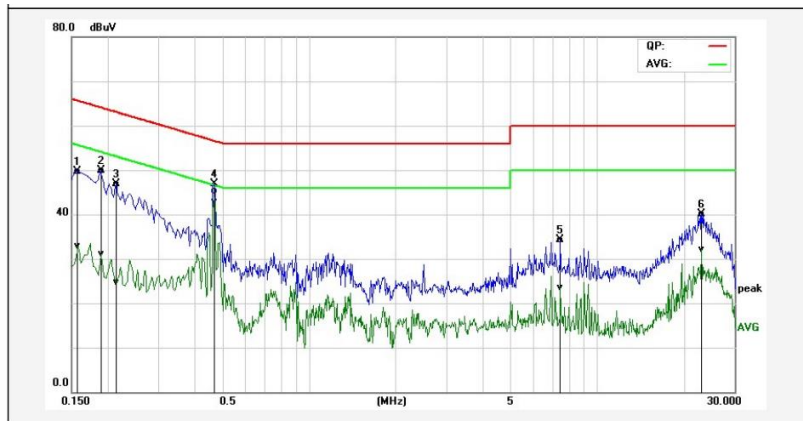
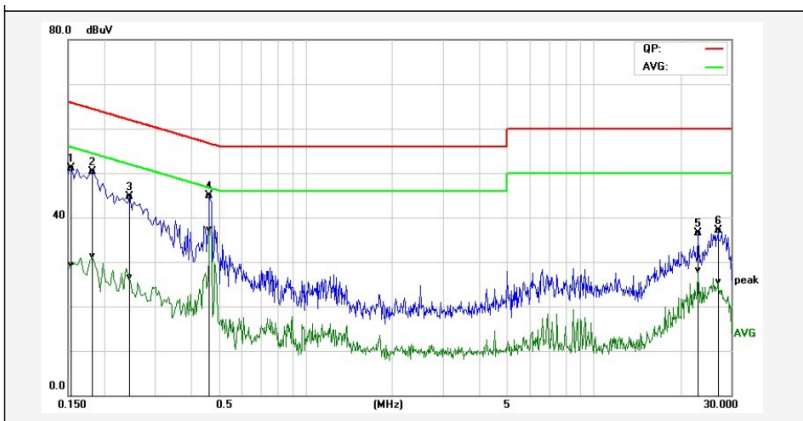


Appendix A: Test Results of BLE

Table of Contents	Page
APPENDIX A.1 TEST RESULTS OF CONDUCTED EMISSION ON AC MAINS	2
APPENDIX A.2 TEST RESULTS OF RADIATED SPURIOUS EMISSION	3
APPENDIX A.3 TEST RESULTS OF CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHZ BANDWIDTH	7
APPENDIX A.4 TEST RESULTS OF CONDUCTED POWER SPECTRAL DENSITY	10
APPENDIX A.5 TEST RESULTS OF 6DB BANDWIDTH	11
APPENDIX A.6 TEST RESULTS OF MAXIMUM CONDUCTED POWER.....	12

