Appendix A. Radiated Spurious Emission

| Test Engineer : | Lewis He | Temperature : | 23~24°C |
|-----------------|----------|---------------------|---------|
| | | Relative Humidity : | 51~52% |

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) |
| | | 2386.14 | 53.3 | -20.7 | 74 | 53.29 | 27.23 | 33.24 | 6.02 | 115 | 61 | Р | Н |
| | | 2321.97 | 41.81 | -12.19 | 54 | 42.09 | 27.05 | 33.26 | 5.93 | 115 | 61 | Α | Н |
| | * | 2402 | 97.03 | - | - | 97 | 27.23 | 33.22 | 6.02 | 115 | 61 | Р | Н |
| | * | 2402 | 93.93 | - | - | 93.9 | 27.23 | 33.22 | 6.02 | 115 | 61 | Α | Н |
| D. F | | | | | | | | | | | | | Н |
| BLE | | | | | | | | | | | | | Н |
| CH 00 2402MHz | | 2388.57 | 53.21 | -20.79 | 74 | 53.2 | 27.23 | 33.24 | 6.02 | 166 | 280 | Р | V |
| 2402111112 | | 2321.97 | 42.2 | -11.8 | 54 | 42.48 | 27.05 | 33.26 | 5.93 | 166 | 280 | Α | V |
| | * | 2402 | 96.1 | - | - | 96.07 | 27.23 | 33.22 | 6.02 | 166 | 280 | Р | V |
| | * | 2402 | 93.01 | 1 | - | 92.98 | 27.23 | 33.22 | 6.02 | 166 | 280 | Α | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| Remark | 1. No | other spurious | s found. | | | | | | | | | | |
| | 2. All | results are PA | SS against F | eak and | Average lim | it line. | | | | | | | |

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: TX2-RTL8723BE Page Number : A1 of A6 Report Issued Date: Feb. 03, 2015 Report Version : Rev. 01

Report No.: FR510105B

| 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) | (dB _µ V) | (dB/m) | (dB) | (dB) | (cm) | (deg) | (P/A) | (H/V) |
| | | 2360.13 | 51.43 | -22.57 | 74 | 51.56 | 27.14 | 33.25 | 5.98 | 151 | 64 | Р | Н |
| | | 2360.04 | 41.92 | -12.08 | 54 | 42.05 | 27.14 | 33.25 | 5.98 | 151 | 64 | Α | Н |
| | * | 2440 | 96.93 | - | - | 96.69 | 27.37 | 33.21 | 6.08 | 151 | 64 | Р | Н |
| | * | 2440 | 93.8 | ı | - | 93.56 | 27.37 | 33.21 | 6.08 | 151 | 64 | Α | Н |
| | | 2490 | 51.61 | -22.39 | 74 | 51.07 | 27.5 | 33.18 | 6.22 | 151 | 64 | Р | Н |
| BLE | | 2484.48 | 41.24 | -12.76 | 54 | 40.74 | 27.46 | 33.18 | 6.22 | 151 | 64 | Α | Н |
| CH 19 2440MHz | | 2360.04 | 52.46 | -21.54 | 74 | 52.59 | 27.14 | 33.25 | 5.98 | 145 | 245 | Р | ٧ |
| 2440WII 12 | | 2359.95 | 42.2 | -11.8 | 54 | 42.33 | 27.14 | 33.25 | 5.98 | 145 | 245 | Α | ٧ |
| | * | 2440 | 96.73 | - | - | 96.49 | 27.37 | 33.21 | 6.08 | 145 | 245 | Р | V |
| | * | 2440 | 93.58 | - | - | 93.34 | 27.37 | 33.21 | 6.08 | 145 | 245 | Α | ٧ |
| | | 2492.92 | 52.52 | -21.48 | 74 | 51.97 | 27.5 | 33.17 | 6.22 | 145 | 245 | Р | ٧ |
| | | 2486.52 | 41.39 | -12.61 | 54 | 40.89 | 27.46 | 33.18 | 6.22 | 145 | 245 | Α | ٧ |
| | * | 2480 | 96.52 | - | - | 96.09 | 27.46 | 33.18 | 6.15 | 116 | 308 | Р | Н |
| | * | 2480 | 93.27 | - | - | 92.84 | 27.46 | 33.18 | 6.15 | 116 | 308 | Α | Н |
| | | 2485.32 | 54.77 | -19.23 | 74 | 54.27 | 27.46 | 33.18 | 6.22 | 116 | 308 | Р | Н |
| | | 2483.52 | 41.6 | -12.4 | 54 | 41.1 | 27.46 | 33.18 | 6.22 | 116 | 308 | Α | Н |
| | | | | | | | | | | | | | Н |
| BLE | | | | | | | | | | | | | Н |
| CH 39 2480MHz | * | 2480 | 95.48 | - | - | 95.05 | 27.46 | 33.18 | 6.15 | 122 | 299 | Р | ٧ |
| 2400WIF12 | * | 2480 | 92.25 | - | - | 91.82 | 27.46 | 33.18 | 6.15 | 122 | 299 | Α | ٧ |
| | | 2485.52 | 54.89 | -19.11 | 74 | 54.39 | 27.46 | 33.18 | 6.22 | 122 | 299 | Р | ٧ |
| | | 2483.72 | 41.54 | -12.46 | 54 | 41.04 | 27.46 | 33.18 | 6.22 | 122 | 299 | Α | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| Remark | | other spurious | | eak and | l Average lim | it line. | | | | | | | |

