

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:

Working

Horizontal

The graph displays the horizontal radiated spurious emission. The y-axis represents the field strength in dBuV/m, ranging from -10 to 70.0. The x-axis represents the frequency in MHz, ranging from 30.000 to 1000.000. A red line indicates the Limit1, and a green line indicates the Margin. The test results are shown as a blue line with peaks labeled 1 through 6. The data table below provides the specific values for each peak.

No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	31.3992	25.76	-6.96	18.80	40.00	-21.20			QP
2	48.3318	36.79	-17.97	18.82	40.00	-21.18			QP
3*	50.2324	37.70	-18.53	19.17	40.00	-20.83			QP
4	66.2662	30.25	-18.62	11.63	40.00	-28.37			QP
5	126.7723	25.37	-11.96	13.41	43.50	-30.09			QP
6	163.7550	28.76	-13.30	15.46	43.50	-28.04			QP

Vertical

The graph displays the vertical radiated spurious emission. The y-axis represents the field strength in dBuV/m, ranging from -10 to 70.0. The x-axis represents the frequency in MHz, ranging from 30.000 to 1000.000. A red line indicates the Limit1, and a green line indicates the Margin. The test results are shown as a blue line with peaks labeled 1 through 6. The data table below provides the specific values for each peak.

No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	43.6584	34.78	-15.33	19.45	40.00	-20.55			QP
2*	48.1625	42.54	-17.91	24.63	40.00	-15.37			QP
3	65.3431	34.96	-18.62	16.34	40.00	-23.66			QP
4	105.6414	30.63	-15.26	15.37	43.50	-28.13			QP
5	169.5990	30.25	-13.56	16.69	43.50	-26.81			QP
6	220.6170	28.53	-13.72	14.81	46.00	-31.19			QP

Correction Factor = insertion loss of LISN + cable loss;

Reading = Reading Amplitude in the instrument;

Result = Correction Factor + Reading;

Margin = Result – Limit.

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	4808	64.1	-13.33	50.77	74	-23.23	peak
2	7188	62.16	-8.03	54.13	56.06	-1.93	peak
3	8208	55.02	-7.62	47.4	74	-26.6	peak
4	10112	53.85	-4.19	49.66	56.06	-6.40	peak
5	11404	53.11	-1.87	51.24	74	-22.76	peak
6	12458	52.82	-1.59	51.23	74	-22.77	peak

GFSK-Low Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4808	62.1	-13.33	48.77	74	-25.23	peak
2	7188	62.89	-8.03	54.86	56.06	-1.20	peak
3	8378	54.11	-7.1	47.01	74	-26.99	peak
4	10486	52.83	-3.53	49.3	56.06	-6.76	peak
5	11472	52.44	-2.21	50.23	74	-23.77	peak
6	12424	53.58	-1.81	51.77	74	-22.23	peak

GFSK- Middle Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4876	63.97	-13	50.97	74	-23.03	peak
2	6168	54.95	-9.92	45.03	56.06	-11.03	peak
3	7324	61.56	-7.38	54.18	74	-19.82	peak
4	7324	55.97	-7.38	48.59	54	-5.41	AVG
5	10214	52.33	-3.78	48.55	56.06	-7.51	peak
6	11132	52.55	-2.48	50.07	74	-23.93	peak
7	12424	52.97	-1.81	51.16	74	-22.84	peak

GFSK-Middle Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3992	59.8	-15.01	44.79	74	-29.21	peak
2	4876	62.15	-13	49.15	74	-24.85	peak
3	7319.449	54.38	-7.4	46.98	54	-7.02	AVG
4	7324	61.21	-7.38	53.83	74	-20.17	peak
5	8412	55.13	-7.14	47.99	74	-26.01	peak
6	10452	53.12	-3.8	49.32	56.06	-6.74	peak
7	11302	52.9	-2.14	50.76	74	-23.24	peak

GFSK-High Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4944	64.88	-12.85	52.03	74	-21.97	peak
2	7426	61.32	-7.09	54.23	74	-19.77	peak
3	7426	55.08	-7.09	47.99	54	-6.01	AVG
4	8820	54.35	-7.83	46.52	56.06	-9.54	peak
5	10316	53.83	-4.06	49.77	56.06	-6.29	peak
6	11404	51.55	-1.87	49.68	74	-24.32	peak
7	13172	51.73	0.25	51.98	56.06	-4.08	peak

GFSK-High Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	4944	63.91	-12.85	51.06	74	-22.94	peak
2	6168	54.96	-9.92	45.04	56.06	-11.02	peak
3	7426	65.96	-7.09	58.87	74	-15.13	peak
4	7439.37	57.58	-7.08	50.5	54	-3.5	AVG
5	8378	54.1	-7.1	47	74	-27	peak
6	11098	53.16	-2.54	50.62	74	-23.38	peak
7	12458	53.11	-1.59	51.52	74	-22.48	peak

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.
- 5、According to section part 15.247(d), frequencies other than those required by part 15.205(a) are limited to the level of the intended emission (min. 76.06) minus 20dB.

