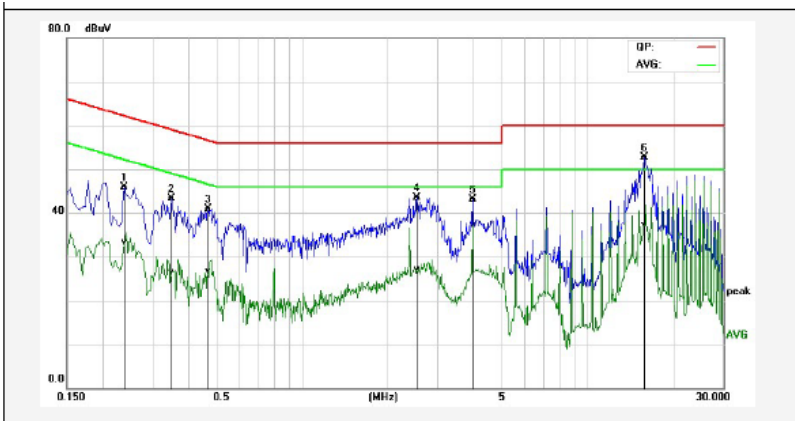
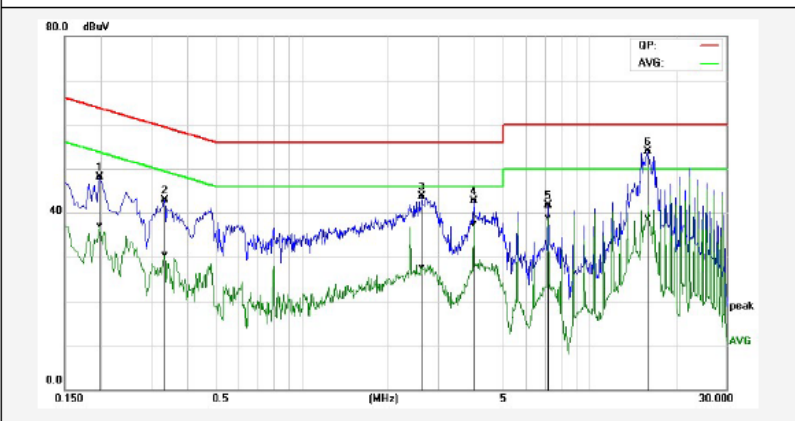


Appendix A: Test Results of BLE

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Appendix A.1 Test Results of Conducted Emission on AC Mains

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

Test Mode :	Mode 7	Test Voltage :	AC 110V/60Hz																																																																																																												
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 <table><tr><th>No.</th><th>Frequency</th><th>QuasiPeak</th><th>Average</th><th>Correction</th><th>QuasiPeak</th><th>Average</th><th>QuasiPeak</th><th>Average</th><th>QuasiPeak</th><th>Average</th><th>Remark</th></tr><tr><th></th><th>(MHz)</th><th>reading</th><th>reading</th><th>factor</th><th>result</th><th>result</th><th>limit</th><th>limit</th><th>margin</th><th>margin</th><th></th></tr><tr><th></th><th></th><th>(dBuV)</th><th>(dBuV)</th><th>(dB)</th><th>(dBuV)</th><th>(dBuV)</th><th>(dBuV)</th><th>(dBuV)</th><th>(dB)</th><th>(dB)</th><th></th></tr><tr><td>1P</td><td>0.2380</td><td>36.34</td><td>23.80</td><td>9.53</td><td>45.87</td><td>33.33</td><td>62.16</td><td>52.17</td><td>-16.29</td><td>-18.84</td><td>Pass</td></tr><tr><td>2P</td><td>0.3500</td><td>33.74</td><td>16.95</td><td>9.52</td><td>43.26</td><td>26.47</td><td>58.96</td><td>48.96</td><td>-15.70</td><td>-22.49</td><td>Pass</td></tr><tr><td>3P</td><td>0.4700</td><td>31.48</td><td>17.19</td><td>9.52</td><td>41.00</td><td>26.71</td><td>56.51</td><td>46.51</td><td>-15.51</td><td>-19.80</td><td>Pass</td></tr><tr><td>4P</td><td>2.5460</td><td>34.31</td><td>17.81</td><td>9.29</td><td>43.60</td><td>27.10</td><td>56.00</td><td>46.00</td><td>-12.40</td><td>-18.90</td><td>Pass</td></tr><tr><td>5P</td><td>3.9980</td><td>34.05</td><td>28.24</td><td>9.15</td><td>43.20</td><td>37.39</td><td>56.00</td><td>46.00</td><td>-12.80</td><td>-8.61</td><td>Pass</td></tr><tr><td>6*</td><td>15.8580</td><td>43.27</td><td>27.83</td><td>9.50</td><td>52.77</td><td>37.33</td><td>60.00</td><td>50.00</td><td>-7.23</td><td>-12.67</td><td>Pass</td></tr></table>				No.	Frequency	QuasiPeak	Average	Correction	QuasiPeak	Average	QuasiPeak	Average	QuasiPeak	Average	Remark		(MHz)	reading	reading	factor	result	result	limit	limit	margin	margin				(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)		1P	0.2380	36.34	23.80	9.53	45.87	33.33	62.16	52.17	-16.29	-18.84	Pass	2P	0.3500	33.74	16.95	9.52	43.26	26.47	58.96	48.96	-15.70	-22.49	Pass	3P	0.4700	31.48	17.19	9.52	41.00	26.71	56.51	46.51	-15.51	-19.80	Pass	4P	2.5460	34.31	17.81	9.29	43.60	27.10	56.00	46.00	-12.40	-18.90	Pass	5P	3.9980	34.05	28.24	9.15	43.20	37.39	56.00	46.00	-12.80	-8.61	Pass	6*	15.8580	43.27	27.83	9.50	52.77	37.33	60.00	50.00	-7.23	-12.67	Pass
No.	Frequency	QuasiPeak	Average	Correction	QuasiPeak	Average	QuasiPeak	Average	QuasiPeak	Average	Remark																																																																																																				
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1P	0.2380	36.34	23.80	9.53	45.87	33.33	62.16	52.17	-16.29	-18.84	Pass																																																																																																				
2P	0.3500	33.74	16.95	9.52	43.26	26.47	58.96	48.96	-15.70	-22.49	Pass																																																																																																				
3P	0.4700	31.48	17.19	9.52	41.00	26.71	56.51	46.51	-15.51	-19.80	Pass																																																																																																				
4P	2.5460	34.31	17.81	9.29	43.60	27.10	56.00	46.00	-12.40	-18.90	Pass																																																																																																				
5P	3.9980	34.05	28.24	9.15	43.20	37.39	56.00	46.00	-12.80	-8.61	Pass																																																																																																				
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No.	Frequency	QuasiPeak	Average	Correction	QuasiPeak	Average	QuasiPeak	Average	QuasiPeak	Average	Remark																																																																																																				
	(MHz)	reading	reading	factor	result	result	limit	limit	margin	margin																																																																																																					
		(dBuV)	(dBuV)	(dB)	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)																																																																																																					
1P	0.1980	38.59	27.76	9.43	48.02	37.19	63.69	53.69	-15.67	-16.50	Pass																																																																																																				
2P	0.3339	33.46	21.08	9.42	42.88	30.50	59.35	49.35	-16.47	-18.85	Pass																																																																																																				
3P	2.6460	34.54	18.25	9.18	43.72	27.43	56.00	46.00	-12.28	-18.57	Pass																																																																																																				
4P	4.0020	33.73	28.43	9.05	42.78	37.48	56.00	46.00	-13.22	-8.52	Pass																																																																																																				
5P	7.2020	32.60	29.91	9.07	41.67	38.98	60.00	50.00	-18.33	-11.02	Pass																																																																																																				
6*	15.9620	44.61	29.71	9.20	53.81	38.91	60.00	50.00	-6.19	-11.09	Pass																																																																																																				

