ant1_Low_2402

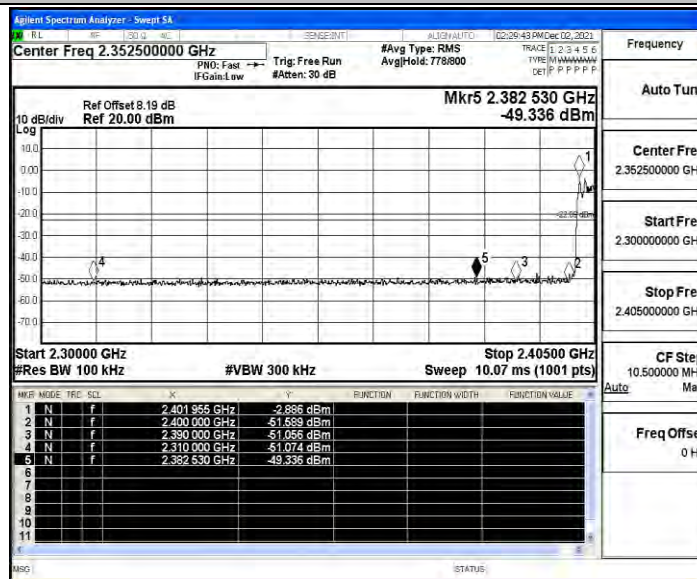


3DH5_Ant1_High_2480

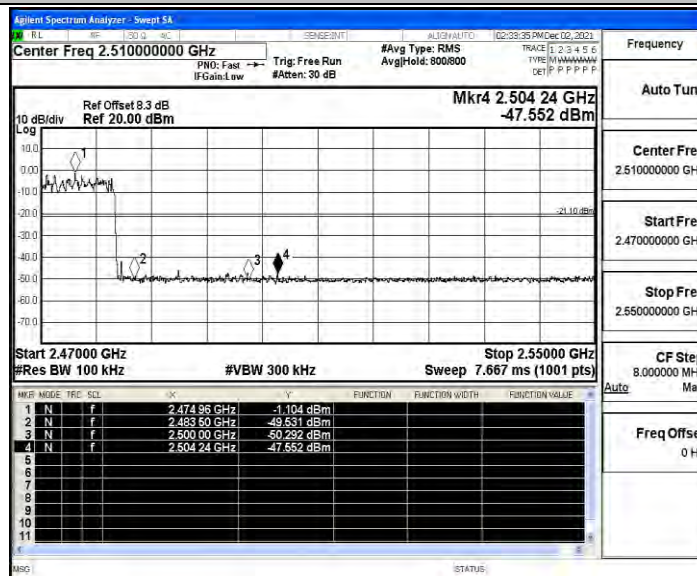




3DH5_Ant1_Low_Hop_2402



3DH5_Ant1_High_Hop_2480





Appendix A.7: Conducted Spurious Emission

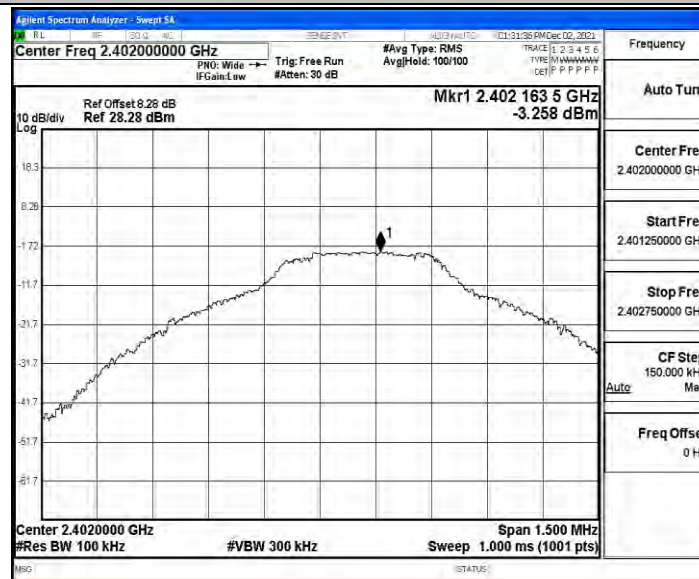
Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	-3.26	-3.26	---	PASS
			30~1000	-3.26	-61.21	≤-23.26	PASS
			1000~26500	-3.26	-46.41	≤-23.26	PASS
		2441	Reference	-2.08	-2.08	---	PASS
			30~1000	-2.08	-61.41	≤-22.08	PASS
			1000~26500	-2.08	-46.14	≤-22.08	PASS
		2480	Reference	-0.60	-0.60	---	PASS
			30~1000	-0.60	-60.58	≤-20.6	PASS
			1000~26500	-0.60	-47	≤-20.6	PASS
2DH5	Ant1	2402	Reference	-2.77	-2.77	---	PASS
			30~1000	-2.77	-60.63	≤-22.77	PASS
			1000~26500	-2.77	-46.21	≤-22.77	PASS
		2441	Reference	-1.52	-1.52	---	PASS
			30~1000	-1.52	-60.44	≤-21.52	PASS
			1000~26500	-1.52	-46.5	≤-21.52	PASS
		2480	Reference	-0.33	-0.33	---	PASS
			30~1000	-0.33	-61.13	≤-20.33	PASS
			1000~26500	-0.33	-46.57	≤-20.33	PASS
3DH5	Ant1	2402	Reference	-2.70	-2.70	---	PASS
			30~1000	-2.70	-61.48	≤-22.7	PASS
			1000~26500	-2.70	-46.68	≤-22.7	PASS
		2441	Reference	-2.00	-2.00	---	PASS
			30~1000	-2.00	-61.37	≤-22	PASS
			1000~26500	-2.00	-46.53	≤-22	PASS
		2480	Reference	-0.30	-0.30	---	PASS
			30~1000	-0.30	-61.31	≤-20.3	PASS
			1000~26500	-0.30	-46.44	≤-20.3	PASS

