

## 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: 4.86dBm(3.06mW) For BLE: 0.76dBm(1.19mW) For WIFI: 9.91dBm(9.79mW)
<b>Antenna gain</b>	3.9dBi
<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	6.69	$\pm 0.1$	4.78	0.0023	1
Middle	2437	6.64	$\pm 0.1$	4.72	0.0023	1
High	2462	6.93	$\pm 0.1$	5.05	0.0025	1
<b>Test Mode: 802.11g</b>						
Low	2412	7.81	$\pm 0.1$	6.18	0.0030	1
Middle	2437	9.37	$\pm 0.1$	8.85	0.0043	1
High	2462	7.43	$\pm 0.1$	5.66	0.0028	1
<b>Test Mode: 802.11n(HT20)</b>						
Low	2412	8.22	$\pm 0.1$	6.79	0.0033	1
Middle	2437	9.91	$\pm 0.1$	10.02	0.0049	1
High	2462	8.49	$\pm 0.1$	7.23	0.0035	1
<b>Test Mode: 802.11n(HT40)</b>						
Low	2422	9.16	$\pm 0.1$	8.43	0.0041	1
Middle	2437	9.21	$\pm 0.1$	8.53	0.0042	1
High	2452	6.77	$\pm 0.1$	4.86	0.0024	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	3.41	±0.1	2.24	0.0011	1
Middle	2441	3.52	±0.1	2.30	0.0011	1
High	2480	3.17	±0.1	2.12	0.0010	1
<b>π/4-DQPSK</b>						
Low	2402	4.35	±0.1	2.79	0.0014	1
Middle	2441	4.49	±0.1	2.88	0.0014	1
High	2480	4.23	±0.1	2.71	0.0013	1
<b>8DPSK</b>						
Low	2402	4.74	±0.1	3.05	0.0015	1
Middle	2441	4.86	±0.1	3.13	0.0015	1
High	2480	4.66	±0.1	2.99	0.0015	1
<b>BLE Mode</b>						
Low	2402	0.49	±0.1	1.15	5.59e-4	1
Middle	2442	0.76	±0.1	1.22	5.95e-4	1
High	2480	0.37	±0.1	1.11	5.44e-4	1