



Appendix A

RF Test Data for BT (Conducted Measurement)

Product Name: SmartHub

Test Model: SmartHub v2

Environmental Conditions

Temperature:	23.8° C
Relative Humidity:	52.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Ling Zhu
Supervised by:	Li Huan





A.1 20dB Emission Bandwidth

Test Result

TestMode	Antenna	Channel	20db EBW[MHz]	FL[MHz]	FH[MHz]	Verdict
DH5	Ant1	2402	0.963	2401.553	2402.516	---
		2441	0.963	2440.550	2441.513	---
		2480	0.960	2479.553	2480.513	---
2DH5	Ant1	2402	1.278	2401.388	2402.666	---
		2441	1.281	2440.388	2441.669	---
		2480	1.281	2479.388	2480.669	---
3DH5	Ant1	2402	1.302	2401.370	2402.672	---
		2441	1.299	2440.370	2441.669	---
		2480	1.302	2479.370	2480.672	---

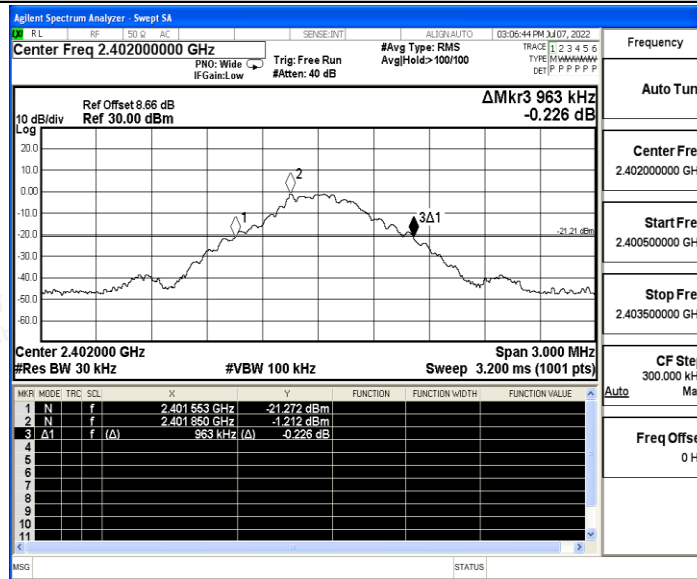


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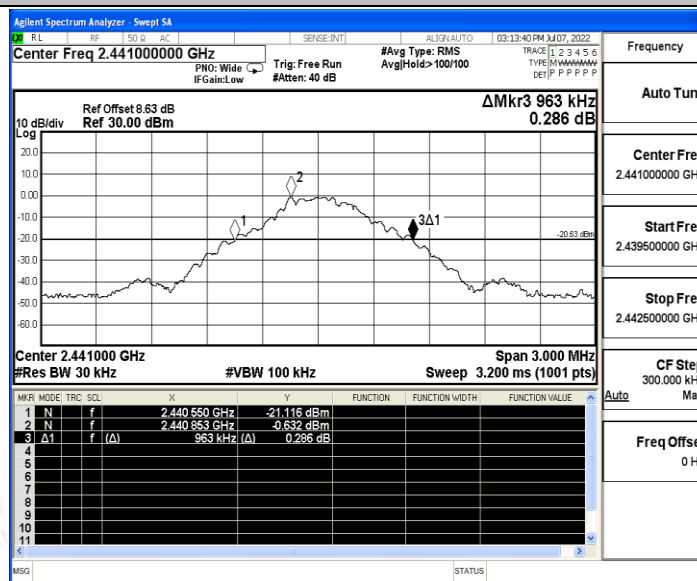


Test Graphs

DH5_Ant1_2402

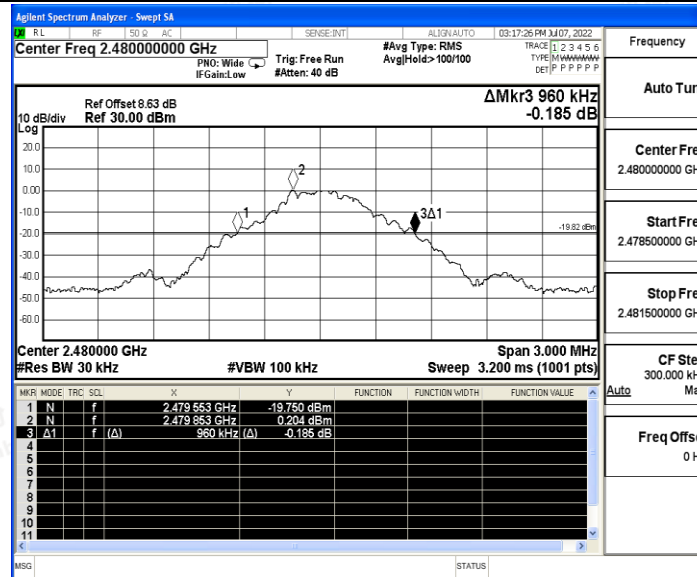


DH5_Ant1_2441

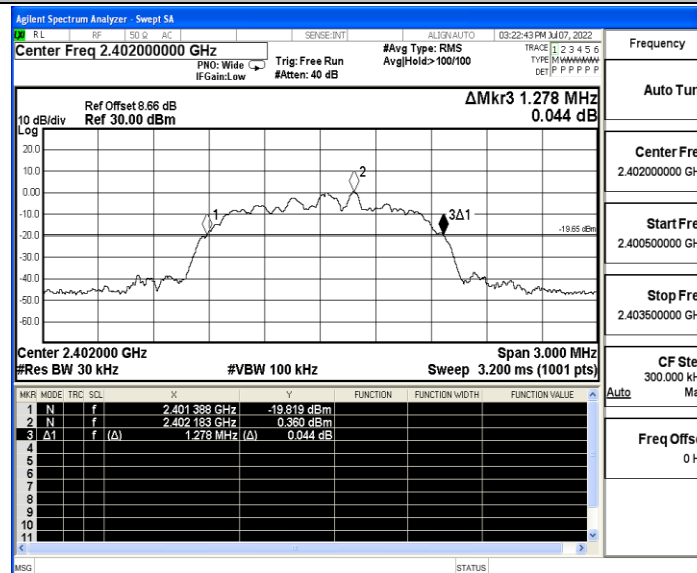


DH5_Ant1_2480



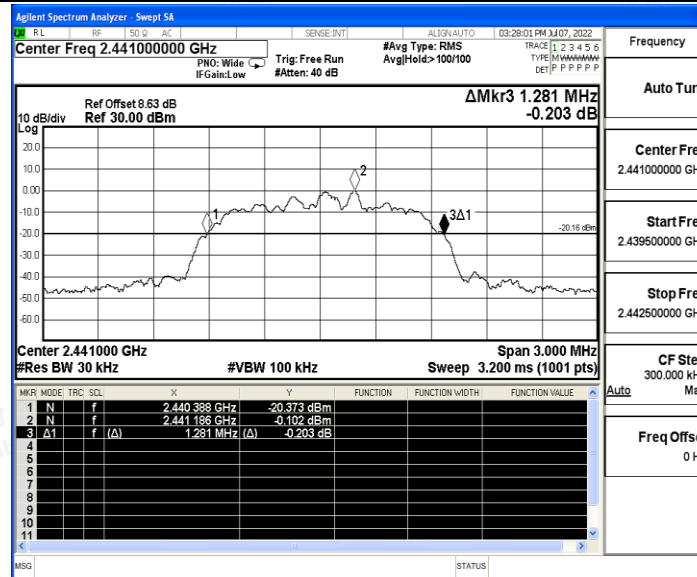


2DH5_Ant1_2402

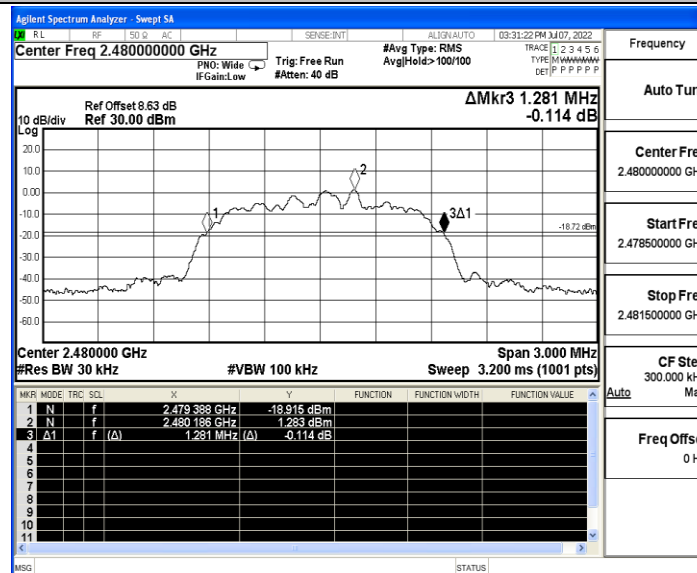


2DH5_Ant1_2441



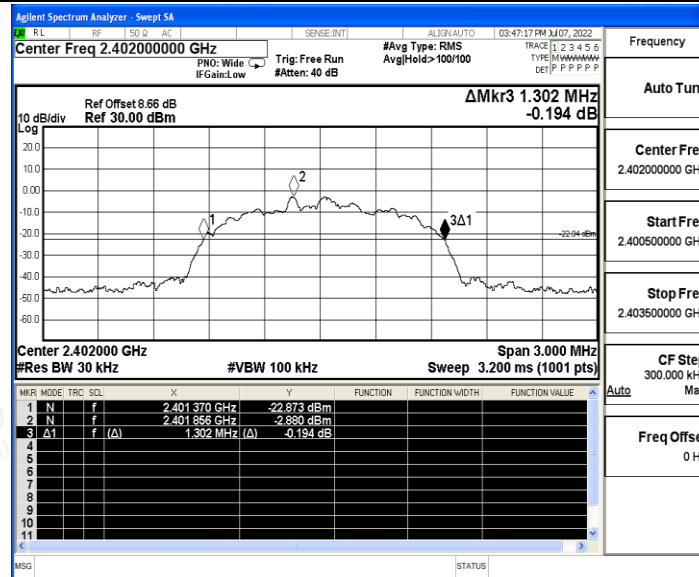


2DH5_Ant1_2480

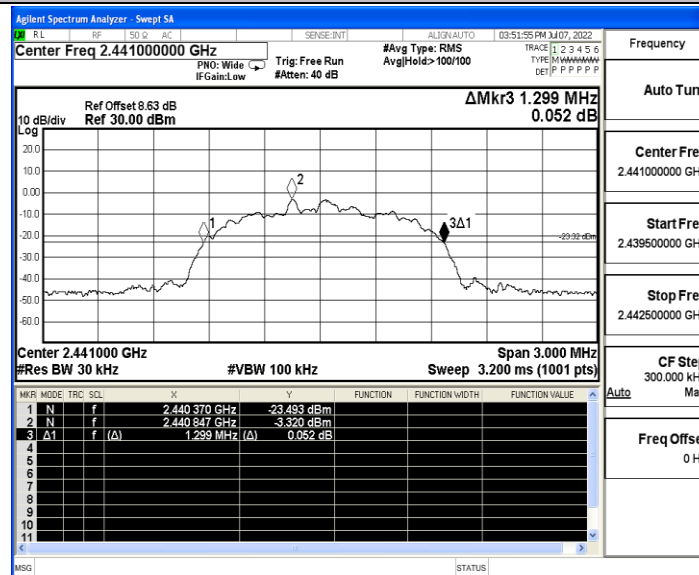


3DH5_Ant1_2402



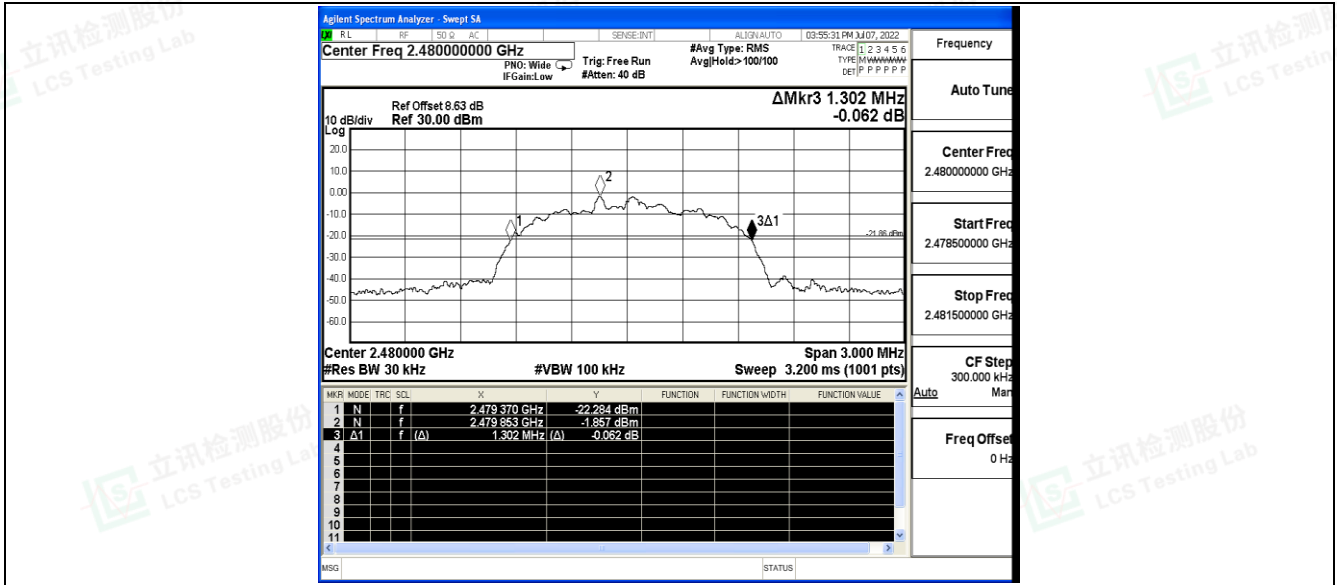


3DH5_Ant1_2441



3DH5_Ant1_2480





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A.2 Maximum peak conducted output power

Test Result

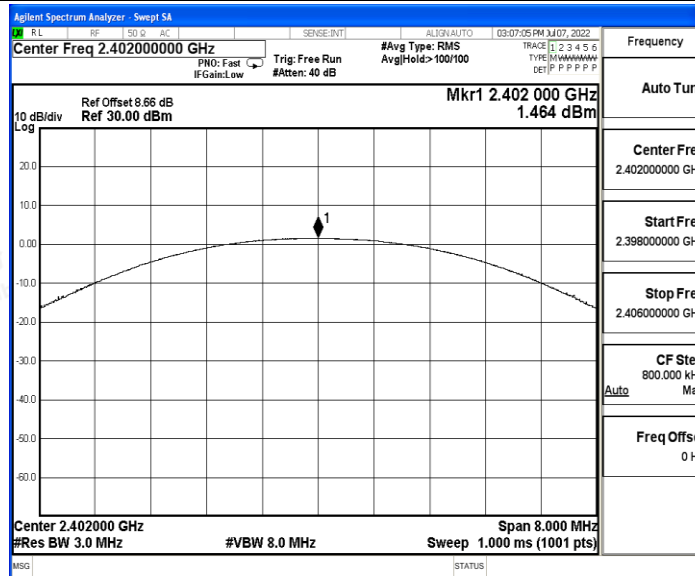
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
DH5	Ant1	2402	1.46	≤20.97	PASS
		2441	1.99	≤20.97	PASS
		2480	2.79	≤20.97	PASS
2DH5	Ant1	2402	3.92	≤20.97	PASS
		2441	3.4	≤20.97	PASS
		2480	1.82	≤20.97	PASS
3DH5	Ant1	2402	1.8	≤20.97	PASS
		2441	1.41	≤20.97	PASS
		2480	2.51	≤20.97	PASS



