

According to KDB 447498 D01 General RF Exposure Guidance v06 and part 2.1091

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

BT mode

Mode	Output power to antenna (dBm)	Tune UP tolerance (dBm)	Max Tune UP power (dBm)	Max Tune UP power (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
GFSK	0.539	0±1	1	1.26	0.000219	1.0	PASS
π/4-DQPSK	1.234	1±1	2	1.58	0.000276	1.0	PASS
8-DPSK	1.688	1±1	2	1.58	0.000276	1.0	PASS

PCB Antenna Gain = -0.58 dBi

2.4G WIFI mode

SISO ANT A								
Mode	Frequency (MHz)	Peak Output Power (dBm)	Tune UP tolerance (dBm)	Max Tune UP power (dBm)	Max Tune UP power (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11b	2412	16.584	16±1	17	50.12	0.019352	1.0	PASS
802.11g	2412	18.852	18±1	19	79.43	0.030670	1.0	PASS
802.11n20	2412	18.000	18±1	19	79.43	0.030670	1.0	PASS
802.11n40	2422	17.480	17±1	18	63.10	0.024362	1.0	PASS
802.11ax20	2412	19.397	19±1	20	100.00	0.038612	1.0	PASS
802.11ax40	2422	18.882	18±1	19	79.43	0.030670	1.0	PASS
SISO ANT B								
802.11b	2462	17.613	17±1	18	63.10	0.024362	1.0	PASS
802.11g	2412	20.124	20±1	21	125.89	0.048609	1.0	PASS
802.11n20	2462	19.071	19±1	20	100.00	0.038612	1.0	PASS
802.11n40	2422	18.798	18±1	19	79.43	0.030670	1.0	PASS
802.11ax20	2412	20.642	20±1	21	125.89	0.048609	1.0	PASS
802.11ax40	2422	20.591	20±1	21	125.89	0.048609	1.0	PASS
MIMO ANT A+B								
802.11n20	2412	21.568	21±1	22	158.49	0.122383	1.0	PASS
802.11n40	2422	21.199	21±1	22	158.49	0.122383	1.0	PASS
802.11ax20	2412	23.074	23±1	24	251.19	0.193963	1.0	PASS
802.11ax40	2422	22.830	22±1	23	199.53	0.154071	1.0	PASS

FPC Antenna A&B is 2.88dBi, and MIMO ANT A+B is 5.89dBi

All model has been tested, only the worst-case data has been evaluated.

Note: The device BT and 2.4G Wi-Fi can transmit at the same time;

So the worst simultaneous transmission consideration:

The ratio = $MPE_{(BT)} / \text{limit} + MPE_{(2.4G\ WIFI)} / \text{limit} = 0.000276 / 1.0 + 0.193963 / 1.0 = 0.194239 < 1.0$.