



Appendix A

RF Test Data for BT LE (Conducted Measurement)

Product Name: Automatic Tamper(OVAL)

Test Model: OVAL-EP1

Environmental Conditions

Temperature:	23.5℃
Relative Humidity:	52.2%
ATM Pressure:	100.0 kPa
Test Engineer:	Wunder Wu
Supervised by:	Li Huan





A.1 DTS Bandwidth

Test Result

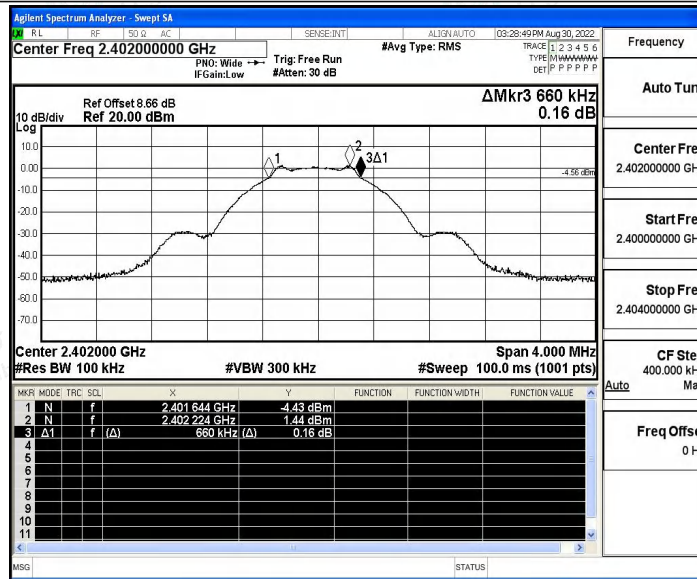
TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.660	2401.644	2402.304	0.5	PASS
		2440	0.660	2439.648	2440.308	0.5	PASS
		2480	0.656	2479.648	2480.304	0.5	PASS
BLE_2M	Ant1	2402	1.380	2401.272	2402.652	0.5	PASS
		2440	1.376	2439.268	2440.644	0.5	PASS
		2480	1.348	2479.304	2480.652	0.5	PASS



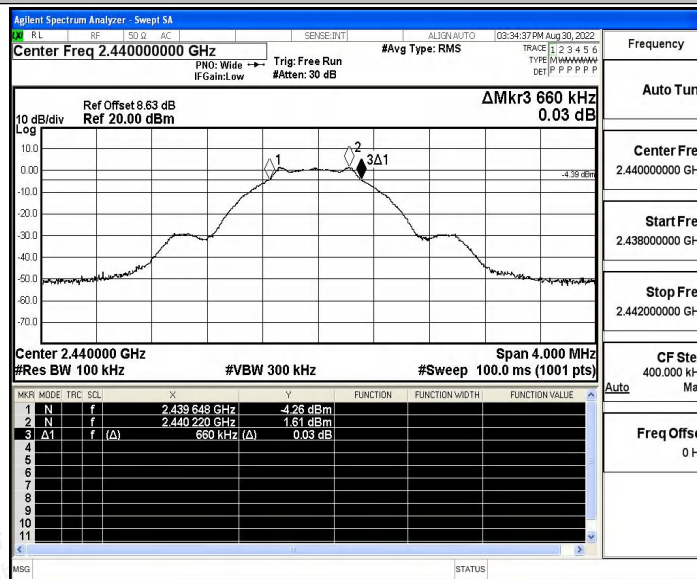


Test Graphs

BLE_1M_Ant1_2402



BLE_1M_Ant1_2440



BLE_1M_Ant1_2480

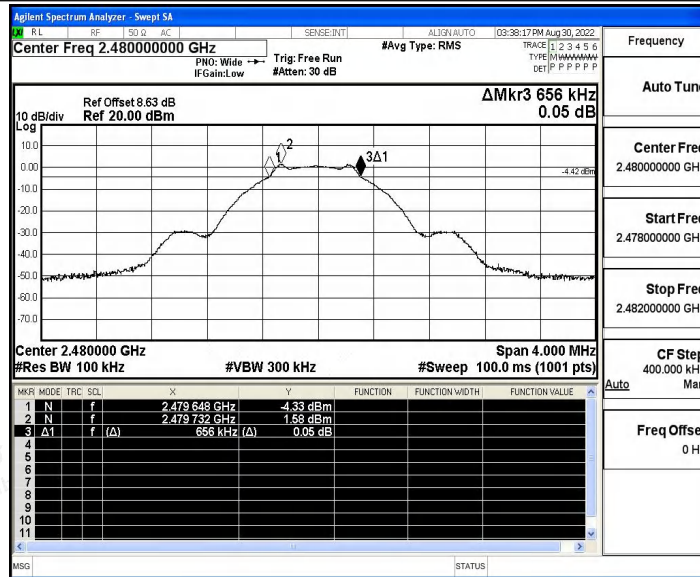


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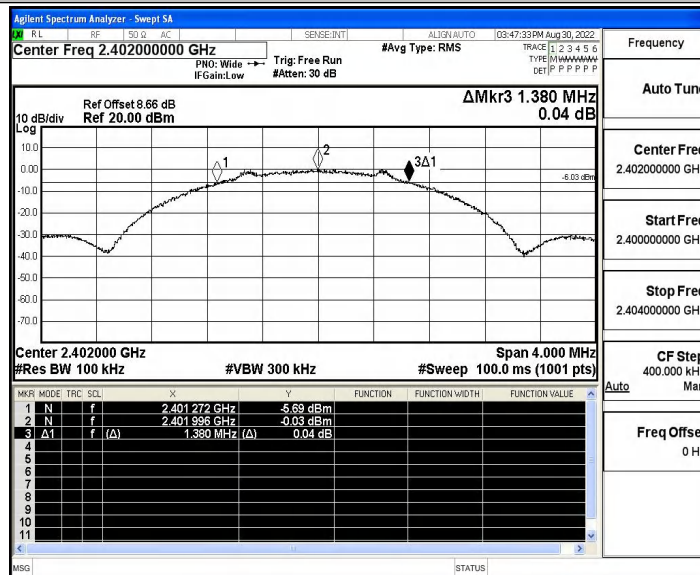
Add: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China

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

Scan code to check authenticity

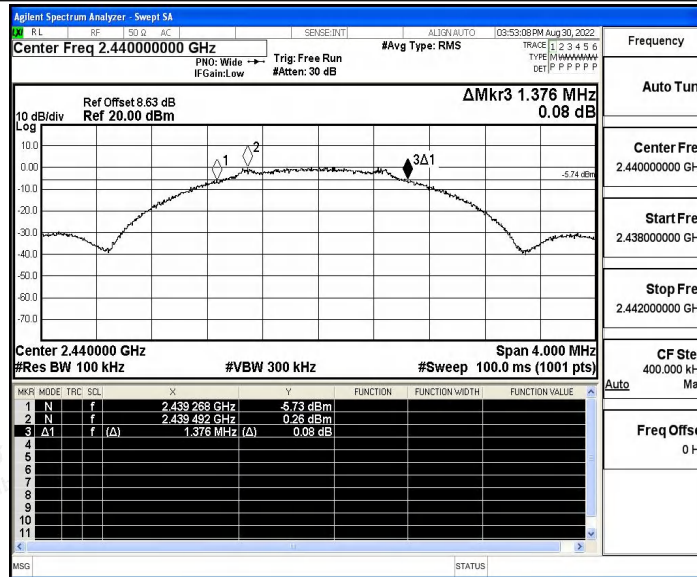


BLE_2M_Ant1_2402

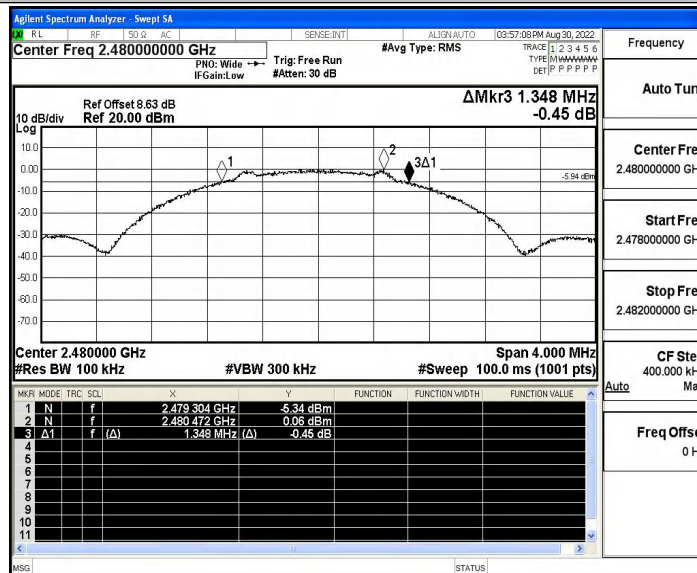


BLE_2M_Ant1_2440





BLE_2M_Ant1_2480



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A.2 Maximum conducted output power

