

Appendix A: Test Results of BLE

Table of Contents	Page
APPENDIX A.1 TEST RESULTS OF RADIATED SPURIOUS EMISSION	2
APPENDIX A.2 TEST RESULTS OF CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHZ BANDWIDTH.....	7
APPENDIX A.3 TEST RESULTS OF CONDUCTED POWER SPECTRAL DENSITY	12
APPENDIX A.4 TEST RESULTS OF 6DB AND 99% BANDWIDTH	14
APPENDIX A.5 TEST RESULTS OF MAXIMUM CONDUCTED POWER	17

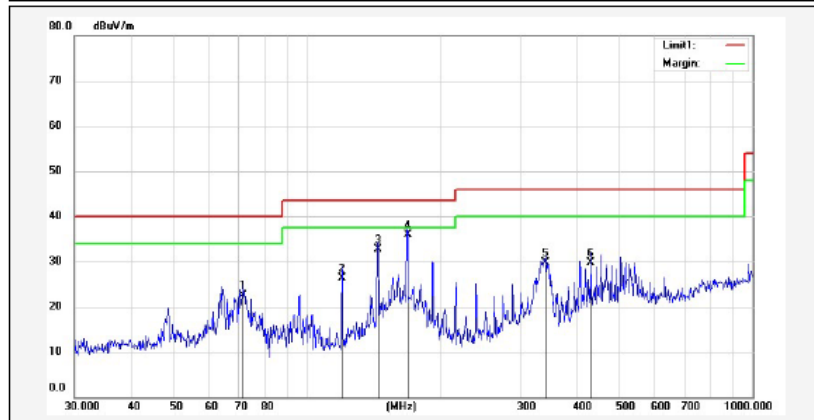
Appendix A.1 Test Results of Radiated Spurious Emission

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

Below 1GHz:

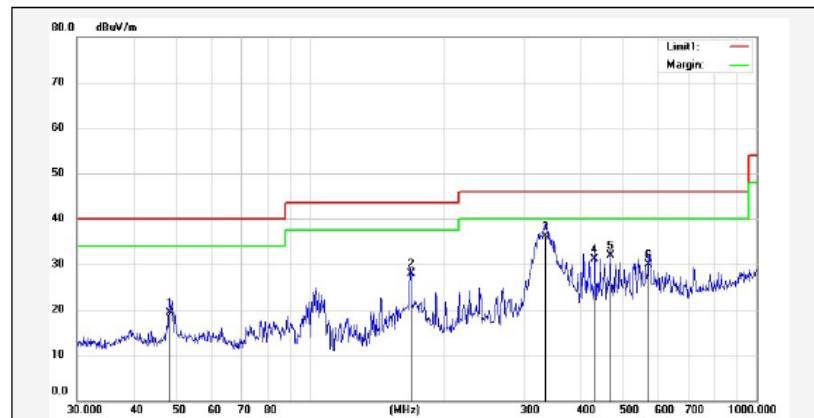
Test Mode:	Mode 3(worst mode)
------------	--------------------

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	71.8320	38.06	-15.58	22.48	40.00	-17.52	---	---	QP
2	119.8555	42.30	-15.99	26.31	43.50	-17.19	---	---	QP
3	143.8294	46.27	-13.53	32.74	43.50	-10.76	---	---	QP
4*	167.8242	49.49	-13.58	35.91	43.50	-7.59	---	---	QP
5	341.9786	40.30	-10.66	29.64	46.00	-16.36	---	---	QP
6	432.5457	37.88	-8.12	29.76	46.00	-16.24	---	---	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	48.3318	32.38	-13.13	19.25	40.00	-20.75	---	---	QP
2	167.8242	41.42	-13.58	27.84	43.50	-15.66	---	---	QP
3*	334.8590	46.97	-10.82	36.15	46.00	-9.85	---	---	QP
4	432.5457	39.14	-8.12	31.02	46.00	-14.98	---	---	QP
5	468.8761	38.96	-7.07	31.89	46.00	-14.11	---	---	QP
6	570.6100	35.02	-5.16	29.86	46.00	-16.14	---	---	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	4842	62.35	-15.72	46.63	74	-27.37	peak
2	4842	47.87	-15.72	32.15	54	-21.85	AVG
3	9398	55.02	-6.20	48.82	74	-25.18	peak
4	9398	40.76	-6.20	34.56	54	-19.44	AVG
5	11982	53.82	-3.03	50.79	74	-23.21	peak
6	11982	38.99	-3.03	35.96	54	-18.04	AVG
7	12832	54.96	-2.94	52.02	74	-21.98	peak
8	12832	40.35	-2.94	37.41	54	-16.59	AVG
9	14328	53.95	-1.38	52.57	74	-21.43	peak
10	14328	38.53	-1.38	37.15	54	-16.85	AVG
11	15756	53.13	-1.28	51.85	74	-22.15	peak
12	15756	37.33	-1.28	36.05	54	-17.95	AVG

GFSK-Low Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	7528	55.2	-8.93	46.27	74	-27.73	peak
2	7528	40.19	-8.93	31.26	54	-22.74	AVG
3	10418	55.31	-6.33	48.98	74	-25.02	peak
4	10418	40.18	-6.33	33.85	54	-20.15	AVG
5	12084	53.09	-3.11	49.98	74	-24.02	peak
6	12084	37.27	-3.11	34.16	54	-19.84	AVG
7	12492	54.09	-2.90	51.19	74	-22.81	peak
8	12492	39.45	-2.90	36.55	54	-17.45	AVG
9	14294	53.18	-1.30	51.88	74	-22.12	peak
10	14294	37.58	-1.30	36.28	54	-17.72	AVG
11	15756	52.57	-1.28	51.29	74	-22.71	peak
12	15756	37.7	-1.28	36.42	54	-17.58	AVG

