

8. RADIO FREQUENCY EXPOSURE

8.1. Limit

According to §1.1310 and §2.1091 RF exposure is calculated.

Table: Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Power Density (S) (mW/cm ²)
0.3–1.34	*(100)
1.34–30	*(180/f ²)
30–300	0.2
300–1500	f/1500
1500–100,000	1.0

F = frequency in MHz

* = Plane-wave equivalent power density

Maximum Permissible Exposure

The MPE was calculated at 20cm to show compliance with the power density limit.

$$S = PG/4\pi R^2$$

S = Power density

P = power input to antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna.

Note:

1. Manufacturer declared that the maximum antenna gain is 2.0 dBi(Max.) for bluetooth and WIFI.
2. Manufacturer declared that the nearest distance between human and the EUT is 20cm.
3. Only record worst case data.

8.2 Test Results

Standalone MPE

5G WIFI

Test	Channel	ANT Power (dBm)	ANT Max. Tune Up Power (dBm)	ANT Max. Tune Up Power (mW)	ANT MPE (mW/cm ²)	Limit (mW/cm ²)
IEEE 802.11a	36	18.272	18.0±1.0	79.4328	0.0251	1.0
	40	18.412	18.0±1.0	79.4328	0.0251	1.0
	48	18.592	18.0±1.0	79.4328	0.0251	1.0
	149	19.005	19.0±1.0	100.0000	0.0315	1.0
	157	19.495	19.0±1.0	100.0000	0.0315	1.0
	165	19.435	19.0±1.0	100.0000	0.0315	1.0
IEEE 802.11n20	36	17.555	17.0±1.0	63.0957	0.0199	1.0
	40	17.745	17.0±1.0	63.0957	0.0199	1.0
	48	17.945	17.0±1.0	63.0957	0.0199	1.0
	149	18.887	18.0±1.0	79.4328	0.0251	1.0
	157	18.837	18.0±1.0	79.4328	0.0251	1.0
	165	18.497	18.0±1.0	79.4328	0.0251	1.0
IEEE 802.11n40	38	18.390	18.0±1.0	79.4328	0.0251	1.0
	46	17.960	18.0±1.0	79.4328	0.0251	1.0
	151	17.539	17.0±1.0	63.0957	0.0199	1.0
	159	17.709	17.0±1.0	63.0957	0.0199	1.0
IEEE 802.11ac20	36	17.776	17.0±1.0	63.0957	0.0199	1.0
	40	17.656	17.0±1.0	63.0957	0.0199	1.0
	48	17.616	17.0±1.0	63.0957	0.0199	1.0
	149	17.980	17.0±1.0	63.0957	0.0199	1.0
	157	17.930	17.0±1.0	63.0957	0.0199	1.0
	165	17.900	17.0±1.0	63.0957	0.0199	1.0
IEEE 802.11ac40	38	18.628	18.0±1.0	79.4328	0.0251	1.0
	46	18.838	18.0±1.0	79.4328	0.0251	1.0
	151	18.124	18.0±1.0	79.4328	0.0251	1.0
	159	18.344	18.0±1.0	79.4328	0.0251	1.0
IEEE 802.11ac80	42	18.523	18.0±1.0	79.4328	0.0251	1.0
	155	19.562	19.0±1.0	100.0000	0.0315	1.0

2.4G wifi:

Test	Channel	ANT Power (dBm)	ANT Max. Tune Up Power (dBm)	ANT Max. Tune Up Power (mW)	ANT MPE (mW/cm ²)	Limit (mW/cm ²)
IEEE 802.11b	1	17.52	17.0±1.0	63.0957	0.0198	1.0
	6	17.46	17.0±1.0	63.0957	0.0198	1.0
	11	17.77	17.0±1.0	63.0957	0.0198	1.0
IEEE 802.11g	1	16.45	16.0±1.0	50.1187	0.0158	1.0
	6	16.62	16.0±1.0	50.1187	0.0158	1.0
	11	16.38	16.0±1.0	50.1187	0.0158	1.0
IEEE 802.11n20	1	16.71	16.0±1.0	50.1187	0.0158	1.0
	6	16.55	16.0±1.0	50.1187	0.0158	1.0
	11	16.23	16.0±1.0	50.1187	0.0158	1.0

2.4G Bluetooth:

Test	Channel	ANT Power (dBm)	ANT Max. Tune Up Power (dBm)	ANT Max. Tune Up Power (mW)	ANT MPE (mW/cm ²)	Limit (mW/cm ²)
1M	1	0.916	0.0±1.0	1.2589	0.0004	1.0
	40	0.831	0.0±1.0	1.2589	0.0004	1.0
	79	0.412	0.0±1.0	1.2589	0.0004	1.0
2M	1	0.173	0.0±1.0	1.2589	0.0004	1.0
	40	0.151	0.0±1.0	1.2589	0.0004	1.0
	79	-0.261	0.0±1.0	1.2589	0.0004	1.0
3M	1	0.491	0.0±1.0	1.2589	0.0004	1.0
	40	0.438	0.0±1.0	1.2589	0.0004	1.0
	79	0.016	0.0±1.0	1.2589	0.0004	1.0
BLE	1	-0.75	0.0±1.0	1.2589	0.0004	1.0
	20	0.46	0.0±1.0	1.2589	0.0004	1.0
	40	0.62	0.0±1.0	1.2589	0.0004	1.0

Note: The estimation distance is 20cm

Simultaneous MPE

Not required as the 5GWifi, 2.4GWifi and Bluetooth can't transmit simultaneously.

Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.