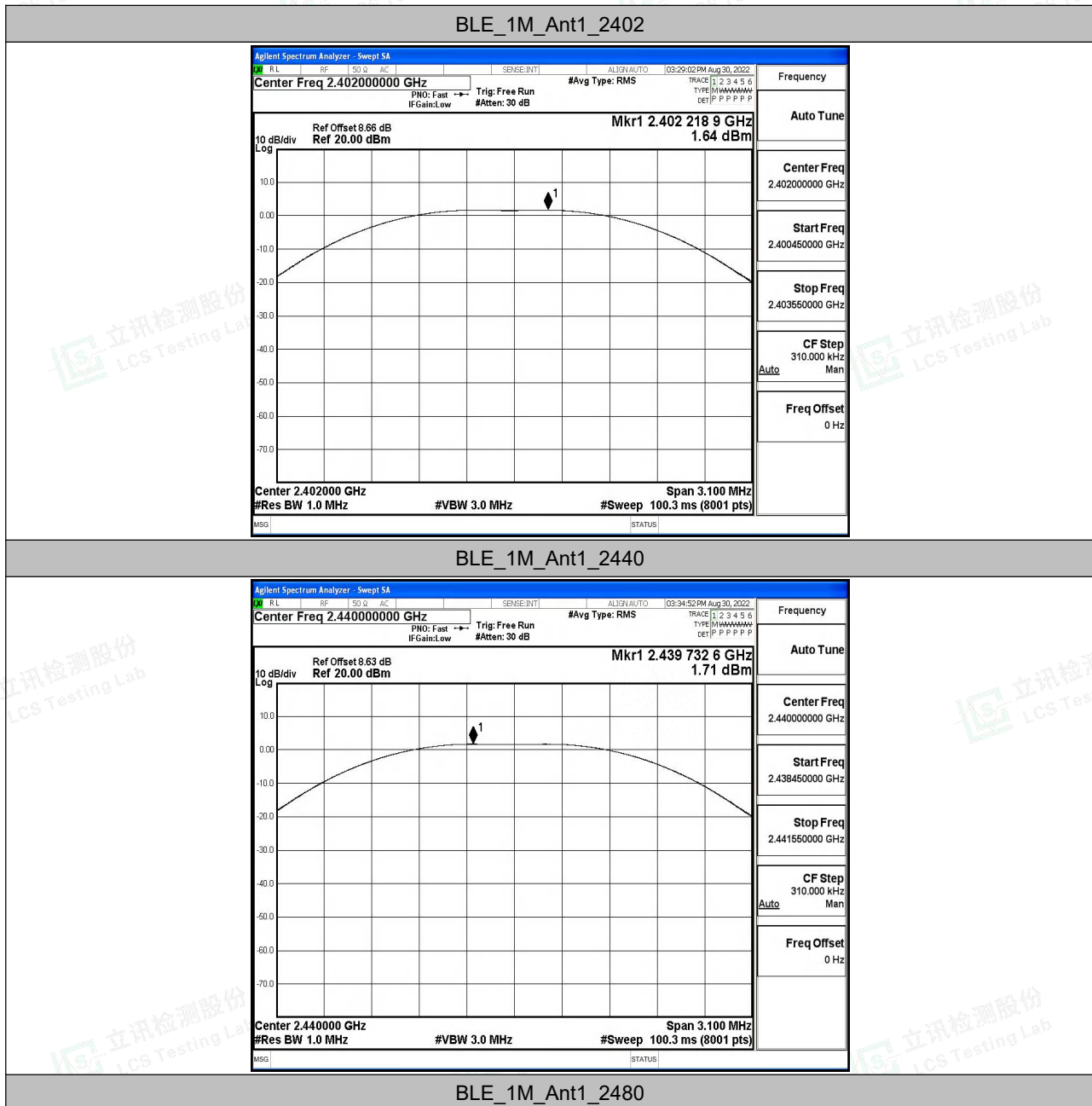
Test Result

TestMode	Antenna	Channel	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	1.64	≤30	PASS
		2440	1.71	≤30	PASS
		2480	1.72	≤30	PASS
BLE_2M	Ant1	2402	1.7	≤30	PASS
		2440	1.69	≤30	PASS
		2480	1.71	≤30	PASS





Test Graphs

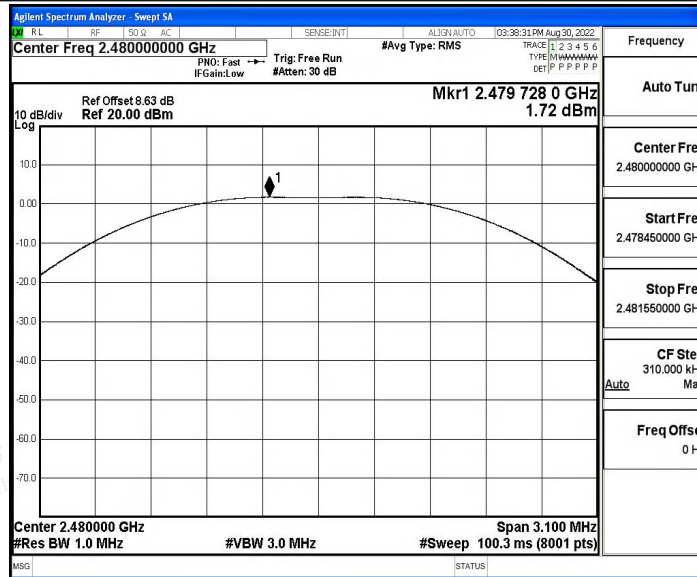


Shenzhen LCS Compliance Testing Laboratory Ltd.

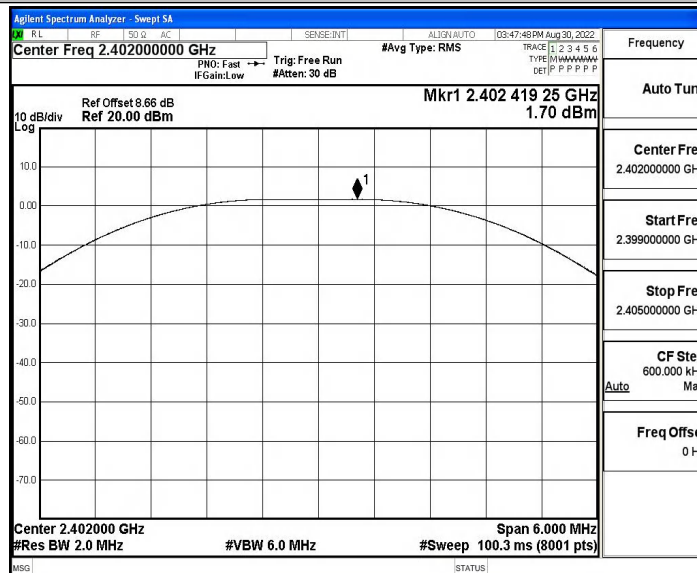
Add: 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China

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

Scan code to check authenticity

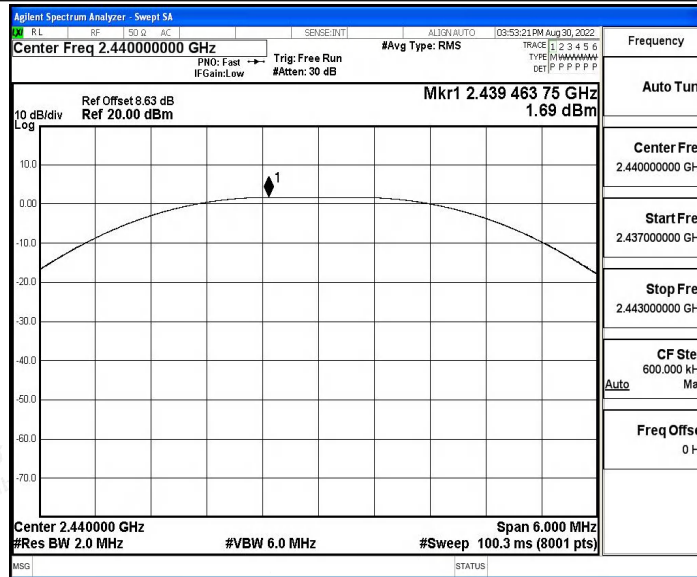


BLE_2M_Ant1_2402

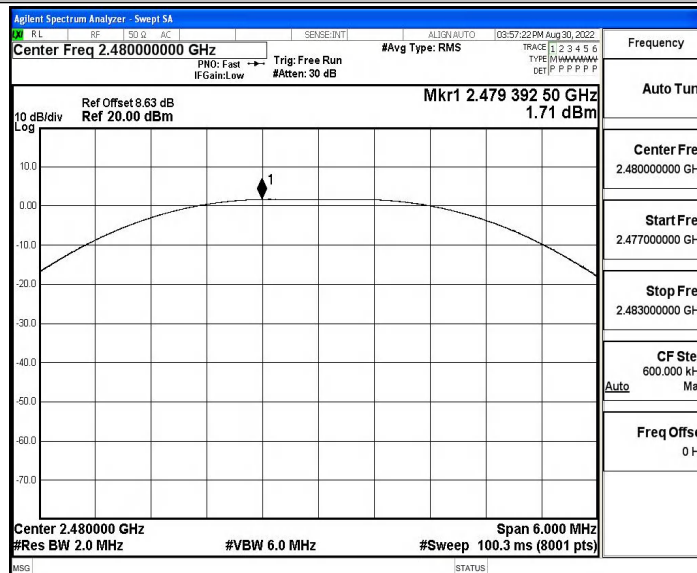


BLE_2M_Ant1_2440





BLE_2M_Ant1_2480





A.3 Maximum power spectral density

Test Result

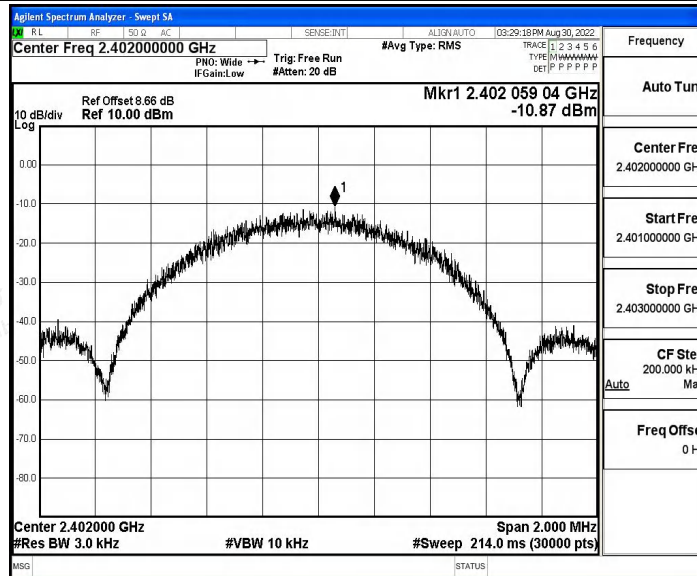
TestMode	Antenna	Channel	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-10.87	≤8.00	PASS
		2440	-10.12	≤8.00	PASS
		2480	-10.43	≤8.00	PASS
BLE_2M	Ant1	2402	-13.06	≤8.00	PASS
		2440	-12.54	≤8.00	PASS
		2480	-14.05	≤8.00	PASS