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 :	Working	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>0.1580</td><td>40.01</td><td>23.18</td><td>9.74</td><td>49.75</td><td>32.92</td><td>65.56</td><td>55.57</td><td>-15.81</td><td>-22.65</td><td>Pass</td></tr><tr><td>2P</td><td>0.1900</td><td>40.23</td><td>21.43</td><td>9.74</td><td>49.97</td><td>31.17</td><td>64.03</td><td>54.04</td><td>-14.06</td><td>-22.87</td><td>Pass</td></tr><tr><td>3P</td><td>0.2140</td><td>37.11</td><td>14.94</td><td>9.74</td><td>46.85</td><td>24.68</td><td>63.04</td><td>53.05</td><td>-16.19</td><td>-28.37</td><td>Pass</td></tr><tr><td>4*</td><td>0.4700</td><td>35.63</td><td>33.23</td><td>9.73</td><td>45.36</td><td>42.96</td><td>56.51</td><td>46.51</td><td>-11.15</td><td>-3.55</td><td>Pass</td></tr><tr><td>5P</td><td>7.4580</td><td>24.47</td><td>13.78</td><td>9.82</td><td>34.29</td><td>23.60</td><td>60.00</td><td>50.00</td><td>-25.71</td><td>-26.40</td><td>Pass</td></tr><tr><td>6P</td><td>23.1259</td><td>29.85</td><td>21.85</td><td>10.16</td><td>40.01</td><td>32.01</td><td>60.00</td><td>50.00</td><td>-19.99</td><td>-17.99</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	0.1580	40.01	23.18	9.74	49.75	32.92	65.56	55.57	-15.81	-22.65	Pass	2P	0.1900	40.23	21.43	9.74	49.97	31.17	64.03	54.04	-14.06	-22.87	Pass	3P	0.2140	37.11	14.94	9.74	46.85	24.68	63.04	53.05	-16.19	-28.37	Pass	4*	0.4700	35.63	33.23	9.73	45.36	42.96	56.51	46.51	-11.15	-3.55	Pass	5P	7.4580	24.47	13.78	9.82	34.29	23.60	60.00	50.00	-25.71	-26.40	Pass	6P	23.1259	29.85	21.85	10.16	40.01	32.01	60.00	50.00	-19.99	-17.99	Pass
No.	Frequency	QuasiPeak	Average	Correction	QuasiPeak	Average	QuasiPeak	Average	QuasiPeak	Average	Remark																																																																																																				
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1P	0.1580	40.01	23.18	9.74	49.75	32.92	65.56	55.57	-15.81	-22.65	Pass																																																																																																				
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4*	0.4700	35.63	33.23	9.73	45.36	42.96	56.51	46.51	-11.15	-3.55	Pass																																																																																																				
5P	7.4580	24.47	13.78	9.82	34.29	23.60	60.00	50.00	-25.71	-26.40	Pass																																																																																																				
6P	23.1259	29.85	21.85	10.16	40.01	32.01	60.00	50.00	-19.99	-17.99	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	0.1539	41.43	19.52	9.74	51.17	29.26	65.78	55.79	-14.61	-26.53	Pass																																																																																																				
2P	0.1819	40.52	21.57	9.74	50.26	31.31	64.39	54.40	-14.13	-23.09	Pass																																																																																																				
3P	0.2460	34.94	16.66	9.76	44.70	26.42	61.89	51.89	-17.19	-25.47	Pass																																																																																																				
4*	0.4660	35.01	27.54	9.82	44.83	37.36	56.58	46.58	-11.75	-9.22	Pass																																																																																																				
5P	23.1299	25.71	17.37	10.71	36.42	28.08	60.00	50.00	-23.58	-21.92	Pass																																																																																																				
6P	27.0020	26.33	14.78	10.75	37.08	25.53	60.00	50.00	-22.92	-24.47	Pass																																																																																																				

Correction Factor = insertion loss of LISN + cable loss;

Reading = Reading Amplitude in the instrument;

Result = Correction Factor + Reading;

Margin = Result – Limit

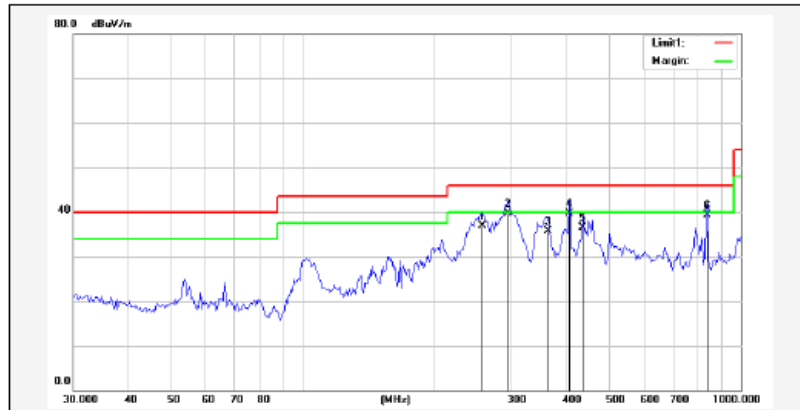
Appendix A.2 Test Results of Radiated Spurious Emission

Below 1G:

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

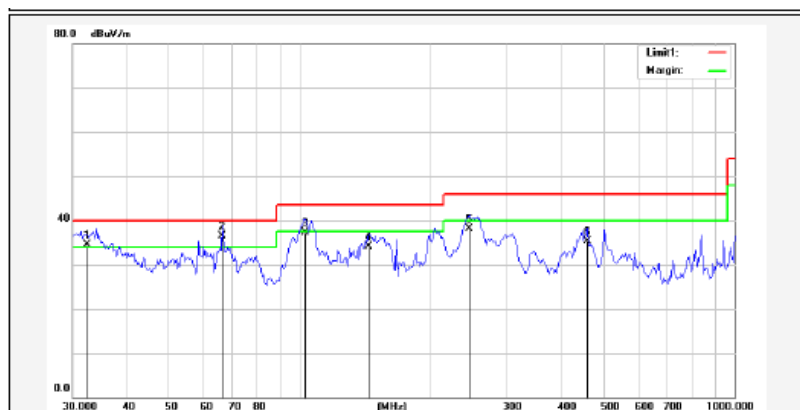
Test Mode : Working Test Voltage : AC 110V/60Hz