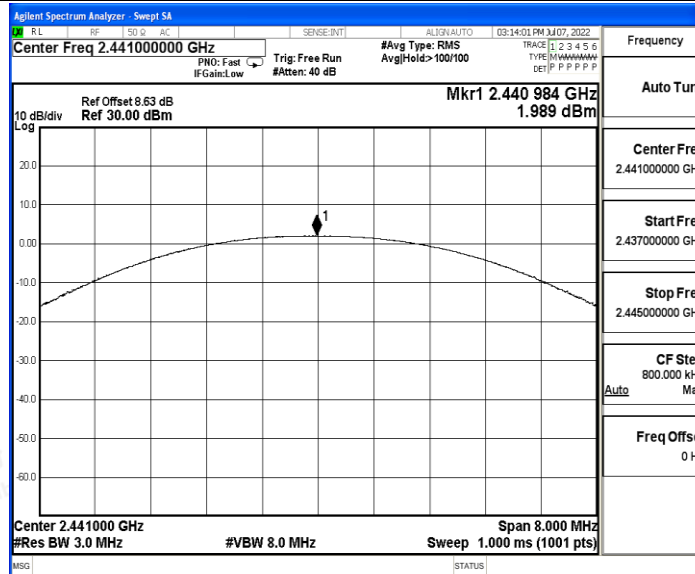


Test Graphs

DH5_Ant1_2402

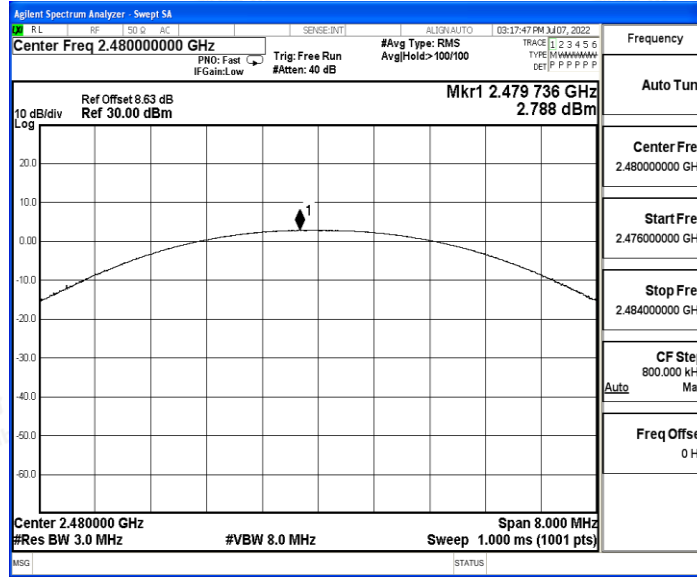


DH5_Ant1_2441

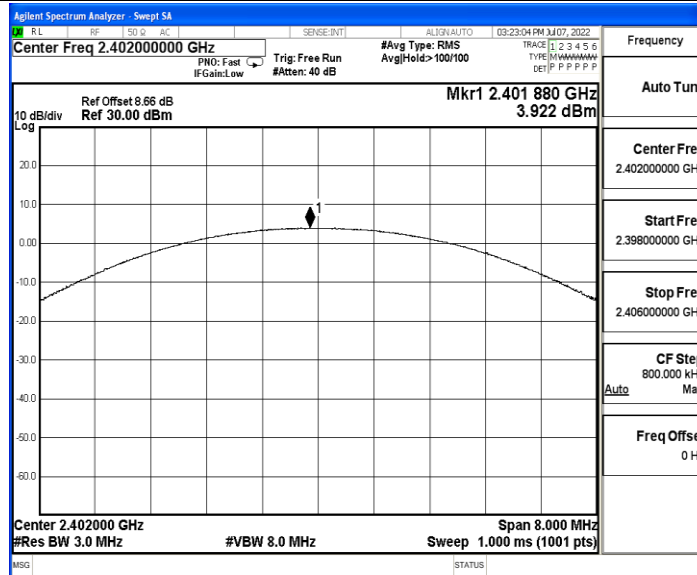


DH5_Ant1_2480



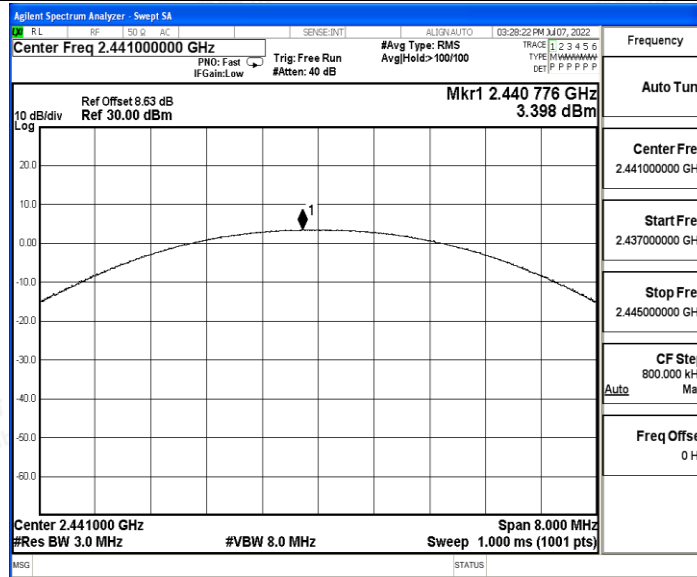


2DH5_Ant1_2402

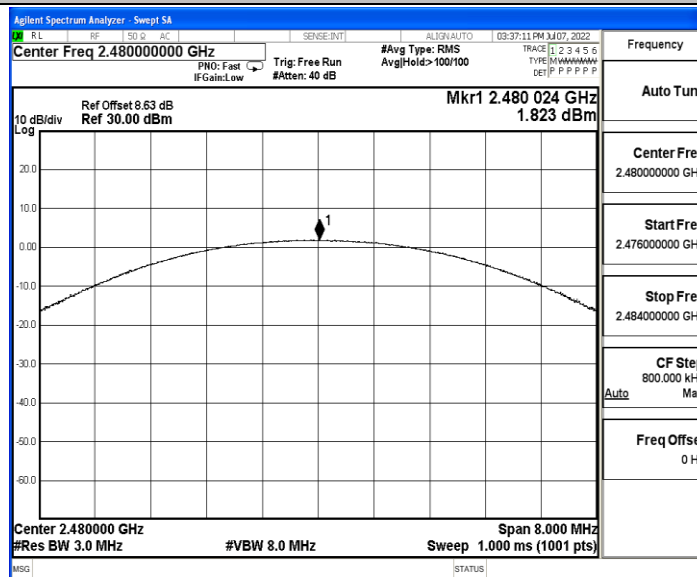


2DH5_Ant1_2441



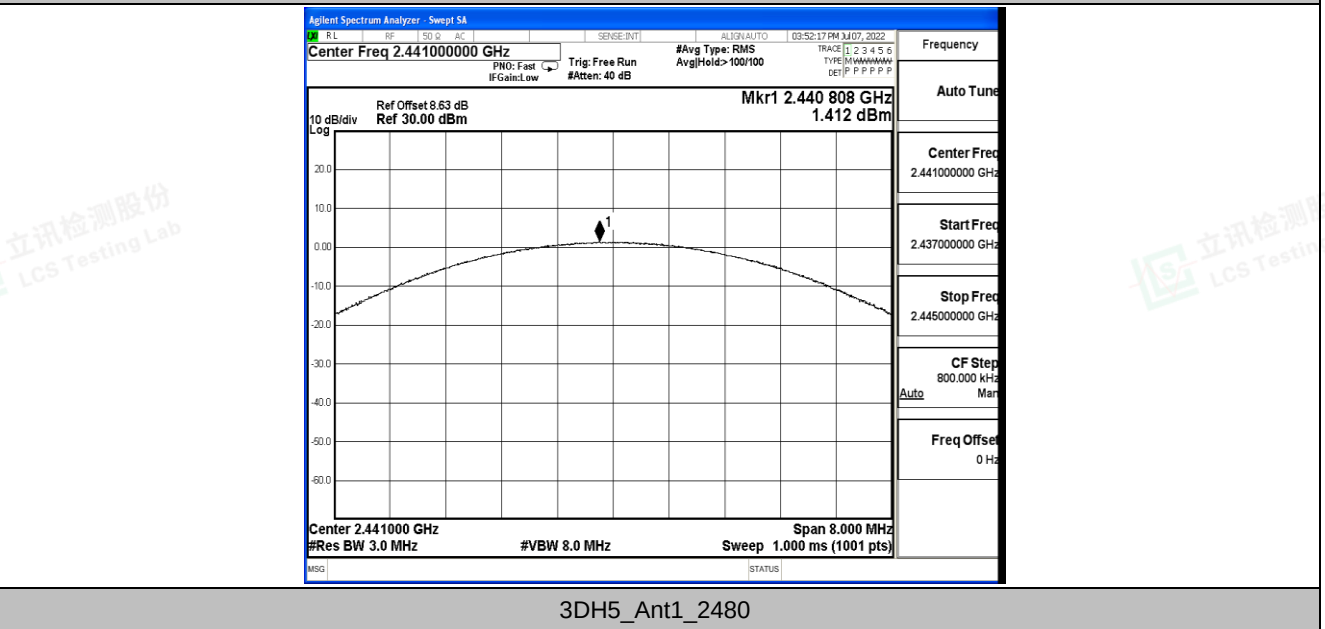
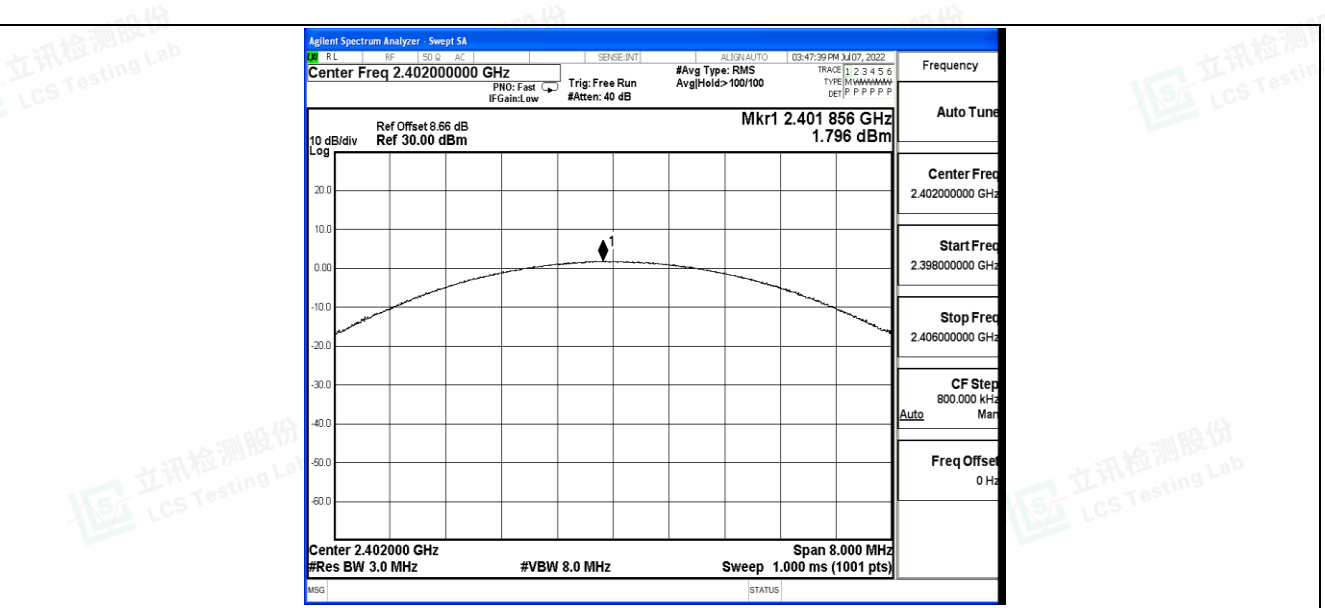


2DH5_Ant1_2480



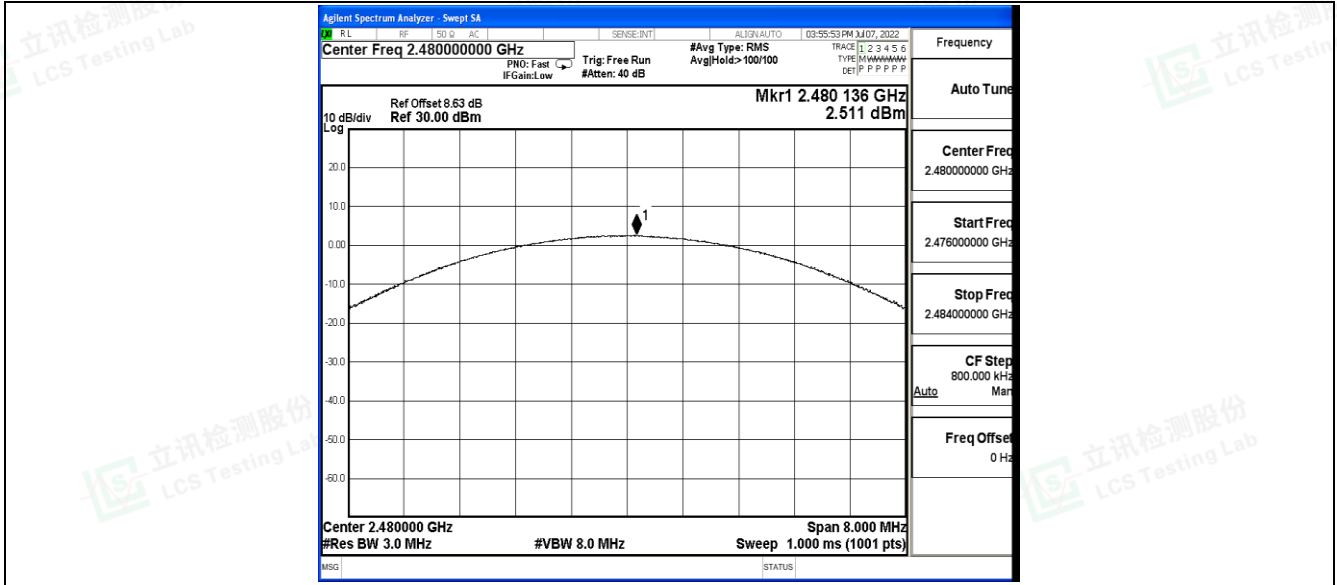
3DH5_Ant1_2402







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A.3 Carrier frequency separation

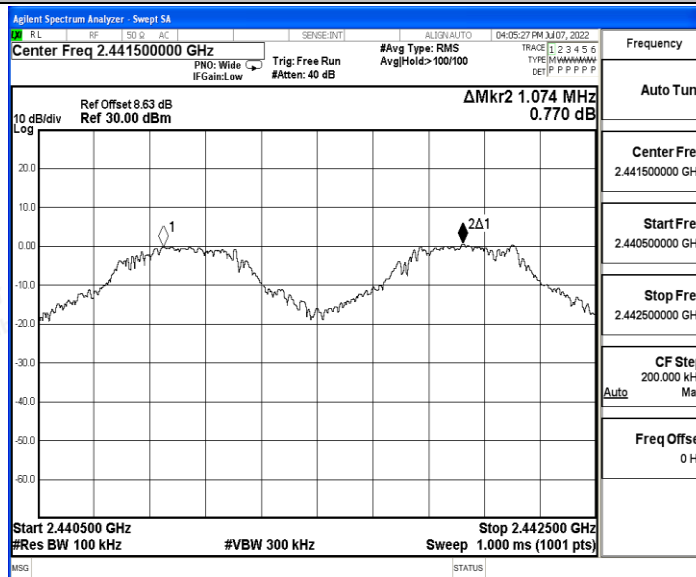
Test Result

TestMode	Antenna	Channel	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	1.074	≥0.963	PASS
2DH5	Ant1	Hop	1.012	≥0.854	PASS
3DH5	Ant1	Hop	1.008	≥0.868	PASS

