

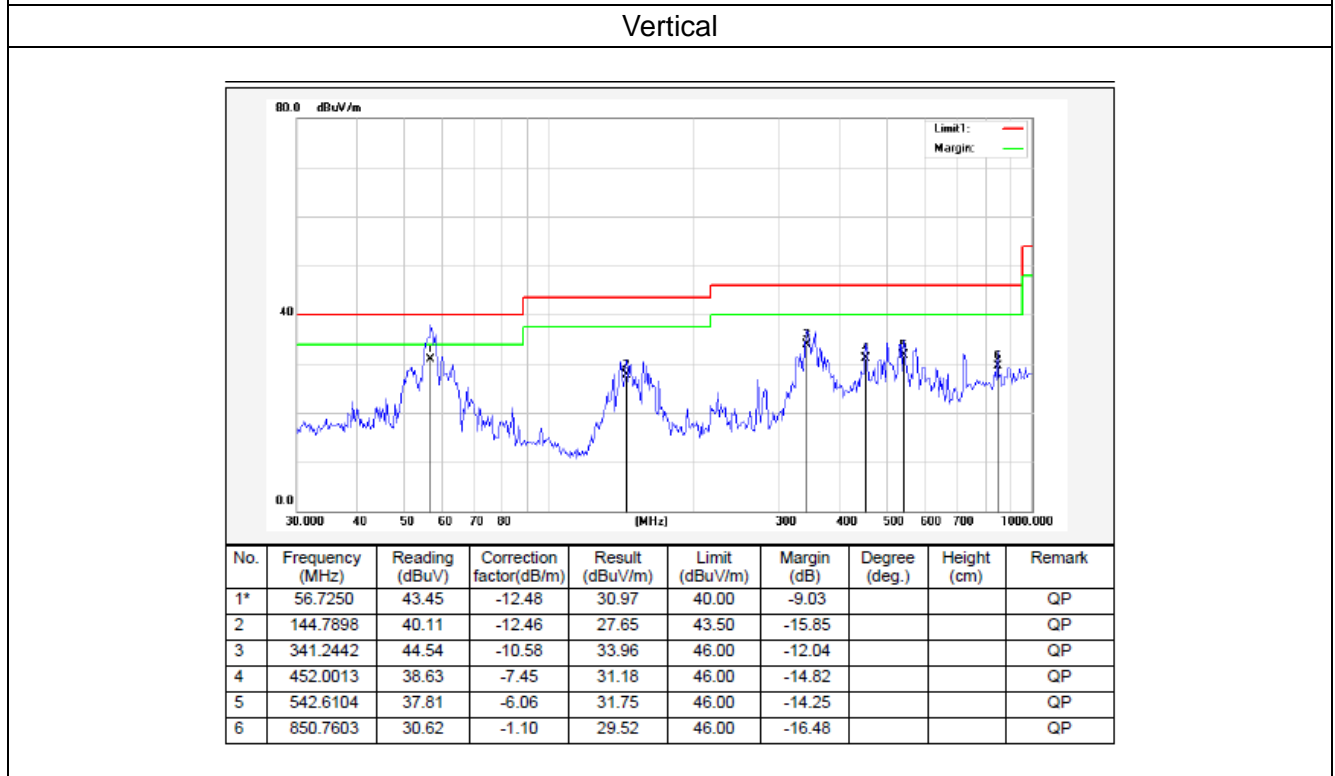
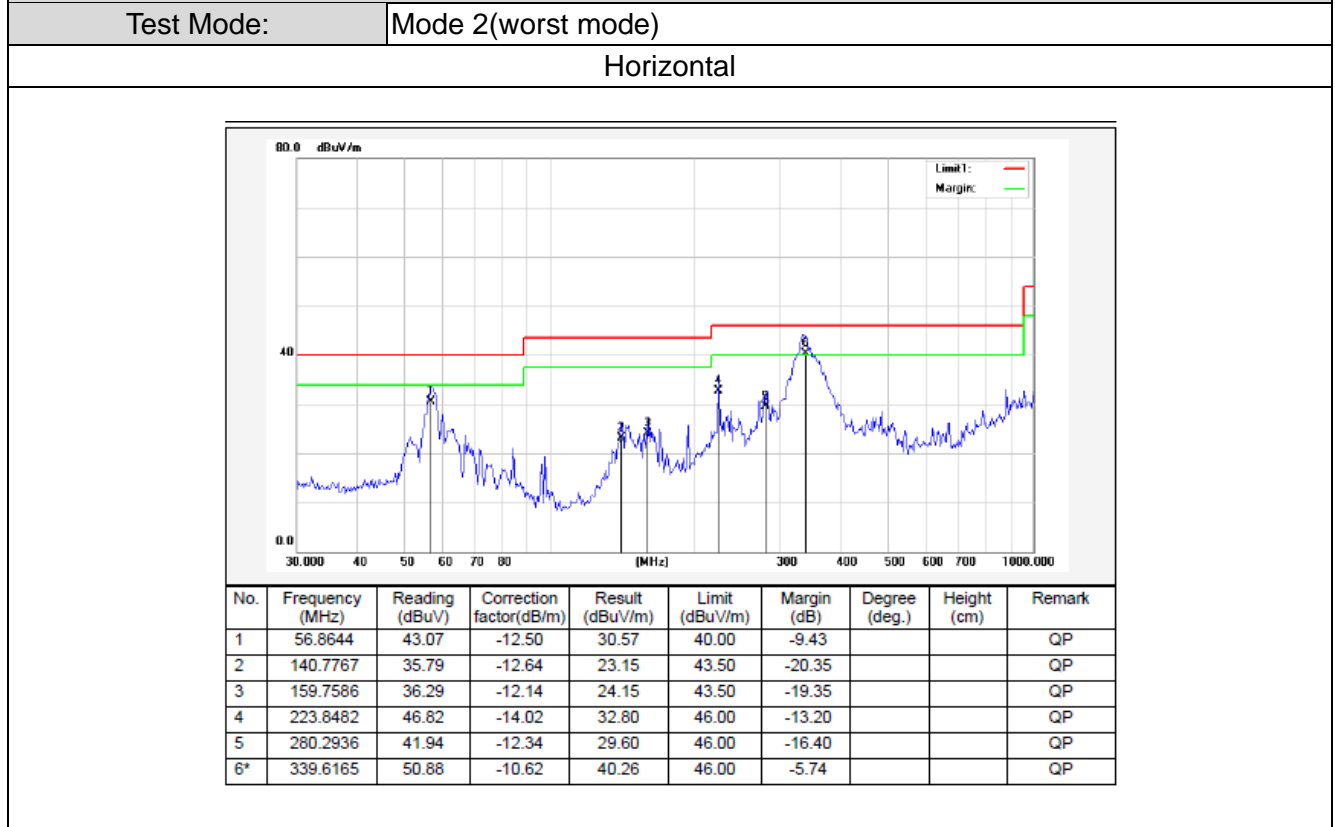
Appendix A: Test Results of BLE

