

12. ANTENNA REQUIREMENTS

12.1. Limit

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§15.211, 15.213, 15.217, 15.219, 15.221, or §15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with §15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

12.2. Test Result

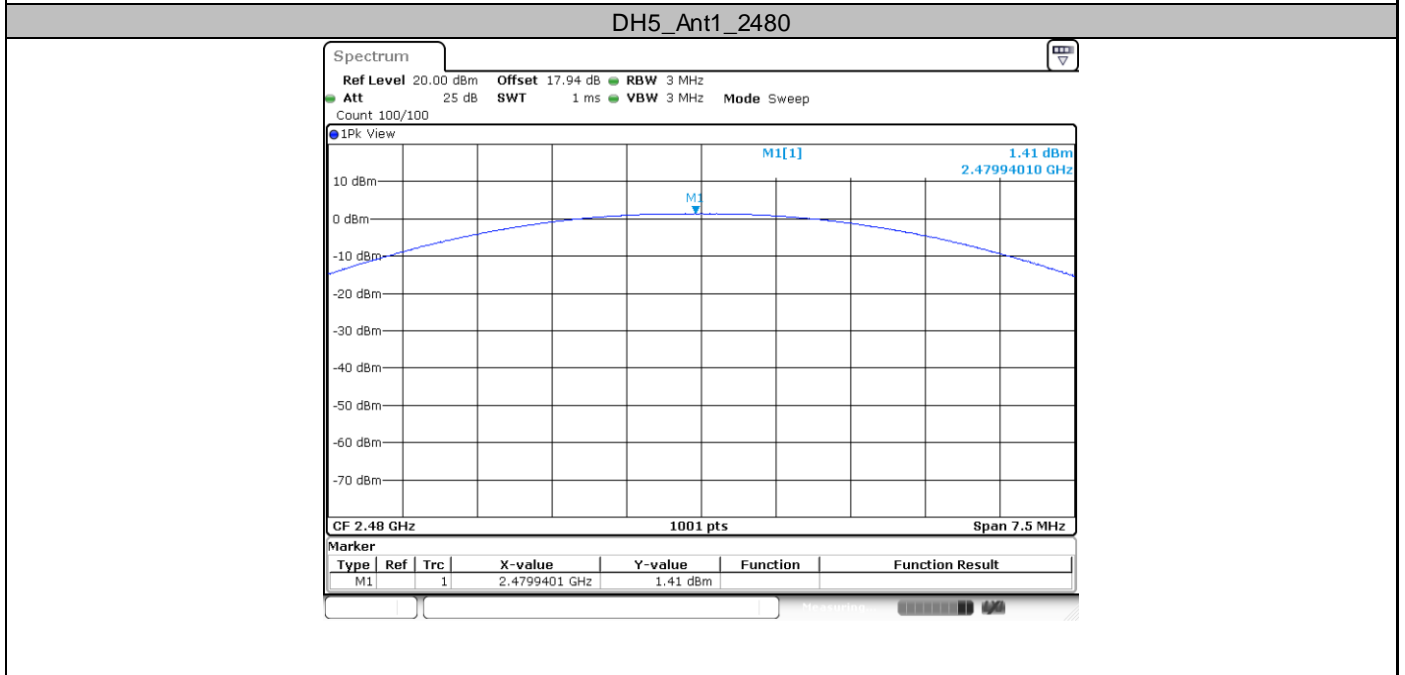
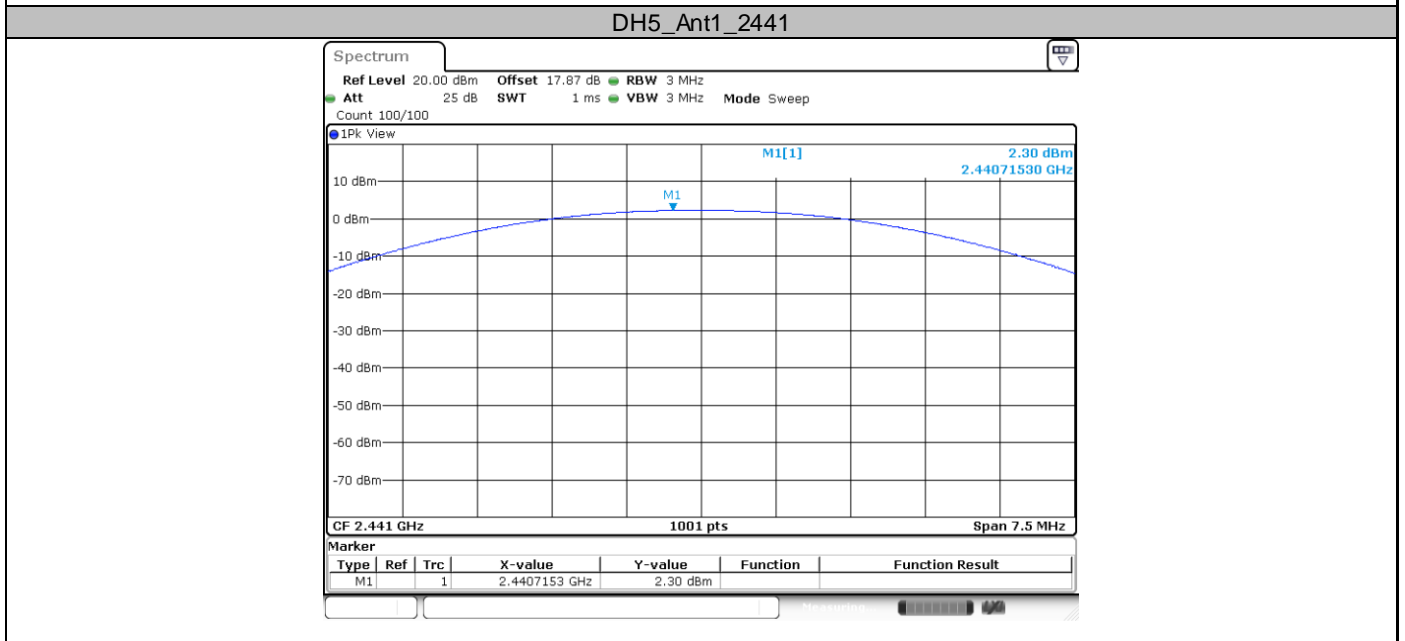
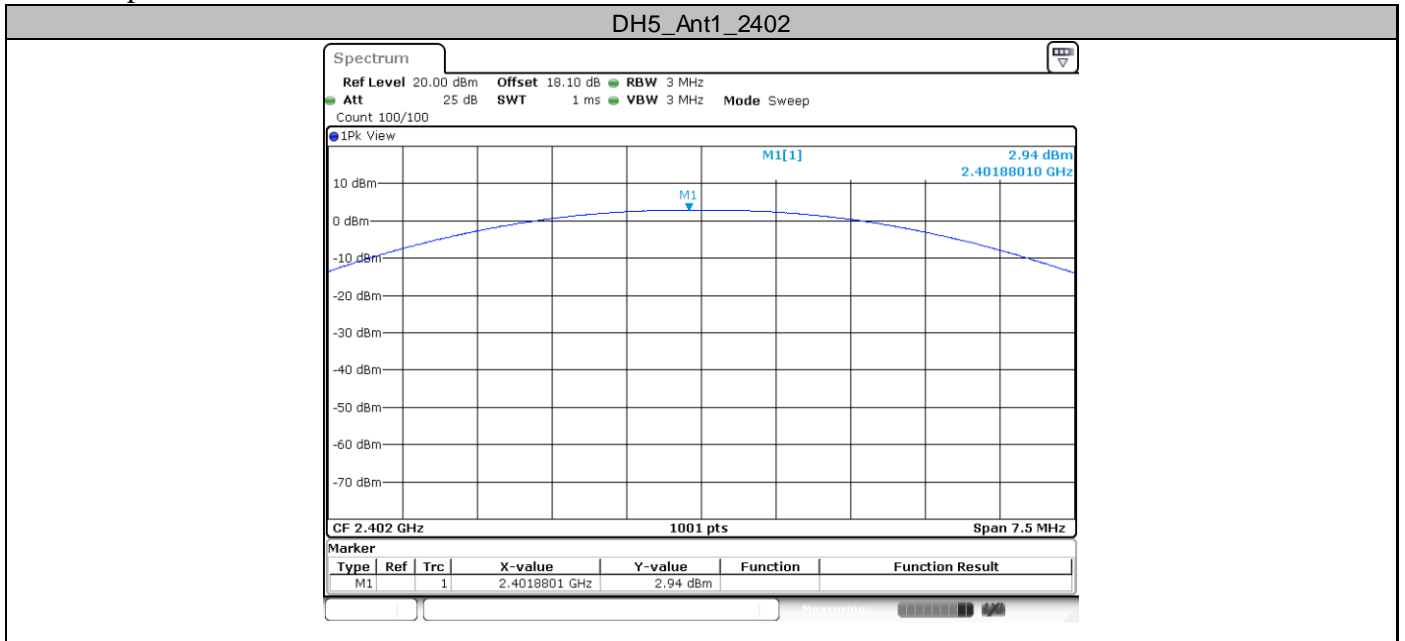
The antennas used for this product is Integral antenna ,so compliance with antenna requirements. (Please refer to the EUT photo for details)

13.APPENDIX

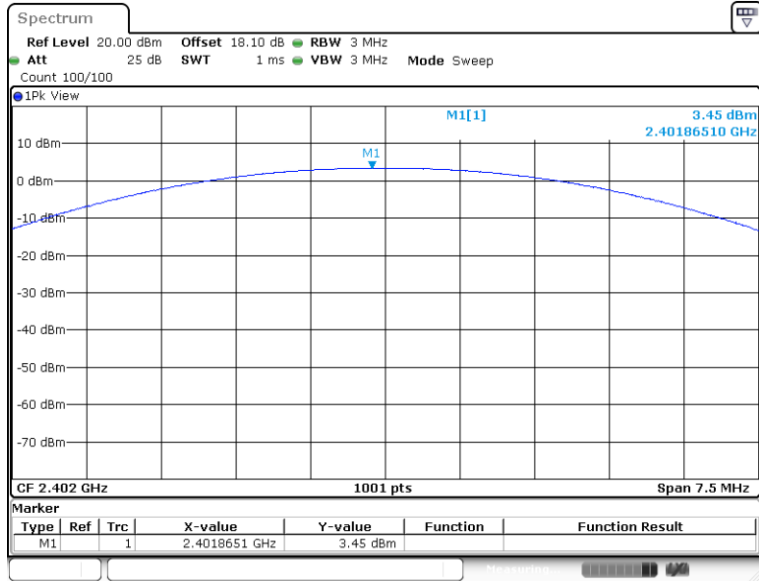
Appendix A: Maximum conducted output power Test Result Peak

Test Mode	Antenna	Freq(MHz)	Conducted Peak Power[dBm]	Conducted Limit[dBm]	Verdict
DH5	Ant1	2402	2.94	≤20.97	PASS
		2441	2.30	≤20.97	PASS
		2480	1.41	≤20.97	PASS
2DH5	Ant1	2402	3.45	≤20.97	PASS
		2441	2.81	≤20.97	PASS
		2480	1.92	≤20.97	PASS
3DH5	Ant1	2402	3.93	≤20.97	PASS
		2441	3.23	≤20.97	PASS
		2480	2.36	≤20.97	PASS

