



## Appendix A. Radiated Spurious Emission

|                 |                                   |                     |         |
|-----------------|-----------------------------------|---------------------|---------|
| Test Engineer : | Karl Hou, Kyle Jhuang and Jet Lui | Temperature :       | 25~26°C |
|                 |                                   | Relative Humidity : | 50~51%  |

### 15C 2.4GHz 2400~2483.5MHz

#### BLE (Band Edge @ 3m)

| BLE                     | Note | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Cable  | Preamp | Ant    | Table   | Peak    | Pol.    |
|-------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| Ant.                    |      |           |            | Limit  | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |
| 1                       |      | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |
| BLE<br>CH 00<br>2402MHz |      | 2363.73   | 52.27      | -21.73 | 74         | 48.65    | 32.7     | 4.6    | 33.68  | 100    | 350     | P       | H       |
|                         |      | 2330.25   | 40.47      | -13.53 | 54         | 37       | 32.62    | 4.55   | 33.7   | 100    | 350     | A       | H       |
|                         | *    | 2402      | 101.83     | -      | -          | 98.09    | 32.77    | 4.62   | 33.65  | 100    | 350     | P       | H       |
|                         | *    | 2402      | 100.88     | -      | -          | 97.14    | 32.77    | 4.62   | 33.65  | 100    | 350     | A       | H       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |      | 2333.76   | 51.66      | -22.34 | 74         | 48.17    | 32.62    | 4.57   | 33.7   | 109    | 31      | P       | V       |
|                         |      | 2373      | 40.32      | -13.68 | 54         | 36.65    | 32.73    | 4.6    | 33.66  | 109    | 31      | A       | V       |
|                         | *    | 2402      | 95.1       | -      | -          | 91.36    | 32.77    | 4.62   | 33.65  | 109    | 31      | P       | V       |
|                         | *    | 2402      | 94.15      | -      | -          | 90.41    | 32.77    | 4.62   | 33.65  | 109    | 31      | A       | V       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 19<br>2440MHz |      | 2340.6    | 51.57      | -22.43 | 74         | 48.03    | 32.66    | 4.57   | 33.69  | 100    | 351     | P       | H       |
|                         |      | 2369.4    | 40.28      | -13.72 | 54         | 36.61    | 32.73    | 4.6    | 33.66  | 100    | 351     | A       | H       |
|                         | *    | 2440      | 106.19     | -      | -          | 102.22   | 32.89    | 4.68   | 33.6   | 100    | 351     | P       | H       |
|                         | *    | 2440      | 105.35     | -      | -          | 101.38   | 32.89    | 4.68   | 33.6   | 100    | 351     | A       | H       |
|                         |      | 2488.32   | 51.6       | -22.4  | 74         | 47.43    | 33       | 4.73   | 33.56  | 100    | 351     | P       | H       |
|                         |      | 2486.28   | 40.75      | -13.25 | 54         | 36.63    | 32.96    | 4.73   | 33.57  | 100    | 351     | A       | H       |
|                         |      | 2355.72   | 50.88      | -23.12 | 74         | 47.29    | 32.7     | 4.57   | 33.68  | 130    | 233     | P       | V       |
|                         |      | 2384.79   | 40.36      | -13.64 | 54         | 36.67    | 32.73    | 4.62   | 33.66  | 130    | 233     | A       | V       |
|                         | *    | 2440      | 98.03      | -      | -          | 94.06    | 32.89    | 4.68   | 33.6   | 130    | 233     | P       | V       |
|                         | *    | 2440      | 97.15      | -      | -          | 93.18    | 32.89    | 4.68   | 33.6   | 130    | 233     | A       | V       |
|                         |      | 2490.2    | 51.31      | -22.69 | 74         | 47.14    | 33       | 4.73   | 33.56  | 130    | 233     | P       | V       |
|                         |      | 2490.6    | 40.99      | -13.01 | 54         | 36.82    | 33       | 4.73   | 33.56  | 130    | 233     | A       | V       |