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.6 TEST RESULTS OF DUTY CYCLE.....	18

Appendix A.1 Test Results of Radiated Spurious Emission

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

Below 1GHz:



**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	1305.319	66.76	-24.47	42.29	74	-31.71	peak
2	1305.319	58.78	-24.47	34.31	54	-19.69	AVG
3	1535.156	66.69	-24.2	42.49	74	-31.51	peak
4	1535.156	59.34	-24.2	35.14	54	-18.86	AVG
5	2541.018	64.79	-19.72	45.07	74	-28.93	peak
6	2541.018	57.32	-19.72	37.6	54	-16.4	AVG
7	4808.307	65.72	-15.73	49.99	74	-24.01	peak
8	4808.307	62.68	-15.73	46.95	54	-7.05	AVG
9	10144.5	54.61	-6.06	48.55	74	-25.45	peak
10	10144.5	44.19	-6.06	38.13	54	-15.87	AVG
11	12069.74	53.37	-3.09	50.28	74	-23.72	peak
12	12069.74	43.2	-3.09	40.11	54	-13.89	AVG

GFSK-Low Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1526.29	66.13	-24.33	41.8	74	-32.2	peak
2	1526.29	57.79	-24.33	33.46	54	-20.54	AVG
3	2384.166	65.49	-19.93	45.56	74	-28.44	peak
4	2384.166	52.84	-19.93	32.91	54	-21.09	AVG
5	3597.016	58.59	-17	41.59	74	-32.41	peak
6	3597.016	50.36	-17	33.36	54	-20.64	AVG
7	4808.307	65.4	-15.73	49.67	74	-24.33	peak
8	4808.307	63.24	-15.73	47.51	54	-6.49	AVG
9	5953.844	57.38	-12.04	45.34	74	-28.66	peak
10	5953.844	49.47	-12.04	37.43	54	-16.57	AVG
11	12352.65	53.54	-3.27	50.27	74	-23.73	peak
12	12352.65	39.92	-3.27	36.65	54	-17.35	AVG

GFSK- Middle Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1335.915	65.12	-24.63	40.49	74	-33.51	peak
2	1335.915	57.77	-24.63	33.14	54	-20.86	AVG
3	4910.943	65.31	-15.74	49.57	74	-24.43	peak
4	4910.943	61.02	-15.74	45.28	54	-8.72	AVG
5	6569.953	55	-11.03	43.97	74	-30.03	peak
6	6569.953	46.5	-11.03	35.47	54	-18.53	AVG
7	8827.884	54.71	-7.96	46.75	74	-27.25	peak
8	8827.884	46.49	-7.96	38.53	54	-15.47	AVG
9	12069.74	51.91	-3.09	48.82	74	-25.18	peak
10	12069.74	44	-3.09	40.91	54	-13.09	AVG
11	14112.97	51.6	-1.59	50.01	74	-23.99	peak
12	14112.97	42.13	-1.59	40.54	54	-13.46	AVG



GFSK-Middle Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1526.29	66.13	-24.33	41.8	74	-32.2	peak
2	1526.29	58.69	-24.33	34.36	54	-19.64	AVG
3	1815.952	66.63	-22.63	44	74	-30	peak
4	1815.952	59.21	-22.63	36.58	54	-17.42	AVG
5	3185.043	61.69	-19.1	42.59	74	-31.41	peak
6	3185.043	53.86	-19.1	34.76	54	-19.24	AVG
7	4910.538	66.02	-15.74	50.28	74	-23.72	peak
8	4910.538	62.89	-15.74	47.15	54	-6.85	AVG
9	8827.884	55.46	-7.96	47.5	74	-26.5	peak
10	8827.884	46.07	-7.96	38.11	54	-15.89	AVG
11	12352.65	53.54	-3.27	50.27	74	-23.73	peak
12	12352.65	40.39	-3.27	37.12	54	-16.88	AVG

GFSK-High Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1351.481	64.99	-24.7	40.29	74	-33.71	peak
2	1351.481	56.84	-24.7	32.14	54	-21.86	AVG
3	3638.928	58.71	-17.17	41.54	74	-32.46	peak
4	3638.928	51.17	-17.17	34	54	-20	AVG
5	4944.943	65.54	-15.61	49.93	74	-24.07	peak
6	4944.943	61.93	-15.61	46.32	54	-7.68	AVG
7	7682.15	54.07	-9.05	45.02	74	-28.98	peak
8	7682.15	46.35	-9.05	37.3	54	-16.7	AVG
9	9969.738	53.12	-6.07	47.05	74	-26.95	peak
10	9969.738	43.54	-6.07	37.47	54	-16.53	AVG
11	14194.95	51.08	-1.12	49.96	74	-24.04	peak
12	14194.95	40.8	-1.12	39.68	54	-14.32	AVG

