

Appendix A: Test Results of BLE

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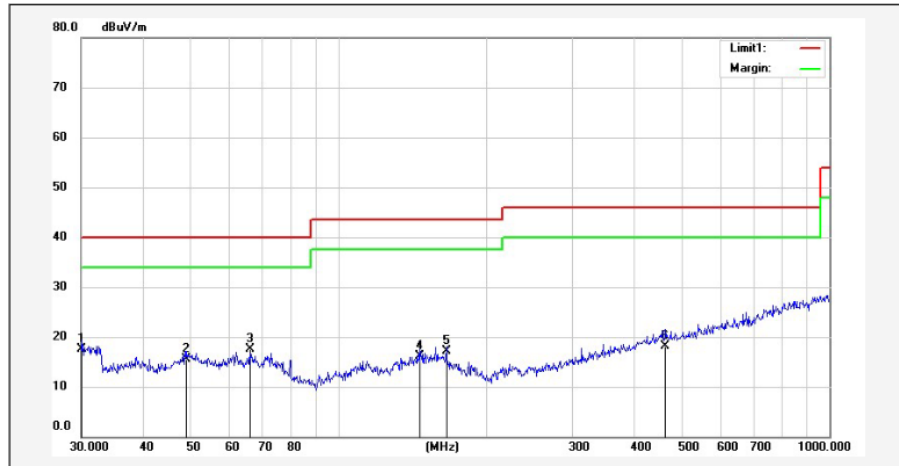
Appendix A.1 Test Results of Radiated Spurious Emission

All modes have been tested, and the report only reflects the worst mode

Below 1GHz:

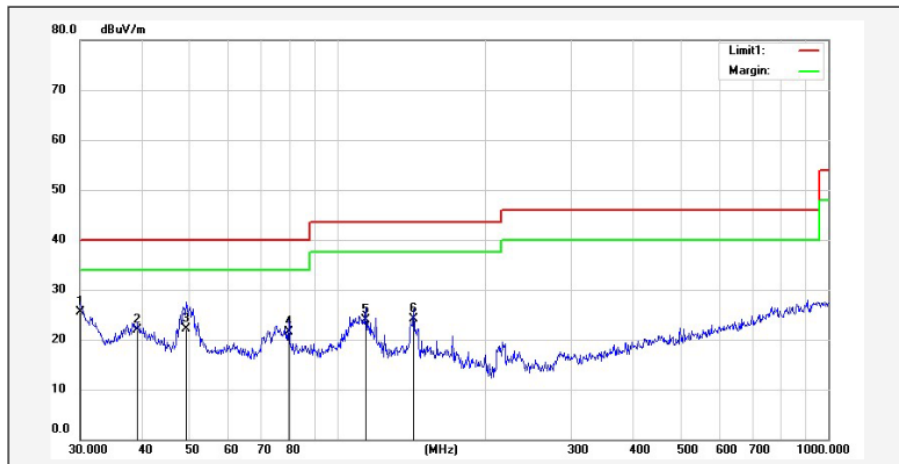
Test Mode:	Mode 2(worst mode)
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Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1*	30.1052	29.45	-12.00	17.45	40.00	-22.55	---	---	QP
2	49.1865	25.89	-10.43	15.46	40.00	-24.54	---	---	QP
3	66.2660	29.51	-12.09	17.42	40.00	-22.58	---	---	QP
4	146.3735	26.89	-10.87	16.02	43.50	-27.48	---	---	QP
5	166.0680	28.17	-11.02	17.15	43.50	-26.35	---	---	QP
6	463.9696	23.37	-5.35	18.02	46.00	-27.98	---	---	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1*	30.0000	37.48	-12.00	25.48	40.00	-14.52	---	---	QP
2	39.2991	33.85	-11.88	21.97	40.00	-18.03	---	---	QP
3	49.3594	32.56	-10.41	22.15	40.00	-17.85	---	---	QP
4	79.8002	36.17	-14.71	21.46	40.00	-18.54	---	---	QP
5	114.5146	37.09	-13.25	23.84	43.50	-19.66	---	---	QP
6	143.3260	35.11	-11.03	24.08	43.50	-19.42	---	---	QP

Above 1GHz:
All modes have been tested, and the report only reflects the worst mode(1Mbps)
GFSK-Low Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4944.000	58.13	-13.24	44.89	74.00	-29.11	peak
2	4944.000	39.72	-13.24	26.48	54.00	-27.52	AVG
3	8174.000	57.55	-10.87	46.68	74.00	-27.32	peak
4	8174.000	38.72	-10.87	27.85	54.00	-26.15	AVG
5	10316.000	56.46	-8.73	47.73	74.00	-26.27	peak
6	10316.000	37.34	-8.73	28.61	54.00	-25.39	AVG
7	12798.000	54.51	-6.06	48.45	74.00	-25.55	peak
8	12798.000	35.36	-6.06	29.30	54.00	-24.70	AVG
9	14158.000	53.31	-3.66	49.65	74.00	-24.35	peak
10	14158.000	34.68	-3.66	31.02	54.00	-22.98	AVG
11	4944.000	58.13	-13.24	44.89	74.00	-29.11	peak
12	4944.000	39.72	-13.24	26.48	54.00	-27.52	AVG