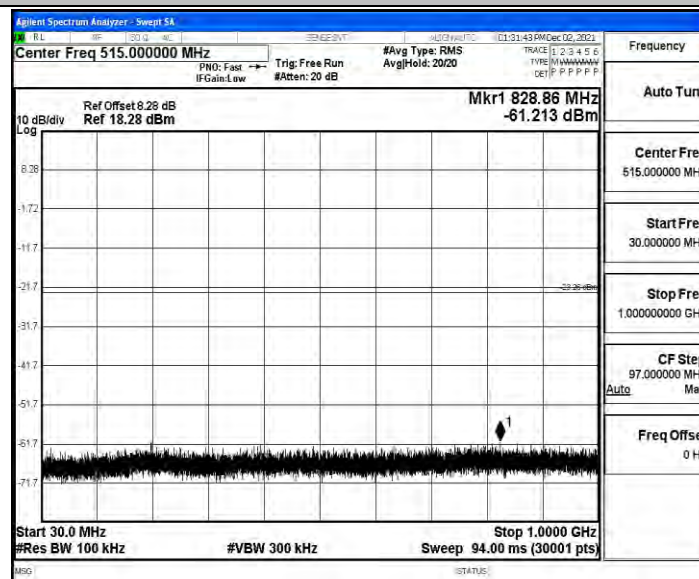


Test Graphs

DH5_Ant1_2402_0~Reference

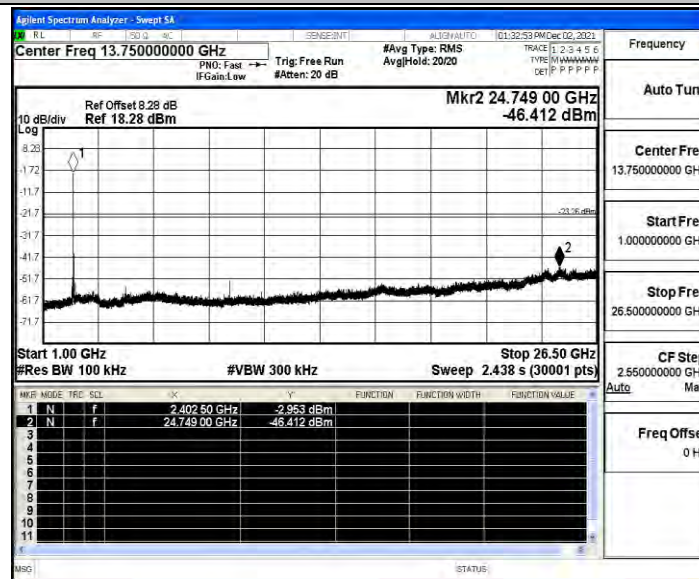


DH5_Ant1_2402_30~1000

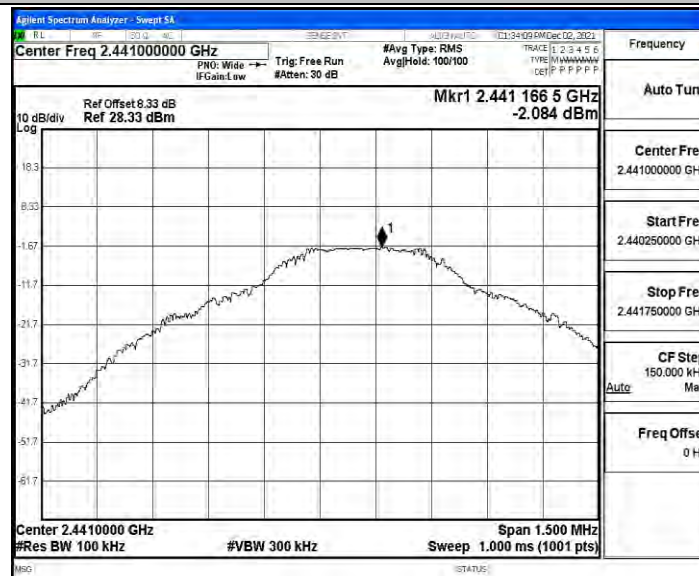


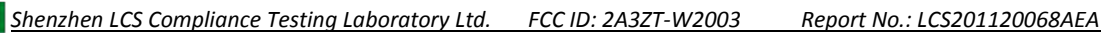


DH5_Ant1_2402_1000~26500

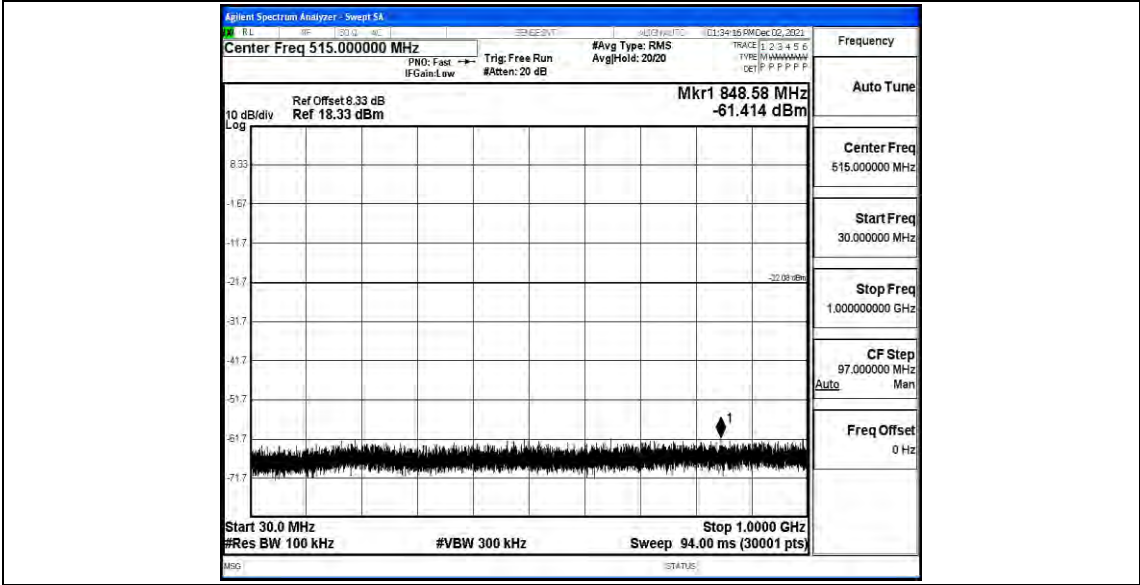


DH5_Ant1_2441_0~Reference

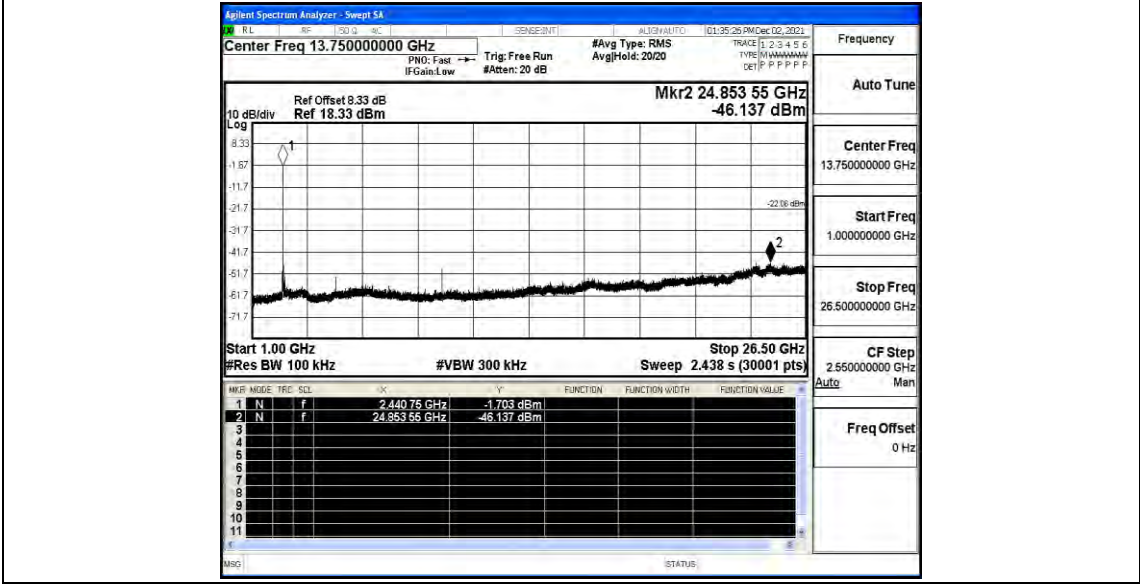




DH5_Ant1_2441_30~1000

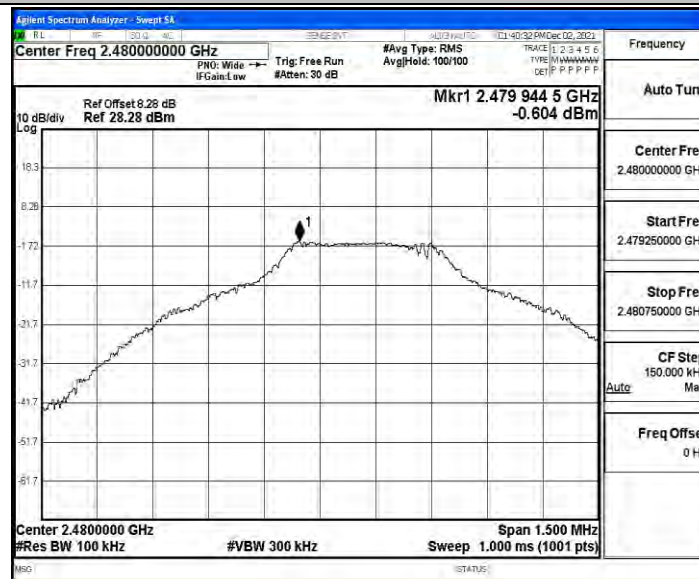


DH5_Ant1_2441_1000~26500