GFSK- Middle Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	9024	55.53	-7.69	47.84	74	-26.16	peak
2	9024	40.78	-7.69	33.09	54	-20.91	AVG
3	9398	54.38	-6.20	48.18	74	-25.82	peak
4	9398	39.31	-6.20	33.11	54	-20.89	AVG
5	12458	54.53	-3.04	51.49	74	-22.51	peak
6	12458	40.06	-3.04	37.02	54	-16.98	AVG
7	14328	52.64	-1.38	51.26	74	-22.74	peak
8	14328	38.27	-1.38	36.89	54	-17.11	AVG
9	15790	51.77	-1.25	50.52	74	-23.48	peak
10	15790	37.24	-1.25	35.99	54	-18.01	AVG
11	16538	51.57	-0.30	51.27	74	-22.73	peak
12	16538	36.85	-0.30	36.55	54	-17.45	AVG

GFSK-Middle Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	8140	55.42	-8.56	46.86	74	-27.14	peak
2	8140	40.12	-8.56	31.56	54	-22.44	AVG
3	9364	54.41	-6.40	48.01	74	-25.99	peak
4	9364	40.28	-6.40	33.88	54	-20.12	AVG
5	12424	54.79	-3.19	51.6	74	-22.4	peak
6	12424	39.39	-3.19	36.2	54	-17.8	AVG
7	14328	52.72	-1.38	51.34	74	-22.66	peak
8	14328	38.27	-1.38	36.89	54	-17.11	AVG
9	14872	52.48	-0.99	51.49	74	-22.51	peak
10	14872	37.19	-0.99	36.2	54	-17.8	AVG
11	16742	52.28	-0.68	51.6	74	-22.4	peak
12	16742	37.78	-0.68	37.1	54	-16.9	AVG

GFSK-High Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	6882	55.56	-10.04	45.52	74	-28.48	peak
2	6882	41.24	-10.04	31.2	54	-22.8	AVG
3	8446	55.47	-8.23	47.24	74	-26.76	peak
4	8446	40.38	-8.23	32.15	54	-21.85	AVG
5	9500	54.14	-6.48	47.66	74	-26.34	peak
6	9500	38.53	-6.48	32.05	54	-21.95	AVG
7	12390	54.93	-3.28	51.65	74	-22.35	peak
8	12390	40.02	-3.28	36.74	54	-17.26	AVG
9	13988	53.1	-2.09	51.01	74	-22.99	peak
10	13988	38.05	-2.09	35.96	54	-18.04	AVG
11	14430	52.8	-1.53	51.27	74	-22.73	peak
12	14430	38.31	-1.53	36.78	54	-17.22	AVG

GFSK-High Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	5624	56.55	-13.51	43.04	74	-30.96	peak
2	5624	42.47	-13.51	28.96	54	-25.04	AVG
3	6100	57.66	-11.77	45.89	74	-28.11	peak
4	6100	42.22	-11.77	30.45	54	-23.55	AVG
5	8990	55.53	-7.73	47.8	74	-26.2	peak
6	8990	40.32	-7.73	32.59	54	-21.41	AVG
7	12458	54.23	-3.04	51.19	74	-22.81	peak
8	12458	39.52	-3.04	36.48	54	-17.52	AVG
9	13920	53.93	-1.93	52	74	-22	peak
10	13920	39.34	-1.93	37.41	54	-16.59	AVG
11	15008	54.43	-1.33	53.1	74	-20.9	peak
12	15008	39.17	-1.33	37.84	54	-16.16	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	2355.6	41.67	2.81	44.48	74	-29.52	peak
2	2355.6	25.69	2.81	28.5	54	-25.5	AVG
3	2390	39.38	3.01	42.39	74	-31.61	peak
4	2390	23.1	3.01	26.11	54	-27.89	AVG

Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2349.52	43.21	2.78	45.99	74	-28.01	peak
2	2349.52	27.37	2.78	30.15	54	-23.85	AVG
3	2390	40.02	3.01	43.03	74	-30.97	peak
4	2390	25.43	3.01	28.44	54	-25.56	AVG

