

INTERTEK TESTING SERVICES

RF Exposure

The equipment under test (EUT) is a UHF transmitter operating in 917~922.2MHz band. It contains two modules that have already been certified. One certified module is operating at 2.4GHz band and subjected to FCC ID: XRSCRMXTIMO101, another certified Bluetooth&2.4G WIFI module is subjected to FCC ID: 2AC7Z-ESP32WROVERE. The EUT is powered by a 3.6VDC rechargeable battery which can be charged via a micro USB cable by an AC/DC adapter with the input of AC100-240V, 50/60Hz, and output of DC 5.0V, 1.5A. The EUT also has a 3.5" socket which can be used to connect to DMX controllers via an adapter cable that is 3.5" jack to 5-pin XLR male. When DMX port connected, the UHF transmitter will stop transmitting. When DMX port is disconnected, the UHF transmitter, Bluetooth(BLE) and 2.4G WIFI can be transmitted Simultaneously. For more detailed features description, please refer to the user's manual.

Antenna Type: Integral Antenna

Antenna Gain: 3.0dBi

Modulation Type: GFSK

The normal radiated output power (e.i.r.p) is: 12.0dBm (tolerance: +/-1dB).

The normal conducted output power is 9.0dBm (tolerance: +/-1dB).

The maximum conducted output power for the EUT is 9.80dBm in the frequency 922.20MHz which is within the production variation.

The minimum conducted output power for the EUT is 9.76dBm in the frequency 919.6MHz which is within the production variation.

According to FCC Part 2.1091, this unlicensed transmitting devices is categorically excluded from routine environmental evaluation for RF exposure prior to equipment authorization or use, According to the KDB 447498 and OET 65, the simple calculation as below:

The source-based time averaged maximum radiated power = 12dBm+1dB= 13dBm = 19.95mW

Power density (S) is calculated by the following formula:

$$S = (P * G) / 4\pi R^2$$

$$E.I.R.P = P * G$$

Where, S = Power density (mW/cm²)

P = Output power to antenna (mW)

R = Distance between radiating structure and observation point (cm)

G = Gain of antenna in numeric

$$\pi = 3.14$$

As the measured power density at 20cm from the transmitter

$$S = E.I.R.P / 4\pi R^2 = 0.0040 \text{ mW/cm}^2$$

Based on FCC ID: XRSCRMXTIMO101 test report, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna for 2.4GHz RF transmitter is 0.0736123 mW/cm², which is less than MPE limit(1.0mW/cm²).

Based on FCC ID: 2AC7Z-ESP32WROVERE test report, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna for 2.4GHz WIFI is 0.2183 mW/cm², and for BLE is 0.0022 mW/cm². which is less than MPE limit(1.0 mW/cm²).

For Simultaneous transmitting of UHF transmitter and 2.4GHz Wi-Fi and Bluetooth, According to 865664D02 2.2 d) 1):

The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = $0.0040/1 + 0.2183/1 + 0.0022/1 = 0.2245 < 1$

The following RF exposure statement or similar sentence is proposed to be included in the user manual:

“FCC RF Radiation Exposure Statement Caution: This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons.”

FCC ID: X55ART7-WIFI