



## Appendix A. Radiated Spurious Emission

|                 |                              |                     |         |
|-----------------|------------------------------|---------------------|---------|
| Test Engineer : | Nick Yu, Ken Wu and Bill Kuo | Temperature :       | 21~23°C |
|                 |                              | Relative Humidity : | 56~60%  |

15C 2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

| BLE                     | Note | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Cable  | Preamp | Ant    | Table   | Peak    | Pol.    |
|-------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
|                         |      |           |            | Limit  | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |
|                         |      | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |
| BLE<br>CH 00<br>2402MHz |      | 2325.12   | 52.12      | -21.88 | 74         | 53.18    | 27.05    | 5.95   | 34.06  | 212    | 58      | P       | H       |
|                         |      | 2325.12   | 46.06      | -7.94  | 54         | 47.12    | 27.05    | 5.95   | 34.06  | 212    | 58      | A       | H       |
|                         | *    | 2402.254  | 99.26      | -      | -          | 100.06   | 27.23    | 6.01   | 34.04  | 212    | 58      | P       | H       |
|                         | *    | 2402.087  | 98.81      | -      | -          | 99.61    | 27.23    | 6.01   | 34.04  | 212    | 58      | A       | H       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |      | 2325.12   | 52.6       | -21.4  | 74         | 53.66    | 27.05    | 5.95   | 34.06  | 324    | 95      | P       | V       |
|                         |      | 2325.3    | 46.79      | -7.21  | 54         | 47.85    | 27.05    | 5.95   | 34.06  | 324    | 95      | A       | V       |
|                         | *    | 2402.254  | 98.14      | -      | -          | 98.94    | 27.23    | 6.01   | 34.04  | 324    | 95      | P       | V       |
|                         | *    | 2402.004  | 97.67      | -      | -          | 98.47    | 27.23    | 6.01   | 34.04  | 324    | 95      | A       | V       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 19<br>2440MHz |      | 2363.55   | 53.47      | -20.53 | 74         | 54.37    | 27.14    | 6.01   | 34.05  | 201    | 58      | P       | H       |
|                         |      | 2363.19   | 48.53      | -5.47  | 54         | 49.49    | 27.14    | 5.95   | 34.05  | 201    | 58      | A       | H       |
|                         | *    | 2439.83   | 98.64      | -      | -          | 99.26    | 27.37    | 6.04   | 34.03  | 201    | 58      | P       | H       |
|                         | *    | 2440.08   | 98.2       | -      | -          | 98.82    | 27.37    | 6.04   | 34.03  | 201    | 58      | A       | H       |
|                         |      | 2486.04   | 50.97      | -23.03 | 74         | 51.43    | 27.46    | 6.09   | 34.01  | 201    | 58      | P       | H       |
|                         |      | 2494.08   | 42.18      | -11.82 | 54         | 42.59    | 27.5     | 6.09   | 34     | 201    | 58      | A       | H       |
|                         |      | 2363.1    | 53.01      | -20.99 | 74         | 53.97    | 27.14    | 5.95   | 34.05  | 329    | 102     | P       | V       |
|                         |      | 2363.19   | 47.9       | -6.1   | 54         | 48.86    | 27.14    | 5.95   | 34.05  | 329    | 102     | A       | V       |
|                         | *    | 2439.83   | 97.95      | -      | -          | 98.57    | 27.37    | 6.04   | 34.03  | 329    | 102     | P       | V       |
|                         | *    | 2439.997  | 97.46      | -      | -          | 98.08    | 27.37    | 6.04   | 34.03  | 329    | 102     | A       | V       |
|                         |      | 2499.16   | 51.81      | -22.19 | 74         | 52.22    | 27.5     | 6.09   | 34     | 329    | 102     | P       | V       |
|                         |      | 2485.4    | 42.1       | -11.9  | 54         | 42.56    | 27.46    | 6.09   | 34.01  | 329    | 102     | A       | V       |



