

INTERTEK TESTING SERVICES

RF Exposure

The equipment under test (EUT) is V5 Robot Radio operating at 2.4G Band which has 2.4G transceiver and BLE function. The EUT can be powered by DC 12.8V (Powered by ROBOT BRAIN), and it has two antennas but can't simultaneously transmitting. For more detail information pls. refer to the user manual.

2.4G transceiver function:

Antenna Type: Integral antenna.

Antenna Gain: 0dBi.

The normal radiated output power (e.i.r.p) is: 2.0dBm (tolerance: +/- 3dB).

The normal conducted output power is 2.0dBm (tolerance: +/- 3dB).

Modulation Type: GFSK.

According to the KDB 447498:

The Maximum peak radiated emission for the EUT is 100.2dB μ V/m at 3m in the frequency 2440MHz

The EIRP = $[(FS \cdot D)^2 / 30]$ mW = 4.97dBm

which is within the production variation.

The Minimum peak radiated emission for the EUT is 98.9 dB μ V/m at 3m in the frequency 2402MHz

The EIRP = $[(FS \cdot D)^2 / 30]$ mW = 3.67dBm

which is within the production variation.

The maximum conducted output power specified is 5dBm = 3.162mW

The source-based time-averaging conducted output power = $3.162 \cdot \text{Duty cycle}$ mW < 3.162 mW (Duty cycle < 100%)

The SAR Exclusion Threshold Level:

= $3.0 \cdot (\text{min. test separation distance, mm}) / \text{sqrt}(\text{freq. in GHz})$

= $3.0 \cdot 5 / \text{sqrt}(2.480)$ mW

= 9.53 mW

Since the source-based time-averaging conducted output power is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.

The duty cycle is simply the on-time divided by the period:

The duration of one cycle = 24.928ms

Effective period of the cycle = 1.304ms

DC = $1.304\text{ms} / 24.928\text{ms} = 0.0523$ or 5.23%

BLE function:

Antenna Type: Integral antenna.

Antenna Gain: 0dBi.

The normal radiated output power (e.i.r.p) is: -11.0dBm (tolerance: +/- 3dB).

The normal conducted output power is -11.0dBm (tolerance: +/- 3dB).

Modulation Type: GFSK.

According to the KDB 447498:

The Maximum peak radiated emission for the EUT is 86.6 dB μ V/m at 3m in the frequency 2402MHz

The EIRP = $[(FS \cdot D)^2 / 30]$ mW = -8.63dBm

which is within the production variation.

The Minimum peak radiated emission for the EUT is 81.5 dB μ V/m at 3m in the frequency 2480MHz

The EIRP = $[(FS \cdot D)^2 / 30]$ mW = -13.73dBm

which is within the production variation.

The maximum conducted output power specified is -8.0dBm= 0.158mW

The source- based time-averaging conducted output power

=0.158* Duty cycle mW = 0.158mW (Duty cycle =100%)

The SAR Exclusion Threshold Level:

= 3.0 * (min. test separation distance, mm) / sqrt(freq. in GHz)

= 3.0 * 5 / sqrt (2.480) mW

= 9.53 mW

Since the source-based time-averaging conducted output power is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.
