

11. RF exposure evaluation

§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)

11.1. Limits for maximum permissible exposure(MPE)

| Frequency range (MHz) | Electric field strength(V/m) | Magnetic field strength (A/m) | Power density (mW/cm ²) | Average time |
|---|------------------------------|-------------------------------|-------------------------------------|--------------|
| (A) Limits for occupational / Control exposures | | | | |
| 300 – 1500 | -- | -- | F/300 | 6 |
| 1500 - 100000 | -- | -- | 5 | 6 |
| (B) Limits for general population / Uncontrol exposures | | | | |
| 300 – 1500 | -- | -- | F/1500 | 6 |
| <u>1500 - 100000</u> | -- | -- | <u>1</u> | <u>30</u> |

11.2. Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$

Where P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

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

P_d the limit of MPE, 1 mW/cm². 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 where the MPE limit is reached.

11.3. EUT operating condition

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

11.4. Test result of RF exposure evaluation

Test item : RF exposure evaluation data

Test mode : Normal operation

11.4.1. Output power into antenna & RF exposure evaluation distance

11.4.1.1. Use AC Adapter

| Channel | Frequency (MHz) | Output peak power to antenna (dBm) | Antenna gain (dBi) | Power density at 20 cm (mW/cm ²) | Limits (mW/cm ²) |
|---------|-----------------|------------------------------------|--------------------|--|------------------------------|
| Low | 2402 | -9.55 | 2.51 | 0.00004 | 1 |
| Middle | 2441 | -7.96 | 2.51 | 0.00006 | |
| High | 2480 | -5.89 | 2.51 | 0.00009 | |

Note :

The power density Pd (4th column) at a distance of 20cm calculated from the friis transmission formula is far below the limit of 1 mW/ cm².

11.4.1.2. Use cigar jack

| Channel | Frequency (MHz) | Output peak power to antenna (dBm) | Antenna gain (dBi) | Power density at 20 cm (mW/cm ²) | Limits (mW/cm ²) |
|---------|-----------------|------------------------------------|--------------------|--|------------------------------|
| Low | 2402 | -9.51 | 2.51 | 0.00004 | 1 |
| Middle | 2441 | -7.94 | 2.51 | 0.00006 | |
| High | 2480 | -5.88 | 2.51 | 0.00009 | |

Note :

The power density Pd (4th column) at a distance of 20cm calculated from the friis transmission formula is far below the limit of 1 mW/ cm².

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11.4.1.3. Use battery

| Channel | Frequency (MHz) | Output peak power to antenna (dBm) | Antenna gain (dBi) | Power density at 20 cm (mW/cm ²) | Limits (mW/cm ²) |
|---------|-----------------|------------------------------------|--------------------|--|------------------------------|
| Low | 2402 | -9.73 | 2.51 | 0.00004 | 1 |
| Middle | 2441 | -8.02 | 2.51 | 0.00006 | |
| High | 2480 | -6.01 | 2.51 | 0.00009 | |

Note :

The power density Pd (4th column) at a distance of 20cm calculated from the friis transmission formula is far below the limit of 1 mW/ cm².