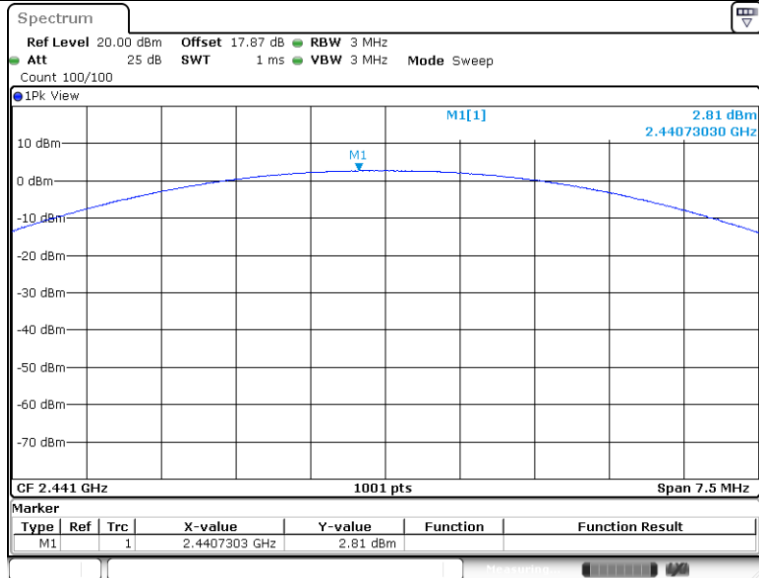
Test Graphs



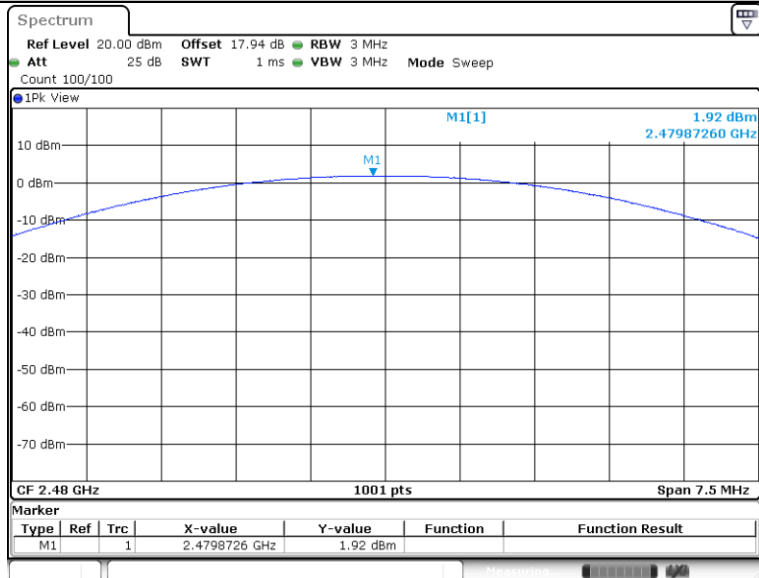
2DH5_Ant1_2402



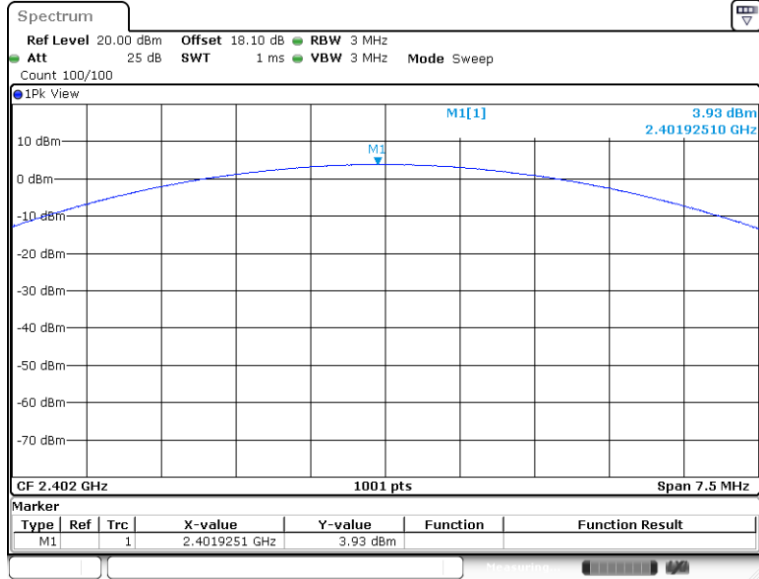
2DH5_Ant1_2441



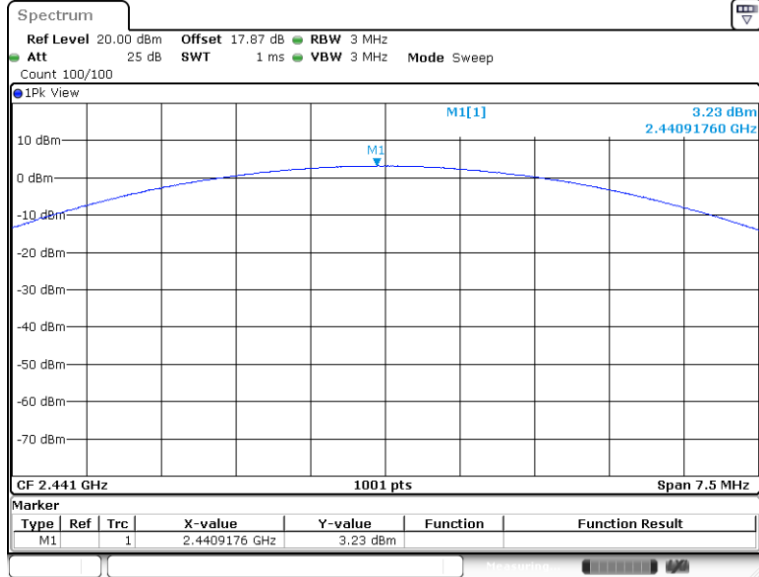
2DH5_Ant1_2480



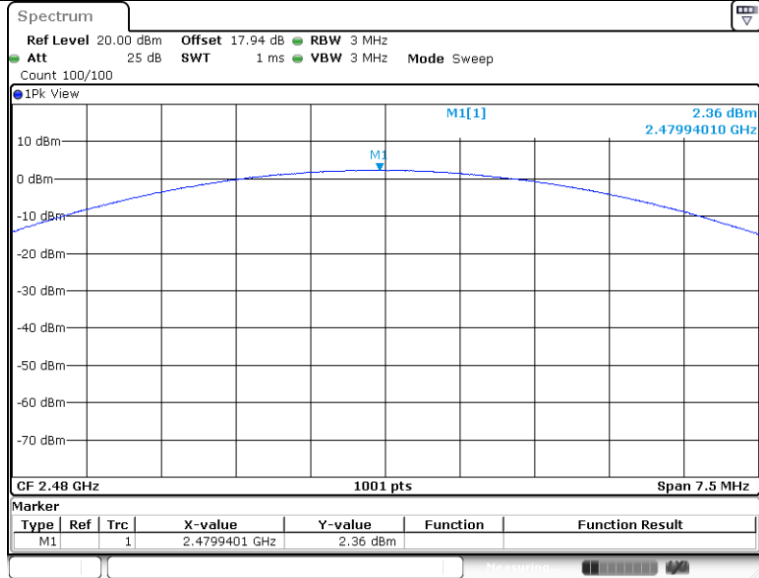
3DH5_Ant1_2402



3DH5_Ant1_2441



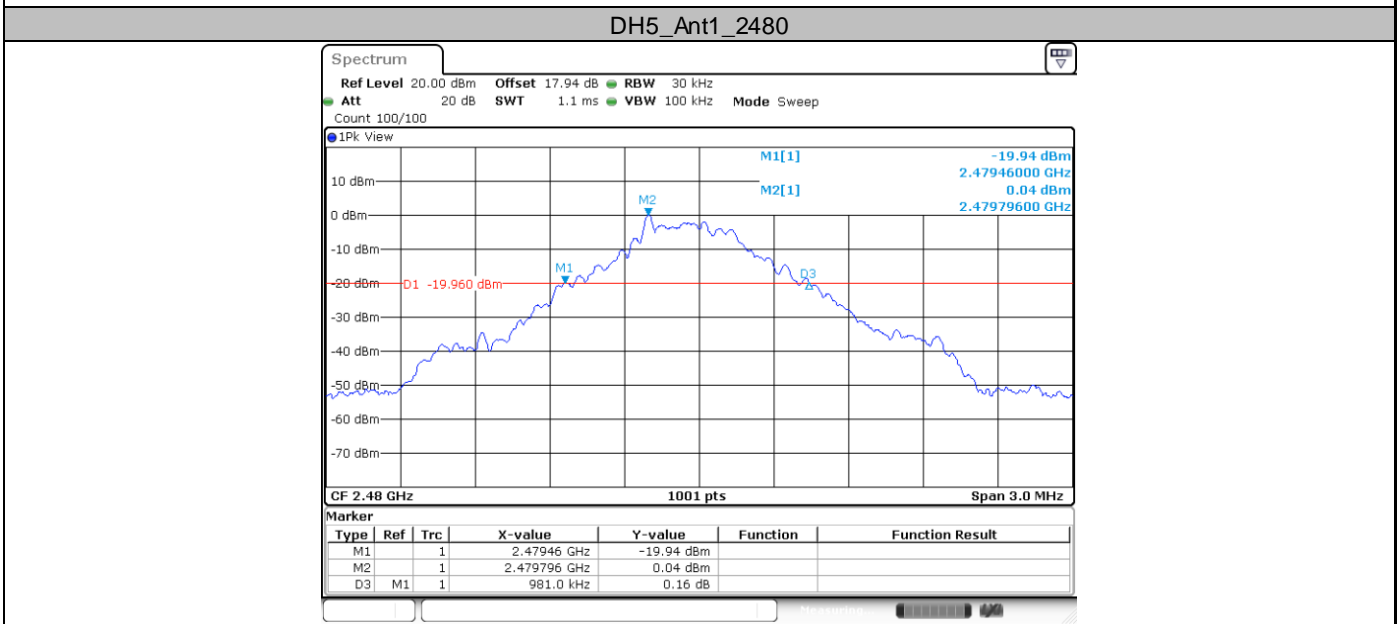
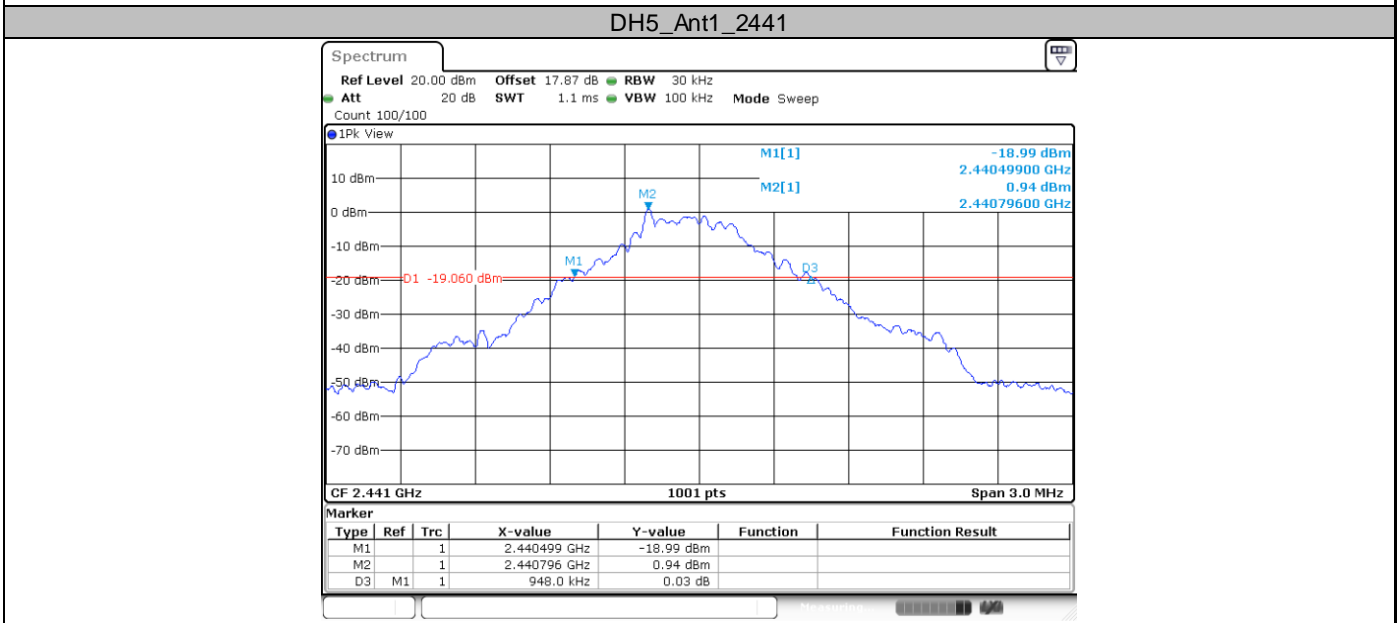
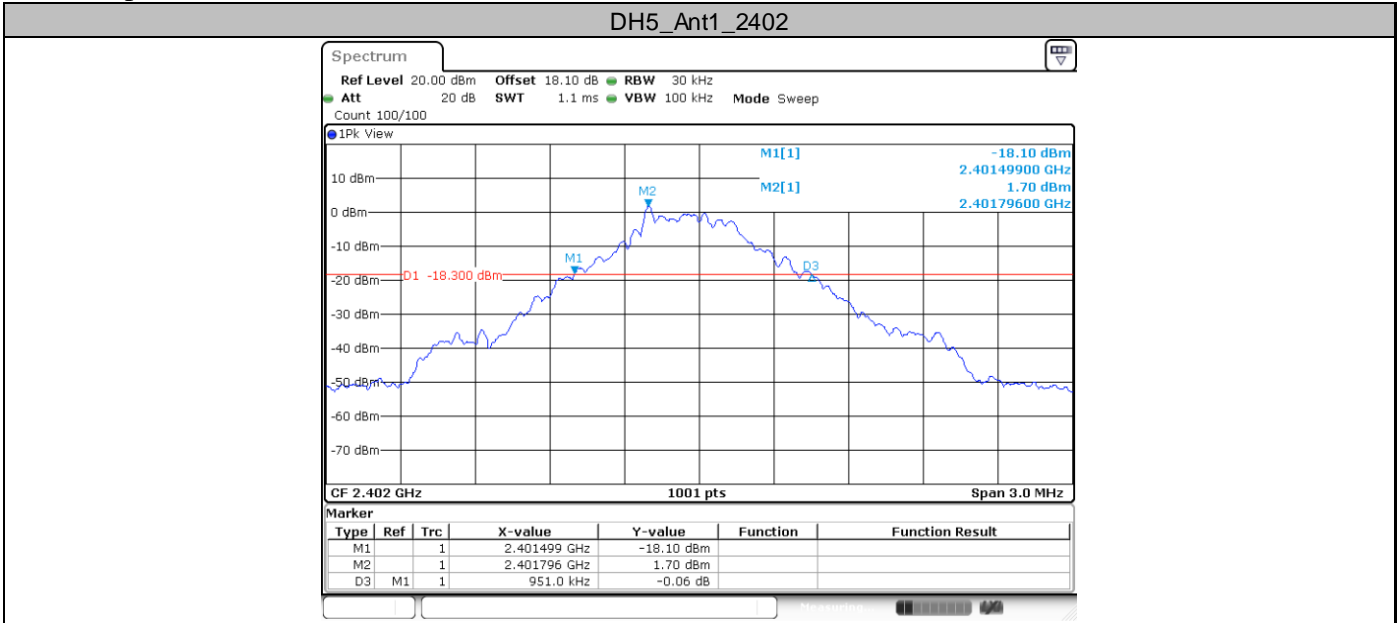
3DH5_Ant1_2480



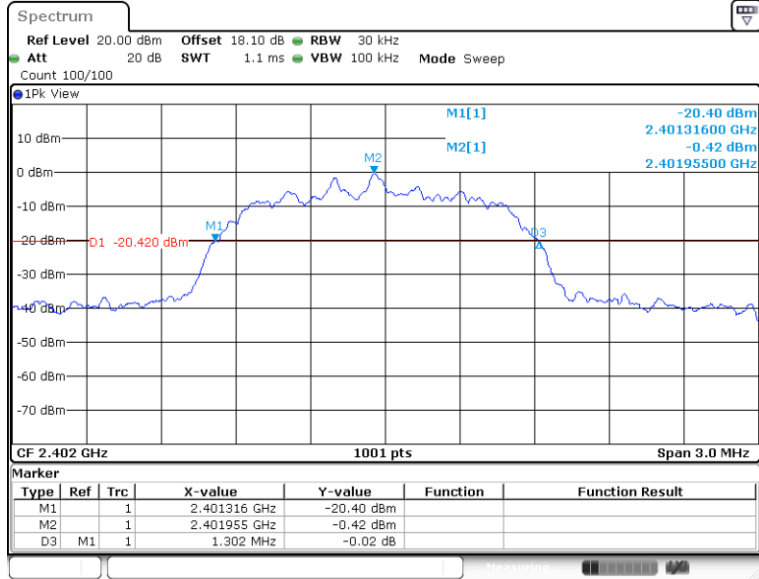
Appendix B: 20dB Emission Bandwidth
Test Result

Test Mode	Antenna	Freq(MHz)	20dB EBW [MHz]	FL [MHz]	FH [MHz]	Limit [MHz]	Verdict
DH5	Ant1	2402	0.95	2401.50	2402.45	---	---
		2441	0.95	2440.50	2441.45	---	---
		2480	0.98	2479.46	2480.44	---	---
2DH5	Ant1	2402	1.30	2401.32	2402.62	---	---
		2441	1.30	2440.32	2441.61	---	---
		2480	1.28	2479.33	2480.61	---	---
3DH5	Ant1	2402	1.25	2401.33	2402.58	---	---
		2441	1.25	2440.33	2441.58	---	---
		2480	1.25	2479.33	2480.58	---	---

