# RF Exposure requirements

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| Product name | Scan Tool |
| Model number | VCI II |
| FCC ID | TMGG1XDDMN001 |
| Radio specification | (WLAN) 2.4 GHz, 5 GHz<br>(Bluetooth) 2.4 GHz |
| Antenna | Internal PCB antenna |
| Power source | DC 7 V ~ DC 35 V(DC 12 V/24 V battery in a vehicle) |

According to the KDB 447498, the following standalone SAR test exclusion was considered to qualify for the SAR test exclusion.

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| Tx frequency range | (a) Bluetooth only (2402 MHz - 2480 MHz),<br>(b) WLAN 2.4 GHz only (2412 MHz - 2462 MHz),<br>(c) WLAN 5 GHz only (5180 MHz - 5240 MHz),<br>(d) Bluetooth and WLAN 5 GHz (simultaneously transmit) |
| Maximum conducted output power | (a) Bluetooth : 3.5 mW (5.48 dBm) @ 2.4 GHz<br>(b) WLAN 2.4 GHz : 72 mW (18.56 dBm) @ 2.4 GHz,<br>(c) WLAN 5 GHz : 27 mW (14.39 dBm) @ 5 GHz,<br>(d) Bluetooth and WLAN 5 GHz (simultaneously transmit): (3.5 mW) + (27 mW) = (30.5 mW) |
| Device category | Mobile station |

This device is sold for use as a Mobile Device, and the antenna used for this transmitter is installed to provide a separation distance of at least 20 cm from all persons to comply with FCC RF exposure compliance requirements.

Remark: the radio module has only one radio chip and one antenna that supports WLAN and BT technologies.

(a) The Bluetooth and WLAN 2.4 GHz are not operated simultaneously, because the signal path for the Bluetooth and WLAN 2.4 GHz is selected by the RF switch including the switching of TX/RX.

(b) The WLAN 2.4 GHz and WLAN 5 GHz are not operated simultaneously. The product can connect to one WLAN device such as Tablet PC via WiFi Direct function. It means the product can use either WLAN 2.4 GHz or WLAN 5 GHz.

(c) The operating mode (BT + WLAN 5 GHz) is considered as the worst case.

**MPE (Maximum Permissive Exposure) Prediction**

*Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01*

$$S = PG/4\pi R^2$$

$$\left(\Rightarrow R = \sqrt{PG/4\pi S}\right)$$

S = power density [mW/cm$^2$]

P = power input to antenna [mW]

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna [cm]

| **Operating mode:** | **Bluetooth only** |
|---|---|
| Operating Frequency: | 2402 MHz - 2480 MHz |
| Peak Antenna assembly gain(G): | Peak 4.864 dBi |

| EUT: Maximum peak output power = 3.5 [mW](= 5.48 dBm) & Antenna gain =3.06 (= 4.864 [dBi]) | |
|---|---|
| 3.5 mW, at 20 cm from the antenna 4.864 [dBi] | S = PG/4πR² = 0.0022 [mW/cm2] < 1.0 [mW/cm$^2$] |
| (calculation example)<br>100 mW, at 20 cm from an antenna 6 [dBi] | S = PG/4πR² = 100 × 3.98 / (4 × π × 400)<br>= 0.0792 [mW/cm2] < 1.0 [mW/cm$^2$] |

| **Operating mode:** | **WLAN 2.4 GHz only** |
|---|---|
| Operating Frequency: | 2412 MHz - 2462 MHz |
| Peak Antenna assembly gain(G): | Peak 4.864 dBi |

| EUT: Maximum peak output power = 72 [mW](= 18.56 dBm) & Antenna gain =3.06 (= 4.864 [dBi]) | |
|---|---|
| 72 mW, at 20 cm from the antenna 4.864 [dBi] | S = PG/4πR² = 0.0438 [mW/cm2] < 1.0 [mW/cm$^2$] |

| **Operating mode:** | **WLAN 5 GHz only** |
|---|---|
| Operating Frequency: | 5180 MHz - 5240 MHz |
| Peak Antenna assembly gain(G): | Peak 3.952 dBi |

| EUT: Maximum peak output power = 27 [mW](= 14.39 dBm) & Antenna gain =2.47 (= 3.952 [dBi]) | |
|---|---|
| 27 mW, at 20 cm from the antenna 3.952 [dBi] | S = PG/4πR² = 0.0136 [mW/cm2] < 1.0 [mW/cm$^2$] |

| **Operating mode:** | **Bluetooth and WLAN 5 GHz (simultaneously transmit)** |
|---|---|
| Operating Frequency: | 2402 MHz - 2480 MHz and 5180 MHz - 5240 MHz |
| Peak Antenna assembly gain(G): | Peak 4.864 dBi and Peak 3.952 dBi |
| Maximum TX power with the summation: | (3.5 mW) + (27 mW) = (30.5 mW) |

| EUT: Maximum peak output power = 30.5 [mW](= 14.84 dBm) & Antenna gain =3.06 (= 4.864 [dBi]) | |
|---|---|
| 30.5 mW, at 20 cm from the antenna 4.864 [dBi] | S = PG/4πR² = 0.0186 [mW/cm2] < 1.0 [mW/cm$^2$] |