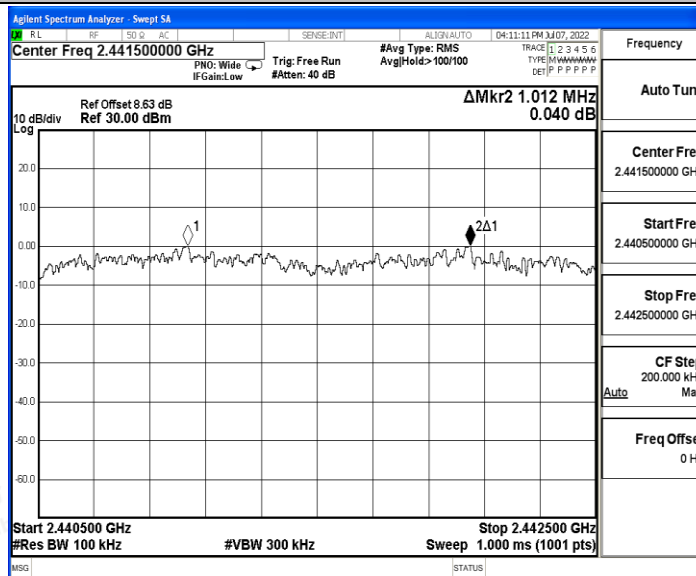


Test Graphs

DH5_Ant1_Hop



2DH5_Ant1_Hop

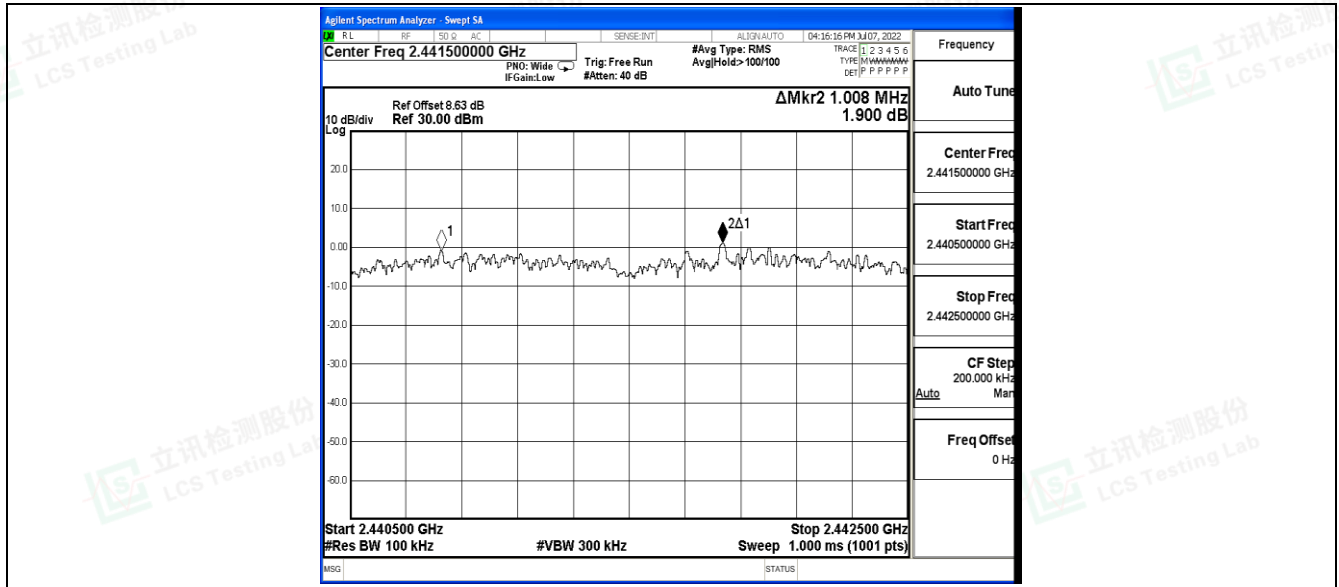


3DH5_Ant1_Hop





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A.4 Time of occupancy

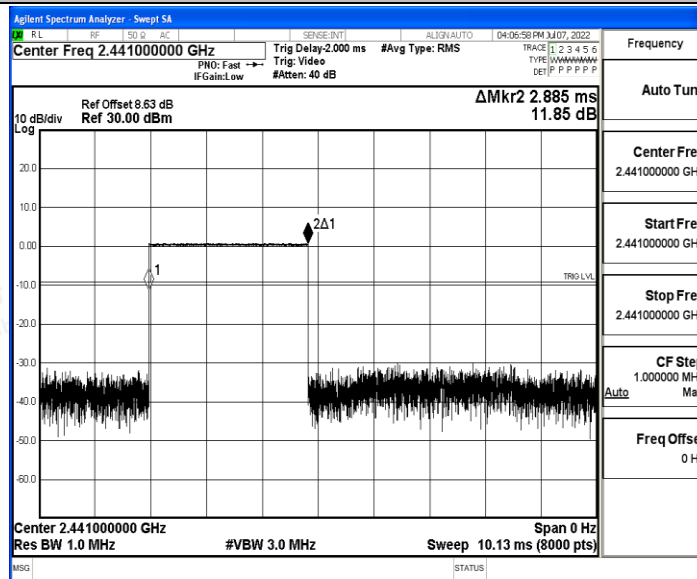
Test Result

TestMode	Antenna	Channel	BurstWidth [ms]	TotalHops [Num]	Result[s]	Limit[s]	Verdict
DH5	Ant1	Hop	2.89	106.67	0.308	≤0.4	PASS
2DH5	Ant1	Hop	2.89	106.67	0.308	≤0.4	PASS
3DH5	Ant1	Hop	2.89	106.67	0.308	≤0.4	PASS

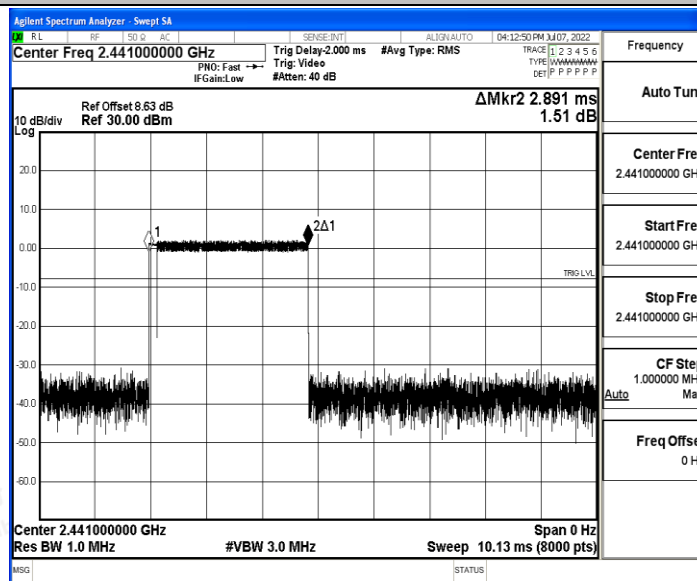


Test Graphs

DH5_Ant1_Hop



2DH5_Ant1_Hop

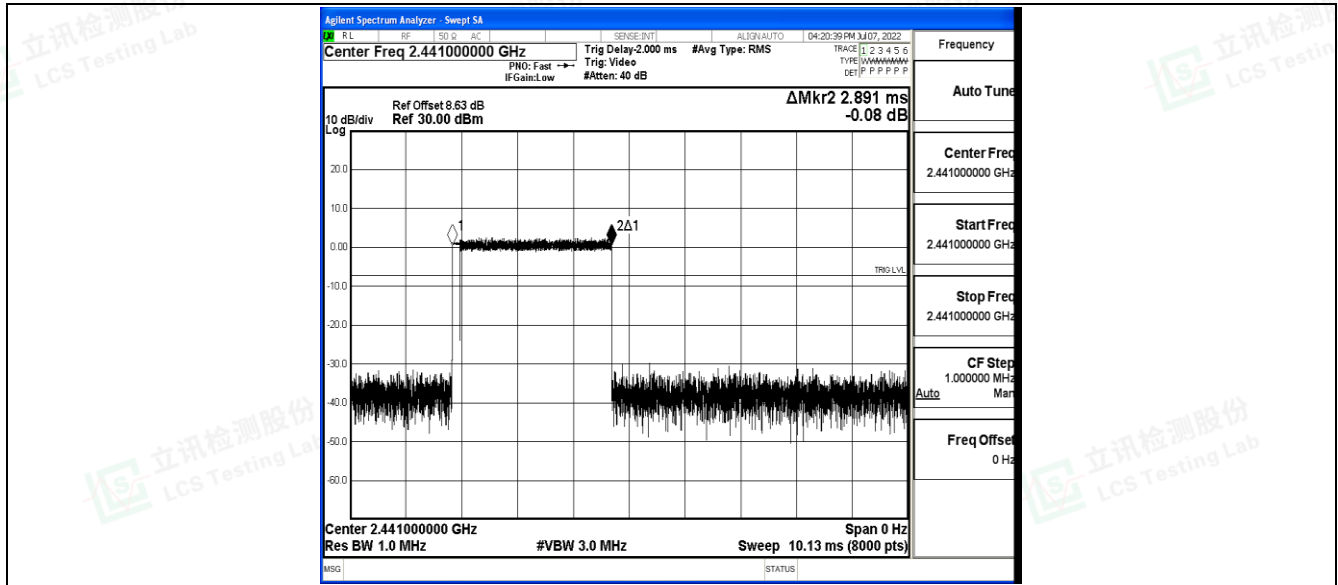


3DH5_Ant1_Hop





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A.5 Number of hopping channels

Test Result

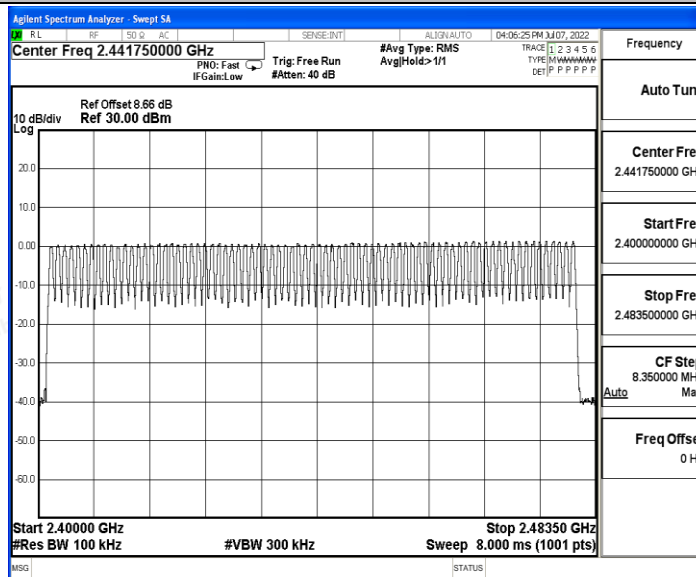
TestMode	Antenna	Channel	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	≥15	PASS
2DH5	Ant1	Hop	79	≥15	PASS
3DH5	Ant1	Hop	79	≥15	PASS



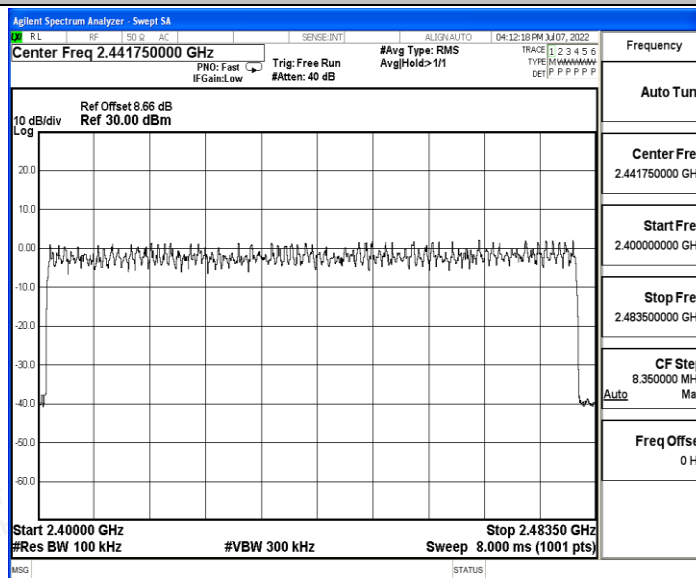


Test Graphs

DH5_Ant1_Hop



2DH5_Ant1_Hop

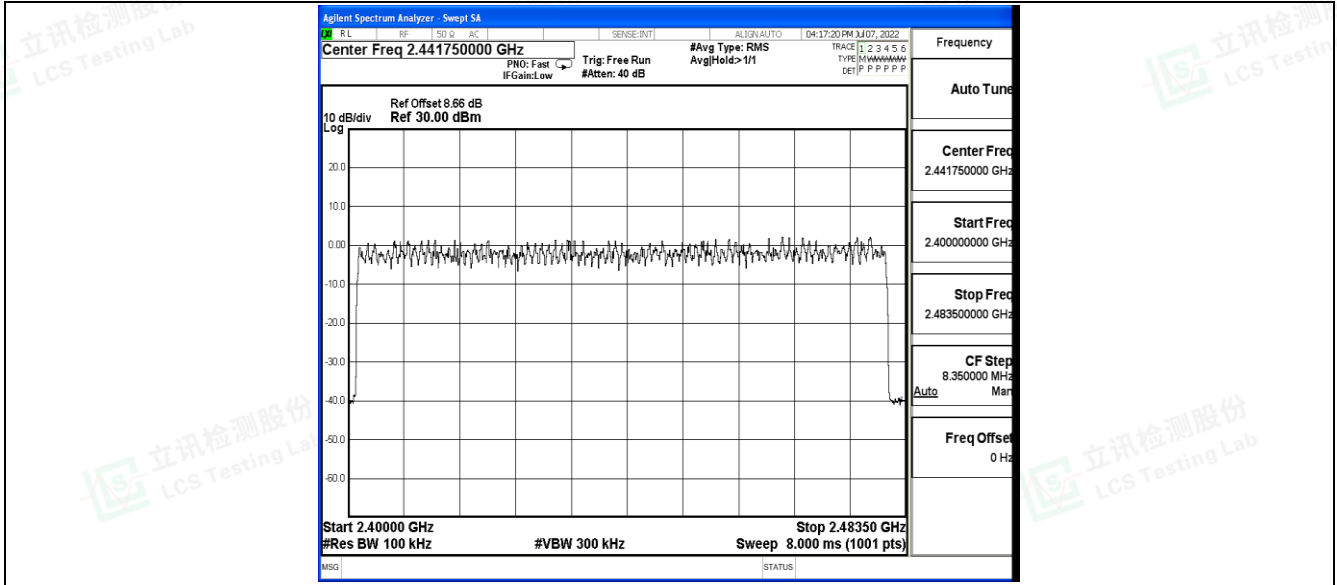


3DH5_Ant1_Hop





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A.6 Band edge measurements

Test Result

TestMode	Antenna	ChName	Channel	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	1.18	-58.46	≤ -18.82	PASS
		High	2480	2.47	-57.32	≤ -17.54	PASS
		Low	Hop_2402	-0.61	-58.98	≤ -20.61	PASS
		High	Hop_2480	1.20	-57.55	≤ -18.8	PASS
2DH5	Ant1	Low	2402	2.29	-56.63	≤ -17.71	PASS
		High	2480	0.06	-57.83	≤ -19.94	PASS
		Low	Hop_2402	-0.05	-58.36	≤ -20.05	PASS
		High	Hop_2480	-0.97	-57.81	≤ -20.97	PASS
3DH5	Ant1	Low	2402	-0.35	-58.43	≤ -20.35	PASS
		High	2480	0.40	-56.64	≤ -19.6	PASS
		Low	Hop_2402	-1.41	-58.95	≤ -21.41	PASS
		High	Hop_2480	1.63	-57.88	≤ -18.37	PASS