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Correction factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (deg.)	Height (cm)	Remark
1	257.6265	49.19	-12.35	36.84	46.00	-9.16			QP
2	294.4280	51.29	-11.57	39.72	46.00	-6.28			QP
3	363.5230	45.09	-9.36	35.73	46.00	-10.27			QP
4*	406.7820	47.58	-7.82	39.76	46.00	-6.24			QP
5	436.3956	43.78	-7.20	36.58	46.00	-9.42			QP
6	838.8870	39.64	-0.40	39.24	46.00	-6.76			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†	32.5947	47.08	-12.49	34.59	40.00	-5.41			QP
2*	66.3113	49.71	-13.15	36.56	40.00	-3.44			QP
3	102.6117	53.27	-15.93	37.34	43.50	-6.16			QP
4	143.7780	45.87	-11.86	34.01	43.50	-9.49			QP
5	245.2606	50.79	-12.59	38.20	46.00	-7.80			QP
6	458.3987	42.08	-6.82	35.26	46.00	-10.74			QP

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

Reading = Reading Amplitude in the instrument;

Result = Correction Factor + Reading;

Margin = Result – Limit

Above 1GHz:
GFSK-Low Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	5862	55.08	-12.14	42.94	62.06	-19.12	peak
2	6984	55.23	-9.74	45.49	62.06	-16.57	peak
3	8820	54.37	-6.97	47.4	62.06	-14.66	peak
4	9772	54.67	-5.26	49.41	62.06	-12.65	peak
5	11132	53.17	-3.15	50.02	74	-23.98	peak
6	12458	53.53	-1.95	51.58	74	-22.42	peak

GFSK-Low Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6338	55.74	-10.95	44.79	62.06	-17.27	peak
2	7766	54.65	-9.04	45.61	62.06	-16.45	peak
3	8990	55.03	-6.5	48.53	62.06	-13.53	peak
4	9942	54.12	-4.83	49.29	62.06	-12.77	peak
5	11064	53.37	-3.22	50.15	74	-23.85	peak
6	12492	54.01	-1.88	52.13	74	-21.87	peak

GFSK- Middle Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4876	56.62	-14.14	42.48	74	-31.52	peak
2	6916	54.63	-9.9	44.73	62.06	-17.33	peak
3	8378	54.42	-8.17	46.25	74	-27.75	peak
4	9364	54.14	-6.3	47.84	74	-26.16	peak
5	11064	53.29	-3.22	50.07	74	-23.93	peak
6	12152	53.33	-2.53	50.8	74	-23.2	peak

GFSK-Middle Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	6950	55.32	-9.82	45.5	62.06	-16.56	peak
2	8378	54.82	-8.17	46.65	74	-27.35	peak
3	9364	54.66	-6.3	48.36	74	-25.64	peak
4	10758	53.76	-3.6	50.16	74	-23.84	peak
5	11778	53.01	-2.99	50.02	74	-23.98	peak
6	12424	54.75	-2.02	52.73	74	-21.27	peak

GFSK-High Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4978	55.66	-14.08	41.58	74	-32.42	peak
2	6882	54.21	-9.98	44.23	62.06	-17.83	peak
3	7562	54.1	-8.8	45.3	74	-28.7	peak
4	8378	54.7	-8.17	46.53	74	-27.47	peak
5	10350	53.47	-4.13	49.34	62.06	-12.72	peak
6	12356	53.52	-2.14	51.38	74	-22.62	peak

GFSK-High Vertical

No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV)	Factor(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
1	7256	53.84	-9.09	44.75	74	-29.25	peak
2	8650	53.95	-7.43	46.52	62.06	-15.54	peak
3	8956	54.53	-6.6	47.93	62.06	-14.13	peak
4	9874	53.88	-4.95	48.93	62.06	-13.13	peak
5	12016	53.33	-2.79	50.54	74	-23.46	peak
6	12458	53.62	-1.95	51.67	74	-22.33	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.82.06) minus 20dB.