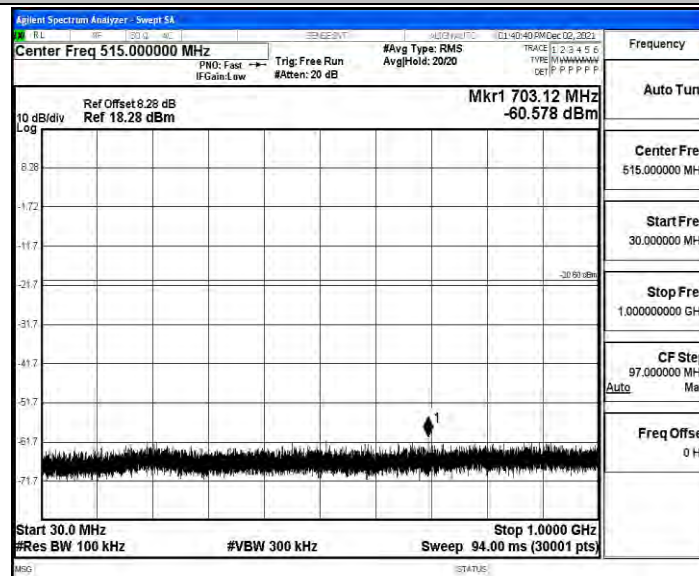




DH5_Ant1_2480_0~Reference

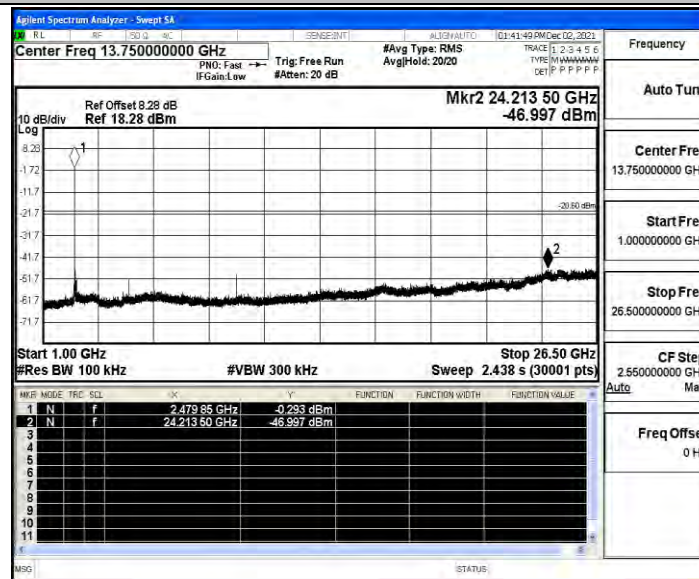


DH5_Ant1_2480_30~1000

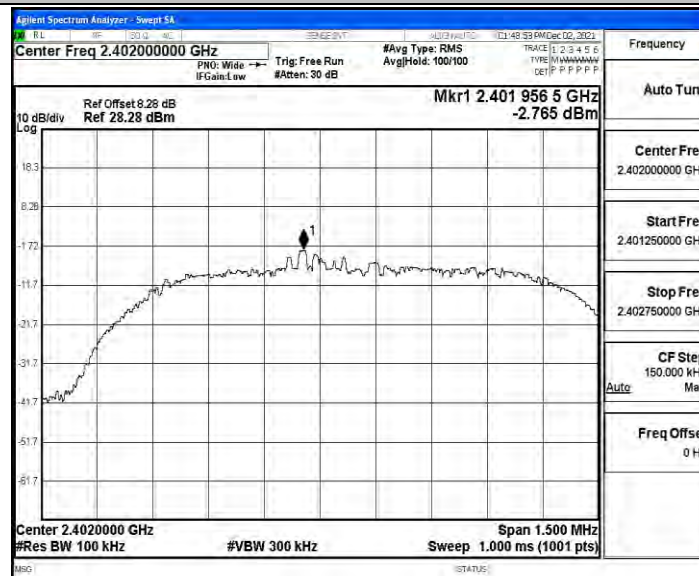




DH5_Ant1_2480_1000~26500

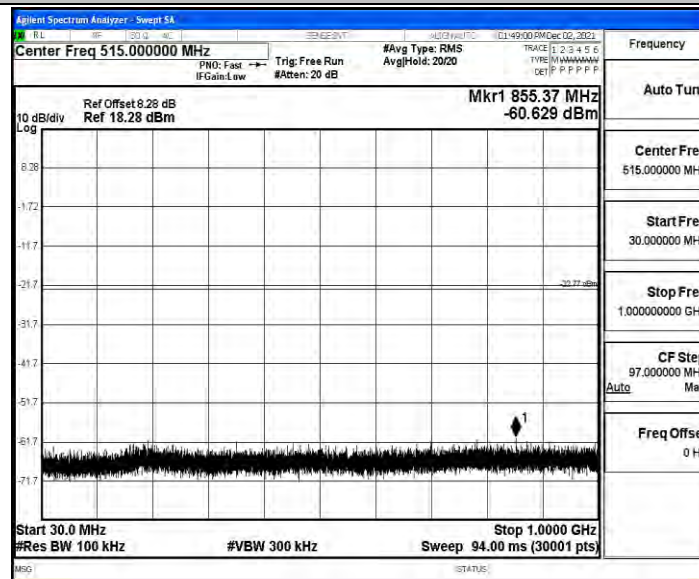


2DH5_Ant1_2402_0~Reference

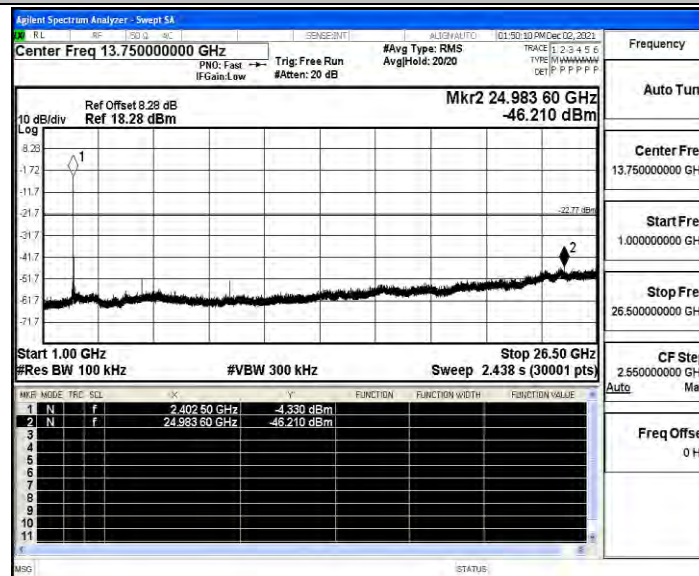




2DH5_Ant1_2402_30~1000

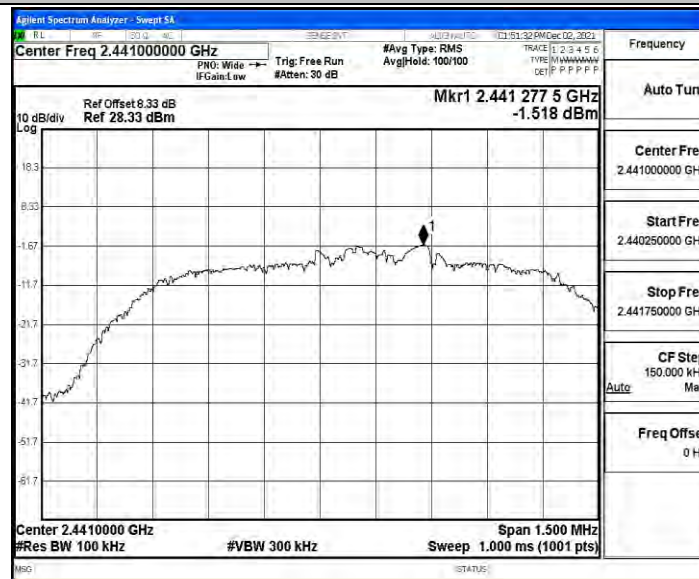


2DH5_Ant1_2402_1000~26500

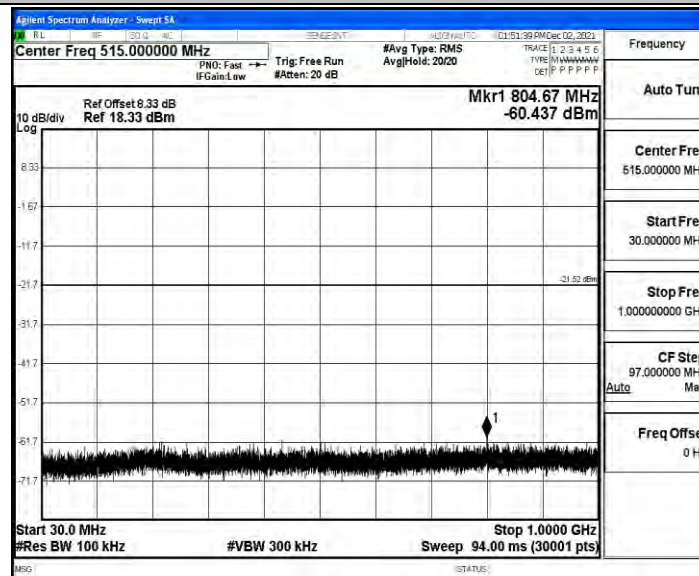