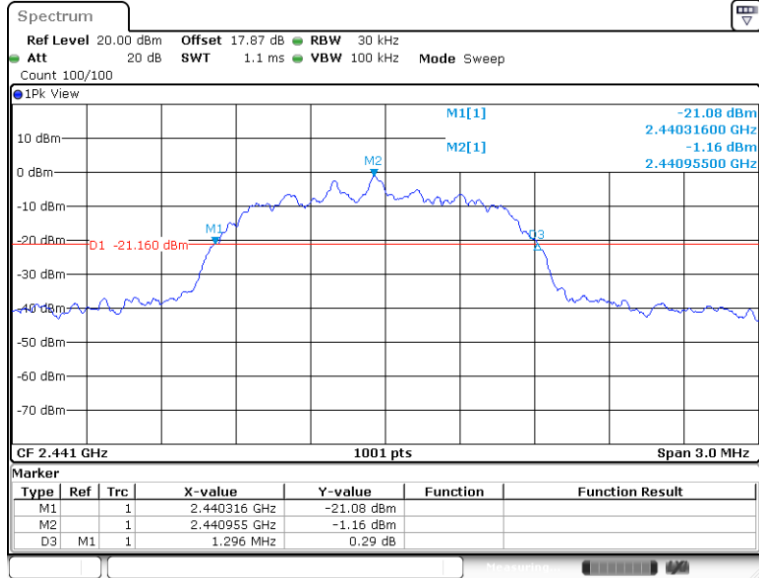
Test Graphs



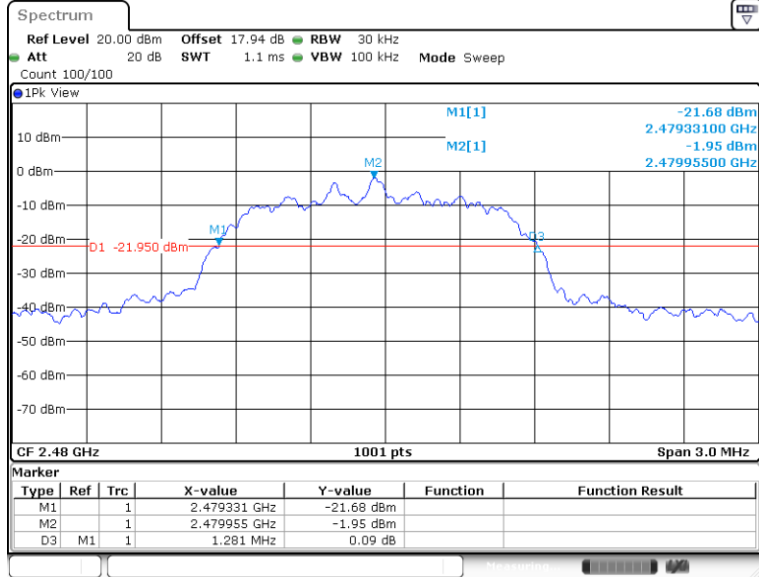
2DH5_Ant1_2402



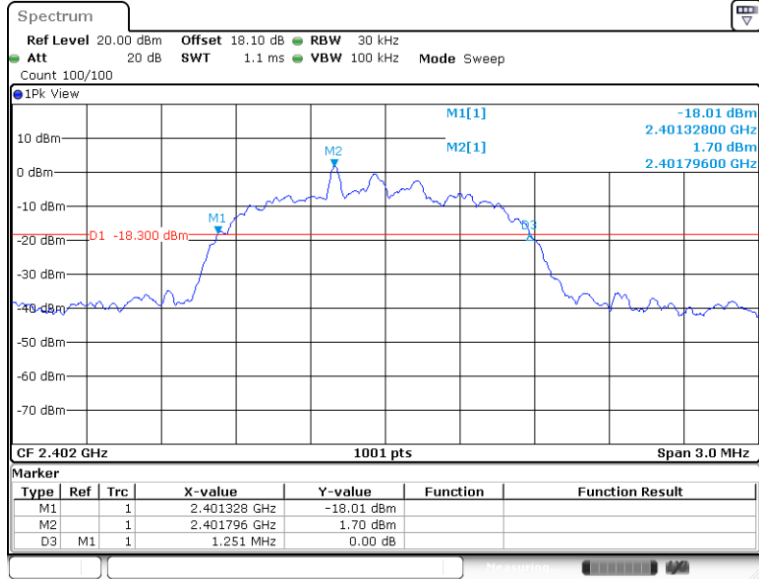
2DH5_Ant1_2441



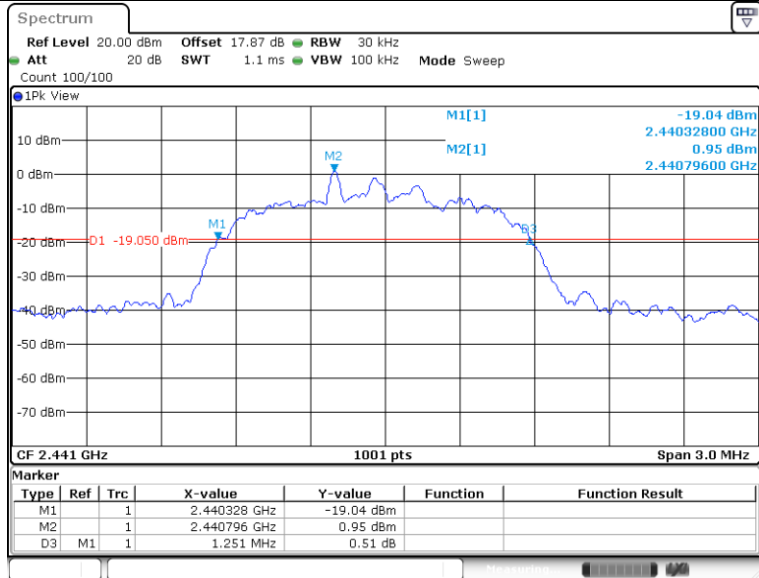
2DH5_Ant1_2480



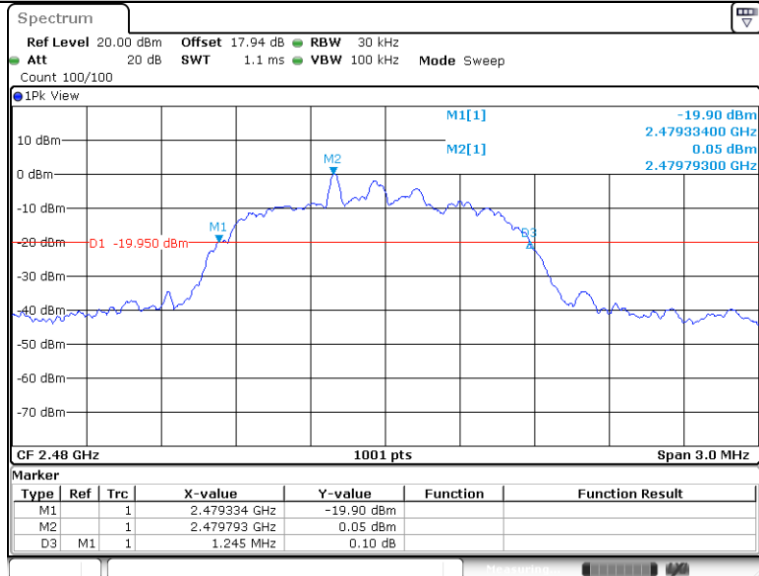
3DH5_Ant1_2402



3DH5_Ant1_2441



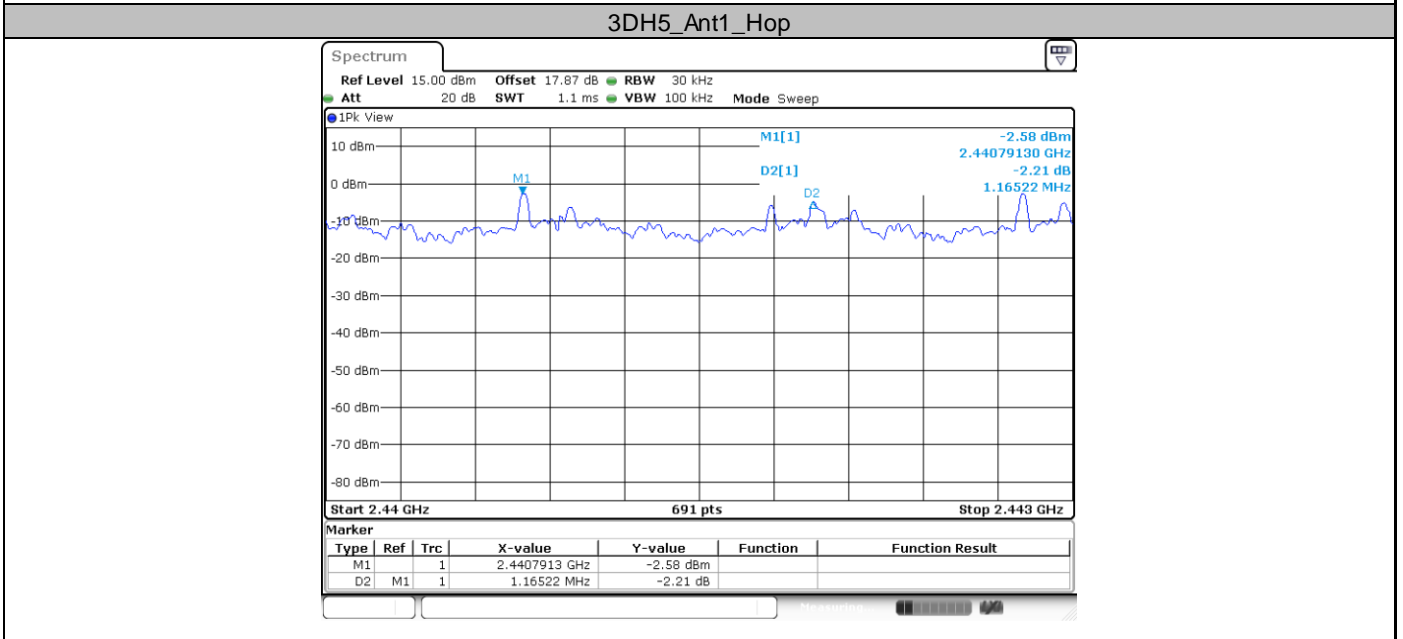
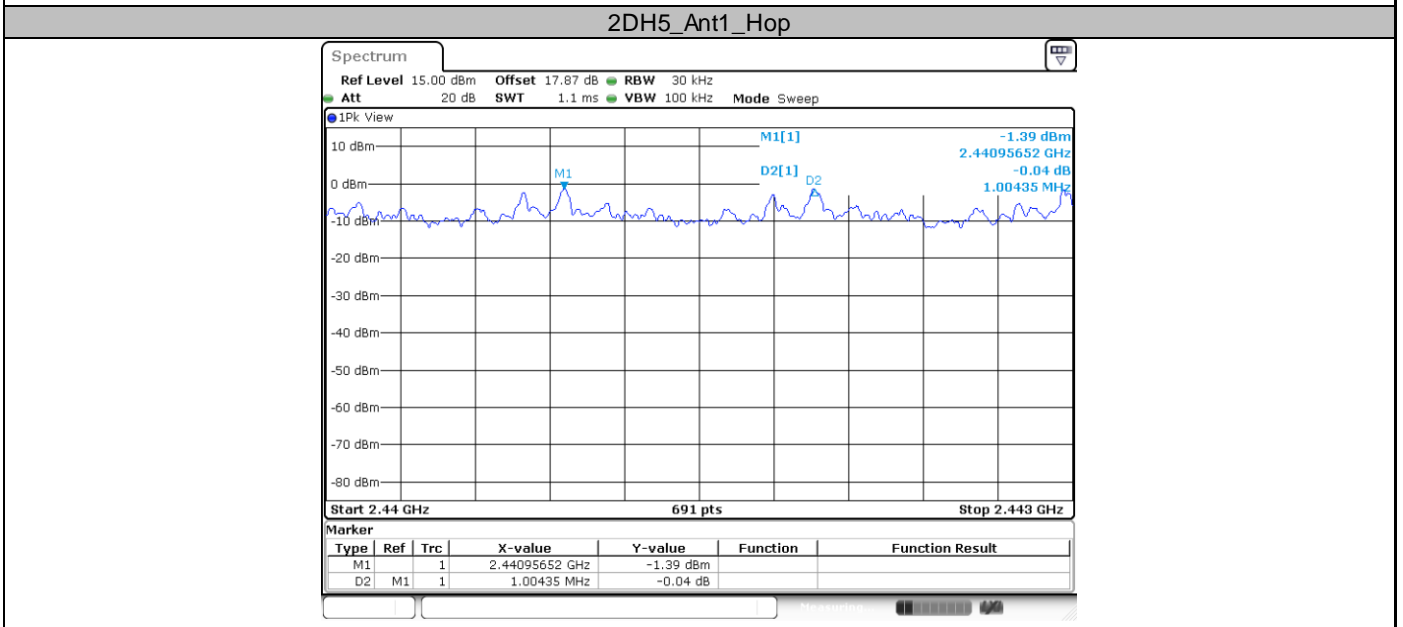
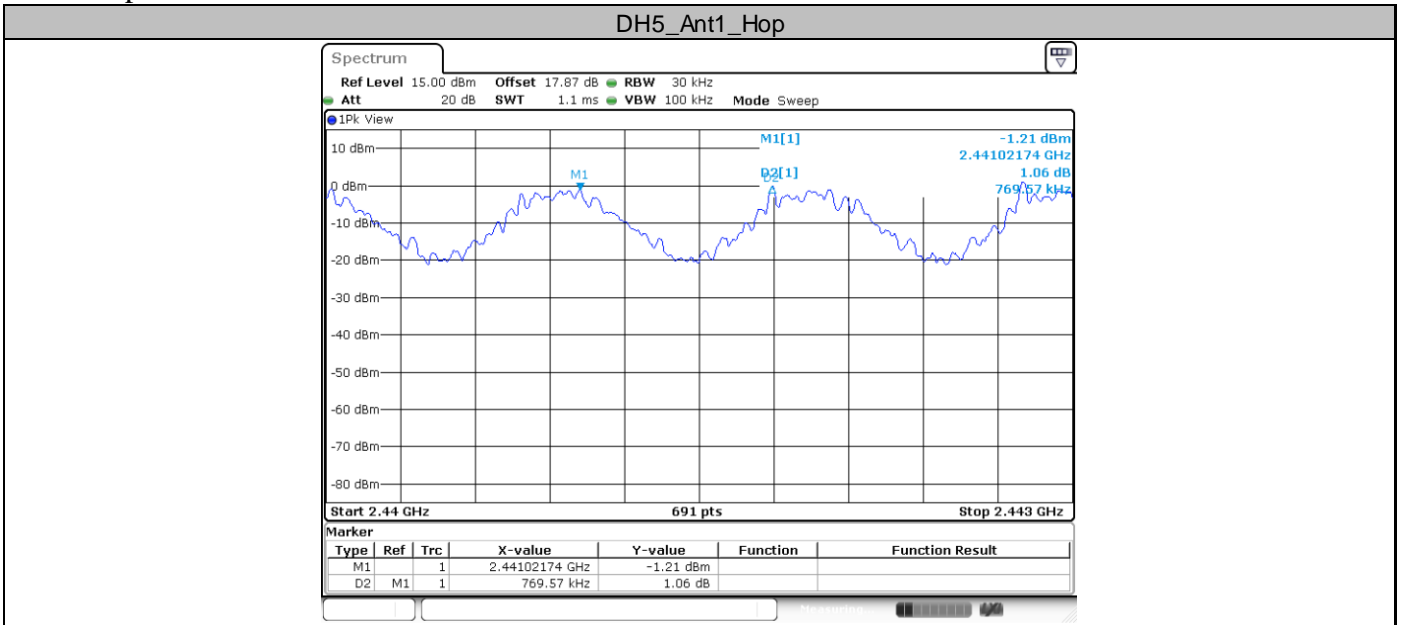
3DH5_Ant1_2480



Appendix C: Carrier frequency separation
 Test Result

Test Mode	Antenna	Freq(MHz)	Result[MHz]	Limit[MHz]	Verdict
DH5	Ant1	Hop	0.770	≥0.653	PASS
2DH5	Ant1	Hop	1.004	≥0.867	PASS
3DH5	Ant1	Hop	1.165	≥0.833	PASS

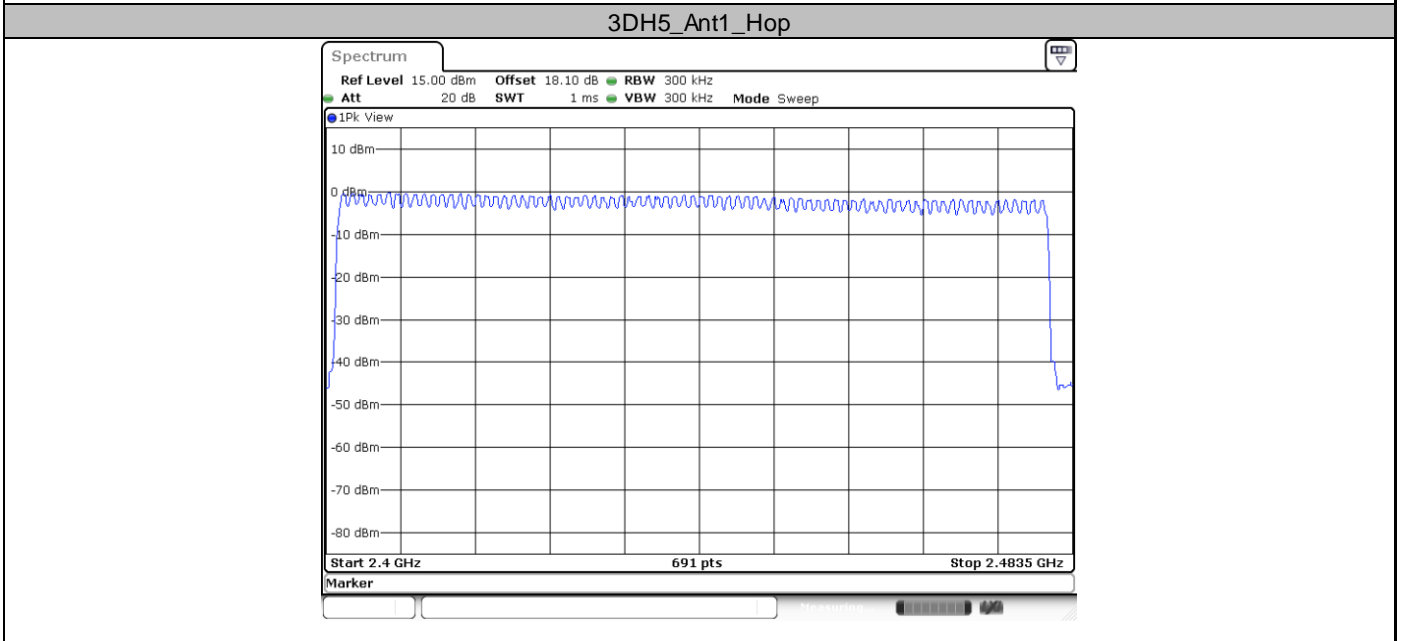
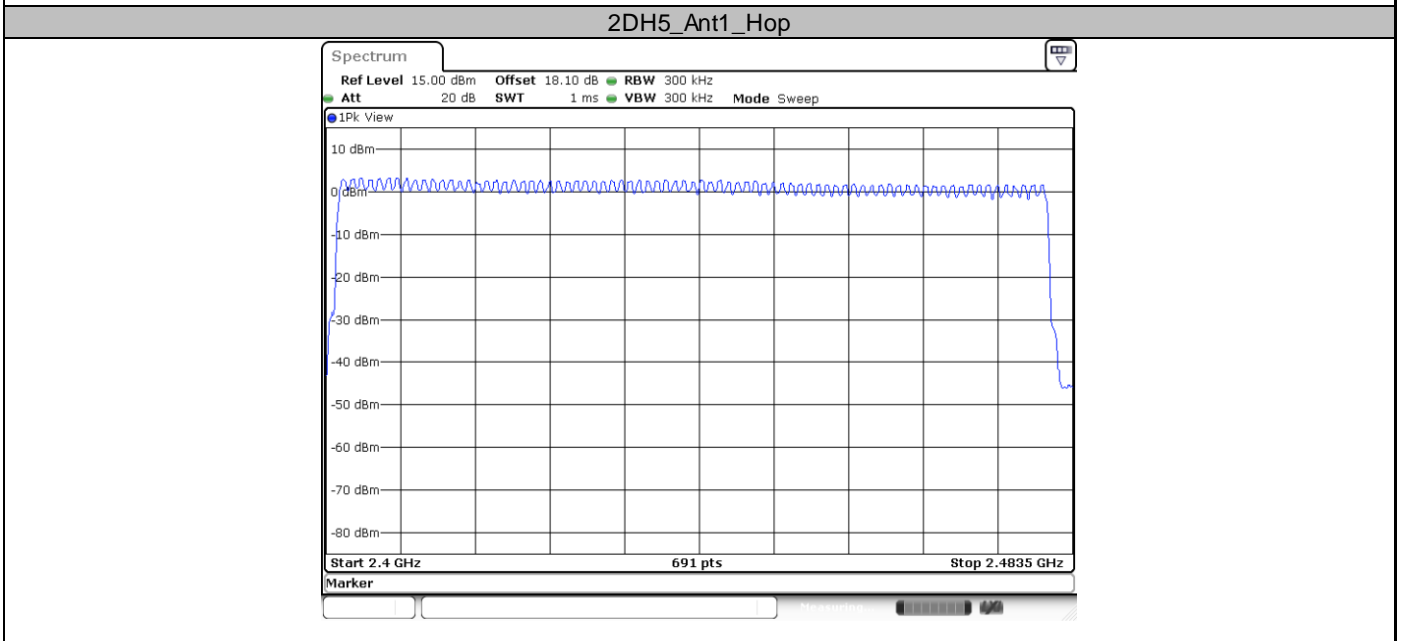
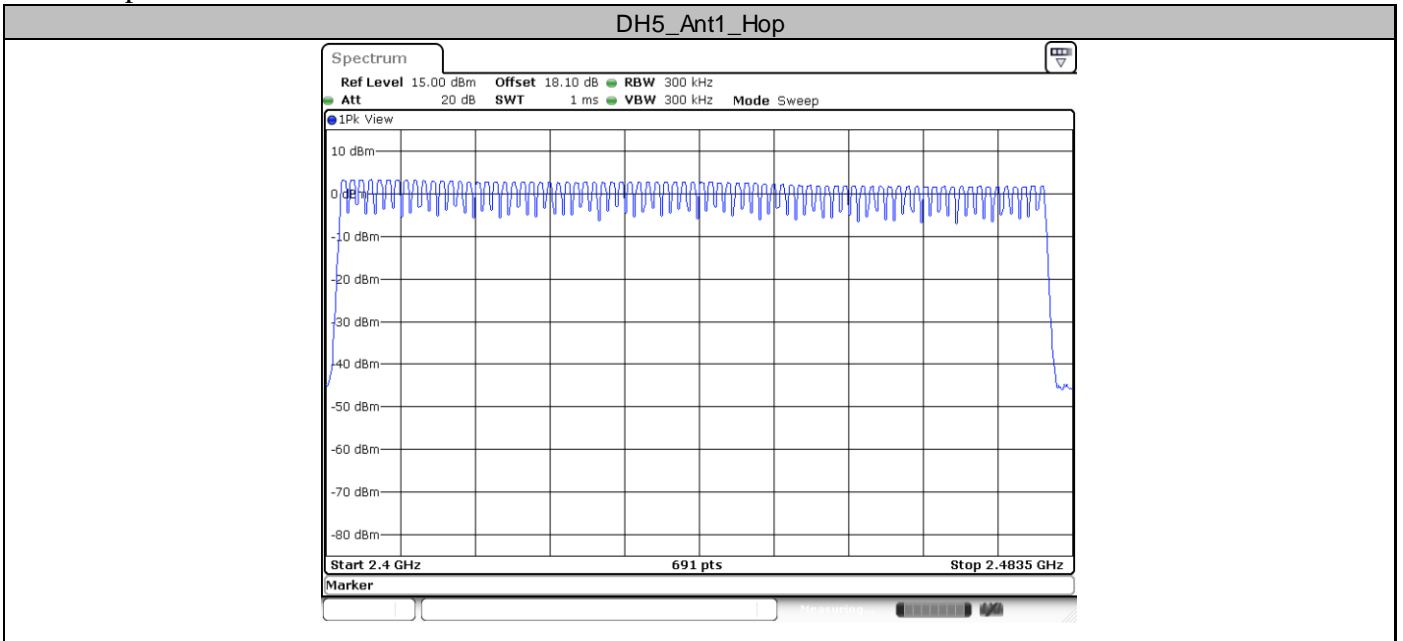
Test Graphs



Appendix D: Number of hopping channels
 Test Result

Test Mode	Antenna	Freq(MHz)	Result[Num]	Limit[Num]	Verdict
DH5	Ant1	Hop	79	≥15	PASS
2DH5	Ant1	Hop	79	≥15	PASS
3DH5	Ant1	Hop	79	≥15	PASS

