FCC ID: 2ABPW-DCS559-R

RF Exposures Evaluation for single antenna transmissions

The Equipment Under Test (EUT) is a Router with internal WiFi and CDMA function, It is powered by AC/DC Adapter (model: GFP181U-090200B-2) with input of 100-240VAC, 50/60Hz and output of DC9V, 2A. The EUT includes 2 antennas,one for WiFi and the other for CDMA. For more detailed features description, please refer to the user's manual.

Antenna Type: Reversed SMA antenna for WiFi and Dedicated antenna for CDMA.
Ant1 for WiFi: 2.3dBi;
Ant2 for CDMA: 1dBi for 850MHz band; 2.8dBi for 1900MHz band.
For WiFi, the nominal conducted output power specified: 18dBm +/-4dB.
For CDMA-Band 850, the nominal conducted output power specified: 22dBm +/-4dB.
For CDMA-Band 1900, the nominal conducted output power specified: 22dBm +/-4dB.

For WiFi:
The maximum conducted output power for the EUT is 19.01dBm in the frequency 2.412GHz 802.11b which is within the production variation.
The minimum conducted output power for the EUT is 15.70dBm in the frequency 2.462GHz 802.11n-HT20 which is within the production variation.

For CDMA-Band 850:
The maximum conducted output power is 22.40dBm which is within the production variation.
The minimum conducted output power is 22.30dBm which is within the production variation.

For CDMA-Band 1900:
The maximum conducted output power is 20.70dBm which is within the production variation.
The minimum conducted output power is 20.60dBm 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
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For WiFi:
The maximum E.I.R.P= 18+4+2.3=24.3dBm=269.15mW
The source-based time averaged maximum radiated power = 269.15 x Duty Cycle = 269.15Mw
The EUT transmit continuously during the test, the duty cycle is 100%

For CDMA-Band 850
The maximum E.I.R.P= 22+4+1=27.0dBm=501.19mW

For CDMA- Band 1900:
The maximum E.I.R.P= 22+4+2.8=28.8dBm=758.58mW

From above data, the exposed power density at a distance (R) of 20cm from the center of radiation of the antenna can be calculated as follow:

For CDMA-Band 850:
= 501.19 / 4πR^2
= 0.10 mW/cm^2
The MPE limit is 0.56mWcm-2 for general population and uncontrolled exposure 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.

For WiFi:
= 269.15 / 4πR^2
= 0.05 mW/cm^2
For CDMA- Band 1900:
= 758.58 / 4πR^2
= 0.15 mW/cm^2
The MPE limit is 1.0 mWcm-2 for general population and uncontrolled exposure 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.

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.”

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RF Exposures Evaluation for both antenna transmissions

The EUT includes 2 antennas,one for WiFi and the other for CDMA. For more detailed features description, please refer to the user's manual.

Antenna Type: Reversed SMA antenna for WiFi and Dedicated antenna for CDMA.
Ant1 for WiFi: 2.3dBi;
Ant2 for CDMA: 1dBi for 850MHz band; 2.8dBi for 1900MHz band.
For WiFi, the nominal conducted output power specified: 18dBm +/-4dB.
For CDMA-Band 850, the nominal conducted output power specified: 22dBm +/-4dB.
For CDMA-Band 1900, the nominal conducted output power specified: 22dBm +/-4dB.

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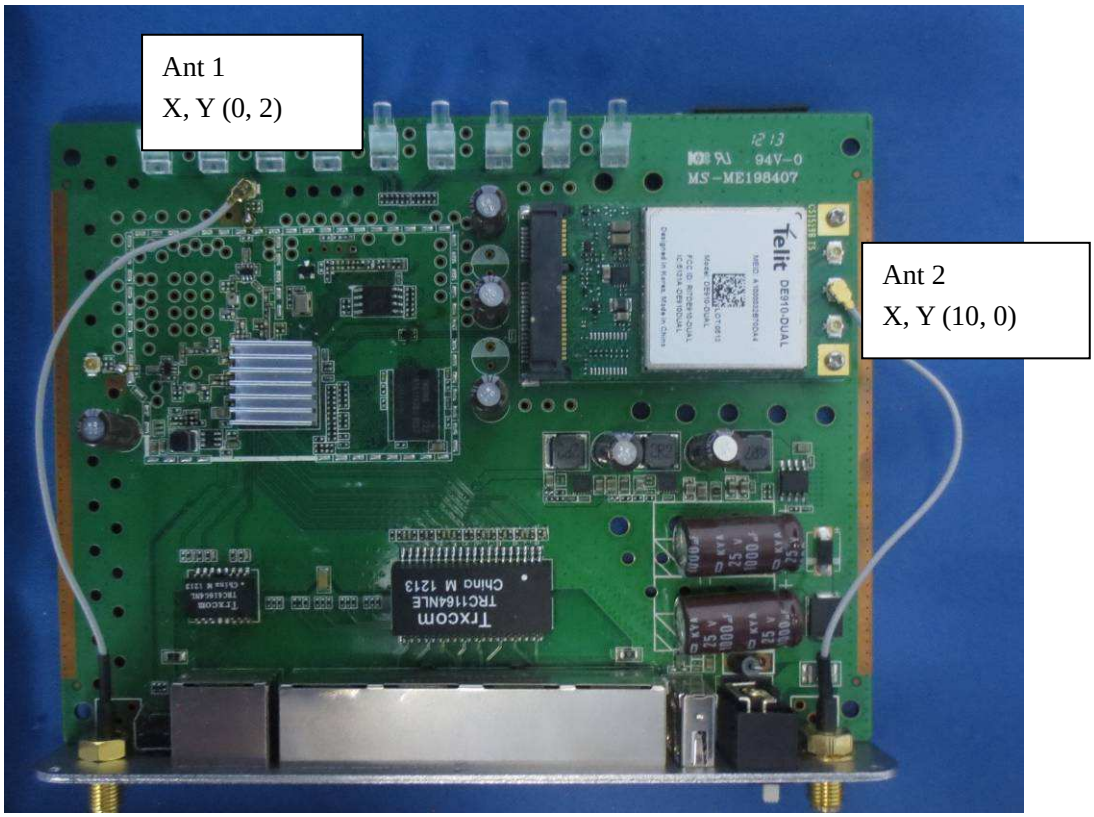
The KDB 447498: A Mobile Multi-transmitter MPE Estimation MPE spreadsheet is used for estimating MPE limits for these 2 antennas' simultaneous transmission.