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	2385.81	72.99	-21.05	51.94	74	-22.06	peak
2	2385.81	54.23	-21.05	33.18	54	-20.82	AVG
3	2390	74.82	-21.03	53.79	74	-20.21	peak
4	2390	57	-21.03	35.97	54	-18.03	AVG
5	2402.34	114.34	-20.99	93.35	125.2	-31.85	peak

Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2385.81	61.56	-21.05	40.51	74	-33.49	peak
2	2385.81	43.55	-21.05	22.5	54	-31.5	AVG
3	2390	64.36	-21.03	43.33	74	-30.67	peak
4	2390	47.05	-21.03	26.02	54	-27.98	AVG
5	2401.96	101.9	-20.99	80.91	125.2	-44.29	peak

GFSK-High

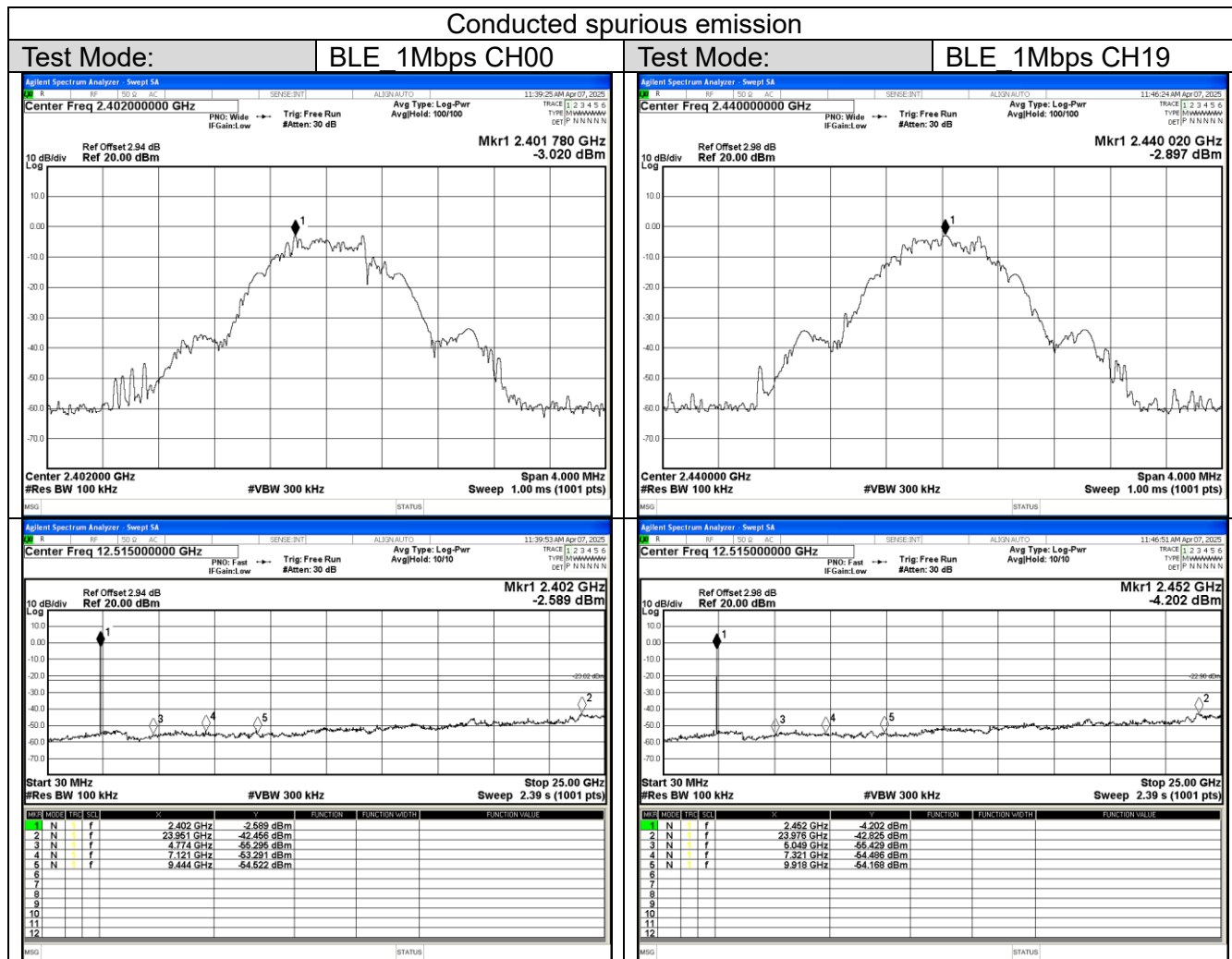
Horizontal

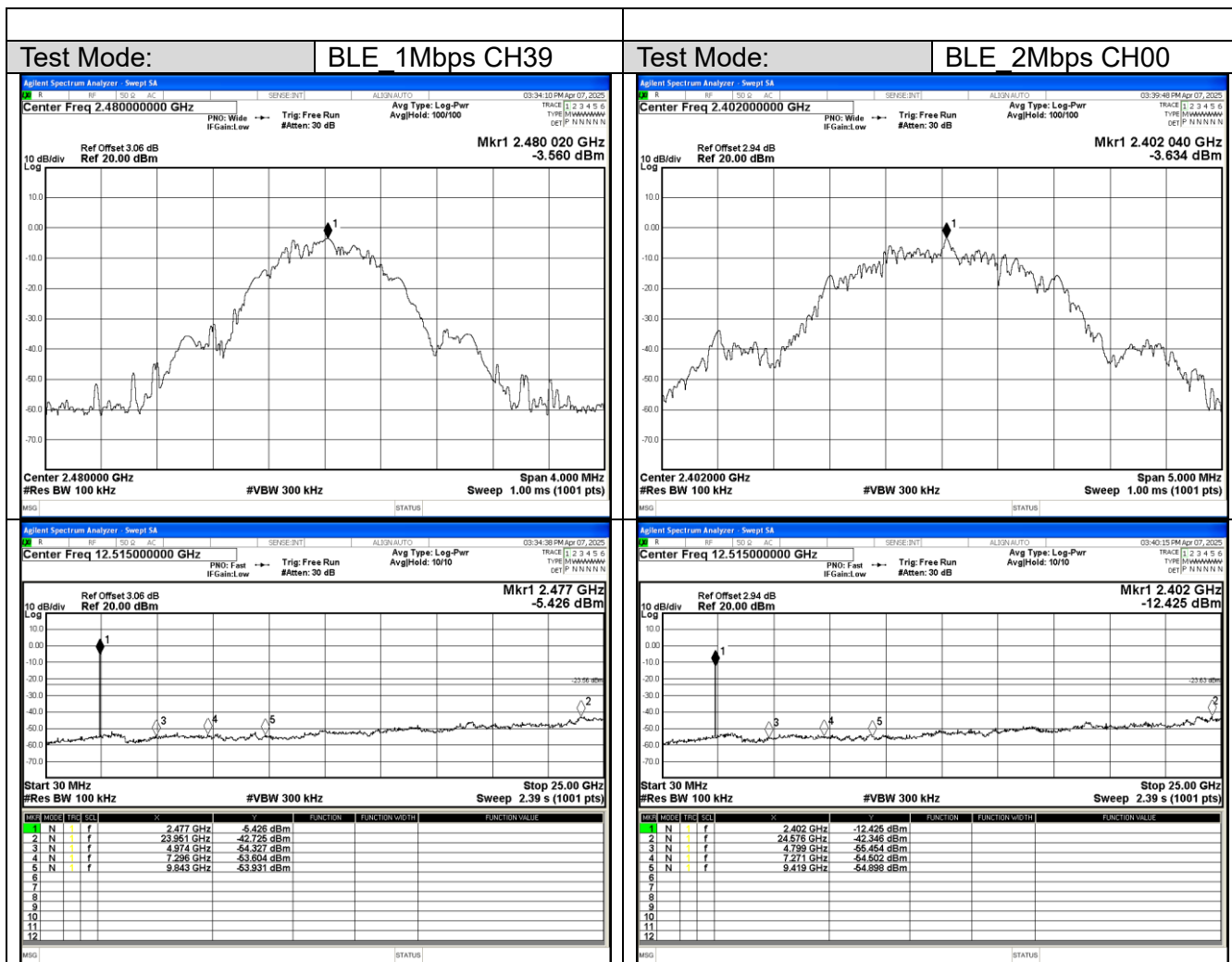
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.8	110.99	-20.91	90.08	125.2	-35.12	peak
2	2483.5	78.14	-20.91	57.23	74	-16.77	peak
3	2483.5	60.45	-20.91	39.54	54	-14.46	AVG
4	2484	80.07	-20.91	59.16	74	-14.84	peak
5	2484	63.7	-20.91	42.79	54	-11.21	AVG