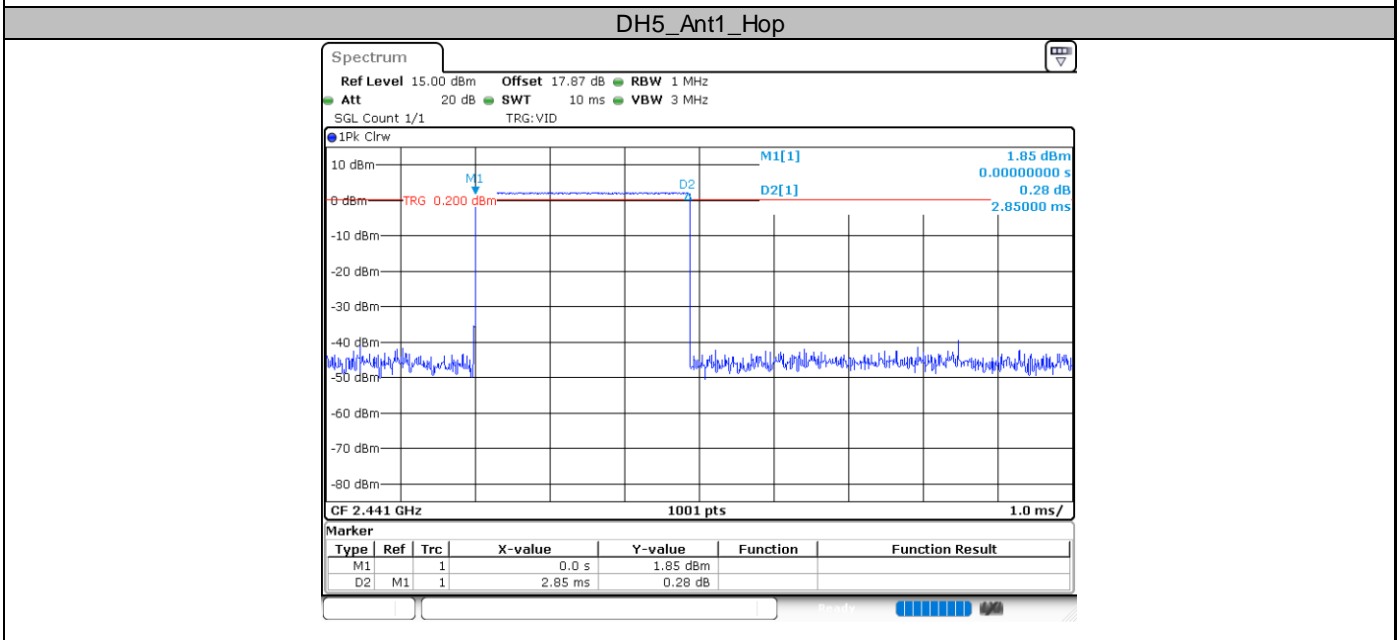
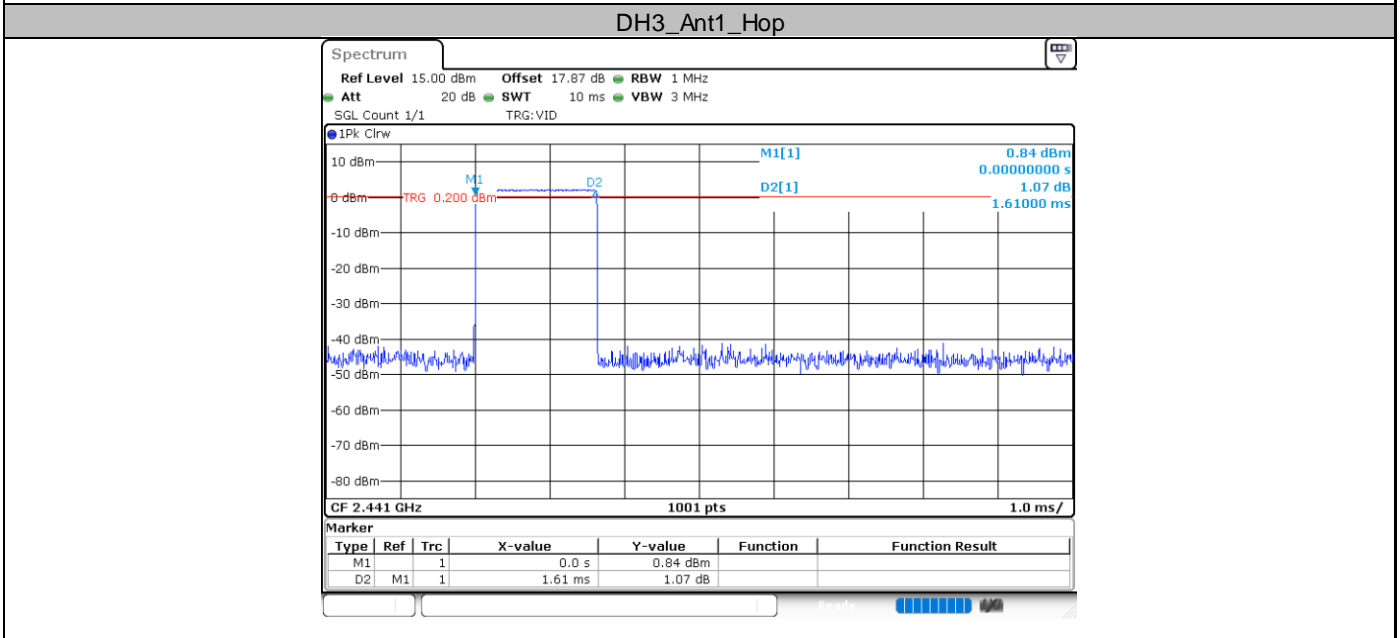
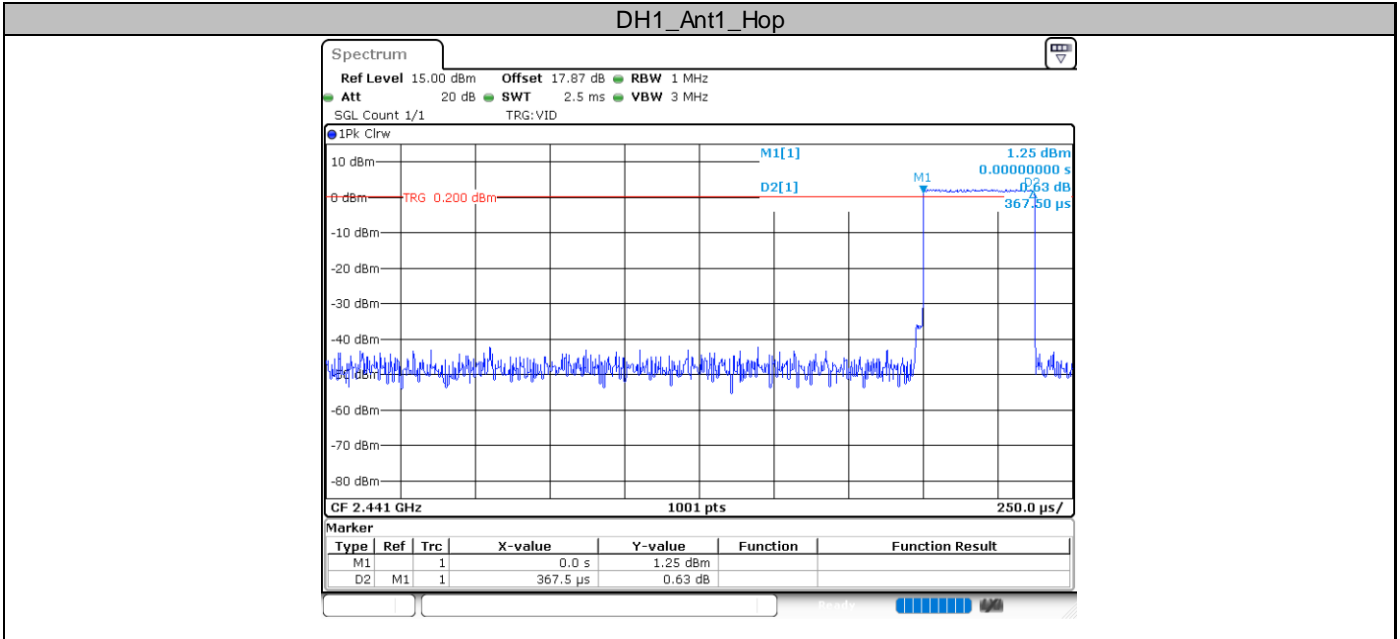
Test Graphs



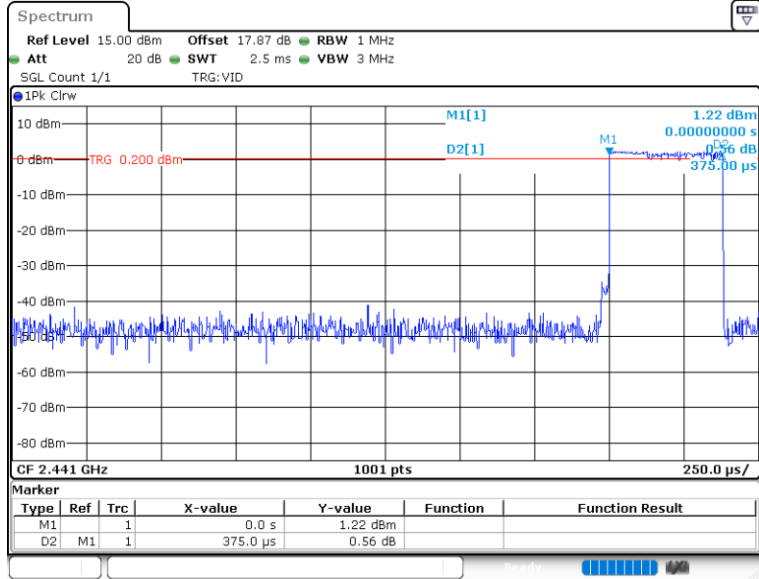
Appendix E: Time of occupancy
Test Result

Test Mode	Antenna	Freq(MHz)	Burst Width [ms]	Total Hops [Num]	Result[s]	Limit[s]	Verdict
DH1	Ant1	Hop	0.37	320	0.118	≤0.4	PASS
DH3	Ant1	Hop	1.61	160	0.258	≤0.4	PASS
DH5	Ant1	Hop	2.85	106.67	0.304	≤0.4	PASS
2DH1	Ant1	Hop	0.38	320	0.120	≤0.4	PASS
2DH3	Ant1	Hop	1.62	160	0.259	≤0.4	PASS
2DH5	Ant1	Hop	2.86	106.67	0.305	≤0.4	PASS
3DH1	Ant1	Hop	0.38	320	0.120	≤0.4	PASS
3DH3	Ant1	Hop	1.61	160	0.258	≤0.4	PASS
3DH5	Ant1	Hop	2.86	106.67	0.305	≤0.4	PASS

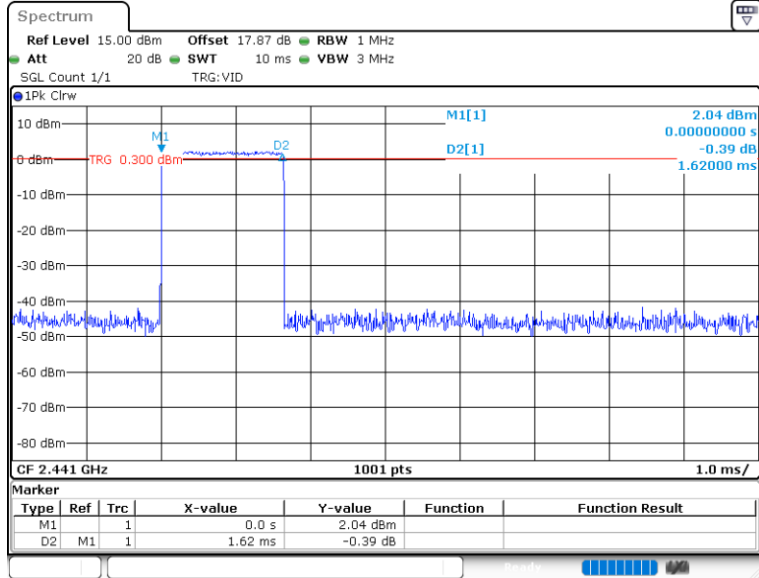
Test Graphs



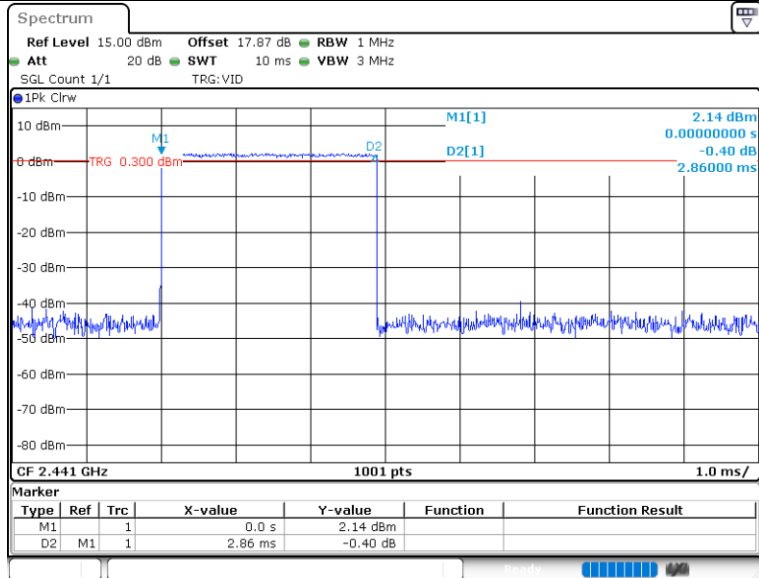
2DH1_Ant1_Hop



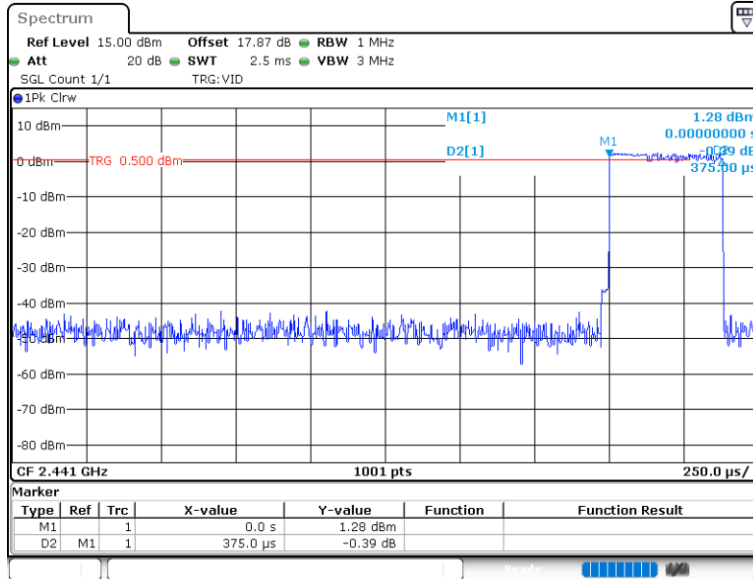
2DH3_Ant1_Hop



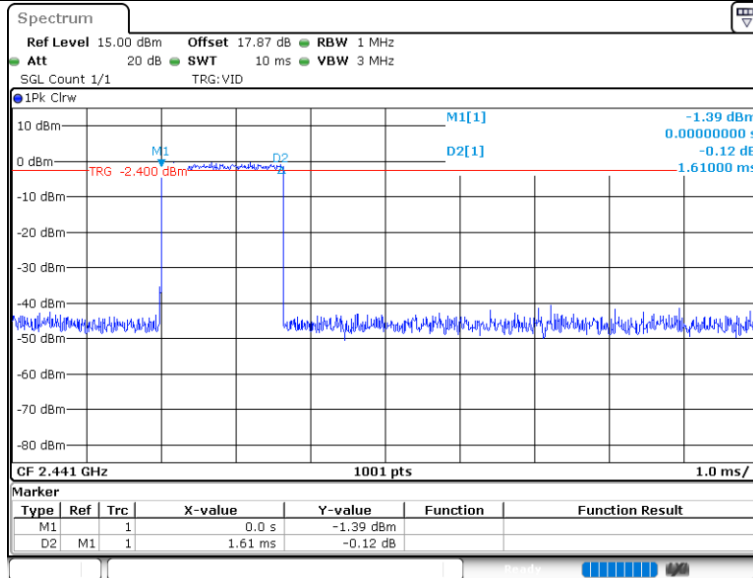
2DH5_Ant1_Hop



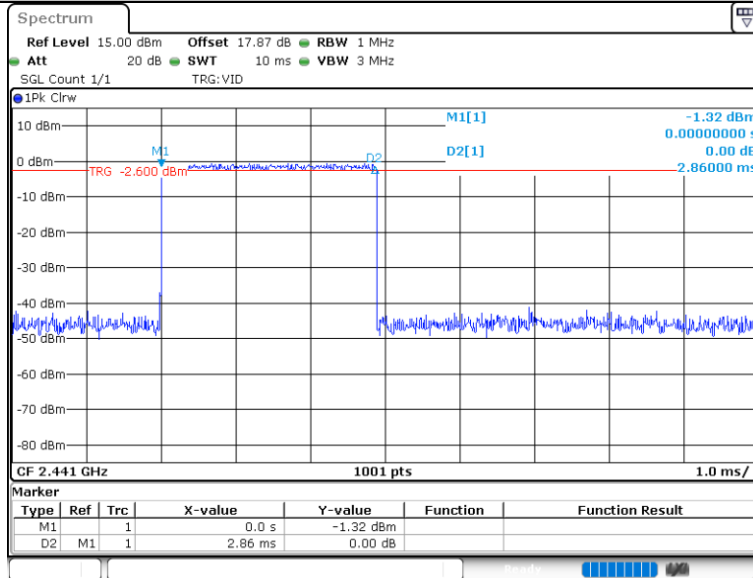
3DH1_Ant1_Hop



3DH3_Ant1_Hop



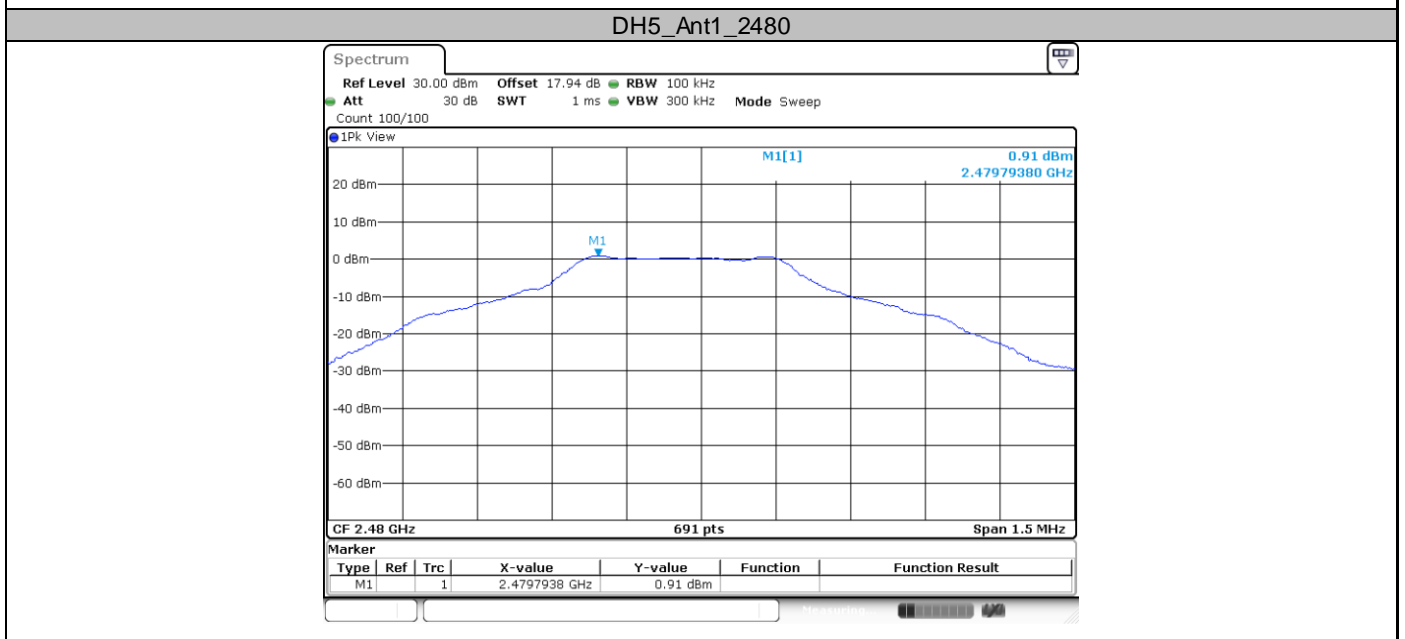
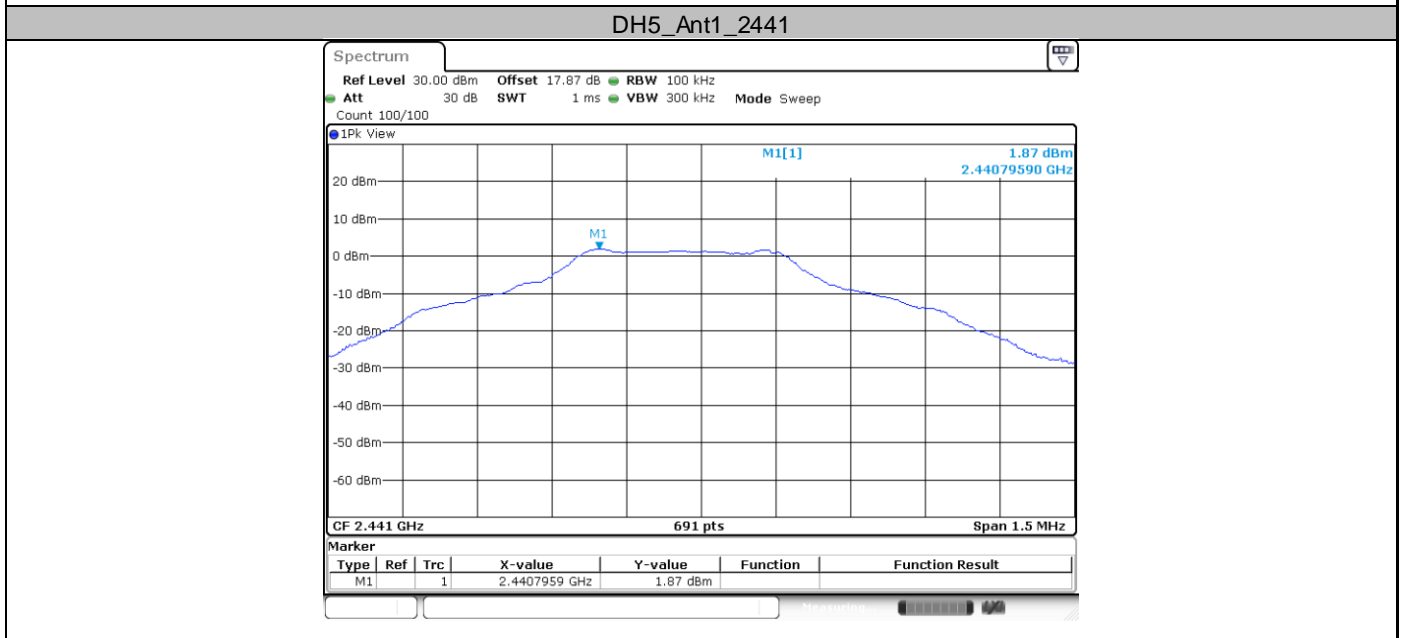
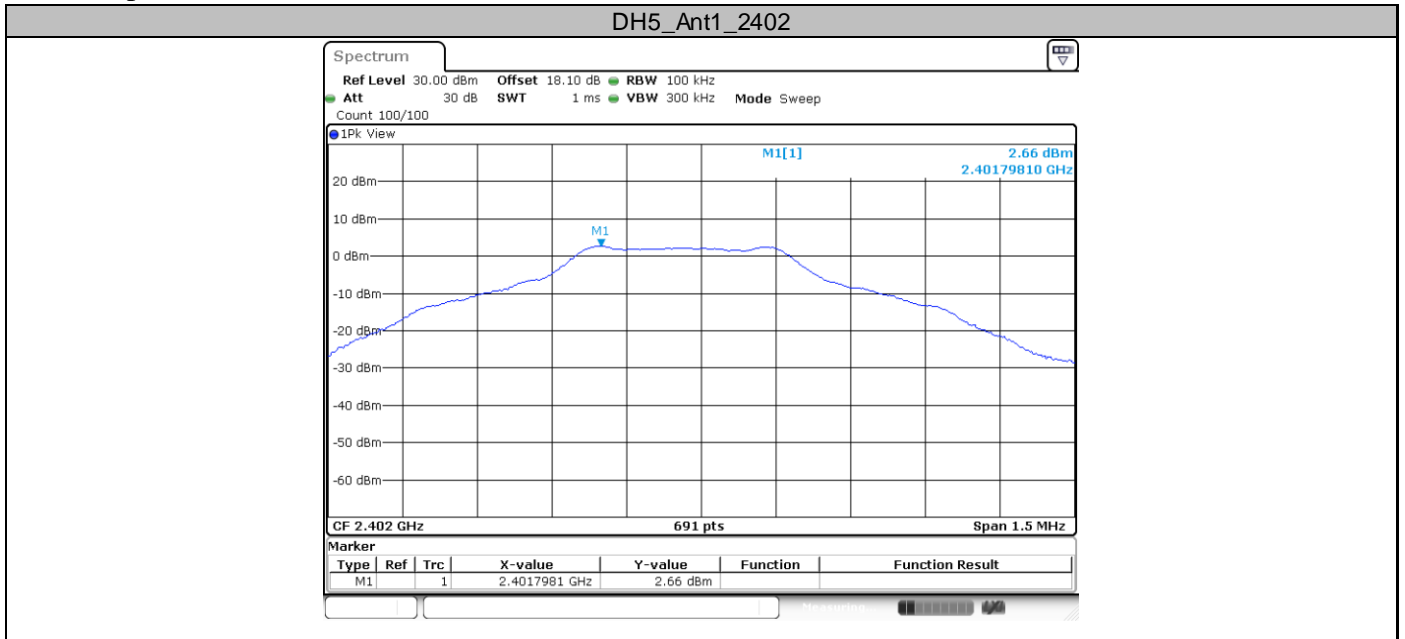
3DH5_Ant1_Hop