|                                  |                                                                                             |          |       |        |    |        |       |      |       |     |    |   |   |
|----------------------------------|---------------------------------------------------------------------------------------------|----------|-------|--------|----|--------|-------|------|-------|-----|----|---|---|
| <b>BLE<br/>CH 39<br/>2480MHz</b> | *                                                                                           | 2479.826 | 99.8  | -      | -  | 100.28 | 27.46 | 6.07 | 34.01 | 206 | 54 | P | H |
|                                  | *                                                                                           | 2480.076 | 99.31 | -      | -  | 99.79  | 27.46 | 6.07 | 34.01 | 206 | 54 | A | H |
|                                  |                                                                                             | 2489.64  | 58.09 | -15.91 | 74 | 58.51  | 27.5  | 6.09 | 34.01 | 206 | 54 | P | H |
|                                  |                                                                                             | 2489.6   | 49.36 | -4.64  | 54 | 49.78  | 27.5  | 6.09 | 34.01 | 206 | 54 | A | H |
|                                  |                                                                                             |          |       |        |    |        |       |      |       |     |    |   | H |
|                                  |                                                                                             |          |       |        |    |        |       |      |       |     |    |   | H |
|                                  | *                                                                                           | 2479.826 | 99.08 | -      | -  | 99.56  | 27.46 | 6.07 | 34.01 | 287 | 84 | P | V |
|                                  | *                                                                                           | 2480.076 | 98.64 | -      | -  | 99.12  | 27.46 | 6.07 | 34.01 | 287 | 84 | A | V |
|                                  |                                                                                             | 2489.48  | 56.68 | -17.32 | 74 | 57.1   | 27.5  | 6.09 | 34.01 | 287 | 84 | P | V |
|                                  |                                                                                             | 2489.44  | 49.26 | -4.74  | 54 | 49.68  | 27.5  | 6.09 | 34.01 | 287 | 84 | A | V |
|                                  |                                                                                             |          |       |        |    |        |       |      |       |     |    |   | V |
|                                  |                                                                                             |          |       |        |    |        |       |      |       |     |    |   | V |
| <b>Remark</b>                    | 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.    |
|-------------------------|---------------------------------------------------------------------------------------------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
|                         |                                                                                             |           |            | Limit  | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |
|                         |                                                                                             | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |
| BLE<br>CH 00<br>2402MHz |                                                                                             | 4806      | 36.22      | -37.78 | 74         | 61.36    | 31.3     | 8.65   | 65.09  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4806      | 35.72      | -38.28 | 74         | 60.86    | 31.3     | 8.65   | 65.09  | 100    | 0       | P       | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 19<br>2440MHz |                                                                                             | 4878      | 35.8       | -38.2  | 74         | 60.72    | 31.41    | 8.69   | 65.02  | 100    | 0       | P       | H       |
|                         |                                                                                             | 7320      | 41.08      | -32.92 | 74         | 59.44    | 36.32    | 10.39  | 65.07  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4878      | 36.01      | -37.99 | 74         | 60.93    | 31.41    | 8.69   | 65.02  | 100    | 0       | P       | V       |
|                         |                                                                                             | 7320      | 40.46      | -33.54 | 74         | 58.82    | 36.32    | 10.39  | 65.07  | 100    | 0       | P       | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 39<br>2480MHz |                                                                                             | 4962      | 36.48      | -37.52 | 74         | 61.04    | 31.54    | 8.83   | 64.93  | 100    | 0       | P       | H       |
|                         |                                                                                             | 7440      | 39.88      | -34.12 | 74         | 57.86    | 36.59    | 10.52  | 65.09  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4962      | 36.85      | -37.15 | 74         | 61.41    | 31.54    | 8.83   | 64.93  | 100    | 0       | P       | V       |
|                         |                                                                                             | 7440      | 40.05      | -33.95 | 74         | 58.03    | 36.59    | 10.52  | 65.09  | 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)

[illegible]



**Note symbol**

|     |                                                                                                                                                                        |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| *   | <b>Fundamental Frequency</b> 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 <b>over limit</b> line.                                                                                                                                 |
| P/A | <b>Peak</b> or <b>Average</b>                                                                                                                                          |
| H/V | <b>Horizontal</b> or <b>Vertical</b>                                                                                                                                   |



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”.**