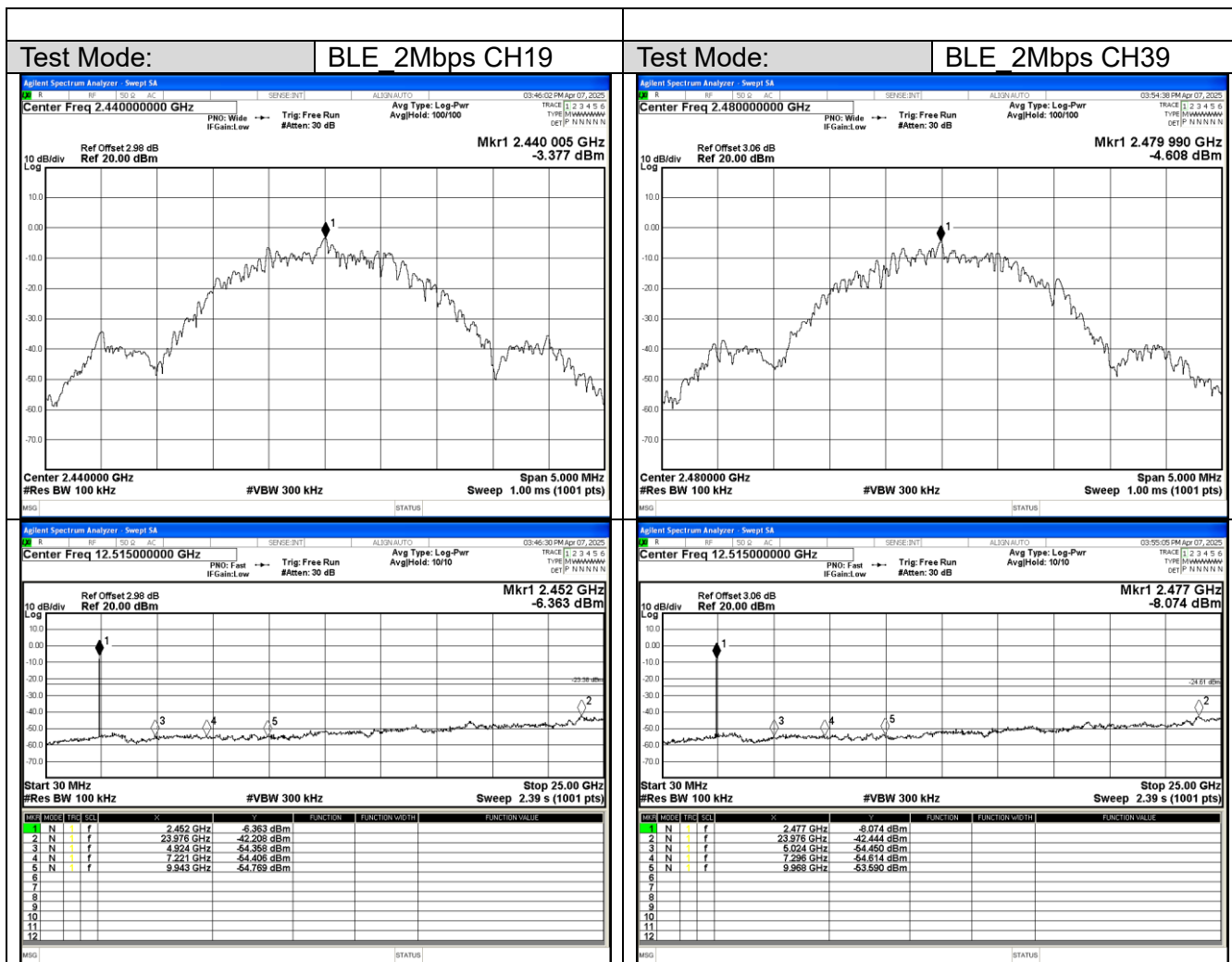
Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.75	96.97	-20.91	76.06	125.2	-49.14	peak
2	2483.5	65.24	-20.91	44.33	74	-29.67	peak
3	2483.5	47.39	-20.91	26.48	54	-27.52	AVG
4	2484.05	67.4	-20.91	46.49	74	-27.51	peak
5	2484.05	48.34	-20.91	27.43	54	-26.57	AVG