Correction Factor = insertion loss of LISN + cable loss;

Reading = Reading Amplitude in the instrument;

Result = Correction Factor + Reading;

Margin = Result – Limit

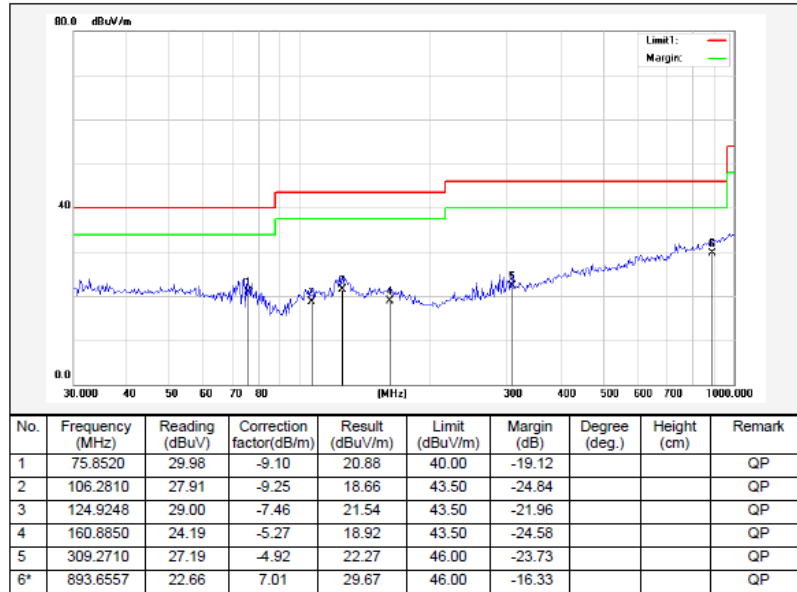
Appendix A.2 Test Results of Radiated Spurious Emission

Below 1G:

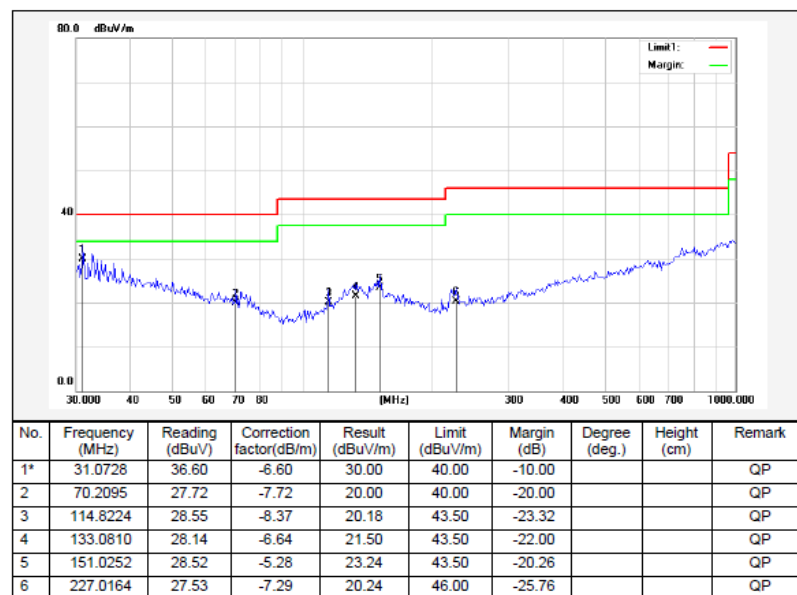
Note: All modes have been tested, and the report only reflects the worst mode.