2DH5_Ant1_2441_0~Reference

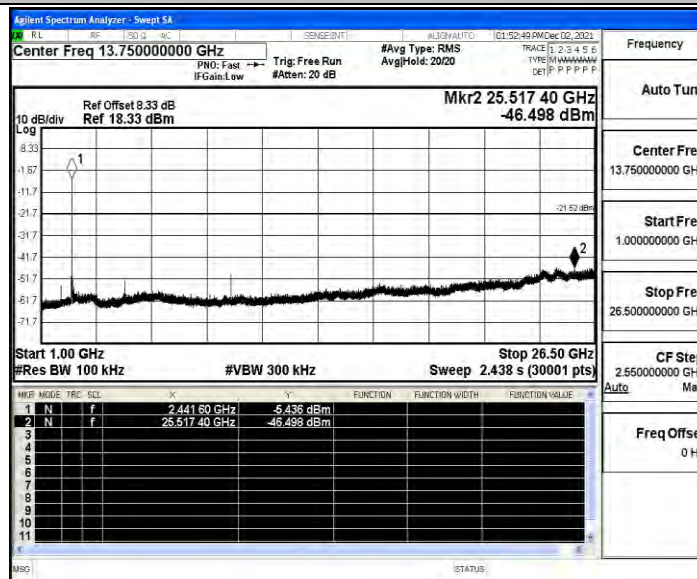


2DH5_Ant1_2441_30~1000

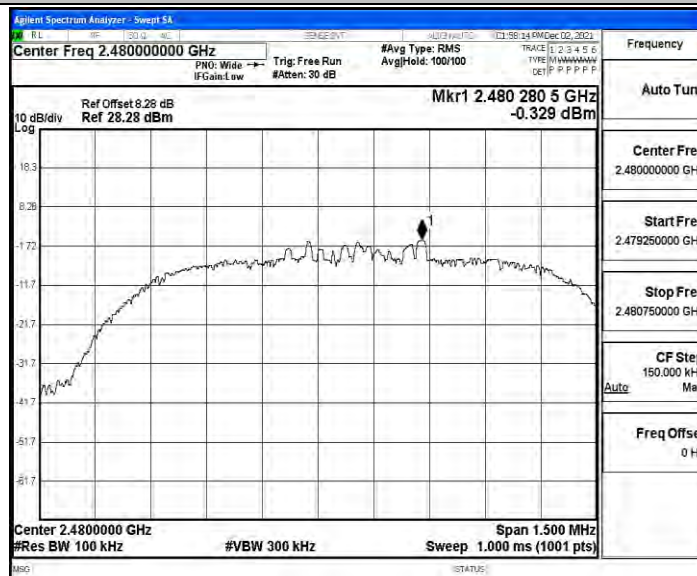




2DH5_Ant1_2441_1000~26500

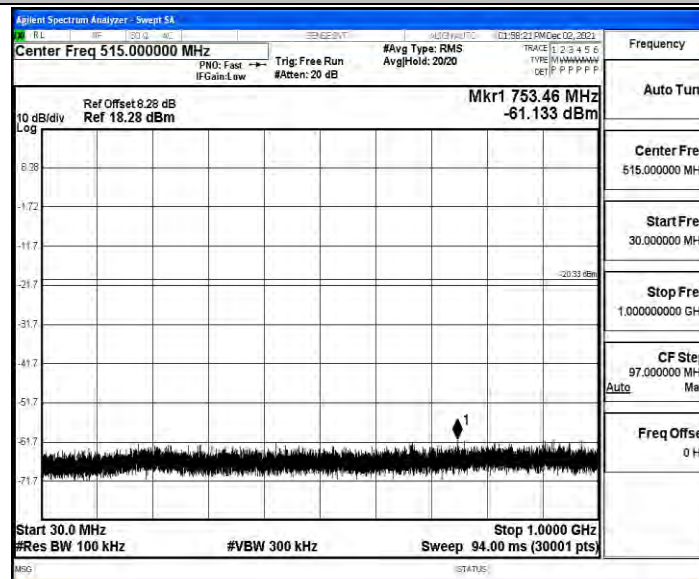


2DH5_Ant1_2480_0~Reference

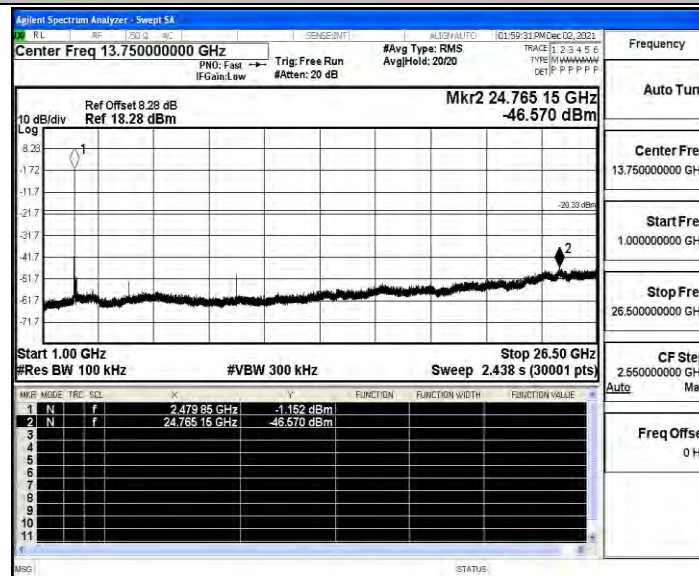




2DH5_Ant1_2480_30~1000

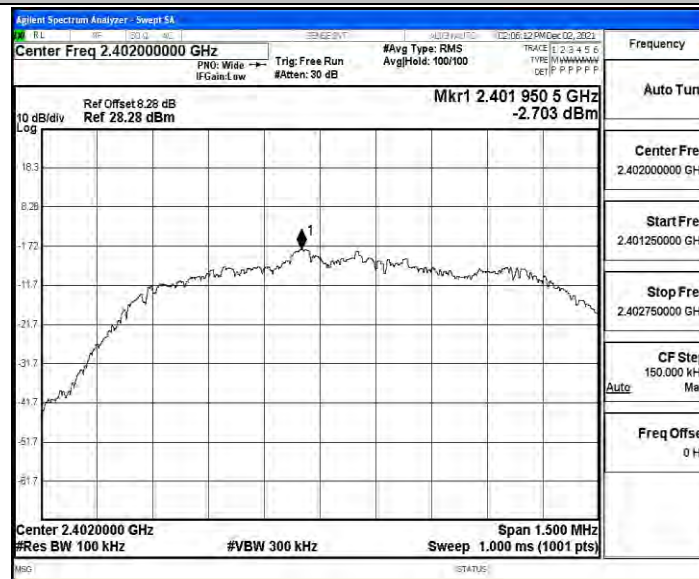


2DH5_Ant1_2480_1000~26500

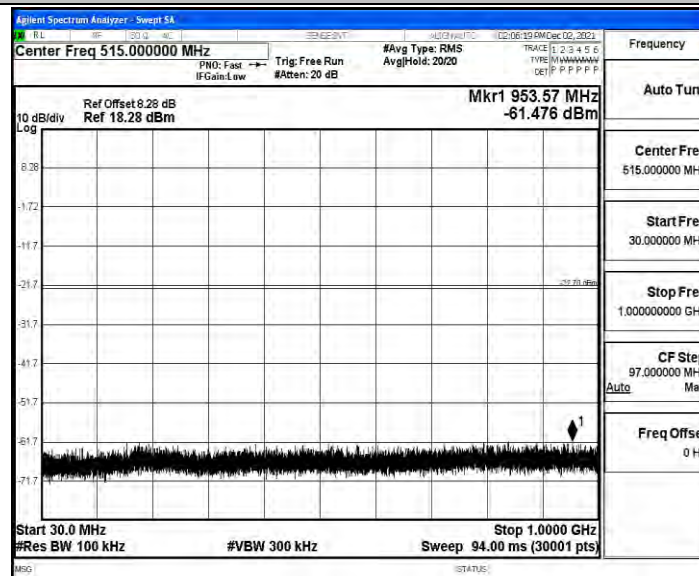




3DH5_Ant1_2402_0~Reference