GFSK-Low Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2088.000	65.34	-21.90	43.44	74.00	-30.56	peak
2	2088.000	46.05	-21.90	24.15	54.00	-29.85	AVG
3	6066.000	56.89	-10.19	46.70	74.00	-27.30	peak
4	6066.000	37.77	-10.19	27.58	54.00	-26.42	AVG
5	7834.000	56.84	-11.00	45.84	74.00	-28.16	peak
6	7834.000	39.96	-11.00	28.96	54.00	-25.04	AVG
7	8888.000	56.50	-10.35	46.15	74.00	-27.85	peak
8	8888.000	39.68	-10.35	29.33	54.00	-24.67	AVG
9	14158.000	54.19	-3.66	50.53	74.00	-23.47	peak
10	14158.000	36.30	-3.66	32.64	54.00	-21.36	AVG
11	2088.000	65.34	-21.90	43.44	74.00	-30.56	peak
12	2088.000	46.05	-21.90	24.15	54.00	-29.85	AVG

GFSK- Middle Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6168.000	57.32	-10.74	46.58	74.00	-27.42	peak
2	6168.000	41.76	-10.74	31.02	54.00	-22.98	AVG
3	7732.000	57.32	-10.89	46.43	74.00	-27.57	peak
4	7732.000	41.74	-10.89	30.85	54.00	-23.15	AVG
5	8888.000	56.98	-10.35	46.63	74.00	-27.37	peak
6	8888.000	41.10	-10.35	30.75	54.00	-23.25	AVG
7	12798.000	54.13	-6.06	48.07	74.00	-25.93	peak
8	12798.000	38.67	-6.06	32.61	54.00	-21.39	AVG
9	14158.000	53.62	-3.66	49.96	74.00	-24.04	peak
10	14158.000	36.35	-3.66	32.69	54.00	-21.31	AVG
11	6168.000	57.32	-10.74	46.58	74.00	-27.42	peak
12	6168.000	41.76	-10.74	31.02	54.00	-22.98	AVG



GFSK-Middle Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4944.000	58.53	-13.24	45.29	74.00	-28.71	peak
2	4944.000	42.88	-13.24	29.64	54.00	-24.36	AVG
3	7698.000	57.24	-10.86	46.38	74.00	-27.62	peak
4	7698.000	41.88	-10.86	31.02	54.00	-22.98	AVG
5	8922.000	57.13	-10.35	46.78	74.00	-27.22	peak
6	8922.000	41.82	-10.35	31.47	54.00	-22.53	AVG
7	10418.000	55.54	-8.71	46.83	74.00	-27.17	peak
8	10418.000	38.86	-8.71	30.15	54.00	-23.85	AVG
9	14158.000	54.14	-3.66	50.48	74.00	-23.52	peak
10	14158.000	37.62	-3.66	33.96	54.00	-20.04	AVG
11	4944.000	58.53	-13.24	45.29	74.00	-28.71	peak
12	4944.000	42.88	-13.24	29.64	54.00	-24.36	AVG

GFSK-High Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5658.000	58.11	-11.18	46.93	74.00	-27.07	peak
2	5658.000	40.79	-11.18	29.61	54.00	-24.39	AVG
3	7154.000	58.09	-11.31	46.78	74.00	-27.22	peak
4	7154.000	40.65	-11.31	29.34	54.00	-24.66	AVG
5	10350.000	55.51	-8.72	46.79	74.00	-27.21	peak
6	10350.000	38.86	-8.72	30.14	54.00	-23.86	AVG
7	12798.000	53.78	-6.06	47.72	74.00	-26.28	peak
8	12798.000	37.72	-6.06	31.66	54.00	-22.34	AVG
9	14158.000	53.26	-3.66	49.60	74.00	-24.40	peak
10	14158.000	36.50	-3.66	32.84	54.00	-21.16	AVG
11	5658.000	58.11	-11.18	46.93	74.00	-27.07	peak
12	5658.000	40.79	-11.18	29.61	54.00	-24.39	AVG

GFSK-High Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4944.000	59.44	-13.24	46.20	74.00	-27.80	peak
2	4944.000	42.85	-13.24	29.61	54.00	-24.39	AVG
3	5760.000	57.10	-11.24	45.86	74.00	-28.14	peak
4	5760.000	39.65	-11.24	28.41	54.00	-25.59	AVG
5	8888.000	56.69	-10.35	46.34	74.00	-27.66	peak
6	8888.000	39.65	-10.35	29.30	54.00	-24.70	AVG
7	14158.000	53.52	-3.66	49.86	74.00	-24.14	peak
8	14158.000	36.50	-3.66	32.84	54.00	-21.16	AVG
9	15620.000	52.19	-0.29	51.90	74.00	-22.10	peak
10	15620.000	34.47	-0.29	34.18	54.00	-19.82	AVG
11	4944.000	59.44	-13.24	46.20	74.00	-27.80	peak
12	4944.000	42.85	-13.24	29.61	54.00	-24.39	AVG

Node:

- 1、 Testing was carried out within frequency range 9kHz to the tenth harmonics. The measurement results below 30MHz and 18GHz - 26.5GHz were greater than 20dB below the limit, so only the radiated spurious emissions from 30MHz to 18GHz were reported..
- 2、 Radiated emissions measured in frequency above 1GHz were made with an instrument using peak/average detector mode.
- 3、 Average test would be performed if the peak result were greater than the average limit or as required by the applicant.
- 4、 Margin (dB), result in dBuV/m – limit in dBuV/m.

