



Appendix B

RF Test Data for BT LE (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





B.1 DTS Bandwidth

Test Result

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.660	2401.692	2402.352	0.5	PASS
		2440	0.660	2439.688	2440.348	0.5	PASS
		2480	0.660	2479.688	2480.348	0.5	PASS
BLE_2M	Ant1	2402	1.124	2401.468	2402.592	0.5	PASS
		2440	1.116	2439.468	2440.584	0.5	PASS
		2480	1.124	2479.468	2480.592	0.5	PASS

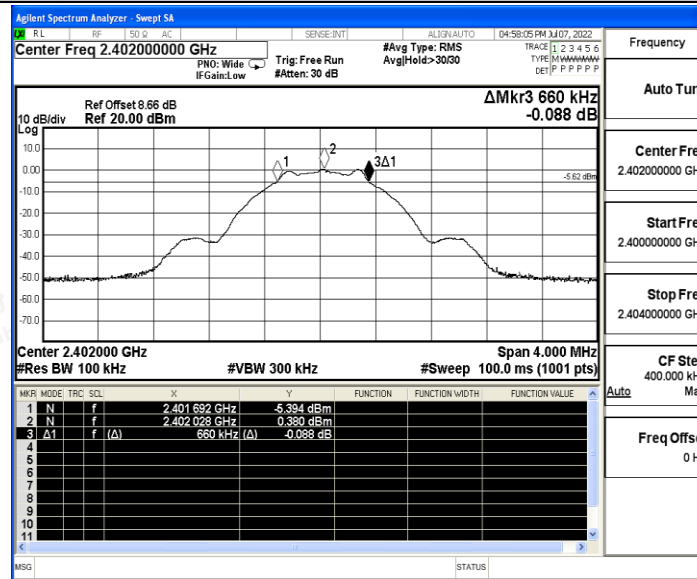


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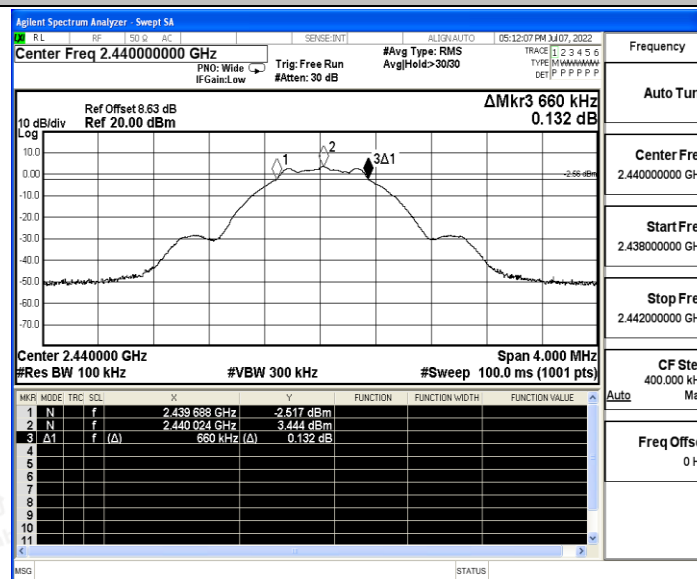


Test Graphs

BLE_1M_Ant1_2402

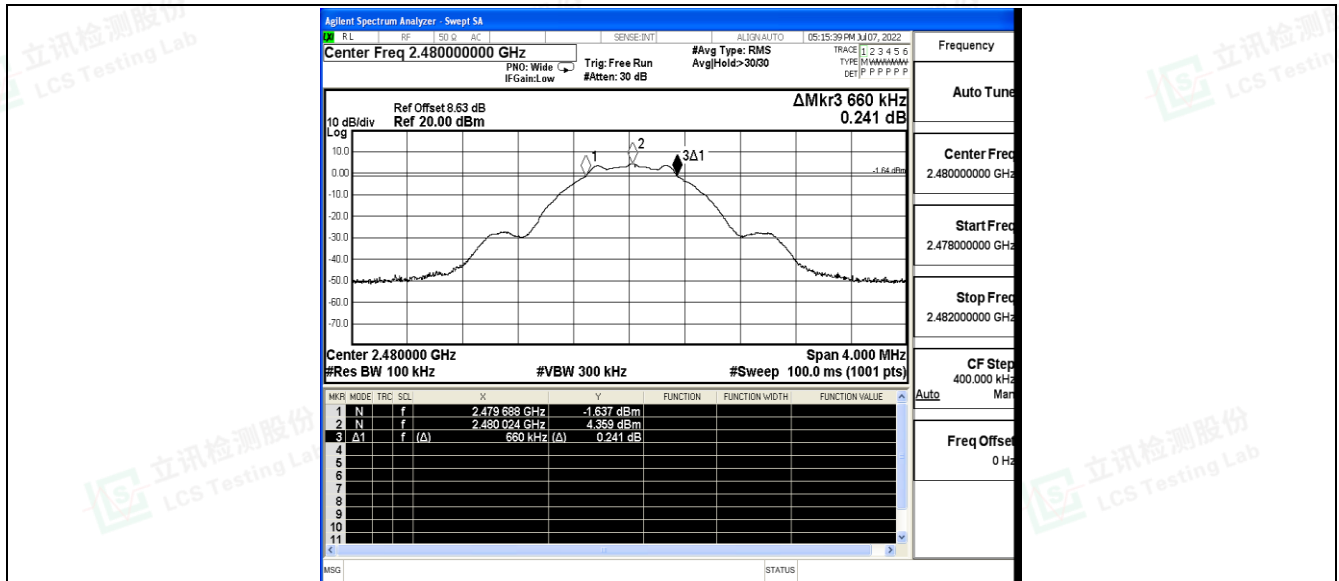


BLE_1M_Ant1_2440

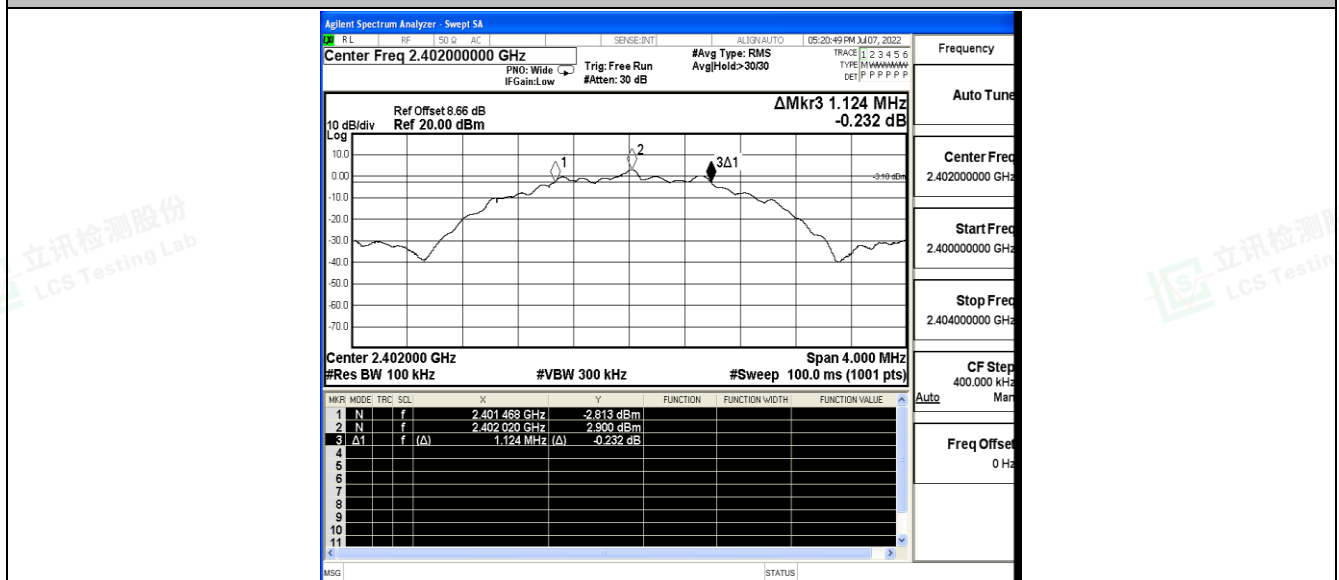


BLE_1M_Ant1_2480



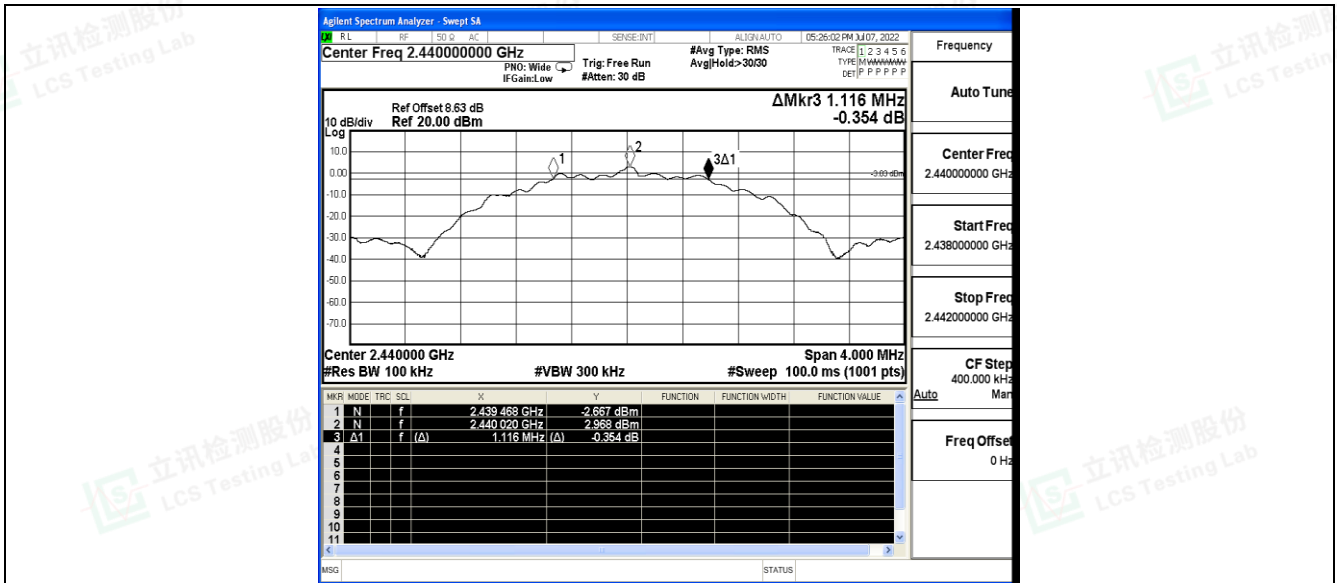


BLE_2M_Ant1_2402

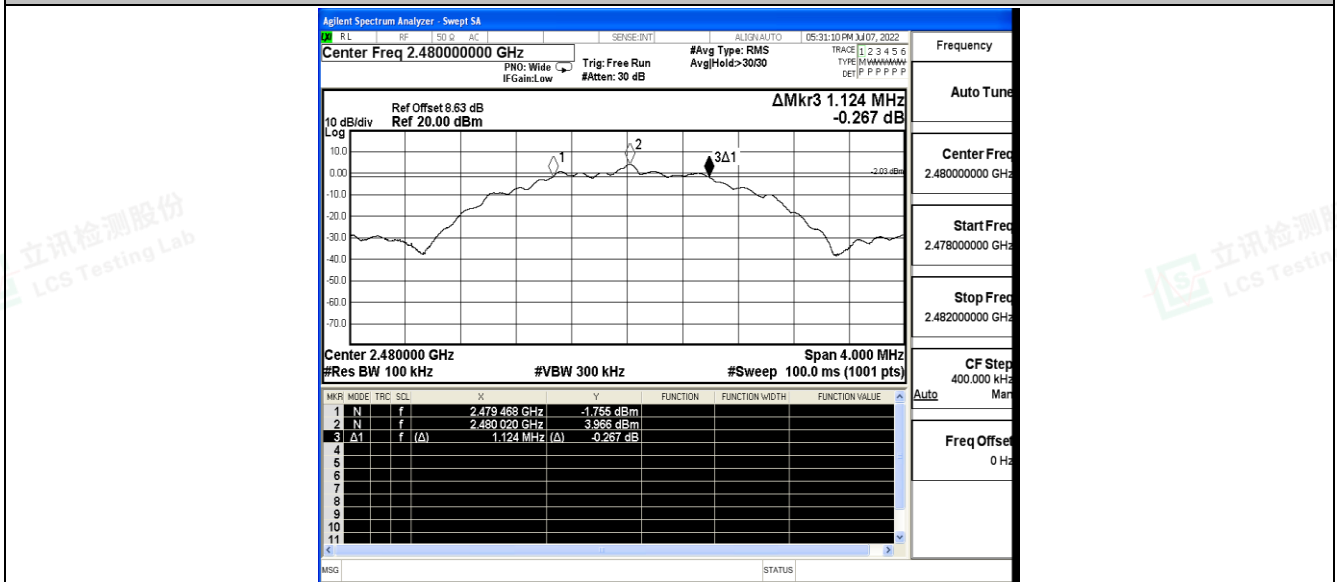


BLE_2M_Ant1_2440





BLE_2M_Ant1_2480





B.2 Maximum peak conducted output power

Test Result

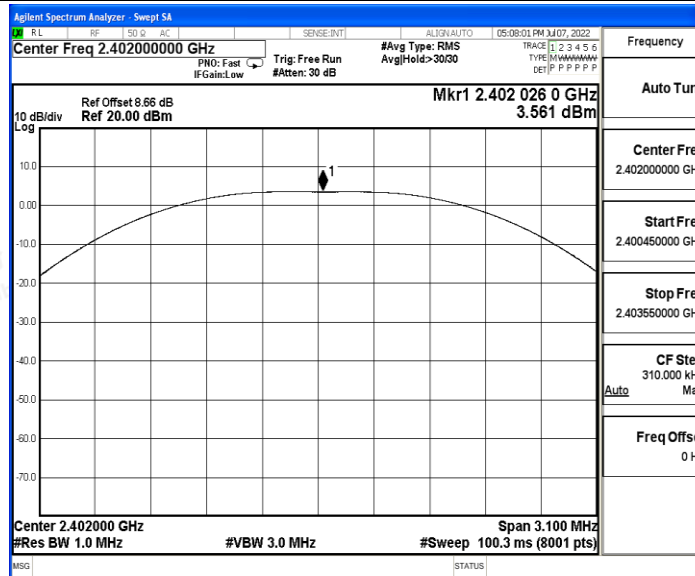
TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	3.56	≤30	PASS
		2440	3.52	≤30	PASS
		2480	4.43	≤30	PASS
BLE_2M	Ant1	2402	3.12	≤30	PASS
		2440	3.17	≤30	PASS
		2480	4.19	≤30	PASS



