



## 9. RF EXPOSURE EVALUATION

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b) LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency Range<br>(MHz)                                | Electric Field<br>Strength (V/m) | Magnetic Field<br>Strength (A/m) | Power Density<br>(mW/cm <sup>2</sup> ) | Average Time |
|---------------------------------------------------------|----------------------------------|----------------------------------|----------------------------------------|--------------|
| (A) Limits for Occupational / Control Exposures         |                                  |                                  |                                        |              |
| 300-1,500                                               | --                               | --                               | F/300                                  | 6            |
| 1,500-100,000                                           | --                               | --                               | 5                                      | 6            |
| (B) Limits for General Population / Uncontrol Exposures |                                  |                                  |                                        |              |
| 300-1,500                                               | --                               | --                               | F/1500                                 | 6            |
| 1,500-100,000                                           | --                               | --                               | 1                                      | 30           |

### 9.1 Friis Formula

Friis transmission formula :  $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

$R$  = distance between observation point and center of the radiator in cm

$P_d$  is the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance  $r$  where the MPE limit is reached.

### 9.2 EUT Operating Condition

A software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.



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### 9.3 Test Result of RF Exposure Evaluation

Test Item : RF Exposure Evaluation Data

Test Mode : Normal Operation

#### 9.3.1 Maximum PEAK Output Power

Refer to 5.6 Maximum peak Output Power is : 19.18 dBm (for 802.11b mode CH6),  
19.90 dBm (for 802.11g mode CH6)

#### 9.3.2 Output Power into Antenna & RF Exposure Evaluation Distance

| Outpower (max) (dBm) | Cable length to antenna (m) | Min Cable Loss (dB) | Input Power to Antenna (dBm) | Antenna Model | Antenna Type       | Antenna Gain (dBi) | EIRP (dBm) | EIRP (Watts) | MPE Distance (cm) | Pd at 20cm (mW/cm <sup>2</sup> ) | Comments                         |
|----------------------|-----------------------------|---------------------|------------------------------|---------------|--------------------|--------------------|------------|--------------|-------------------|----------------------------------|----------------------------------|
| 17.92                |                             | 0                   | 17.92                        | ANT24P2       | Omni               | 2                  | 19.92      | 0.098175     | 2.80              | 0.019531                         | Minimum separation shall be 20cm |
| 17.92                |                             | 0                   | 17.92                        | ANT24P3       | Omni               | 3                  | 20.92      | 0.123595     | 3.14              | 0.024588                         | Minimum separation shall be 20cm |
| 17.92                |                             | 0                   | 17.92                        | ANT24P4       | Omni               | 4                  | 21.92      | 0.155597     | 3.52              | 0.030955                         | Minimum separation shall be 20cm |
| 17.92                | 1.5                         | 1.1                 | 16.82                        | ANT24S4       | Omni Triband Stand | 4                  | 20.82      | 0.120781     | 3.10              | 0.024029                         | Minimum separation shall be 20cm |
| 17.92                |                             | 0                   | 17.92                        | ANT24P5       | Omni               | 5                  | 22.92      | 0.195884     | 3.95              | 0.03897                          | Minimum separation shall be 20cm |
| 17.92                | 1.5                         | 1.1                 | 16.82                        | ANT24S5       | Omni Stand         | 5                  | 21.82      | 0.152055     | 3.48              | 0.03025                          | Minimum separation shall be 20cm |
| 17.92                |                             | 0                   | 17.92                        | ANT24P7       | Omni               | 7                  | 24.92      | 0.310456     | 4.97              | 0.061763                         | Minimum separation shall be 20cm |
| 17.92                | 1.5                         | 1.1                 | 16.82                        | ANT24P93      | Omni triband       | 9                  | 25.82      | 0.381944     | 5.51              | 0.075985                         | Minimum separation shall be 20cm |
| 17.92                | 1.5                         | 1.1                 | 16.82                        | ANT2409       | Omni               | 9                  | 25.82      | 0.381944     | 5.51              | 0.075985                         | Minimum separation shall be 20cm |
| 17.92                | 1.5                         | 1.1                 | 16.82                        | ANT24P12      | Omni               | 12                 | 28.82      | 0.762079     | 7.79              | 0.151611                         | Minimum separation shall be 20cm |
| 17.92                | 1.5                         | 1.1                 | 16.82                        | ANT24P123     | Omni triband       | 12                 | 28.82      | 0.762079     | 7.79              | 0.151611                         | Minimum separation shall be 20cm |
| 17.92                | 1.5                         | 1.1                 | 16.82                        | ANT24O5       | Ceiling            | 5                  | 21.82      | 0.152055     | 3.48              | 0.03025                          | Minimum separation shall be 20cm |
| 17.92                | 1.5                         | 1.1                 | 16.82                        | ANT24D12      | Patch              | 12                 | 28.82      | 0.762079     | 7.79              | 0.151611                         | Minimum separation shall be 20cm |
| 17.92                | 1.5                         | 1.1                 | 16.82                        | ANT24D18      | Patch              | 18                 | 34.82      | 3.033891     | 15.54             | 0.603573                         | Minimum separation shall be 20cm |

Note : 1. For 802.11b Mode.