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: TX2-RTL8723BE Page Number : A2 of A6
Report Issued Date : Feb. 03, 2015
Report Version : Rev. 01

Report Template No.: BU5-FR15CBT4.0 Version 1.0

Report No.: FR510105B

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) |
| | | 4806 | 38.09 | -35.91 | 74 | 59.8 | 31.42 | 60.64 | 7.51 | 100 | 0 | Р | Н |
| | | | | | | | | | | | | | Н |
| | | | | | | | | | | | | | Н |
| BLE | | | | | | | | | | | | | Н |
| CH 00 | | 4806 | 38.02 | -35.98 | 74 | 59.73 | 31.42 | 60.64 | 7.51 | 100 | 0 | Р | V |
| 2402MHz | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | 4878 | 37.99 | -36.01 | 74 | 59.41 | 31.56 | 60.52 | 7.54 | 100 | 0 | Р | Н |
| | | 7320 | 43.28 | -30.72 | 74 | 56.78 | 36.22 | 60.98 | 11.26 | 100 | 0 | Р | Н |
| | | | | | | | | | | | | | Н |
| BLE | | | | | | | | | | | | | Н |
| CH 19 2440MHz | | 4878 | 36.47 | -37.53 | 74 | 57.89 | 31.56 | 60.52 | 7.54 | 100 | 0 | Р | V |
| 2440WIF12 | | 7320 | 42.92 | -31.08 | 74 | 56.42 | 36.22 | 60.98 | 11.26 | 100 | 0 | Р | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | 4962 | 38.59 | -35.41 | 74 | 59.59 | 31.73 | 60.36 | 7.63 | 100 | 0 | Р | Н |
| | | 7440 | 43.43 | -30.57 | 74 | 56.51 | 36.49 | 61.34 | 11.77 | 100 | 0 | Р | Н |
| DI E | | | | | | | | | | | | | Н |
| BLE CH 39 | | | | | | | | | | | | | Н |
| 2480MHz | | 4962 | 38.94 | -35.06 | 74 | 59.94 | 31.73 | 60.36 | 7.63 | 100 | 0 | Р | V |
| 00111112 | | 7440 | 43.25 | -30.75 | 74 | 56.33 | 36.49 | 61.34 | 11.77 | 100 | 0 | Р | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| Remark | | other spurious | | Peak and | l Average lim | it line. | | | | _ | | | |

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: TX2-RTL8723BE Page Number : A3 of A6
Report Issued Date : Feb. 03, 2015
Report Version : Rev. 01