Restricted band Requirements GFSK Low

Horizontal

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2353.32	67.17	-21.94	45.23	74	-28.77	peak
2	2353.32	61.49	-21.94	39.55	54	-14.45	AVG
3	2390	60.1	-21.89	38.21	74	-35.79	peak
4	2390	57.58	-21.89	35.69	54	-18.31	AVG
5	2402.34	115.41	-21.87	93.54	125.2	-31.66	peak

Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2374.79	67.41	-21.92	45.49	74	-28.51	peak
2	2374.79	61	-21.92	39.08	54	-14.92	AVG
3	2390	62.96	-21.89	41.07	74	-32.93	peak
4	2390	60.68	-21.89	38.79	54	-15.21	AVG
5	2401.96	105.74	-21.87	83.87	125.2	-41.33	peak

GFSK-High

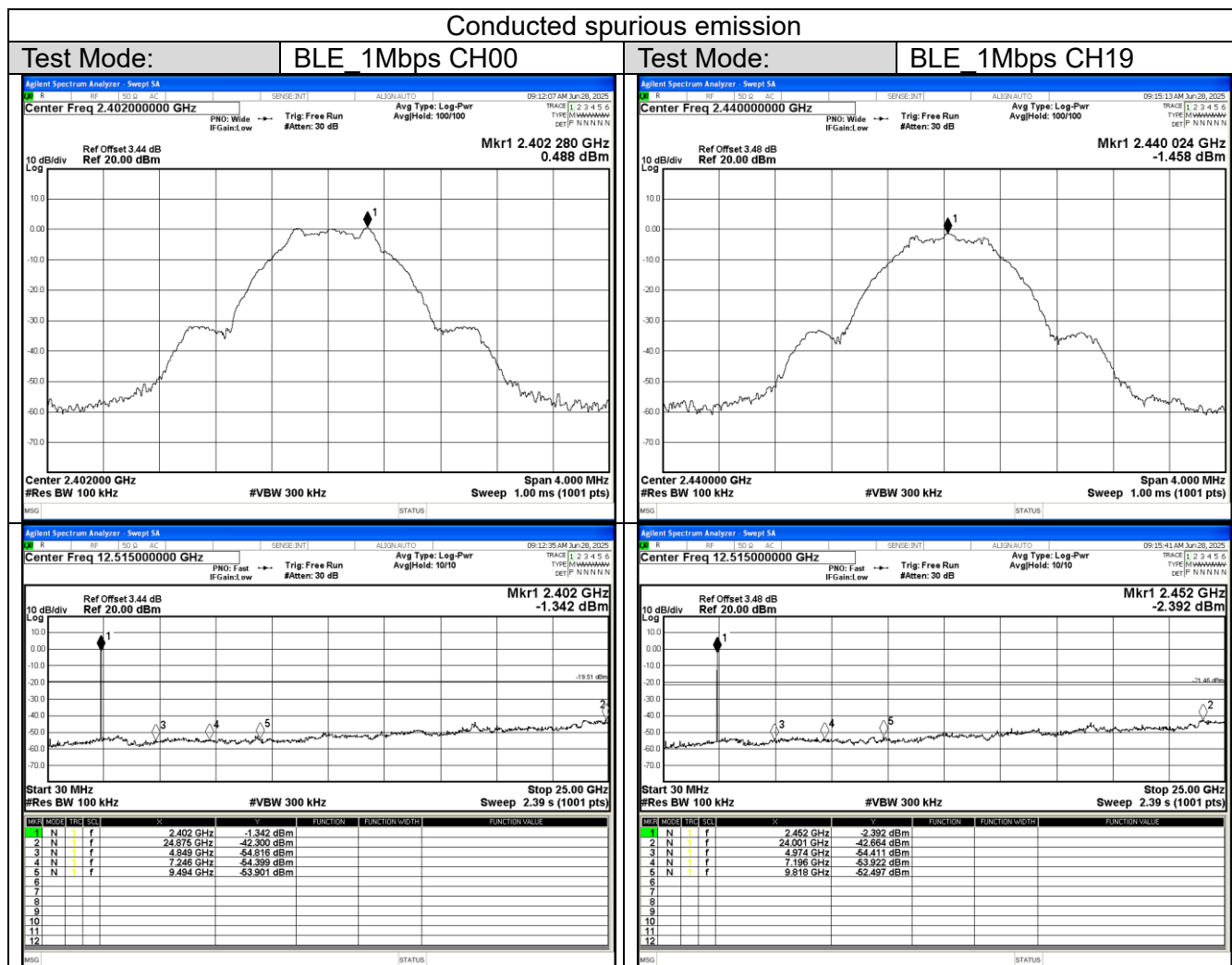
Horizontal

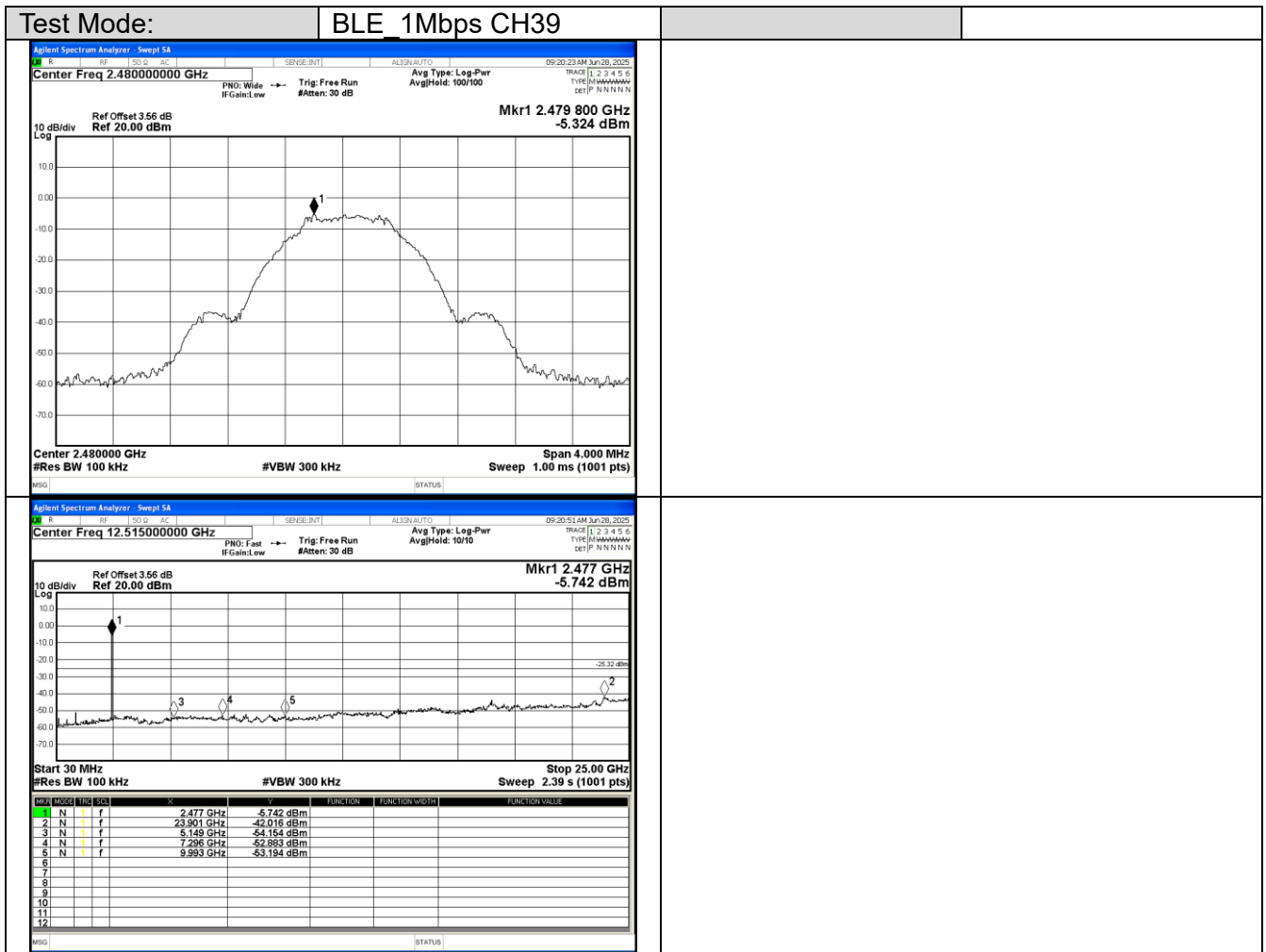
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2480.2	115.51	-21.53	93.98	125.2	-31.22	peak
2	2483.5	61.28	-21.52	39.76	74	-34.24	peak
3	2483.5	58.76	-21.52	37.24	54	-16.76	AVG
4	2498.7	64.26	-21.47	42.79	74	-31.21	peak
5	2498.7	59.56	-21.47	38.09	54	-15.91	AVG

