INTERTEK TESTING SERVICES

RF Exposure report

The Equipment Under Test (EUT) is a WiFi Module. The EUT was powered by DC 3.3V. For more detailed features description, please refer to the user's manual.

For 2.4GHz transmit function and operating at 2424.999878 - 2475.187622MHz.

Modulation Type: 2-FSK.
Antenna Type: Integral antenna
Antenna Gain: 2.0dBi
The nominal conducted output power specified: -2.0dBm +/-3dB.
The nominal radiated output power (e.i.r.p) specified: 0dBm (+/- 3dB)

The maximun peak radiated emission for the EUT is 95.1dBμV/m at 3m in the frequency 2450.193726MHz
The EIRP = [(FS*D) ^2 / 30] mW = -0.1dBm
which is within the production variation.

The minimum peak radiated emission for the EUT is 94.0dBμV/m at 3m in the frequency 2475.187622MHz
The EIRP = [(FS*D) ^2 / 30] mW = -1.2dBm
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:

For Maximum Permissible Exposure (MPE) evaluation of the product, the maximum power density at 20 cm from this transmitter shall be less than the General Population / Uncontrolled MPE limit in FCC Part 1.1310.

The maximum E.I.R.P= 3.0dBm=2.00mW
The source-based time averaged maximum radiated power = 2.00 x Duty Cycle = 2.00mW

From above 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:
= 2.00 / 4πR^2
= 0.0004 mW/cm^2

The MPE limit is 1.0 mWcm-2 for general population and uncontrolled exposure in the WiFi frequency range according to FCC Part 1.1310. 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 structure and body of the user or nearby persons.

Transmitter Duty Cycle Calculation
The EUT transmit continuously during the test, the duty cycle is 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.”

For WiFi function and operating at 2412-2462MHz for 802.11b/g/n-HT20, 11 channels with 5MHz channel spacing and 2422-2452MHz for 802.11n-HT40, 9 channels with 5MHz channel spacing.

Modulation Type: BPSK, QPSK, 16QAM, 64QAM, CCK, DQPSK, DBPSK.
Antenna Type: Integral antenna
Antenna Gain: 1.0dBi
The nominal conducted output power specified: 14.0dBm (Tolerance: +/-3dB)

The maximum conducted output power for the EUT is 15.6dBm in the frequency 2.437GHz 802.11b mode which is within the production variation.

The minimum conducted output power for the EUT is 12.0dBm in the frequency 2.437GHz 802.11n-HT40 mode 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:

For Maximum Permissible Exposure (MPE) evaluation of the product, the maximum power density at 20 cm from this transmitter shall be less than the General Population / Uncontrolled MPE limit in FCC Part 1.1310.

The maximum E.I.R.P= 14+3+1=18dBm=63.1mW
The source-based time averaged maximum radiated power = 63.1 x Duty Cycle = 63.1mW

From above 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:
= 63.1 / 4π R^2
= 0.0126 mW/cm^2

The MPE limit is 1.0 mWcm-2 for general population and uncontrolled exposure in the WiFi frequency range according to FCC Part 1.1310. 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 structure and body of the user or nearby persons.

Transmitter Duty Cycle Calculation
The EUT transmit continuously during the test, the duty cycle is 1.

