

## RF EXPOSURE EVALUATION

### EUT Specification

<b>EUT</b>	<b>WiFi+BT Module</b>
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz <input type="checkbox"/> WLAN: 5.745GHz ~ 5825GHz <input checked="" type="checkbox"/> Others(Bluetooth: 2.402GHz ~ 2.480GHz)
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others ____
<b>Antenna diversity</b>	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
<b>Max. output power</b>	For BT2.1+EDR: 1.64dBm(1.46mW) For BLE: 9.29dBm(8.49mW) For WIFI: 12.46dBm(17.62mW)
<b>Antenna gain</b>	1.5dBi
<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation <input type="checkbox"/> SAR Evaluation

Limits for Maximum Permissible Exposure (MPE)

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(mW/cm <sup>2</sup> )	Average Time
<b>(A) Limits for Occupational/Control Exposures</b>				
300-1500	--	--	F/300	6
1500-100000	--	--	5	6
<b>(B) Limits for General Population/Uncontrol Exposures</b>				
300-1500	--	--	F/1500	6
1500-100000	--	--	1	30

## Friis transmission formula: $P_d = \frac{P_{out} * G}{4 * \pi * R^2}$

Where

$P_d$  = Power density in  $mW/cm^2$

$P_{out}$  = output power to antenna in Mw

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

$R$  = distance between observation point and center of the radiator in cm

$P_d$  the limit of MPE,  $1mW/cm^2$ . If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

## Measurement Result

Channel	Channel Frequency (MHz)	Max Output power (dBm)	Tolerance	Max Tune-UP power (mW)	Power density at 20cm ( $mW/cm^2$ )	Power density Limits ( $mW/cm^2$ )
<b>Test Mode: 802.11b</b>						
Low	2412	11.03	$\pm 0.1$	12.97	0.0036	1
Middle	2437	10.83	$\pm 0.1$	12.39	0.0035	1
High	2462	10.89	$\pm 0.1$	12.56	0.0035	1
<b>Test Mode: 802.11g</b>						
Low	2412	9.84	$\pm 0.1$	9.86	0.0028	1
Middle	2437	11.74	$\pm 0.1$	15.28	0.0043	1
High	2462	10.00	$\pm 0.1$	10.23	0.0029	1
<b>Test Mode: 802.11n(HT20)</b>						
Low	2412	9.01	$\pm 0.1$	8.15	0.0023	1
Middle	2437	11.97	$\pm 0.1$	16.11	0.0045	1
High	2462	9.49	$\pm 0.1$	9.10	0.0026	1
<b>Test Mode: 802.11n(HT40)</b>						
Low	2422	8.06	$\pm 0.1$	6.55	0.0018	1
Middle	2437	12.46	$\pm 0.1$	18.03	0.0051	1
High	2452	8.40	$\pm 0.1$	7.08	0.0018	1

Channel	Channel Frequency (MHz)	Max Output power (dBm)	Tolerance	Max Tune-UP power (mW)	Power density at 20cm (mW/cm <sup>2</sup> )	Power density Limits (mW/cm <sup>2</sup> )
<b>GFSK</b>						
Low	2402	1.17	±0.1	1.34	3.76e-4	1
Middle	2441	1.46	±0.1	1.43	4.02e-4	1
High	2480	1.64	±0.1	1.49	4.19e-4	1
<b>π/4-DQPSK</b>						
Low	2402	1.05	±0.1	1.30	3.66e-4	1
Middle	2441	0.97	±0.1	1.28	3.60e-4	1
High	2480	1.09	±0.1	1.32	3.70e-4	1
<b>8DPSK</b>						
Low	2402	1.00	±0.1	1.29	3.62e-4	1
Middle	2441	0.96	±0.1	1.28	3.59e-4	1
High	2480	1.32	±0.1	1.39	3.90e-4	1
<b>BLE Mode</b>						
Low	2402	9.25	±0.1	8.61	0.0024	1
Middle	2442	9.29	±0.1	8.69	0.0024	1
High	2480	8.56	±0.1	7.35	0.0021	1