Vertical

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2479.8	103.59	-21.53	82.06	125.2	-43.14	peak
2	2483.5	63.53	-21.52	42.01	74	-31.99	peak
3	2483.5	58.58	-21.52	37.06	54	-16.94	AVG
4	2499.35	66.74	-21.47	45.27	74	-28.73	peak
5	2499.35	59.58	-21.47	38.11	54	-15.89	AVG

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

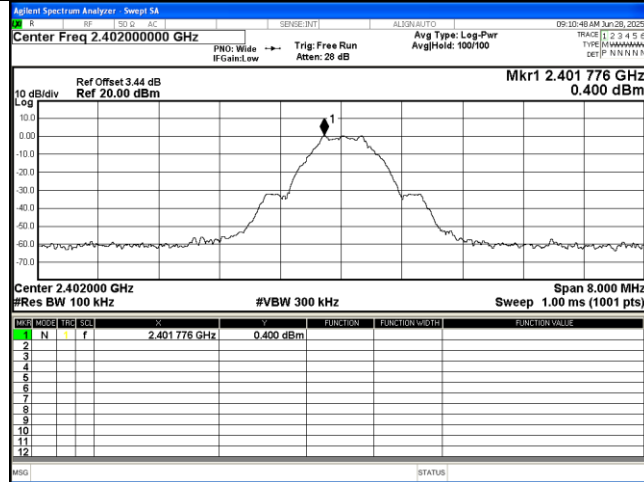




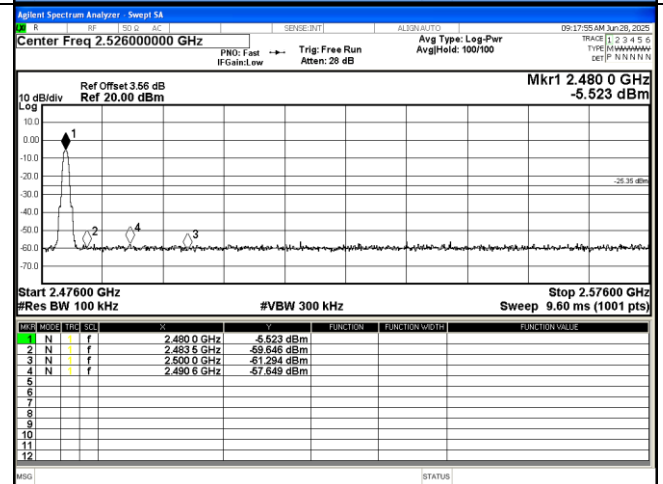
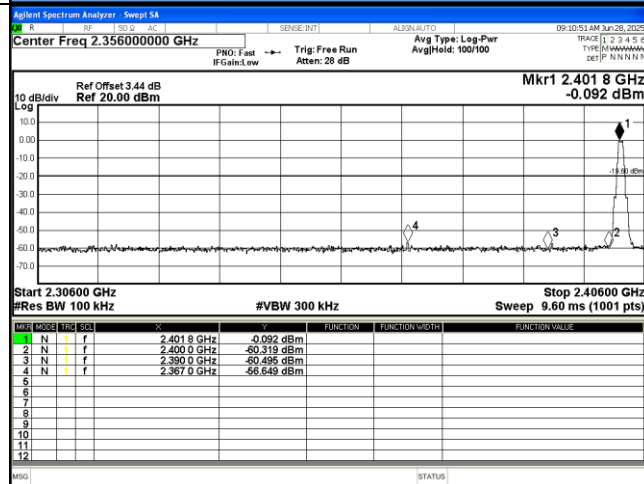
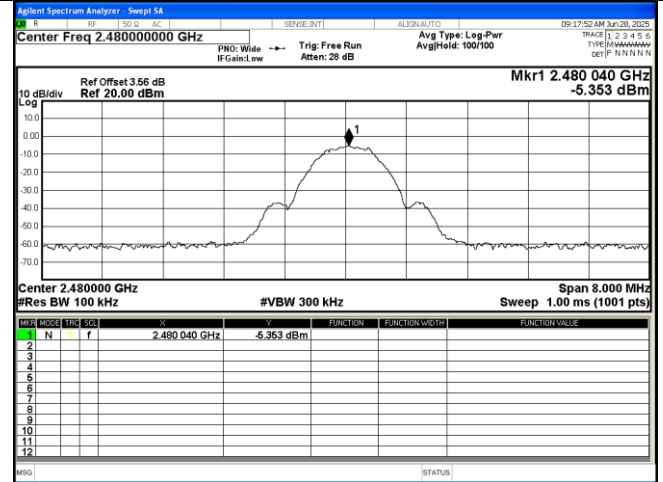