Report No.: FR510105B

15C Emission below 1GHz

2.4GHz BLE (LF)

| 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) |
| | | 32.16 | 26.54 | -13.46 | 40 | 39.71 | 18.92 | 32.82 | 0.73 | - | - | Р | Н |
| | | 140.97 | 24.82 | -18.68 | 43.5 | 44.16 | 11.87 | 32.67 | 1.46 | - | - | Р | Н |
| | | 276.24 | 36.88 | -9.12 | 46 | 54.32 | 13.37 | 32.73 | 1.92 | 100 | 0 | Р | Н |
| | | 402.2 | 32.91 | -13.09 | 46 | 46.93 | 16.55 | 32.84 | 2.27 | - | - | Р | Н |
| | | 781.6 | 34.34 | -11.66 | 46 | 42.06 | 21.92 | 32.9 | 3.26 | - | - | Р | Н |
| | | 932.1 | 35.41 | -10.59 | 46 | 39.96 | 23.91 | 31.96 | 3.5 | - | - | Р | Н |
| | | | | | | | | | | | | | Н |
| | | | | | | | | | | | | | Н |
| | | | | | | | | | | | | | Н |
| | | | | | | | | | | | | | Н |
| 2.4011- | | | | | | | | | | | | | Н |
| 2.4GHz BLE | | | | | | | | | | | | | Н |
| LF | | 31.89 | 32.62 | -7.38 | 40 | 45.79 | 18.92 | 32.82 | 0.73 | 100 | 0 | Р | ٧ |
| | | 148.8 | 27.42 | -16.08 | 43.5 | 46.99 | 11.65 | 32.68 | 1.46 | - | - | Р | V |
| | | 282.45 | 33.6 | -12.4 | 46 | 51.05 | 13.36 | 32.73 | 1.92 | - | - | Р | V |
| | | 405.7 | 32.88 | -13.12 | 46 | 46.8 | 16.59 | 32.85 | 2.34 | - | - | Р | V |
| | | 876.8 | 31.88 | -14.12 | 46 | 38.07 | 22.88 | 32.44 | 3.37 | - | - | Р | V |
| | | 985.3 | 38.25 | -15.75 | 54 | 41.63 | 24.16 | 31.38 | 3.84 | - | - | Р | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| | | | | | | | | | | | | | V |
| Remark | | other spurious | | mit line. | | | | | | | | | |

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: TX2-RTL8723BE Page Number : A4 of A6
Report Issued Date : Feb. 03, 2015
Report Version : Rev. 01

Report No.: FR510105B

Note symbol

| * | 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. |
| P/A | Peak or Average |
| H/V | Horizontal or Vertical |

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TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: TX2-RTL8723BE Page Number : A5 of A6
Report Issued Date : Feb. 03, 2015
Report Version : Rev. 01

Report No. : FR510105B

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) | (dB _µ V) | (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 | Р | Н |
| CH 01 | | | | | | | | | | | | | |
| 2412MHz | | 2390 | 43.54 | -10.46 | 54 | 42.6 | 32.22 | 4.58 | 35.86 | 103 | 308 | Α | Н |

1. Level($dB\mu V/m$) =

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

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

For Peak Limit @ 2390MHz:

- 1. Level(dBµV/m)
- = Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) Preamp Factor(dB)
- $= 32.22(dB/m) + 4.58(dB) + 54.51(dB\mu V) 35.86 (dB)$
- $= 55.45 (dB\mu V/m)$
- 2. Over Limit(dB)
- = Level(dBµV/m) Limit Line(dBµV/m)
- $= 55.45(dB\mu V/m) 74(dB\mu V/m)$
- = -18.55(dB)

For Average Limit @ 2390MHz:

- 1. Level(dBµV/m)
- = Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBµV) Preamp Factor(dB)
- $= 32.22(dB/m) + 4.58(dB) + 42.6(dB\mu V) 35.86 (dB)$
- $= 43.54 (dB\mu V/m)$
- 2. Over Limit(dB)
- = Level(dBµV/m) Limit Line(dBµV/m)
- $= 43.54(dB\mu V/m) 54(dB\mu V/m)$
- = -10.46(dB)

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

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: TX2-RTL8723BE Page Number : A6 of A6
Report Issued Date : Feb. 03, 2015
Report Version : Rev. 01

Report No.: FR510105B