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

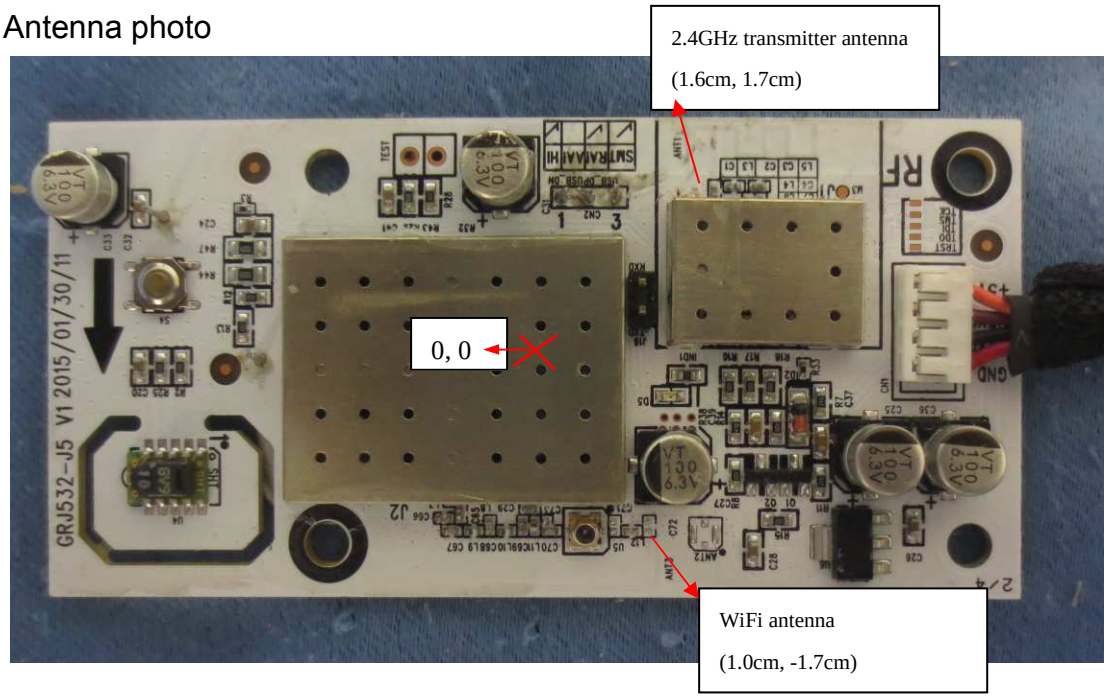
“FCC RF Radiation Exposure Statement Caution: This Transmitter must be installed to provide a separation distance of at least 20 cm from all persons.”

Simultaneous transmissions for both 2.4GHz transmit function and WiFi function

According to the KDB 447498:

The information of operating frequency (MHz), power (W), antenna gain (dBi), location (X and Y coordinates showed on below antenna photo) for each antenna are entered in the MPE spreadsheet.

Antenna photo



The power densities of up to 2 antennas located within a 16 cm² region at 0.1cm intervals are estimated first. Then the power densities computed for each antenna are summed.

The plot "% MPE Contour" displays the result in percentages of the frequency-dependent power density limits. As the measured power density at 20cm from the transmitter is lower than the MPE limit (the compliance boundary for simultaneous transmission), the compliance to the MPE limit can be ensured by indicating the minimum 20cm separation between the radiating structures of the transmitter and body of the user or nearby persons.

Antenna No.		Total	1	2	3	4	5	6
Tx Status			On	On	Off	Off	Off	Off
Frequency	MHz		2450	2450	1900	2450	2450	5800
MPE Limit	mW/cm^2		1.00	1.00	0.00	0.00	0.00	0.00
Max % MPE	%	1.3	0.0	1.3	0.0	0.0	0.0	0.0
Power	(W)	0.051	0.001	0.050	0.000	0.000	0.000	0.000
Antenna Gain	dBi		2.00	1.00	3.00	1.50	0.50	1.00
EIRP	(W)	0.06	0.002	0.063	0.000	0.000	0.000	0.000
X	(cm)		1.6	1.0	12.0	4.0	-8.0	8.0
Y	(cm)		1.7	-1.7	0.0	0.0	0.0	0.0
Sector			FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
Arc			FALSE	FALSE	FALSE	FALSE	FALSE	FALSE
θ_1	degs	input	-120	-120	-120	-120	-120	-120
θ_2			60	60	60	60	60	60
θ_1		actual	-120	-120	-120	-120	-120	-120
θ_2			60	60	60	60	60	60