For Band edge(it's also the reference level for conducted spurious emission)

Test Mode: BLE_1Mbps CH00

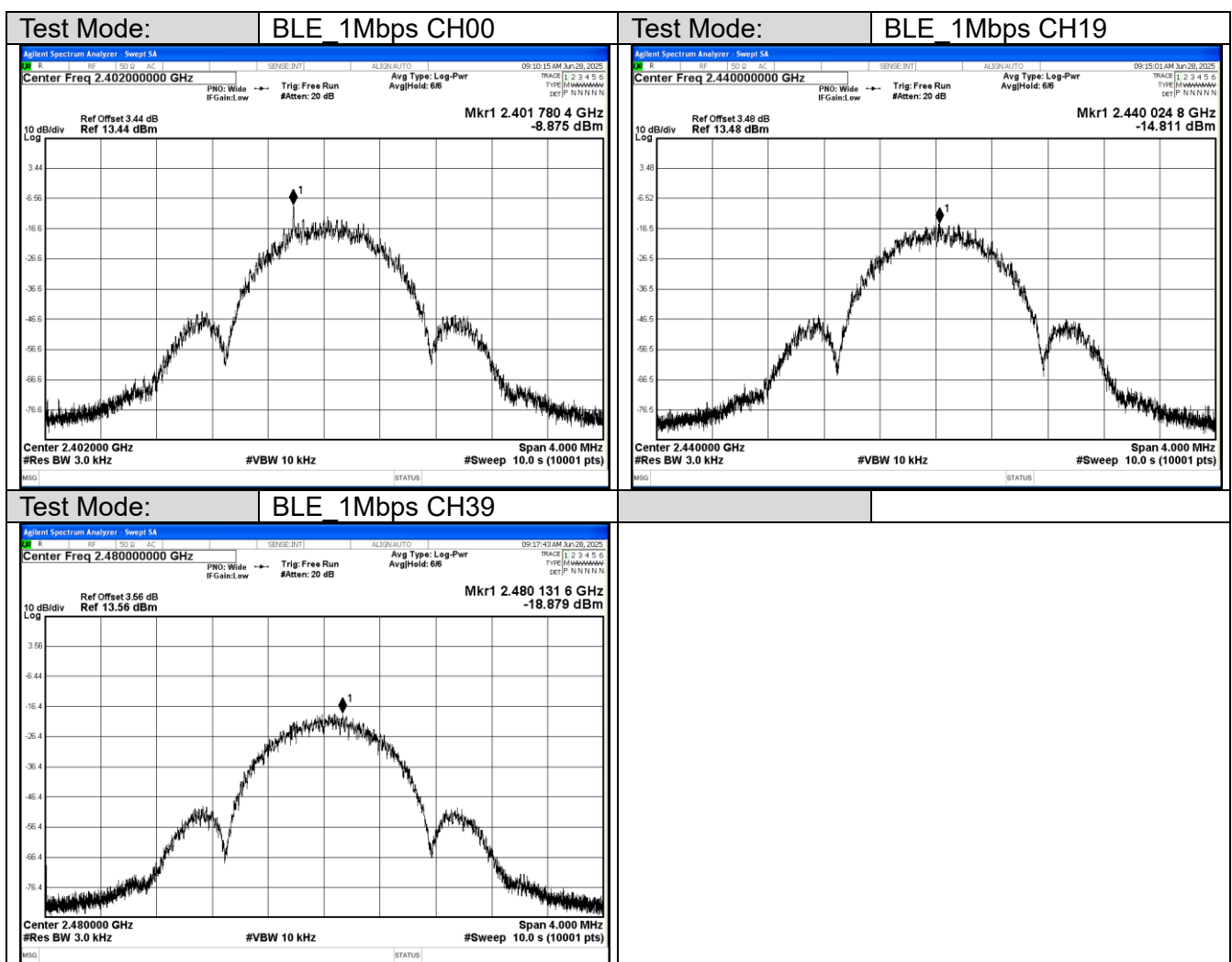


Test Mode: BLE_1Mbps CH39



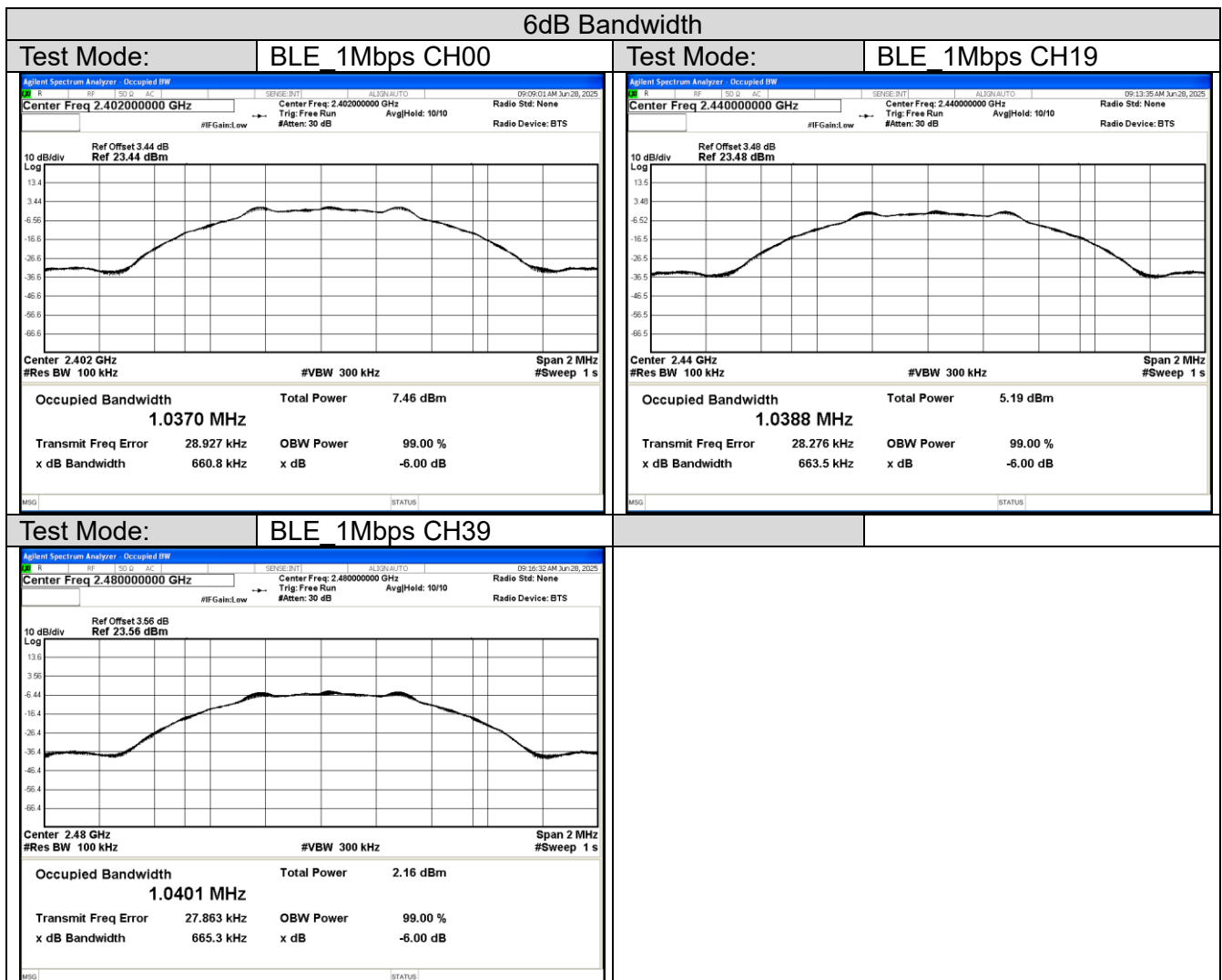
Appendix A.4 Test Results of Conducted Power Spectral Density

BLE_1Mbps			
Frequency	Power Density	Limit (dBm/3KHz)	Result
	(dBm/3kHz)		
CH00	-8.875	8	Pass
CH19	-14.811	8	Pass
CH39	-18.879	8	Pass



Appendix A.5 Test Results of 6dB BANDWIDTH

BLE_1Mbps			
Frequency	Bandwidth (MHz)	6dB limit (MHz)	Result
	6dB		
CH00	0.6608	0.5	Pass
CH19	0.6635	0.5	Pass
CH39	0.6653	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	1.001	0.0012	≤ 1.0
	2440	-1.254	0.0007	≤ 1.0
	2480	-4.157	0.0003	≤ 1.0

Note:

- 1) The cable loss is taken into account in results.
 - 2) Antenna gain(G) BLE: 2.00 dBi
- e.i.r.p.=P (peak power) + G, which is far below the 4 W