|                                  |                                                                                             |         |       |        |    |       |       |      |       |     |     |   |   |
|----------------------------------|---------------------------------------------------------------------------------------------|---------|-------|--------|----|-------|-------|------|-------|-----|-----|---|---|
| <b>BLE<br/>CH 39<br/>2480MHz</b> | *                                                                                           | 2480    | 97.98 | -      | -  | 93.86 | 32.96 | 4.73 | 33.57 | 146 | 9   | P | H |
|                                  | *                                                                                           | 2480    | 97    | -      | -  | 92.88 | 32.96 | 4.73 | 33.57 | 146 | 9   | A | H |
|                                  |                                                                                             | 2487.12 | 51.22 | -22.78 | 74 | 47.1  | 32.96 | 4.73 | 33.57 | 146 | 9   | P | H |
|                                  |                                                                                             | 2496    | 40.75 | -13.25 | 54 | 36.58 | 33    | 4.73 | 33.56 | 146 | 9   | A | H |
|                                  |                                                                                             |         |       |        |    |       |       |      |       |     |     |   | H |
|                                  |                                                                                             |         |       |        |    |       |       |      |       |     |     |   | H |
|                                  | *                                                                                           | 2480    | 94.89 | -      | -  | 90.77 | 32.96 | 4.73 | 33.57 | 103 | 230 | P | V |
|                                  | *                                                                                           | 2480    | 93.99 | -      | -  | 89.87 | 32.96 | 4.73 | 33.57 | 103 | 230 | A | V |
|                                  |                                                                                             | 2490    | 51.49 | -22.51 | 74 | 47.32 | 33    | 4.73 | 33.56 | 103 | 230 | P | V |
|                                  |                                                                                             | 2491.28 | 40.7  | -13.3  | 54 | 36.53 | 33    | 4.73 | 33.56 | 103 | 230 | A | V |
|                                  |                                                                                             |         |       |        |    |       |       |      |       |     |     |   | V |
|                                  |                                                                                             |         |       |        |    |       |       |      |       |     |     |   | V |
| Remark                           | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |         |       |        |    |       |       |      |       |     |     |   |   |



**15C 2.4GHz 2400~2483.5MHz**

**BLE (Harmonic @ 3m)**

| BLE                     | Note                                                                                        | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Cable  | Preamp | Ant    | Table   | Peak    | Pol.    |
|-------------------------|---------------------------------------------------------------------------------------------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| Ant.                    |                                                                                             |           |            | Limit  | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |
| 1                       |                                                                                             | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |
| BLE<br>CH 00<br>2402MHz |                                                                                             | 4803      | 40.11      | -33.89 | 74         | 57.19    | 35.04    | 6.52   | 58.64  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4803      | 40.54      | -33.46 | 74         | 57.62    | 35.04    | 6.52   | 58.64  | 100    | 0       | P       | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 19<br>2440MHz |                                                                                             | 4881      | 41.05      | -32.95 | 74         | 57.97    | 35.02    | 6.58   | 58.52  | 100    | 0       | P       | H       |
|                         |                                                                                             | 7320      | 42.9       | -31.1  | 74         | 56.45    | 36.4     | 8.24   | 58.19  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4881      | 40.76      | -33.24 | 74         | 57.68    | 35.02    | 6.58   | 58.52  | 100    | 0       | P       | V       |
|                         |                                                                                             | 7320      | 42.06      | -31.94 | 74         | 55.61    | 36.4     | 8.24   | 58.19  | 100    | 0       | P       | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 39<br>2480MHz |                                                                                             | 4959      | 40.37      | -33.63 | 74         | 57.11    | 35.01    | 6.61   | 58.36  | 100    | 0       | P       | H       |
|                         |                                                                                             | 7440      | 42.44      | -31.56 | 74         | 56.02    | 36.47    | 8.36   | 58.41  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4959      | 40.18      | -33.82 | 74         | 56.92    | 35.01    | 6.61   | 58.36  | 100    | 0       | P       | V       |
|                         |                                                                                             | 7440      | 43.16      | -30.84 | 74         | 56.74    | 36.47    | 8.36   | 58.41  | 100    | 0       | P       | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
| Remark                  | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |           |            |        |            |          |          |        |        |        |         |         |         |