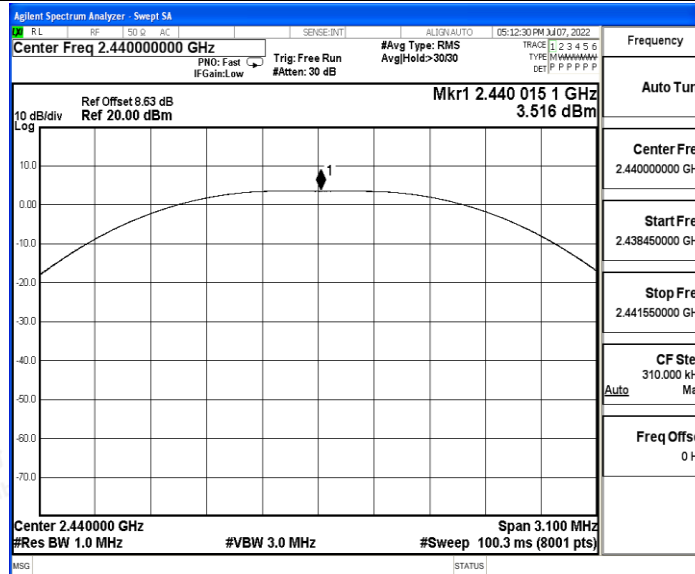


Test Graphs

BLE_1M_Ant1_2402

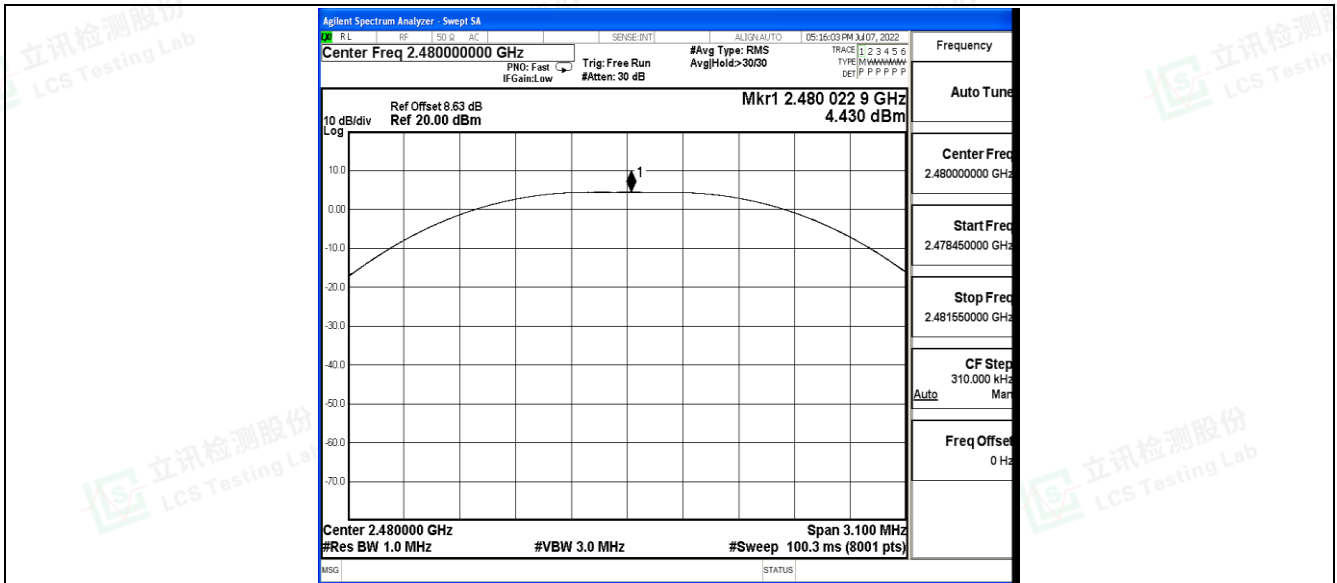


BLE_1M_Ant1_2440

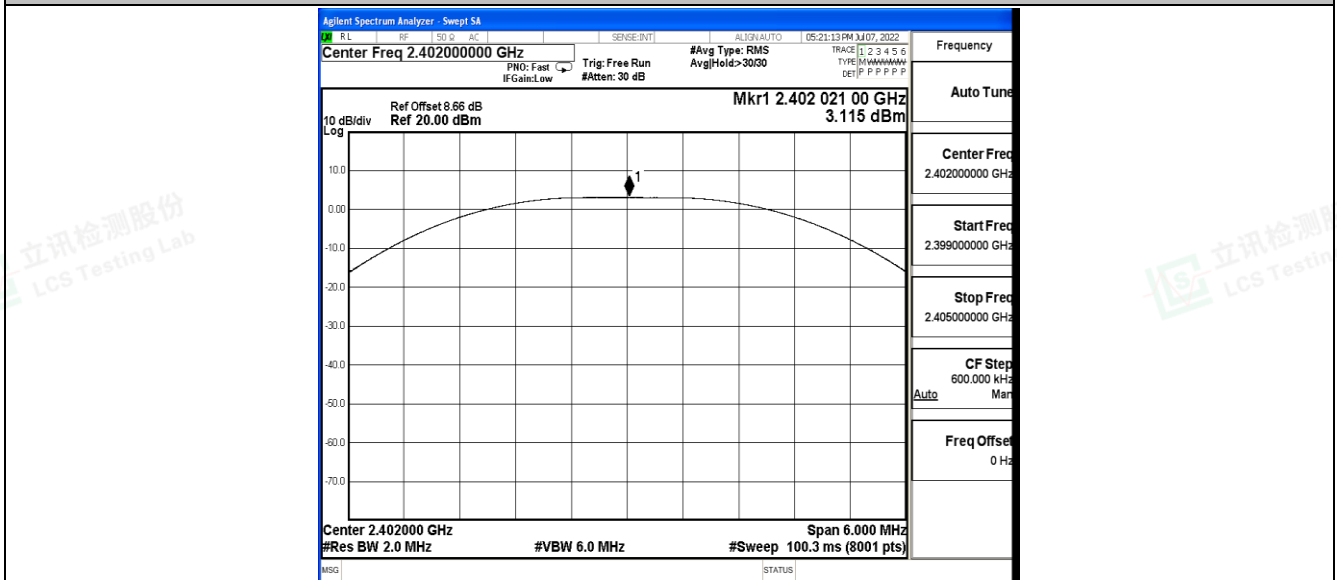


BLE_1M_Ant1_2480



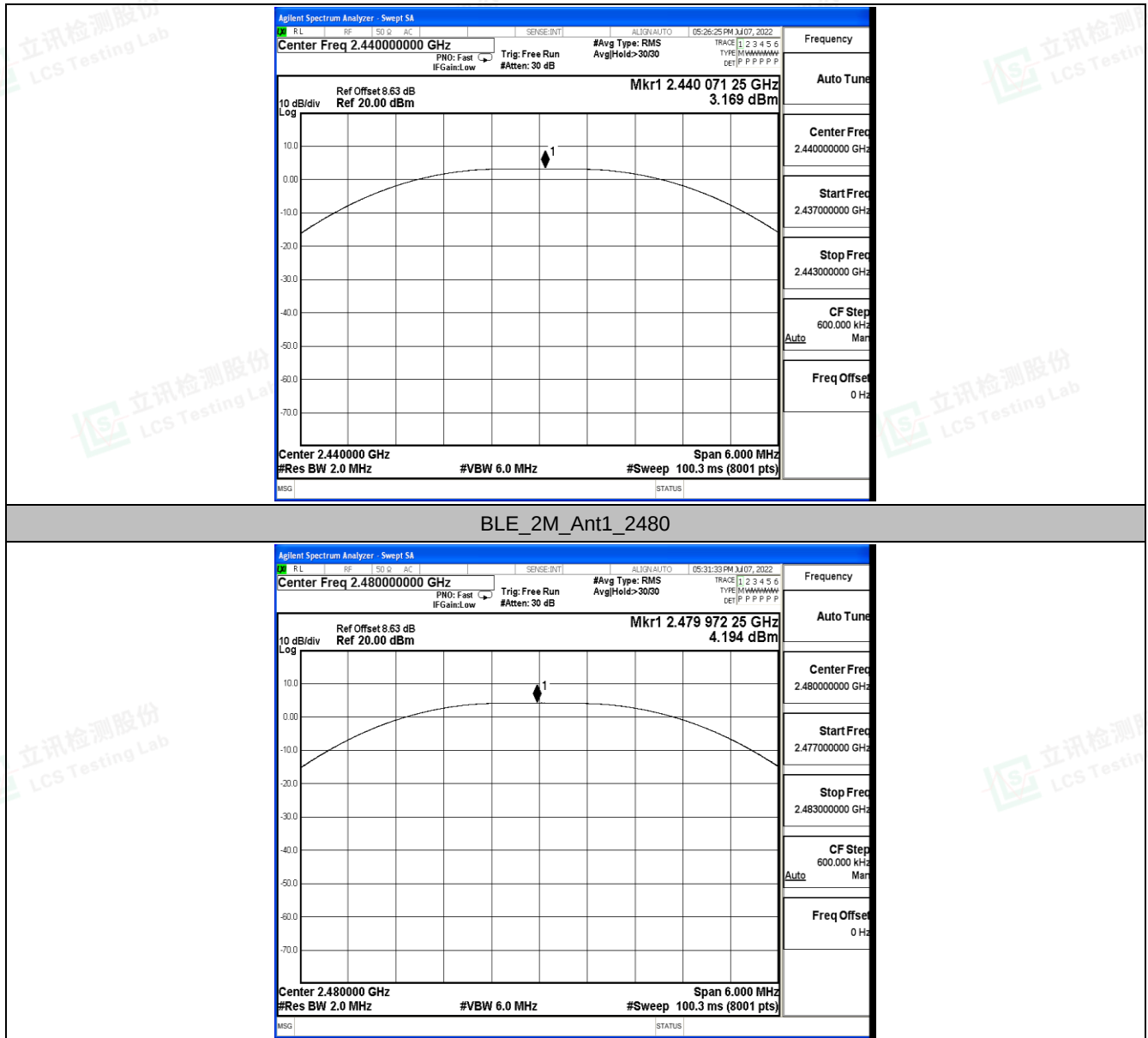


BLE_2M_Ant1_2402



BLE_2M_Ant1_2440







B.3 Maximum power spectral density

Test Result

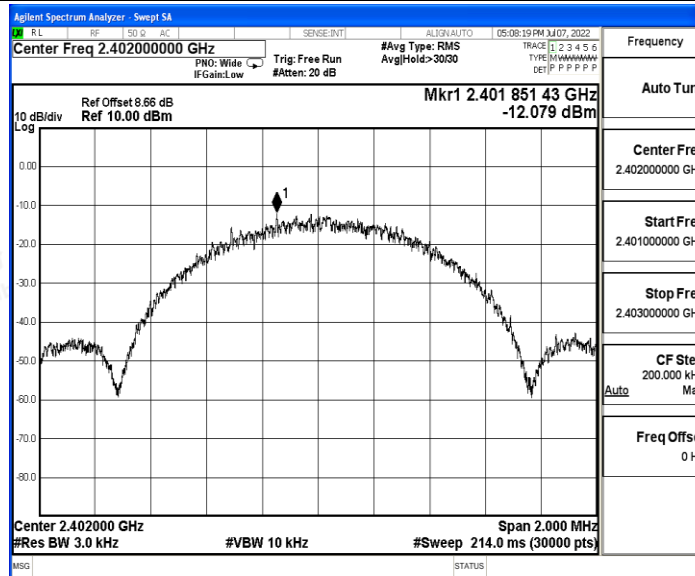
TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-12.08	≤8.00	PASS
		2440	-11.57	≤8.00	PASS
		2480	-11.86	≤8.00	PASS
BLE_2M	Ant1	2402	-13.69	≤8.00	PASS
		2440	-15.15	≤8.00	PASS
		2480	-12.26	≤8.00	PASS