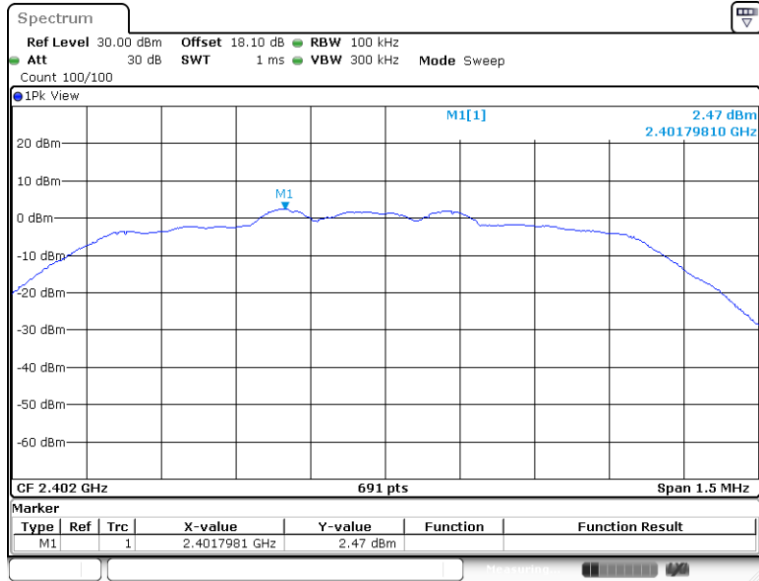
Appendix F: Reference level measurement
 Test Result

Test Mode	Antenna	Freq(MHz)	Max.Point[MHz]	Result[dBm]
DH5	Ant1	2402	2401.80	2.66
		2441	2440.80	1.87
		2480	2479.79	0.91
2DH5	Ant1	2402	2401.80	2.47
		2441	2440.80	1.67
		2480	2479.80	0.71
3DH5	Ant1	2402	2401.80	2.66
		2441	2440.80	1.90
		2480	2479.79	0.93

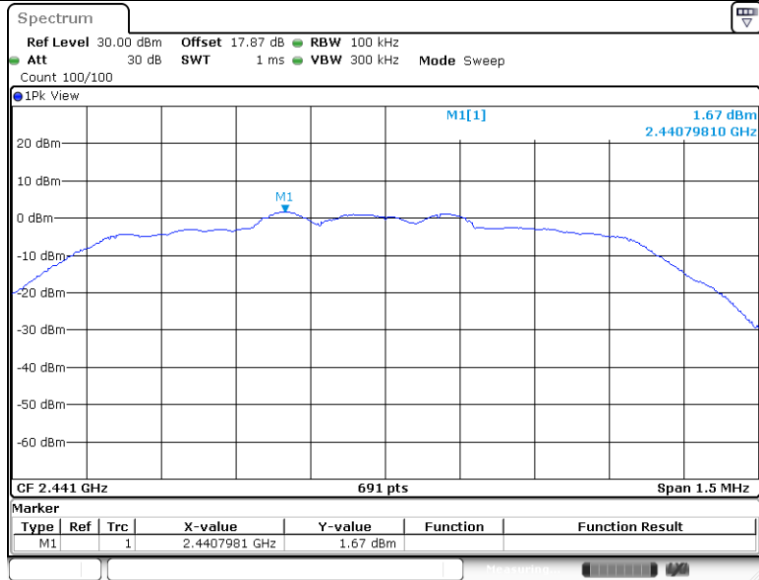
Test Graphs



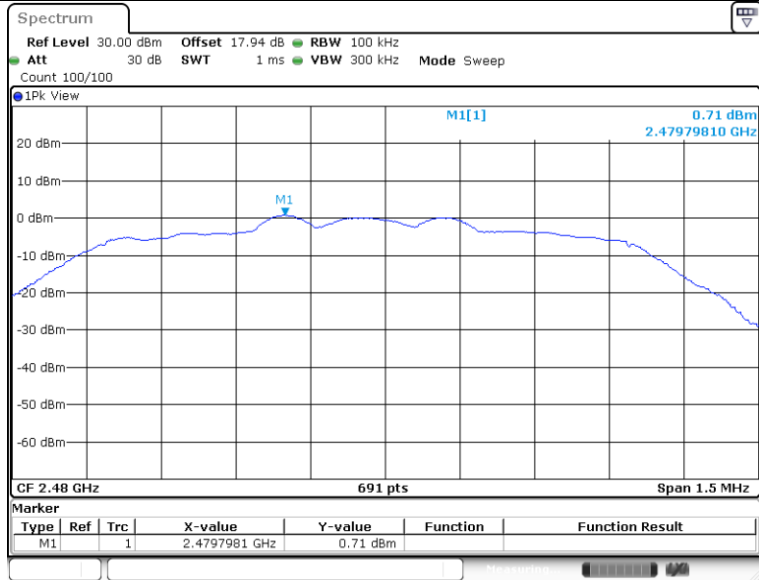
2DH5_Ant1_2402



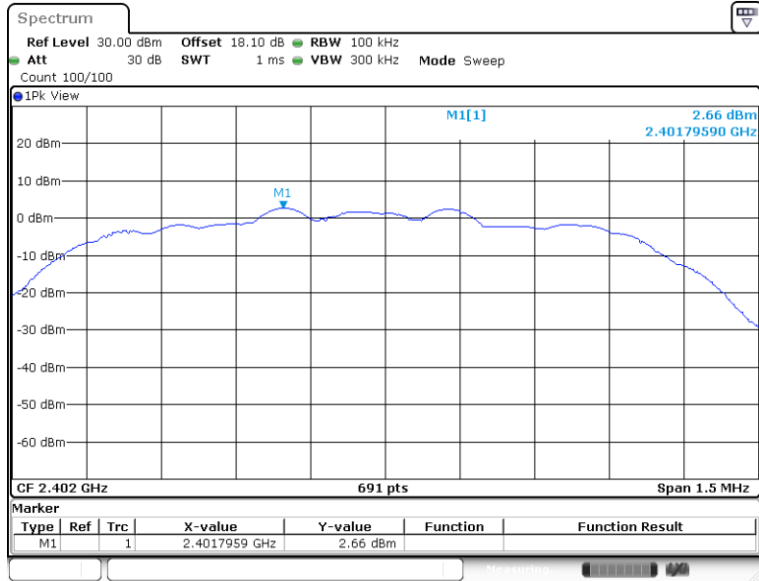
2DH5_Ant1_2441



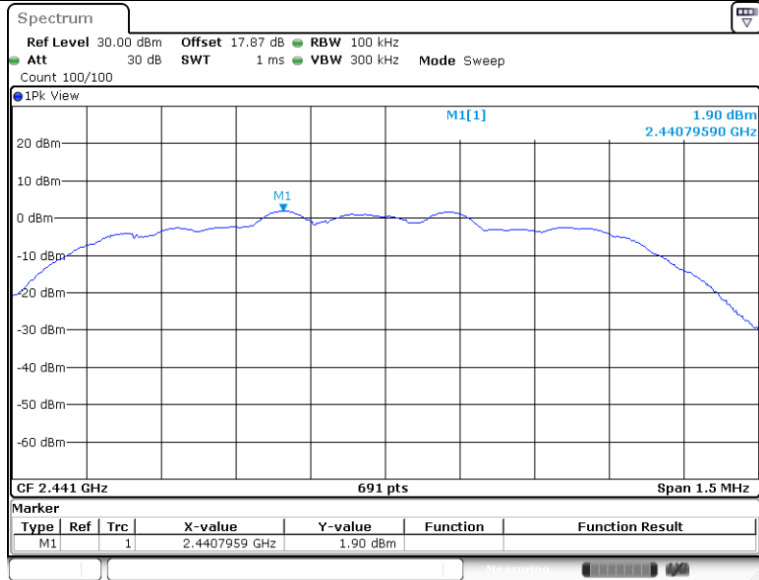
2DH5_Ant1_2480



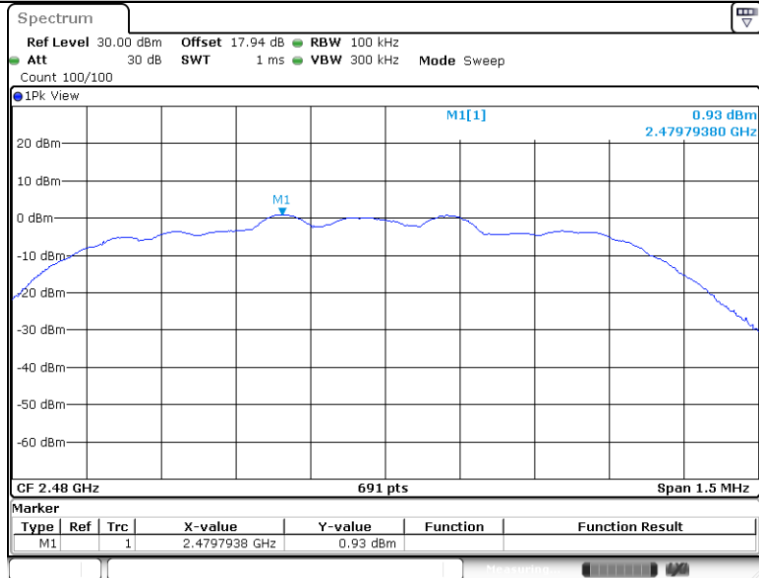
3DH5_Ant1_2402



3DH5_Ant1_2441



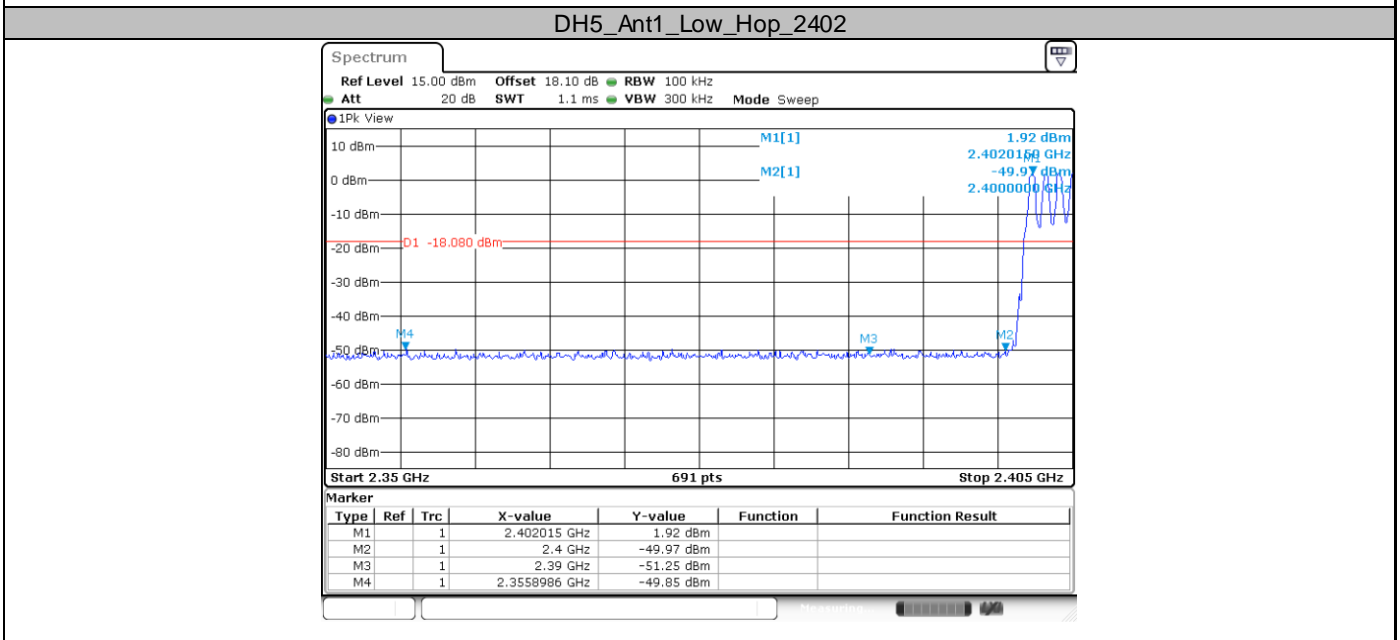
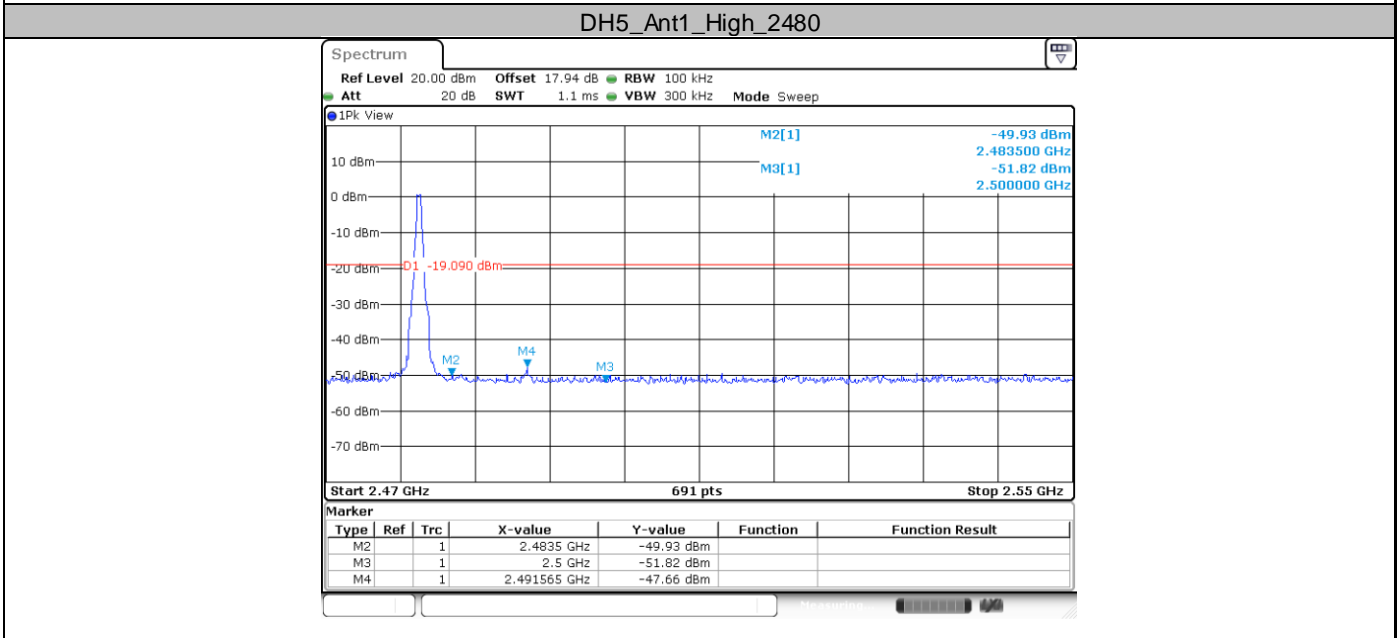
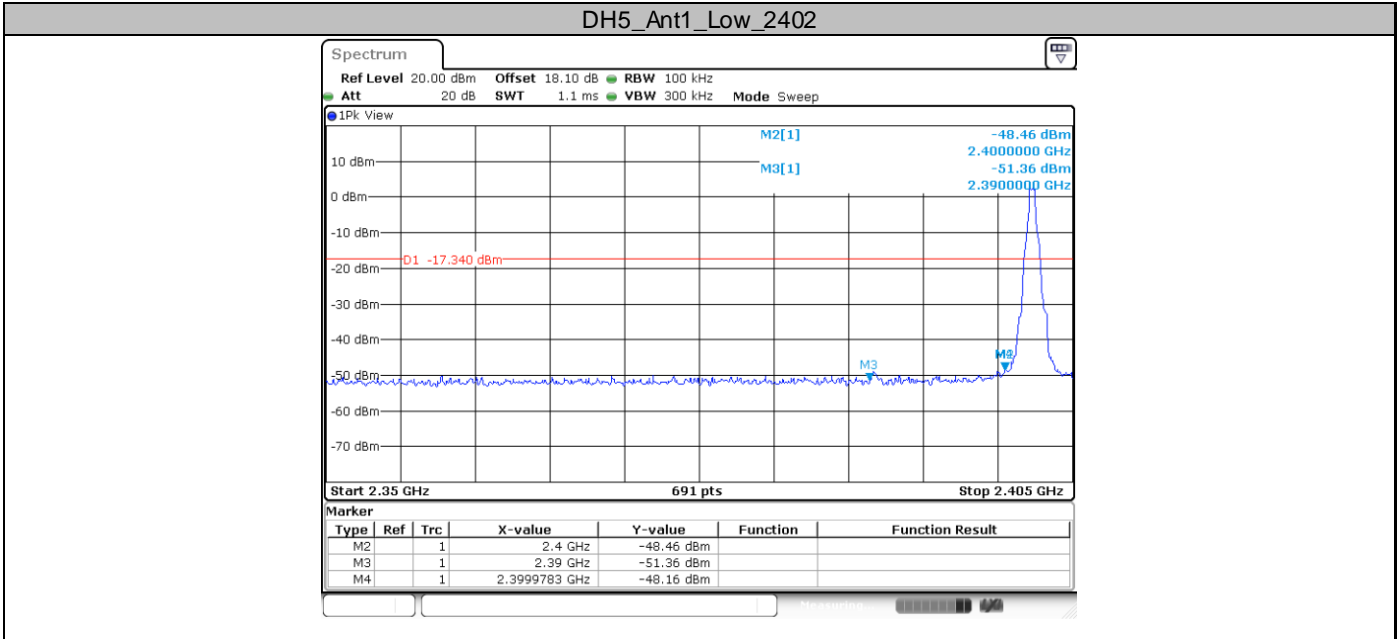
3DH5_Ant1_2480