Restricted band Requirements
GFSK Low

All modes have been tested, and the report only reflects the worst mode(1Mbps)

Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2348.800	63.97	-21.33	42.64	74.00	-31.36	peak
2	2348.800	45.41	-21.33	24.08	54.00	-29.92	AVG
3	2390.000	62.00	-21.31	40.69	74.00	-33.31	peak
4	2390.000	45.21	-21.31	23.90	54.00	-30.10	AVG

Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2349.000	66.24	-21.33	44.91	74.00	-29.09	peak
2	2349.000	46.94	-21.33	25.61	54.00	-28.39	AVG
3	2390.000	62.63	-21.31	41.32	74.00	-32.68	peak
4	2390.000	45.15	-21.31	23.84	54.00	-30.16	AVG

GFSK-High

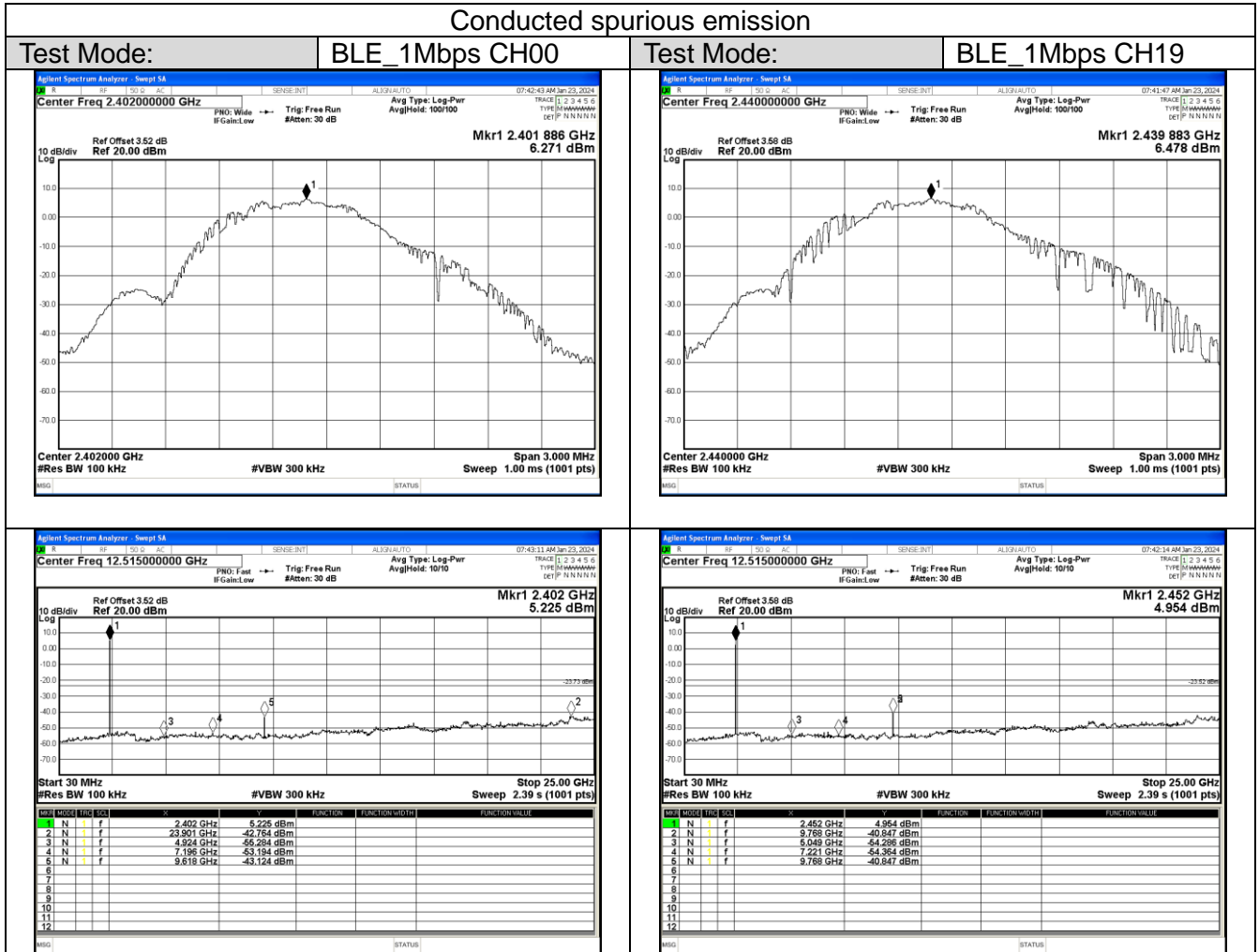
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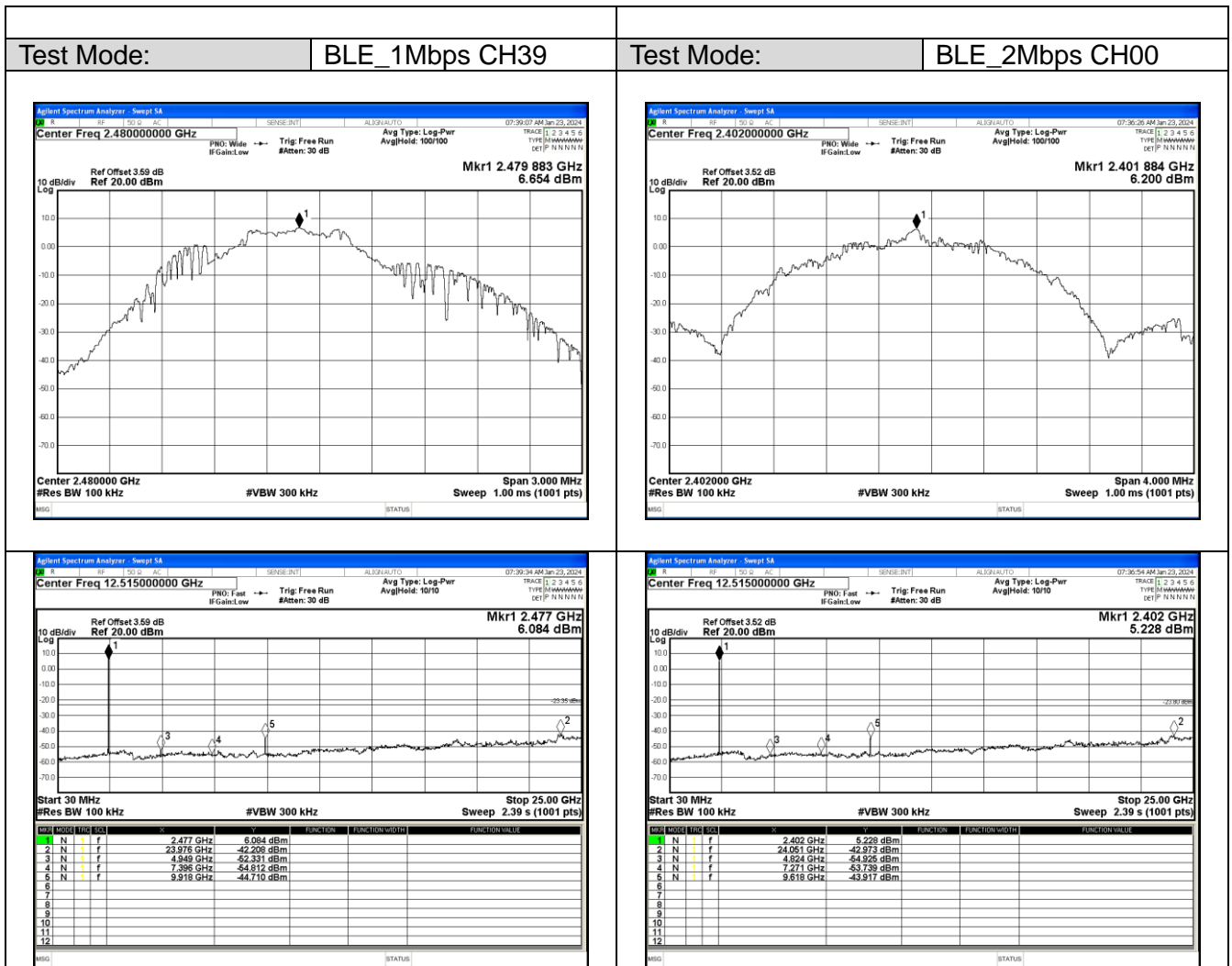
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	66.73	-21.10	45.63	74.00	-28.37	peak
2	2483.500	49.71	-21.10	28.61	54.00	-25.39	AVG
3	2491.840	63.23	-21.08	42.15	74.00	-31.85	peak
4	2491.840	46.99	-21.08	25.91	54.00	-28.09	AVG