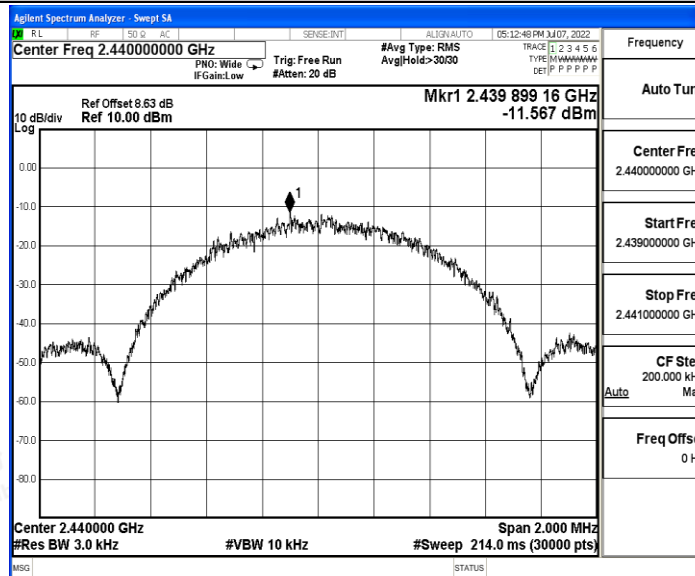


Test Graphs

BLE_1M_Ant1_2402

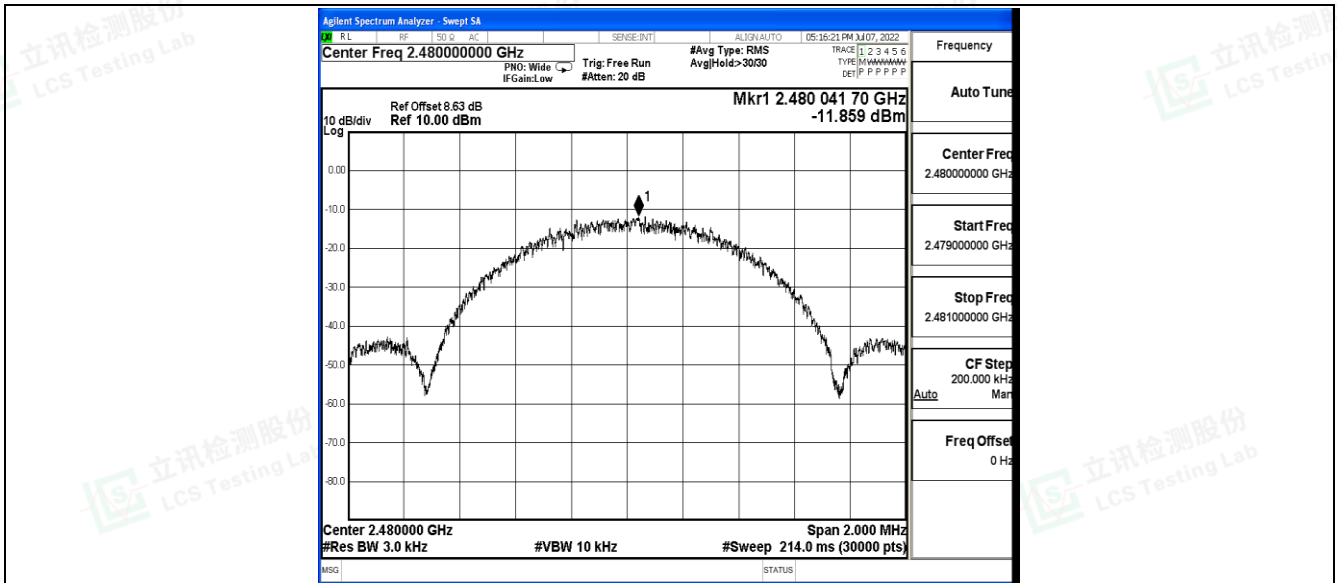


BLE_1M_Ant1_2440

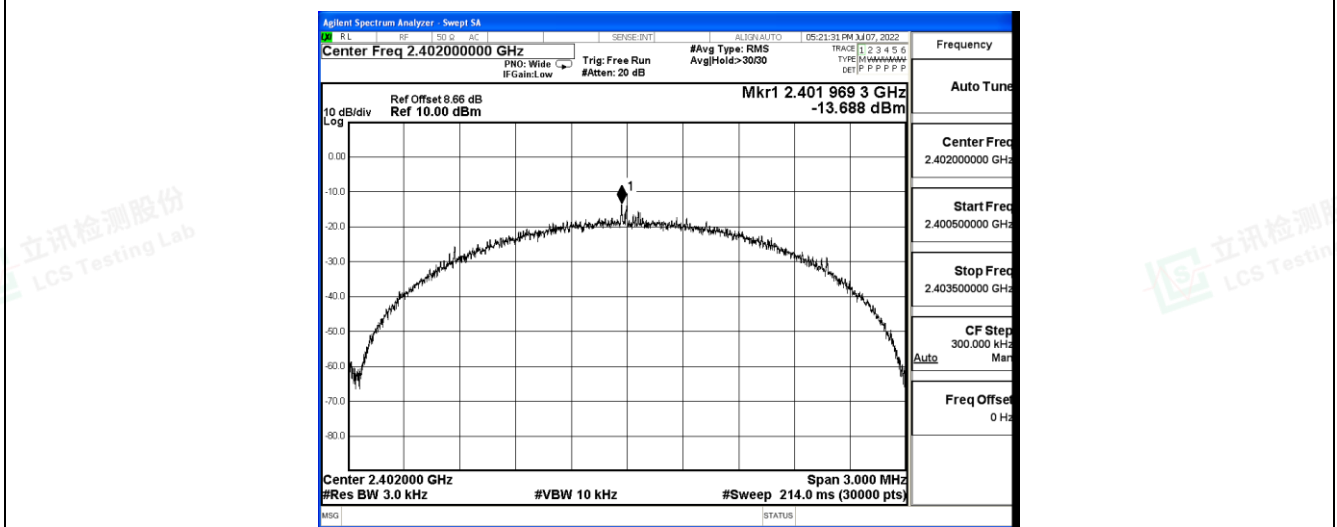


BLE_1M_Ant1_2480

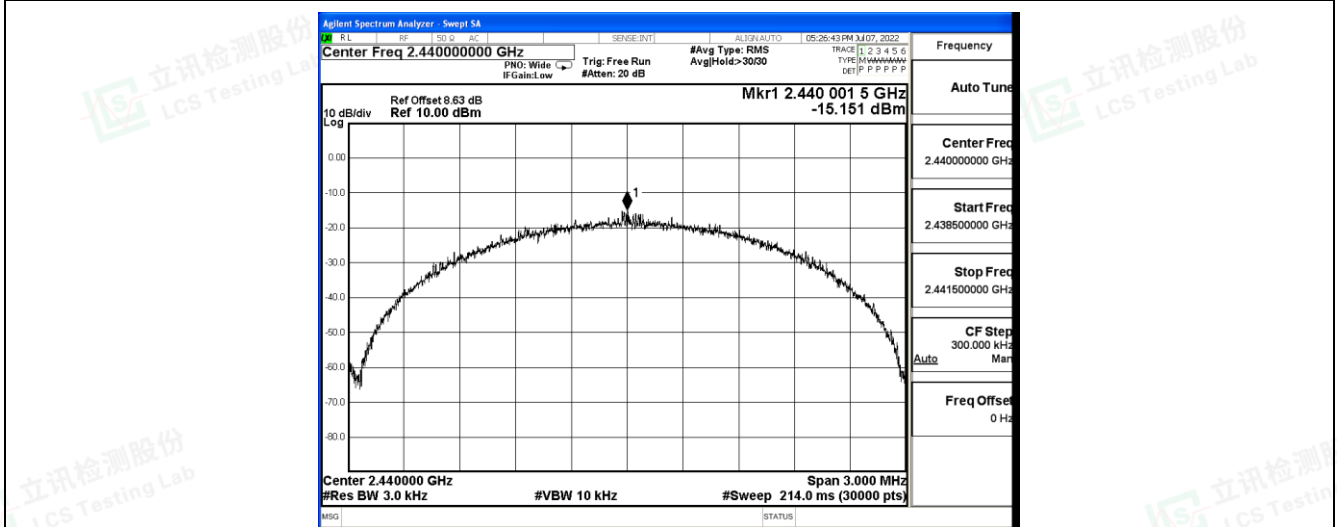




BLE_2M_Ant1_2402

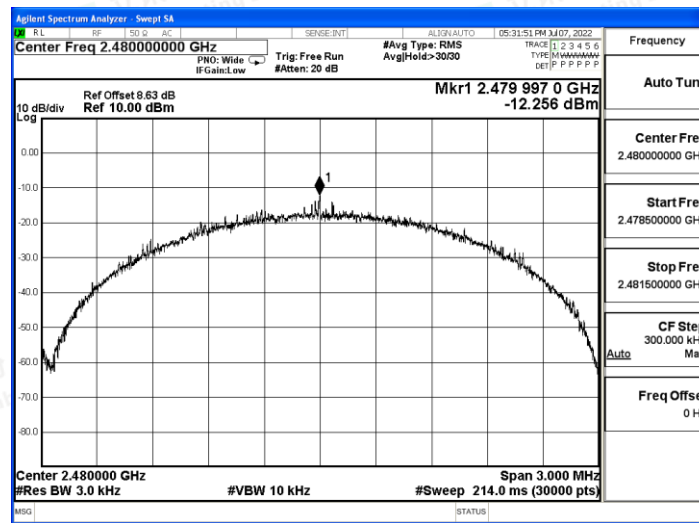


BLE_2M_Ant1_2440





BLE_2M_Ant1_2480





B.4 Band edge measurements

Test Result

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	-0.19	-57.89	≤-20.19	PASS
		High	2480	4.48	-56.43	≤-15.53	PASS
BLE_2M	Ant1	Low	2402	2.92	-33.26	≤-17.08	PASS
		High	2480	4.00	-55.14	≤-16	PASS

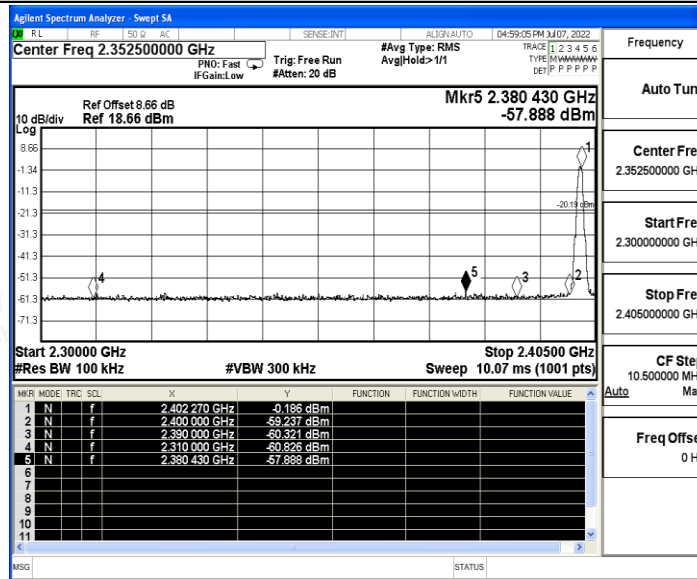


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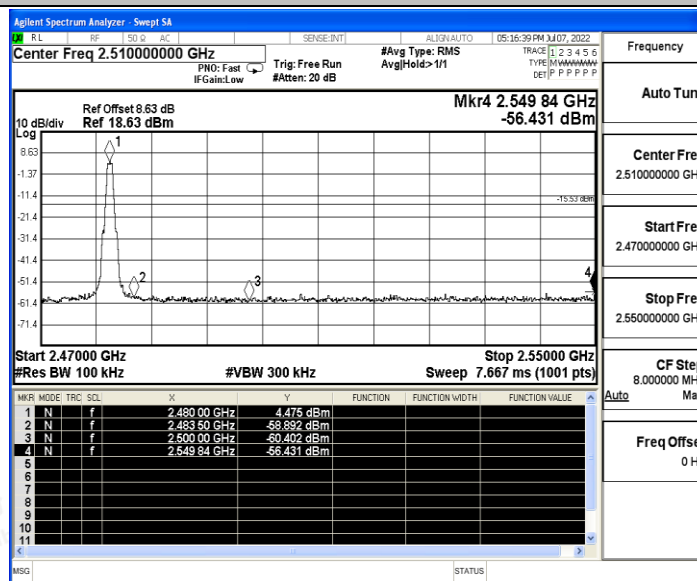


Test Graphs

BLE_1M_Ant1_Low_2402

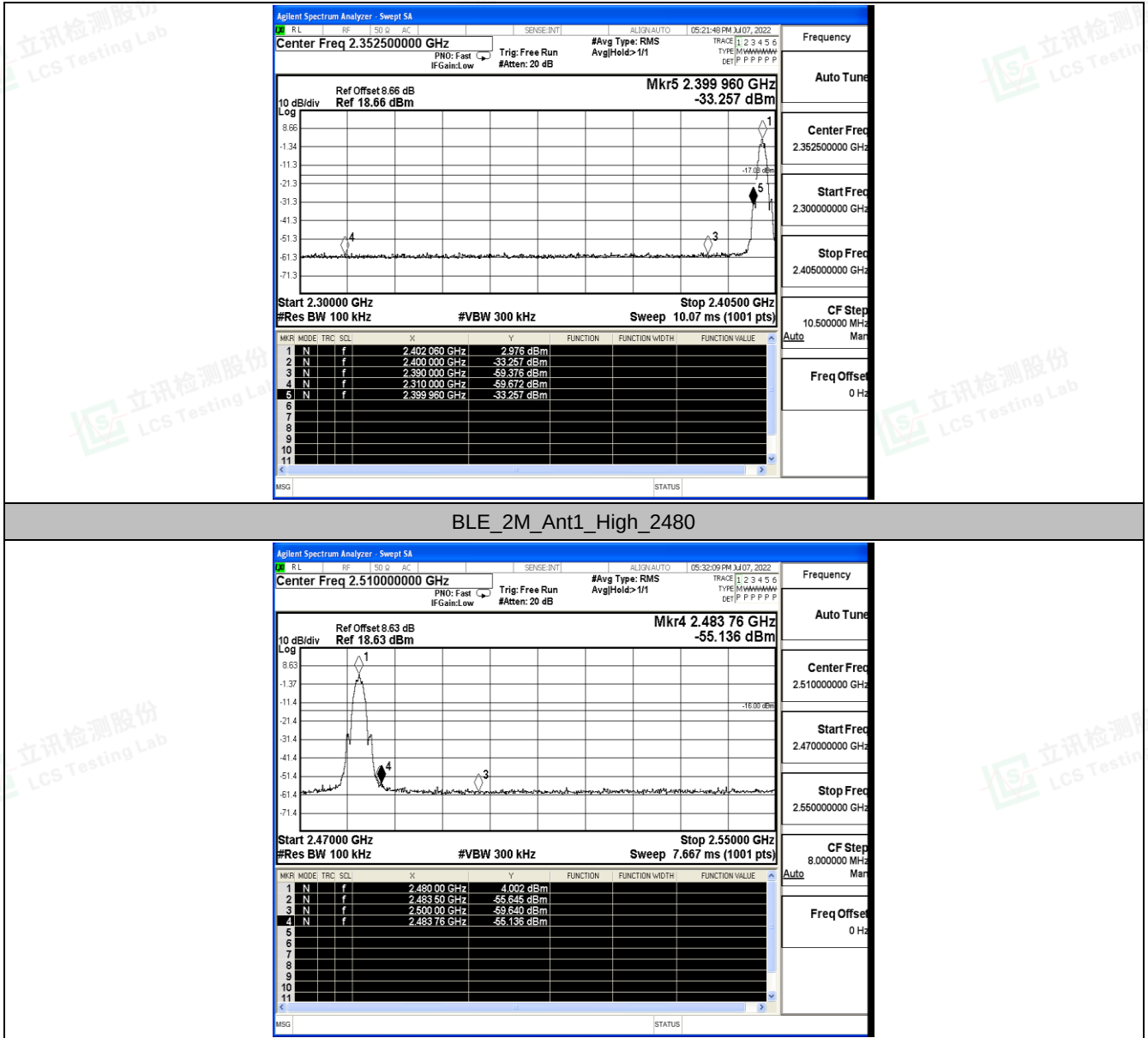


BLE_1M_Ant1_High_2480



BLE_2M_Ant1_Low_2402







B.5 Conducted Spurious Emission

Test Result

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	3.46	3.46	---	PASS
			30~1000	3.46	-60.69	≤-16.54	PASS
			1000~26500	3.46	-45.3	≤-16.54	PASS
		2440	Reference	3.38	3.38	---	PASS
			30~1000	3.38	-60.46	≤-16.62	PASS
			1000~26500	3.38	-45.48	≤-16.62	PASS
		2480	Reference	4.34	4.34	---	PASS
			30~1000	4.34	-60.5	≤-15.66	PASS
			1000~26500	4.34	-45.95	≤-15.66	PASS
BLE_2M	Ant1	2402	Reference	2.89	2.89	---	PASS
			30~1000	2.89	-60.47	≤-17.11	PASS
			1000~26500	2.89	-45.26	≤-17.11	PASS
		2440	Reference	2.96	2.96	---	PASS
			30~1000	2.96	-60.52	≤-17.04	PASS
			1000~26500	2.96	-45.86	≤-17.04	PASS
		2480	Reference	3.85	3.85	---	PASS
			30~1000	3.85	-60.54	≤-16.15	PASS
			1000~26500	3.85	-46.06	≤-16.15	PASS