GFSK-High

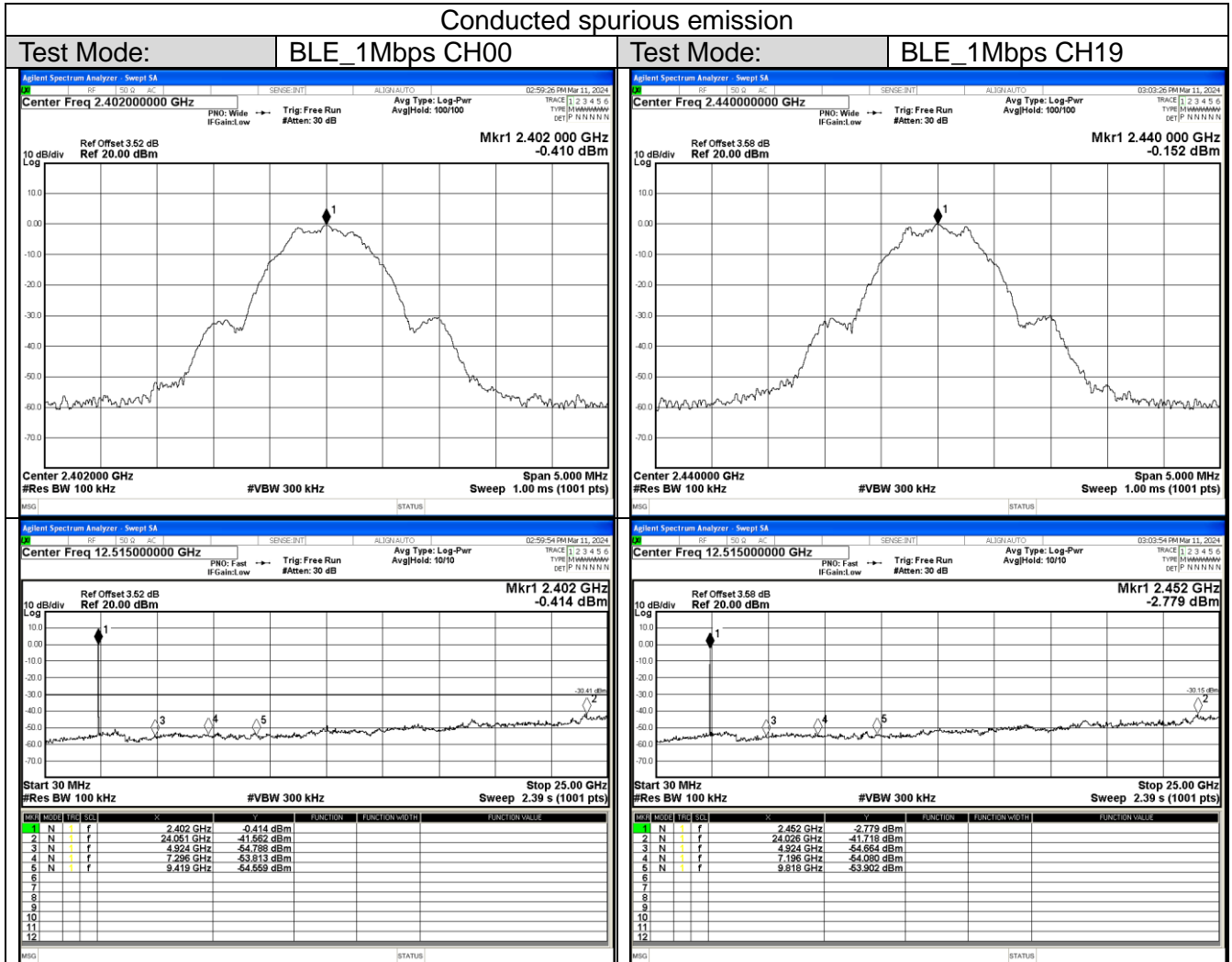
Horizontal

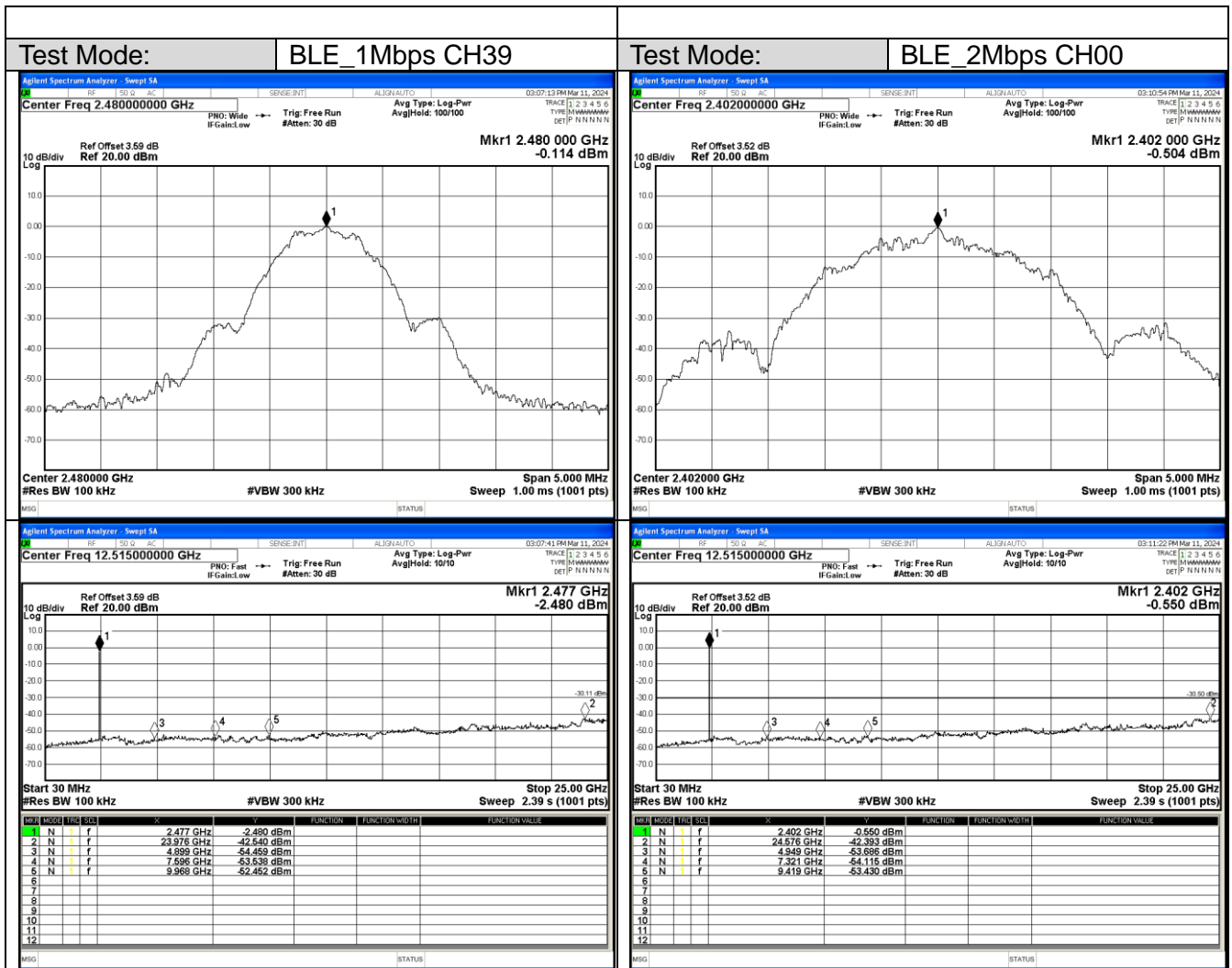
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	44.05	3.54	47.59	74	-26.41	peak
2	2483.5	27.55	3.54	31.09	54	-22.91	AVG
3	2486.7	44.53	3.56	48.09	74	-25.91	peak
4	2486.7	28.99	3.56	32.55	54	-21.45	AVG