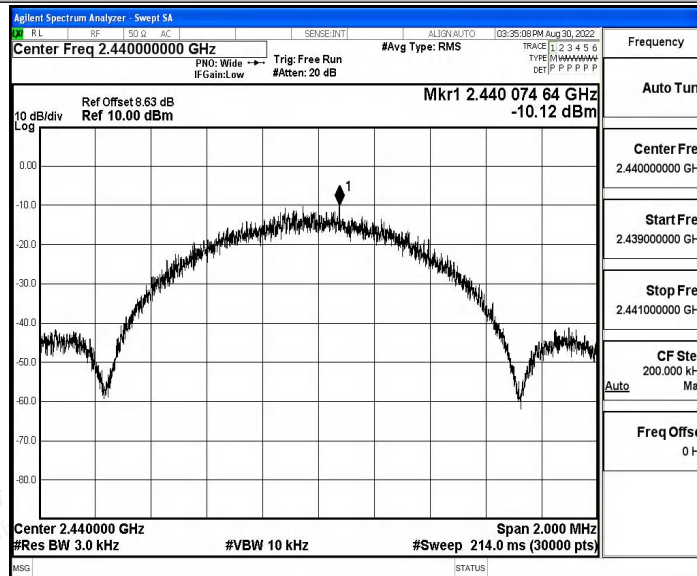


Test Graphs

BLE_1M_Ant1_2402

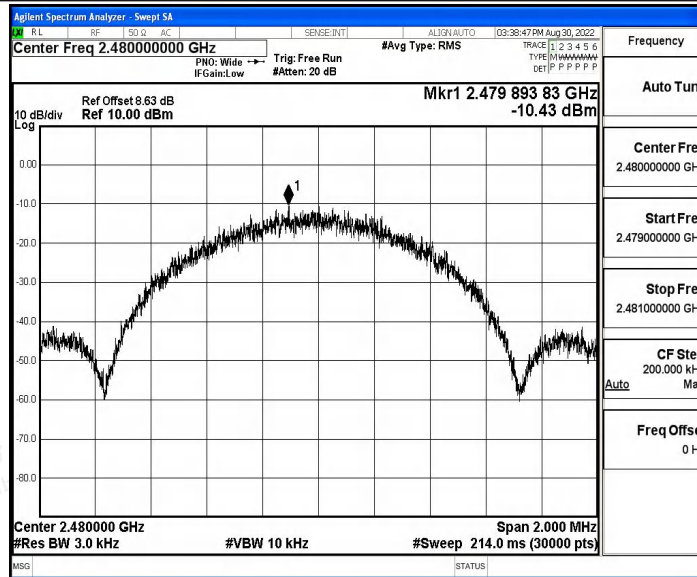


BLE_1M_Ant1_2440

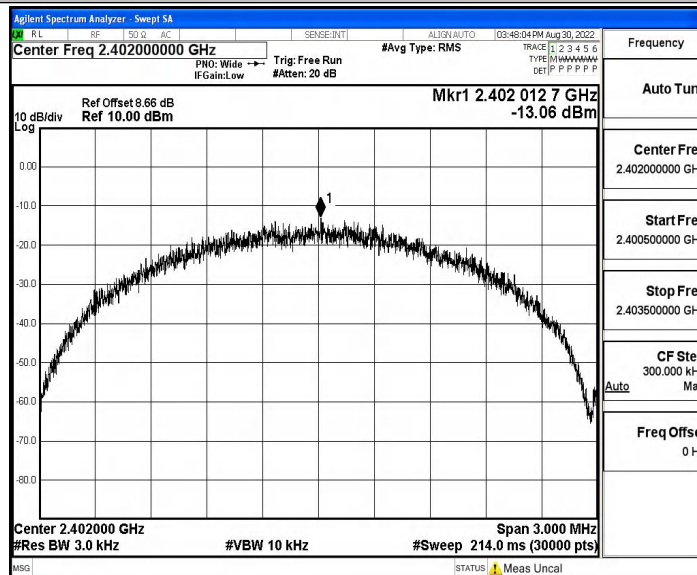


BLE_1M_Ant1_2480



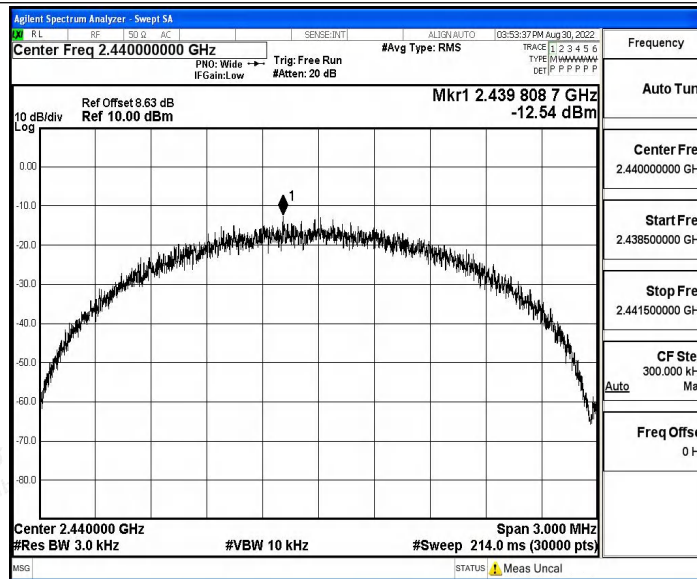


BLE_2M_Ant1_2402

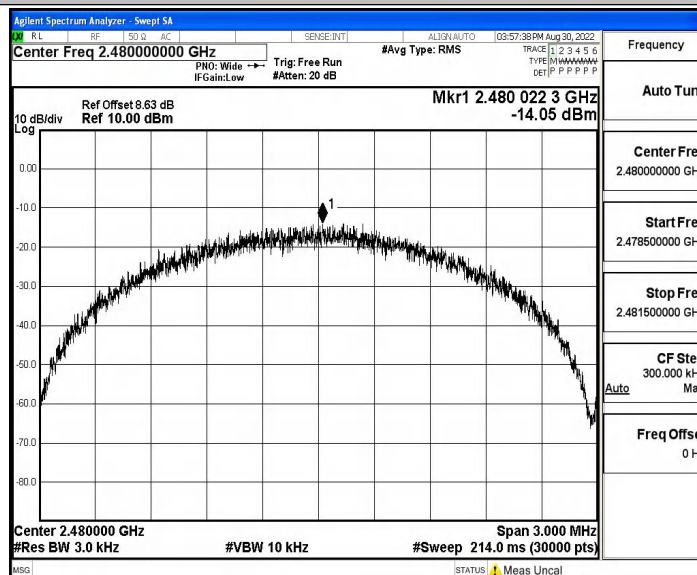


BLE_2M_Ant1_2440





BLE_2M_Ant1_2480





A.4 Band edge measurements

Test Result

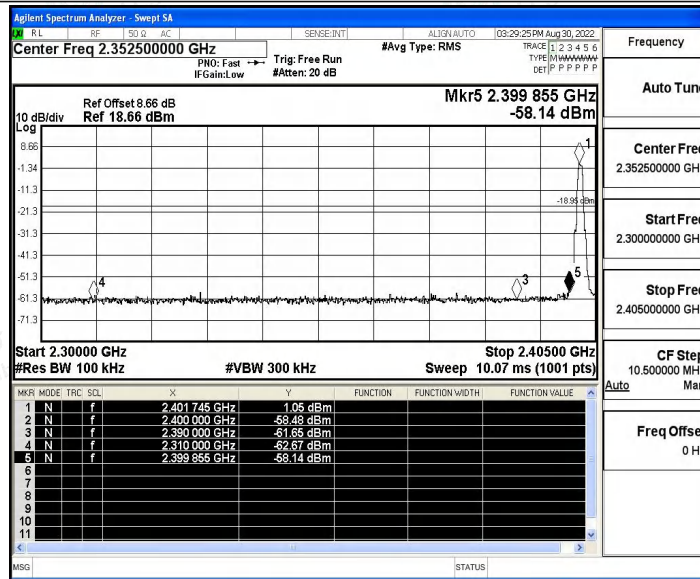
TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	1.06	-58.14	≤ -18.95	PASS
		High	2480	0.63	-52.1	≤ -19.37	PASS
BLE_2M	Ant1	Low	2402	-1.24	-31.26	≤ -21.24	PASS
		High	2480	-0.69	-54.46	≤ -20.69	PASS