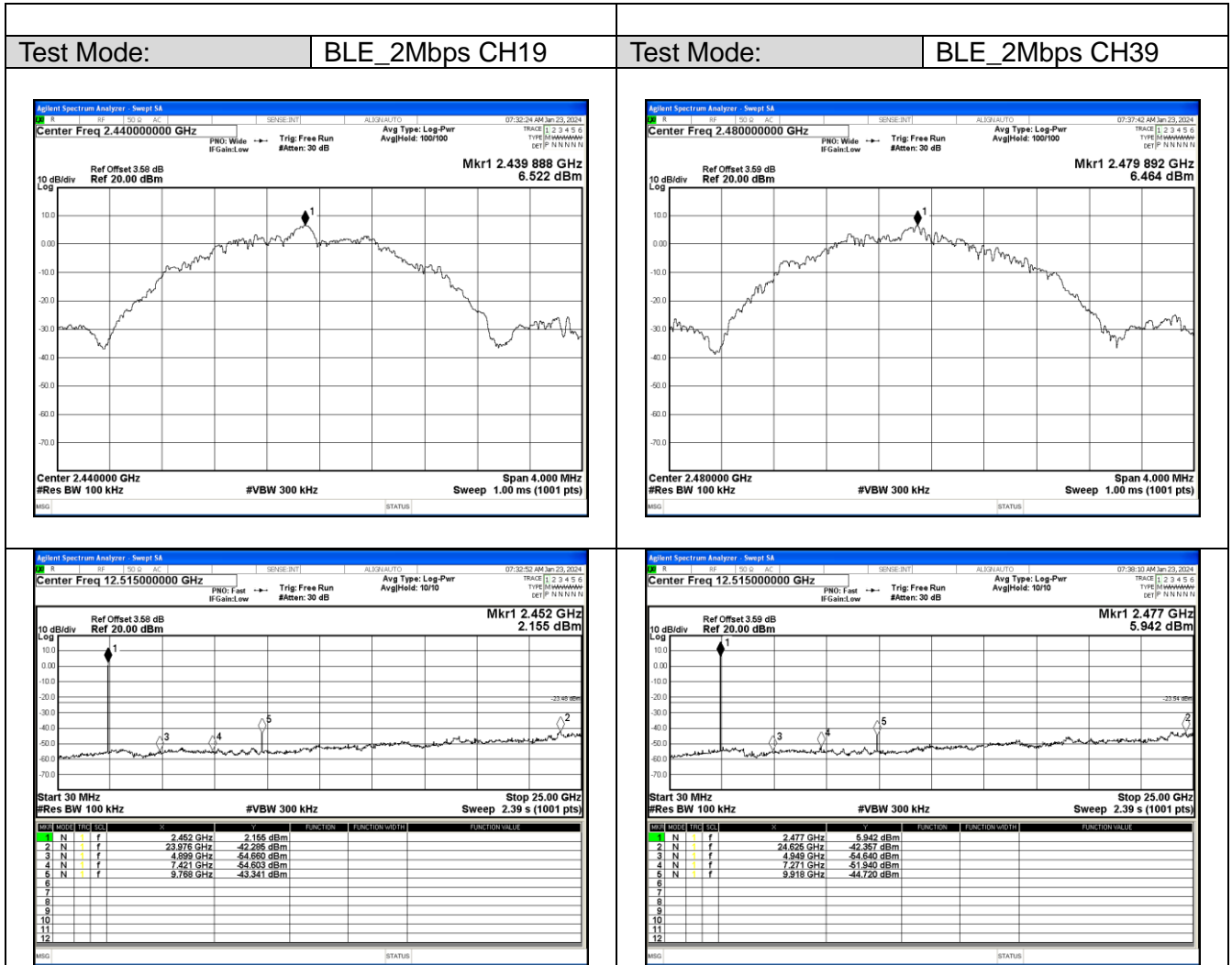
Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.500	64.49	-21.10	43.39	74.00	-30.61	peak
2	2483.500	47.04	-21.10	25.94	54.00	-28.06	AVG
3	2492.620	64.98	-21.08	43.90	74.00	-30.10	peak
4	2492.620	46.07	-21.08	24.99	54.00	-29.01	AVG