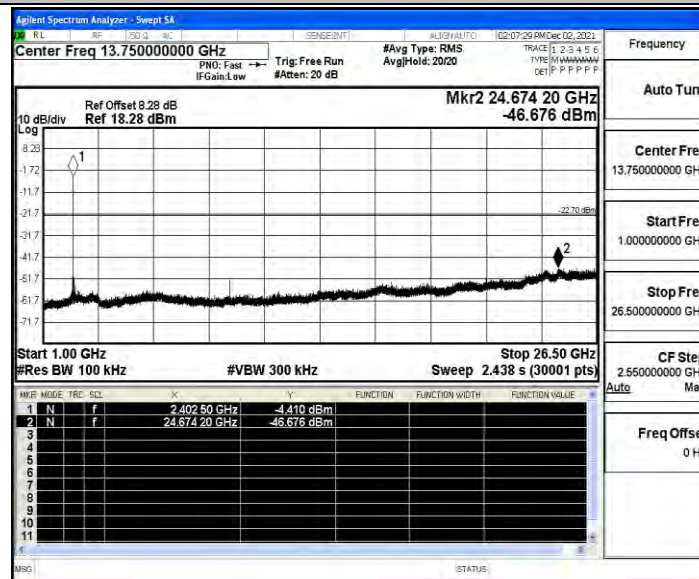


3DH5_Ant1_2402_30~1000

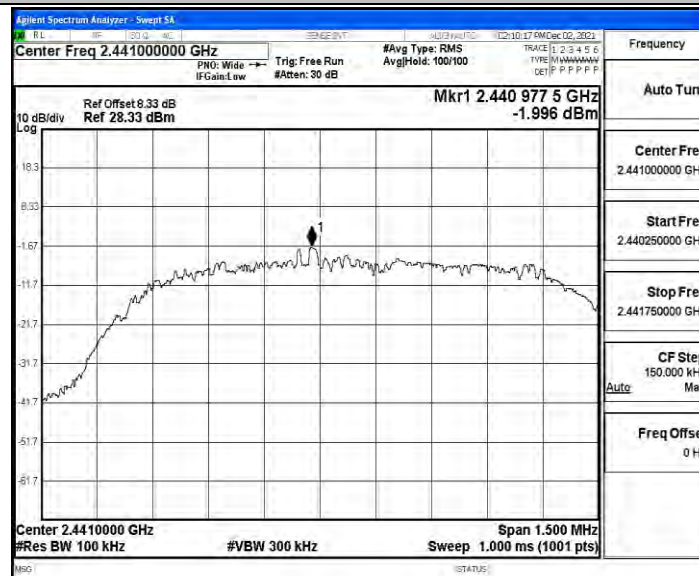




3DH5_Ant1_2402_1000~26500

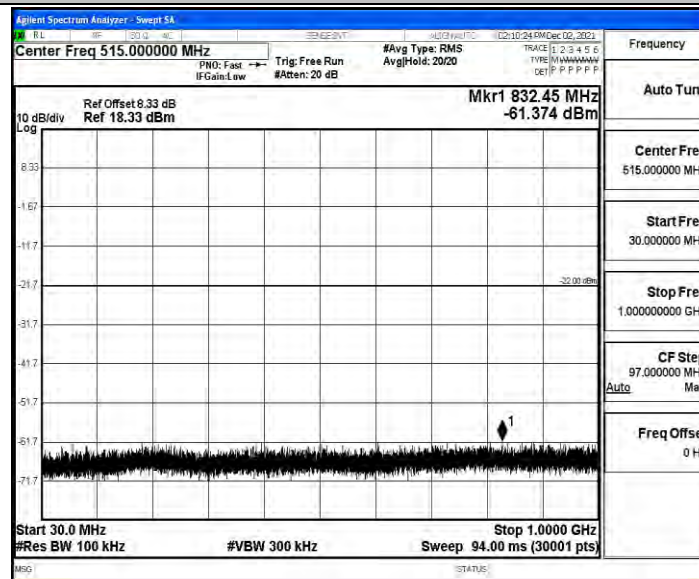


3DH5_Ant1_2441_0~Reference

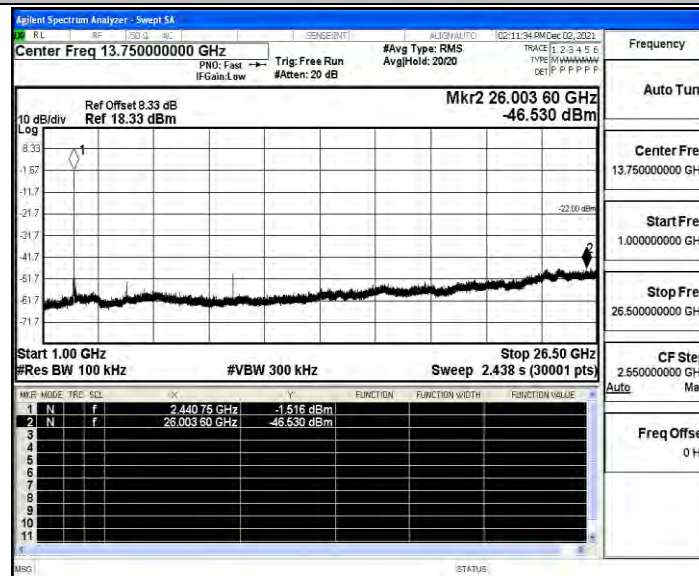




3DH5_Ant1_2441_30~1000

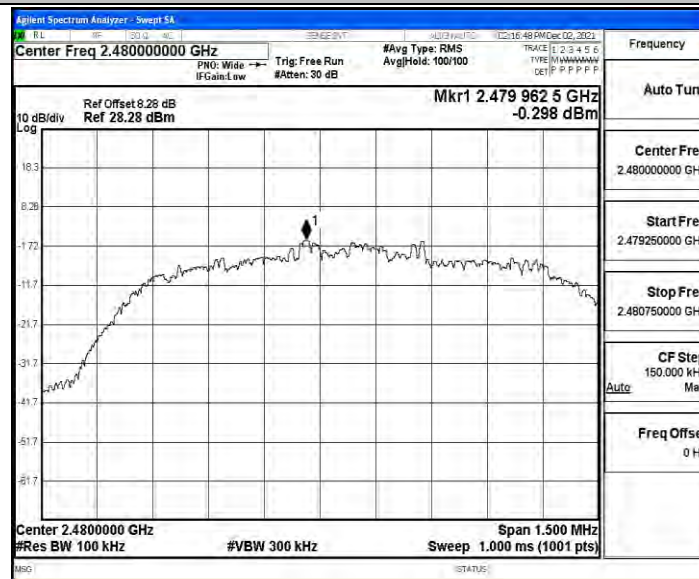


3DH5_Ant1_2441_1000~26500

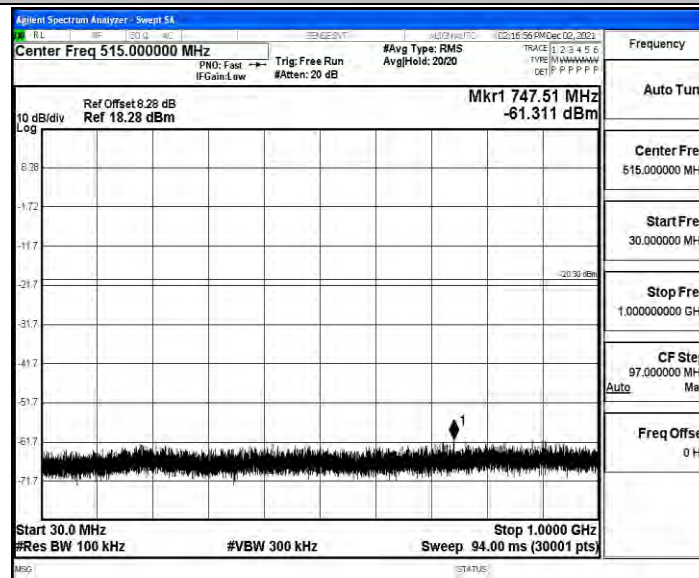


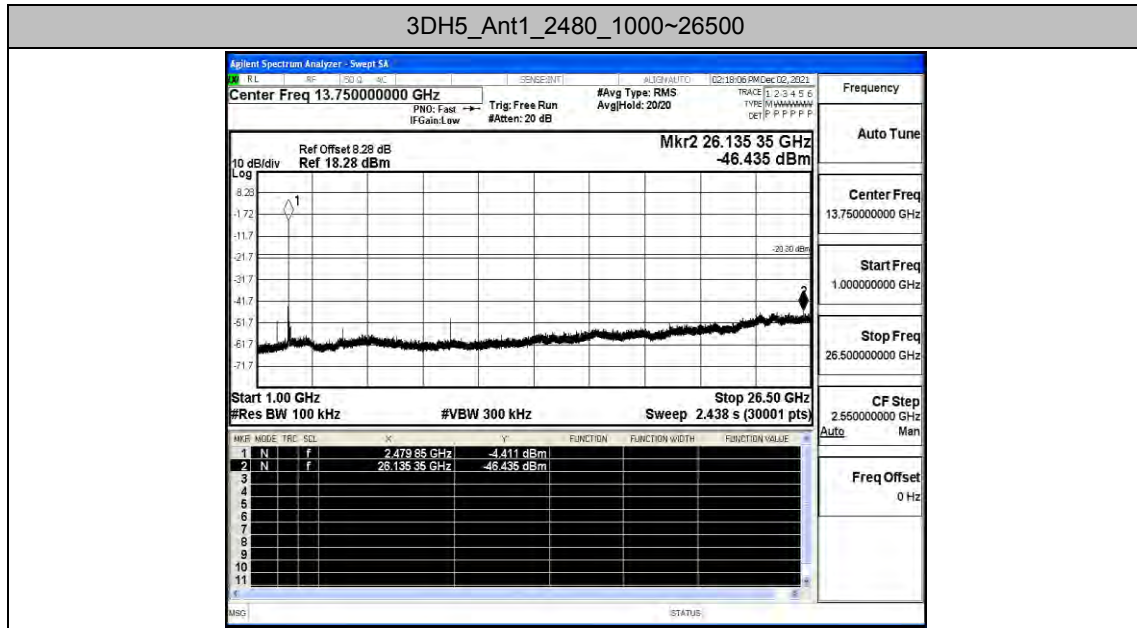
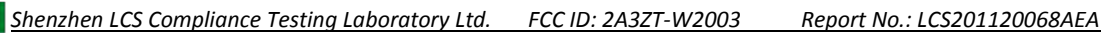