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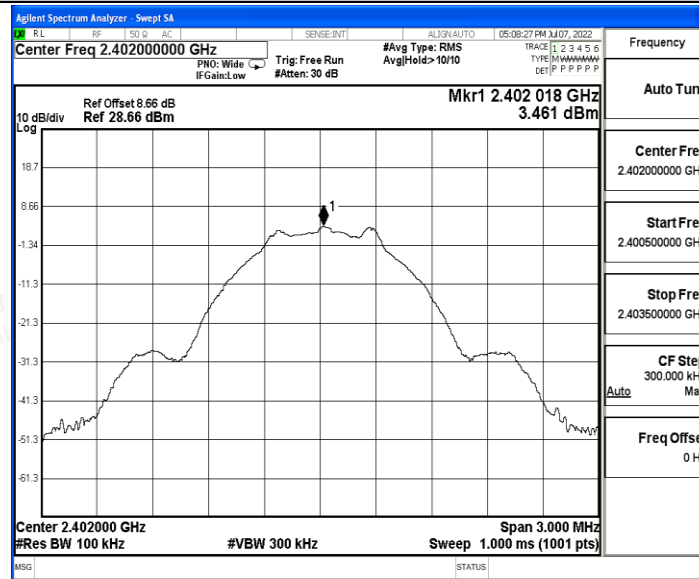
Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com