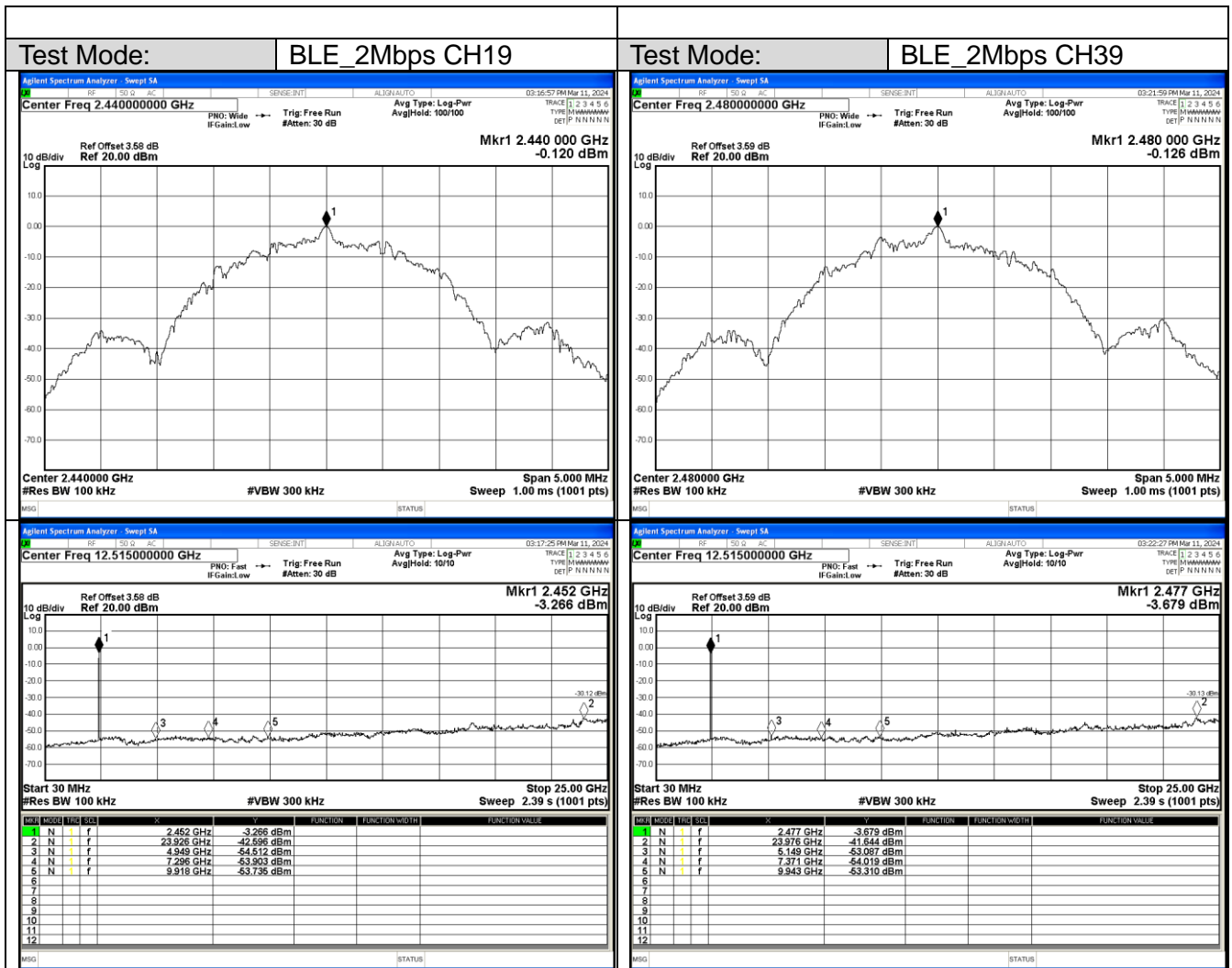
Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	40.08	3.54	43.62	74	-30.38	peak
2	2483.5	24.92	3.54	28.46	54	-25.54	AVG
3	2494.2	45.68	3.63	49.31	74	-24.69	peak
4	2494.2	27.03	3.63	30.66	54	-23.34	AVG