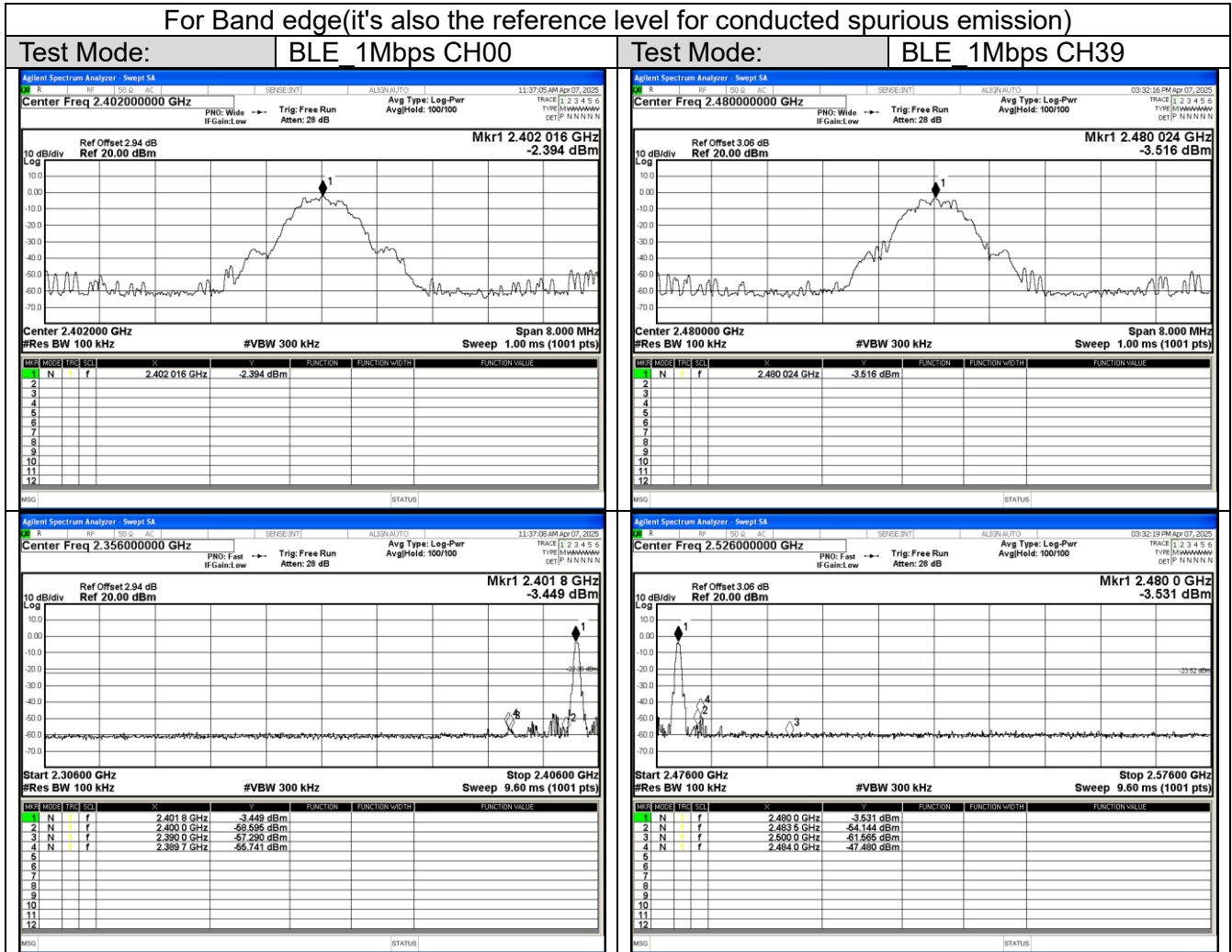
Appendix A.2 Test Results of Conducted Spurious Emissions Measured in 100 kHz Bandwidth