Scan code to check authenticity

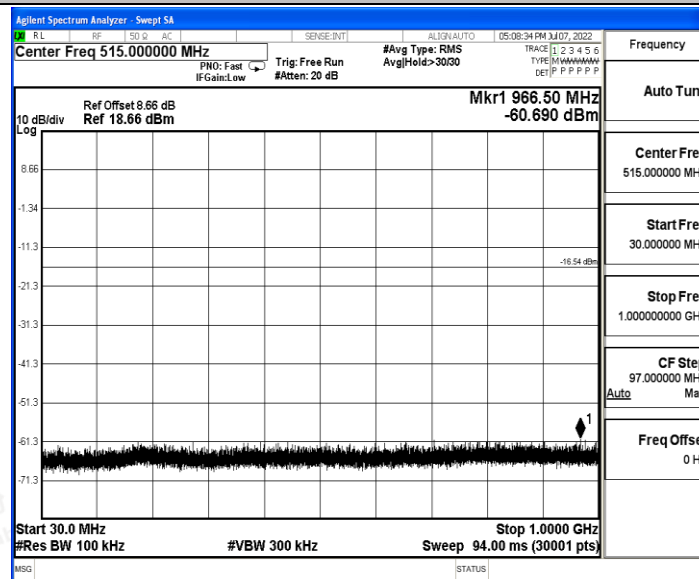


Test Graphs

BLE_1M_Ant1_2402_0~Reference

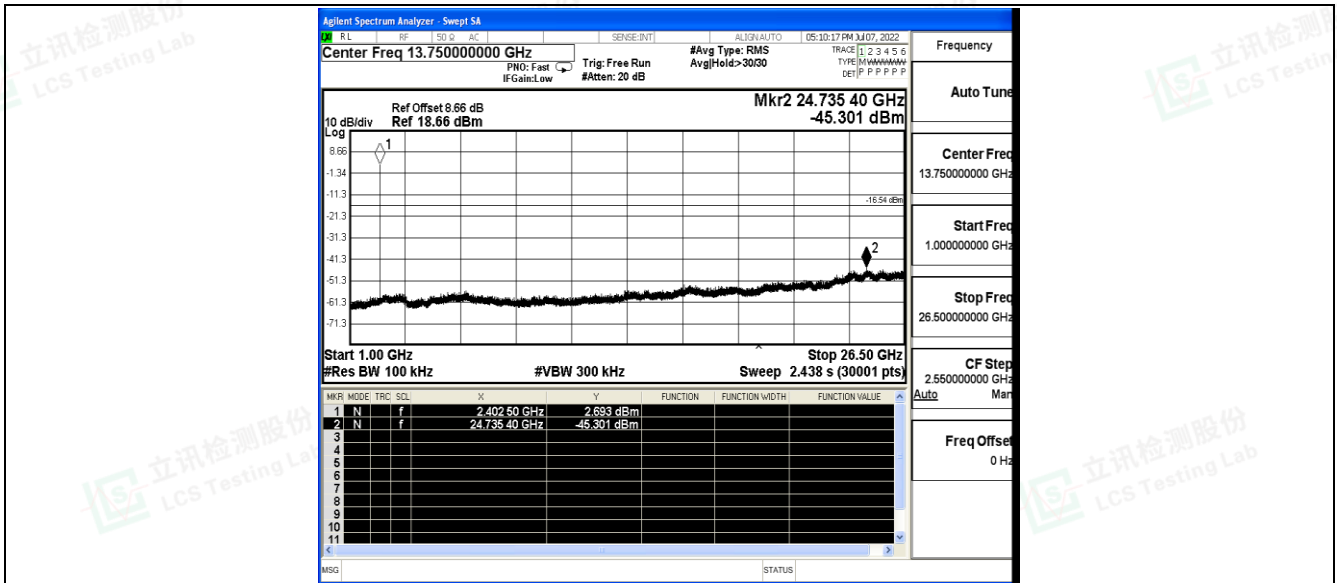


BLE_1M_Ant1_2402_30~1000

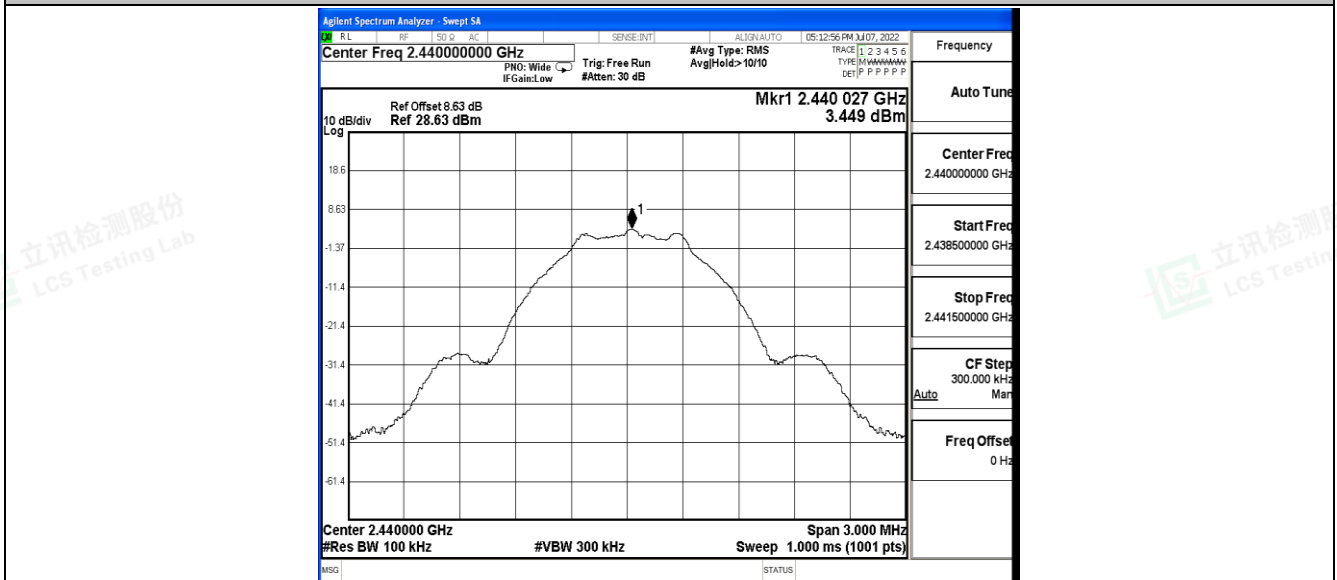


BLE_1M_Ant1_2402_1000~26500



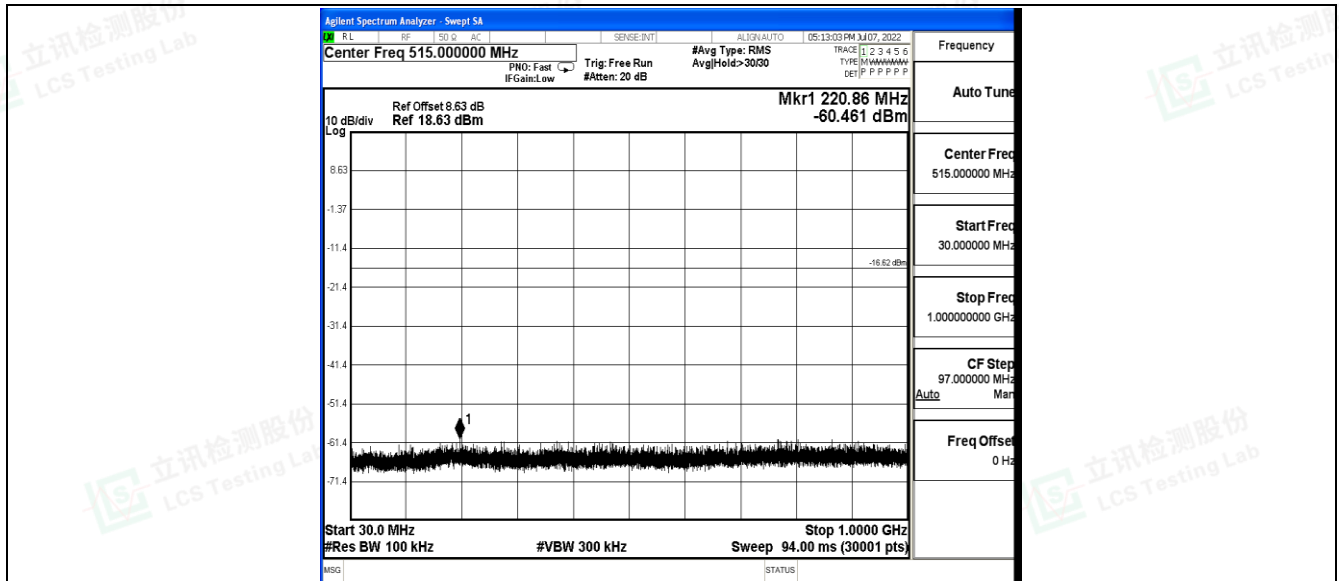


BLE_1M_Ant1_2440_0~Reference

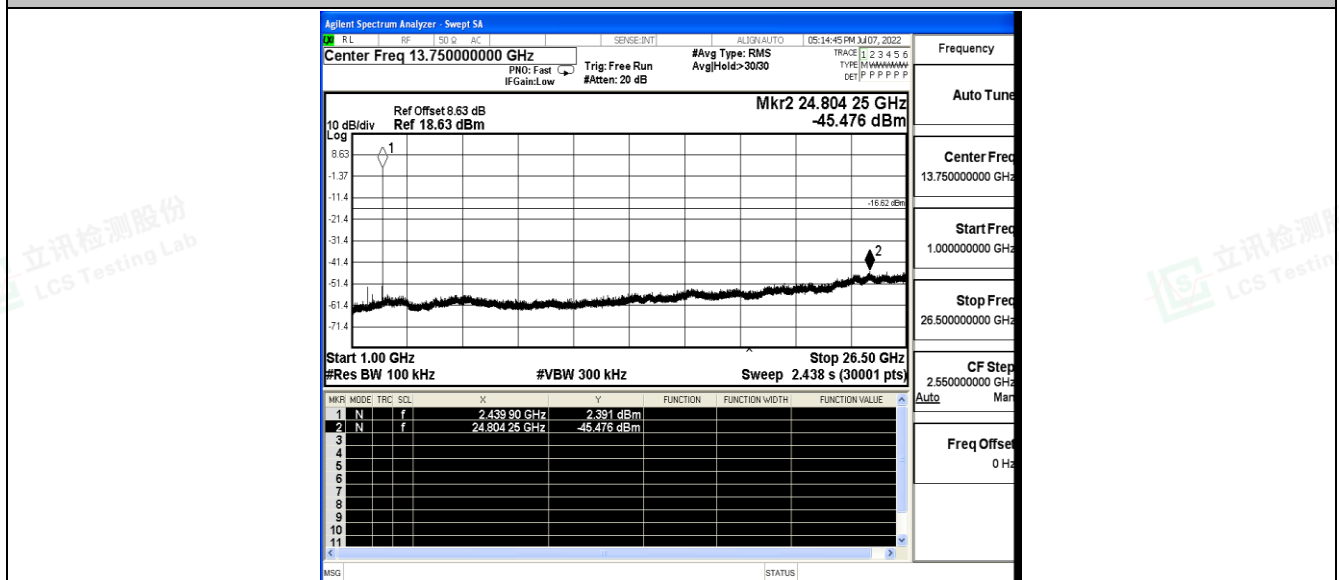


BLE_1M_Ant1_2440_30~1000



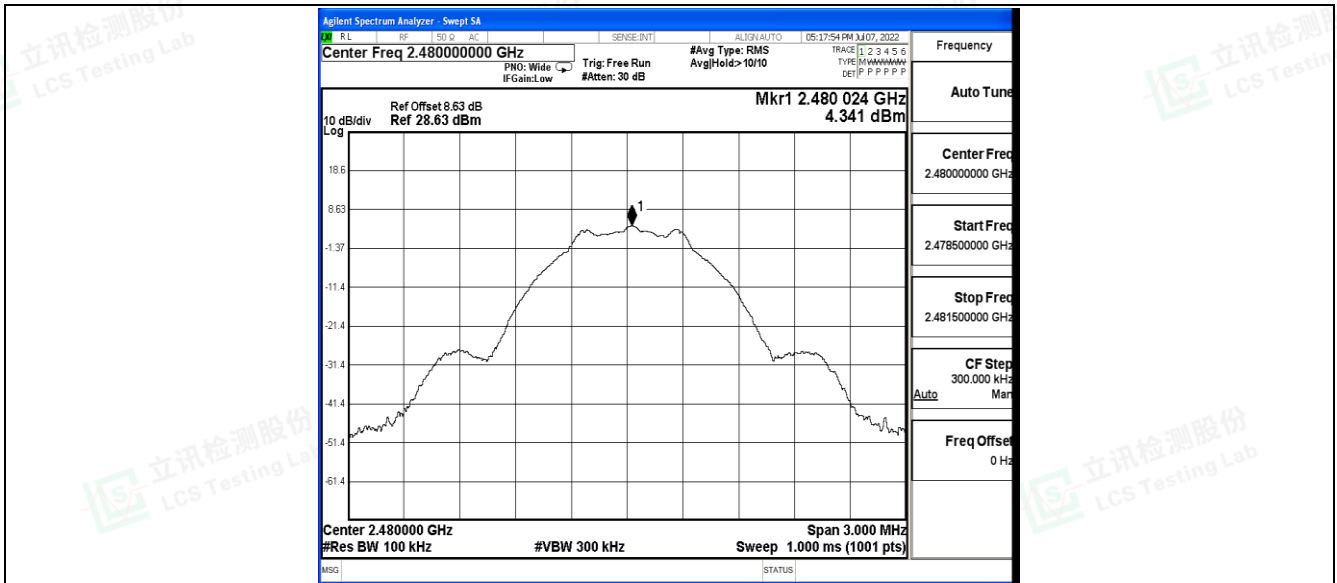


