

MPE Analysis Report

The Equipment Under Test (EUT) is a portable 2.4GHz Transceiver (Car Unit) operating at 2443, 2446, 2452, 2456, 2458, 2460, 2463, 2466, 2468 and 2470MHz for RC Controller. The EUT is powered by 1 X 3.7V rechargeable battery. After switch on the EUT and paired with RC Controller, the RC Car can be controlled to move forward, backward, turning left/ right direction by the controller.

Wifi Camera:

The Equipment Under Test (EUT) operates at frequency range of 2412MHz to 2422MHz with 3 channels.

For 802.11b mode, it operates at frequency range of 2412.000MHz to 2422.000MHz with 3 channels. It transmits via Direct-sequence spread spectrum (DSSS) modulation. Maximum bit rate can be up to 11Mbps.

For 802.11g mode, it operates at frequency range of 2412.000MHz to 2422.000MHz with 3 channels. It transmits via Orthogonal Frequency Division Multiplexing (OFDM) modulation. Maximum bit rate can be up to 54Mbps.

The EUT is power by 1 X 3.7V rechargeable battery.

WiFi Module

Antenna Type: External, Integral

Antenna Gain: 2dBi

Operating mode	Nominal Conducted Power	Production Tolerance	Modulation Type
802.11b	18.51 dBm	+/- 2dB	DSSS
802.11g	23.31 dBm	+/- 2dB	OFDM

2.4GHz RF Module

Antenna Type: Internal, Integral

Antenna Gain: 0dBi

Operating mode	Nominal Conducted Power	Production Tolerance	Modulation Type
2.4GHz RF Module	98.1dBµV/m at 3m	+/- 3dB	GFSK

For Maximum Permissible Exposure (MPE) evaluation of the 44578RX, the maximum power density at 20 cm from this mobile transmitter shall be less than the General Population / Uncontrolled MPE limit in OET Bulletin 65.

1) For the WLAN (WiFi), maximum conducted power measured within its production tolerance was 23.31dBm (maximum). The antenna gain is 2 dBi = 1.58 (num gain) and the maximum source-based time-averaging duty factor is 100%. From these data, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

The conducted power = 23.31dBm (214.29mW)

The radiated (EIRP) source-based time-averaging output power (with antenna gain)
= (214.29 * 1.58 * 1) mW
= 338.5782 mW

The power density at 20 cm from the antenna
= $EIRP / 4\pi R^2$
= 0.06736mW cm⁻²

2) For the 2.4GHz RF Module, maximum field strength measured within its production tolerance was 101.1 dBμV/m (maximum). The distance (D) between the antenna and the equipment under test (EUT) was 3 meters. And the maximum source-based time-averaging duty factor is 100%. From these data, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated according to OET Bulletin 65 as follow:

The radiated power = $(FS \cdot D)^2 / 30$ = 3.865 mW

The radiated (EIRP) source-based time-averaging output power
= (0.28 * 1) mW
= 3.865 mW

The power density at 20 cm from the antenna
= $EIRP / 4\pi R^2$
= 0.000769 mW cm⁻²

In the frequency range of 1,500 - 100,000MHz, the MPE limit is 1.0 mWcm-2 for general population and uncontrolled exposure. As the measured power density at 20cm from the transmitter is lower than the MPE limit, the compliance to the MPE limit can be ensured by indicating the minimum 20cm separation between the transmitter's radiating structures and body of the user or nearby persons. The following RF exposure statement is proposed to be included in the user manual:

“ FCC RF Radiation Exposure Statement

Caution: To maintain compliance with the FCC’s RF exposure guidelines, place the product at least 20cm from nearby persons.”

In addition, for this product with multiple transmitter and antenna (Bluetooth and WiFi), the requirement of Simultaneous Transmission evaluation has also been considered and has complied with the following conditions of the worse case;

$$\text{MPE1/Limit1} + \text{MPE2/Limit2} \leq 1$$

Thus,

$$\begin{array}{l} 0.06736 / 1 + 0.000769 / 1 \\ \text{WiFi} \quad \quad \quad 2.4\text{GHz RF} \end{array} = 0.068129$$

It is concluded that no Simultaneous Transmission evaluation is required.