

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), KDB-447498 D01 V06, part 2.1091.

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: $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

P_d = power density in mW/cm², **P_{out}** = output power to antenna in mW;

G = gain of antenna in linear scale, **π** = 3.1416;

R = distance between observation point and center of the radiator in cm

P_d 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

WI-FI Mode: WIFI 2.4G

Test Mode	Channel	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11b	Lowest (2412MHz)	86.298	0.03489	1.0	PASS
	Middle (2437MHz)	88.716	0.03587	1.0	PASS
	Highest (2462MHz)	93.756	0.03791	1.0	PASS
802.11g	Lowest (2412MHz)	244.906	0.09902	1.0	PASS
	Middle (2437MHz)	246.604	0.09971	1.0	PASS
	Highest (2462MHz)	231.739	0.09370	1.0	PASS
802.11n(HT20)	Lowest (2412MHz)	234.963	0.09500	1.0	PASS
	Middle (2437MHz)	244.906	0.09902	1.0	PASS
	Highest (2462MHz)	243.220	0.09834	1.0	PASS

Remark:

antenna gain: 3.08dBi

linear gain: 2.032dBi

WI-FI Mode: UNII 5G

Test Mode	Channel (MHz)		Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11a	Band I	5180	14.588	0.0055	1.0	PASS
		5200	14.791	0.0055	1.0	PASS
		5240	13.583	0.0051	1.0	PASS
	Band II-2A	5260	13.552	0.0054	1.0	PASS
		5280	15.311	0.0061	1.0	PASS
		5320	15.740	0.0063	1.0	PASS
	Band II-2C	5500	17.701	0.0093	1.0	PASS
		5580	14.488	0.0076	1.0	PASS
		5700	16.904	0.0089	1.0	PASS
802.11n20	Band I	5180	11.695	0.0044	1.0	PASS
		5200	11.298	0.0042	1.0	PASS
		5240	10.375	0.0039	1.0	PASS
	Band II-2A	5260	10.715	0.0043	1.0	PASS
		5280	11.830	0.0047	1.0	PASS
		5320	12.388	0.0049	1.0	PASS
	Band II-2C	5500	12.764	0.0067	1.0	PASS
		5580	11.041	0.0058	1.0	PASS
		5700	13.305	0.0070	1.0	PASS
802.11n40	Band I	5190	11.350	0.0043	1.0	PASS
		5230	10.495	0.0039	1.0	PASS
	Band II-2A	5270	11.143	0.0044	1.0	PASS
		5310	12.589	0.0050	1.0	PASS
	Band II-2C	5510	13.459	0.0071	1.0	PASS
		5550	11.376	0.0060	1.0	PASS
		5670	13.183	0.0069	1.0	PASS
802.11ac20	Band I	5180	11.749	0.0044	1.0	PASS
		5200	11.324	0.0042	1.0	PASS
		5240	10.617	0.0040	1.0	PASS
	Band II-2A	5260	10.965	0.0044	1.0	PASS
		5280	12.190	0.0049	1.0	PASS
		5320	12.735	0.0051	1.0	PASS
	Band II-2C	5500	13.459	0.0071	1.0	PASS

		5580	11.695	0.0061	1.0	PASS
		5700	13.305	0.0070	1.0	PASS
802.11ac40	Band I	5190	11.535	0.0043	1.0	PASS
		5230	10.351	0.0039	1.0	PASS
	Band II-2A	5270	11.324	0.0045	1.0	PASS
		5310	12.853	0.0051	1.0	PASS
	Band II-2C	5510	13.614	0.0071	1.0	PASS
		5550	12.050	0.0063	1.0	PASS
		5670	13.243	0.0069	1.0	PASS

Remark:

antenna gain: 2.75dBi @Band I, 3.02dBi @Band II-2A, 4.21dBi @Band II-2C

linear gain: 1.884dBi @Band I, 2.004dBi @Band II-2A, 2.636dBi @Band II-2C