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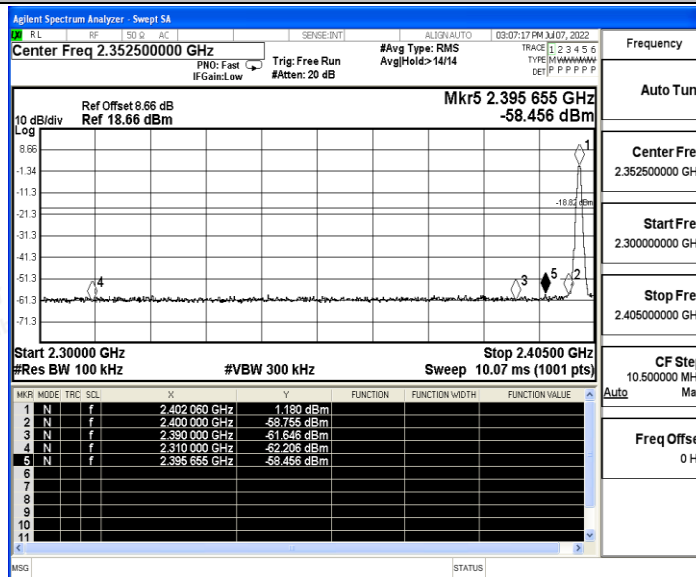
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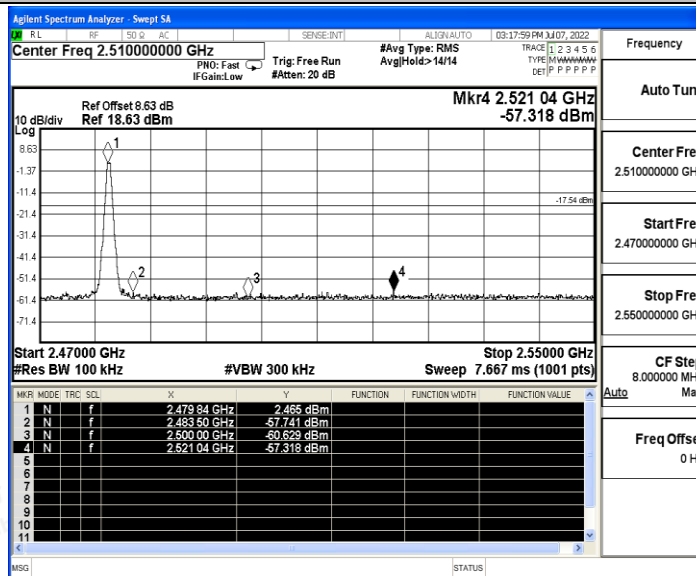


Test Graphs

DH5_Ant1_Low_2402



DH5_Ant1_High_2480

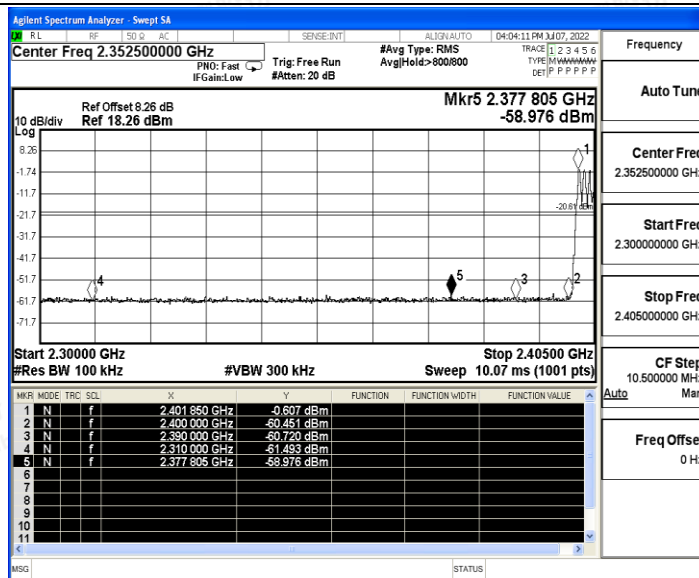


DH5_Ant1_Low_Hop_2402

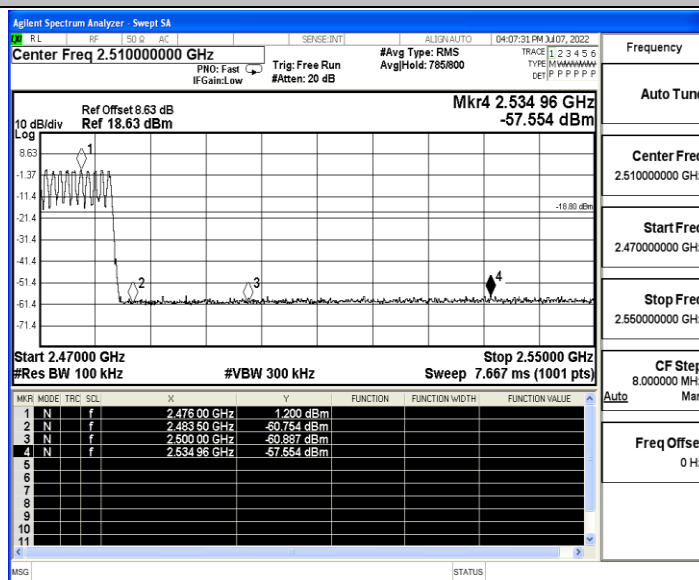




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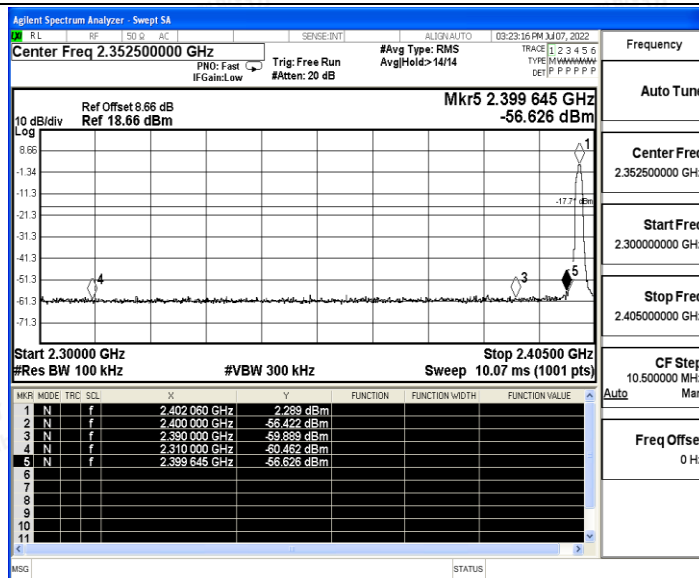


DH5_Ant1_High_Hop_2480

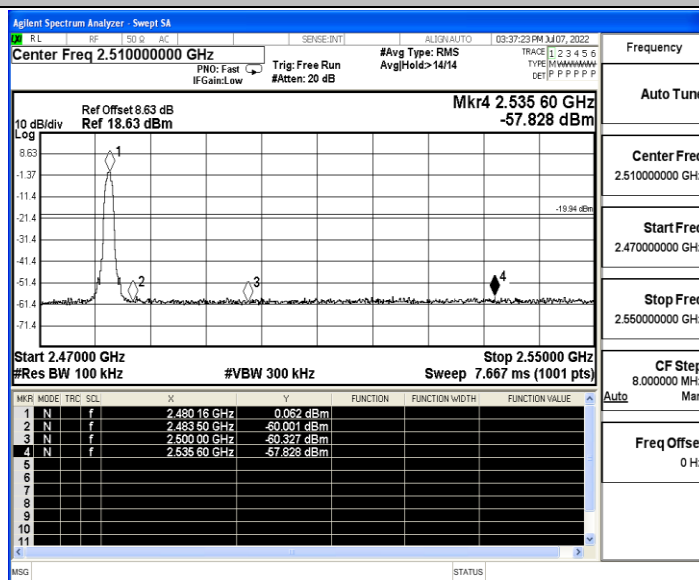


2DH5_Ant1_Low_2402





2DH5_Ant1_High_2480

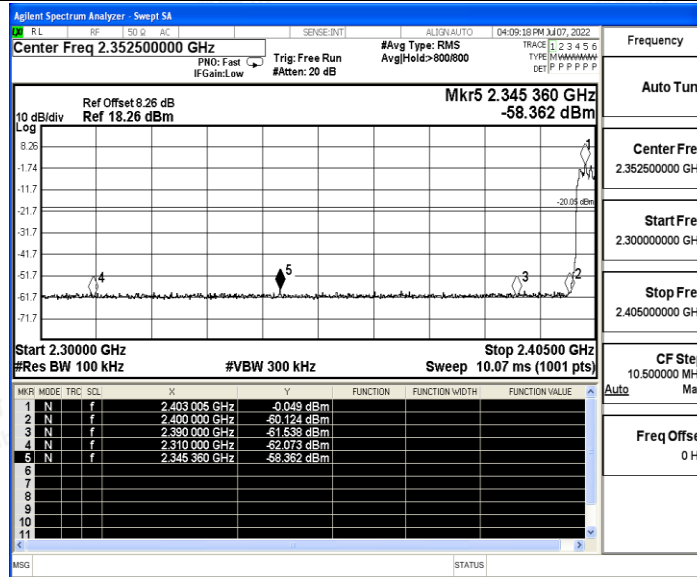


2DH5_Ant1_Low_Hop_2402

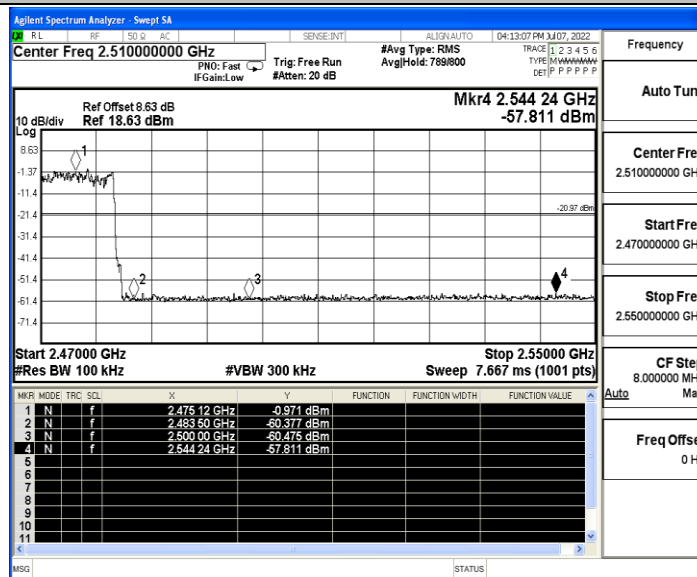




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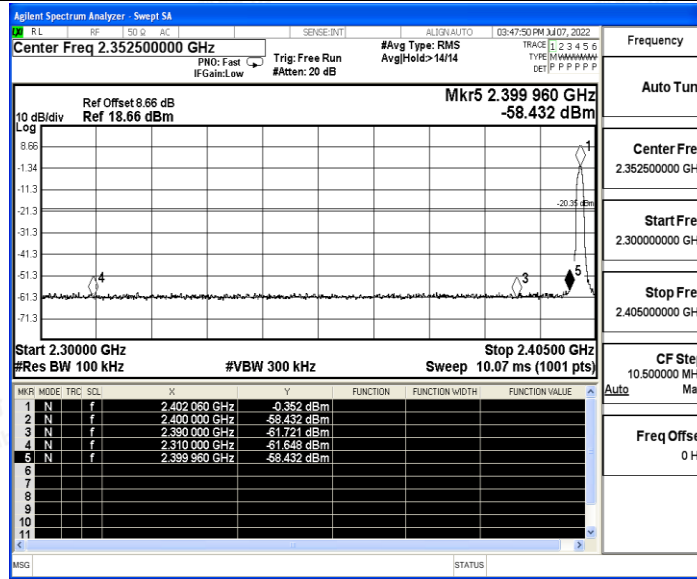


2DH5_Ant1_High_Hop_2480

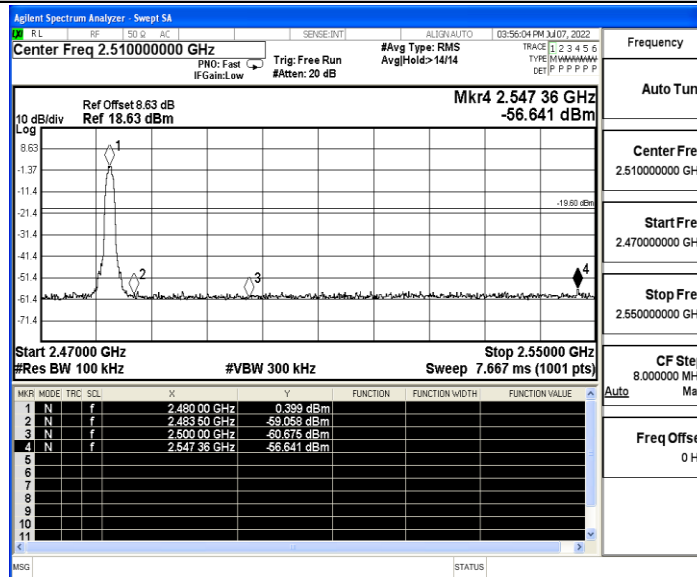


3DH5_Ant1_Low_2402





3DH5_Ant1_High_2480

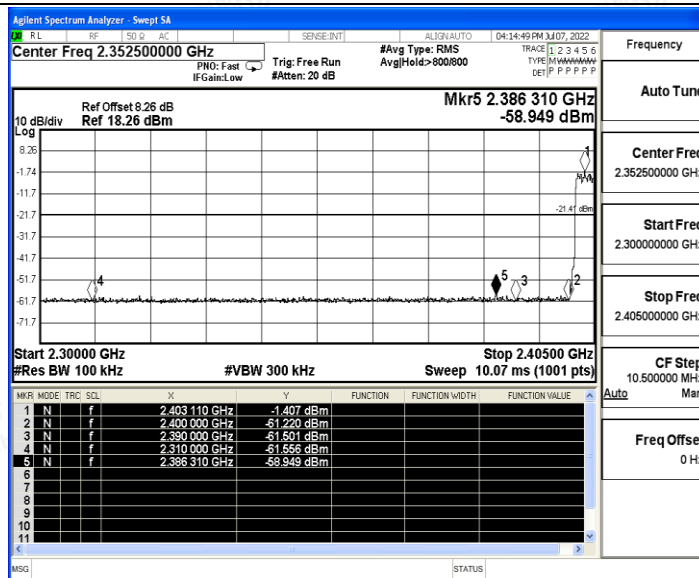


3DH5_Ant1_Low_Hop_2402

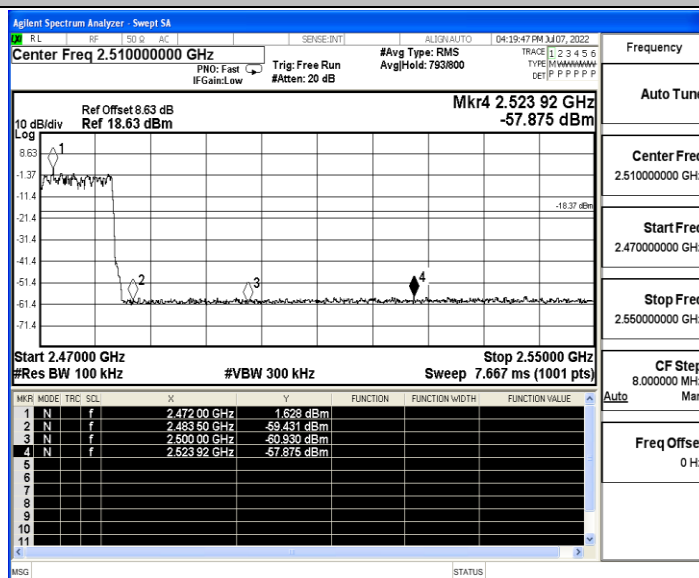




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3DH5_Ant1_High_Hop_2480



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A.7 Conducted Spurious Emission

Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	Reference	1.57	1.57	---	PASS
			30~1000	1.57	-60.42	≤-18.43	PASS
			1000~26500	1.57	-45.05	≤-18.43	PASS
		2441	Reference	1.50	1.50	---	PASS
			30~1000	1.50	-60.61	≤-18.5	PASS
			1000~26500	1.50	-45.63	≤-18.5	PASS
		2480	Reference	2.45	2.45	---	PASS
			30~1000	2.45	-60.83	≤-17.55	PASS
			1000~26500	2.45	-45.57	≤-17.55	PASS
2DH5	Ant1	2402	Reference	2.24	2.24	---	PASS
			30~1000	2.24	-60.43	≤-17.76	PASS
			1000~26500	2.24	-45.54	≤-17.76	PASS
		2441	Reference	1.72	1.72	---	PASS
			30~1000	1.72	-59.83	≤-18.28	PASS
			1000~26500	1.72	-46.21	≤-18.28	PASS
		2480	Reference	0.12	0.12	---	PASS
			30~1000	0.12	-60.61	≤-19.88	PASS
			1000~26500	0.12	-46.15	≤-19.88	PASS
3DH5	Ant1	2402	Reference	-0.45	-0.45	---	PASS
			30~1000	-0.45	-60.31	≤-20.45	PASS
			1000~26500	-0.45	-46.04	≤-20.45	PASS
		2441	Reference	-0.96	-0.96	---	PASS
			30~1000	-0.96	-60.6	≤-20.96	PASS
			1000~26500	-0.96	-46.06	≤-20.96	PASS
		2480	Reference	0.30	0.30	---	PASS
			30~1000	0.30	-60.22	≤-19.7	PASS
			1000~26500	0.30	-46.29	≤-19.7	PASS