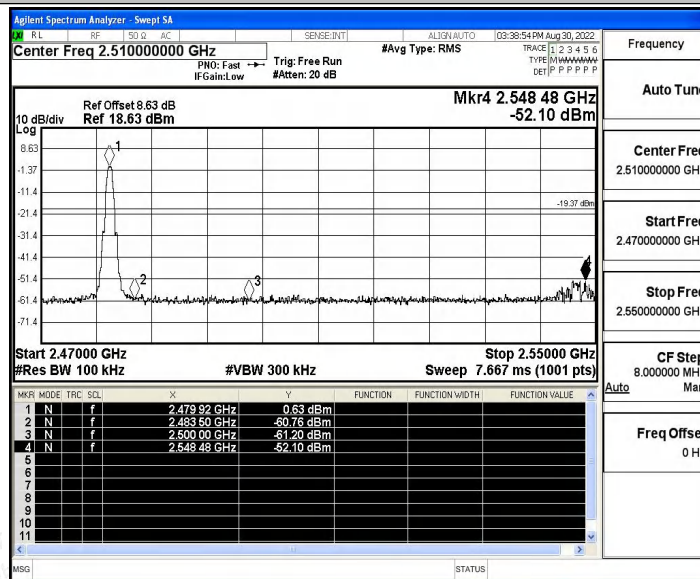


Test Graphs

BLE_1M_Ant1_Low_2402

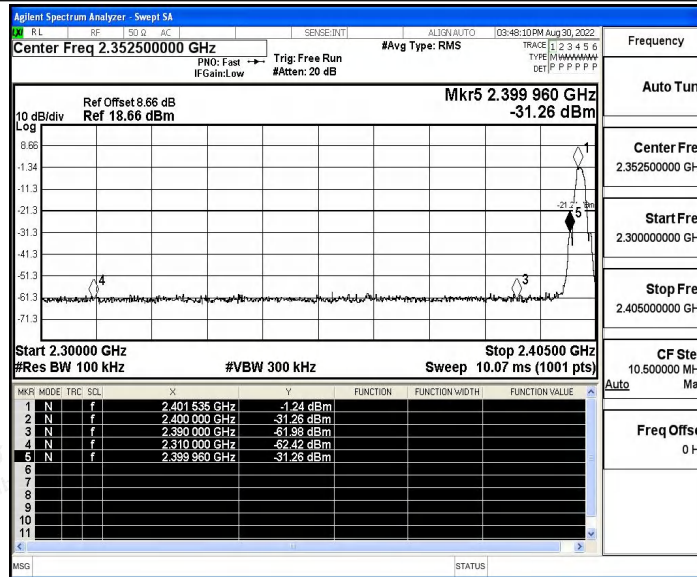


BLE_1M_Ant1_High_2480

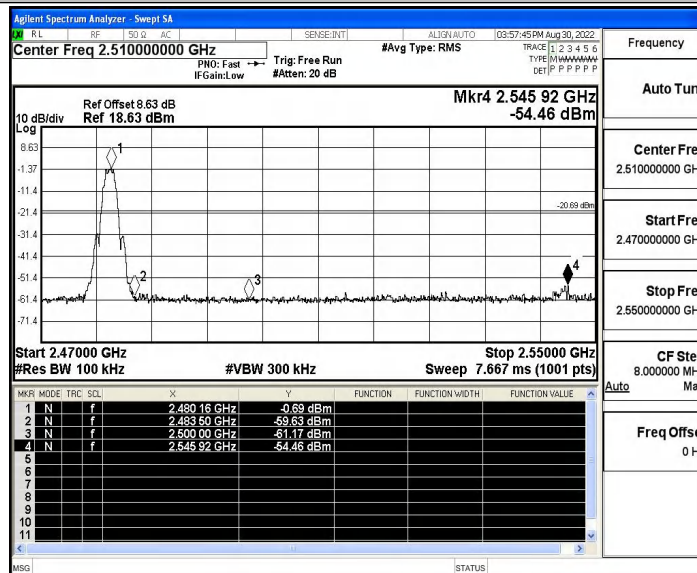


BLE_2M_Ant1_Low_2402





BLE_2M_Ant1_High_2480





A.5 Conducted Spurious Emission

Test Result

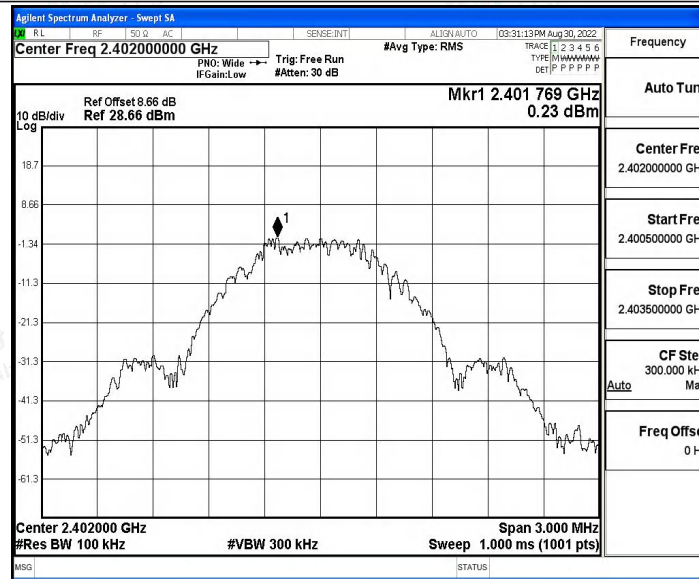
TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	0.23	0.23	---	PASS
			30~1000	0.23	-54.55	≤-19.77	PASS
			1000~26500	0.23	-45	≤-19.77	PASS
		2440	Reference	0.54	0.54	---	PASS
			30~1000	0.54	-58.95	≤-19.46	PASS
			1000~26500	0.54	-46.25	≤-19.46	PASS
		2480	Reference	0.31	0.31	---	PASS
			30~1000	0.31	-59.64	≤-19.69	PASS
			1000~26500	0.31	-46	≤-19.69	PASS
BLE_2M	Ant1	2402	Reference	-0.72	-0.72	---	PASS
			30~1000	-0.72	-59.8	≤-20.72	PASS
			1000~26500	-0.72	-46.27	≤-20.72	PASS
		2440	Reference	-0.15	-0.15	---	PASS
			30~1000	-0.15	-60.13	≤-20.15	PASS
			1000~26500	-0.15	-20.28	≤-20.15	PASS
		2480	Reference	-0.96	-0.96	---	PASS
			30~1000	-0.96	-59.62	≤-20.96	PASS
			1000~26500	-0.96	-44.73	≤-20.96	PASS



