

## RF EXPOSURE EVALUATION

### EUT Specification

<b>EUT</b>	WIFI+BT Module
<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 ~ 5.825GHz <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>	19.45dBm(88.10mW)
<b>Antenna gain</b>	2.99dBi
<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: $Pd=(Pout \cdot G) / (4 \cdot \pi \cdot R^2)$

Where

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

$Pout$ =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

$Pd$  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	19.45	$\pm 0.5$	98.86	0.03915	1
Middle	2437	18.83	$\pm 0.5$	85.70	0.03394	1
High	2462	18.30	$\pm 0.5$	75.86	0.03004	1
<b>Test Mode: 802.11g</b>						
Low	2412	18.75	$\pm 0.5$	84.14	0.03332	1
Middle	2437	18.57	$\pm 0.5$	80.72	0.03197	1
High	2462	18.11	$\pm 0.5$	72.61	0.02876	1
<b>Test Mode: 802.11n(HT20)</b>						
Low	2412	17.23	$\pm 0.5$	59.29	0.02348	1
Middle	2437	17.10	$\pm 0.5$	57.54	0.02279	1
High	2462	16.95	$\pm 0.5$	55.59	0.02202	1
<b>Test Mode: 802.11n(HT40)</b>						
Low	2422	16.62	$\pm 0.5$	51.52	0.02040	1
Middle	2437	16.23	$\pm 0.5$	47.10	0.01865	1
High	2452	16.08	$\pm 0.5$	45.50	0.01802	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>Test Mode: BLE</b>						
Low	2402	6.99	±0.5	5.61	0.00222	1
Middle	2440	6.97	±0.5	5.59	0.00221	1
High	2480	7.14	±0.5	5.81	0.00230	1
<b>Test Mode: GFSK</b>						
Low	2402	4.61	±0.5	3.24	0.00128	1
Middle	2441	4.66	±0.5	3.28	0.00130	1
High	2480	5.29	±0.5	3.79	0.00150	1
<b>Test Mode: π4/-DQPSK</b>						
Low	2402	5.94	±0.5	4.41	0.00175	1
Middle	2441	5.94	±0.5	4.41	0.00175	1
High	2480	6.60	±0.5	5.13	0.00203	1
<b>Test Mode: 8DPSK</b>						
Low	2402	6.26	±0.5	4.74	0.00188	1
Middle	2441	6.28	±0.5	4.76	0.00189	1
High	2480	6.90	±0.5	5.50	0.00218	1

Note: For the device consider simultaneous transmission of 2.4G WIFI and BT, the worst MPE evaluation =  $0.03915 + 0.00230 = 0.04145 < 1.0$