Test Mode : Mode 2 Test Voltage : DC 3.7V

Horizontal



Vertical



Correction Factor = antenna factor + cable loss – amplifier gain;

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	3890	60.94	-15.36	45.58	74	-28.42	peak
2	3890	48.6	-15.36	33.24	54	-20.76	AVG
3	5046	58.4	-12.62	45.78	74	-28.22	peak
4	5046	45.49	-12.62	32.87	54	-21.13	AVG
5	5998	56.95	-10.12	46.83	74	-27.17	peak
6	5998	45.26	-10.12	35.14	54	-18.86	AVG
7	6950	56.75	-8.79	47.96	74	-26.04	peak
8	6950	40.64	-8.79	31.85	54	-22.15	AVG
9	7562	57.94	-7.22	50.72	74	-23.28	peak
10	7562	45.46	-7.22	38.24	54	-15.76	AVG
11	8854	56.51	-7.88	48.63	74	-25.37	peak
12	8854	40.74	-7.88	32.86	54	-21.14	AVG

GFSK-Low Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5250	58.29	-12.63	45.66	74	-28.34	peak
2	5250	43.32	-12.63	30.69	54	-23.31	AVG
3	5624	58.71	-12.01	46.7	74	-27.3	peak
4	5624	45.29	-12.01	33.28	54	-20.72	AVG
5	6100	58.02	-10.06	47.96	74	-26.04	peak
6	6100	43.92	-10.06	33.86	54	-20.14	AVG
7	6950	56.33	-8.79	47.54	74	-26.46	peak
8	6950	44	-8.79	35.21	54	-18.79	AVG
9	7392	55.93	-7.13	48.8	74	-25.2	peak
10	7392	43.34	-7.13	36.21	54	-17.79	AVG
11	8208	56.26	-7.62	48.64	74	-25.36	peak
12	8208	39.51	-7.62	31.89	54	-22.11	AVG

GFSK- Middle Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	3924	59.69	-15.19	44.5	74	-29.5	peak
2	3924	44.32	-15.19	29.13	54	-24.87	AVG
3	4876	58.36	-13	45.36	74	-28.64	peak
4	4876	43.42	-13	30.42	54	-23.58	AVG
5	5964	57.83	-10.23	47.6	74	-26.4	peak
6	5964	40.8	-10.23	30.57	54	-23.43	AVG
7	6712	57.69	-9.49	48.2	74	-25.8	peak
8	6712	43.39	-9.49	33.9	54	-20.1	AVG
9	8038	57.06	-7.79	49.27	74	-24.73	peak
10	8038	42.91	-7.79	35.12	54	-18.88	AVG
11	8854	56.99	-7.88	49.11	74	-24.89	peak
12	8854	41.08	-7.88	33.2	54	-20.8	AVG

GFSK-Middle Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	3550	60.29	-16.79	43.5	74	-30.5	peak
2	3550	45.11	-16.79	28.32	54	-25.68	AVG
3	3890	60.94	-15.36	45.58	74	-28.42	peak
4	3890	45.47	-15.36	30.11	54	-23.89	AVG
5	5998	56.95	-10.12	46.83	74	-27.17	peak
6	5998	39.6	-10.12	29.48	54	-24.52	AVG
7	6950	56.75	-8.79	47.96	74	-26.04	peak
8	6950	40.26	-8.79	31.47	54	-22.53	AVG
9	9772	56.24	-6.07	50.17	74	-23.83	peak
10	9772	38.52	-6.07	32.45	54	-21.55	AVG
11	11404	55.24	-1.87	53.37	74	-20.63	peak
12	11404	38.84	-1.87	36.97	54	-17.03	AVG

GFSK-High Horizontal

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	3856	60	-15.7	44.3	74	-29.7	peak
2	3856	46.05	-15.7	30.35	54	-23.65	AVG
3	5046	58.65	-12.62	46.03	74	-27.97	peak
4	5046	44.2	-12.62	31.58	54	-22.42	AVG
5	6134	57.75	-9.98	47.77	74	-26.23	peak
6	6134	41.84	-9.98	31.86	54	-22.14	AVG
7	6950	56.73	-8.79	47.94	74	-26.06	peak
8	6950	41.47	-8.79	32.68	54	-21.32	AVG
9	7426	55.79	-7.09	48.7	74	-25.3	peak
10	7426	42.41	-7.09	35.32	54	-18.68	AVG
11	8208	56.22	-7.62	48.6	74	-25.4	peak
12	8208	41.18	-7.62	33.56	54	-20.44	AVG

GFSK-High Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	3720	62.27	-16.15	46.12	74	-27.88	peak
2	3720	46.68	-16.15	30.53	54	-23.47	AVG
3	3992	63.3	-15.01	48.29	74	-25.71	peak
4	3992	47.86	-15.01	32.85	54	-21.15	AVG
5	4910	58.91	-12.91	46	74	-28	peak
6	4910	46.47	-12.91	33.56	54	-20.44	AVG
7	6134	57.41	-9.98	47.43	74	-26.57	peak
8	6134	40.54	-9.98	30.56	54	-23.44	AVG
9	6950	56.85	-8.79	48.06	74	-25.94	peak
10	6950	41.66	-8.79	32.87	54	-21.13	AVG
11	8378	56.48	-7.1	49.38	74	-24.62	peak
12	8378	43.34	-7.1	36.24	54	-17.76	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	2387.4	67.06	-21.04	46.02	74	-27.98	peak
2	2387.4	60.61	-21.04	39.57	54	-14.43	AVG
3	2390	67.49	-21.03	46.46	74	-27.54	peak
4	2390	61.26	-21.03	40.23	54	-13.77	AVG

Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2323.8	67.74	-21.25	46.49	74	-27.51	peak
2	2323.8	61.48	-21.25	40.23	54	-13.77	AVG
3	2390	62.46	-21.03	41.43	74	-32.57	peak
4	2390	56.3	-21.03	35.27	54	-18.73	AVG