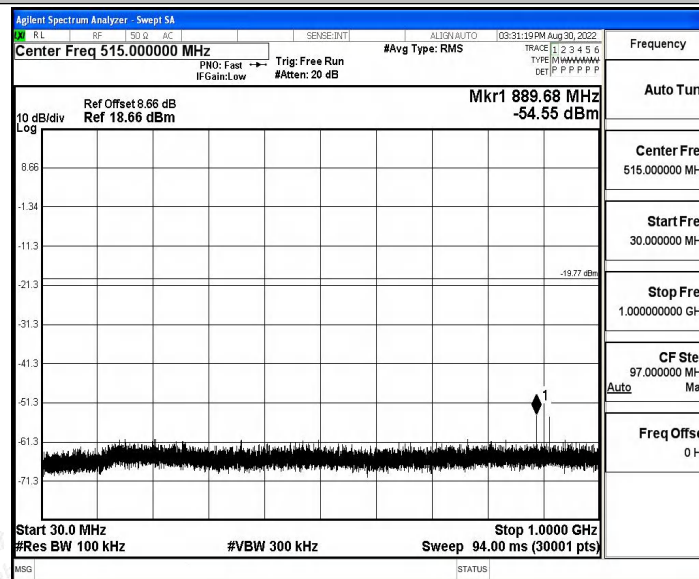


Test Graphs

BLE_1M_Ant1_2402_0~Reference

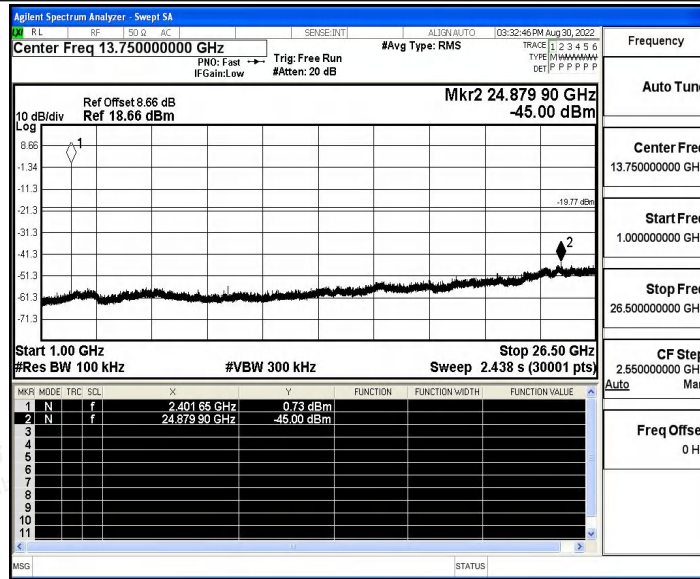


BLE_1M_Ant1_2402_30~1000

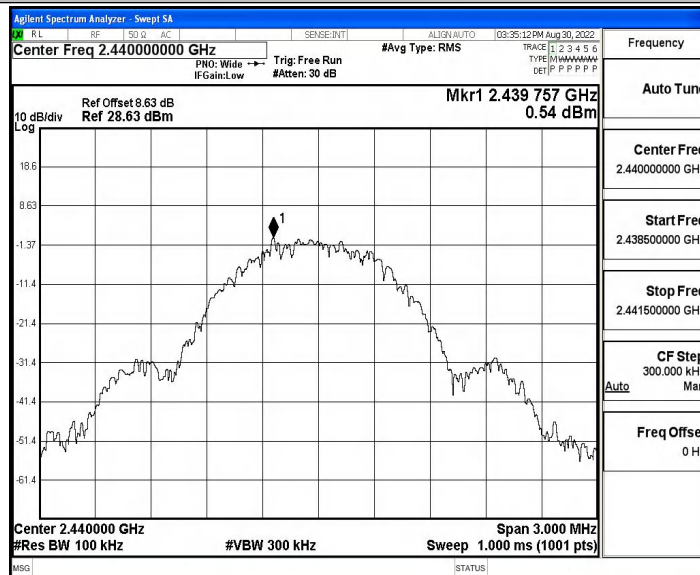


BLE_1M_Ant1_2402_1000~26500



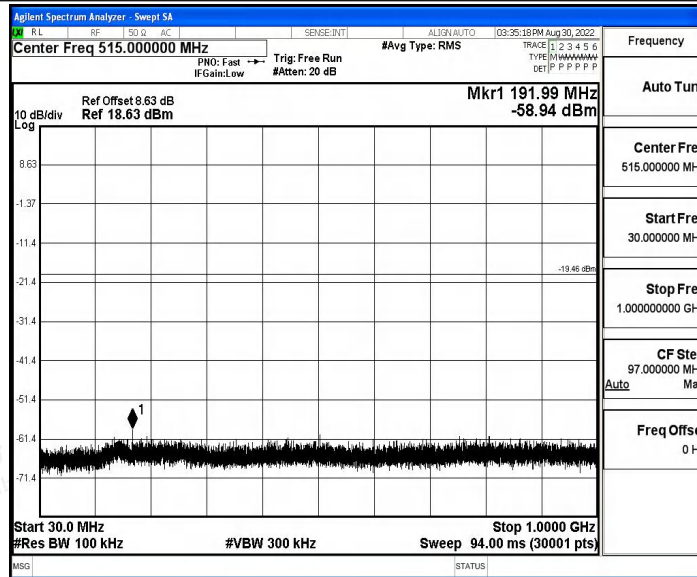


BLE_1M_Ant1_2440_0~Reference

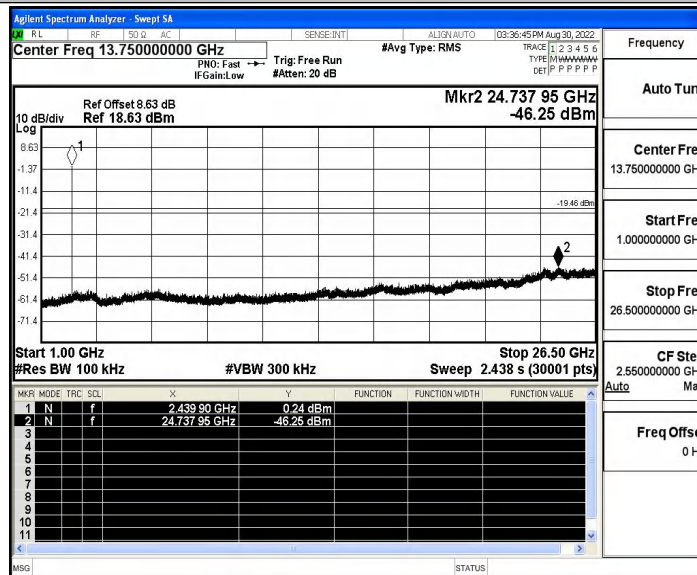


BLE_1M_Ant1_2440_30~1000



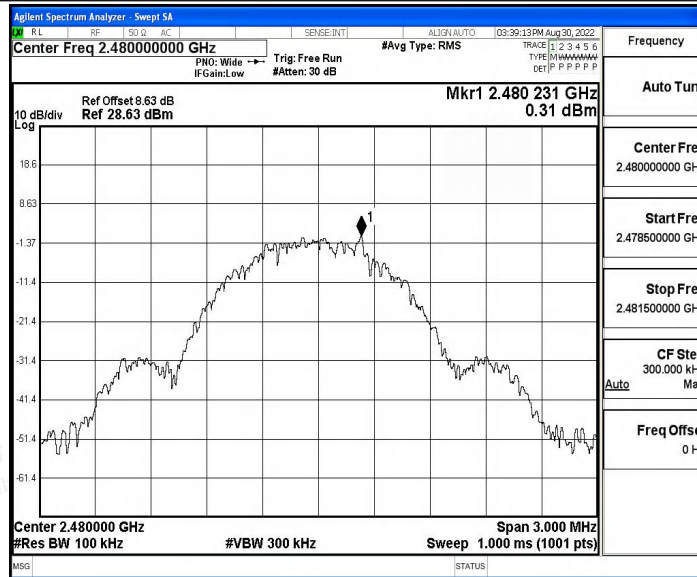


BLE_1M_Ant1_2440_1000~26500

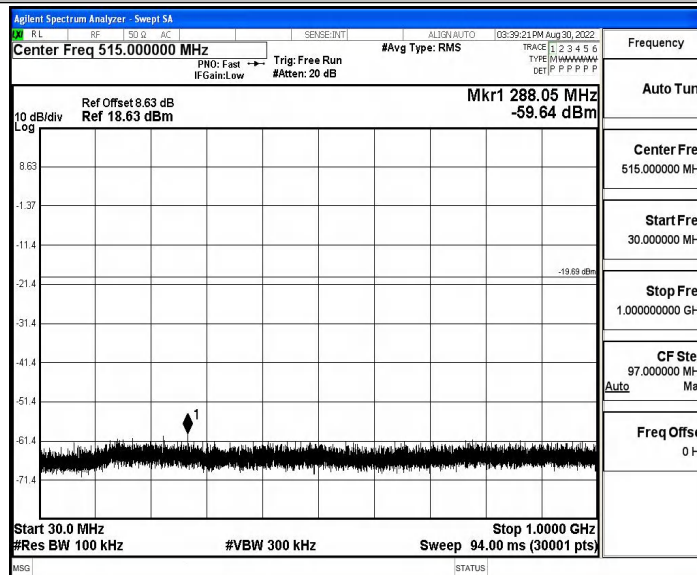


BLE_1M_Ant1_2480_0~Reference



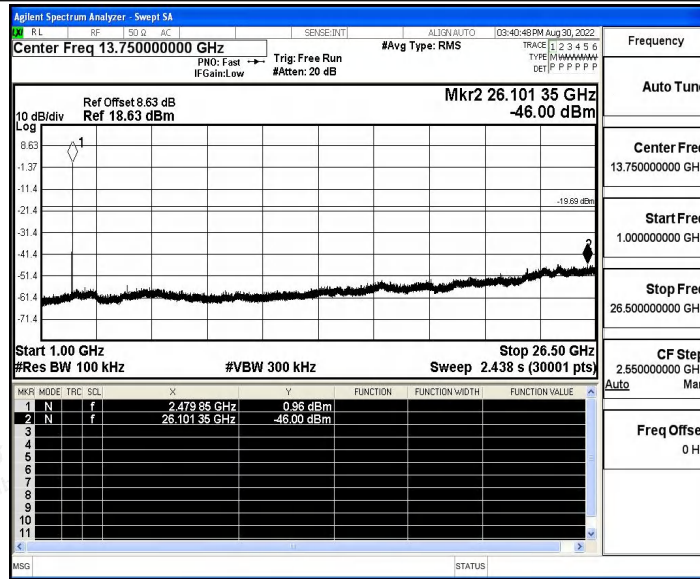


BLE_1M_Ant1_2480_30~1000

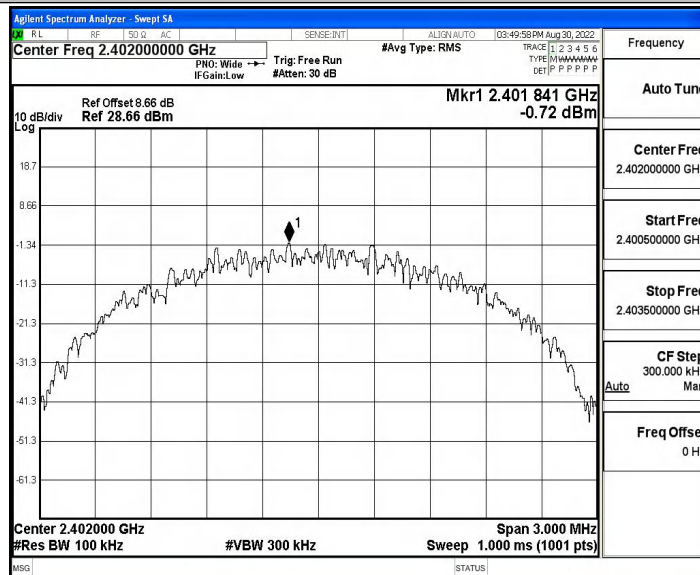


BLE_1M_Ant1_2480_1000~26500



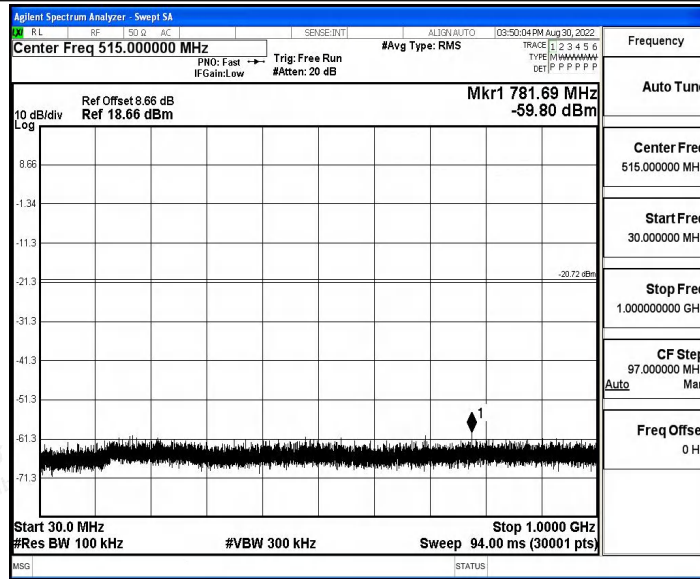


BLE_2M_Ant1_2402_0~Reference

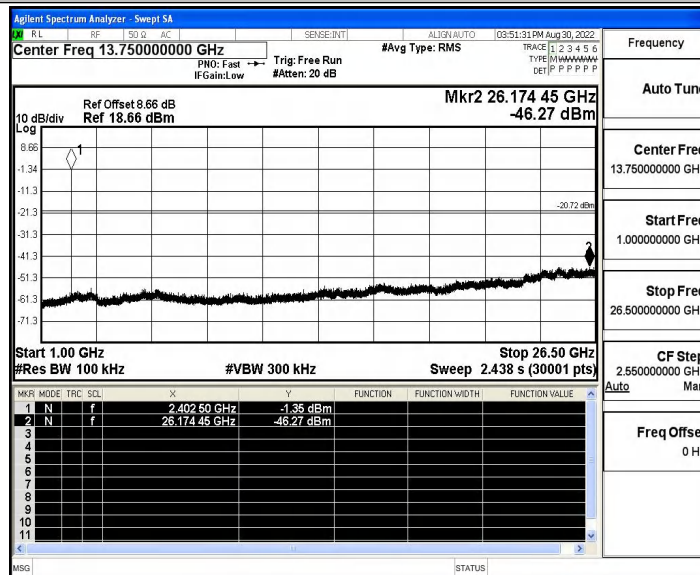


