



## Appendix A. Radiated Spurious Emission

|                 |                                  |                     |         |
|-----------------|----------------------------------|---------------------|---------|
| Test Engineer : | Derreck Chen, Ken Wu and Nick Yu | Temperature :       | 23~25°C |
|                 |                                  | Relative Humidity : | 48~51%  |

## 15C 2.4GHz 2400~2483.5MHz

## BLE (Band Edge @ 3m)

| BLE                     | Note | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Cable  | Preamp | Ant    | Table   | Peak    | Pol.    |
|-------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
|                         |      |           |            | 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 |      | 2330.88   | 46         | -28    | 74         | 40.53    | 32.09    | 7.6    | 34.22  | 121    | 360     | P       | H       |
|                         |      | 2363.37   | 34.03      | -19.97 | 54         | 28.47    | 32.13    | 7.68   | 34.25  | 121    | 360     | A       | H       |
|                         | *    | 2402.254  | 97.74      | -      | -          | 92.11    | 32.18    | 7.75   | 34.3   | 121    | 360     | P       | H       |
|                         | *    | 2401.92   | 96.83      | -      | -          | 91.2     | 32.18    | 7.75   | 34.3   | 121    | 360     | A       | H       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |      | 2336.28   | 46.22      | -27.78 | 74         | 40.73    | 32.11    | 7.6    | 34.22  | 118    | 6       | P       | V       |
|                         |      | 2347.62   | 33.99      | -20.01 | 54         | 28.45    | 32.11    | 7.68   | 34.25  | 118    | 6       | A       | V       |
|                         | *    | 2402.254  | 95.91      | -      | -          | 90.28    | 32.18    | 7.75   | 34.3   | 118    | 6       | P       | V       |
|                         | *    | 2402.004  | 94.96      | -      | -          | 89.33    | 32.18    | 7.75   | 34.3   | 118    | 6       | A       | V       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |      |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 19<br>2440MHz |      | 2324.76   | 45.98      | -28.02 | 74         | 40.51    | 32.09    | 7.6    | 34.22  | 100    | 358     | P       | H       |
|                         |      | 2352.3    | 33.96      | -20.04 | 54         | 28.4     | 32.13    | 7.68   | 34.25  | 100    | 358     | A       | H       |
|                         | *    | 2440.247  | 97.69      | -      | -          | 91.97    | 32.24    | 7.83   | 34.35  | 100    | 358     | P       | H       |
|                         | *    | 2439.997  | 96.84      | -      | -          | 91.12    | 32.24    | 7.83   | 34.35  | 100    | 358     | A       | H       |
|                         |      | 2496.36   | 46.1       | -27.9  | 74         | 40.37    | 32.3     | 7.91   | 34.48  | 100    | 358     | P       | H       |
|                         |      | 2488.2    | 34.09      | -19.91 | 54         | 28.31    | 32.3     | 7.91   | 34.43  | 100    | 358     | A       | H       |
|                         |      | 2320.89   | 46.05      | -27.95 | 74         | 40.58    | 32.09    | 7.6    | 34.22  | 143    | 103     | P       | V       |
|                         |      | 2356.8    | 33.87      | -20.13 | 54         | 28.31    | 32.13    | 7.68   | 34.25  | 143    | 103     | A       | V       |
|                         | *    | 2440.331  | 97.06      | -      | -          | 91.34    | 32.24    | 7.83   | 34.35  | 143    | 103     | P       | V       |
|                         | *    | 2439.997  | 96.2       | -      | -          | 90.48    | 32.24    | 7.83   | 34.35  | 143    | 103     | A       | V       |
|                         |      | 2496.44   | 46.74      | -27.26 | 74         | 41.01    | 32.3     | 7.91   | 34.48  | 143    | 103     | P       | V       |
|                         |      | 2488.36   | 34.18      | -19.82 | 54         | 28.4     | 32.3     | 7.91   | 34.43  | 143    | 103     | A       | V       |



|                                  |                                                                                             |          |       |        |    |       |       |      |       |     |     |   |   |
|----------------------------------|---------------------------------------------------------------------------------------------|----------|-------|--------|----|-------|-------|------|-------|-----|-----|---|---|
| <b>BLE<br/>CH 39<br/>2480MHz</b> | *                                                                                           | 2479.826 | 97.49 | -      | -  | 91.73 | 32.28 | 7.91 | 34.43 | 120 | 359 | P | H |
|                                  | *                                                                                           | 2480.076 | 96.63 | -      | -  | 90.87 | 32.28 | 7.91 | 34.43 | 120 | 359 | A | H |
|                                  |                                                                                             | 2487     | 47.15 | -26.85 | 74 | 41.39 | 32.28 | 7.91 | 34.43 | 120 | 359 | P | H |
|                                  |                                                                                             | 2483.72  | 34.67 | -19.33 | 54 | 28.91 | 32.28 | 7.91 | 34.43 | 120 | 359 | A | H |
|                                  |                                                                                             |          |       |        |    |       |       |      |       |     |     |   | H |
|                                  |                                                                                             |          |       |        |    |       |       |      |       |     |     |   | H |
|                                  | *                                                                                           | 2480.327 | 96.9  | -      | -  | 91.14 | 32.28 | 7.91 | 34.43 | 302 | 119 | P | V |
|                                  | *                                                                                           | 2480.076 | 96.04 | -      | -  | 90.28 | 32.28 | 7.91 | 34.43 | 302 | 119 | A | V |
|                                  |                                                                                             | 2483.52  | 46.67 | -27.33 | 74 | 40.91 | 32.28 | 7.91 | 34.43 | 302 | 119 | P | V |
|                                  |                                                                                             | 2483.52  | 34.53 | -19.47 | 54 | 28.77 | 32.28 | 7.91 | 34.43 | 302 | 119 | 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      | 47.03      | -26.97 | 74         | 60.63    | 34.25    | 11.11  | 58.96  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4806      | 45.81      | -28.19 | 74         | 59.41    | 34.25    | 11.11  | 58.96  | 100    | 0       | P       | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 19<br>2440MHz |                                                                                             | 4878      | 44.14      | -29.86 | 74         | 57.46    | 34.3     | 11.21  | 58.83  | 100    | 0       | P       | H       |
|                         |                                                                                             | 7320      | 45.09      | -28.91 | 74         | 52.15    | 35.6     | 15.08  | 57.74  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4878      | 42.15      | -31.85 | 74         | 55.47    | 34.3     | 11.21  | 58.83  | 100    | 0       | P       | V       |
|                         |                                                                                             | 7320      | 47.28      | -26.72 | 74         | 54.34    | 35.6     | 15.08  | 57.74  | 100    | 0       | P       | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | V       |
| BLE<br>CH 39<br>2480MHz |                                                                                             | 4962      | 42.15      | -31.85 | 74         | 55.12    | 34.37    | 11.32  | 58.66  | 100    | 0       | P       | H       |
|                         |                                                                                             | 7440      | 42.9       | -31.1  | 74         | 50.02    | 35.6     | 15.13  | 57.85  | 100    | 0       | P       | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             |           |            |        |            |          |          |        |        |        |         |         | H       |
|                         |                                                                                             | 4962      | 40.85      | -33.15 | 74         | 53.82    | 34.37    | 11.32  | 58.66  | 100    | 0       | P       | V       |
|                         |                                                                                             | 7440      | 43.25      | -30.75 | 74         | 50.37    | 35.6     | 15.13  | 57.85  | 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”.**