GFSK-High

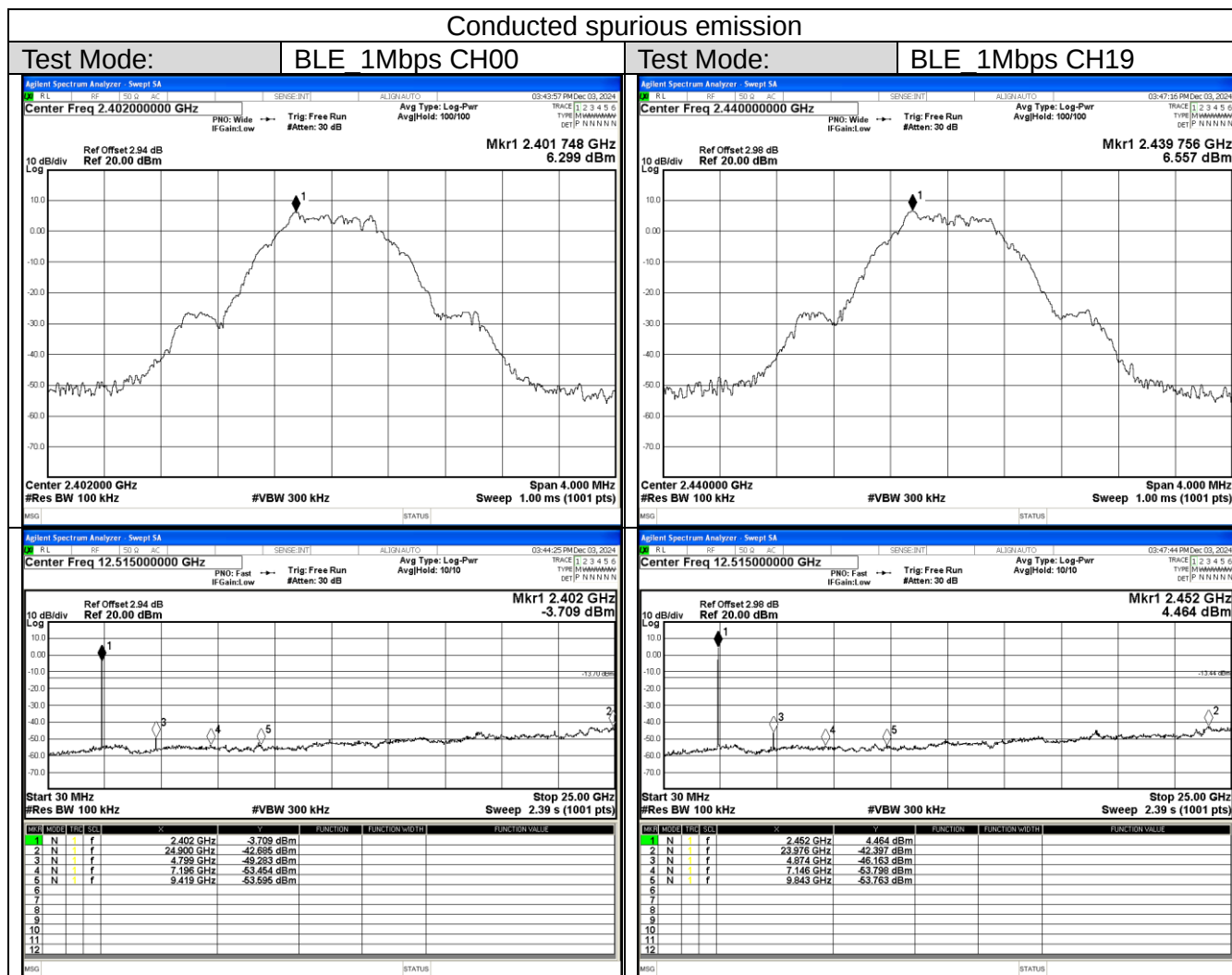
Horizontal

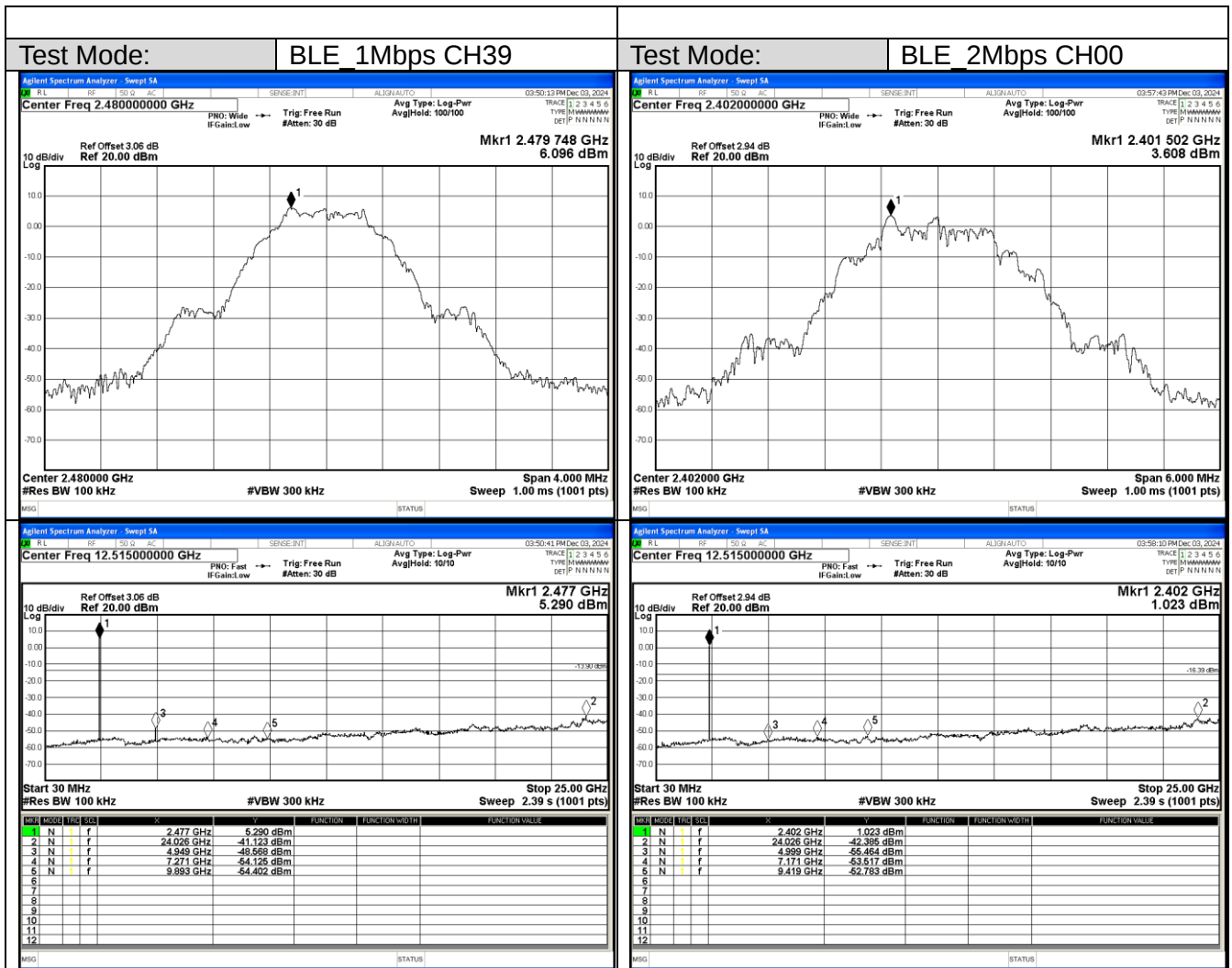
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	74.02	-20.91	53.11	74	-20.89	peak
2	2483.5	68.23	-20.91	47.32	54	-6.68	AVG
3	2483.92	72.28	-20.91	51.37	74	-22.63	peak
4	2483.92	65.95	-20.91	45.04	54	-8.96	AVG