3DH5_Ant1_2480_0~Reference



3DH5_Ant1_2480_30~1000







Appendix A.8: Emissions in Restricted Bands

Test Result

TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
DH5	Ant1	Low	2402	AV	2310.000	-48.51	≤-41.20	46.69	≤54	PASS
				AV	2378.015	-45.07	≤-41.20	50.13	≤54	PASS
				AV	2390.000	-47.62	≤-41.20	47.58	≤54	PASS
				Peak	2310.000	-40.12	≤-21.20	55.08	≤74	PASS
				Peak	2378.015	-35.59	≤-21.20	59.61	≤74	PASS
				Peak	2390.000	-40.36	≤-21.20	54.84	≤74	PASS
		High	2480	AV	2483.500	-42.36	≤-41.20	52.84	≤54	PASS
				AV	2483.520	-42.36	≤-41.20	52.84	≤54	PASS
				AV	2500.000	-46.23	≤-41.20	48.97	≤54	PASS
				Peak	2483.500	-36.13	≤-21.20	59.07	≤74	PASS
				Peak	2483.600	-35.74	≤-21.20	59.46	≤74	PASS
				Peak	2500.000	-38.1	≤-21.20	57.10	≤74	PASS
		Low	Hop_24 02	Peak	2310.000	-41.11	≤-21.20	54.09	≤74	PASS
				Peak	2383.160	-37.18	≤-21.20	58.02	≤74	PASS
				Peak	2390.000	-39.57	≤-21.20	55.63	≤74	PASS
		High	Hop_24 80	Peak	2483.500	-38.85	≤-21.20	56.35	≤74	PASS
				Peak	2491.520	-35.71	≤-21.20	59.49	≤74	PASS
				Peak	2500.000	-37.98	≤-21.20	57.22	≤74	PASS
2DH5	Ant1	Low	2402	AV	2310.000	-48.43	≤-41.20	46.77	≤54	PASS
				AV	2378.120	-45.87	≤-41.20	49.33	≤54	PASS
				AV	2390.000	-47.64	≤-41.20	47.56	≤54	PASS
				Peak	2310.000	-40.39	≤-21.20	54.81	≤74	PASS
				Peak	2381.270	-37.25	≤-21.20	57.95	≤74	PASS
				Peak	2390.000	-40.39	≤-21.20	54.81	≤74	PASS
		High	2480	AV	2483.500	-44.01	≤-41.20	51.19	≤54	PASS
				AV	2483.520	-44.01	≤-41.20	51.19	≤54	PASS
				AV	2500.000	-46.12	≤-41.20	49.08	≤54	PASS
				Peak	2483.500	-36.36	≤-21.20	58.84	≤74	PASS
				Peak	2493.120	-35.98	≤-21.20	59.22	≤74	PASS
				Peak	2500.000	-37.75	≤-21.20	57.45	≤74	PASS
		Low	Hop_24 02	Peak	2310.000	-40.28	≤-21.20	54.92	≤74	PASS
				Peak	2380.430	-38.26	≤-21.20	56.94	≤74	PASS
				Peak	2390.000	-39.7	≤-21.20	55.50	≤74	PASS
		High	Hop_24 80	Peak	2483.500	-38.04	≤-21.20	57.16	≤74	PASS
				Peak	2499.280	-36.68	≤-21.20	58.52	≤74	PASS
				Peak	2500.000	-39.65	≤-21.20	55.55	≤74	PASS
3DH5	Ant1	Low	2402	AV	2310.000	-48.54	≤-41.20	46.66	≤54	PASS



				AV	2378.015	-45.84	≤ -41.20	49.36	≤ 54	PASS
				AV	2390.000	-47.64	≤ -41.20	47.56	≤ 54	PASS
				Peak	2310.000	-40.35	≤ -21.20	54.85	≤ 74	PASS
				Peak	2378.435	-36.6	≤ -21.20	58.60	≤ 74	PASS
				Peak	2390.000	-39.83	≤ -21.20	55.37	≤ 74	PASS
		High	2480	AV	2483.500	-43.99	≤ -41.20	51.21	≤ 54	PASS
				AV	2483.520	-43.99	≤ -41.20	51.21	≤ 54	PASS
				AV	2500.000	-46.2	≤ -41.20	49.00	≤ 54	PASS
				Peak	2483.500	-36.35	≤ -21.20	58.85	≤ 74	PASS
				Peak	2483.760	-35.53	≤ -21.20	59.67	≤ 74	PASS
				Peak	2500.000	-38.36	≤ -21.20	56.84	≤ 74	PASS
		Low	Hop_24 02	Peak	2310.000	-39.16	≤ -21.20	56.04	≤ 74	PASS
				Peak	2385.680	-37.79	≤ -21.20	57.41	≤ 74	PASS
				Peak	2390.000	-38.57	≤ -21.20	56.63	≤ 74	PASS
		High	Hop_24 80	Peak	2483.500	-38.78	≤ -21.20	56.42	≤ 74	PASS
				Peak	2494.800	-36.11	≤ -21.20	59.09	≤ 74	PASS
				Peak	2500.000	-37.99	≤ -21.20	57.21	≤ 74	PASS

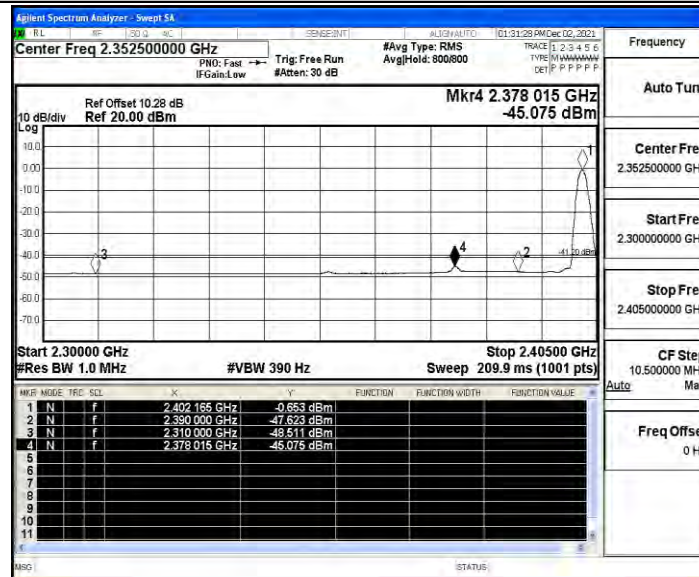
Note:

1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.

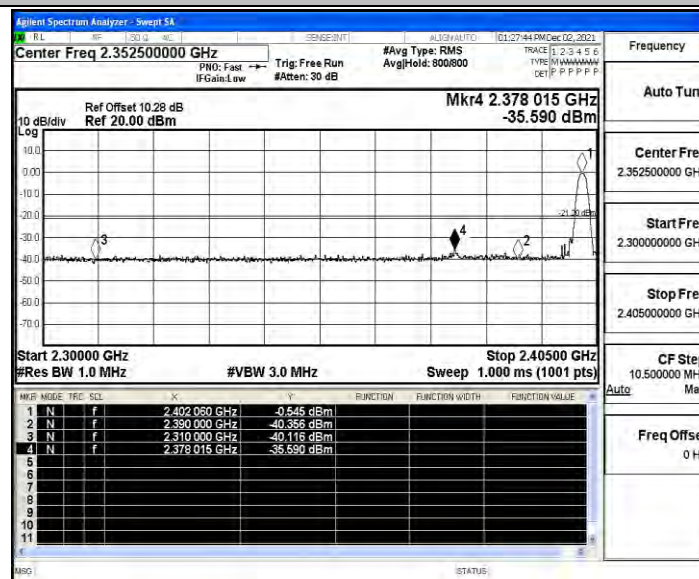


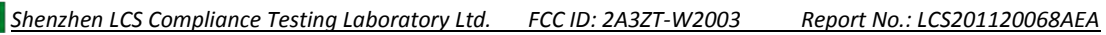
Test Graphs

DH5_Ant1_Low_2402_AV



DH5_Ant1_Low_2402_Peak





Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.510000000 GHz

Ref Offset 10.28 dB

Ref 20.00 dBm

Mkr4 2.483 52 GHz -42.360 dBm

Start 2.47000 GHz

Stop 2.50000 GHz

#Res BW 1.0 MHz

#VBW 390 Hz

Sweep 160.0 ms (1001 pts)

