



## Appendix A. Radiated Spurious Emission

|                 |                                      |                     |         |
|-----------------|--------------------------------------|---------------------|---------|
| Test Engineer : | Stan Hsieh, Luke Chang, and Lewis He | Temperature :       | 22~23°C |
|                 |                                      | Relative Humidity : | 45~47%  |

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 |      | 2371.11   | 51.25      | -22.75 | 74         | 52.09    | 27.19    | 6.01   | 34.04  | 246    | 235     | P       | H       |
|                         |      | 2389.74   | 41.93      | -12.07 | 54         | 42.73    | 27.23    | 6.01   | 34.04  | 246    | 235     | A       | H       |
|                         | *    | 2402.254  | 101.13     | -      | -          | 101.93   | 27.23    | 6.01   | 34.04  | 246    | 235     | P       | H       |
|                         | *    | 2402.087  | 100.48     | -      | -          | 101.28   | 27.23    | 6.01   | 34.04  | 246    | 235     | A       | H       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |      | 2374.44   | 51.03      | -22.97 | 74         | 51.87    | 27.19    | 6.01   | 34.04  | 125    | 279     | P       | V       |
|                         |      | 2389.47   | 41.9       | -12.1  | 54         | 42.7     | 27.23    | 6.01   | 34.04  | 125    | 279     | A       | V       |
|                         | *    | 2402.254  | 101.15     | -      | -          | 101.95   | 27.23    | 6.01   | 34.04  | 125    | 279     | P       | V       |
|                         | *    | 2402.004  | 100.51     | -      | -          | 101.31   | 27.23    | 6.01   | 34.04  | 125    | 279     | A       | V       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 19<br>2440MHz |      | 2387.49   | 51.7       | -22.3  | 74         | 52.5     | 27.23    | 6.01   | 34.04  | 238    | 226     | P       | H       |
|                         |      | 2371.65   | 41.94      | -12.06 | 54         | 42.78    | 27.19    | 6.01   | 34.04  | 238    | 226     | A       | H       |
|                         | *    | 2440.247  | 102.95     | -      | -          | 103.57   | 27.37    | 6.04   | 34.03  | 238    | 226     | P       | H       |
|                         | *    | 2439.997  | 102.39     | -      | -          | 103.01   | 27.37    | 6.04   | 34.03  | 238    | 226     | A       | H       |
|                         |      | 2498.6    | 51.74      | -22.26 | 74         | 52.15    | 27.5     | 6.09   | 34     | 238    | 226     | P       | H       |
|                         |      | 2492.52   | 42.31      | -11.69 | 54         | 42.72    | 27.5     | 6.09   | 34     | 238    | 226     | A       | H       |
|                         |      | 2310.72   | 50.57      | -23.43 | 74         | 51.74    | 27.01    | 5.89   | 34.07  | 100    | 44      | P       | V       |
|                         |      | 2377.5    | 41.71      | -12.29 | 54         | 42.55    | 27.19    | 6.01   | 34.04  | 100    | 44      | A       | V       |
|                         | *    | 2439.746  | 99.66      | -      | -          | 100.28   | 27.37    | 6.04   | 34.03  | 100    | 44      | P       | V       |
|                         | *    | 2439.997  | 99.07      | -      | -          | 99.69    | 27.37    | 6.04   | 34.03  | 100    | 44      | A       | V       |
|                         |      | 2492.12   | 51.23      | -22.77 | 74         | 51.64    | 27.5     | 6.09   | 34     | 100    | 44      | P       | V       |
|                         |      | 2499.32   | 42.11      | -11.89 | 54         | 42.52    | 27.5     | 6.09   | 34     | 100    | 44      | A       | V       |



| 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 39<br>2480MHz | *                                                                                           | 2479.742  | 101.33     | -      | -          | 101.81   | 27.46    | 6.07   | 34.01  | 235    | 234     | P     | H     |
|                         | *                                                                                           | 2479.993  | 100.74     | -      | -          | 101.22   | 27.46    | 6.07   | 34.01  | 235    | 234     | A     | H     |
|                         |                                                                                             | 2492.8    | 51.3       | -22.7  | 74         | 51.71    | 27.5     | 6.09   | 34     | 235    | 234     | P     | H     |
|                         |                                                                                             | 2483.64   | 42.31      | -11.69 | 54         | 42.77    | 27.46    | 6.09   | 34.01  | 235    | 234     | A     | H     |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |       | H     |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |       | H     |
|                         | *                                                                                           | 2479.742  | 100.51     | -      | -          | 100.99   | 27.46    | 6.07   | 34.01  | 117    | 281     | P     | V     |
|                         | *                                                                                           | 2479.993  | 99.96      | -      | -          | 100.44   | 27.46    | 6.07   | 34.01  | 117    | 281     | A     | V     |
|                         |                                                                                             | 2498.08   | 51.17      | -22.83 | 74         | 51.58    | 27.5     | 6.09   | 34     | 117    | 281     | P     | V     |
|                         |                                                                                             | 2483.84   | 42.3       | -11.7  | 54         | 42.76    | 27.46    | 6.09   | 34.01  | 117    | 281     | 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.    |
|-------------------------|---------------------------------------------------------------------------------------------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
|                         |                                                                                             |           |            | 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      | 33.38      | -40.62 | 74         | 52.07    | 31.3     | 8.65   | 58.64  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4806      | 32.52      | -41.48 | 74         | 51.21    | 31.3     | 8.65   | 58.64  | 100    | 0       | P       | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 19<br>2440MHz |                                                                                             | 4878      | 33.46      | -40.54 | 74         | 51.88    | 31.41    | 8.69   | 58.52  | 100    | 0       | P       | H       |
|                         |                                                                                             | 7320      | 37.42      | -36.58 | 74         | 48.9     | 36.32    | 10.39  | 58.19  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4878      | 32.95      | -41.05 | 74         | 51.37    | 31.41    | 8.69   | 58.52  | 100    | 0       | P       | V       |
|                         |                                                                                             | 7320      | 37.25      | -36.75 | 74         | 48.73    | 36.32    | 10.39  | 58.19  | 100    | 0       | P       | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 39<br>2480MHz |                                                                                             | 4962      | 32.56      | -41.44 | 74         | 50.55    | 31.54    | 8.83   | 58.36  | 100    | 0       | P       | H       |
|                         |                                                                                             | 7440      | 37.94      | -36.06 | 74         | 49.24    | 36.59    | 10.52  | 58.41  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4962      | 33.17      | -40.83 | 74         | 51.16    | 31.54    | 8.83   | 58.36  | 100    | 0       | P       | V       |
|                         |                                                                                             | 7440      | 37.87      | -36.13 | 74         | 49.17    | 36.59    | 10.52  | 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)

[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<br>CH 01<br>2412MHz |      | 2390      | 55.45      | -18.55 | 74         | 54.51    | 32.22    | 4.58   | 35.86  | 103    | 308     | P       | H       |
|                             |      | 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”.