The information of operating frequency (MHz), power (W), antenna gain (dBi), location (X and Y coordinates showed on page 2) for each antenna are entered in the MPE spreadsheet.

The power densities of up to 2 antennas located within a 90 cm² region at 1cm intervals are estimated first. Then the power densities computed for each antenna are summed.

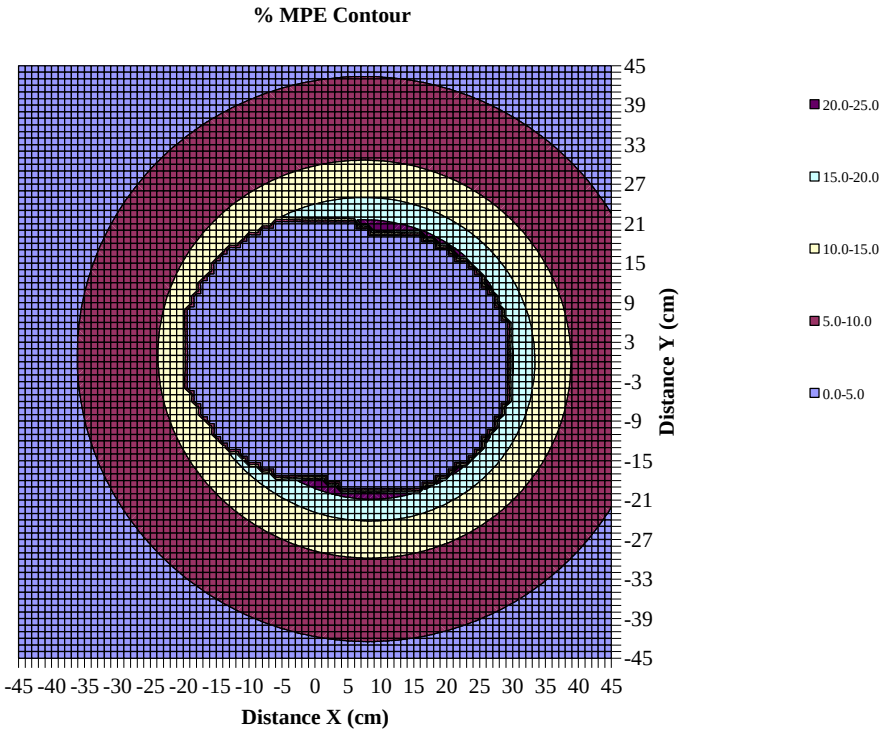
The plot "% MPE Contour" displays the result in percentages of the frequency-dependent power density limits. As the measured power density at 20cm from the transmitter is lower than the MPE limit (the compliance boundary for simultaneous transmission), the compliance to the MPE limit can be ensured by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


Ant 1
X, Y (0, 2)
Ant 2
X, Y (10, 0)
MS-ME198407
Telit
DE910-DUAL
Trxcom
TRC1164NLE
China M 1213

Ant1+Ant2 (WiFi and CDMA 850)

Antenna No.		Total	1	2	3	4	5	6
Tx Status			On	On	Off	Off	Off	Off
Frequency	MHz		2450	837	1900	2450	2450	5800
MPE Limit	mW/cm^2		1.00	0.56	0.00	0.00	0.00	0.00
Max % MPE	%	23.1	5.3	17.9	0.0	0.0	0.0	0.0
Power	(W)	0.556	0.158	0.398	0.000	0.000	0.000	0.000
Antenna Gain	dBi		2.30	1.00	2.80	1.50	0.50	1.00
EIRP	(W)	0.77	0.268	0.501	0.000	0.000	0.000	0.000
X	(cm)		0.0	10.0	12.0	4.0	-8.0	8.0
Y	(cm)		2.0	0.0	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

Note: The 0% contour surrounding the antennas identifies a 20 cm perimeter surrounding all active antennas



Ant1+Ant2 (WiFi and CDMA 1900)

Antenna No.		Total	1	2	3	4	5	6
Tx Status			On	On	Off	Off	Off	Off
Frequency	MHz		2450	1880	1900	2450	2450	5800
MPE Limit	mW/cm^2		1.00	1.00	0.00	0.00	0.00	0.00
Max % MPE	%	20.3	5.3	15.1	0.0	0.0	0.0	0.0
Power	(W)	0.556	0.158	0.398	0.000	0.000	0.000	0.000
Antenna Gain	dBi		2.30	2.80	2.80	1.50	0.50	1.00
EIRP	(W)	1.03	0.268	0.758	0.000	0.000	0.000	0.000
X	(cm)		0.0	10.0	12.0	4.0	-8.0	8.0
Y	(cm)		2.0	0.0	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

Note: The 0% contour surrounding the antennas identifies a 20 cm perimeter surrounding all active antennas