MKR	MODE	FREQ	SCL	DB	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	2.480 16 GHz	f	-1.702 dBm			
2	N	2.483 50 GHz	f	-42.360 dBm			
3	N	2.500 00 GHz	f	-46.227 dBm			
4	N	2.483 52 GHz	f	-42.360 dBm			
5							
6							
7							
8							
9							
10							
11							

Frequency

Auto Tune

Center Freq 2.510000000 GHz

Start Freq 2.470000000 GHz

Stop Freq 2.500000000 GHz

CF Step 8.000000 MHz

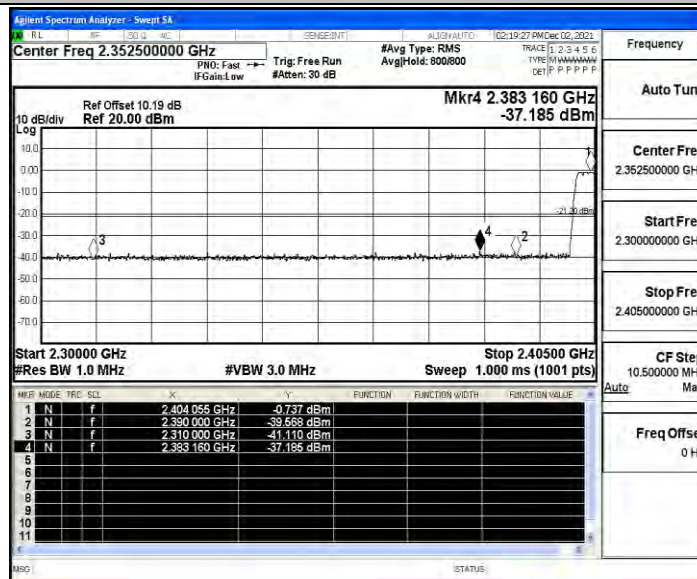
Man

Freq Offset 0 Hz

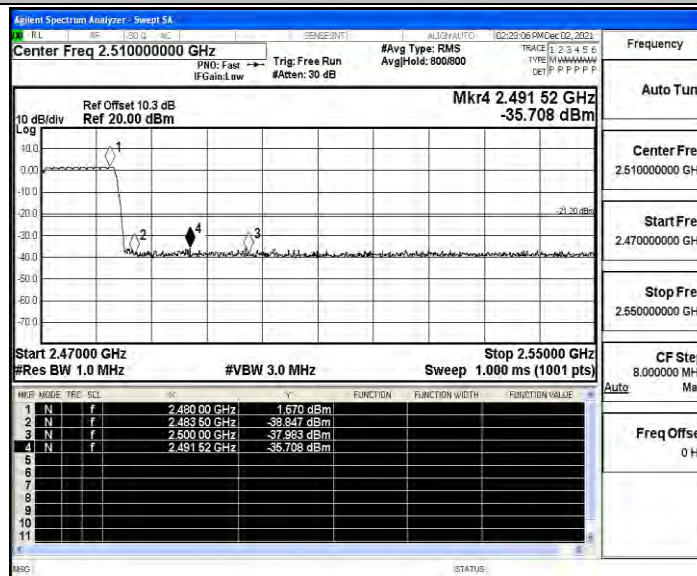
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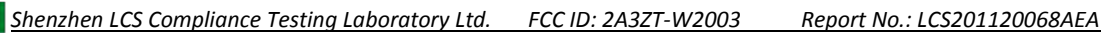


DH5_Ant1_Low_Hop_2402_Peak



DH5_Ant1_High_Hop_2480_Peak



[illegible]

2DH5_Ant1_Low_2402_Mpeak

Agilent Spectrum Analyzer - Sweet SA

RL 1.30 dBS

Center Freq 2.352500000 GHz

PNO: Fast IF Gain Low Trig: Free Run #Atten: 30 dB

#Avg Type: RMS Avg/Hold: 800/800

TRAC 1 2 3 4 5 6 TYPE [M] WAAAAA DEF: P P P P P

Mkr4 2.381 270 GHz -37.253 dBm

Ref Offset 10.28 dB Ref 20.00 dBm

10 dB/div Log

Start 2.30000 GHz #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 1.000 ms (1001 pts)

MARK	MODE	FREQ	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f		2.402 060 GHz	0.040 dBm			
2	N	f		2.390 000 GHz	-40.390 dBm			
3	N	f		2.310 000 GHz	-40.381 dBm			
4	N	f		2.381 270 GHz	-37.253 dBm			
5								
6								
7								
8								
9								
10								
11								