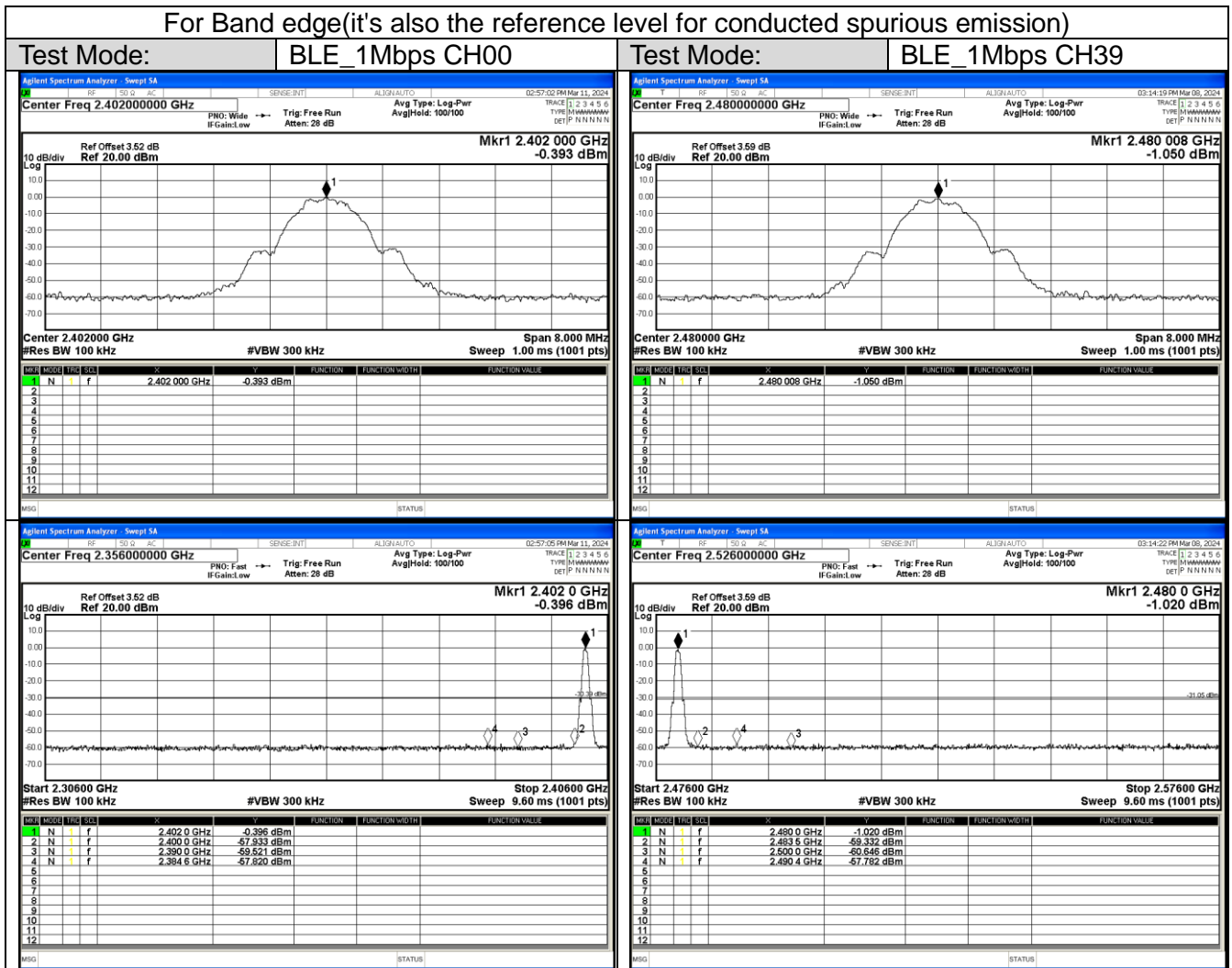
Appendix A.2 Test Results of Conducted Spurious Emissions Measured in 100 kHz Bandwidth