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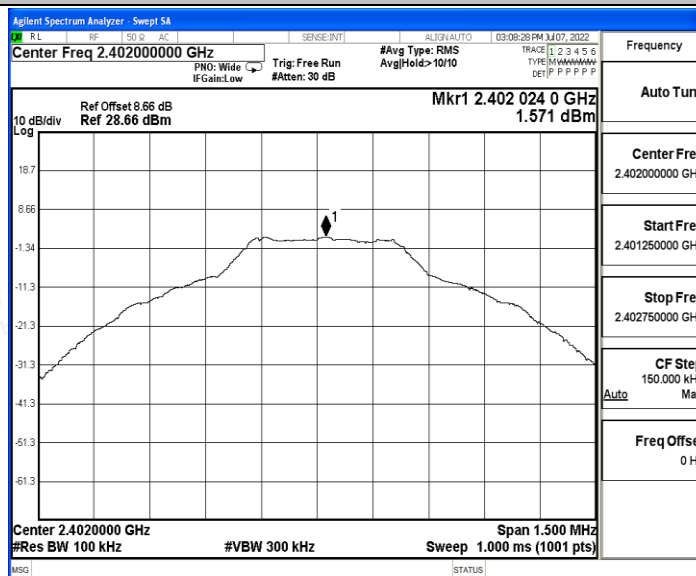
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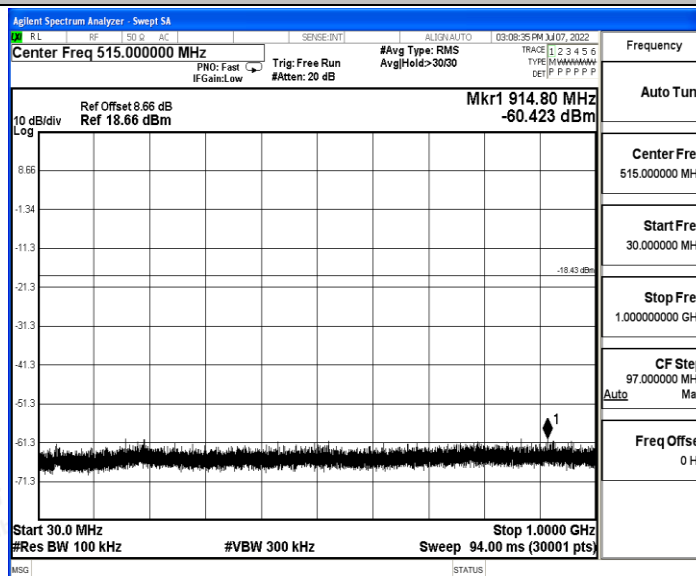


Test Graphs

DH5_Ant1_2402_0-Reference

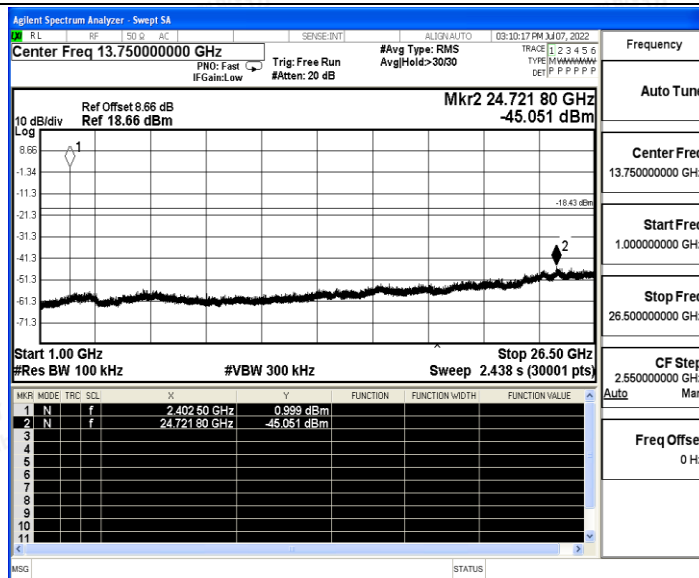


DH5_Ant1_2402_30~1000

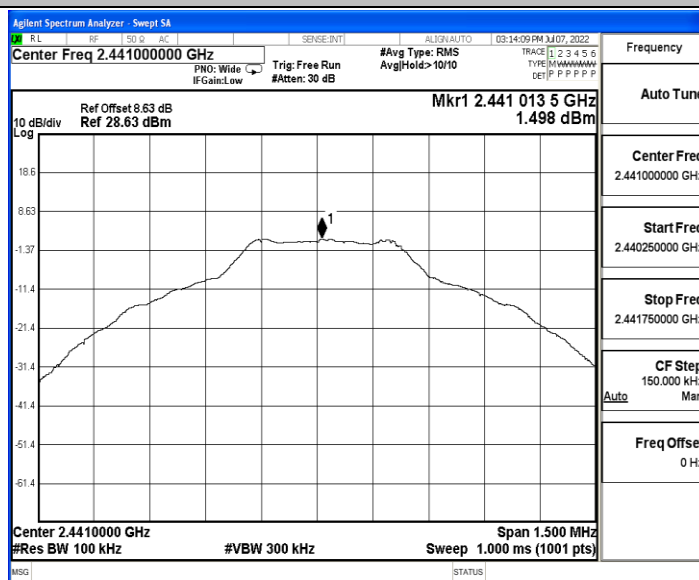


DH5_Ant1_2402_1000~26500





DH5_Ant1_2441_0~Reference

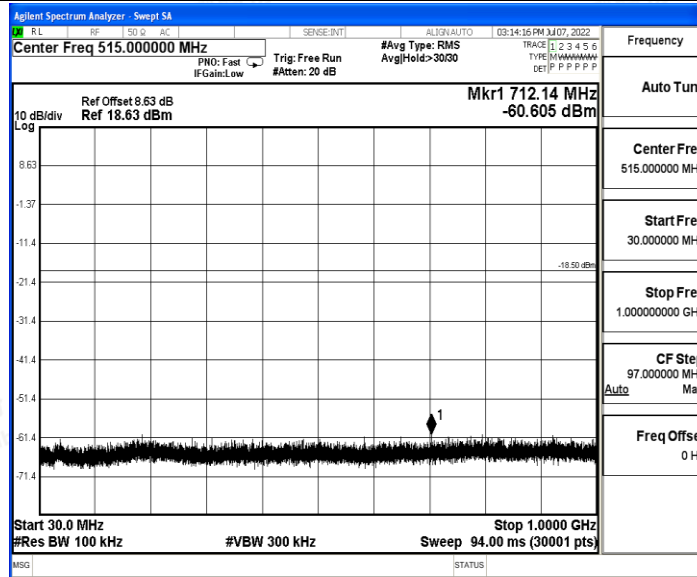


DH5_Ant1_2441_30~1000

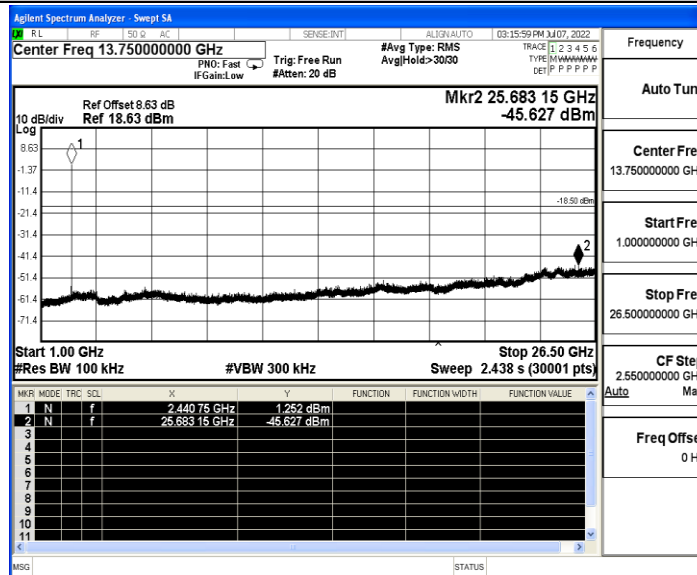




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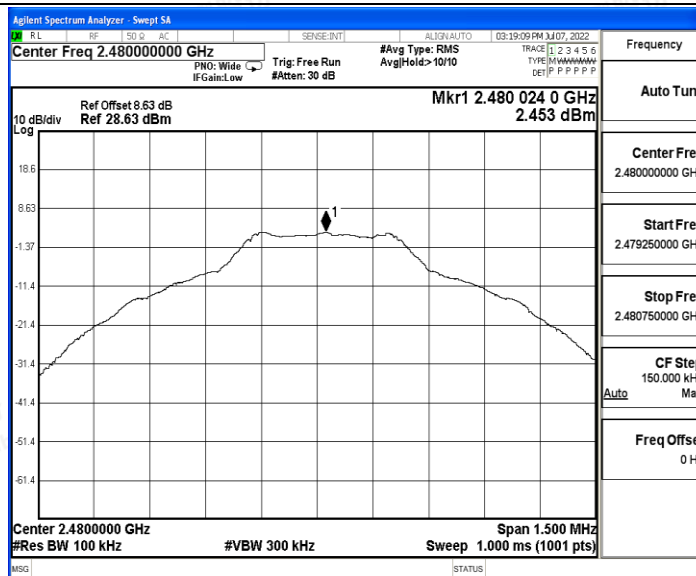