BLE_1M_Ant1_2440_1000~26500

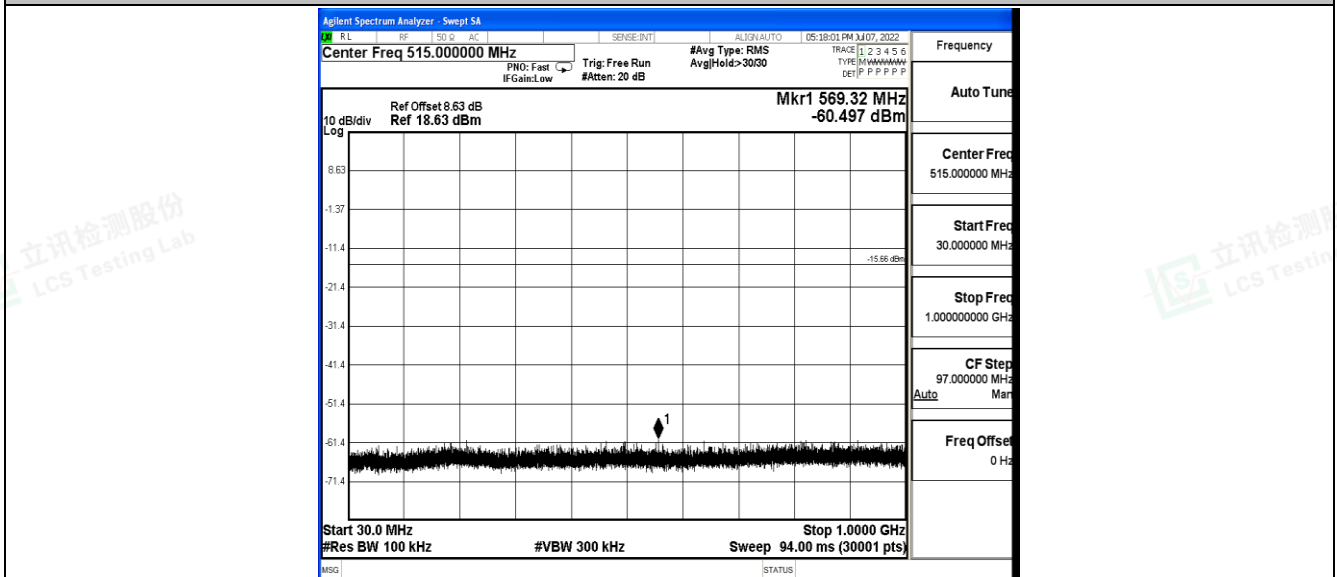


BLE_1M_Ant1_2480_0~Reference



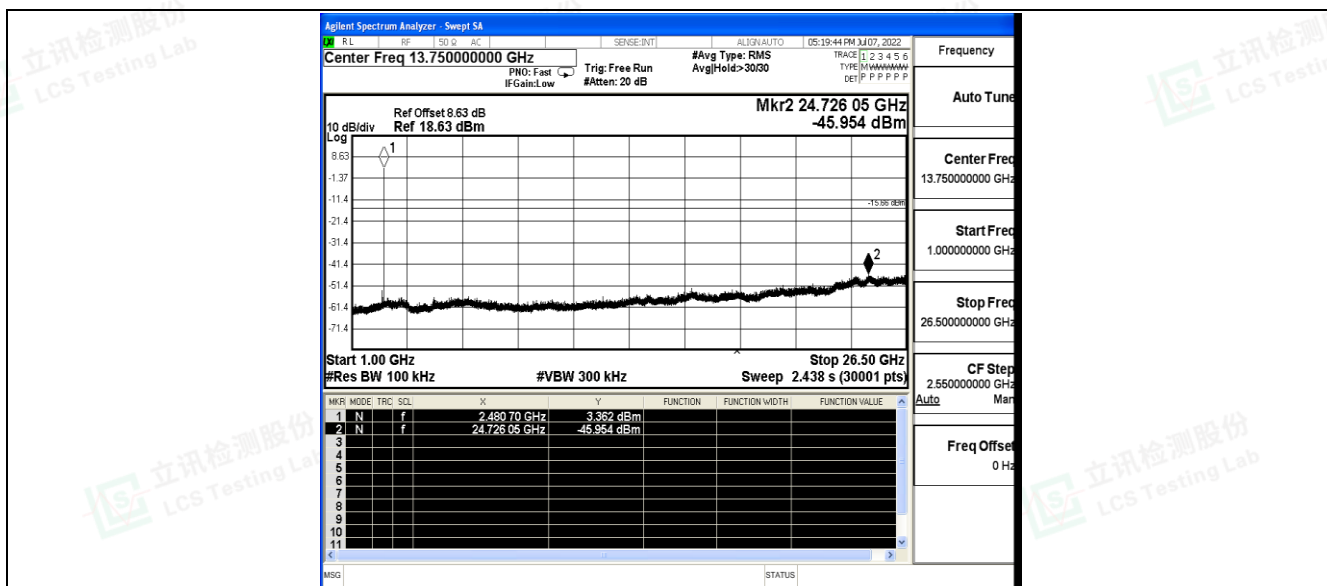


BLE_1M_Ant1_2480_30~1000

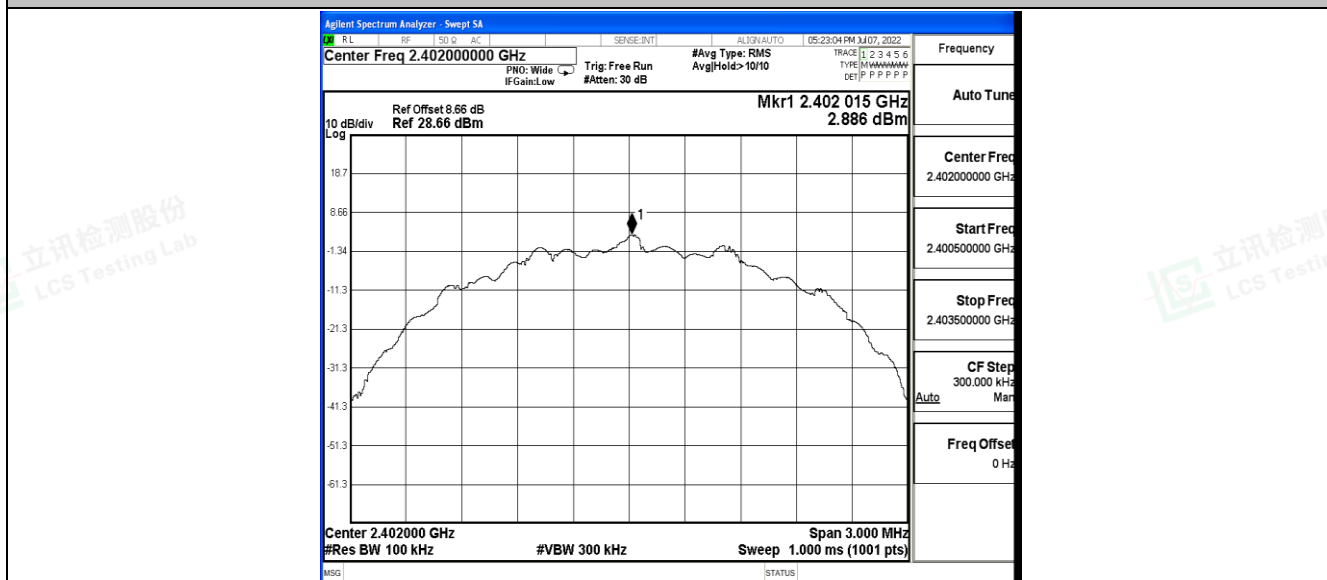


BLE_1M_Ant1_2480_1000~26500



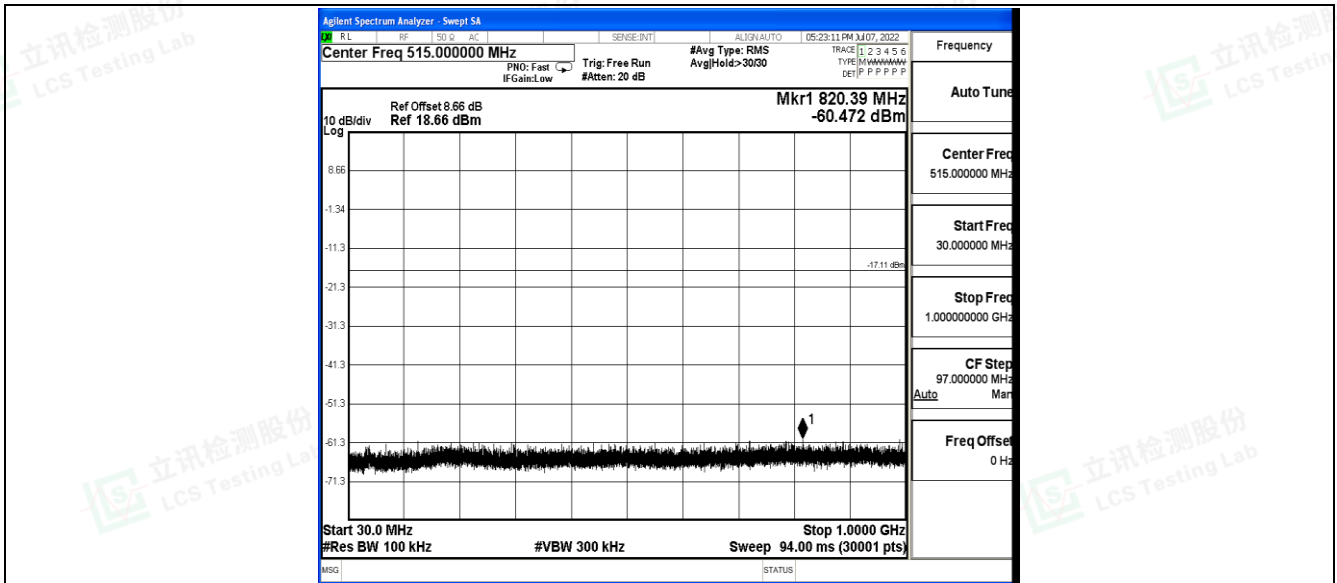


BLE_2M_Ant1_2402_0~Reference

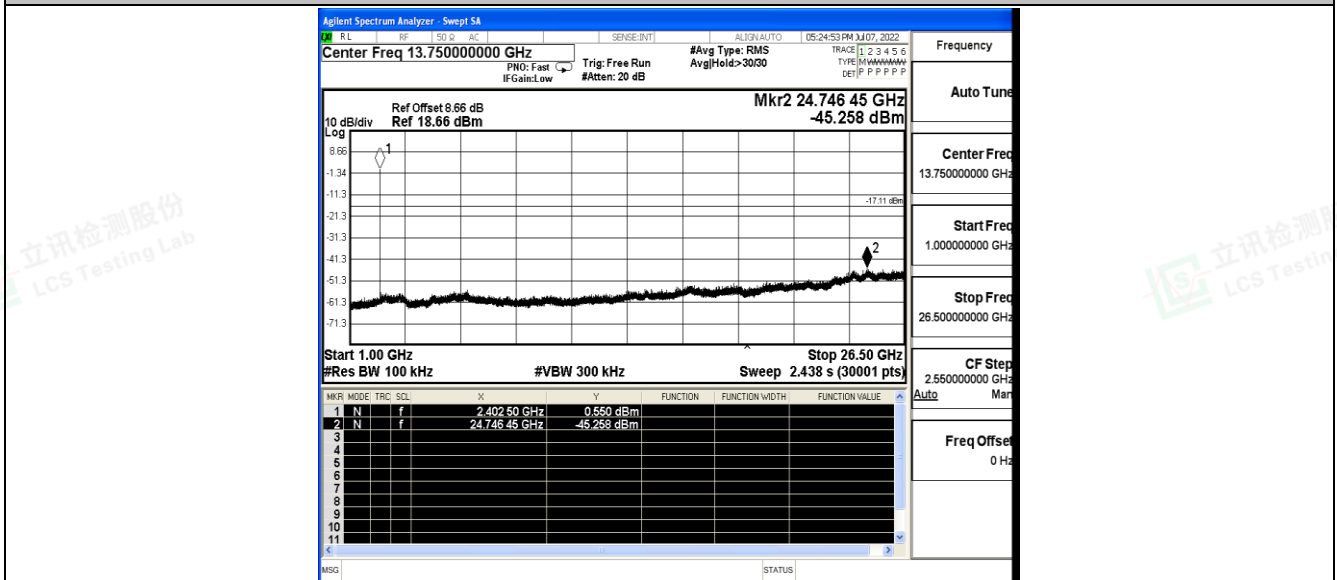


BLE_2M_Ant1_2402_30~1000



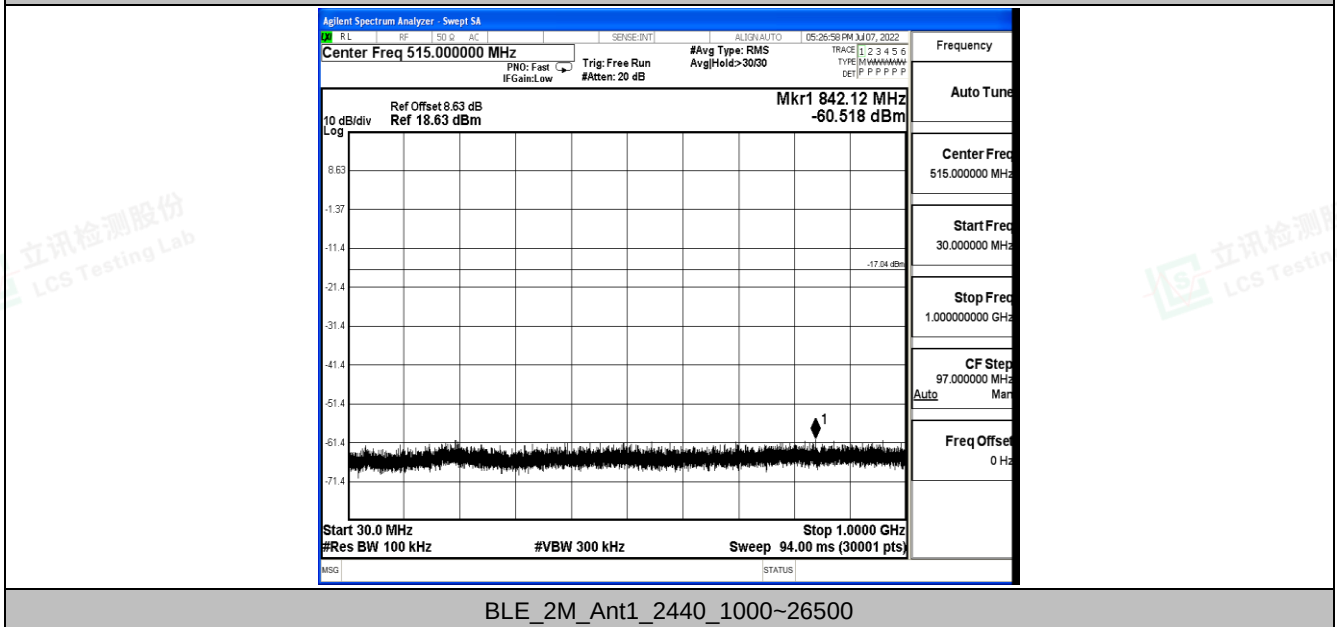
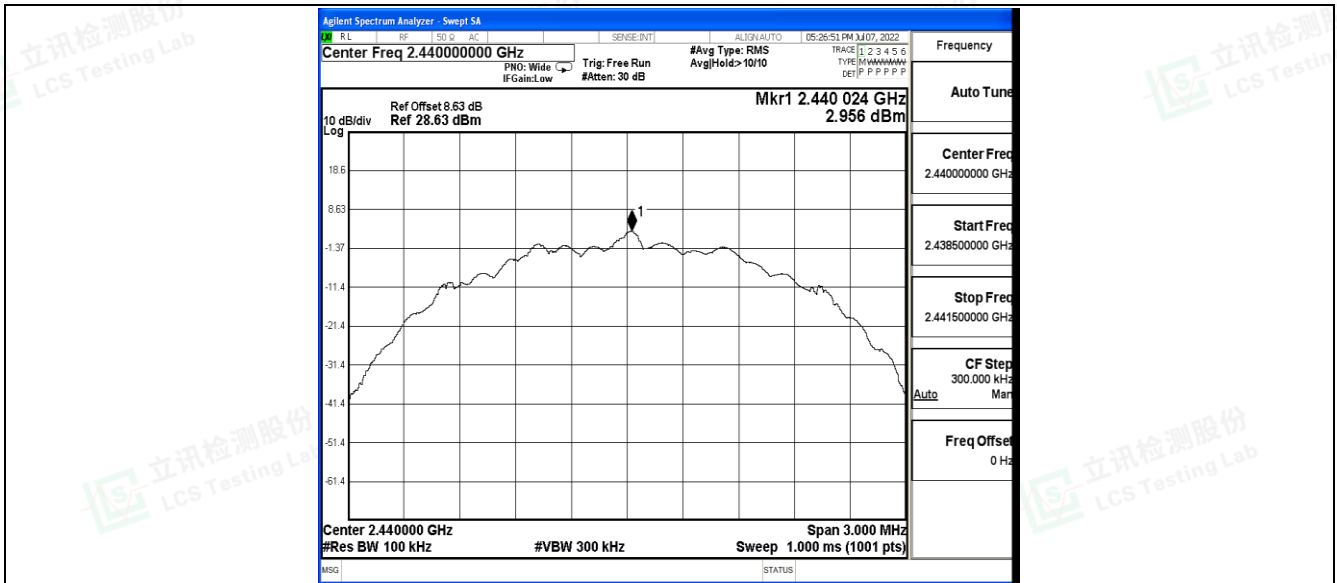