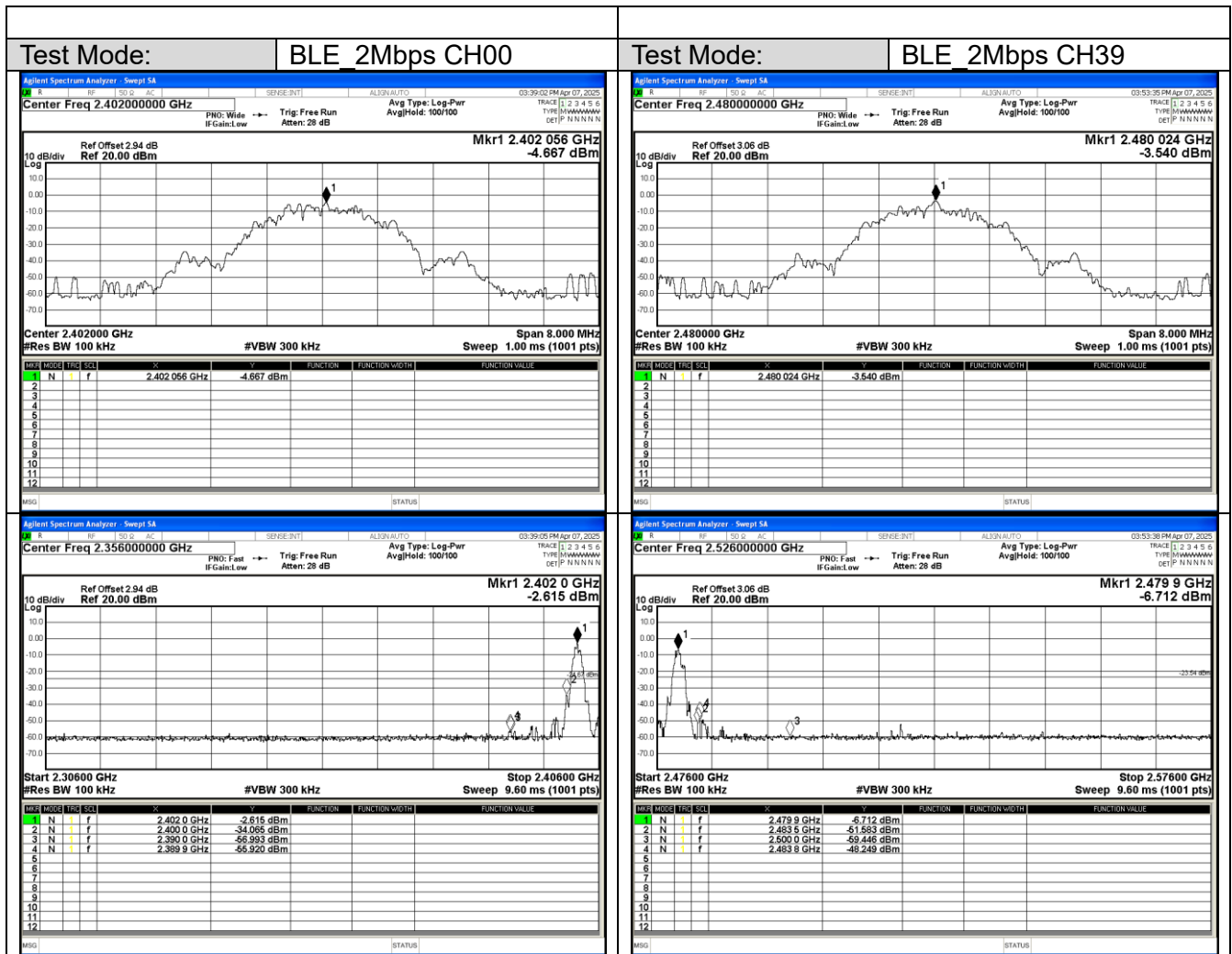






For Band edge(it's also the reference level for conducted spurious emission)