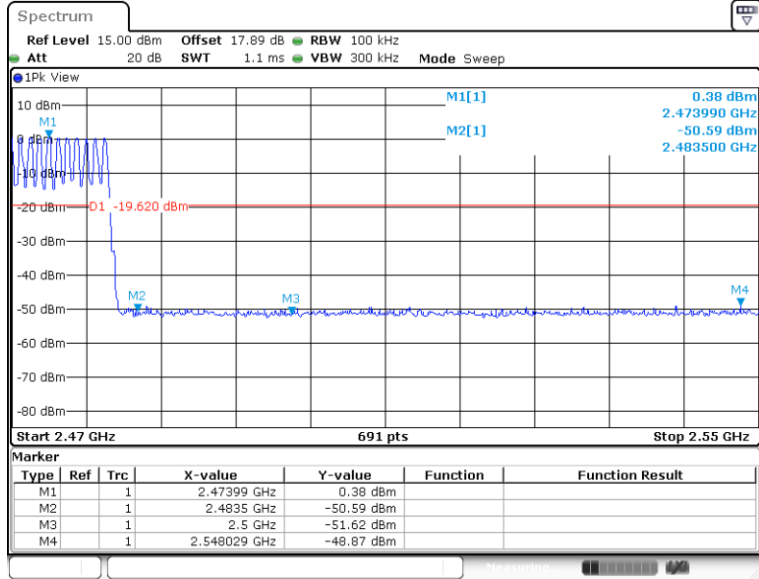
Appendix G: Band edge measurements
 Test Result

Test Mode	Antenna	Ch Name	Freq(MHz)	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	Low	2402	2.66	-48.16	≤-17.34	PASS
		High	2480	0.91	-47.66	≤-19.09	PASS
		Low	Hop_2402	1.92	-49.85	≤-18.08	PASS
		High	Hop_2480	0.38	-48.87	≤-19.62	PASS
2DH5	Ant1	Low	2402	2.47	-47.41	≤-17.53	PASS
		High	2480	0.71	-47.95	≤-19.29	PASS
		Low	Hop_2402	2.31	-49.05	≤-17.69	PASS
		High	Hop_2480	-0.62	-49.60	≤-20.62	PASS
3DH5	Ant1	Low	2402	2.66	-49.00	≤-17.34	PASS
		High	2480	0.93	-48.87	≤-19.07	PASS
		Low	Hop_2402	-1.50	-49.23	≤-21.5	PASS
		High	Hop_2480	-2.64	-49.61	≤-22.64	PASS