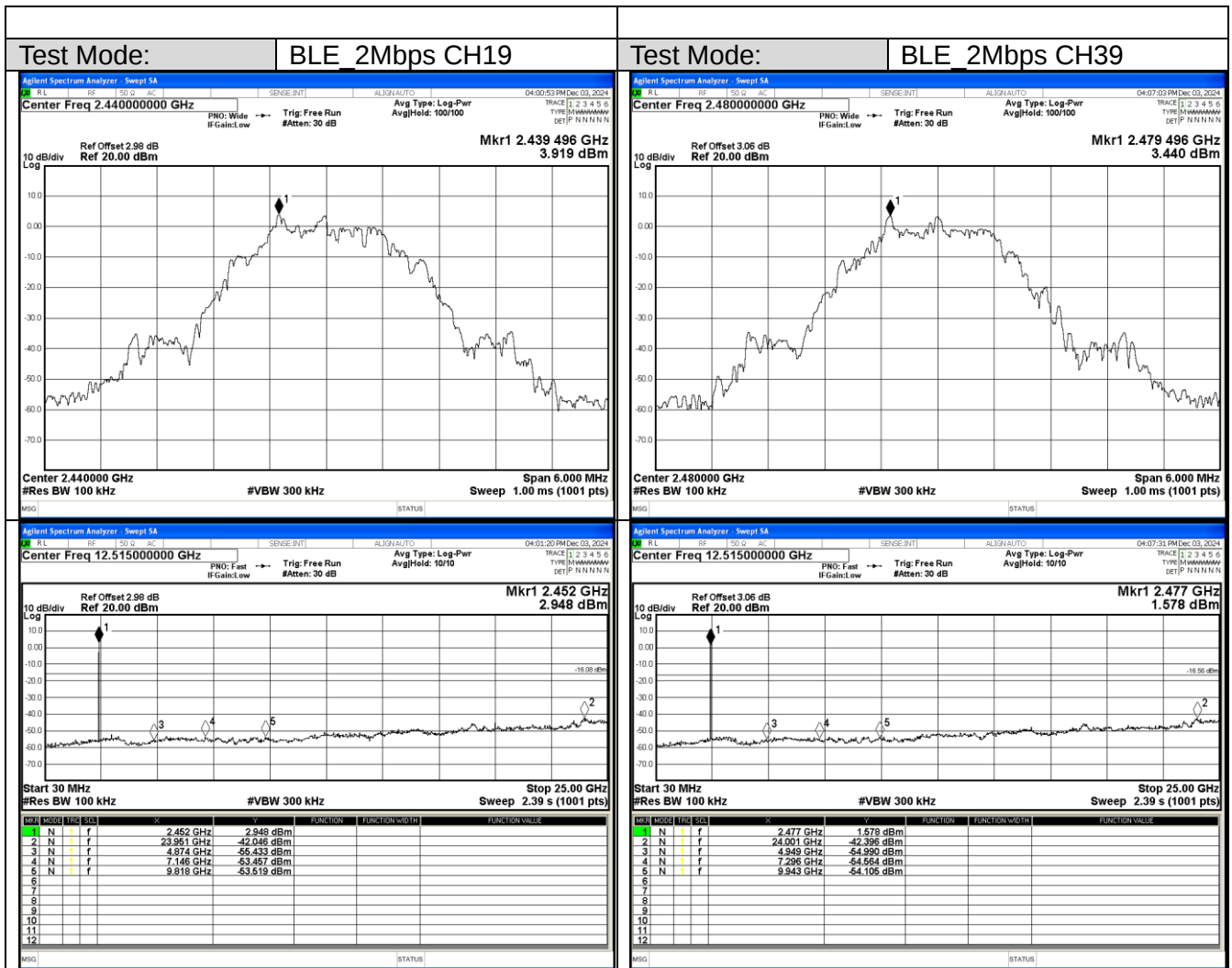
Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2483.5	68.4	-20.91	47.49	74	-26.51	peak
2	2483.5	62.77	-20.91	41.86	54	-12.14	AVG
3	2491.96	67.95	-20.92	47.03	74	-26.97	peak
4	2491.96	62.15	-20.92	41.23	54	-12.77	AVG

Appendix A.3 Test Results of Conducted Spurious Emissions Measured in 100 kHz Bandwidth