Appendix A.2 Test Results of Conducted Spurious Emissions Measured in 100 kHz Bandwidth



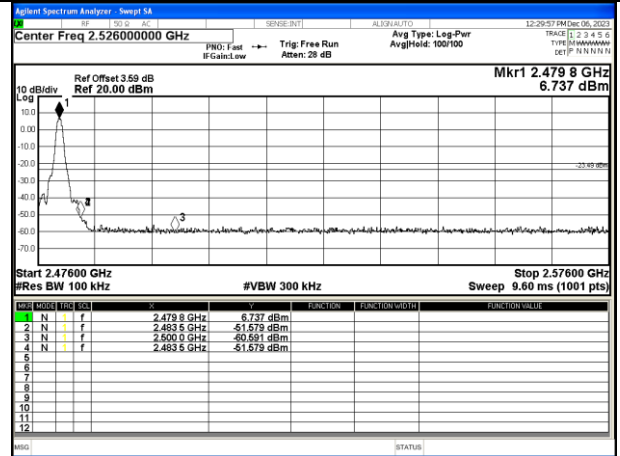
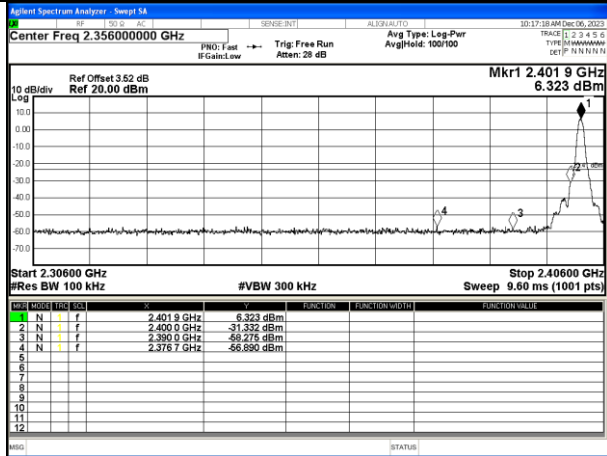
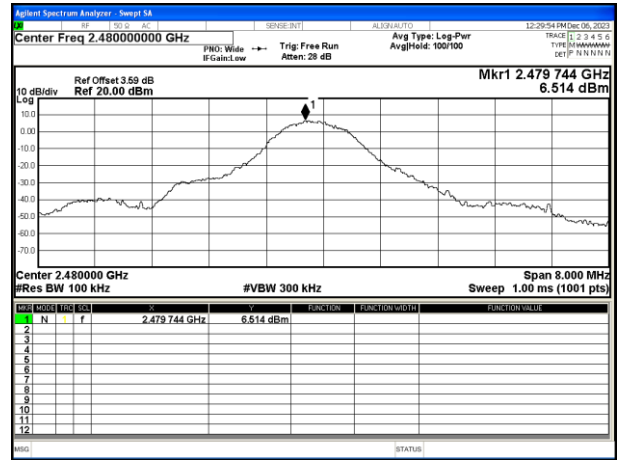
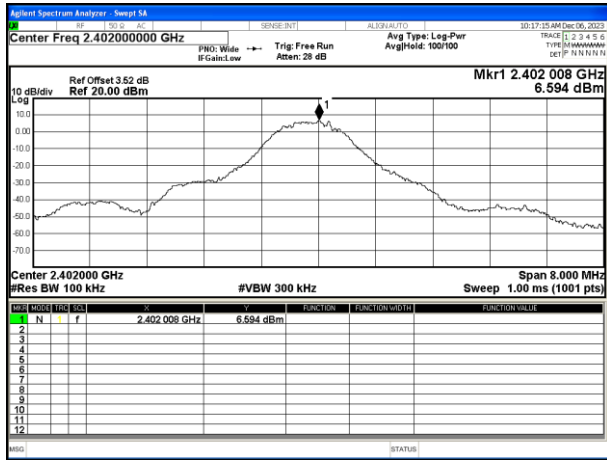