GFSK-High Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	1571.14	64.66	-23.86	40.8	74	-33.2	peak
2	1571.14	56.85	-23.86	32.99	54	-21.01	AVG
3	3660.067	59.76	-17.37	42.39	74	-31.61	peak
4	3660.067	51.84	-17.37	34.47	54	-19.53	AVG
5	4944.943	67.35	-15.61	51.74	74	-22.26	peak
6	4944.943	64.14	-15.61	48.53	54	-5.47	AVG
7	5953.844	56.94	-12.04	44.9	74	-29.1	peak
8	5953.844	49.05	-12.04	37.01	54	-16.99	AVG
9	8046.507	54.22	-8.22	46	74	-28	peak
10	8046.507	47.11	-8.22	38.89	54	-15.11	AVG
11	12642.19	52.33	-2.67	49.66	74	-24.34	peak
12	12642.19	40.15	-2.67	37.48	54	-16.52	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	2348.717	46.62	2.77	49.39	74	-24.61	peak
2	2348.717	27.37	2.77	30.14	54	-23.86	AVG
3	2390	38.8	3.01	41.81	74	-32.19	peak
4	2390	19.79	3.01	22.8	54	-31.2	AVG

Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2348.998	45.51	2.78	48.29	74	-25.71	peak
2	2348.998	26.53	2.78	29.31	54	-24.69	AVG
3	2390	38.89	3.01	41.9	74	-32.1	peak
4	2390	18.27	3.01	21.28	54	-32.72	AVG