DH5_Ant1_2441_1000~26500

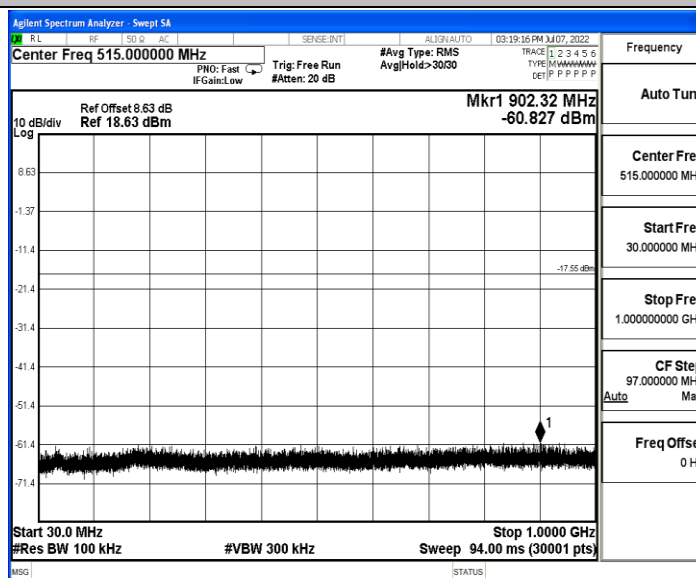


DH5_Ant1_2480_0~Reference



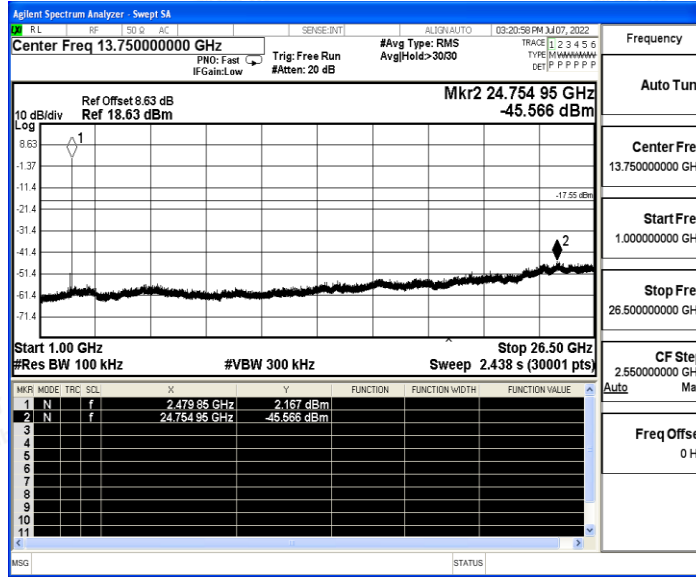


DH5_Ant1_2480_30~1000

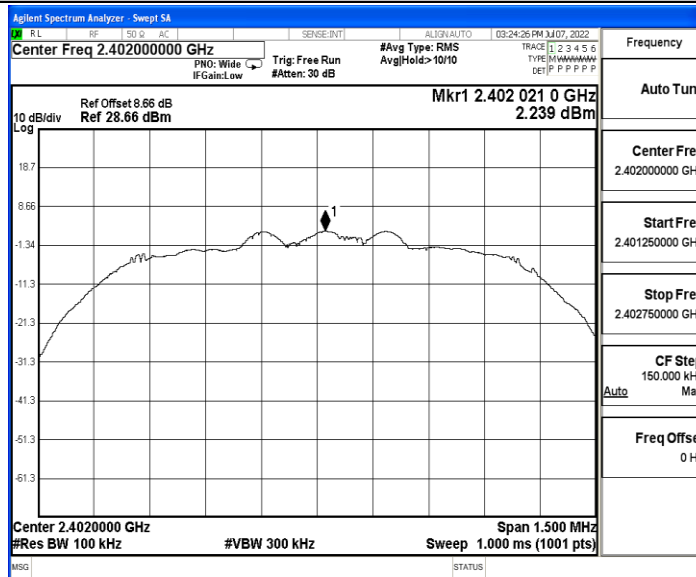


DH5_Ant1_2480_1000~26500



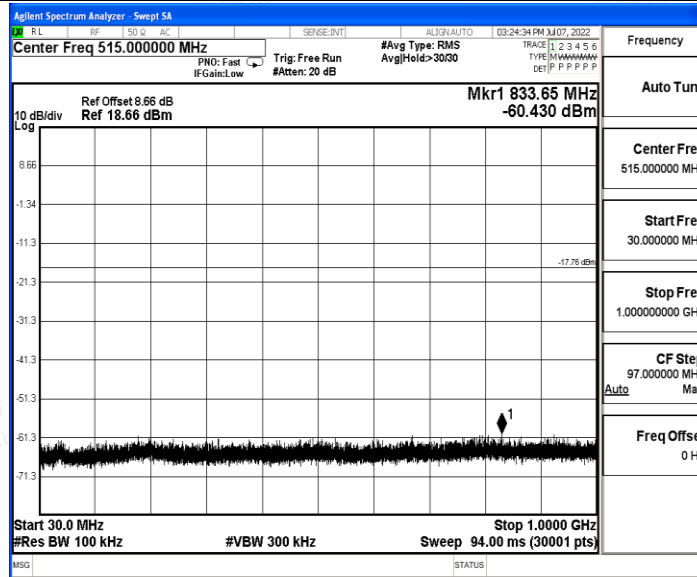


2DH5_Ant1_2402_0~Reference

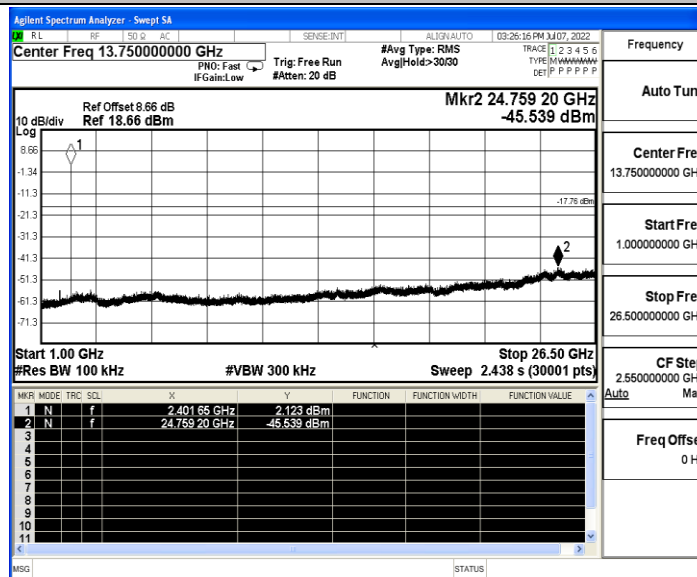


2DH5_Ant1_2402_30~1000



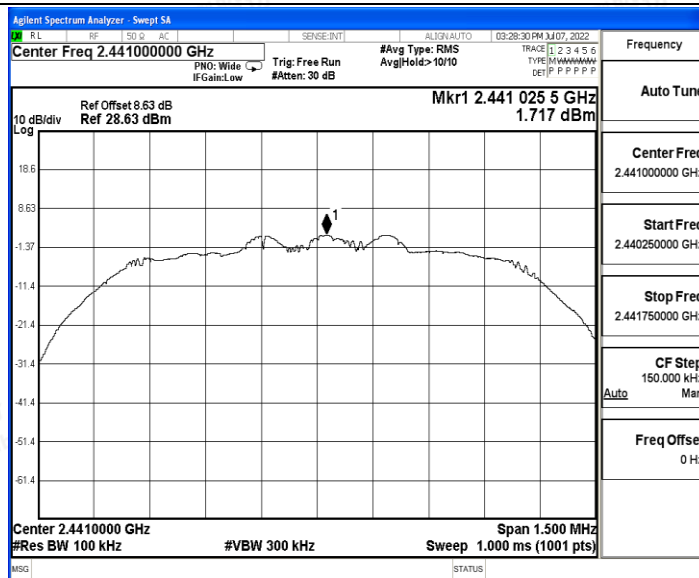


2DH5_Ant1_2402_1000~26500

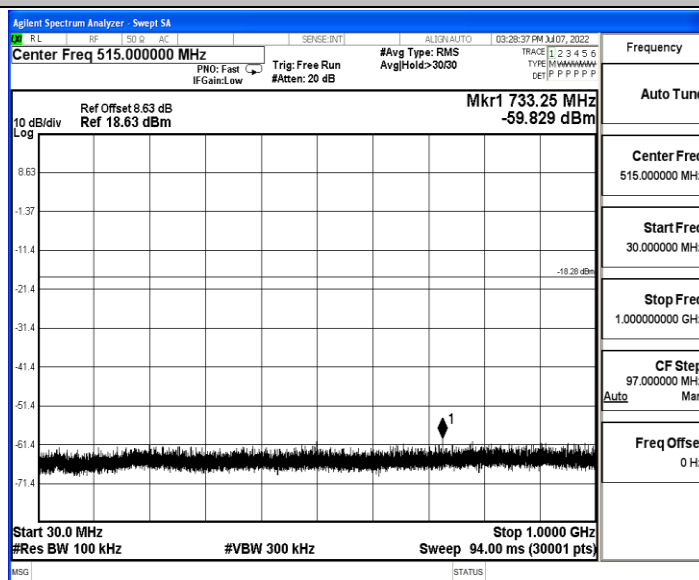


2DH5_Ant1_2441_0~Reference



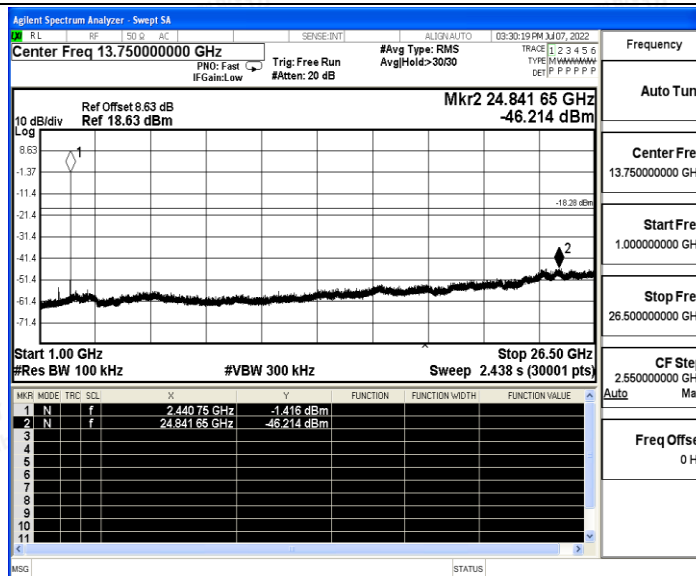


2DH5_Ant1_2441_30~1000

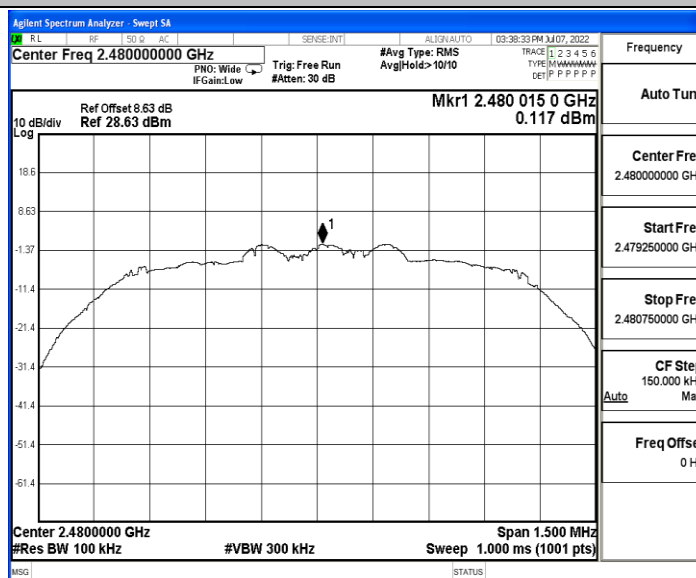


2DH5_Ant1_2441_1000~26500



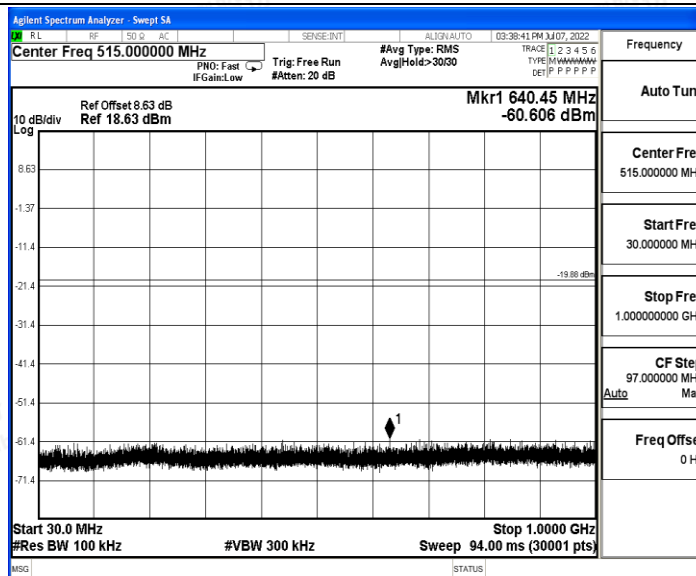


2DH5_Ant1_2480_0~Reference

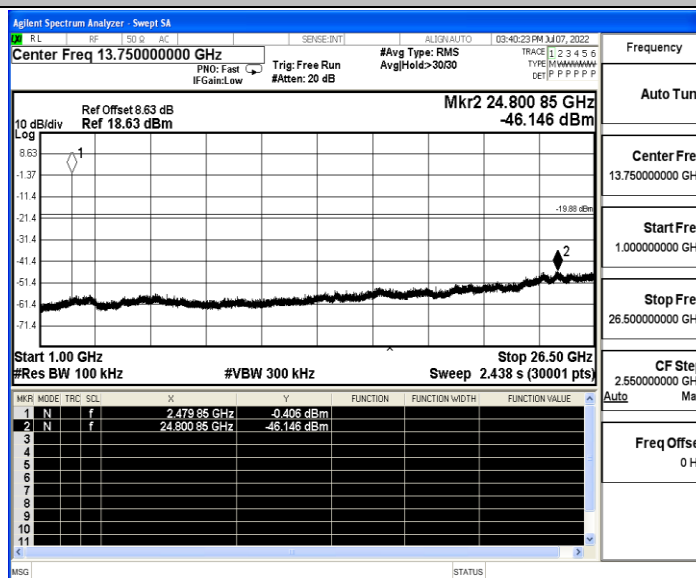


2DH5_Ant1_2480_30~1000



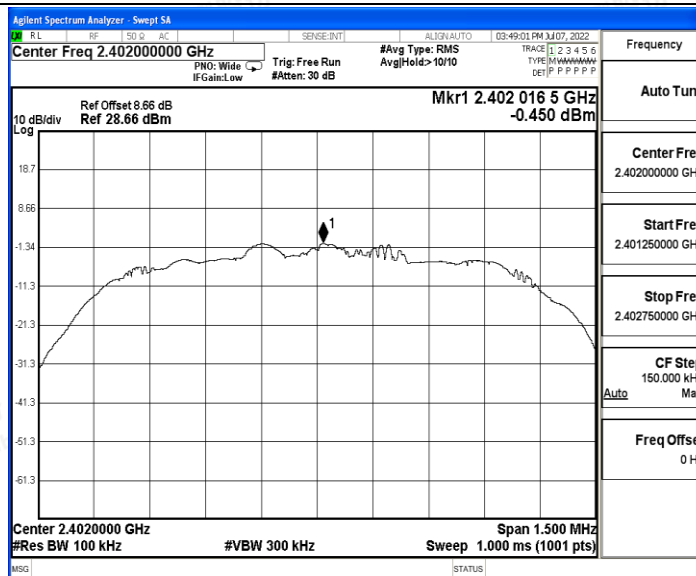


2DH5_Ant1_2480_1000~26500

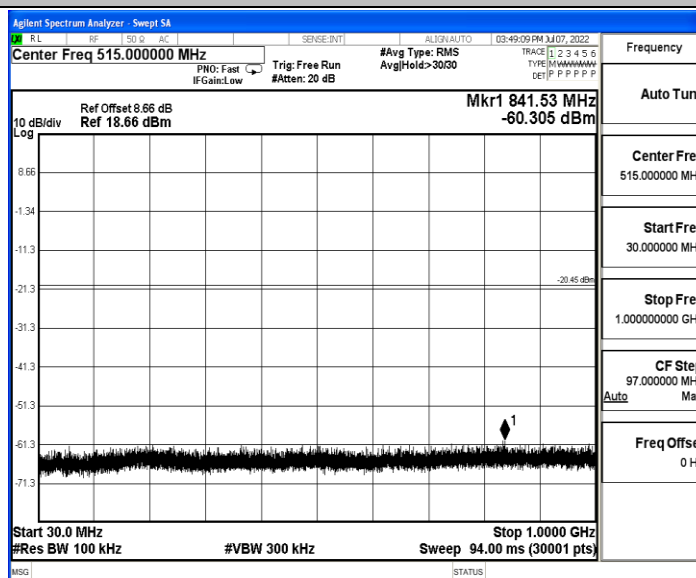


3DH5_Ant1_2402_0~Reference



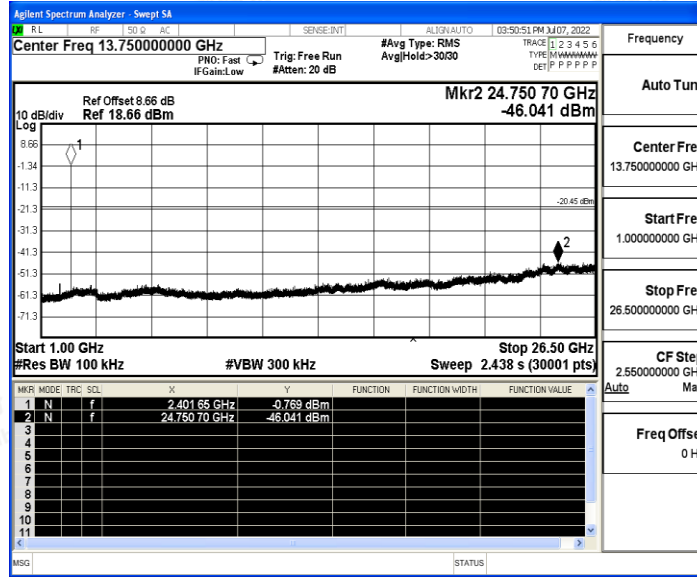


3DH5_Ant1_2402_30~1000

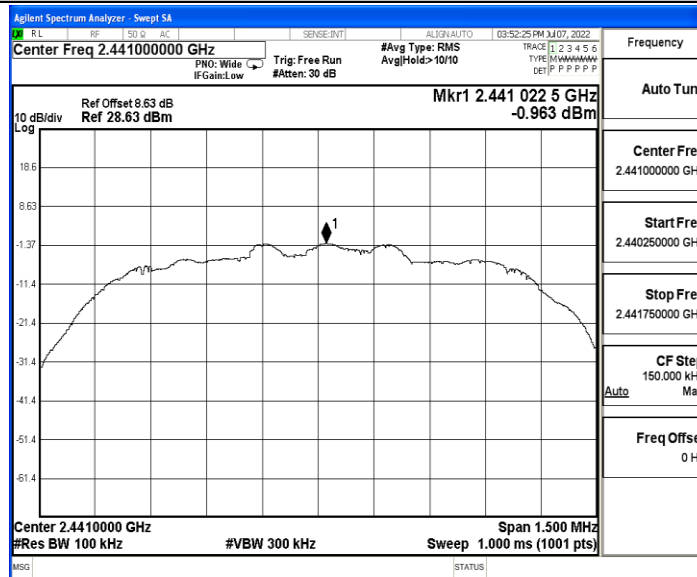


3DH5_Ant1_2402_1000~26500



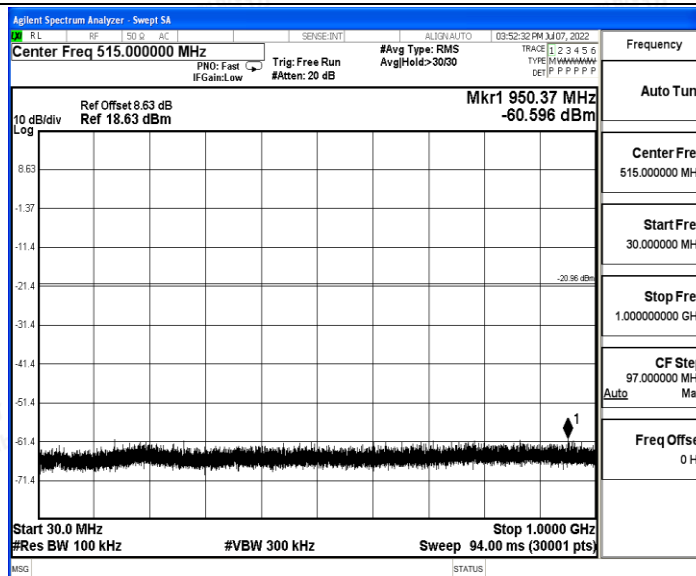


3DH5_Ant1_2441_0~Reference

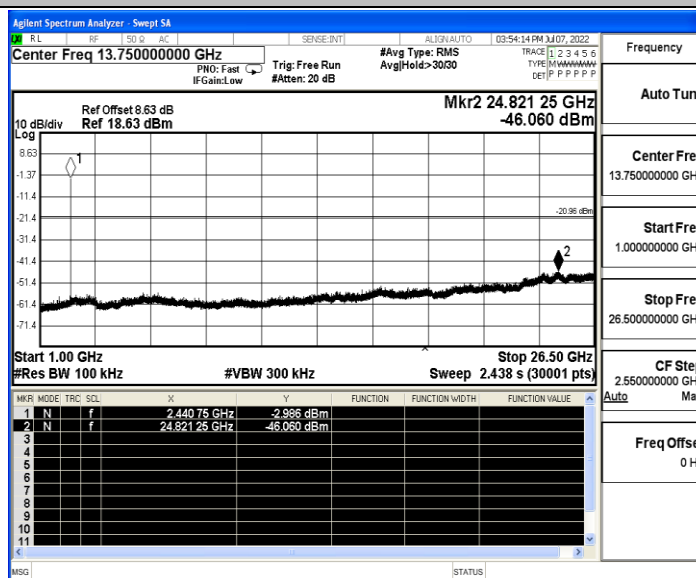


3DH5_Ant1_2441_30~1000



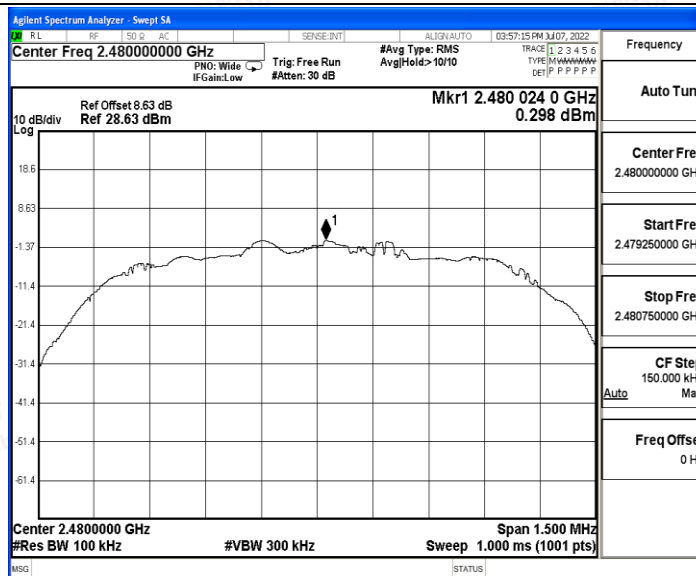


3DH5_Ant1_2441_1000~26500

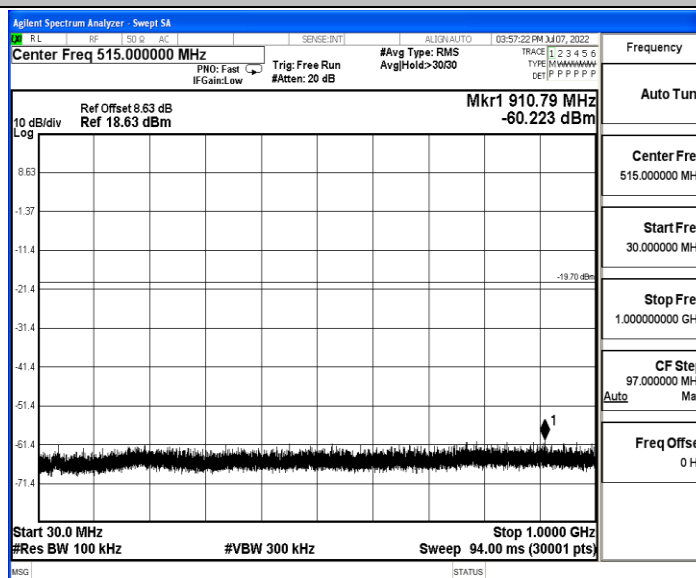


3DH5_Ant1_2480_0~Reference





3DH5_Ant1_2480_30~1000

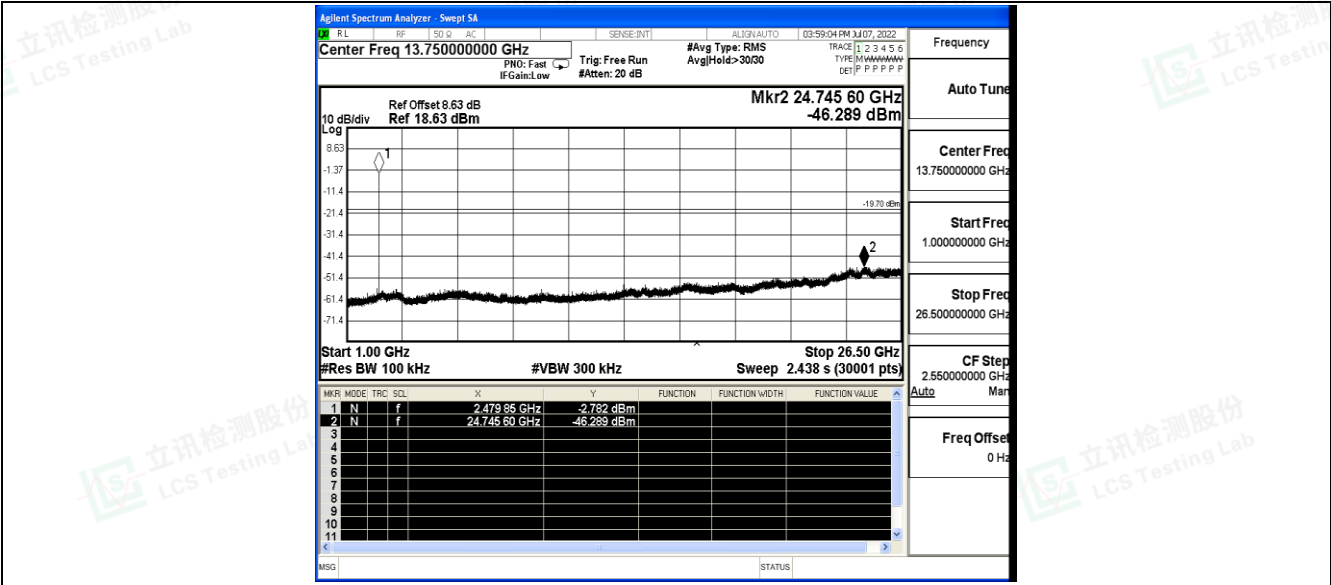


3DH5_Ant1_2480_1000~26500





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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	-57.99	≤-41.20	37.21	≤54	PASS
				AV	2389.250	-57.34	≤-41.20	37.86	≤54	PASS
				AV	2390.000	-57.52	≤-41.20	37.68	≤54	PASS
				Peak	2310.000	-48.75	≤-21.20	46.45	≤74	PASS
				Peak	2357.330	-46.28	≤-21.20	48.92	≤74	PASS
				Peak	2390.000	-48.69	≤-21.20	46.51	≤74	PASS
		High	2480	AV	2483.500	-53.65	≤-41.20	41.55	≤54	PASS
				AV	2483.520	-53.65	≤-41.20	41.55	≤54	PASS
				AV	2500.000	-57.02	≤-41.20	38.18	≤54	PASS
				Peak	2483.500	-46.57	≤-21.20	48.63	≤74	PASS
				Peak	2484.080	-45.56	≤-21.20	49.64	≤74	PASS
				Peak	2500.000	-46.92	≤-21.20	48.28	≤74	PASS
		Low	Hop_24 02	Peak	2310.000	-47.53	≤-21.20	47.67	≤74	PASS
