



RF Exposure Evaluation

Limits

According to 47 CFR Part 2.1091 and 447498 D01 General RF Exposure Guidance v06

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

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**

The source of the evaluation data results is based on the report ET-26084429E01/02/03/04

BT Antenna gain: 1.16dBi Max

2.4GHz Antenna gain: ANT1:1.16dBi Max ANT2:1.1dBi Max

5.2G WIFI ANT1:2.16dBi and WIFI ANT2: -1.01dBi

5.3G WIFI ANT1:1.76dBi and WIFI ANT2: -1.01dBi

5.6G WIFI ANT1:0.57dBi and WIFI ANT2: -3.22dBi

5.8G WIFI ANT1:0.58dBi and WIFI ANT2: -3.53dBi

	Mode	Max Tune-up (dBm)	Max Tune-up (mW)	Numeric antenna gain	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
BT	BT	7.53	5.66	1.31	0.0015	1.0	PASS
BLE	BLE	6.90	4.90	1.31	0.0013	1.0	PASS
2.4G WIFI	802.11b	17.09	51.17	1.31	0.0133	1.0	PASS
5.2G WIFI	802.11a	14.54	28.44	0.79	0.0045	1.0	PASS
5.3G WIFI	802.11n20	16.20	41.69	2.24	0.0186	1.0	PASS
5.6G WIFI	802.11n20	16.50	44.67	1.55	0.0138	1.0	PASS
5.8G WIFI	802.11ac20	16.20	41.69	1.51	0.0125	1.0	PASS

Worst mode 5.3G WIFI ANT1+ANT2 working simultaneously 0.0186mW/cm² less than 1mW/cm², so the symbol exemption requirement is determined

MIMO mode: ant gain is

Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{\text{ANT}}]$ dBi