GFSK-High

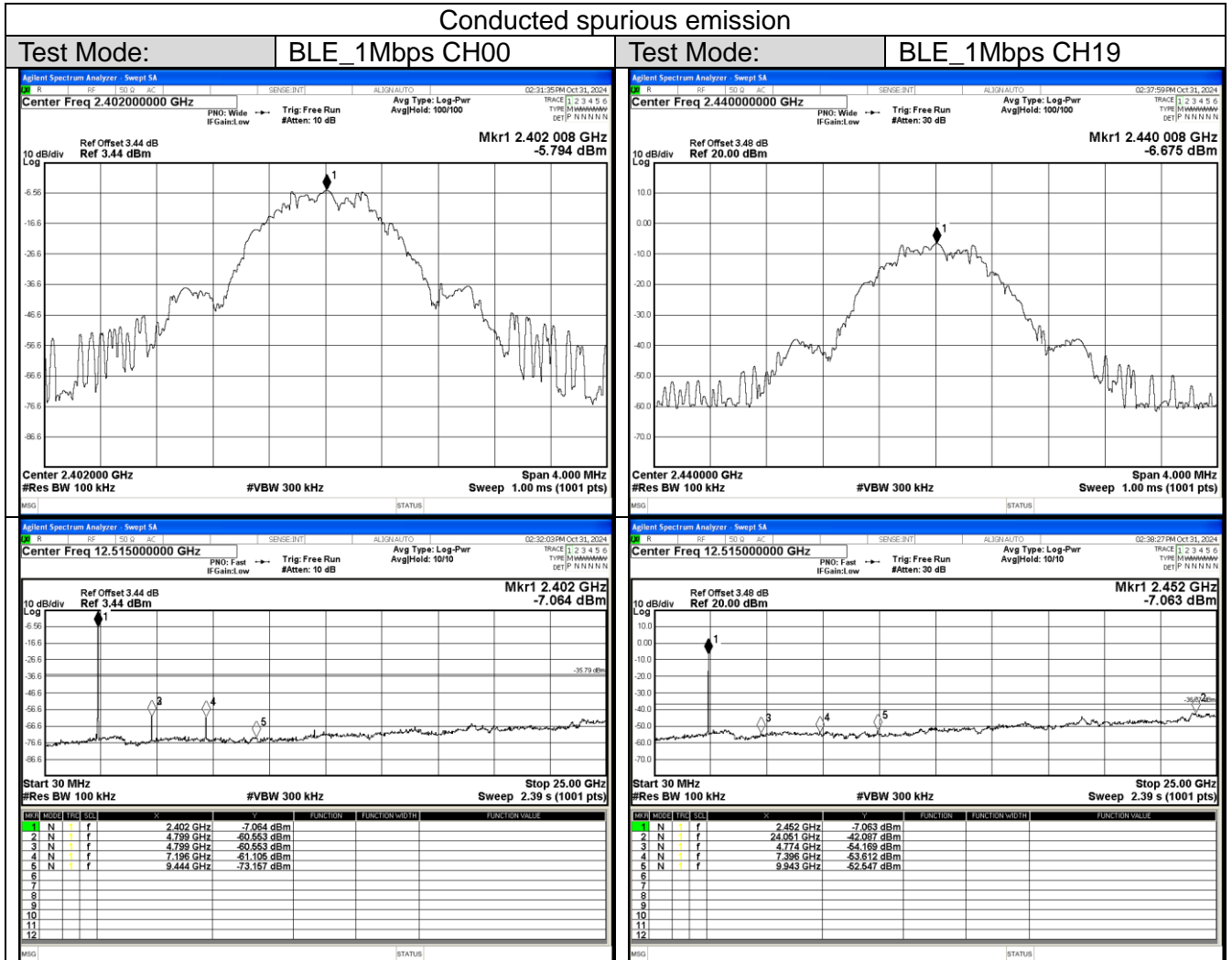
Horizontal

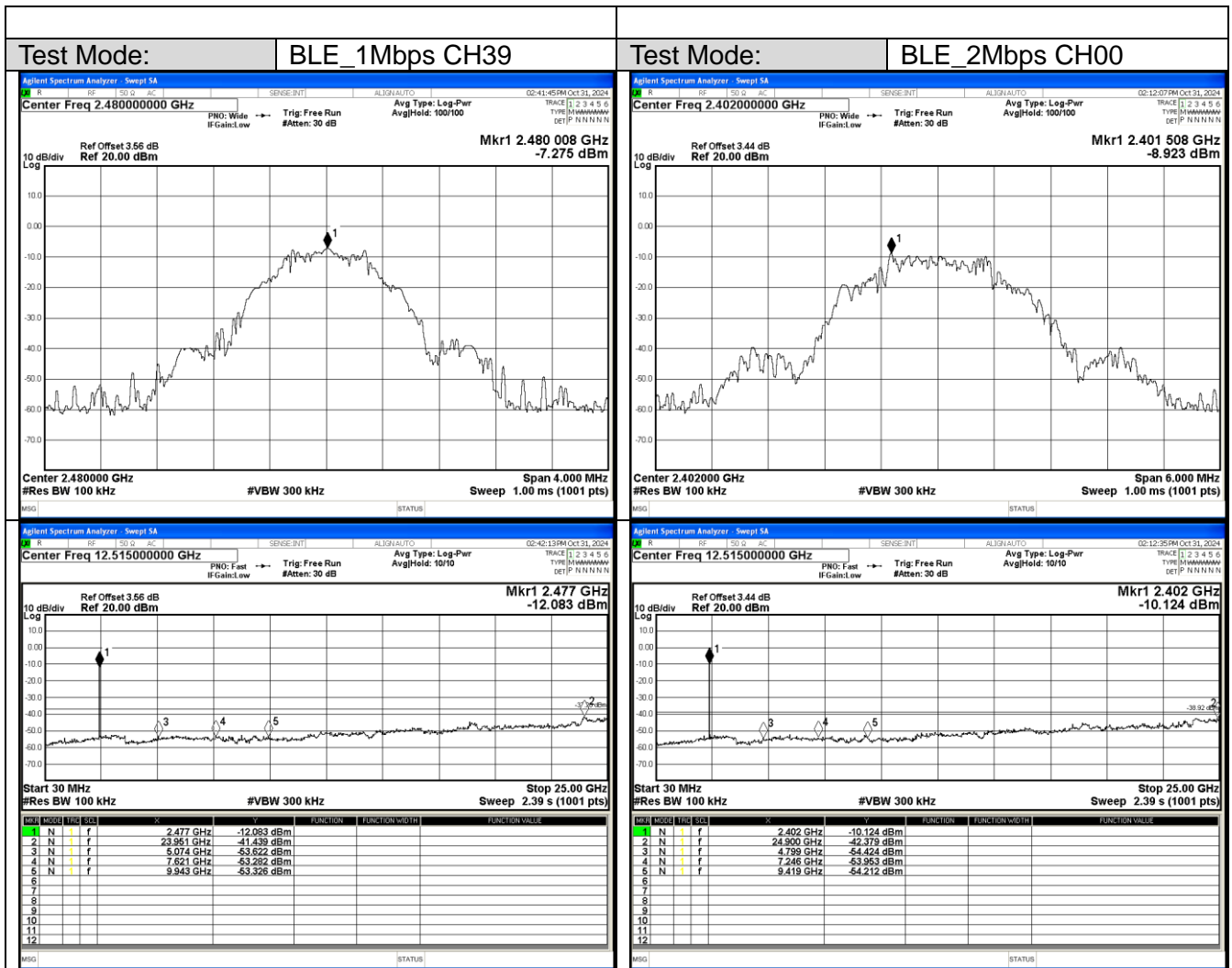
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	51.63	3.54	55.17	74	-18.83	peak
2	2483.5	32.15	3.54	35.69	54	-18.31	AVG
3	2486.172	44.25	3.56	47.81	74	-26.19	peak
4	2486.172	24.45	3.56	28.01	54	-25.99	AVG

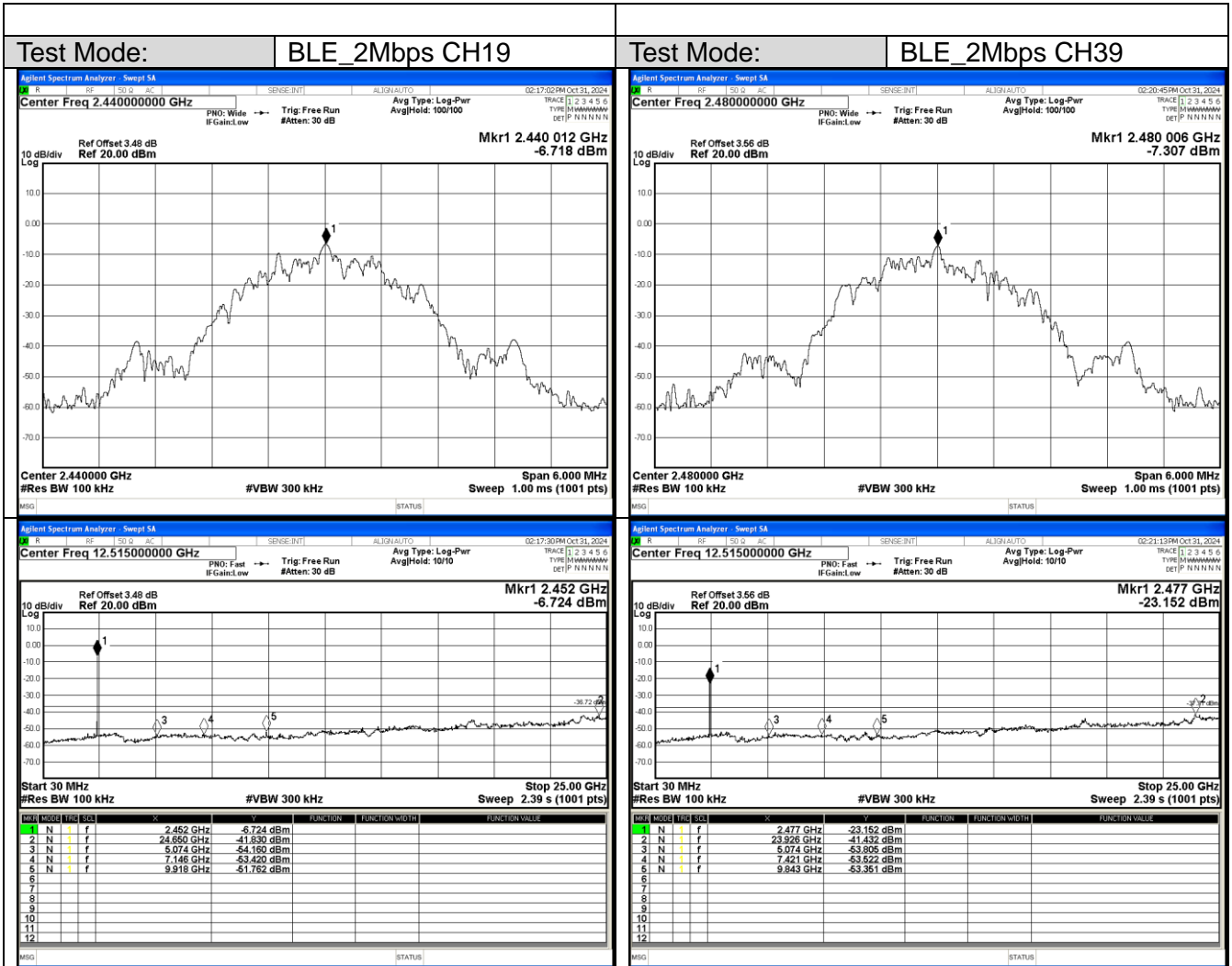
Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	50.93	3.54	54.47	74	-19.53	peak
2	2483.5	31.22	3.54	34.76	54	-19.24	AVG
3	2489.379	48.84	3.59	52.43	74	-21.57	peak
4	2489.379	28.39	3.59	31.98	54	-22.02	AVG