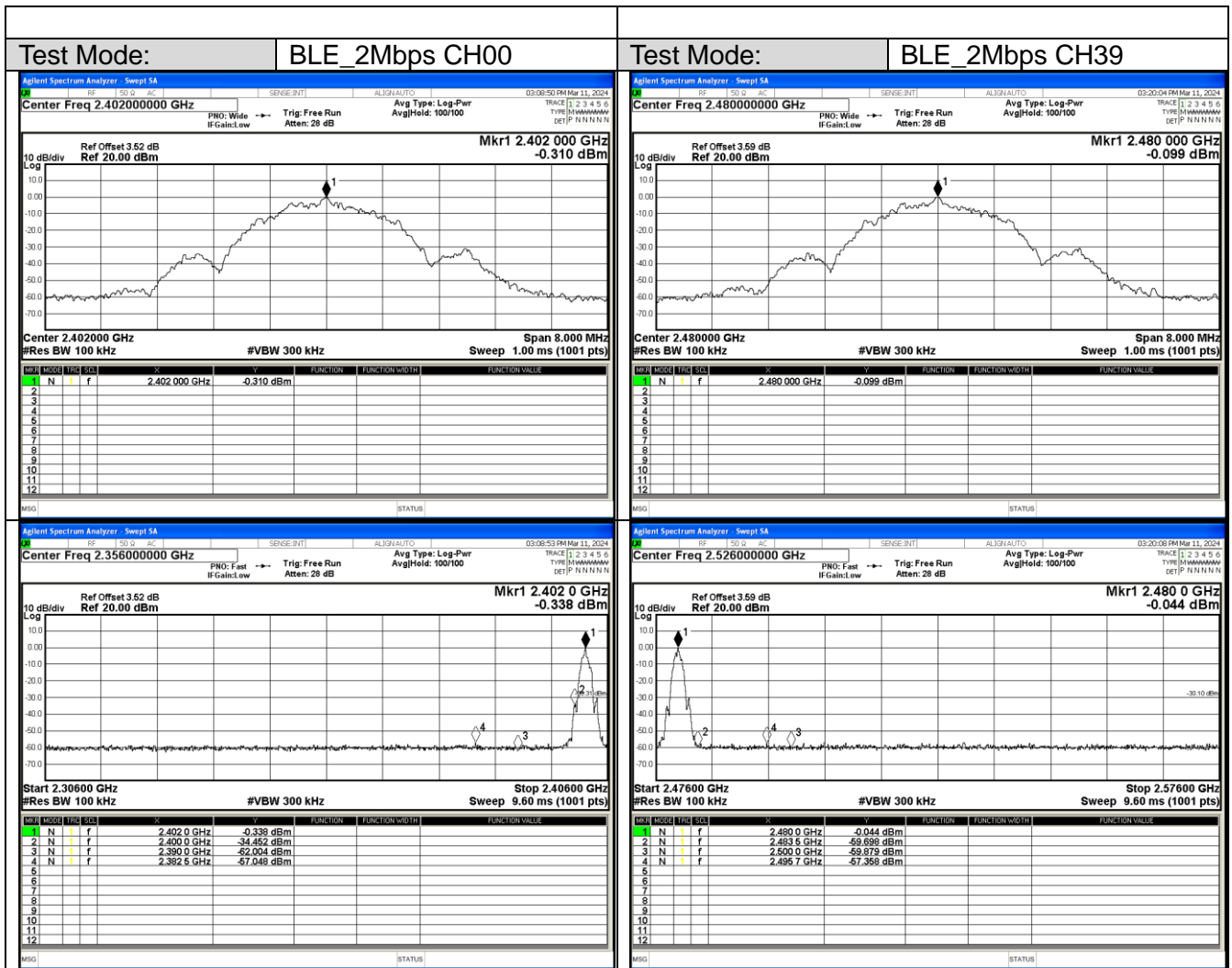






For Band edge(it's also the reference level for conducted spurious emission)