- The power density Pd (4<sup>th</sup> column) at a distance of 20cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm<sup>2</sup>. The EUT is classified as mobile product. So, RF exposure limit warning or SAR test are not required.



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| Outpower (max) (dBm) | Cable length to antenna(m) | Min Cable Loss (dB) | Input Power to Antenna (dBm) | Antenna Model | Antenna Type       | Antenna Gain (dBi) | EIRP (dBm) | EIRP (Watts) | MPE Distance(cm) | Pd at 20cm (mW/cm <sup>2</sup> ) | Comments                         |
|----------------------|----------------------------|---------------------|------------------------------|---------------|--------------------|--------------------|------------|--------------|------------------|----------------------------------|----------------------------------|
| 18.38                |                            | 0                   | 18.38                        | ANT24P2       | Omni               | 2                  | 20.38      | 0.109144     | 2.95             | 0.021714                         | Minimum separation shall be 20cm |
| 18.38                |                            | 0                   | 18.38                        | ANT24P3       | Omni               | 3                  | 21.38      | 0.137404     | 3.31             | 0.027336                         | Minimum separation shall be 20cm |
| 18.38                |                            | 0                   | 18.38                        | ANT24P4       | Omni               | 4                  | 22.38      | 0.172982     | 3.71             | 0.034414                         | Minimum separation shall be 20cm |
| 18.38                | 1.5                        | 1.1                 | 17.28                        | ANT24S4       | Omni Triband Stand | 4                  | 21.28      | 0.134276     | 3.27             | 0.026713                         | Minimum separation shall be 20cm |
| 18.38                |                            | 0                   | 18.38                        | ANT24P5       | Omni               | 5                  | 23.38      | 0.217771     | 4.16             | 0.043324                         | Minimum separation shall be 20cm |
| 18.38                | 1.5                        | 1.1                 | 17.28                        | ANT24S5       | Omni Stand         | 5                  | 22.28      | 0.169044     | 3.67             | 0.03363                          | Minimum separation shall be 20cm |
| 18.38                |                            | 0                   | 18.38                        | ANT24P7       | Omni               | 7                  | 25.38      | 0.345144     | 5.24             | 0.068664                         | Minimum separation shall be 20cm |
| 18.38                | 1.5                        | 1.1                 | 17.28                        | ANT24P93      | Omni triband       | 9                  | 26.28      | 0.42462      | 5.81             | 0.084475                         | Minimum separation shall be 20cm |
| 18.38                | 1.5                        | 1.1                 | 17.28                        | ANT2409       | Omni               | 9                  | 26.28      | 0.42462      | 5.81             | 0.084475                         | Minimum separation shall be 20cm |
| 18.38                | 1.5                        | 1.1                 | 17.28                        | ANT24P12      | Omni               | 12                 | 29.28      | 0.847227     | 8.21             | 0.16855                          | Minimum separation shall be 20cm |
| 18.38                | 1.5                        | 1.1                 | 17.28                        | ANT24P123     | Omni triband       | 12                 | 29.28      | 0.847227     | 8.21             | 0.16855                          | Minimum separation shall be 20cm |
| 18.38                | 1.5                        | 1.1                 | 17.28                        | ANT24O5       | Ceiling            | 5                  | 22.28      | 0.169044     | 3.67             | 0.03363                          | Minimum separation shall be 20cm |
| 18.38                | 1.5                        | 1.1                 | 17.28                        | ANT24D12      | Patch              | 12                 | 29.28      | 0.847227     | 8.21             | 0.16855                          | Minimum separation shall be 20cm |
| 18.38                | 1.5                        | 1.1                 | 17.28                        | ANT24D18      | Patch              | 18                 | 35.28      | 3.372873     | 16.38            | 0.671012                         | Minimum separation shall be 20cm |

Note : 1. For 802.11g Mode.

- The power density Pd (4<sup>th</sup> column) at a distance of 20cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm<sup>2</sup>. The EUT is classified as mobile product. So, RF exposure limit warning or SAR test are not required.