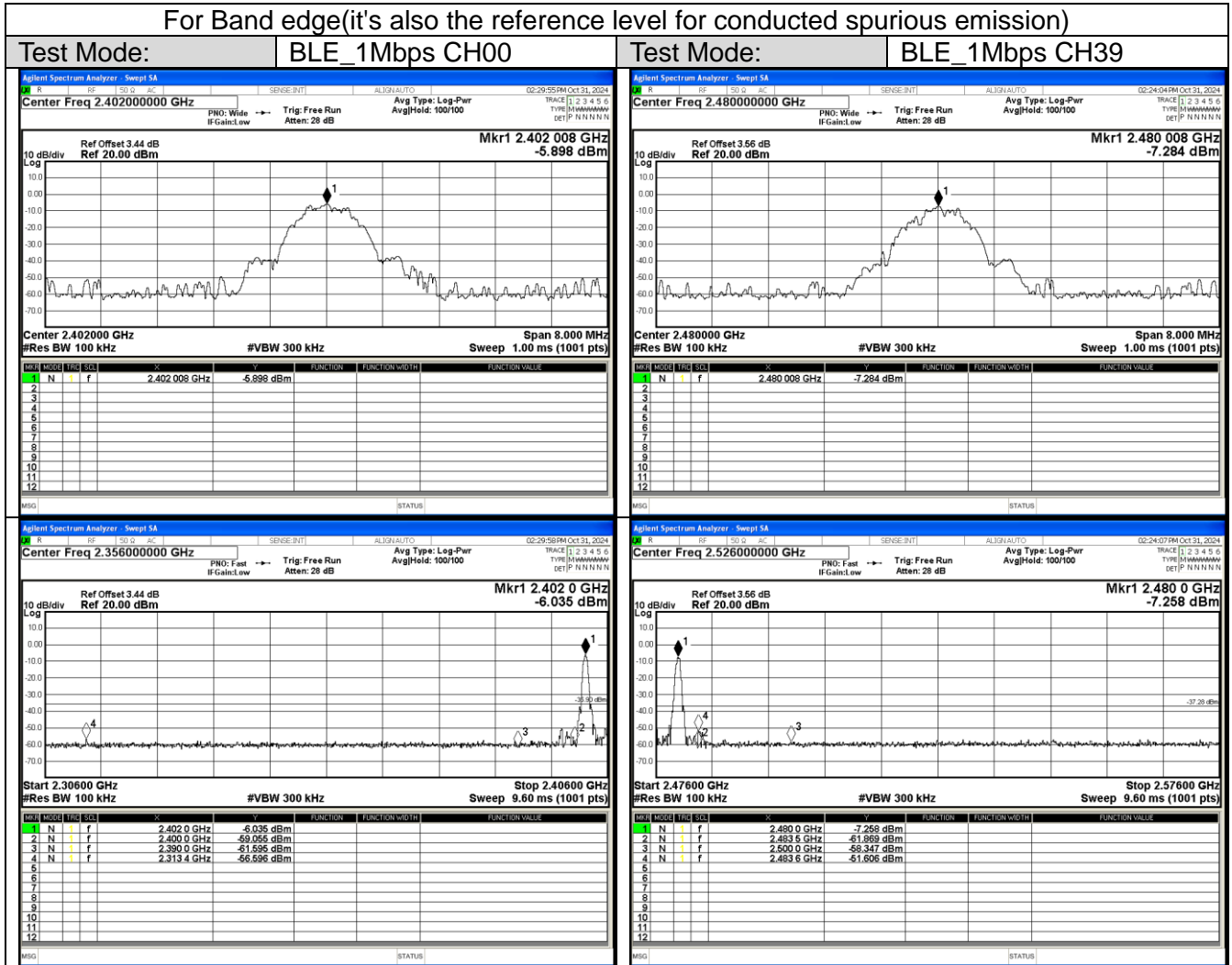
Appendix A.2 Test Results of Conducted Spurious Emissions Measured in 100 kHz Bandwidth