Frequency Auto Tune

Center Freq 2.352500000 GHz

Start Freq 2.300000000 GHz

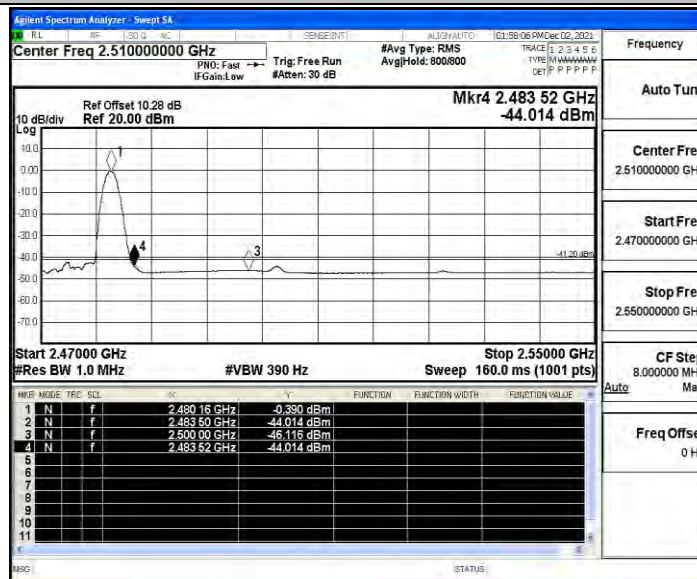
Stop Freq 2.405000000 GHz

CF Step 10.500000 MHz Man

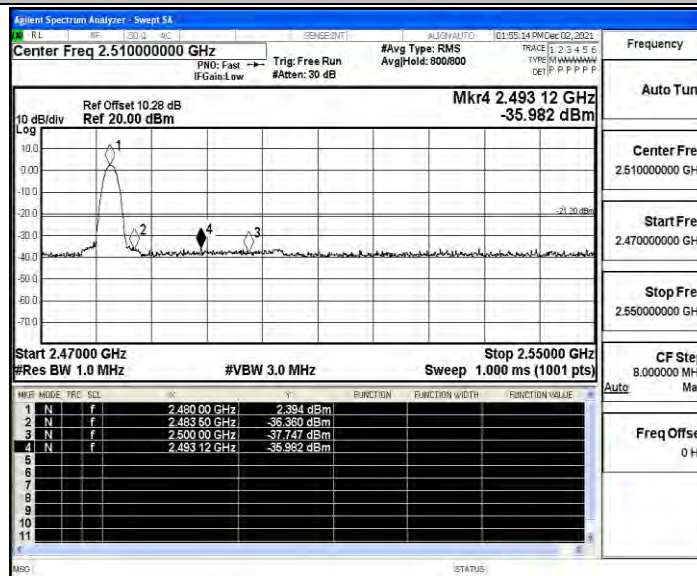
Freq Offset 0 Hz



2DH5_Ant1_High_2480_AV

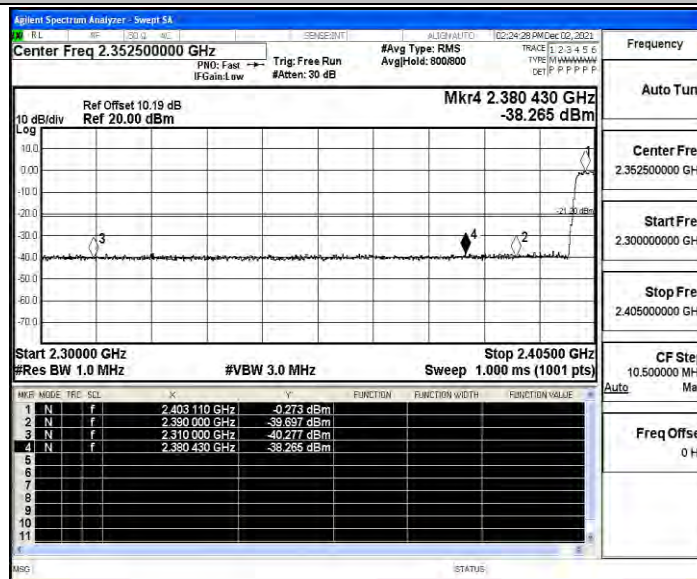


2DH5_Ant1_High_2480_Peak

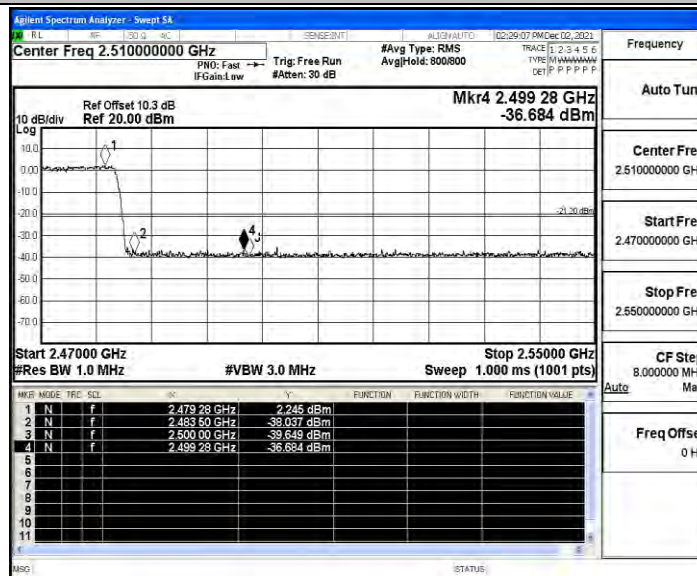




2DH5_Ant1_Low_Hop_2402_Peak

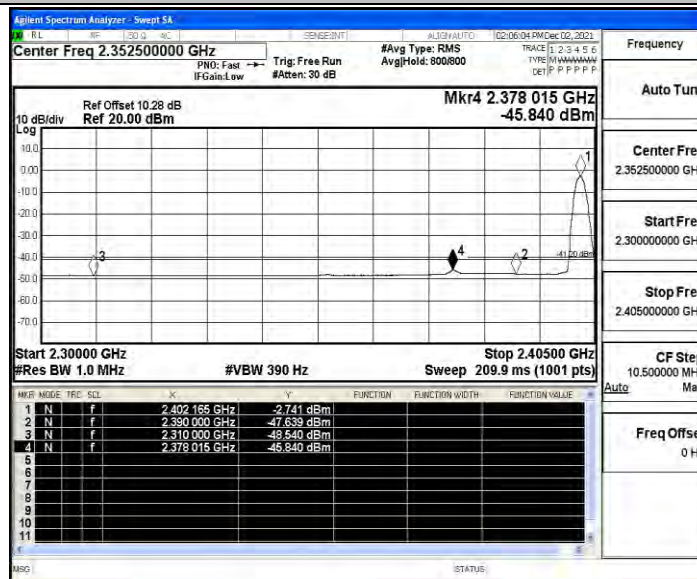


2DH5_Ant1_High_Hop_2480_Peak

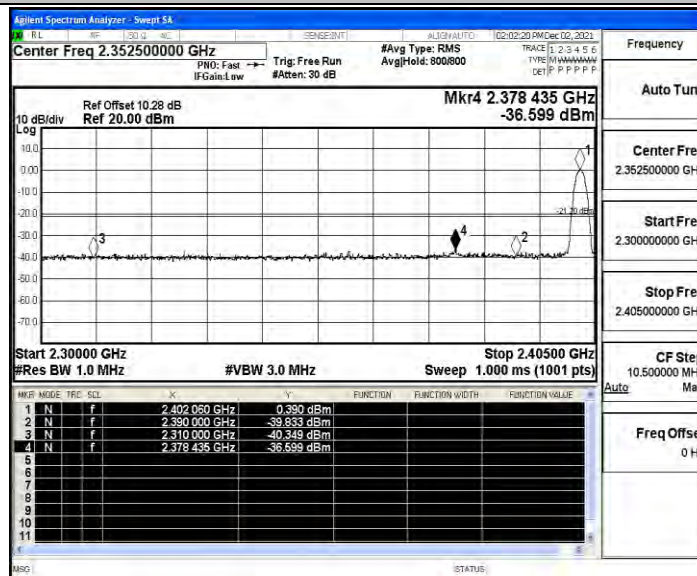




3DH5_Ant1_Low_2402_AV

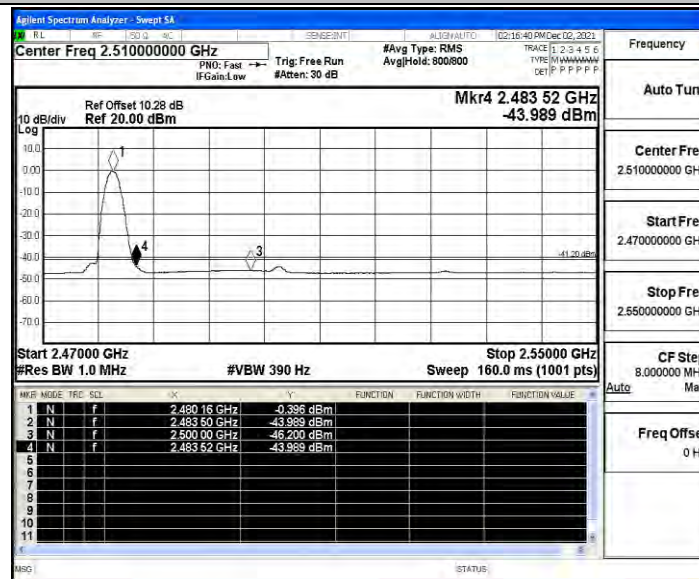


3DH5_Ant1_Low_2402_Peak

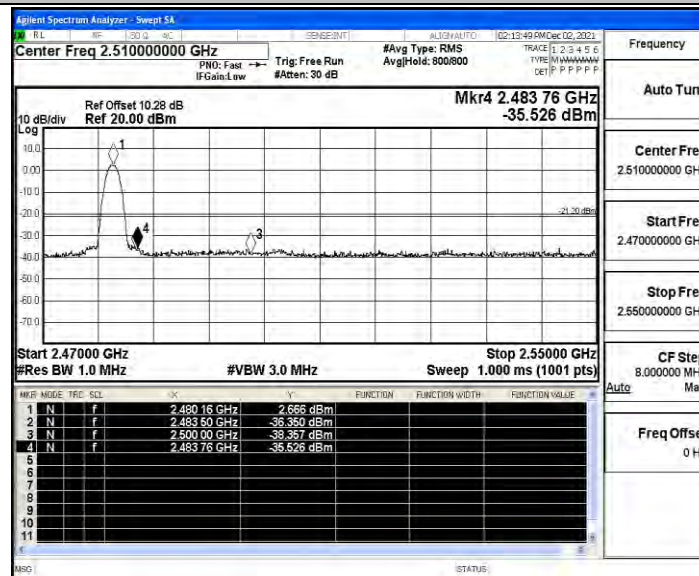


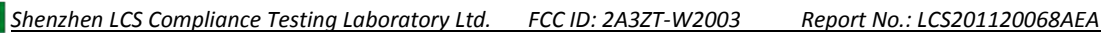


3DH5_Ant1_High_2480_AV



3DH5_Ant1_High_2480_Peak





Agilent Spectrum Analyzer - Swept SA

Center Freq 2.352500000 GHz

Ref Offset 10.19 dB

Ref 20.00 dBm

Mkr4 2.385 680 GHz

-37.787 dBm

Start 2.300000 GHz

Stop 2.405000 GHz

CF Step 10.500000 MHz

Freq Offset 0 Hz

Auto Tune

Center Freq 2.352500000 GHz

Start Freq 2.300000000 GHz

Stop Freq 2.405000000 GHz

CF Step 10.500000 MHz

Freq Offset 0 Hz

Auto

MAN

MAN

STATUS

MKR MODE	FREQ	SCL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	f	2.402 155 GHz	0.237 dBm			
2	N	f	2.390 000 GHz	-38.653 dBm			
3	N	f	2.310 000 GHz	-38.155 dBm			
4	N	f	2.385 680 GHz	-37.787 dBm			
5							
6							
7							
8							
9							
10							
11							

Agilent Spectrum Analyzer - Sweep SA

Center Freq 2.510000000 GHz

Ref Offset 10.3 dB
Ref 20.00 dBm

Mkr4 2.494 80 GHz
-36.107 dBm

Start 2.47000 GHz
#Res BW 1.0 MHz

Stop 2.55000 GHz
Sweep 1.000 ms (1001 pts)

#VBW 3.0 MHz

Frequency

Auto Tune

Center Freq
2.510000000 GHz

Start Freq
2.470000000 GHz

Stop Freq
2.550000000 GHz

CF Step
8.000000 MHz

Auto Man

Freq Offset
0 Hz

Mkr	Mode	Freq	Power	Function	Function Width	Function Value
1	N	2.476 96 GHz	2.392 dBm			
2	N	2.483 50 GHz	-39.780 dBm			
3	N	2.500 00 GHz	-37.498 dBm			
4	N	2.494 80 GHz	-36.107 dBm			