



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 ²)	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 ²)	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 ²)	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: $Pd = (Pout \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

Pd = power density in mW/cm², **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 is the limit of MPE, 1 mW/cm². 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

BLE mode

Modulation Type	Frequency (MHz)	Output power to antenna (dBm)	Tune-up power (dBm)	Max Power (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
GFSK	2402	4.60	5±1	3.981	0.001	1.0	PASS
	2440	5.10	5±1	3.981	0.001	1.0	PASS
	2480	4.59	5±1	3.981	0.001	1.0	PASS

2.4GWIFI

Antenna	Modulation Type	Frequency (MHz)	Output power to antenna (dBm)	Tune-up power (dBm)	Max Power (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
ANT1	802.11b	2412	12.31	12±1	19.95	0.006	1.0	PASS
		2437	12.51	12±1	19.95	0.006	1.0	PASS
		2462	12.73	12±1	19.95	0.006	1.0	PASS
	802.11g	2412	15.17	15±1	39.81	0.013	1.0	PASS
		2437	14.64	15±1	39.81	0.013	1.0	PASS
		2462	14.81	15±1	39.81	0.013	1.0	PASS
ANT2	802.11b	2412	12.27	12±1	19.95	0.006	1.0	PASS
		2437	12.56	12±1	19.95	0.006	1.0	PASS
		2462	12.79	12±1	19.95	0.006	1.0	PASS
	802.11g	2412	14.58	14±1	31.62	0.010	1.0	PASS
		2437	14.76	14±1	31.62	0.010	1.0	PASS
		2462	14.99	14±1	31.62	0.010	1.0	PASS

Modulation Type	MIMO EIRP POWER (dBm)	Tune-up power (dBm)	MIMO EIRP POWER (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11n20	17.06	17±1	63.09	0.020	1.0	PASS
	17.16	17±1	63.09	0.020	1.0	PASS
	17.28	17±1	63.09	0.020	1.0	PASS
802.11n40	16.16	16±1	50.11	0.016	1.0	PASS
	16.14	16±1	50.11	0.016	1.0	PASS
	16.31	16±1	50.11	0.016	1.0	PASS



5G Wi-Fi mode

Antenna	Modulation Type	Frequency (MHz)	Output power to antenna (dBm)	Tune-up power (dBm)	Max Power (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
ANT1	802.11a	5745	11.69	12±1	19.95	0.016	1.0	PASS
		5785	12.10	12±1	19.95	0.016	1.0	PASS
		5825	8.62	12±1	19.95	0.016	1.0	PASS
ANT2		5745	11.91	11±1	15.85	0.013	1.0	PASS
		5785	11.45	11±1	15.85	0.013	1.0	PASS
		5825	11.25	11±1	15.85	0.013	1.0	PASS

Modulation Type	Frequency (MHz)	MIMO EIRP POWER (dBm)	Tune-up power (dBm)	MIMO EIRP POWER (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11n20	5745	14.47	15±1	39.8	0.03	1.0	PASS
	5785	15.20	15±1	39.8	0.03	1.0	PASS
	5825	13.03	15±1	39.8	0.03	1.0	PASS
802.11n40	5755	18.81	19±1	100	0.08	1.0	PASS
	5795	19.33	19±1	100	0.08	1.0	PASS
	5745	11.46	19±1	100	0.08	1.0	PASS
802.11ac20	5785	13.45	18±1	79.4	0.06	1.0	PASS
	5825	13.33	18±1	79.4	0.06	1.0	PASS
	5755	18.25	18±1	79.4	0.06	1.0	PASS
802.11ac40	5795	14.54	14±1	31.6	0.26	1.0	PASS
	5775	6.74	14±1	31.6	0.26	1.0	PASS
	5745	14.47	14±1	31.6	0.26	1.0	PASS
802.11ac80	5785	15.20	15±1	39.8	0.03	1.0	PASS

MIMO: 0.001+0.013+0.01+0.02+0.016+0.013+0.08=0.153 < 1.0

The device could not support transmission with WIFI and BT simultaneously.

Remark: BT antenna gain=2.16dBi, Wi-Fi antenna gain=3.26dBi

Conclusion: No RF Exposure Evaluation/SAR test is required.