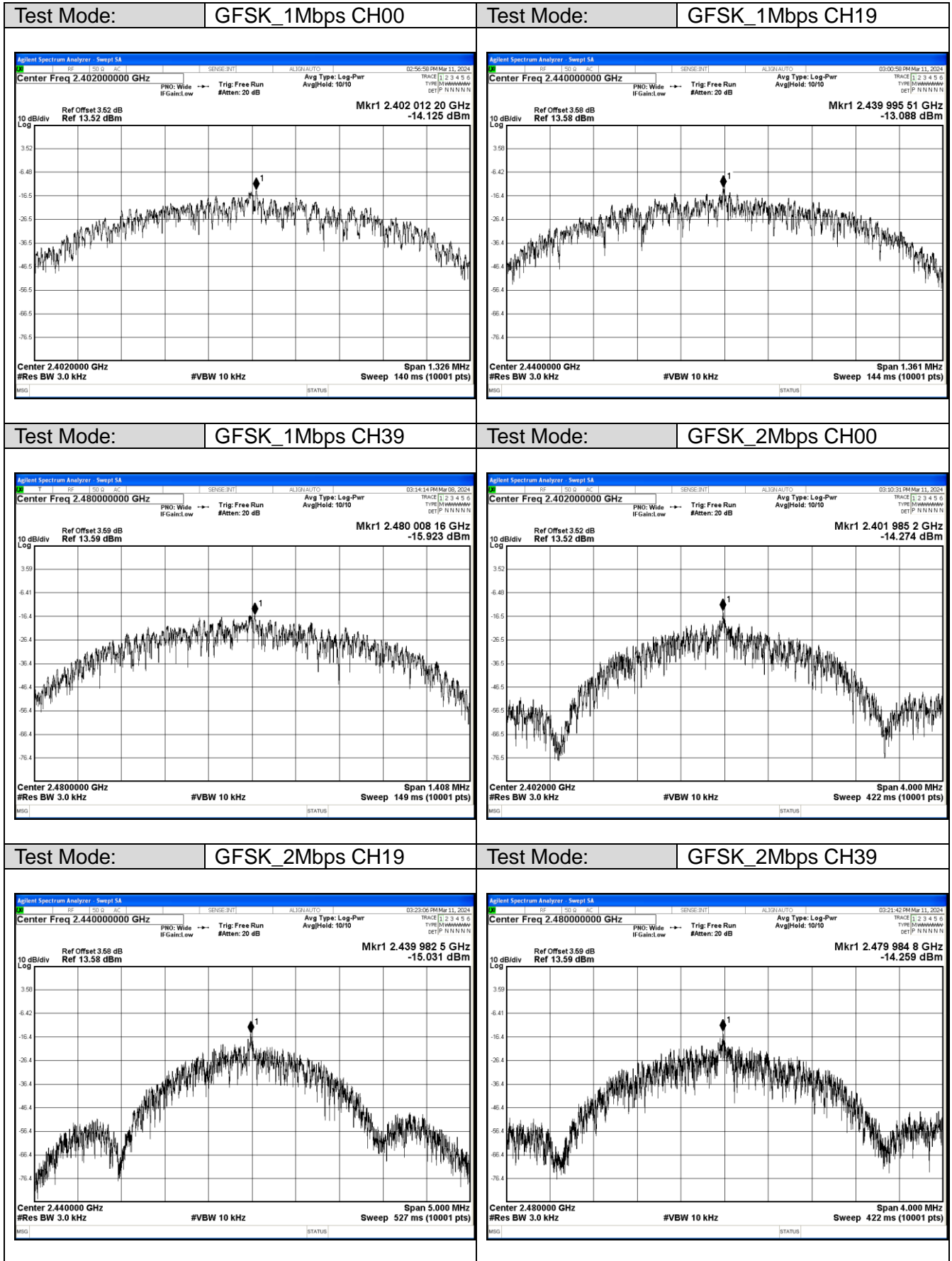




Appendix A.3 Test Results of Conducted Power Spectral Density

GFSK_1Mbps			
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
CH00	-14.125	8	Pass
CH19	-13.088	8	Pass
CH39	-15.923	8	Pass

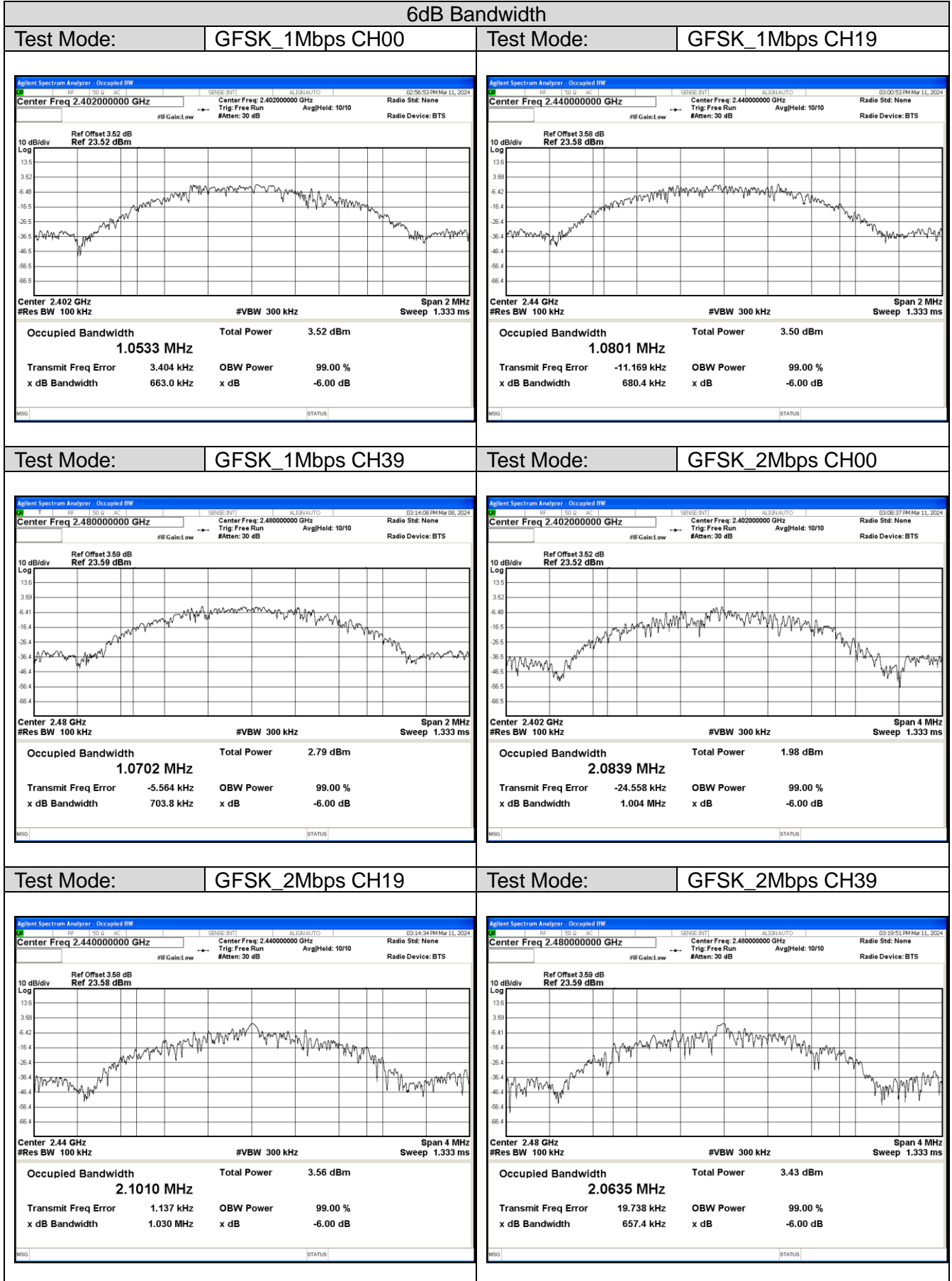
GFSK_2Mbps			
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
CH00	-14.274	8	Pass
CH19	-15.031	8	Pass
CH39	-14.259	8	Pass