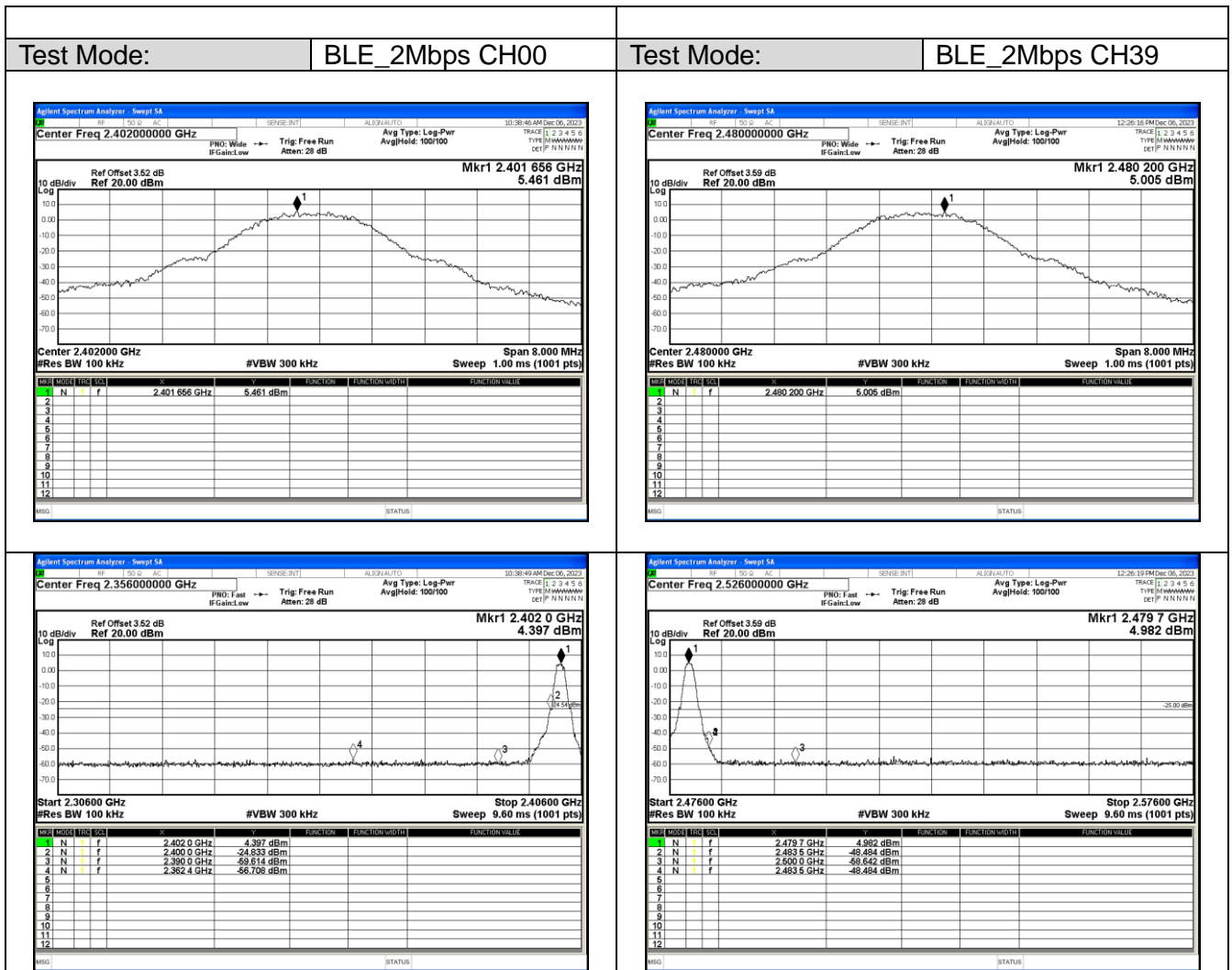


For Band edge(it's also the reference level for conducted spurious emission)