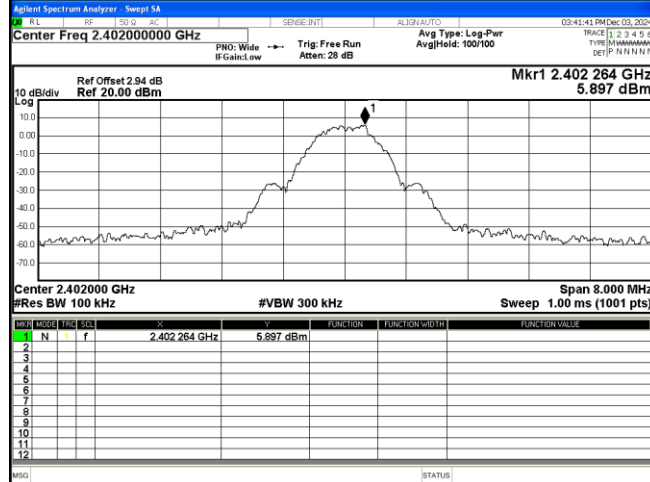




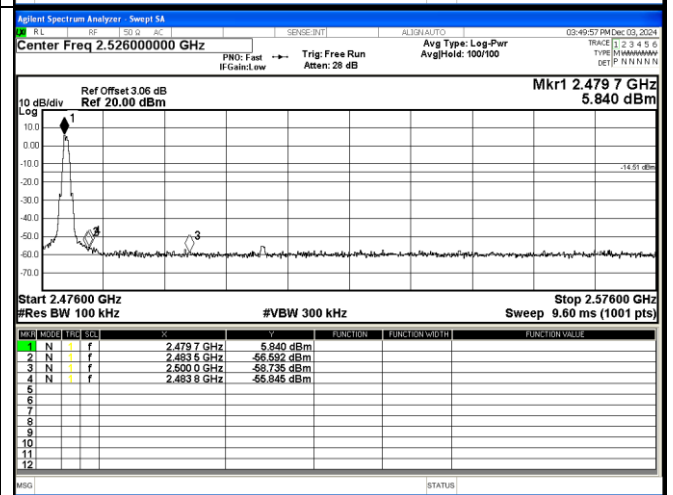
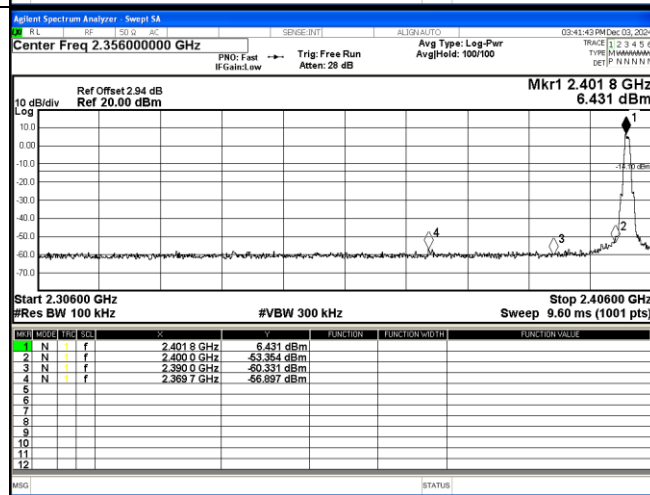
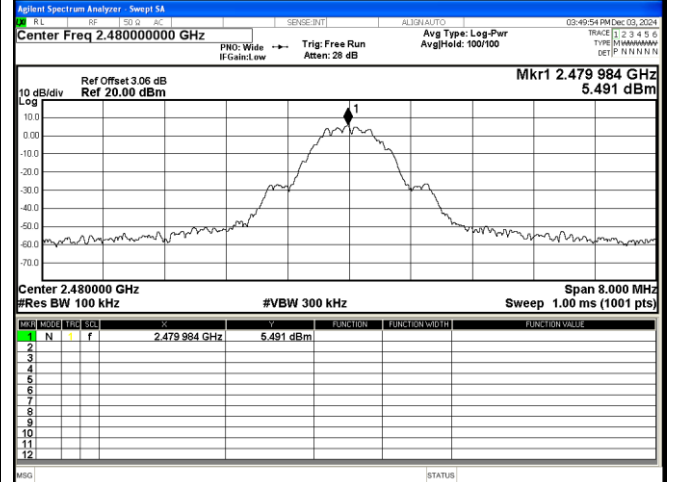