### 15C Emission below 1GHz

## 2.4GHz BLE

**(LF @ 3m)**

| BLE                         | Note                                                                       | Frequency | Level      | Over   | Limit      | Read   | Antenna  | Cable  | Preamp | Ant    | Table   | Peak  | Pol.  |
|-----------------------------|----------------------------------------------------------------------------|-----------|------------|--------|------------|--------|----------|--------|--------|--------|---------|-------|-------|
| Ant.                        |                                                                            |           |            | Limit  | Line       | Level  | Factor   | Loss   | Factor | Pos    | Pos     | Avg.  |       |
| 1                           |                                                                            | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | (dBμV) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | (P/A) | (H/V) |
| 2.4GHz<br><br>BLE<br><br>LF |                                                                            | 100.47    | 27.96      | -15.54 | 43.5       | 48.2   | 10.44    | 1.1    | 31.78  |        |         | P     | H     |
|                             | !                                                                          | 249.78    | 40.3       | -5.7   | 46         | 58.03  | 12.4     | 1.64   | 31.77  | 125    | 186     | P     | H     |
|                             |                                                                            | 253.02    | 39.98      | -6.02  | 46         | 57.25  | 12.85    | 1.65   | 31.77  |        |         | P     | H     |
|                             |                                                                            | 323.1     | 33.46      | -12.54 | 46         | 49.87  | 13.52    | 1.84   | 31.77  |        |         | P     | H     |
|                             |                                                                            | 342       | 31.79      | -14.21 | 46         | 47.53  | 14.16    | 1.88   | 31.78  |        |         | P     | H     |
|                             |                                                                            | 731.9     | 33.14      | -12.86 | 46         | 40.47  | 21.96    | 2.71   | 32     |        |         | P     | H     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |
|                             | !                                                                          | 30.54     | 36.25      | -3.75  | 40         | 48.98  | 18.38    | 0.71   | 31.82  | 112    | 220     | P     | V     |
|                             |                                                                            | 46.2      | 28.13      | -11.87 | 40         | 49.44  | 9.7      | 0.79   | 31.8   |        |         | P     | V     |
|                             |                                                                            | 246.54    | 31.6       | -14.4  | 46         | 49.74  | 12       | 1.63   | 31.77  |        |         | P     | V     |
|                             |                                                                            | 316.8     | 30.9       | -15.1  | 46         | 47.48  | 13.37    | 1.82   | 31.77  |        |         | P     | V     |
|                             |                                                                            | 731.9     | 37.59      | -8.41  | 46         | 44.92  | 21.96    | 2.71   | 32     |        |         | P     | V     |
|                             |                                                                            | 756.4     | 35.41      | -10.59 | 46         | 42.42  | 22.2     | 2.76   | 31.97  |        |         | P     | V     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | V     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | V     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | V     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | V     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | V     |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | V     |
| Remark                      | 1. No other spurious found.<br>2. All results are PASS against limit line. |           |            |        |            |        |          |        |        |        |         |       |       |



Note symbol for Part 15C rule

15C 2.4GHz 2400~2483.5MHz

15C band 4 - 5725~5850MHz

|     |                                                                                                                                                                  |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *   | Fundamental Frequency which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency per 15.209(c).  |
| !   | Test result is over limit line.                                                                                                                                  |
| @   | Frequency falls in non-restricted band is passed and tested by conducted band edges and spurious emission measurement in the test report.                        |
| #   | Peak measured value is under 20dB and complies with the average limit, so it is unnecessary to perform an average measurement per clause 6.5.4.2 of ANSI C63.10. |
| P/A | Peak or Average                                                                                                                                                  |
| H/V | Horizontal or Vertical                                                                                                                                           |



A calculation example for radiated spurious emission is shown as below:

| WIFI    | Note | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Cable  | Preamp | Ant    | Table   | Peak    | Pol.    |
|---------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| Ant.    |      |           |            | Limit  | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |
| 1+2     |      | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |
| 802.11b |      | 2390      | 55.45      | -18.55 | 74         | 54.51    | 32.22    | 4.58   | 35.86  | 103    | 308     | P       | H       |
| CH 01   |      |           |            |        |            |          |          |        |        |        |         |         |         |
| 2412MHz |      | 2390      | 43.54      | -10.46 | 54         | 42.6     | 32.22    | 4.58   | 35.86  | 103    | 308     | A       | H       |

1. Level(dBμV/m) =

Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

2. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

**For Average Limit @ 2390MHz:**

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

**Both peak and average measured complies with the limit line, so test result is “PASS”.**