Test Mode: BLE_1Mbps CH00

Test Mode: BLE_1Mbps CH39

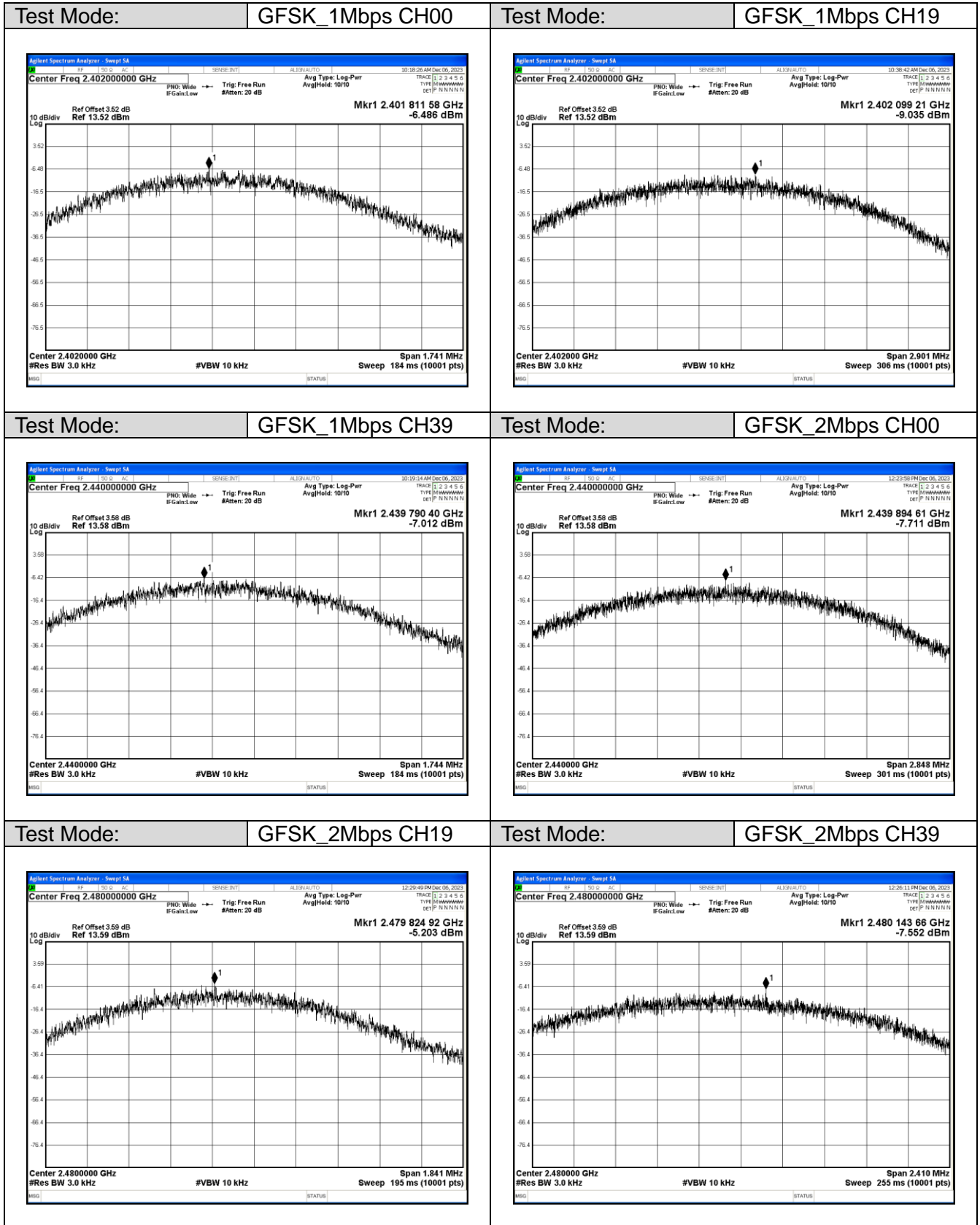




Appendix A.3 Test Results of Conducted Power Spectral Density

GFSK_1Mbps			
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
CH00	-6.486	8	Pass
CH19	-7.012	8	Pass
CH39	-5.203	8	Pass

