



## RF Exposure Evaluation

### Limits

The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

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> )	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz

Friis transmission formula:  $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

$P_d$  = power density in mW/cm<sup>2</sup>,  $P_{out}$  = 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

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

### Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.



## Test Result of RF Exposure Evaluation

### BR+EDR

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
8DPSK	7.78	6.00	0.0018	1.0	PASS

### 2.4G Wi-Fi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
802.11b	17.25	53.09	0.0173	1.0	PASS

### 5.2G Wi-Fi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
802.11a	12.81	19.10	0.0112	1.0	PASS

### 5.8G Wi-Fi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
802.11a	12.38	17.30	0.0105	1.0	PASS

### Sum 2.4GWiFi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
802.11n20	15.14	32.66	0.0213	1.0	PASS

### Sum 5.2GWiFi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
802.11n20	11.16	13.06	0.0159	1.0	PASS

## Sum 5.8GWiFi

Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Result
802.11n20	11.27	13.40	0.0163	1.0	PASS

Remark: Antenna Gain: BR+EDR:1.8dBi, 2.4GWiFi: ANT1:1.38dBi, ANT2:2.15dBi, 5GWiFi:  
ANT1:4.69dBi, ANT2:4.86dBi, Sum 2.4GWiFi: 5.16dBi, Sum 5GWiFi:7.87dBi

Directional gain = GANT MAX + 10 log(NANT/NSS) dBi

The device cannot transmit with 2.4G WI-FI and 5.2, 5.8G WI-FI simultaneously, can transmit with  
2.4G WI-FI ,5.2, 5.8G WI-FI and BT simultaneously.



Calculations for simultaneously transmit

Mode	Ratios	Result	Limit	Result
BR+EDR	0.0018	0.0231	1	PASS
2.4G Wi-Fi	0.0213			

Mode	Ratios	Result	Limit	Result
BR+EDR	0.0018	0.0177	1	PASS
5.2G Wi-Fi	0.0159			

Mode	Ratios	Result	Limit	Result
BR+EDR	0.0018	0.0181	1	PASS
5.8G Wi-Fi	0.0163			

Ratios = Power Density / Power density Limit

So a SAR test is not required