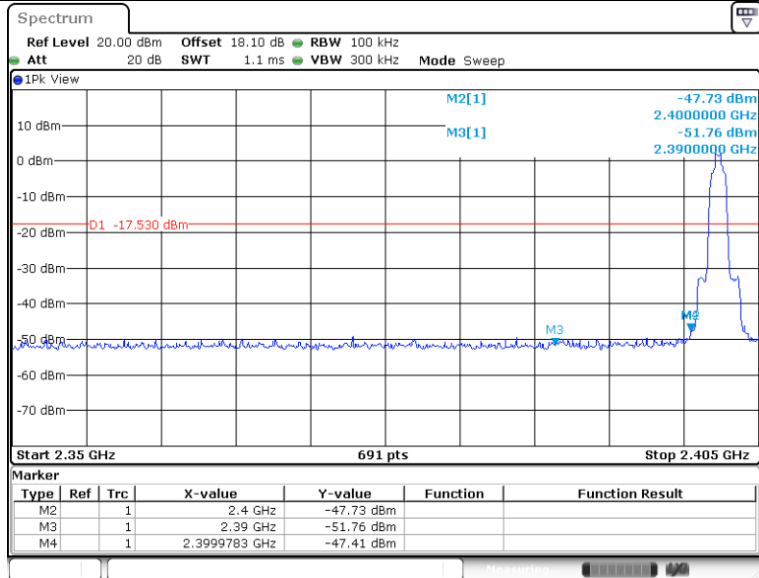
Test Graphs



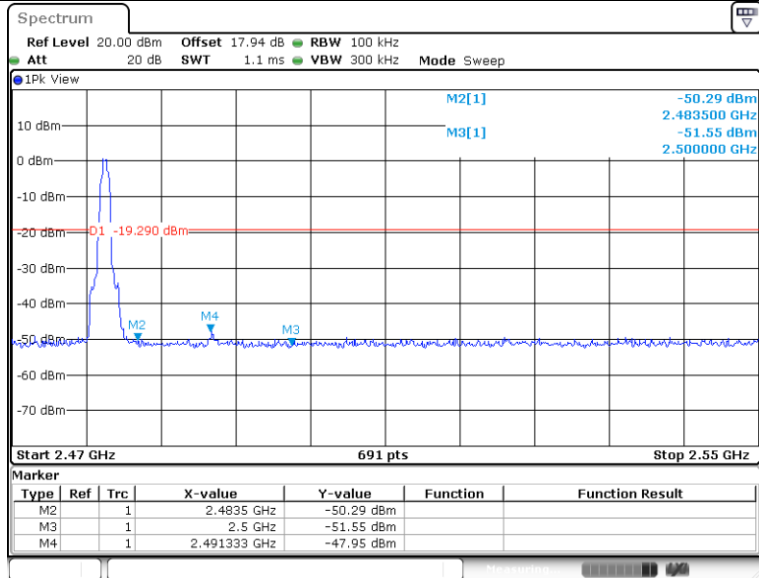
DH5_Ant1_High_Hop_2480



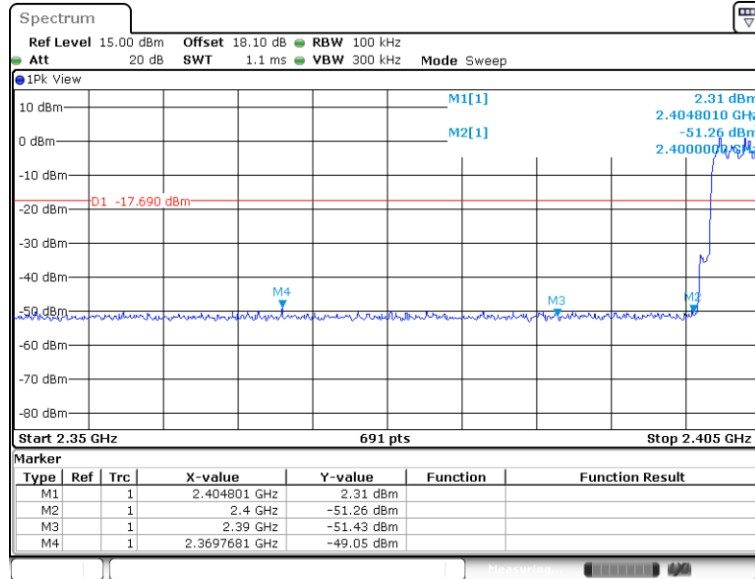
2DH5_Ant1_Low_2402



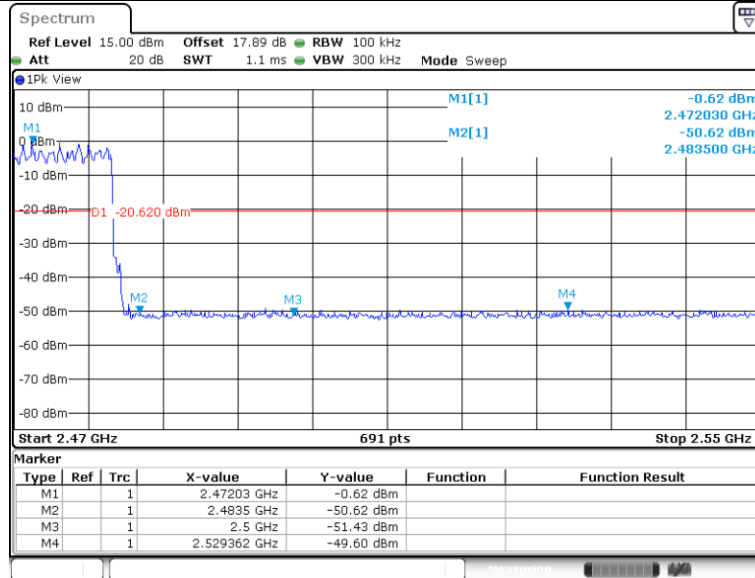
2DH5_Ant1_High_2480



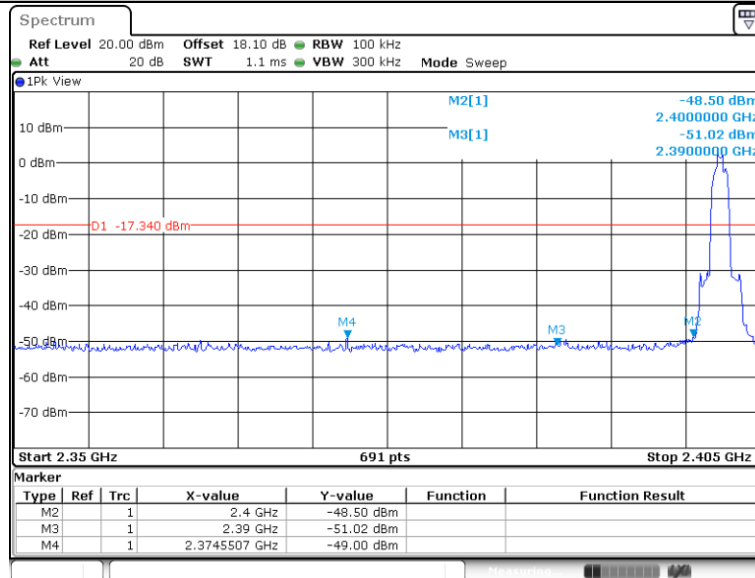
2DH5_Ant1_Low_Hop_2402



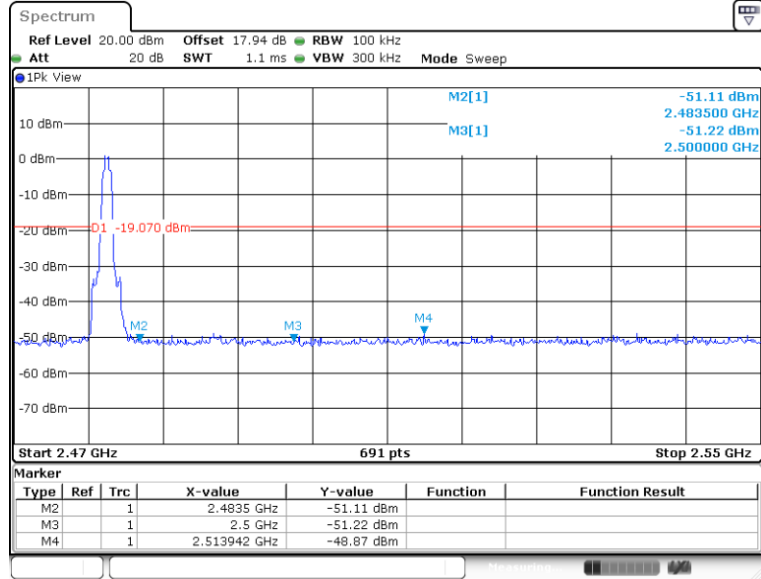
2DH5_Ant1_High_Hop_2480



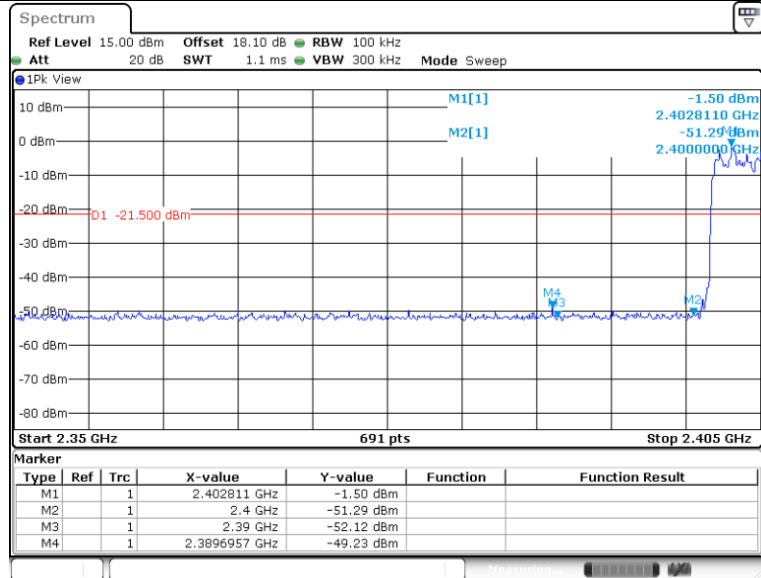
3DH5_Ant1_Low_2402



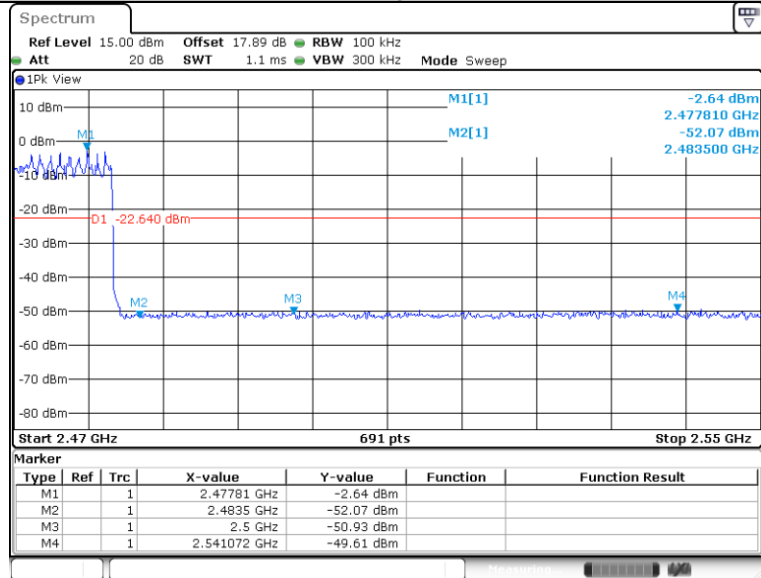
3DH5_Ant1_High_2480



3DH5_Ant1_Low_Hop_2402



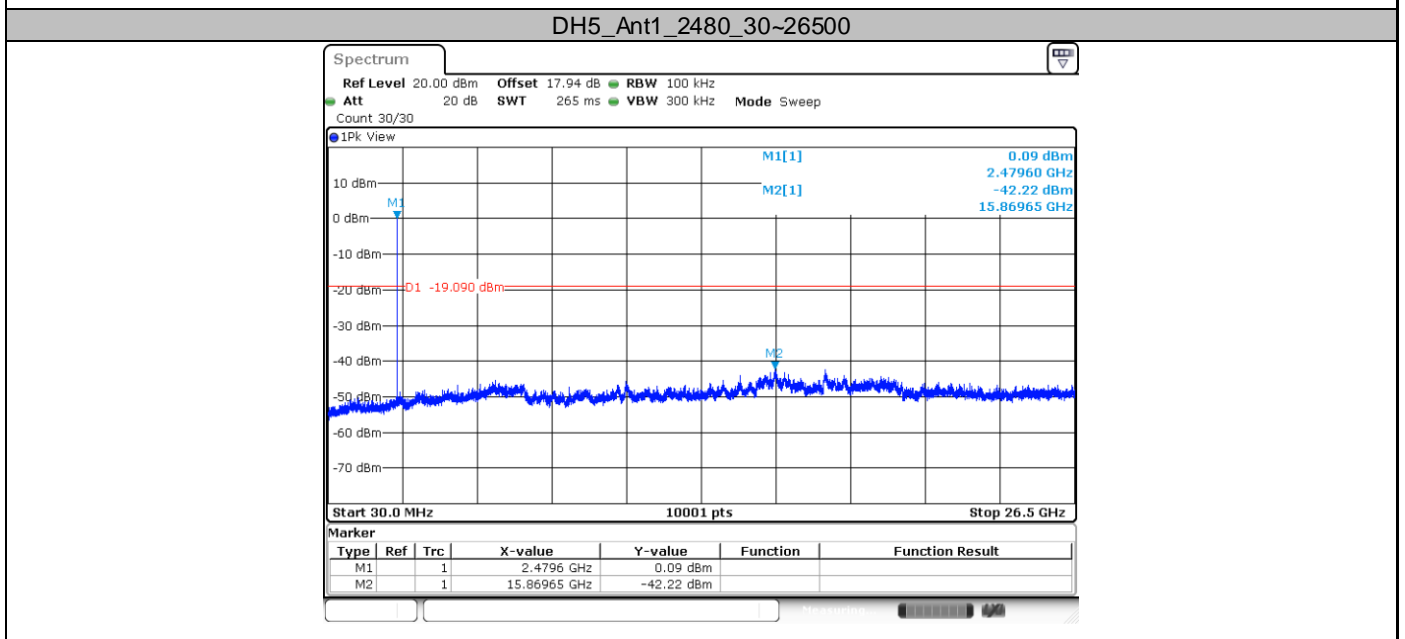
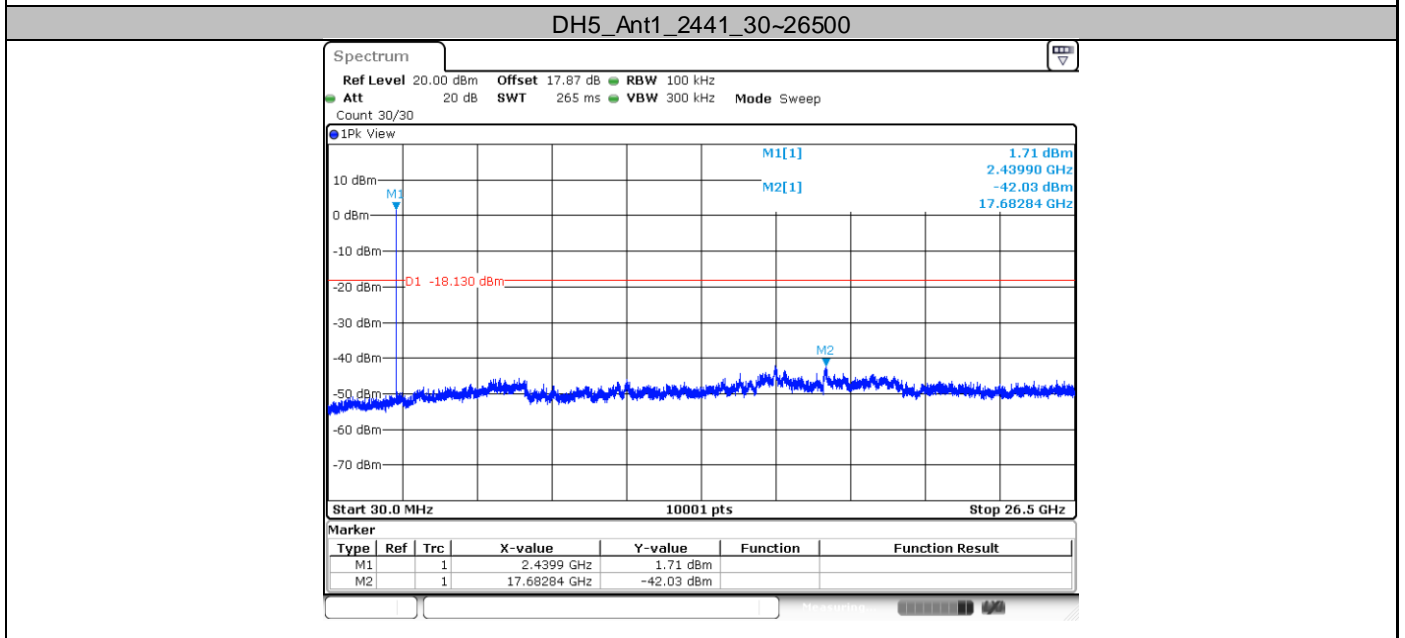
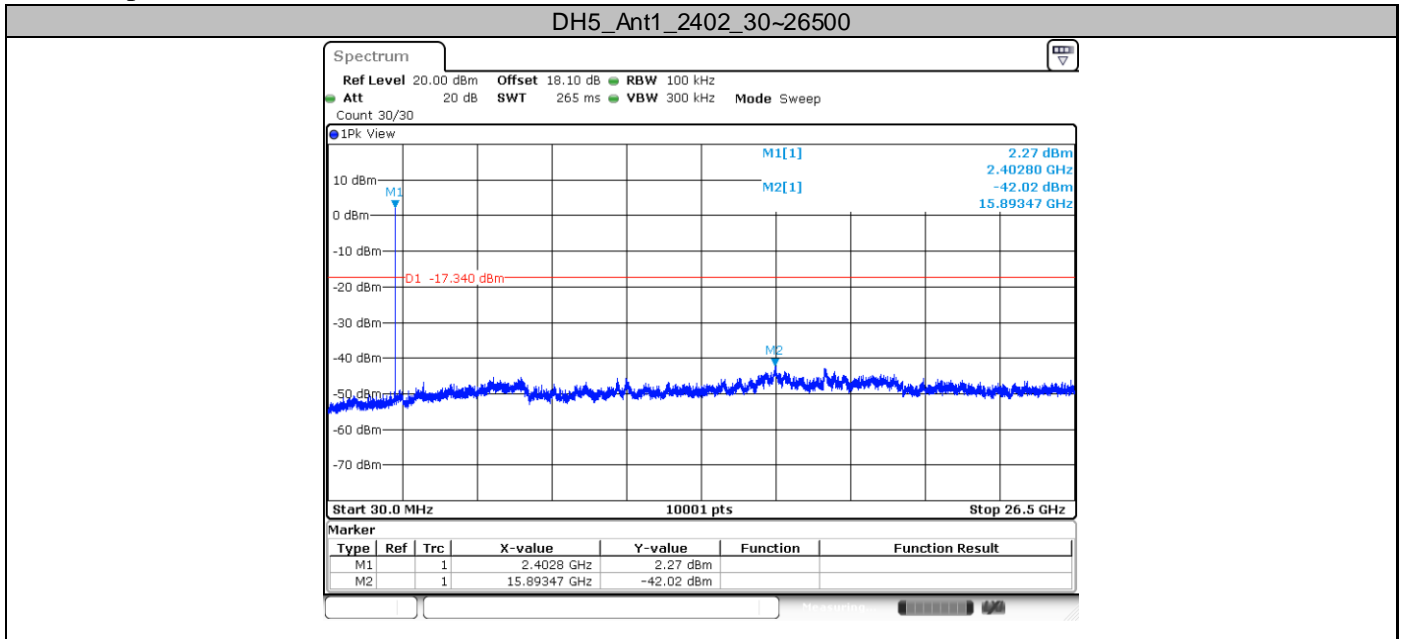
3DH5_Ant1_High_Hop_2480



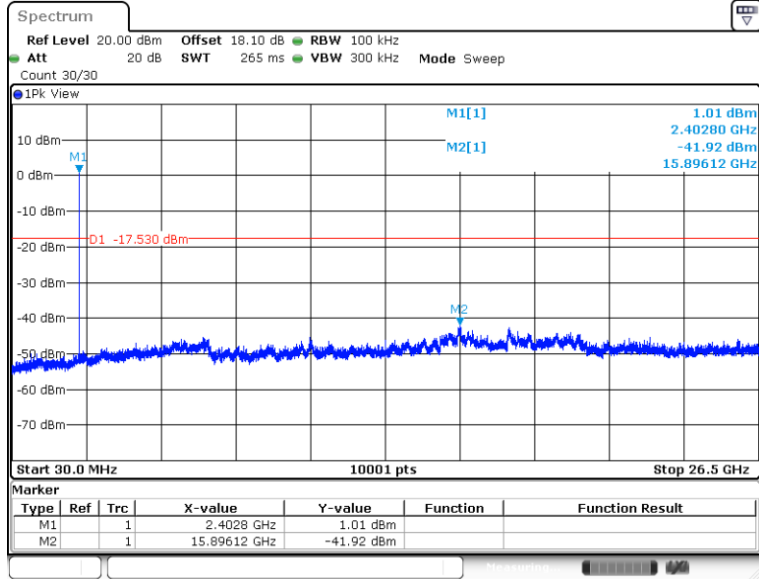
Appendix H: Conducted Spurious Emission
Test Result

Test Mode	Antenna	Freq(MHz)	Freq Range [MHz]	Ref Level [dBm]	Result [dBm]	Limit [dBm]	Verdict
DH5	Ant1	2402	30~26500	2.66	-42.02	≤-17.34	PASS
		2441	30~26500	1.87	-42.03	≤-18.13	PASS
		2480	30~26500	0.91	-42.22	≤-19.09	PASS
2DH5	Ant1	2402	30~26500	2.47	-41.92	≤-17.53	PASS
		2441	30~26500	1.67	-42.23	≤-18.33	PASS
		2480	30~26500	0.71	-42.06	≤-19.29	PASS
3DH5	Ant1	2402	30~26500	2.66	-41.50	≤-17.34	PASS
		2441	30~26500	1.90	-41.45	≤-18.10	PASS
		2480	30~26500	0.93	-42.04	≤-19.07	PASS

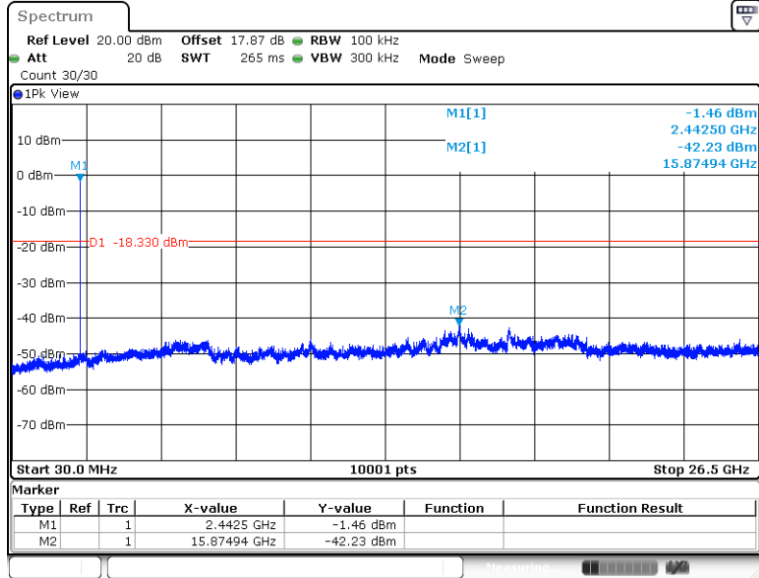
Test Graphs



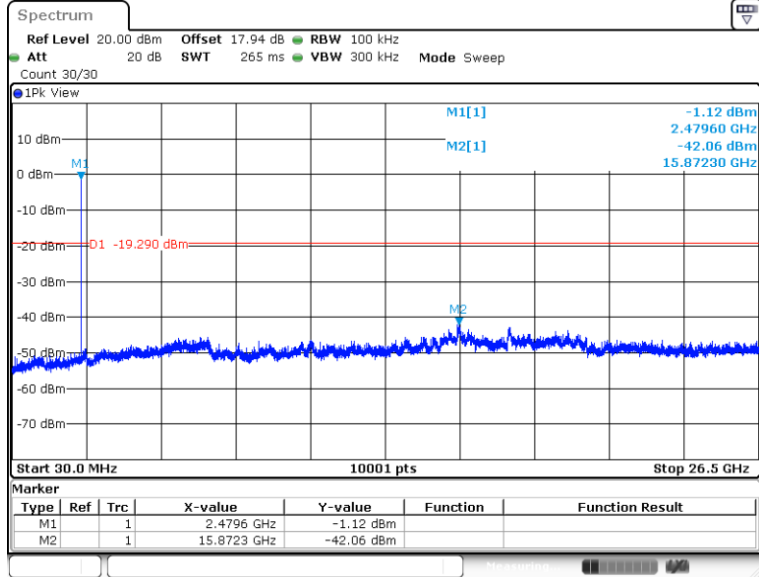
2DH5_Ant1_2402_30~26500



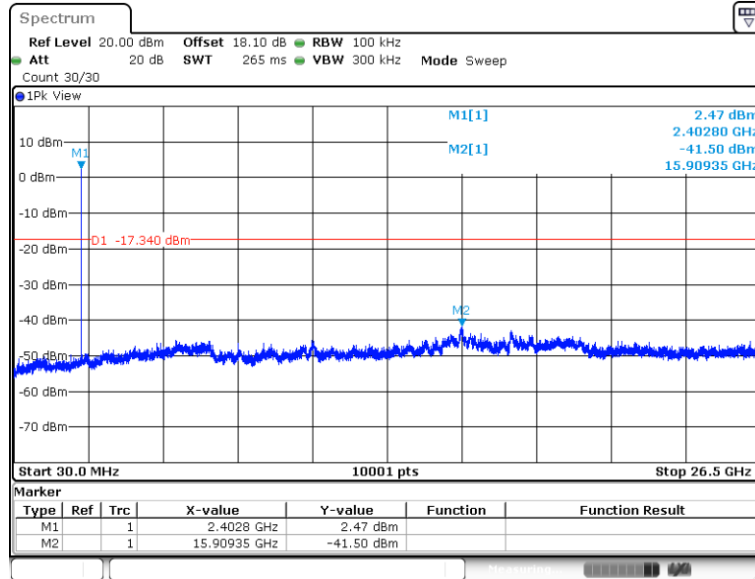
2DH5_Ant1_2441_30~26500



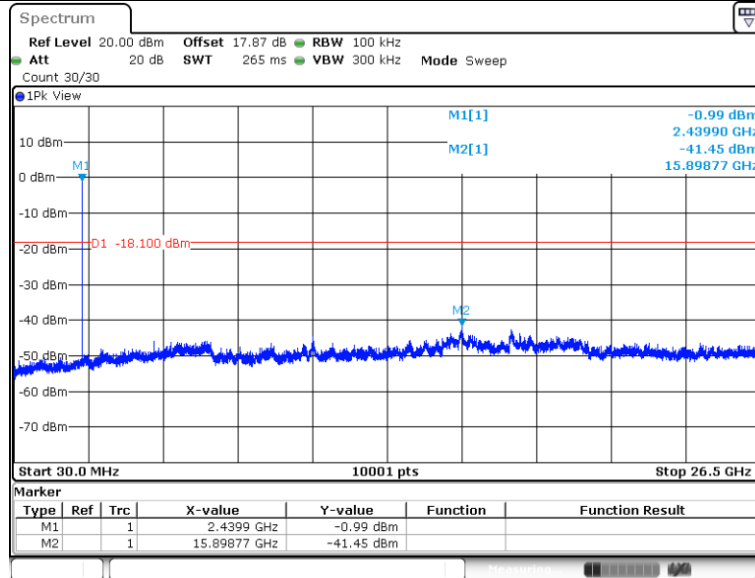
2DH5_Ant1_2480_30~26500



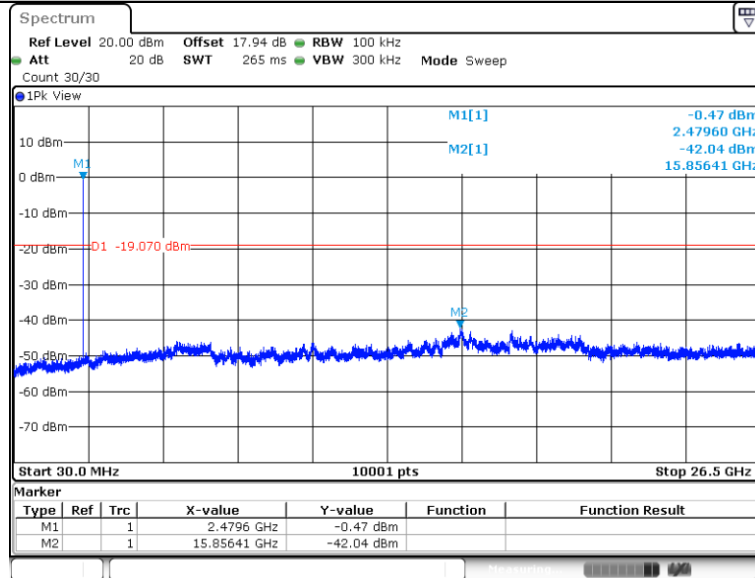
3DH5_Ant1_2402_30~26500



3DH5_Ant1_2441_30~26500

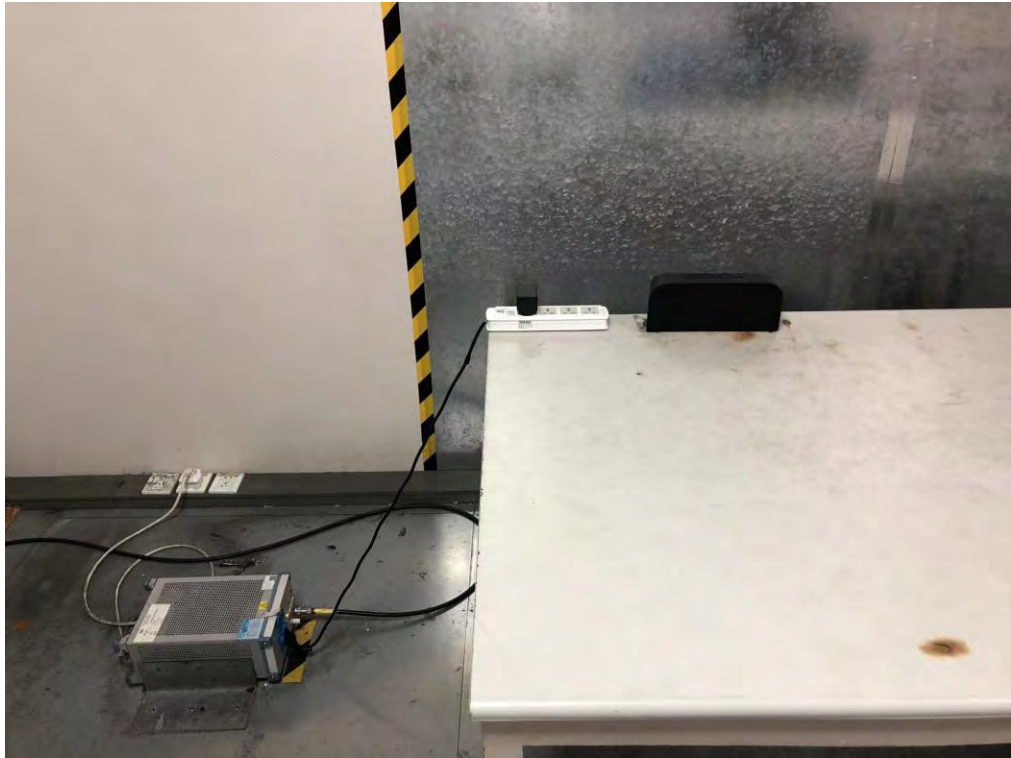


3DH5_Ant1_2480_30~26500

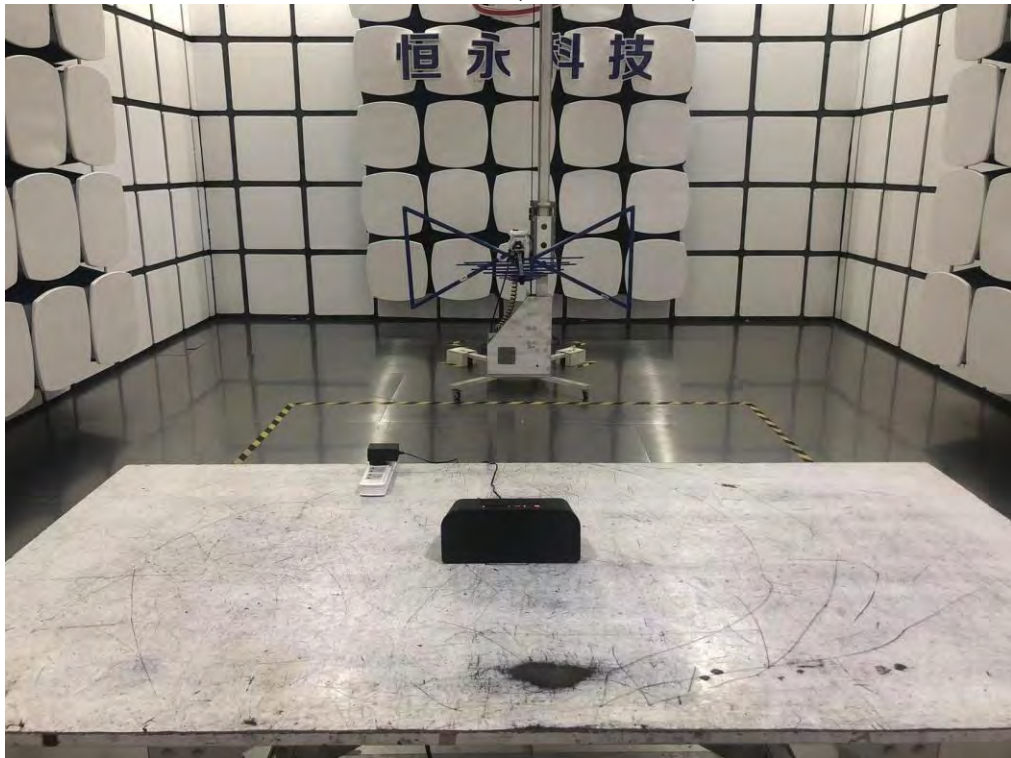


14. TEST SETUP PHOTO

Conducted Test



Radiated Test (Below 1GHz)