BLE_2M_Ant1_2402_30~1000



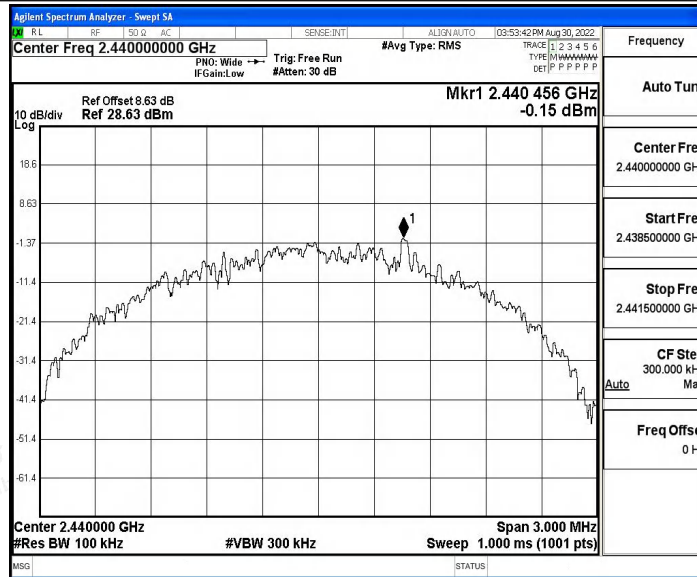


BLE_2M_Ant1_2402_1000~26500

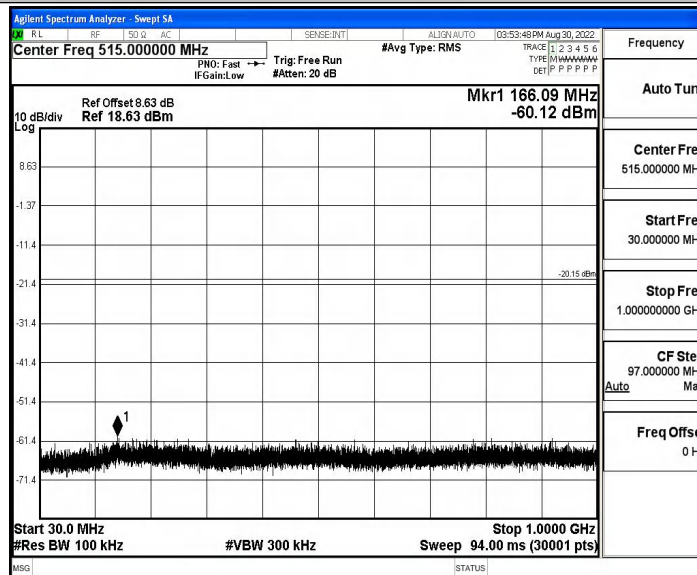


BLE_2M_Ant1_2440_0~Reference



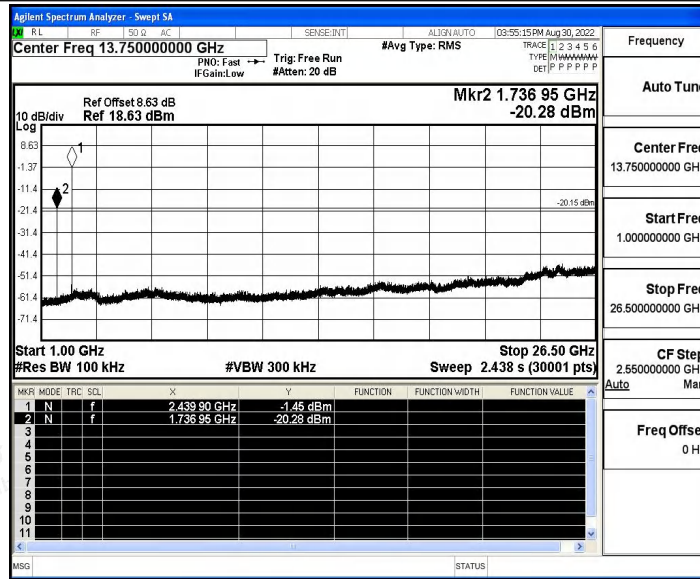


BLE_2M_Ant1_2440_30~1000

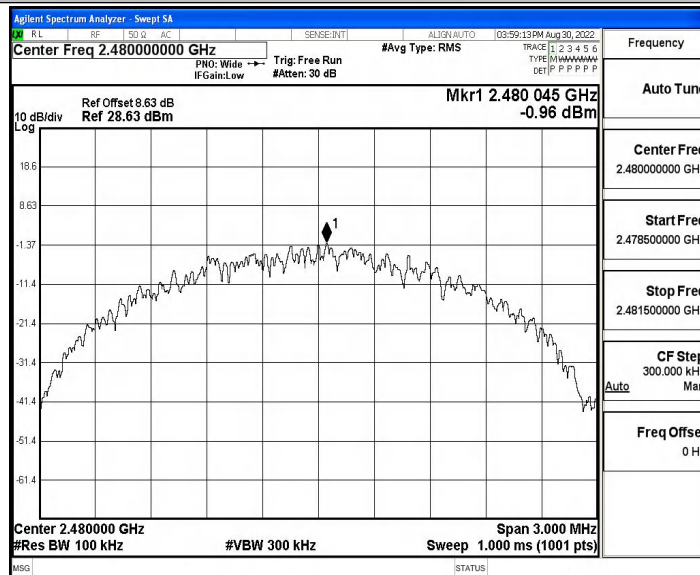


BLE_2M_Ant1_2440_1000~26500



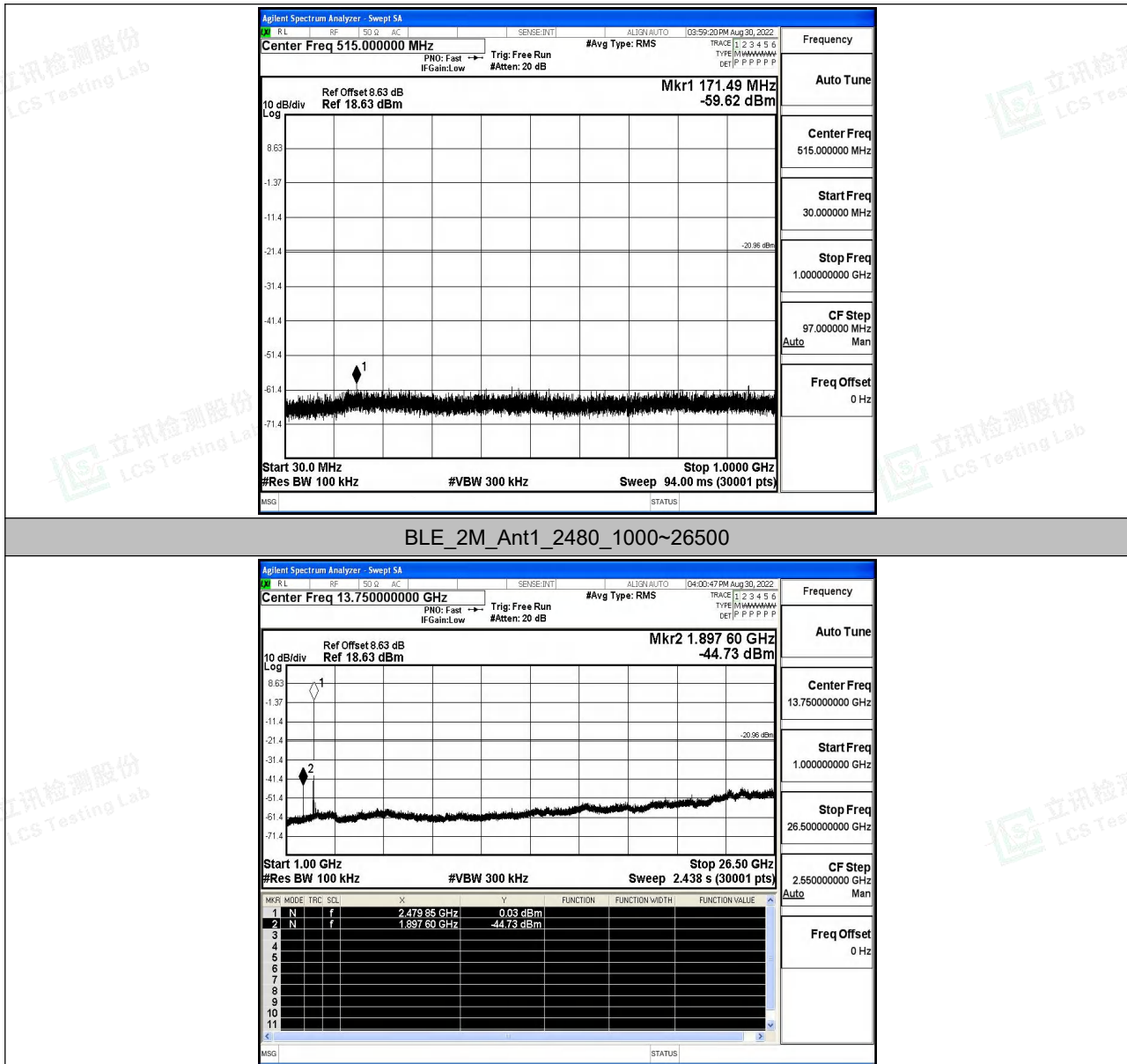


BLE_2M_Ant1_2480_0~Reference



BLE_2M_Ant1_2480_30~1000







A.6 Duty Cycle

Test Result

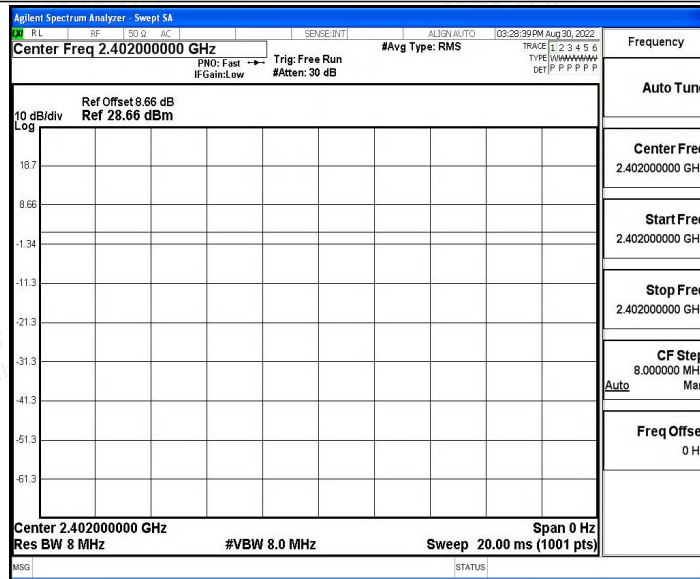
TestMode	Antenna	Channel	ON Time [ms]	Period [ms]	X	DC [%]	xFactor	1/T
BLE_1M	Ant1	2402	0.00	0.00	0	100	0	0.01K
		2440	0.00	0.00	0	100	0	0.01K
		2480	0.00	0.00	0	100	0	0.01K
BLE_2M	Ant1	2402	0.00	0.00	0	100	0	0.01K
		2440	0.00	0.00	0	100	0	0.01K
		2480	0.00	0.00	0	100	0	0.01K