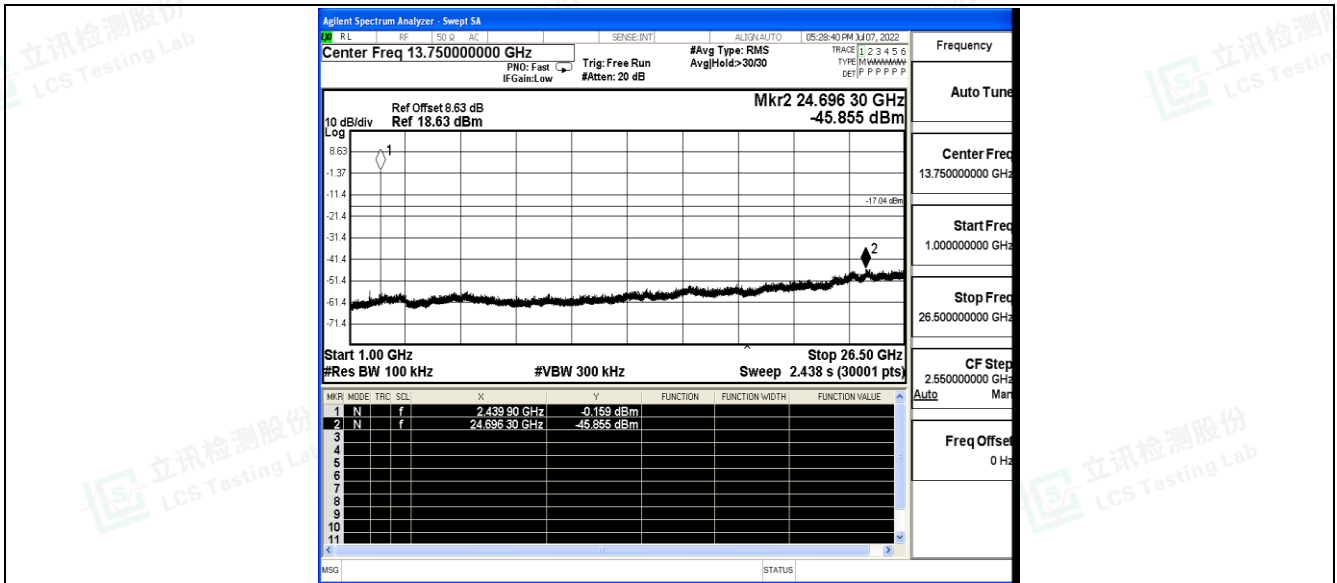
BLE_2M_Ant1_2402_1000~26500



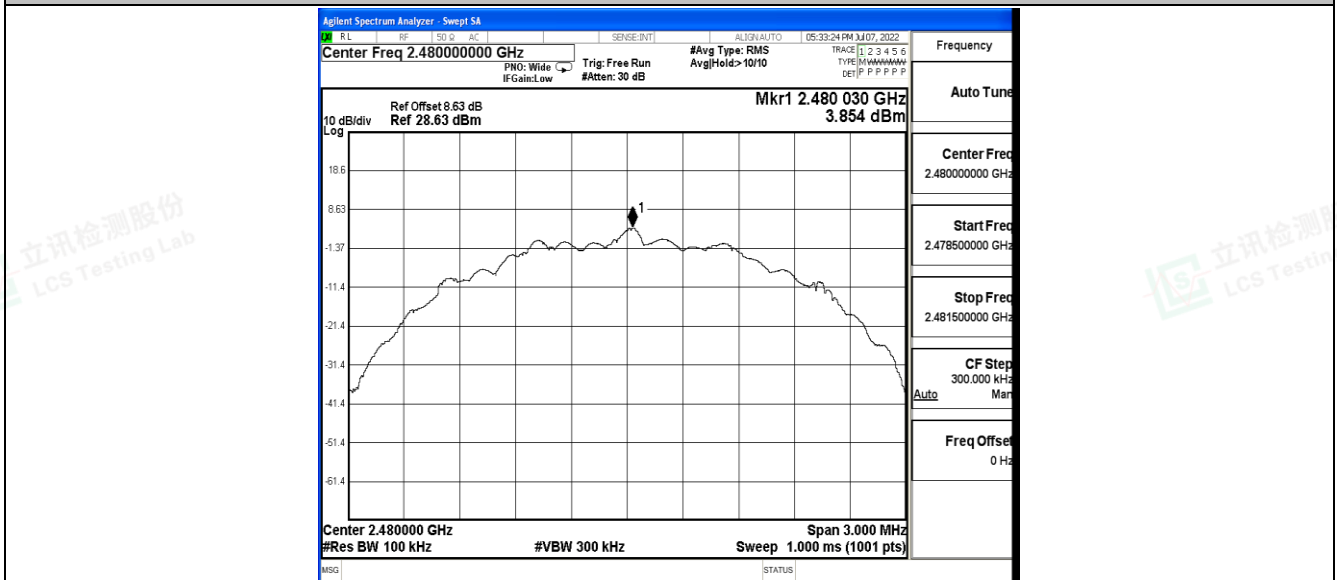
BLE_2M_Ant1_2440_0~Reference





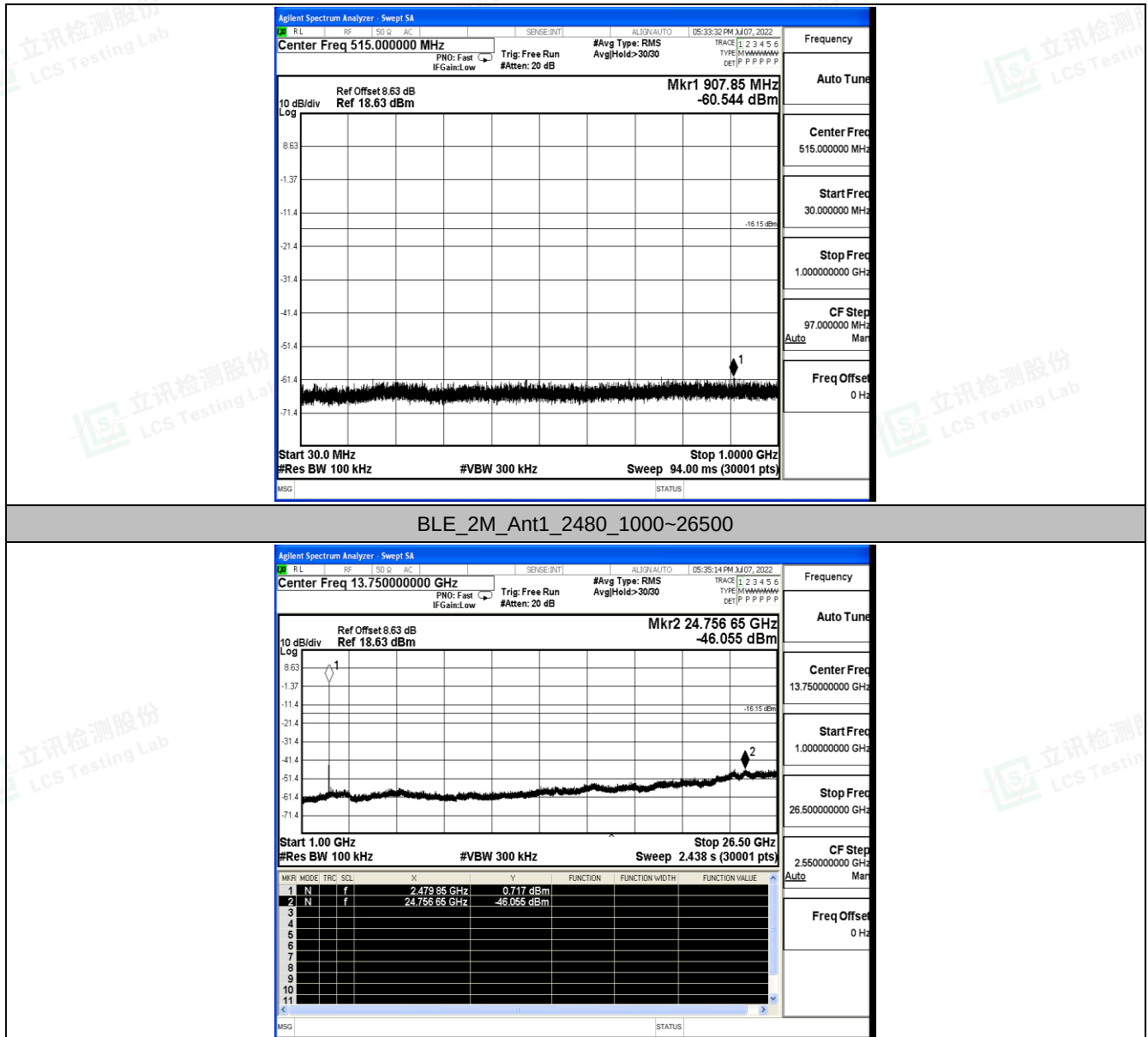


BLE_2M_Ant1_2480_0~Reference



BLE_2M_Ant1_2480_30~1000







B.6 Duty Cycle

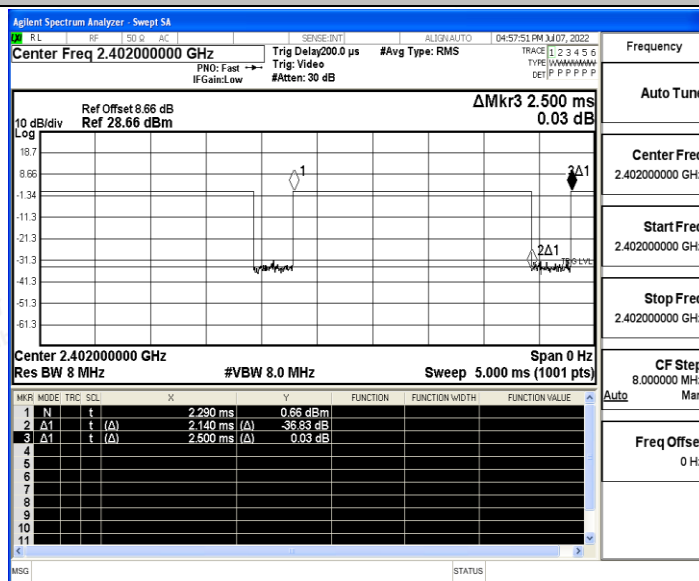
Test Result

TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	1/T	Limit	Verdict
BLE_1M	Ant1	2402	2.14	2.50	0.8560	85.60	0.68	0.47	---	---
		2440	2.14	2.50	0.8560	85.60	0.68	0.47	---	---
		2480	2.14	2.50	0.8560	85.60	0.68	0.47	---	---
BLE_2M	Ant1	2402	1.08	1.88	0.5745	57.45	2.41	0.93	---	---
		2440	1.08	1.88	0.5745	57.45	2.41	0.93	---	---
		2480	1.08	1.88	0.5745	57.45	2.41	0.93	---	---





Test Graphs



Agilent Spectrum Analyzer - Sweep SA

U I RL RF SD G AC SENSE INT1 ALIGN AUTO 05:11:53 PM 1/07, 2022
Center Freq 2.440000000 GHz Trig Delay 200.0 μ s #Avg Type: RMS TRACE 1 2 3 4 5
 PNO: Fast IF Gain: Low Trig: Video TYPE: DAWHAMM de P P P P P P
 #Atten: 30 dB

Ref Offset 8.63 dB Δ Mkr3 2.500 ms
 Ref 28.63 dBm -0.04 dB

10 dB/div Log
 18.6
 8.63
 -1.37
 -11.4
 -21.4
 -31.4
 -41.4
 -51.4
 -61.4

Center 2.440000000 GHz Span 0 Hz
 Res BW 8 MHz #VBW 8.0 MHz Sweep 5.000 ms (1001 pts)

MKR	MODE	TRC	SDL	X	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE
1	N	t		2.230 ms	3.56 dBm			
2	Δ 1	t	(Δ)	2.140 ms (Δ)	-40.77 dB			
3	Δ 1	t	(Δ)	2.500 ms (Δ)	-0.04 dB			
4								
5								
6								
7								
8								
9								
10								
11								

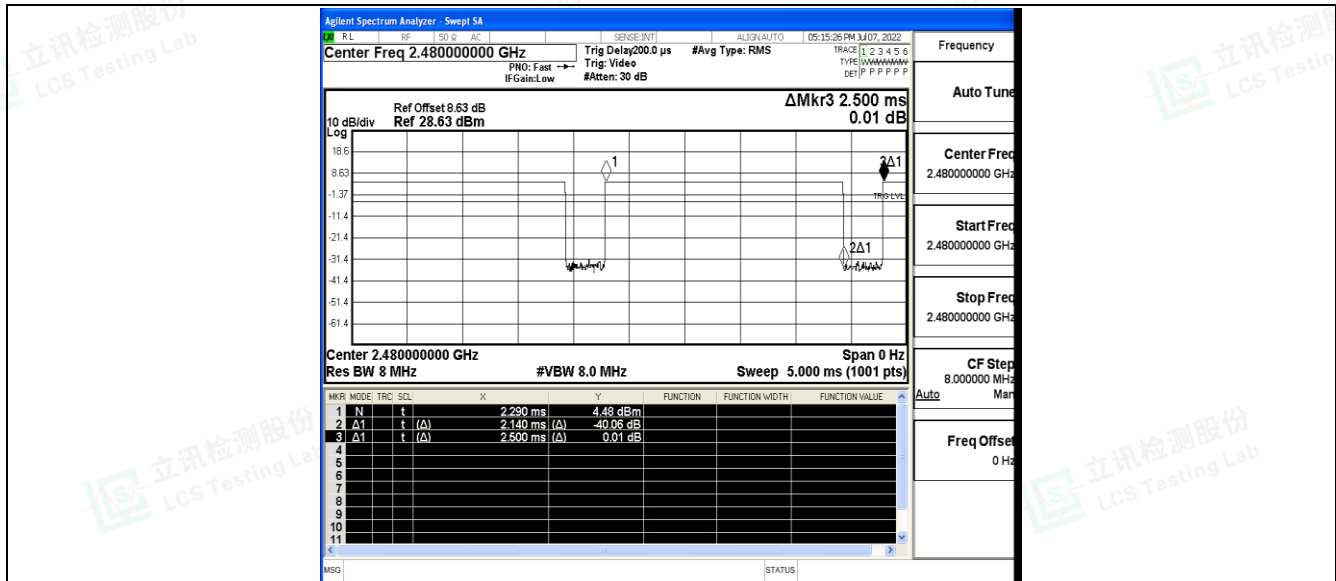
Auto
 CF Step 8.000000 MHz
 Freq Offset 0 Hz

MSG [STATUS]

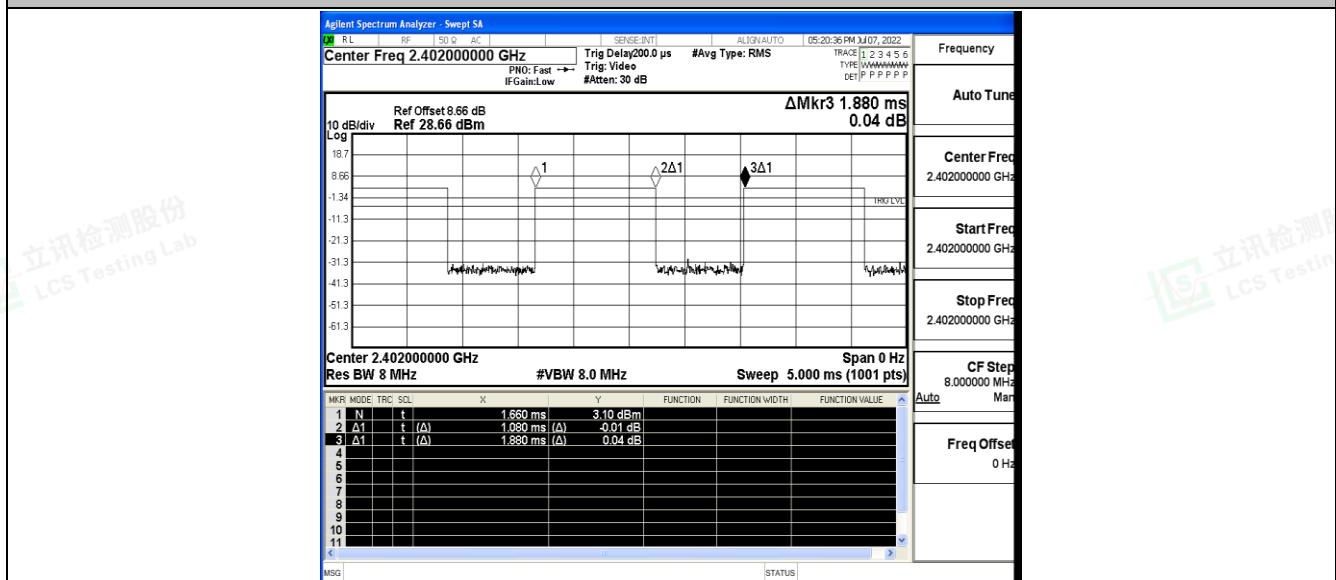
BLE 1M Ant1 2480



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518000, China
Tel: +(86) 0755-82591330 | E-mail: webmaster@lcs-cert.com | Web: www.lcs-cert.com
Scan code to check authenticity