Radiated Test (Above 1GHz)



15. EUT PHOTO

External Photos
M/N: GROOVE XL



External Photos
M/N: GROOVE XL



External Photos
M/N: GROOVE XL



External Photos
M/N: GROOVE XL



External Photos
M/N: GROOVE XL



External Photos
M/N: GROOVE XL



External Photos
M/N: GROOVE XL



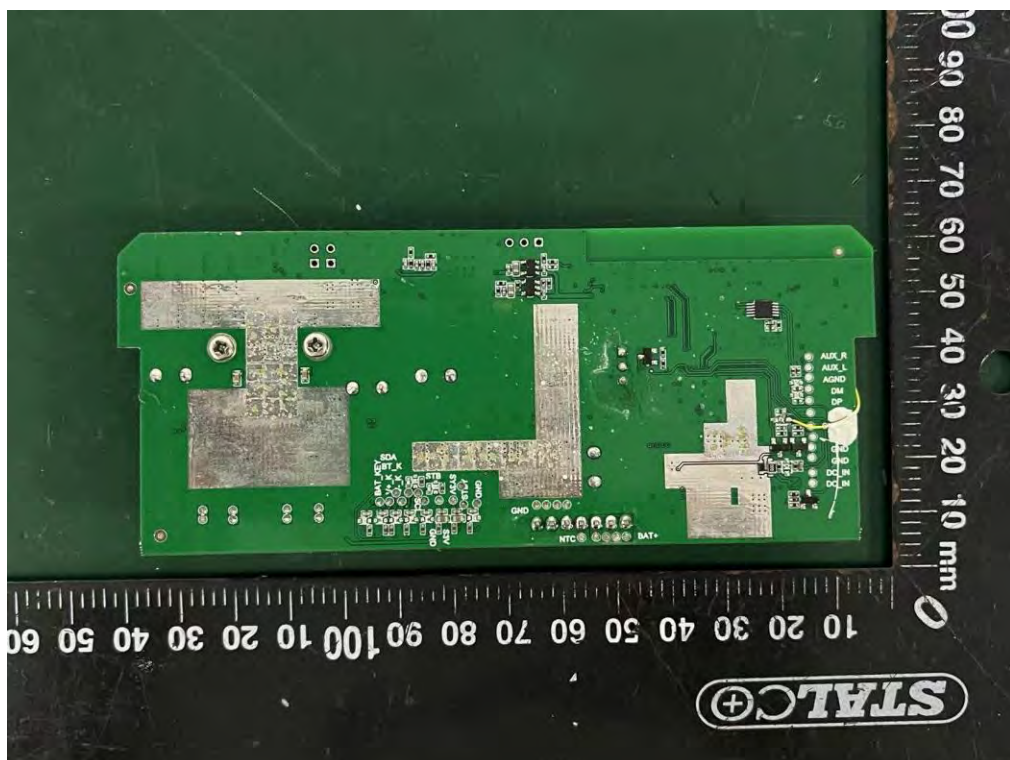
Internal Photos
M/N: GROOVE XL



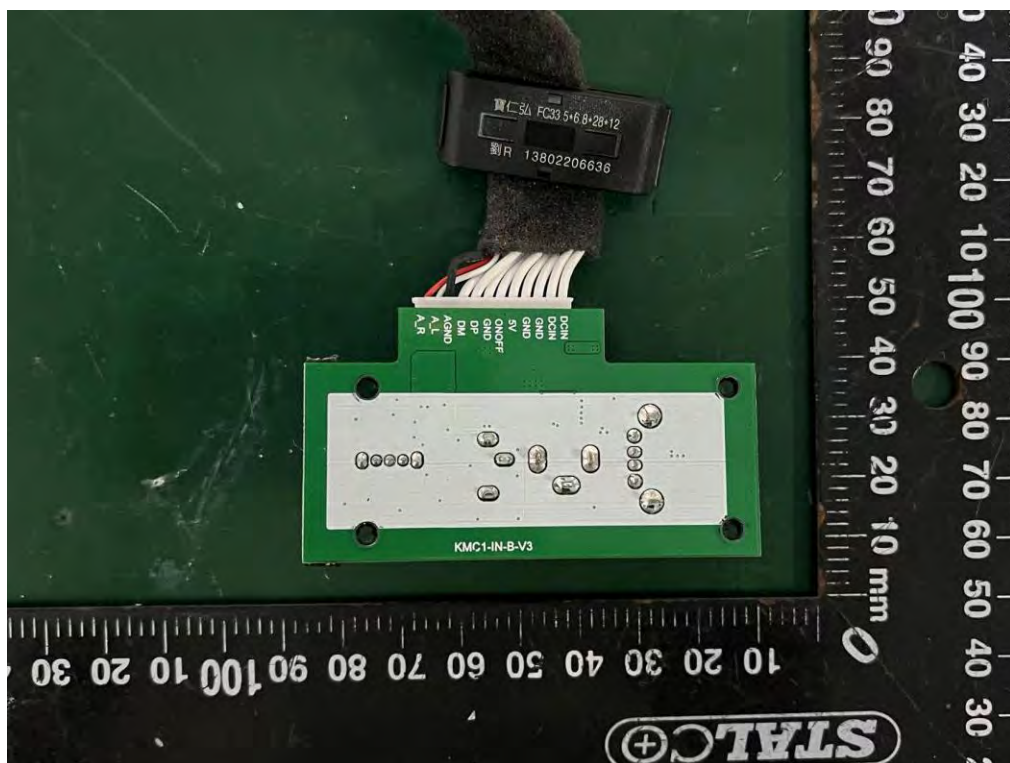
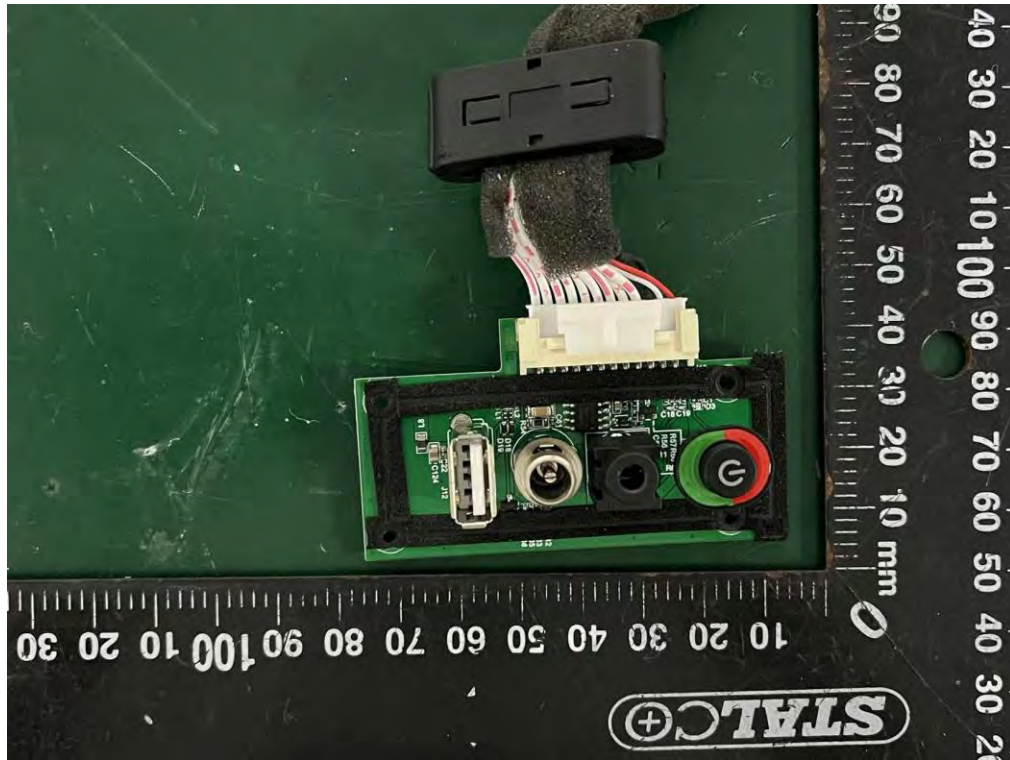
Internal Photos
M/N: GROOVE XL



Internal Photos
M/N: GROOVE XL



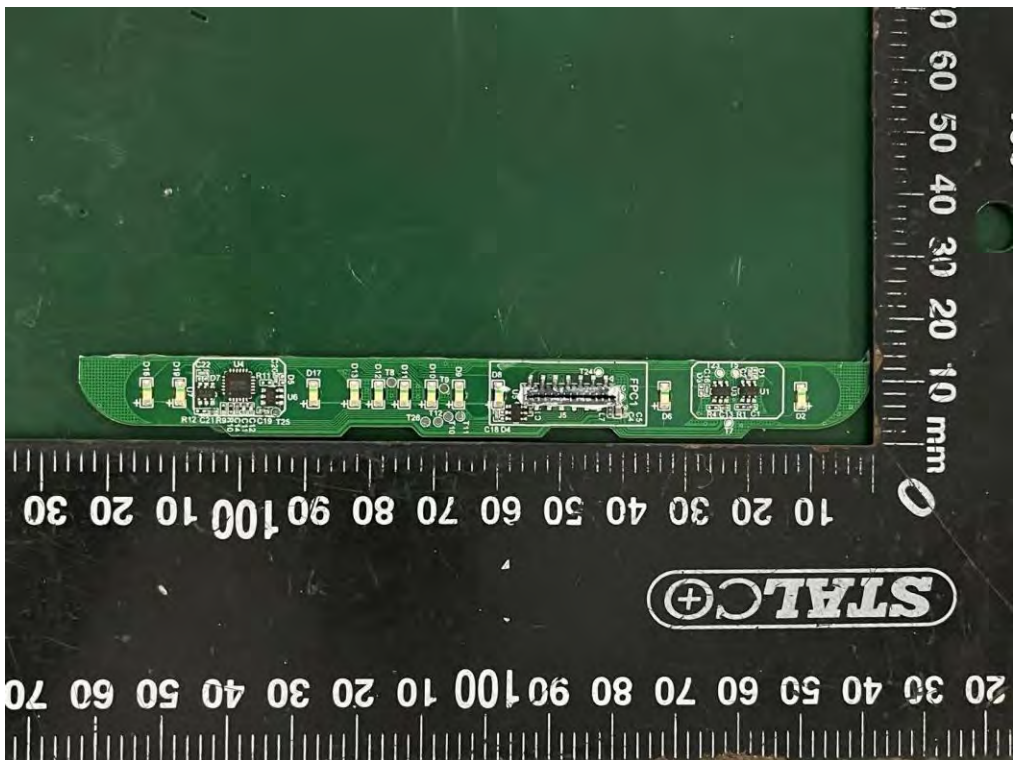
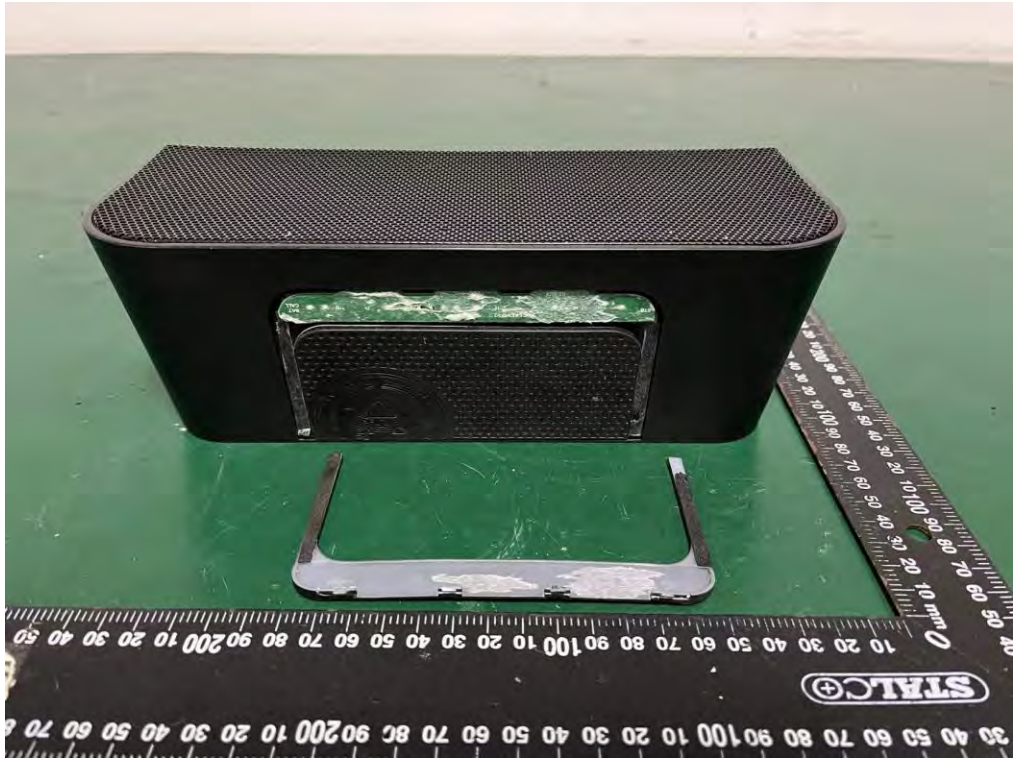
Internal Photos
M/N: GROOVE XL



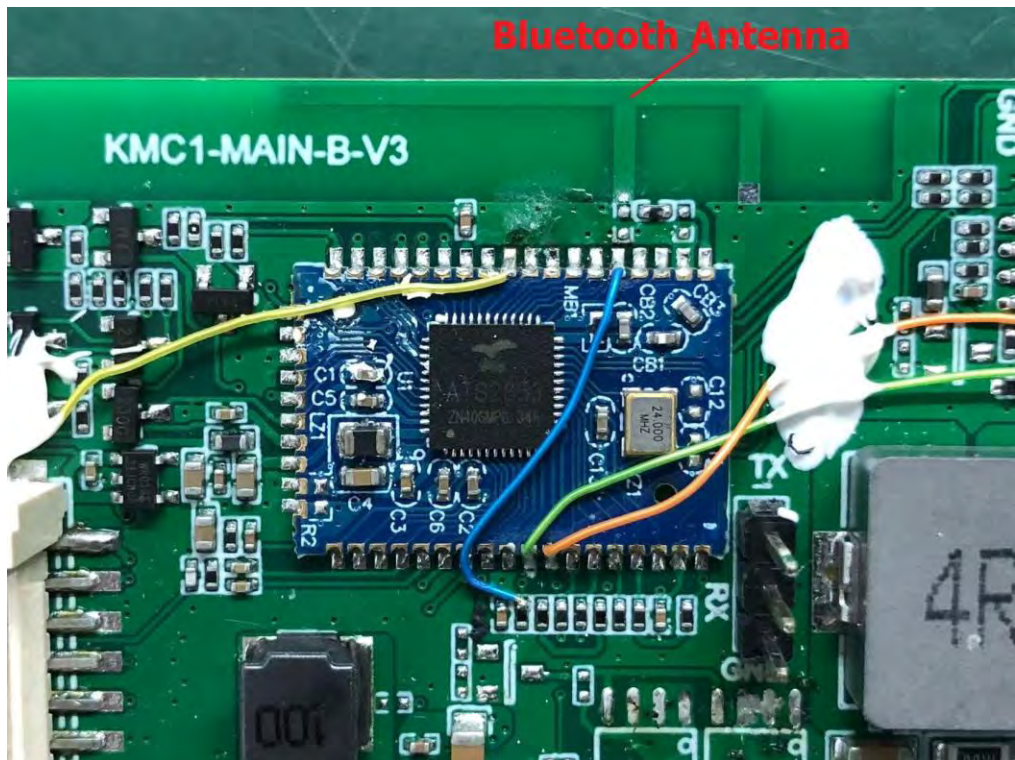
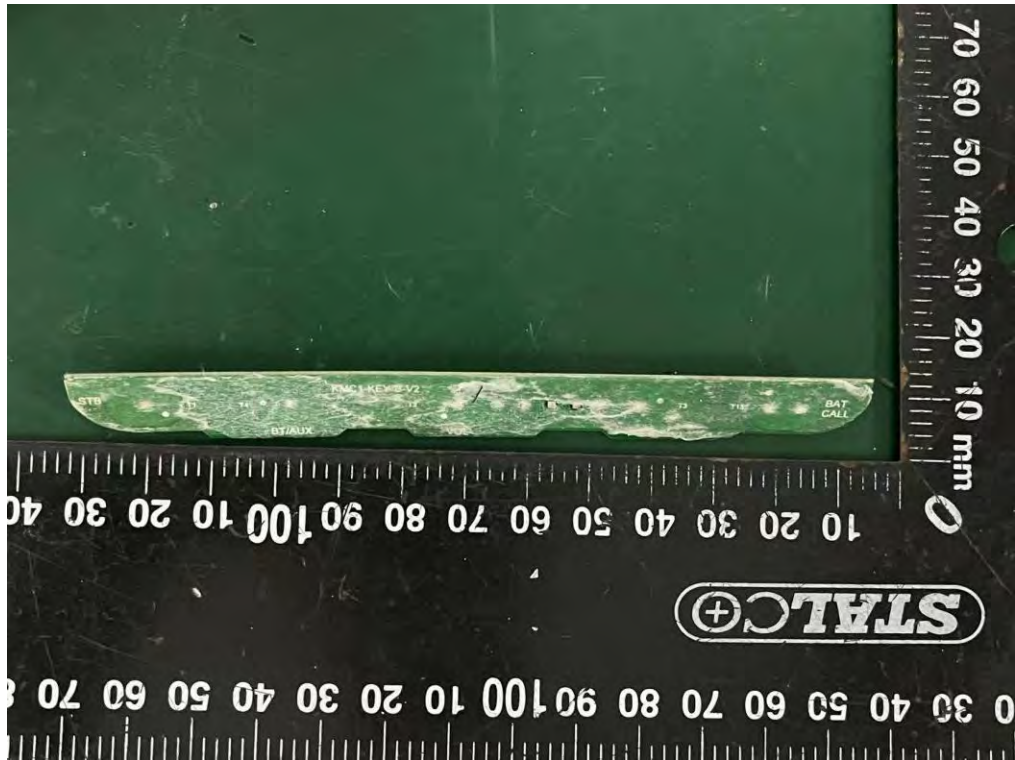
Internal Photos
M/N: GROOVE XL



Internal Photos
M/N: GROOVE XL



Internal Photos
M/N: GROOVE XL



End of Test Report