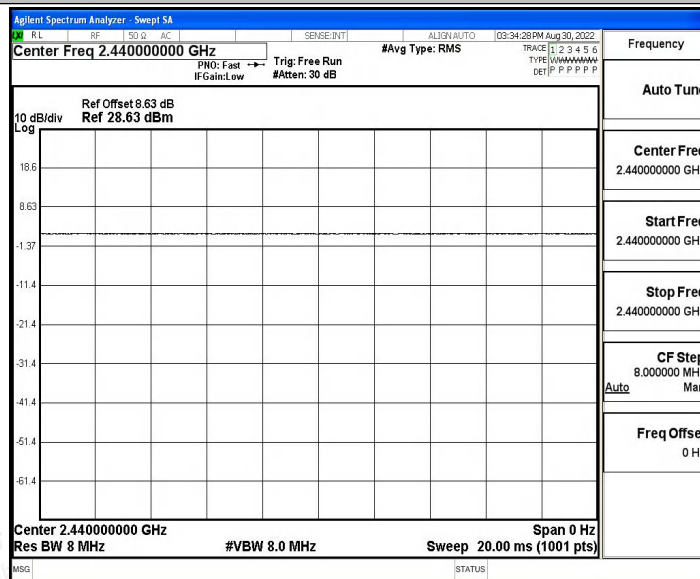


Test Graphs

BLE_1M_Ant1_2402

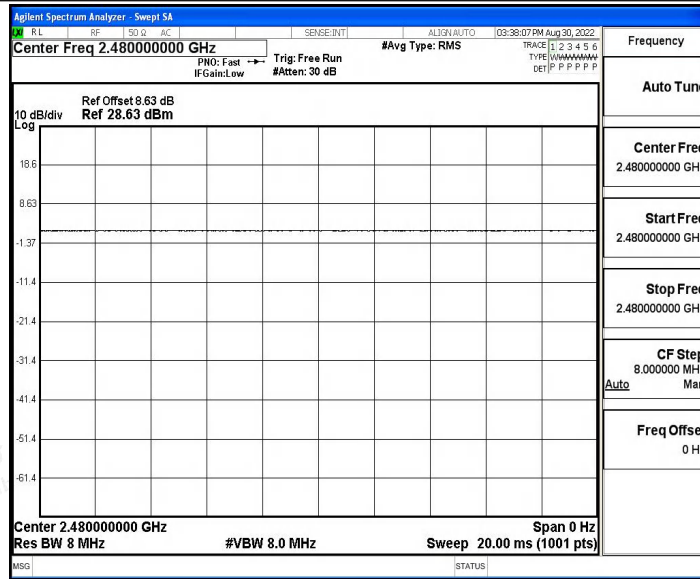


BLE_1M_Ant1_2440

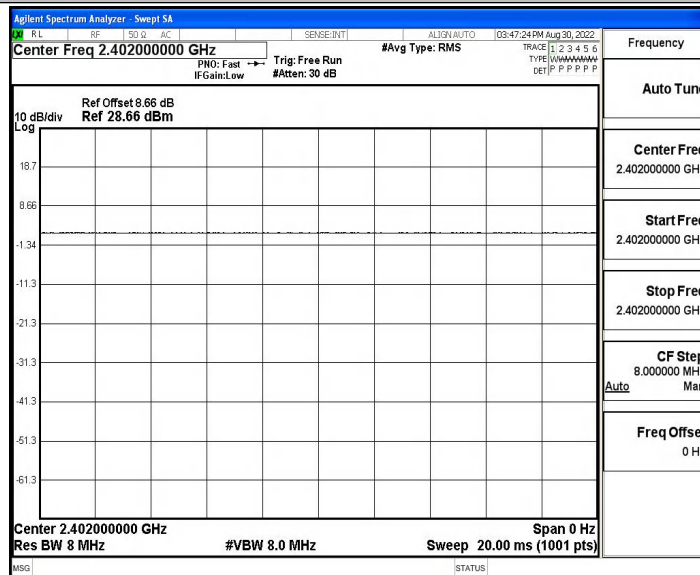


BLE_1M_Ant1_2480





BLE_2M_Ant1_2402



BLE_2M_Ant1_2440

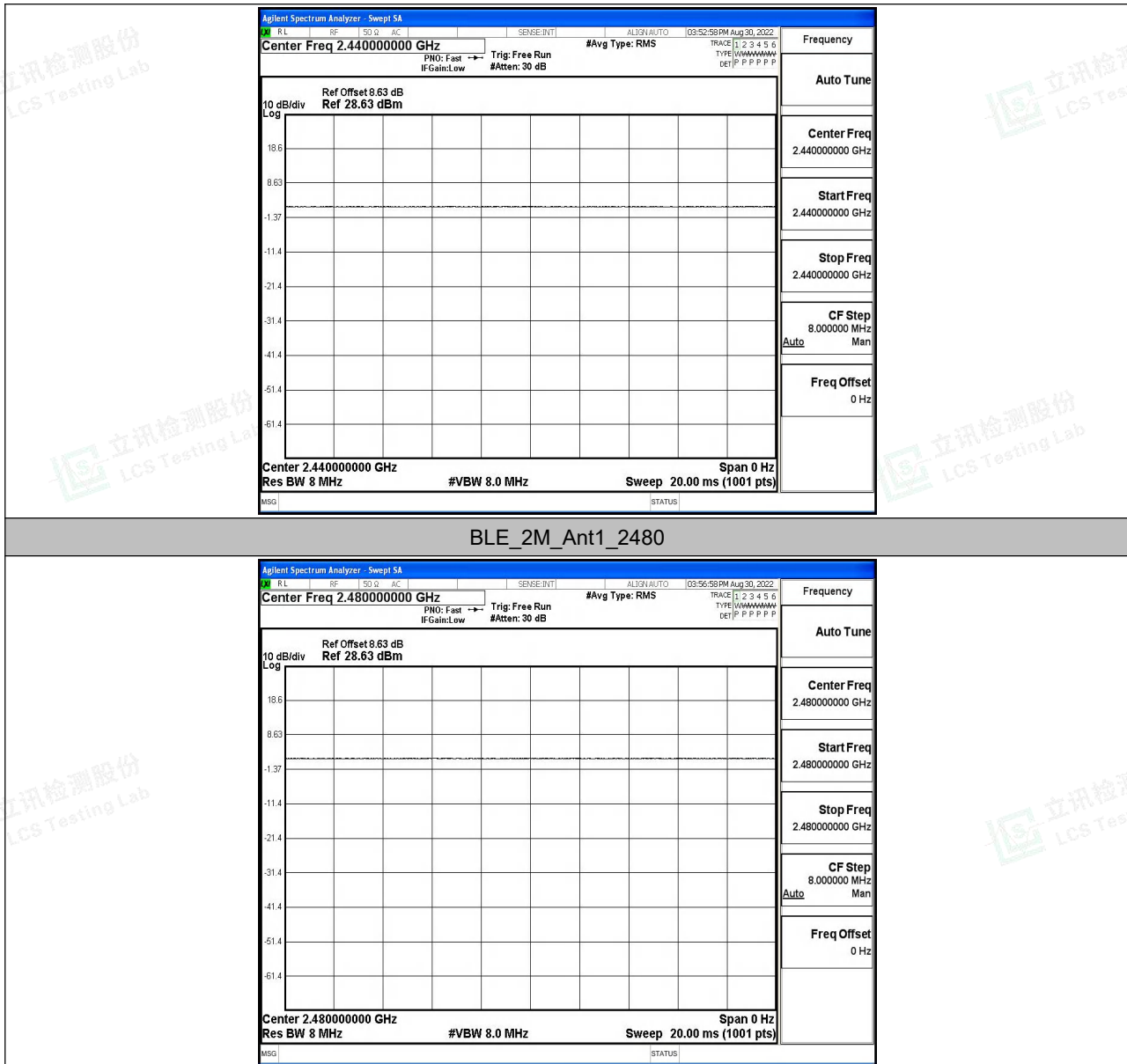


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A.7 Emissions in Restricted Bands

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	-58.29	≤-41.20	36.91	≤54	PASS
				AV	2350.505	-57.27	≤-41.20	37.93	≤54	PASS
				AV	2390.000	-57.77	≤-41.20	37.43	≤54	PASS
				Peak	2310.000	-55.11	≤-21.20	40.09	≤74	PASS
				Peak	2353.550	-46.99	≤-21.20	48.21	≤74	PASS
				Peak	2390.000	-51.17	≤-21.20	44.03	≤74	PASS
		High	2480	AV	2483.500	-53.47	≤-41.20	41.73	≤54	PASS
				AV	2483.520	-53.47	≤-41.20	41.73	≤54	PASS
				AV	2500.000	-57.31	≤-41.20	37.89	≤54	PASS
				Peak	2483.500	-50.8	≤-21.20	44.40	≤74	PASS
				Peak	2491.840	-48.25	≤-21.20	46.95	≤74	PASS
				Peak	2500.000	-53.06	≤-21.20	42.14	≤74	PASS
BLE_2M	Ant1	Low	2402	AV	2310.000	-58.3	≤-41.20	36.90	≤54	PASS
				AV	2389.880	-57.78	≤-41.20	37.42	≤54	PASS
				AV	2390.000	-57.79	≤-41.20	37.41	≤54	PASS
				Peak	2310.000	-51.78	≤-21.20	43.42	≤74	PASS
				Peak	2316.905	-48.17	≤-21.20	47.03	≤74	PASS
				Peak	2390.000	-51.15	≤-21.20	44.05	≤74	PASS
		High	2480	AV	2483.500	-47.08	≤-41.20	48.12	≤54	PASS
				AV	2483.520	-47.08	≤-41.20	48.12	≤54	PASS
				AV	2500.000	-57.34	≤-41.20	37.86	≤54	PASS
				Peak	2483.500	-47	≤-21.20	48.20	≤74	PASS
				Peak	2483.520	-47	≤-21.20	48.20	≤74	PASS
				Peak	2500.000	-51.69	≤-21.20	43.51	≤74	PASS