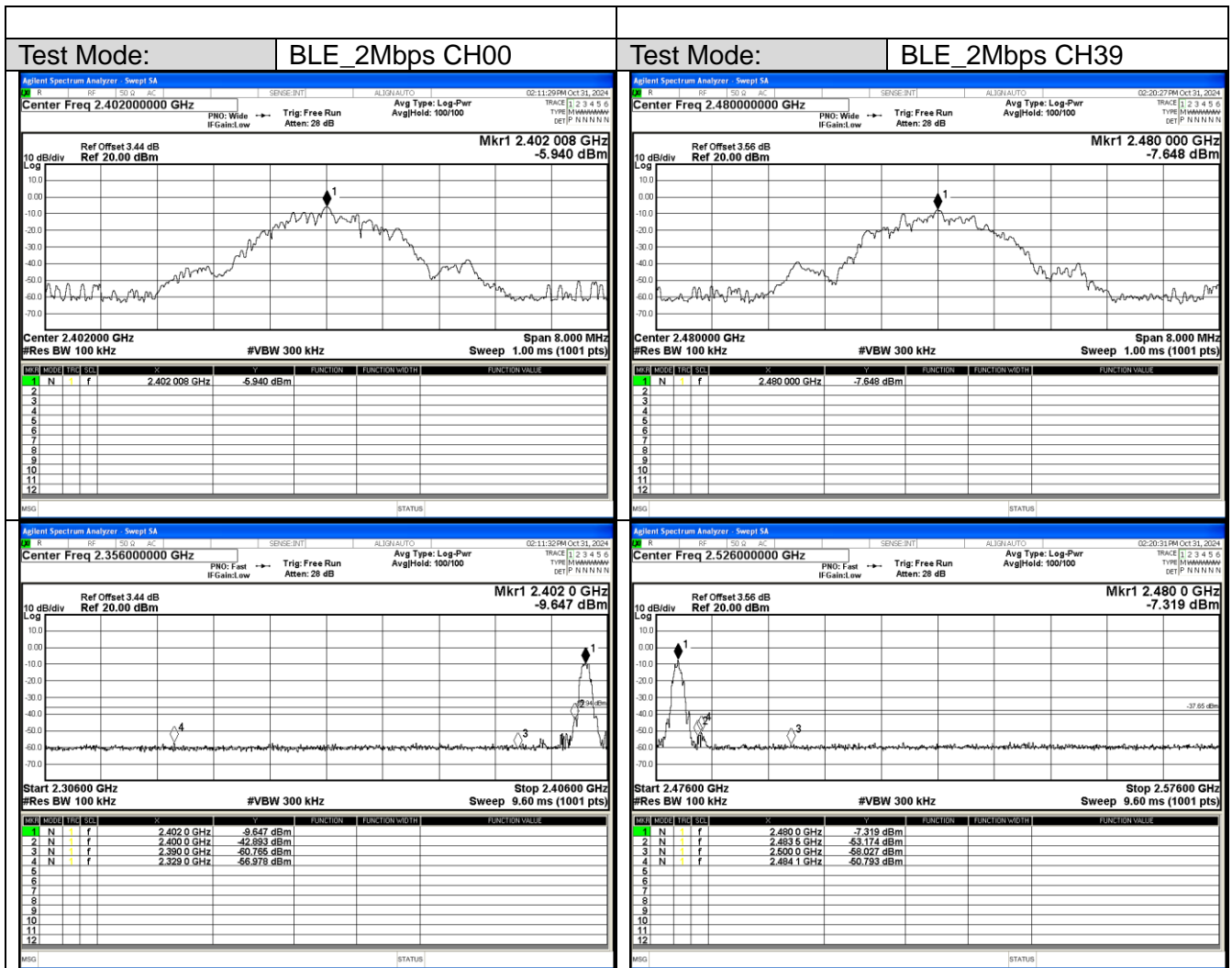






For Band edge(it's also the reference level for conducted spurious emission)