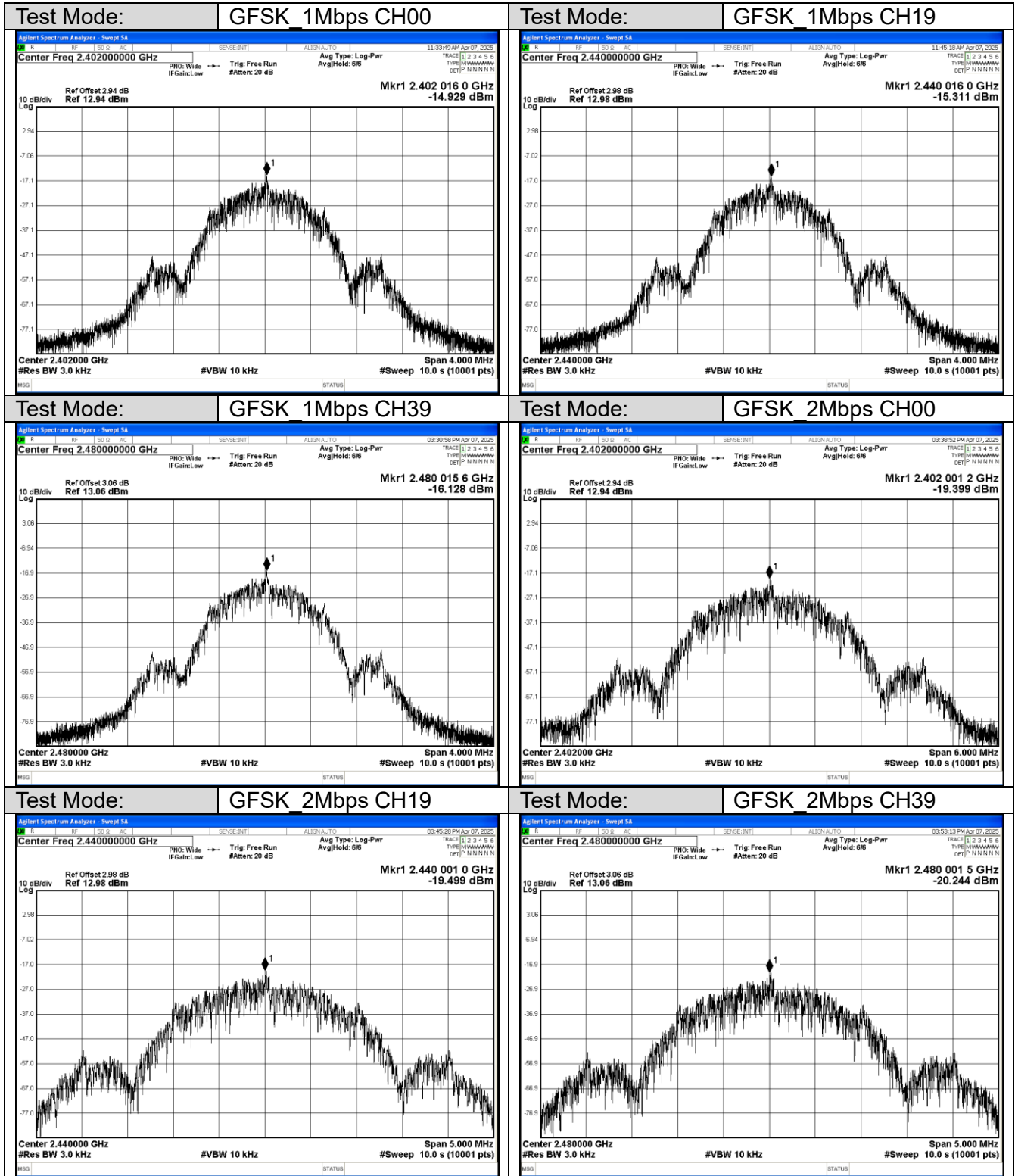




Appendix A.3 Test Results of Conducted Power Spectral Density

GFSK_1Mbps			
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
CH00	-14.929	8	Pass
CH19	-15.311	8	Pass
CH39	-16.128	8	Pass