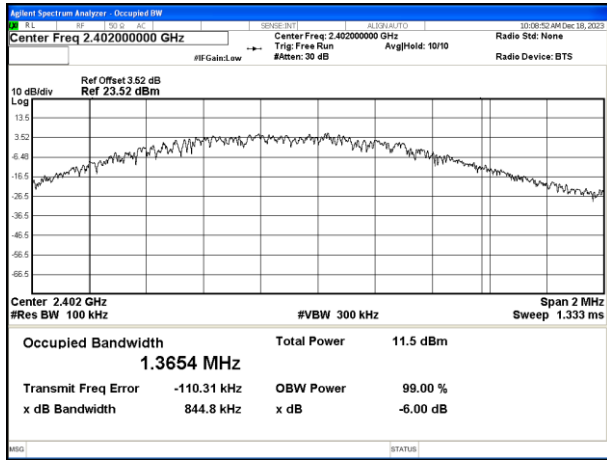
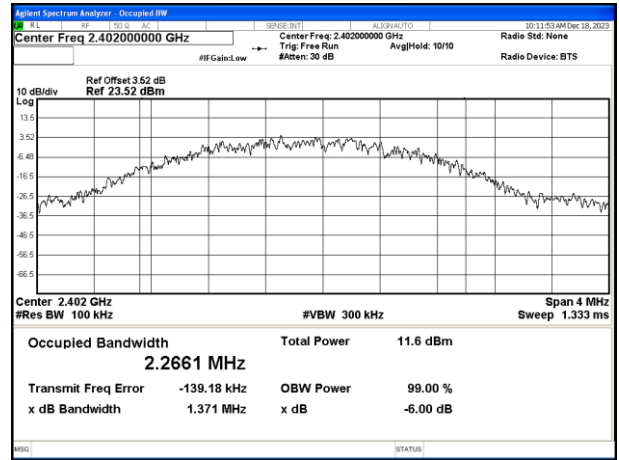
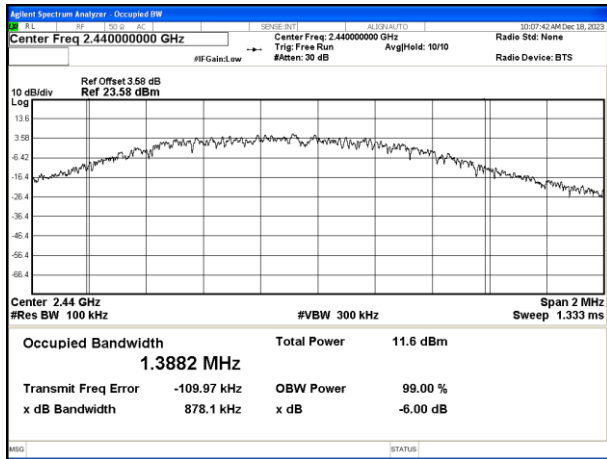
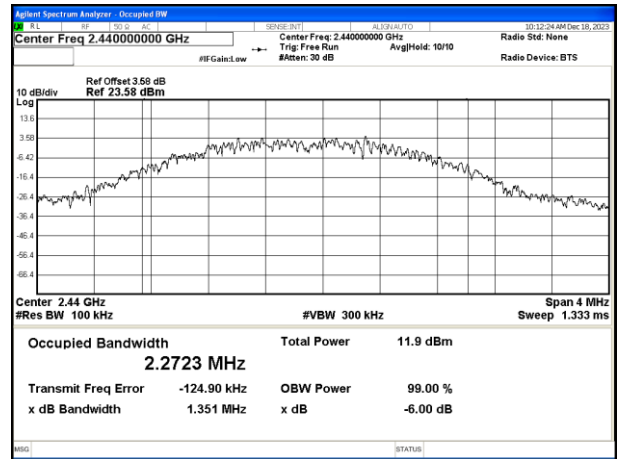
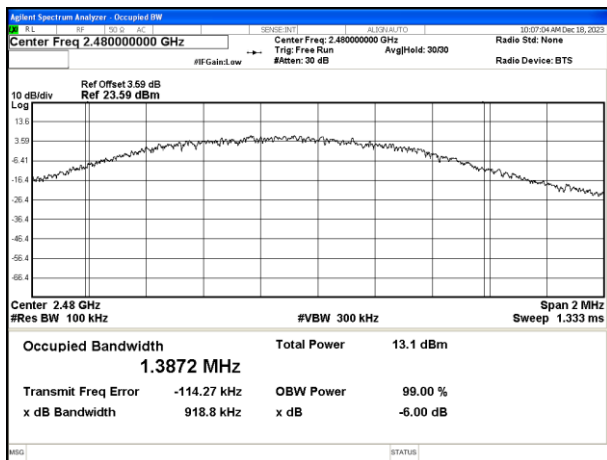
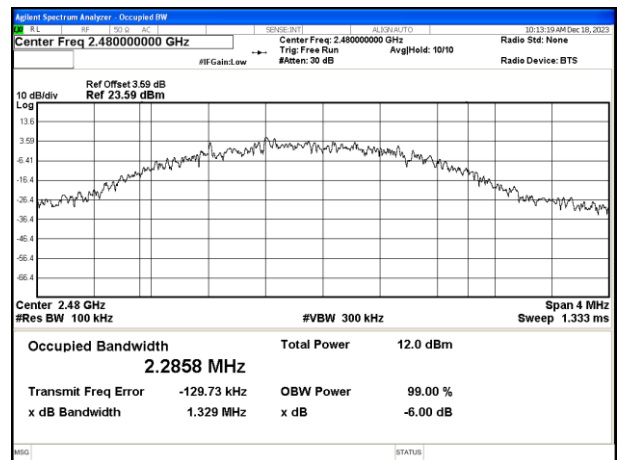
GFSK_2Mbps			
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
CH00	-9.035	8	Pass
CH19	-7.711	8	Pass
CH39	-7.552	8	Pass



Appendix A.4 Test Results of 6dB BANDWIDTH

GFSK_1Mbps			
Frequency	Bandwidth (MHz)	6dB limit (KHz)	Result
	6dB		
CH00	0.8448	0.5	Pass
CH19	0.8781	0.5	Pass
CH39	0.9188	0.5	Pass

GFSK_2Mbps			
Frequency	Bandwidth (MHz)	6dB limit (KHz)	Result
	6dB		
CH00	1.3713	0.5	Pass
CH19	1.3507	0.5	Pass
CH39	1.3292	0.5	Pass

6dB Bandwidth
Test Mode: GFSK_1Mbps CH00

Test Mode: GFSK_1Mbps CH19

Test Mode: GFSK_1Mbps CH39

Test Mode: GFSK_2Mbps CH00

Test Mode: GFSK_2Mbps CH19

Test Mode: GFSK_2Mbps CH39


Appendix A.5 Test Results of Maximum Conducted Power

For FCC:

Mode	Frequency [MHz]	Measured of Average Power		Limit [W]
		Conducted [dBm]	W	
BLE_1Mbps	2402	4.46	0.0028	≤ 1.0
	2440	4.65	0.0029	≤ 1.0
	2480	4.53	0.0028	≤ 1.0
BLE_2Mbps	2402	1.90	0.0015	≤ 1.0
	2440	2.10	0.0016	≤ 1.0
	2480	1.96	0.0016	≤ 1.0

Note:

- 1) The cable loss is taken into account in results.
 - 2) Antenna gain(G) BLE: -2.77 dBi
- e.i.r.p.=P(AVG power)+ G, which is far below the 4 W