

RF Exposure Evaluation

Limits

KDB 447498 D01 General RF Exposure Guidance v06

FCC CFR 47 part2 2.1091: Radiofrequency radiation exposure evaluation: mobile devices

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.

$$EIRP = E_{Meas} + 20 \log(d_{Meas}) - 104.7$$

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dB μ V/m

d_{Meas} is the measurement distance, in m

Test Result of RF Exposure Evaluation

wifi 2.4G mode

Channel	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11b	13.42	21.9786	0.00799	1.0	PASS
802.11g	12.60	18.1970	0.00662	1.0	PASS
802.11n HT20	12.53	17.9061	0.00651	1.0	PASS
802.11n HT40	12.76	18.8799	0.00687	1.0	PASS

Remark: antenna gain=2.62dBi

wifi 5G mode:

Band	Channel	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
Band 1	802.11a	12.695	18.5994	0.01077	1.0	PASS
	802.11n HT20	13.196	20.8737	0.01209	1.0	PASS
	802.11n HT40	7.994	6.3009	0.00365	1.0	PASS
	802.11ac HT20	12.747	18.8235	0.01090	1.0	PASS
	802.11ac HT40	8.07	6.4121	0.00371	1.0	PASS
	802.11ac HT80	8.696	7.4063	0.00429	1.0	PASS

Remark: antenna gain=4.64dBi

Band	Channel	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
Band 4	802.11a	9.861	9.6850	0.00561	1.0	PASS
	802.11n HT20	10.229	10.5414	0.00610	1.0	PASS
	802.11n HT40	6.183	4.1524	0.00240	1.0	PASS
	802.11ac HT20	10.384	10.9245	0.00633	1.0	PASS
	802.11ac HT40	6.39	4.3551	0.00252	1.0	PASS
	802.11ac HT80	6.211	4.1793	0.00242	1.0	PASS

Remark: antenna gain=4.64dBi

For BT

Field strength (dBuV/m)	EIRP (dBm)	Max tune-up (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
85.27	-9.89	0.1026	0.00004	1.0	PASS

Remark: antenna gain=2.62dBi

Note: the WIFI and BT can't work same time.