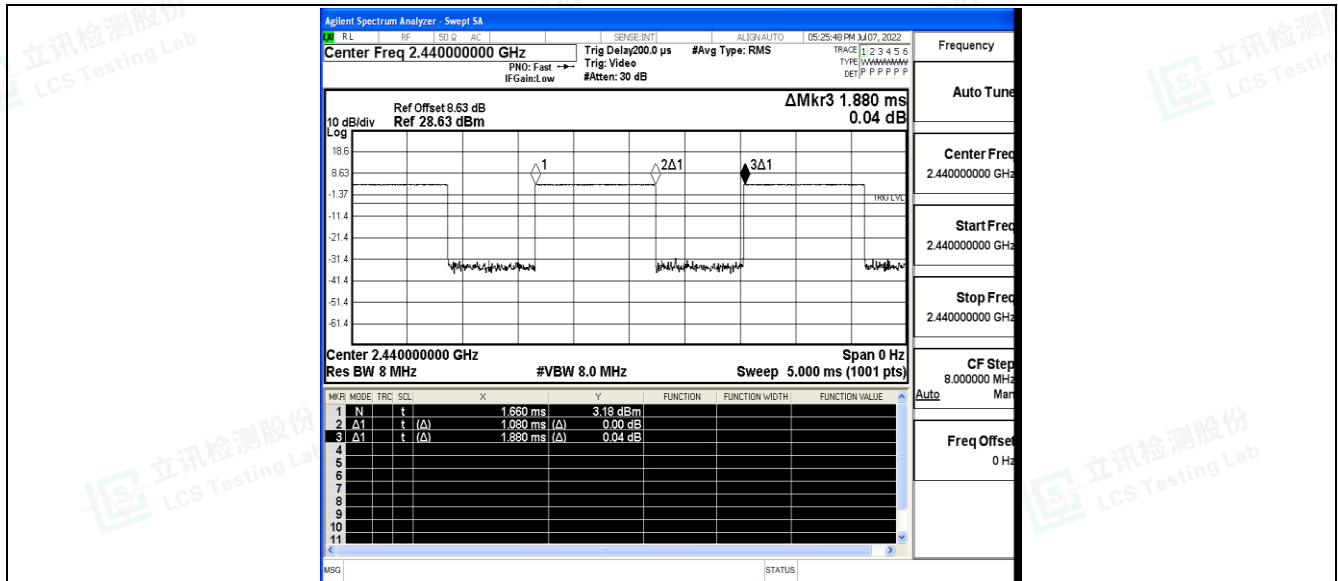


BLE_2M_Ant1_2402

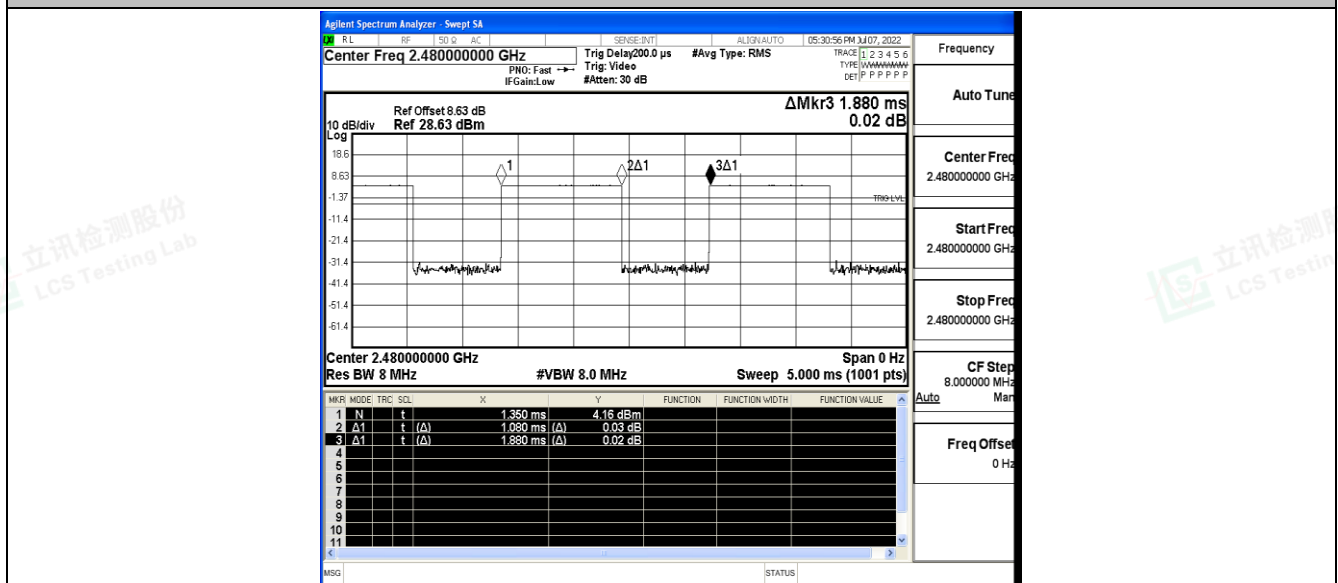


BLE_2M_Ant1_2440





BLE_2M_Ant1_2480





B.7 Emissions in Restricted Bands

Test Result

TestMode	Antenna	ChName	Channel	Detector	Freq. [MHz]	Result [dBm]	Limit [dBm]	Result [dBuV/m]	Limit [dBuV/m]	Verdict
BLE_1M	Ant1	Low	2402	AV	2310.000	-57.87	≤-41.20	37.33	≤54	PASS
				AV	2381.690	-57.34	≤-41.20	37.86	≤54	PASS
				AV	2390.000	-57.48	≤-41.20	37.72	≤54	PASS
				Peak	2310.000	-48.48	≤-21.20	46.72	≤74	PASS
				Peak	2375.600	-45.97	≤-21.20	49.23	≤74	PASS
				Peak	2390.000	-47.3	≤-21.20	47.90	≤74	PASS
		High	2480	AV	2483.500	-50.94	≤-41.20	44.26	≤54	PASS
				AV	2483.520	-50.94	≤-41.20	44.26	≤54	PASS
				AV	2500.000	-56.82	≤-41.20	38.38	≤54	PASS
				Peak	2483.500	-46.29	≤-21.20	48.91	≤74	PASS
				Peak	2499.440	-45.93	≤-21.20	49.27	≤74	PASS
				Peak	2500.000	-45.9	≤-21.20	49.30	≤74	PASS
BLE_2M	Ant1	Low	2402	AV	2310.000	-57.61	≤-41.20	37.59	≤54	PASS
				AV	2388.620	-56.93	≤-41.20	38.27	≤54	PASS
				AV	2390.000	-57.2	≤-41.20	38.00	≤54	PASS
				Peak	2310.000	-48.55	≤-21.20	46.65	≤74	PASS
				Peak	2360.900	-46.18	≤-21.20	49.02	≤74	PASS
				Peak	2390.000	-47.78	≤-21.20	47.42	≤74	PASS
		High	2480	AV	2483.500	-45.87	≤-41.20	49.33	≤54	PASS
				AV	2483.520	-45.87	≤-41.20	49.33	≤54	PASS
				AV	2500.000	-56.65	≤-41.20	38.55	≤54	PASS
				Peak	2483.500	-40.69	≤-21.20	54.51	≤74	PASS
				Peak	2483.520	-40.69	≤-21.20	54.51	≤74	PASS
				Peak	2500.000	-46.44	≤-21.20	48.76	≤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.

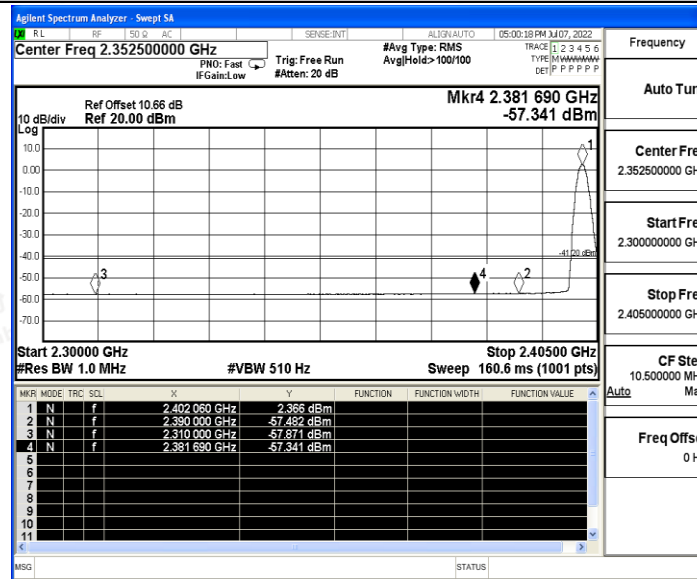


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Scan code to check authenticity

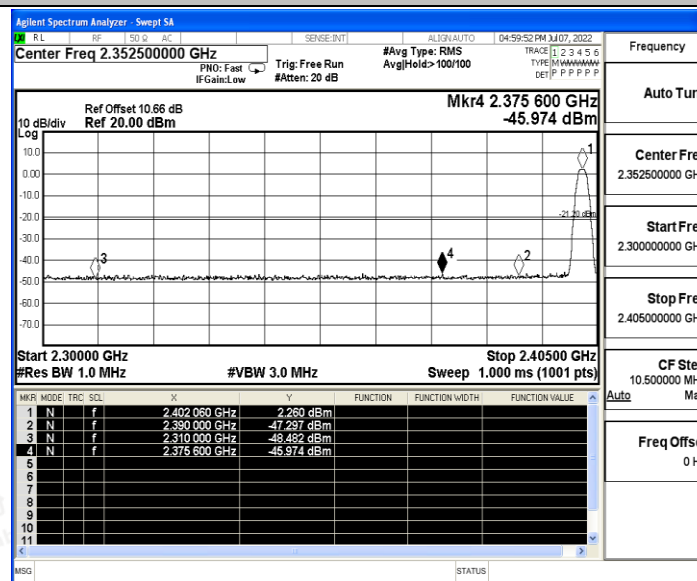


Test Graphs

BLE_1M_Ant1_Low_2402_AV

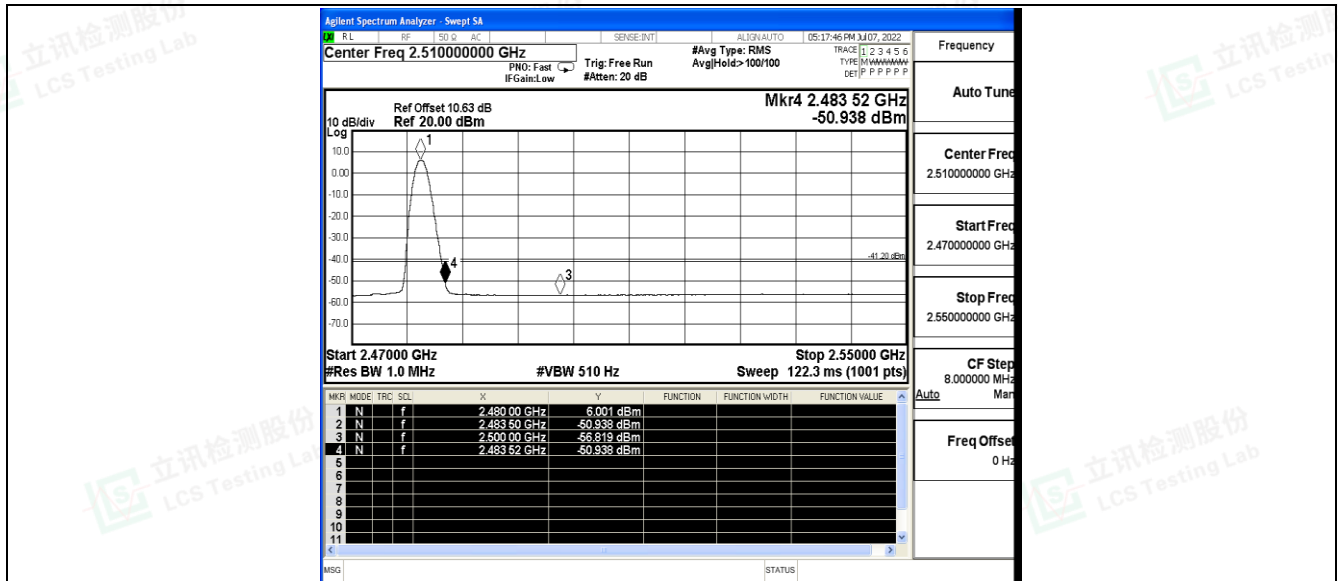


BLE_1M_Ant1_Low_2402_Peak

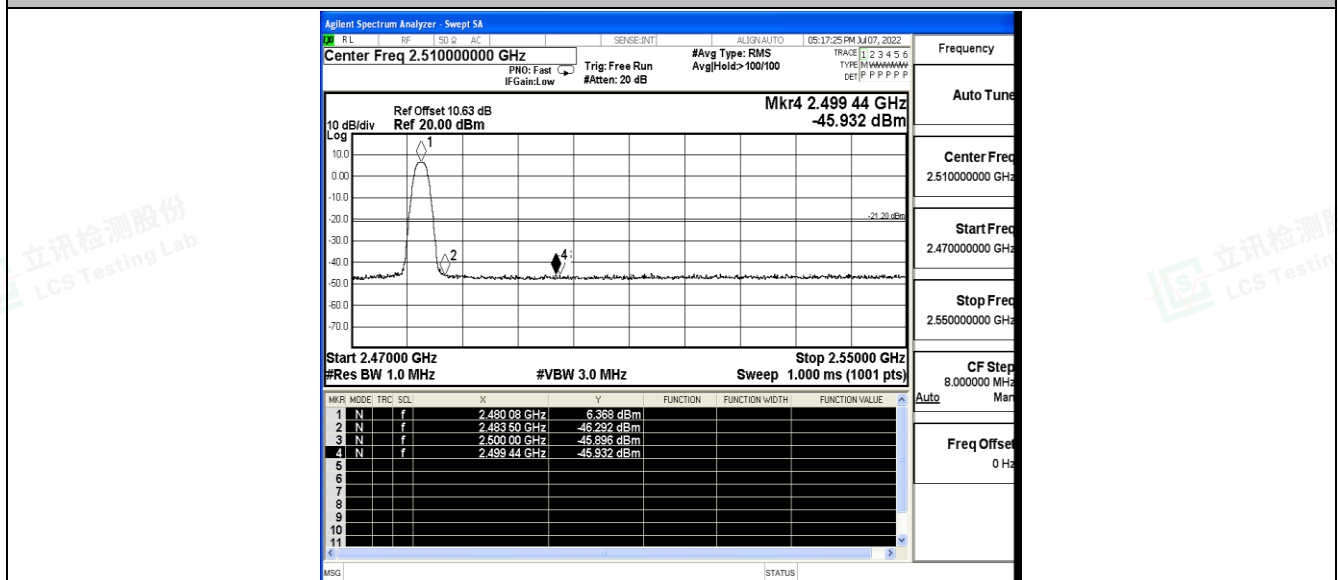


BLE_1M_Ant1_High_2480_AV



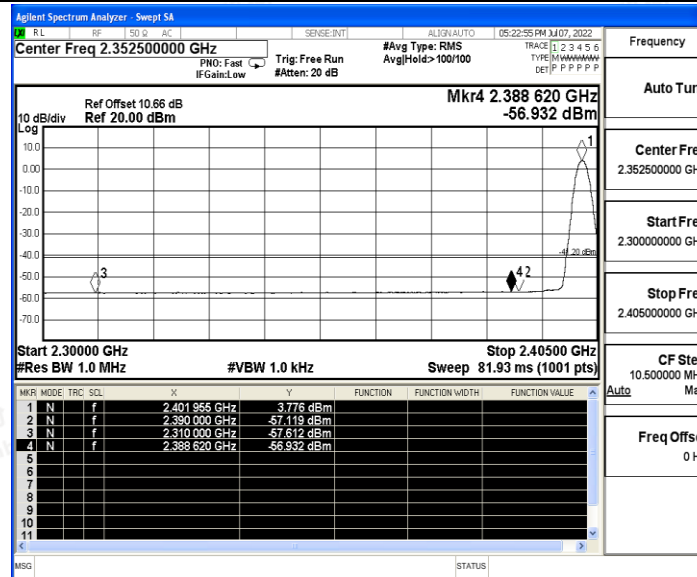


BLE_1M_Ant1_High_2480_Peak

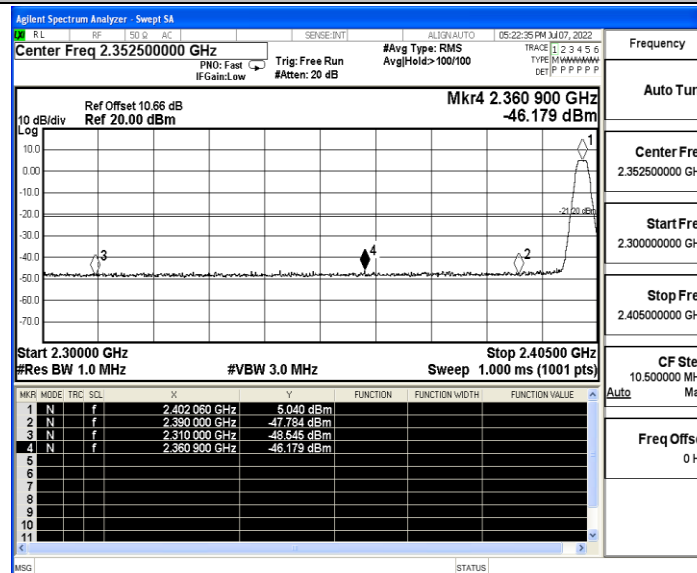


BLE_2M_Ant1_Low_2402_AV



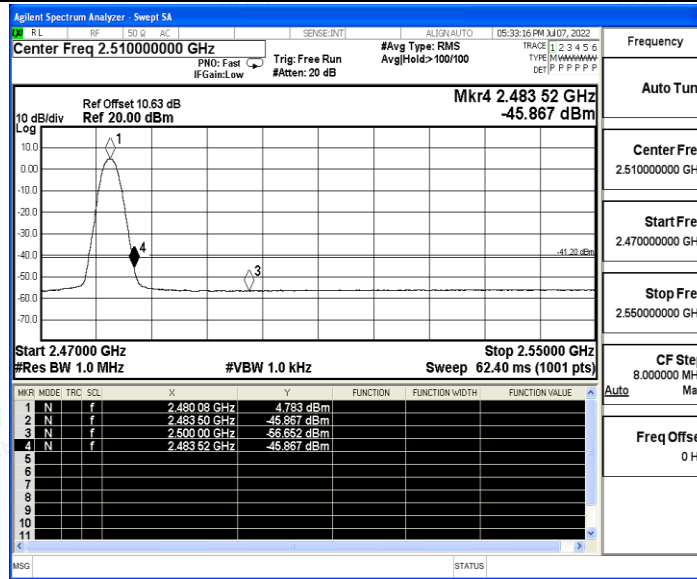


BLE_2M_Ant1_Low_2402_Peak



BLE_2M_Ant1_High_2480_AV





BLE_2M_Ant1_High_2480_Peak