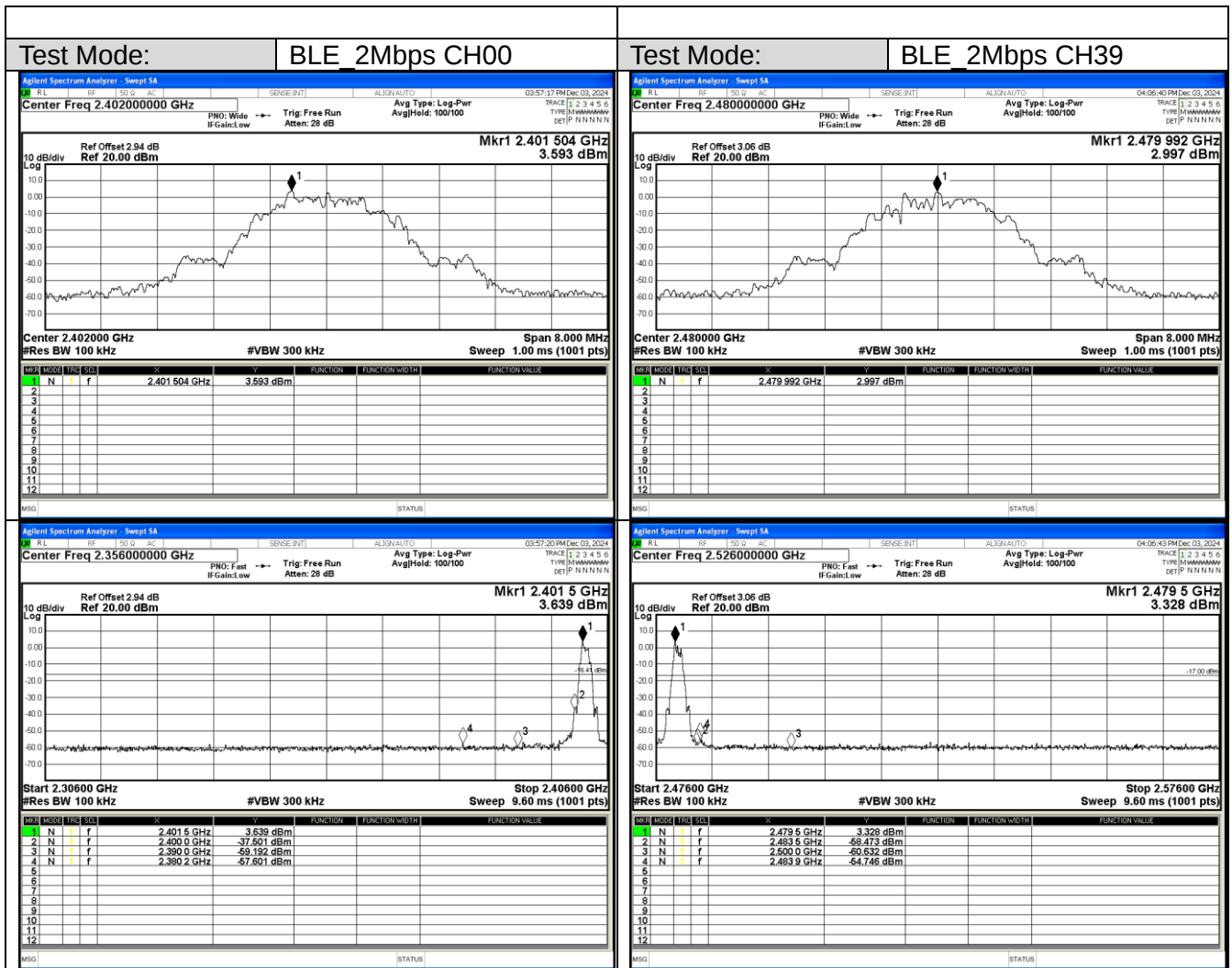
For Band edge(it's also the reference level for conducted spurious emission)

Test Mode: BLE_1Mbps CH00



Test Mode: BLE_1Mbps CH39

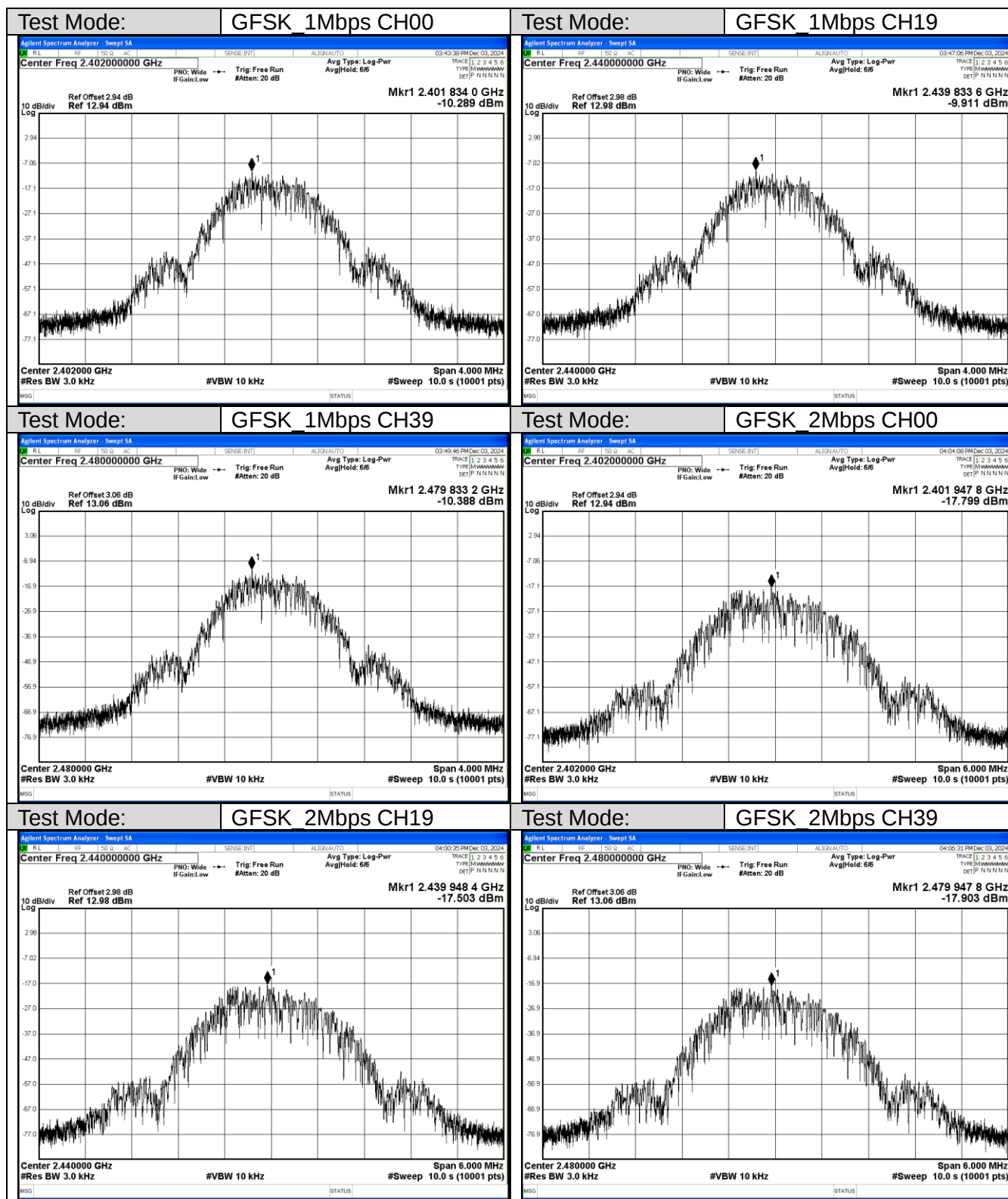




Appendix A.4 Test Results of Conducted Power Spectral Density

GFSK_1Mbps			
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
CH00	-10.289	8	Pass
CH19	-9.911	8	Pass
CH39	-10.388	8	Pass