				Peak	2384.525	-46.92	≤-21.20	48.28	≤74	PASS
				Peak	2390.000	-48.74	≤-21.20	46.46	≤74	PASS
		High	Hop_24 80	Peak	2483.500	-48.17	≤-21.20	47.03	≤74	PASS
				Peak	2498.880	-45.58	≤-21.20	49.62	≤74	PASS
				Peak	2500.000	-47.45	≤-21.20	47.75	≤74	PASS
2DH5	Ant1	Low	2402	AV	2310.000	-57.84	≤-41.20	37.36	≤54	PASS
				AV	2383.475	-57.37	≤-41.20	37.83	≤54	PASS
				AV	2390.000	-57.48	≤-41.20	37.72	≤54	PASS
				Peak	2310.000	-48.31	≤-21.20	46.89	≤74	PASS
				Peak	2333.180	-45.52	≤-21.20	49.68	≤74	PASS
				Peak	2390.000	-47.84	≤-21.20	47.36	≤74	PASS
		High	2480	AV	2483.500	-54.02	≤-41.20	41.18	≤54	PASS
				AV	2483.520	-54.02	≤-41.20	41.18	≤54	PASS
				AV	2500.000	-57.06	≤-41.20	38.14	≤54	PASS
				Peak	2483.500	-46.4	≤-21.20	48.80	≤74	PASS
				Peak	2488.960	-45.63	≤-21.20	49.57	≤74	PASS
				Peak	2500.000	-47	≤-21.20	48.20	≤74	PASS
		Low	Hop_24 02	Peak	2310.000	-48.4	≤-21.20	46.80	≤74	PASS
				Peak	2375.600	-46.73	≤-21.20	48.47	≤74	PASS
				Peak	2390.000	-48.13	≤-21.20	47.07	≤74	PASS
		High	Hop_24	Peak	2483.500	-47.83	≤-21.20	47.37	≤74	PASS



3DH5	Ant1		80	Peak	2483.680	-46.11	≤-21.20	49.09	≤74	PASS
				Peak	2500.000	-46.97	≤-21.20	48.23	≤74	PASS
			2402	AV	2310.000	-58.02	≤-41.20	37.18	≤54	PASS
				AV	2385.785	-57.41	≤-41.20	37.79	≤54	PASS
				AV	2390.000	-57.54	≤-41.20	37.66	≤54	PASS
				Peak	2310.000	-48.78	≤-21.20	46.42	≤74	PASS
				Peak	2332.445	-46.08	≤-21.20	49.12	≤74	PASS
				Peak	2390.000	-48.57	≤-21.20	46.63	≤74	PASS
			2480	AV	2483.500	-53.95	≤-41.20	41.25	≤54	PASS
				AV	2483.520	-53.95	≤-41.20	41.25	≤54	PASS
				AV	2500.000	-57.03	≤-41.20	38.17	≤54	PASS
				Peak	2483.500	-46.21	≤-21.20	48.99	≤74	PASS
				Peak	2488.080	-46.07	≤-21.20	49.13	≤74	PASS
				Peak	2500.000	-47.8	≤-21.20	47.40	≤74	PASS
			Hop_24 02	Peak	2310.000	-48.59	≤-21.20	46.61	≤74	PASS
				Peak	2353.865	-46.49	≤-21.20	48.71	≤74	PASS
				Peak	2390.000	-48.84	≤-21.20	46.36	≤74	PASS
			Hop_24 80	Peak	2483.500	-47.74	≤-21.20	47.46	≤74	PASS
				Peak	2499.920	-45.75	≤-21.20	49.45	≤74	PASS
				Peak	2500.000	-47.31	≤-21.20	47.89	≤74	PASS

Note:

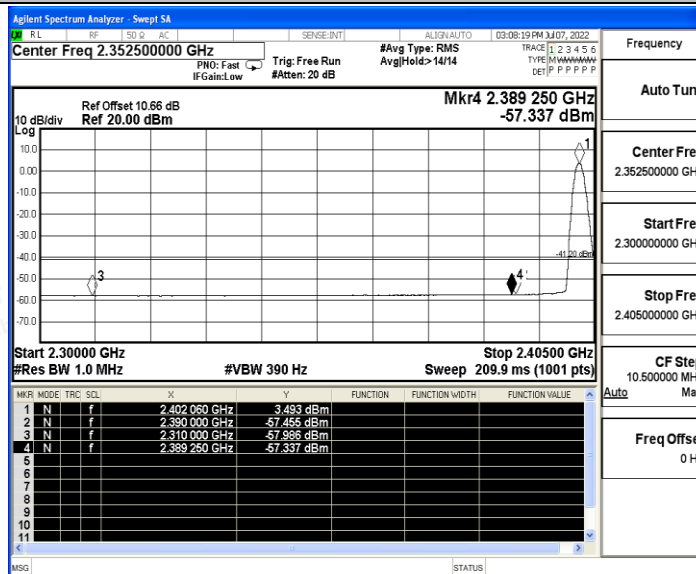
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.