Note:

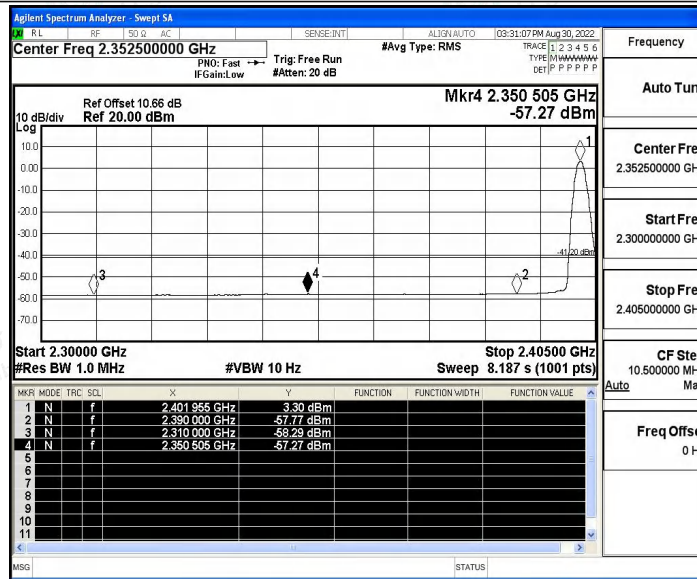
1. The Antenna Gain is compensated in the graph.
2. The limit in dBm for average detector is conversion from 54dBuV/m, according to 15.209(a). The limit in dBm for peak detector is 20dB above the limit of average detector in dBm.



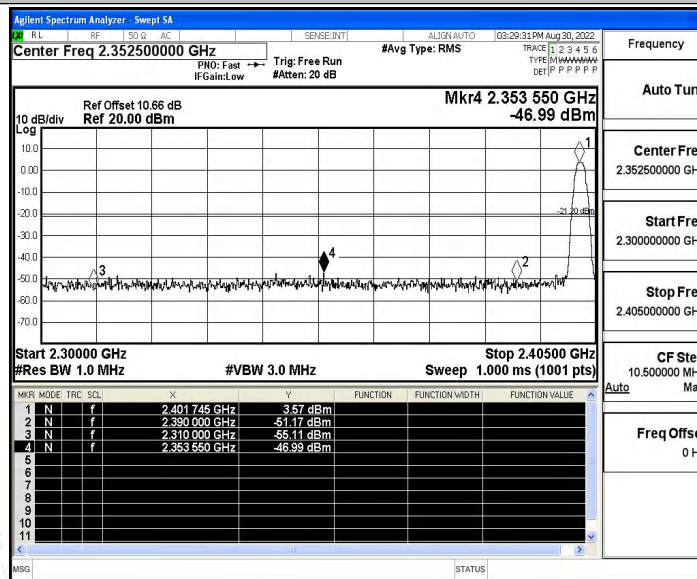


Test Graphs

BLE_1M_Ant1_Low_2402_AV

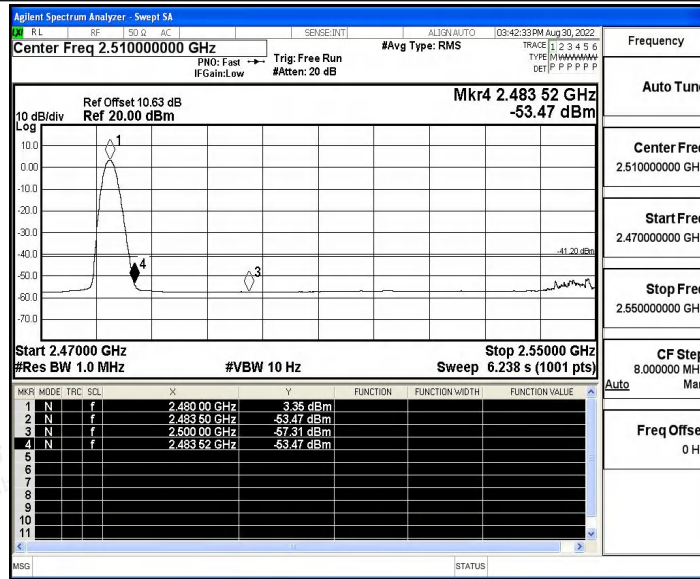


BLE_1M_Ant1_Low_2402_Peak

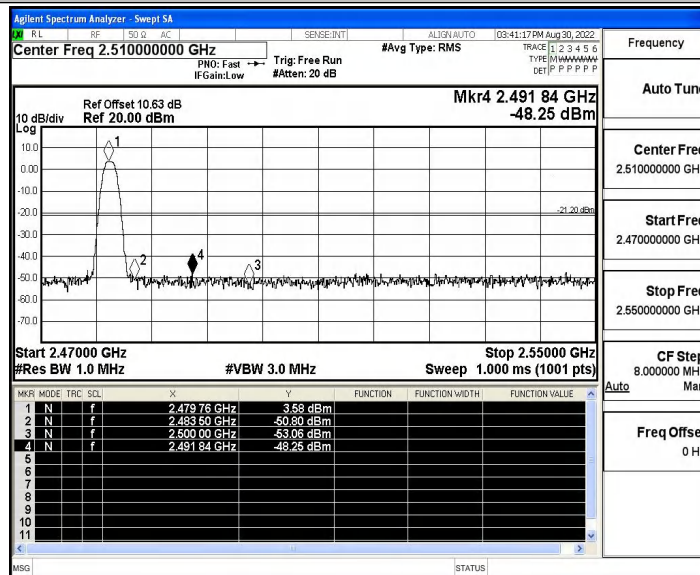


BLE_1M_Ant1_High_2480_AV



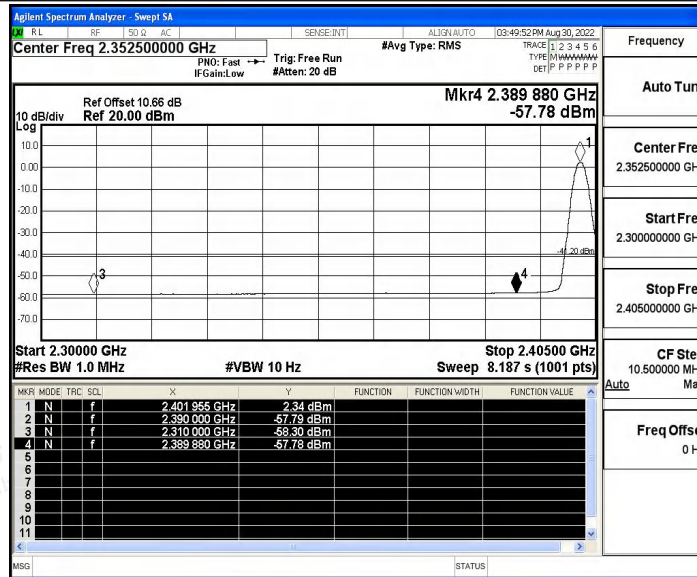


BLE_1M_Ant1_High_2480_Peak

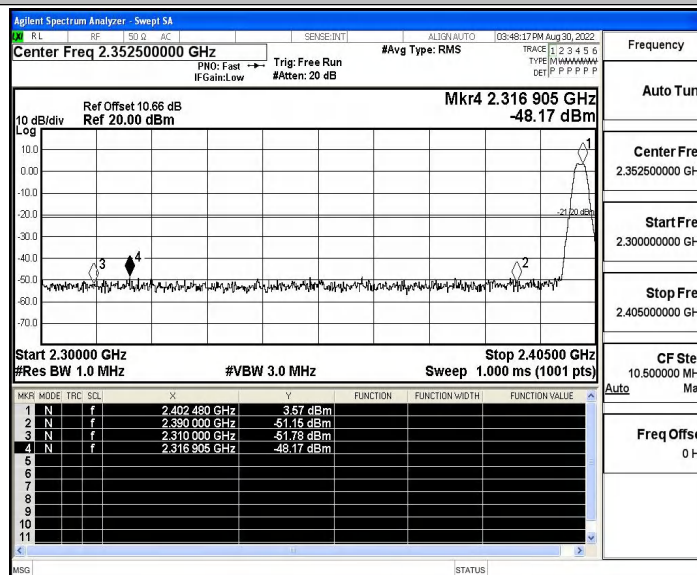


BLE_2M_Ant1_Low_2402_AV



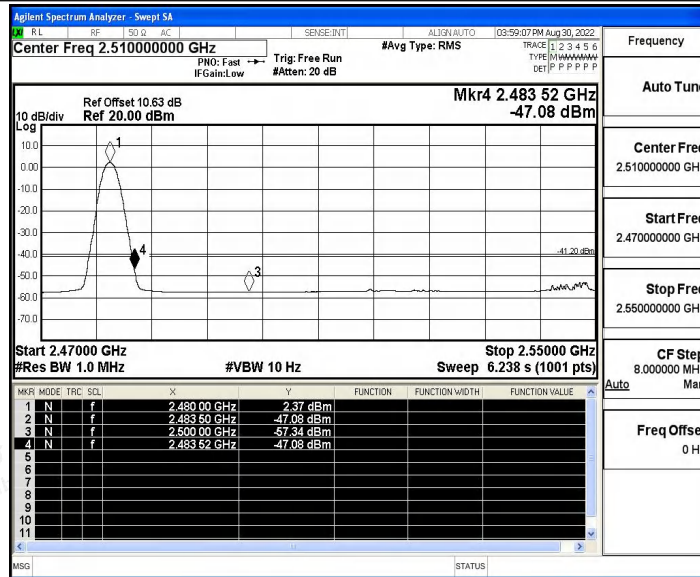


BLE_2M_Ant1_Low_2402_Peak



BLE_2M_Ant1_High_2480_AV





BLE_2M_Ant1_High_2480_Peak

