

**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

For BLE

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/cm2)	Limit (mW/cm2)	Result
GFSK	3.433	3 ± 1	4	2.51	0.000488	1.0	PASS

Antenna1 gain:-0.1dB

For EDR

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/cm2)	Limit (mW/cm2)	Result
GFSK	2.508	2 ± 1	3	2.00	0.000389	1.0	PASS
$\pi/4$ -DQPSK	2.504	2 ± 1	3	2.00	0.000389	1.0	PASS
8-DPSK	2.709	3 ± 1	3	2.00	0.000389	1.0	PASS

Antenna1 gain:-0.1dB

For 2.4GWIFI

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/cm2)	Limit (mW/cm2)	Result
802.11b	7.511	7 ± 1	8	6.31	0.001544	1.0	PASS
802.11g	7.747	7 ± 1	8	6.31	0.001544	1.0	PASS
802.11n20	7.652	7 ± 1	8	6.31	0.001544	1.0	PASS
802.11n40	7.986	7 ± 1	8	6.31	0.001544	1.0	PASS
802.11ac20	8.23	8 ± 1	9	7.94	0.001943	1.0	PASS
802.11ac40	8.375	8 ± 1	9	7.94	0.001943	1.0	PASS

Antenna2 gain:0.9dB



For 5.2GWIFI

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/cm2)	Limit (mW/cm2)	Result
802.11a	9.833	9 ± 1	10	10.00	0.003153	1.0	PASS
802.11n20	10.001	10 ± 1	11	12.59	0.003970	1.0	PASS
802.11n40	9.929	9 ± 1	10	10.00	0.003153	1.0	PASS
802.11ac20	10.825	10 ± 1	11	12.59	0.003970	1.0	PASS
802.11ac40	10.137	10 ± 1	11	12.59	0.003970	1.0	PASS
802.11ax20	9.836	9 ± 1	10	10.00	0.003153	1.0	PASS
802.11ax40	9.946	9 ± 1	10	10.00	0.003153	1.0	PASS

Antenna2 gain :2dB

For 5.8GWIFI

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/cm2)	Limit (mW/cm2)	Result
802.11a	6.751	6 ± 1	7	5.01	0.001616	1.0	PASS
802.11n20	6.965	6 ± 1	7	5.01	0.001616	1.0	PASS
802.11n40	8.237	8 ± 1	9	7.94	0.002562	1.0	PASS
802.11ac20	6.807	6 ± 1	7	5.01	0.001616	1.0	PASS
802.11ac40	8.114	8 ± 1	9	7.94	0.002562	1.0	PASS
802.11ax20	8.007	8 ± 1	9	7.94	0.002562	1.0	PASS
802.11ax40	8.086	8 ± 1	9	7.94	0.002562	1.0	PASS

Antenna2 gain:2.1dB

Note:

The same antenna cannot transmit at the same time, but BT ANT1 and WIFI ANT2 can transmit at the same time, so the worst simultaneous transmitting consideration:

The ratio = $\text{ANT1}_{\text{MPE(MAX)}} / \text{limit} + \text{ANT2}_{\text{MPE(MAX)}} / \text{limit}$

$$= 0.000488 / 1 + 0.003970 / 1$$

$$= 0.004458 < 1.0$$

So a SAR test is not required