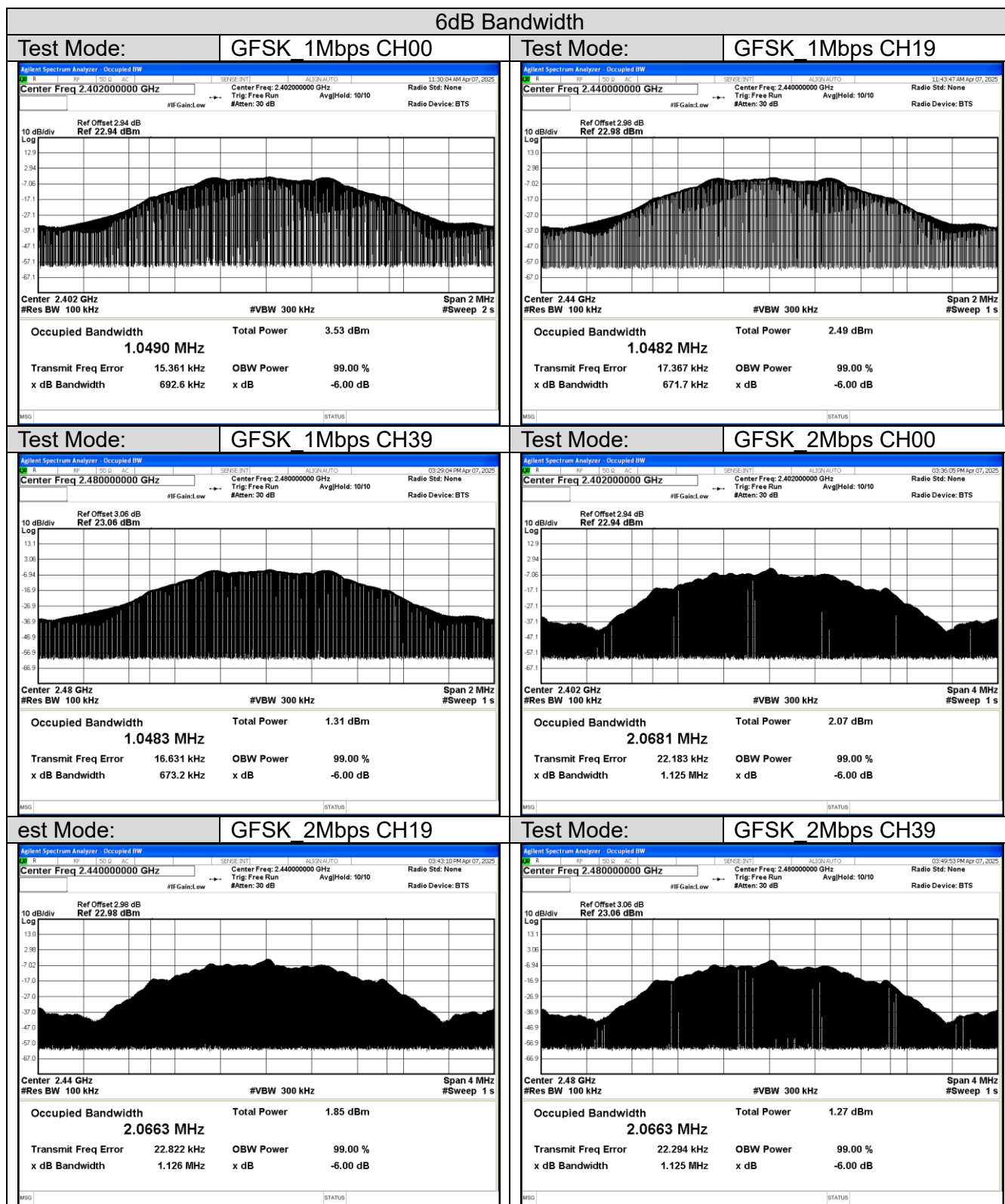
GFSK_2Mbps			
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
CH00	-19.399	8	Pass
CH19	-19.499	8	Pass
CH39	-20.244	8	Pass



Appendix A.4 Test Results of 6dB BANDWIDTH

GFSK_1Mbps			
Frequency	Bandwidth (MHz)	6dB limit (KHz)	Result
	6dB		
CH00	0.6926	0.5	Pass
CH19	0.6717	0.5	Pass
CH39	0.6732	0.5	Pass

GFSK_2Mbps			
Frequency	Bandwidth (MHz)	6dB limit (KHz)	Result
	6dB		
CH00	1.1253	0.5	Pass
CH19	1.1264	0.5	Pass
CH39	1.1253	0.5	Pass



Appendix A.5 Test Results of Maximum Conducted Power

For FCC:

Mode	Frequency [MHz]	Measured of peak Power		Limit [W]
		Conducted [dBm]	W	
BLE_1Mbps	2402	-2.011	0.0006	≤ 1.0
	2440	-2.343	0.0006	≤ 1.0
	2480	-3.037	0.0005	≤ 1.0
BLE_2Mbps	2402	-2.134	0.0006	≤ 1.0
	2440	-2.423	0.0006	≤ 1.0
	2480	-3.008	0.0005	≤ 1.0

Note:

- 1) The cable loss is taken into account in results.
 - 2) Antenna gain(G) BLE: 0.3 dBi
- e.i.r.p.=P(PK power)+ G, which is far below the 4 W