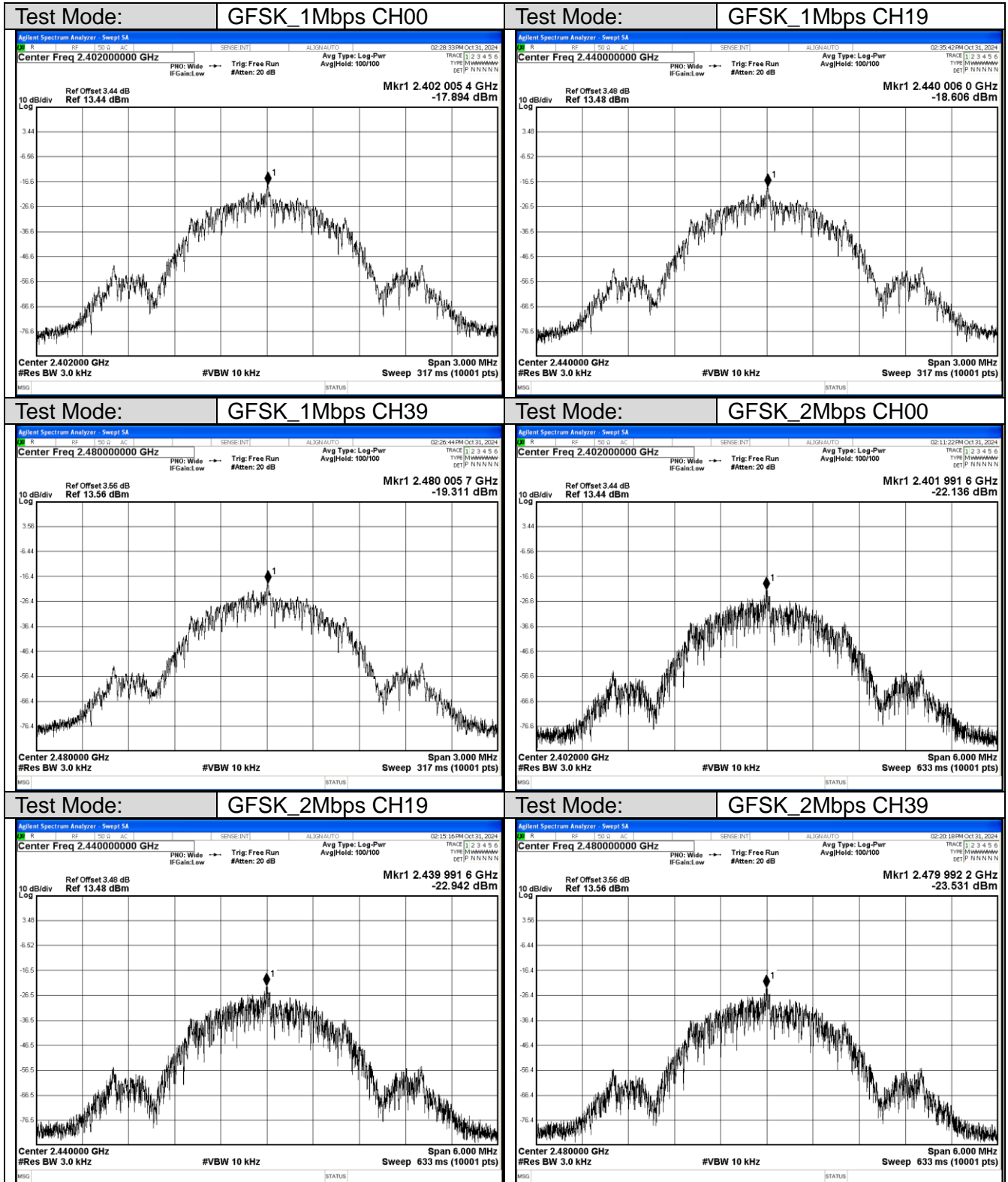




Appendix A.3 Test Results of Conducted Power Spectral Density

GFSK_1Mbps			
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
CH00	-17.894	8	Pass
CH19	-18.606	8	Pass
CH39	-19.311	8	Pass

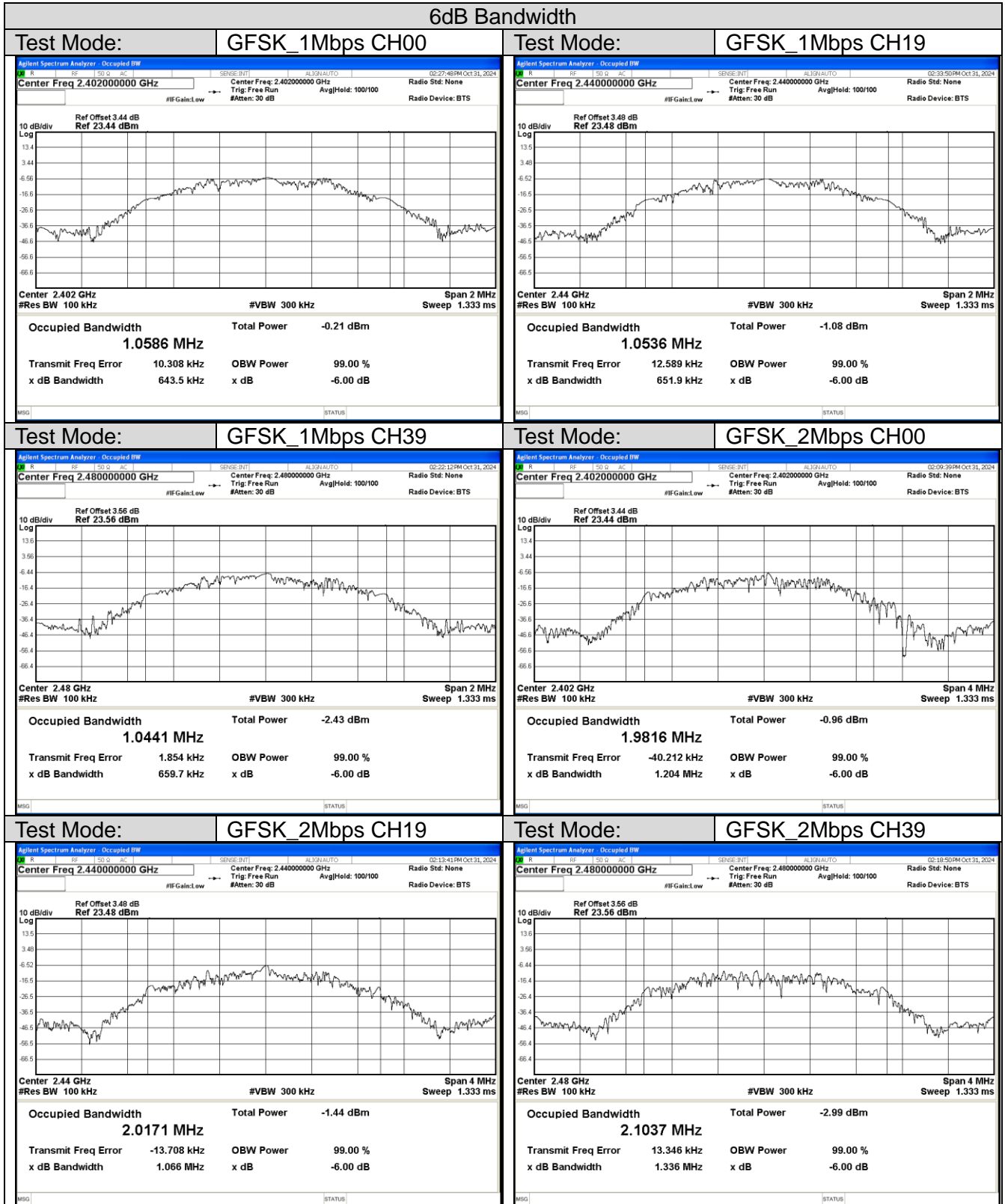
GFSK_2Mbps			
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
CH00	-22.136	8	Pass
CH19	-22.942	8	Pass
CH39	-23.531	8	Pass