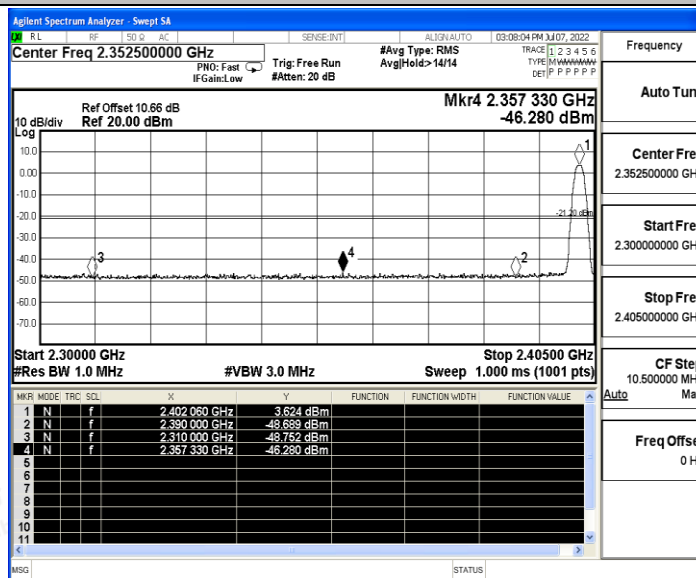


Test Graphs

DH5_Ant1_Low_2402_AV

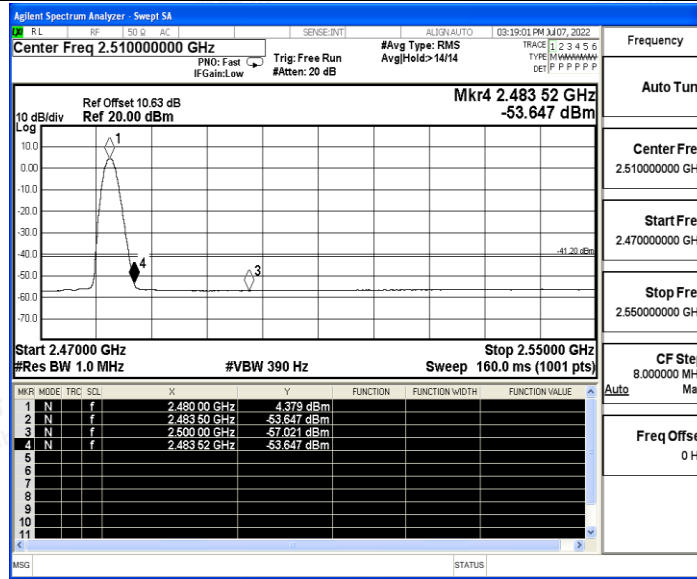


DH5_Ant1_Low_2402_Peak

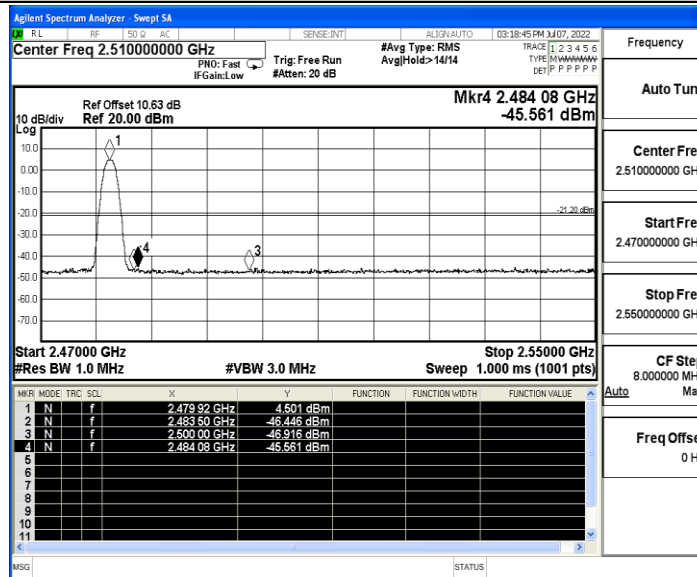


DH5_Ant1_High_2480_AV



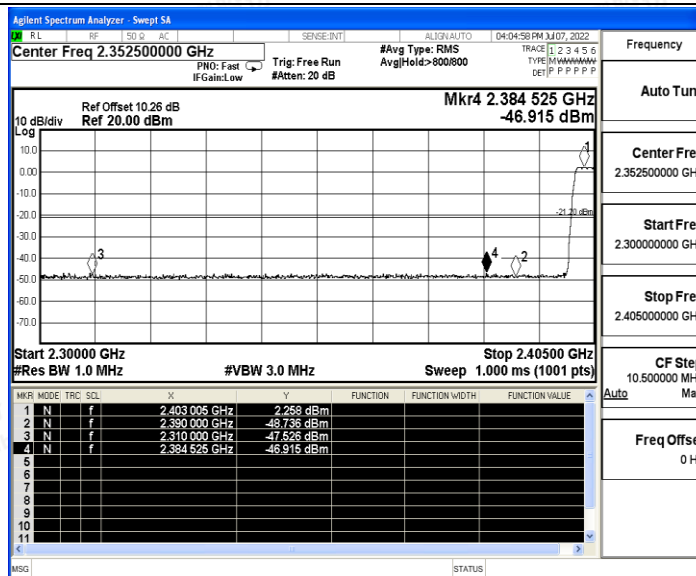


DH5_Ant1_High_2480_Peak

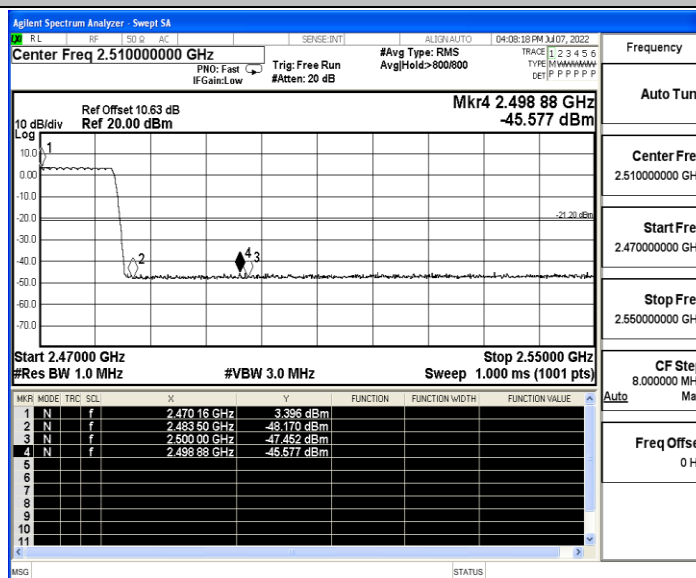


DH5_Ant1_Low_Hop_2402_Peak



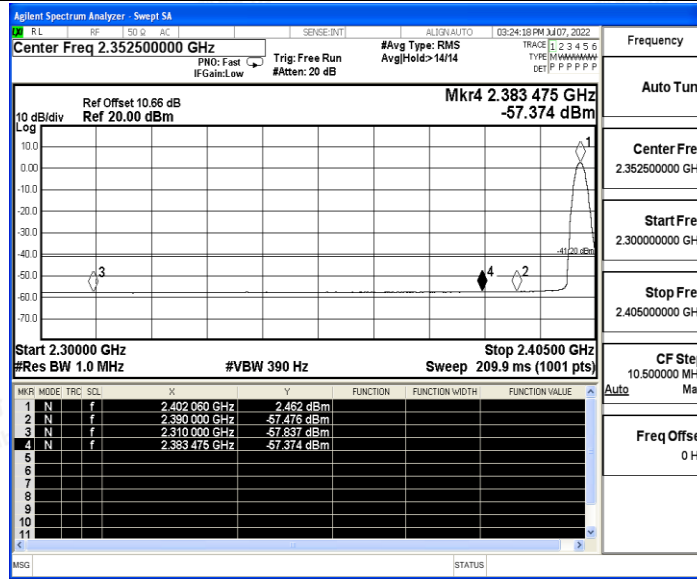


DH5_Ant1_High_Hop_2480_Peak

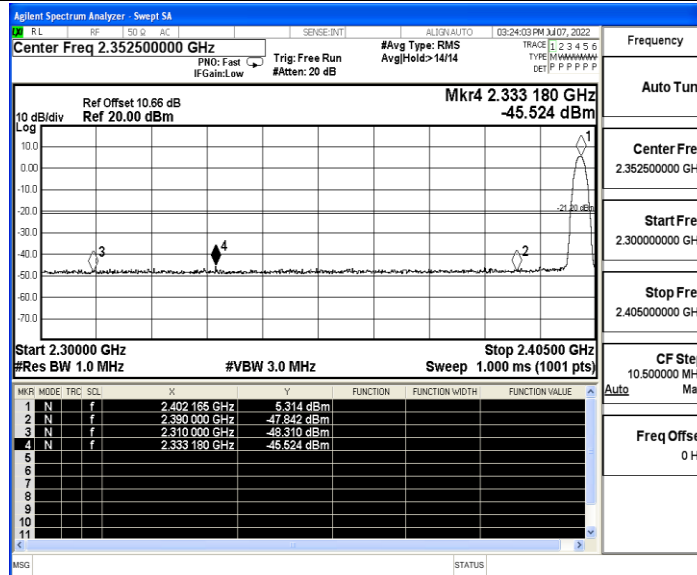


2DH5_Ant1_Low_2402_AV



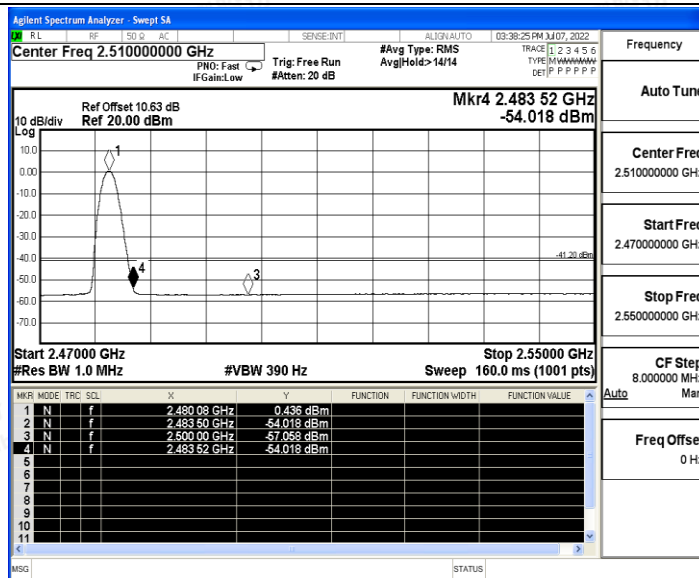


2DH5_Ant1_Low_2402_Peak

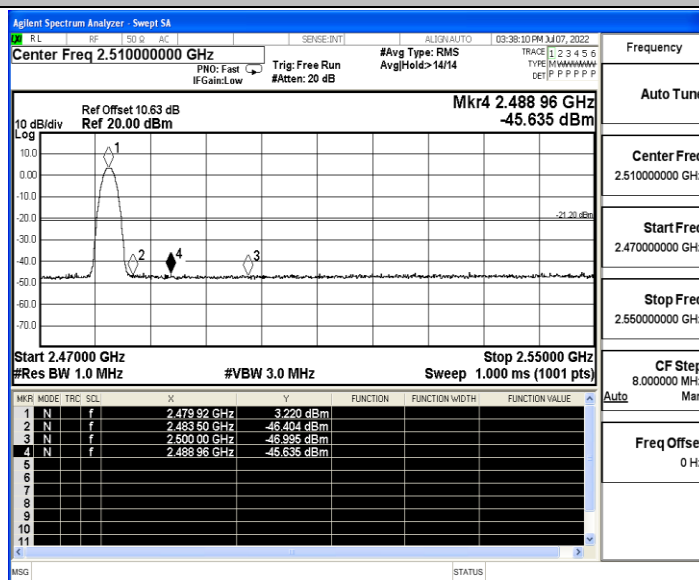


2DH5_Ant1_High_2480_AV



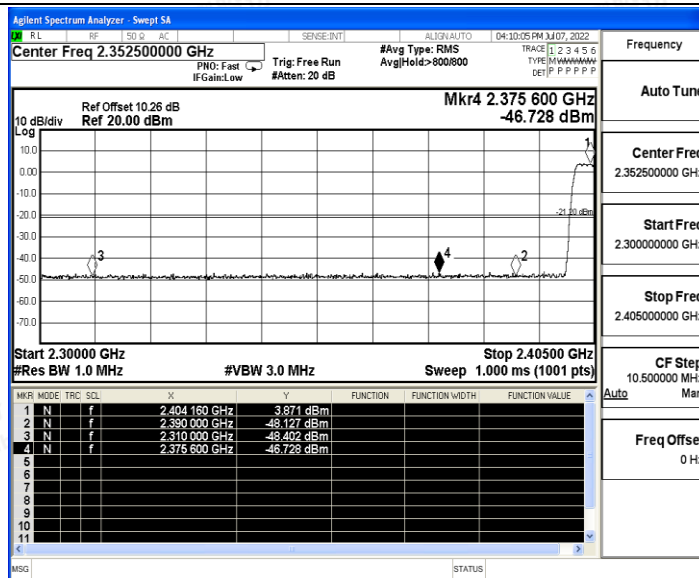


2DH5_Ant1_High_2480_Peak

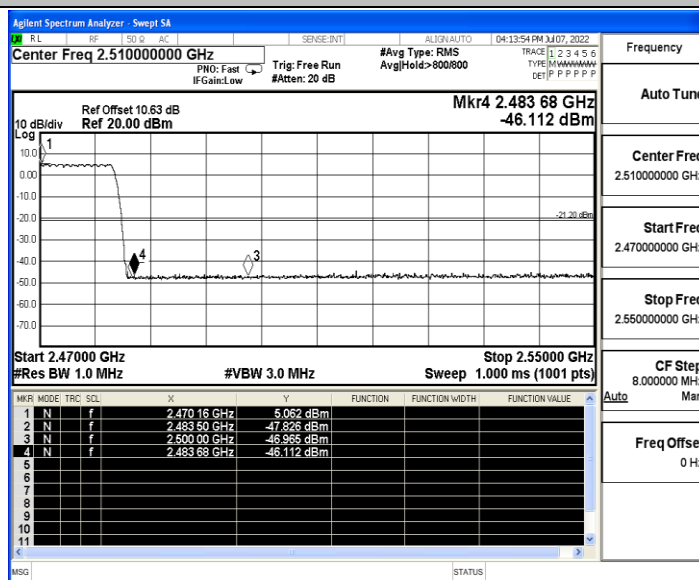


2DH5_Ant1_Low_Hop_2402_Peak



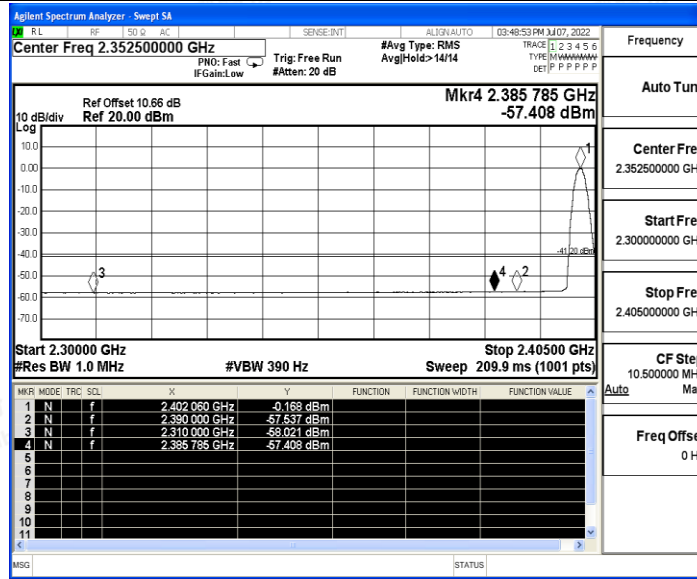


2DH5_Ant1_High_Hop_2480_Peak

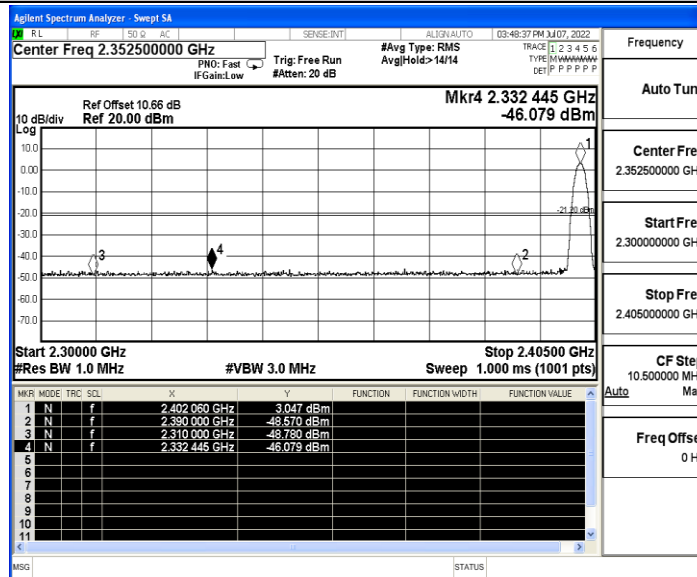


3DH5_Ant1_Low_2402_AV



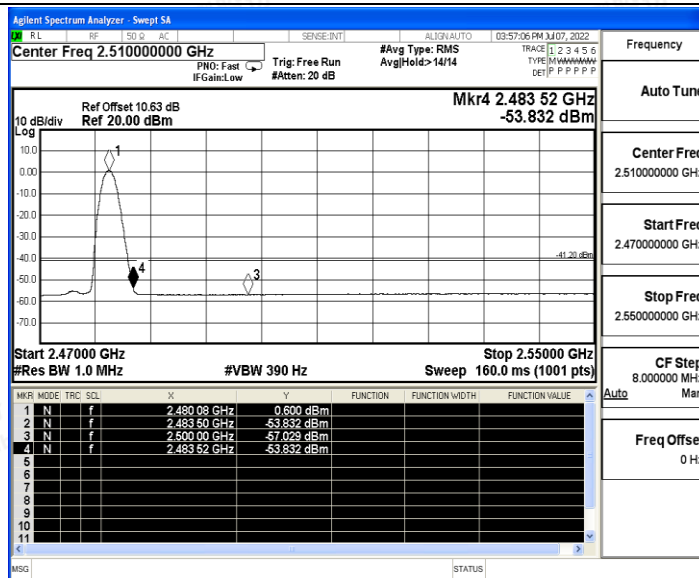


3DH5_Ant1_Low_2402_Peak

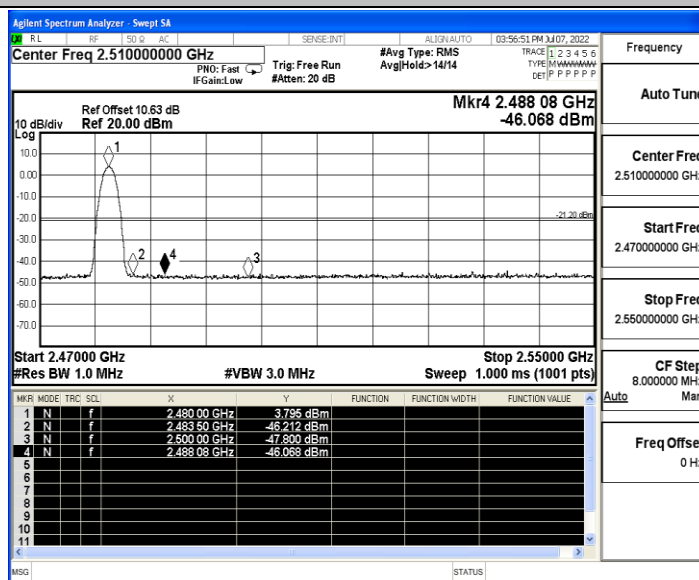


3DH5_Ant1_High_2480_AV





3DH5_Ant1_High_2480_Peak

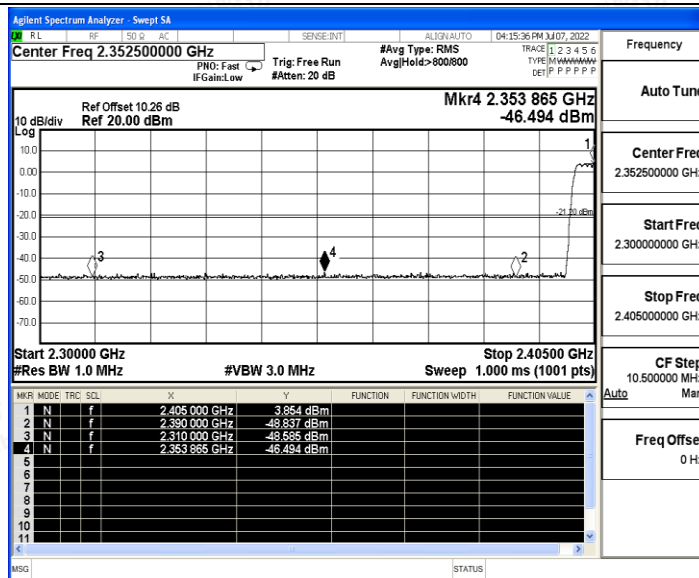


3DH5_Ant1_Low_Hop_2402_Peak





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3DH5_Ant1_High_Hop_2480_Peak