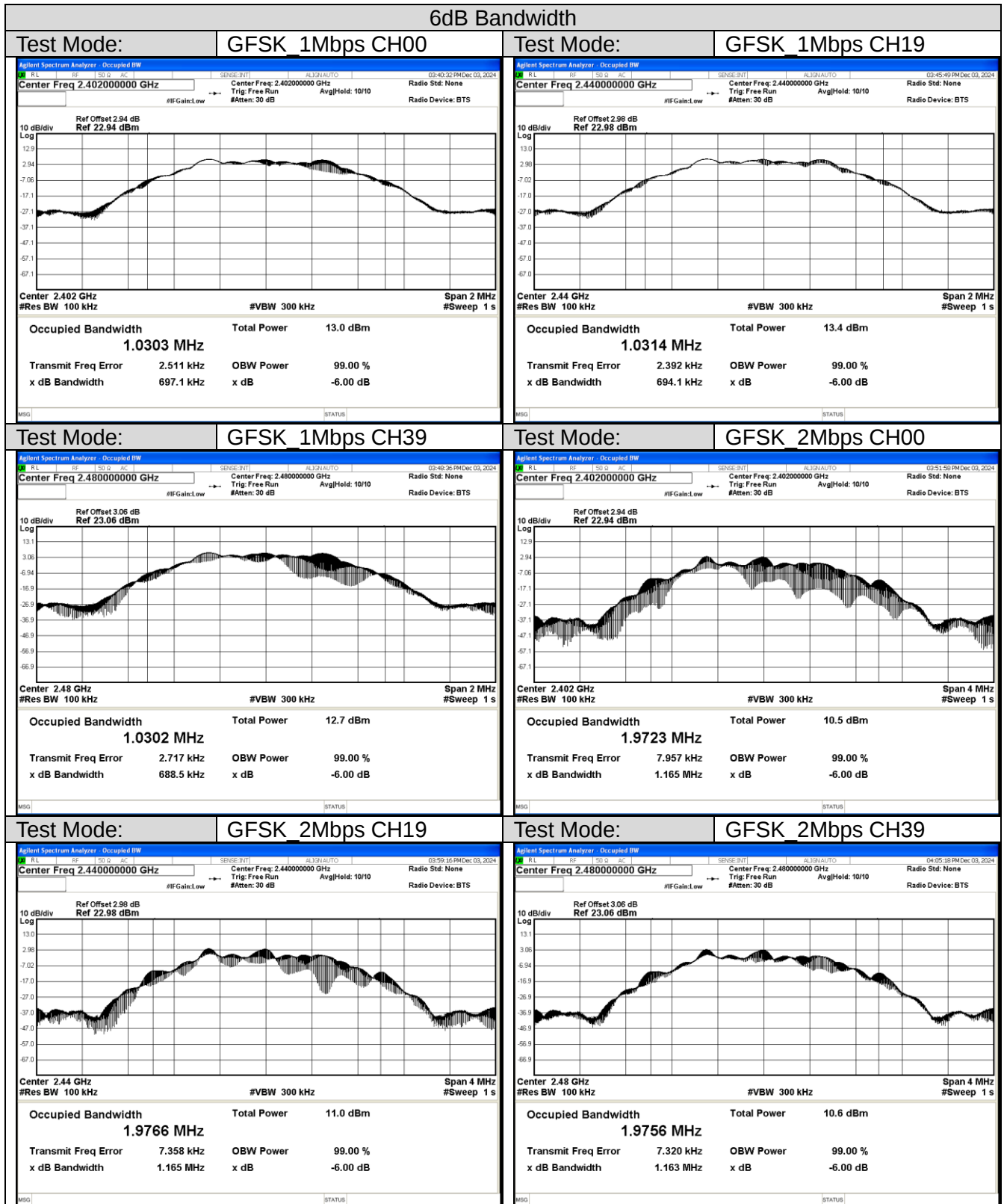
GFSK_2Mbps			
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
CH00	-17.799	8	Pass
CH19	-17.503	8	Pass
CH39	-17.903	8	Pass



Appendix A.5 Test Results of 6dB BANDWIDTH

GFSK_1Mbps			
Frequency	Bandwidth (MHz)	6dB limit (MHz)	Result
	6dB		
CH00	0.6971	0.5	Pass
CH19	0.6941	0.5	Pass
CH39	0.6885	0.5	Pass

GFSK_2Mbps			
Frequency	Bandwidth (MHz)	6dB limit (MHz)	Result
	6dB		
CH00	1.1654	0.5	Pass
CH19	1.1649	0.5	Pass
CH39	1.1628	0.5	Pass



Appendix A.6 Test Results of Maximum Conducted Power

For FCC:

Mode	Frequency [MHz]	Measured of Conducted Power		Limit [W]
		Conducted [dBm]	W	
BLE_1Mbps	2402	6.91	0.0049	≤ 1.0
	2440	7.131	0.0052	≤ 1.0
	2480	6.714	0.0047	≤ 1.0
BLE_2Mbps	2402	4.506	0.0028	≤ 1.0
	2440	4.808	0.0030	≤ 1.0
	2480	4.305	0.0027	≤ 1.0

Note:

- 1) The cable loss is taken into account in results.
 - 2) Antenna gain(G) BLE: 2.67 dBi
- e.i.r.p.=P (peak power) + G, which is far below the 4 W