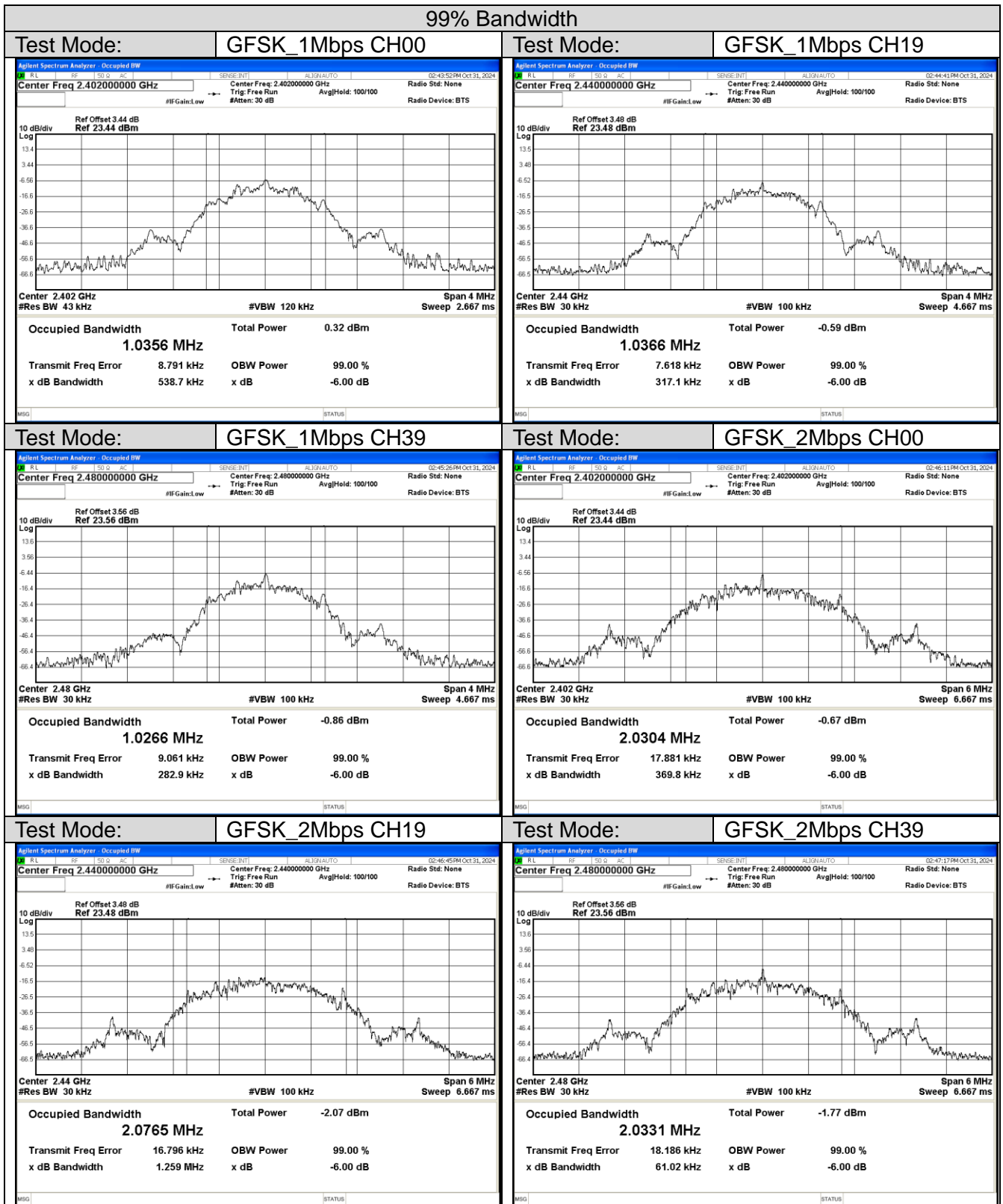


Appendix A.4 Test Results of 6dB and 99% BANDWIDTH

GFSK_1Mbps				
Frequency	Bandwidth (MHz)		6dB limit (MHz)	Result
	99%	6dB		
CH00	1.0356	0.6435	0.5	Pass
CH19	1.0366	0.6519	0.5	Pass
CH39	1.0266	0.6597	0.5	Pass

GFSK_2Mbps				
Frequency	Bandwidth (MHz)		6dB limit (MHz)	Result
	99%	6dB		
CH00	2.0304	1.2042	0.5	Pass
CH19	2.0765	1.0658	0.5	Pass
CH39	2.0331	1.3362	0.5	Pass





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	-6.979	0.0002	≤ 1.0
	2440	-7.715	0.0002	≤ 1.0
	2480	-8.365	0.0001	≤ 1.0
BLE_2Mbps	2402	-6.146	0.0002	≤ 1.0
	2440	-6.874	0.0002	≤ 1.0
	2480	-7.467	0.0002	≤ 1.0

Note:

- 1) The cable loss is taken into account in results.
 - 2) Antenna gain(G) BLE: 1.0 dBi
- e.i.r.p.=P(AVG power)+ G, which is far below the 4 W

For ISED:

Mode	Frequency [MHz]	Measured of Average Power		Limit [dBm]
		Conducted [dBm]	EIRP [dBm]	
BLE_1Mbps	2402	-6.979	-5.979	≤ 36
	2440	-7.715	-6.715	≤ 36
	2480	-8.365	-7.365	≤ 36
BLE_2Mbps	2402	-6.146	-5.146	≤ 36
	2440	-6.874	-5.874	≤ 36
	2480	-7.467	-6.467	≤ 36

Note:

- 1) The cable loss is taken into account in results.
 - 2) Antenna gain(G) BLE: 1.0 dBi
- e.i.r.p.=P(AVG power)+ G, which is far below the 4 W

Appendix A.6 Test Results of Duty Cycle

Mode	Frequency [MHz]	Duty Cycle [%]	Correction Factor [dB]
BLE_1Mbps	2402	15.48	8.1
	2440	15.43	8.12
	2480	15.46	8.11
BLE_2Mbps	2402	8.6	10.66
	2440	8.59	10.66
	2480	8.59	10.66

