



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 test report ET-26062638E01/02/03

BLE Antenna gain=3.88dBi 2.4G WIFI Antenna gain=3.88dBi 5G WIFI Antenna gain=4.28dBi

FOR BLE

Mode	Output power (dBm)	Tune-up power (dBm)	Max Tune-up (dBm)	Max Tune-up (mW)	Numeric antenna gain	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
GFSK	1.53	2±1	3	2.00	2.44	0.0010	1.0	PASS

FOR BLE

Mode	Output power (dBm)	Tune-up power (dBm)	Max Tune-up (dBm)	Max Tune-up (mW)	Numeric antenna gain	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
GFSK	-0.27	0±1	1	1.26	2.44	0.0006	1.0	PASS
π/4-DQPSK	0.53	1±1	2	1.58	2.44	0.0008	1.0	PASS
8DPSK	0.88	1±1	2	1.58	2.44	0.0008	1.0	PASS

FOR 2.4GWIFI

Mode	Output power (dBm)	Tune-up power (dBm)	Max Tune-up (dBm)	Max Tune-up (mW)	Numeric antenna gain	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11b	13.96	14±1	15	31.62	2.44	0.0154	1.0	PASS
802.11g	14.63	15±1	16	39.81	2.44	0.0193	1.0	PASS
802.11n20	14.52	15±1	16	39.81	2.44	0.0193	1.0	PASS
802.11n40	13.78	14±1	15	31.62	2.44	0.0154	1.0	PASS

FOR 5GWIFI

Mode	Output power (dBm)	Tune-up power (dBm)	Max Tune-up (dBm)	Max Tune-up (mW)	Numeric antenna gain	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11a	14.83	15±1	16	39.81	2.68	0.0212	1.0	PASS
802.11n20	14.73	15±1	16	39.81	2.68	0.0212	1.0	PASS
802.11ac20	14.59	15±1	16	39.81	2.68	0.0212	1.0	PASS
802.11n40	13.62	14±1	15	31.62	2.68	0.0169	1.0	PASS
802.11ac40	13.69	14±1	15	31.62	2.68	0.0169	1.0	PASS
802.11ac80	12.66	13±1	14	25.12	2.68	0.0134	1.0	PASS

**FOR 5.8GWIFI**

Mode	Output power (dBm)	Tune-up power (dBm)	Max Tune-up (dBm)	Max Tune-up (mW)	Numeric antenna gain	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11a	14.63	15±1	16	39.81	2.68	0.0212	1.0	PASS
802.11n20	14.35	15±1	16	39.81	2.68	0.0212	1.0	PASS
802.11ac20	14.52	15±1	16	39.81	2.68	0.0212	1.0	PASS
802.11n40	13.59	14±1	15	31.62	2.68	0.0169	1.0	PASS
802.11ac40	13.62	14±1	15	31.62	2.68	0.0169	1.0	PASS
802.11ac80	12.27	12±1	13	25.12	2.68	0.0106	1.0	PASS

Note: that BT and BLE cannot work simultaneously

If BT and WIFI work simultaneously

BLE+2.4G WIFI, the total power density is $0.0010/1+0.0193/1=0.0203<1$.

BLE+5GWIFI, the total power density is $0.0010/1+0.0212/1=0.0222<1$.

BLE+5.8GWIFI, the total power density is $0.0010/1+0.0212/1=0.0222<1$.

Maximum power density=0.0222<1. Then SAR evaluation is not require .