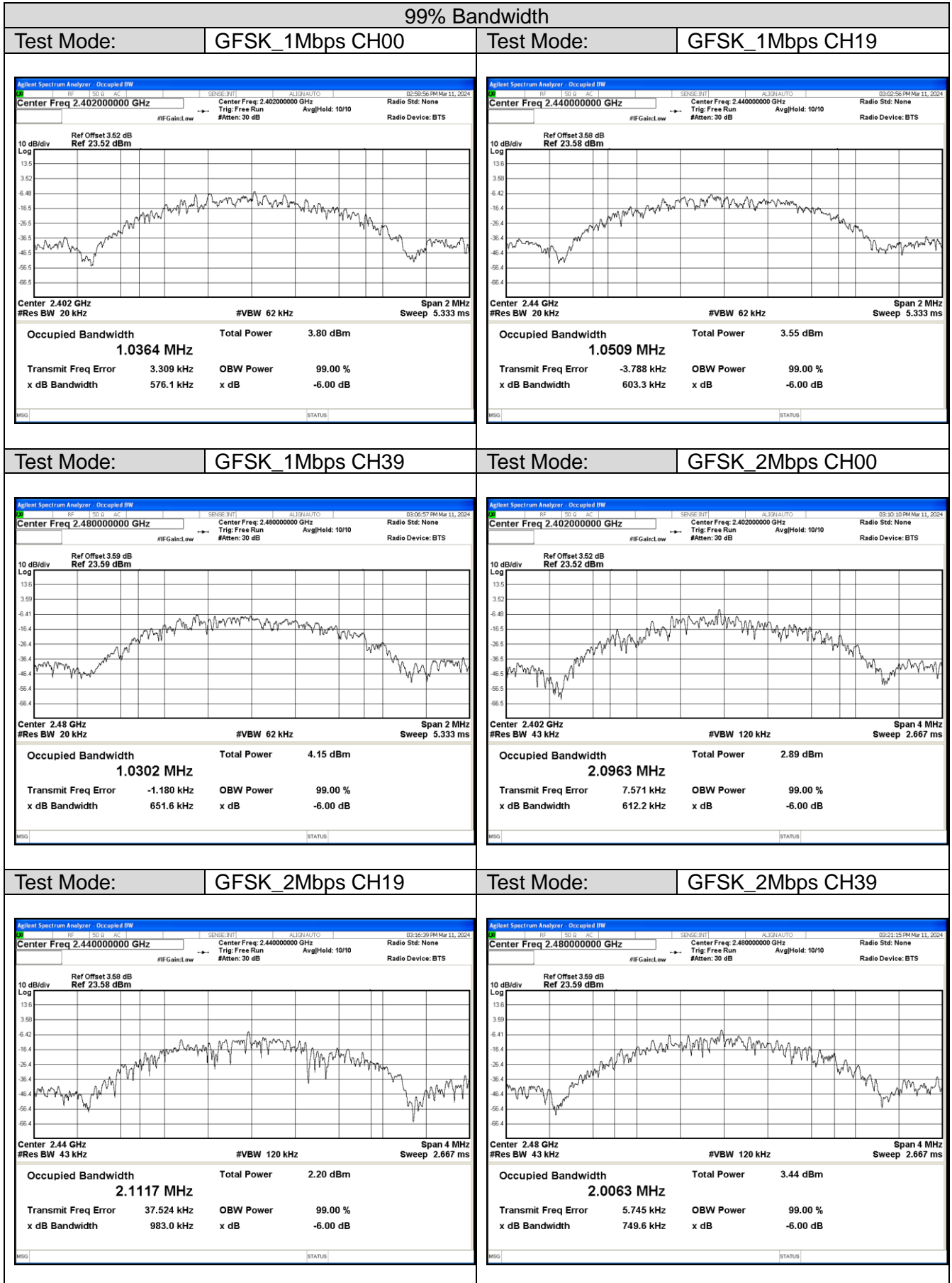


Appendix A.4 Test Results of 6dB and 99% BANDWIDTH

GFSK_1Mbps				
Frequency	Bandwidth (MHz)		6dB limit (MHz)	Result
	99%	6dB		
CH00	1.0364	0.6630	0.5	Pass
CH19	1.0509	0.6804	0.5	Pass
CH39	1.0302	0.7038	0.5	Pass

GFSK_2Mbps				
Frequency	Bandwidth (MHz)		6dB limit (MHz)	Result
	99%	6dB		
CH00	2.0963	1.0044	0.5	Pass
CH19	2.1117	1.0305	0.5	Pass
CH39	2.0063	0.6574	0.5	Pass

6dB Bandwidth




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	-1.77	0.0007	≤ 1.0
	2440	-1.96	0.0006	≤ 1.0
	2480	-2.13	0.0006	≤ 1.0
BLE_2Mbps	2402	-1.79	0.0007	≤ 1.0
	2440	-1.96	0.0006	≤ 1.0
	2480	-2.14	0.0006	≤ 1.0

Note:

- 1) The cable loss is taken into account in results.
 - 2) Antenna gain(G) BLE: 2.68 dBi
- e.i.r.p.=P(AVG power)+ G, which is far below the 4 W

For IC:

Mode	Frequency [MHz]	Measured of Average Power		Limit [dBm]
		Conducted [dBm]	EIRP [dBm]	
BLE_1Mbps	2402	-1.77	0.91	≤ 36
	2440	-1.96	0.72	≤ 36
	2480	-2.13	0.55	≤ 36
BLE_2Mbps	2402	-1.79	0.89	≤ 36
	2440	-1.96	0.72	≤ 36
	2480	-2.14	0.54	≤ 36

Note:

- 1) The cable loss is taken into account in results.
 - 2) Antenna gain(G) BLE: 2.68 dBi
- e.i.r.p.=P(AVG power)+ G, which is far below the 4 W