

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

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

For MIMO mode, the antenna gain is 5.01dBi.

wifi 2.4 mode

Channel	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11ax20 ANT1+2	21.39	137.72	0.08684	1.0	PASS
802.11ax40 ANT1+2	21.46	139.96	0.08825	1.0	PASS
802.11b ANT1	18.14	65.16	0.02078	1.0	PASS
802.11b ANT2	18.19	65.92	0.02069	1.0	PASS
802.11g ANT1	18.17	65.61	0.02059	1.0	PASS
802.11g ANT2	18.15	65.31	0.01831	1.0	PASS
802.11n20 ANT1+2	20.67	116.68	0.07357	1.0	PASS
802.11n40 ANT1+2	20.11	102.57	0.06467	1.0	PASS

wifi 5G mode

Channel		Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
Band 1	802.11a ANT1	18.28	67.30	0.02122	1.0	PASS
	802.11a ANT2	17.96	62.52	0.01971	1.0	PASS
	802.11 ac20 ANT1+2	21.29	134.59	0.08487	1.0	PASS
	802.11 ac40 ANT1+2	20.99	125.60	0.07920	1.0	PASS
	802.11 ac80 ANT1+2	21.03	126.77	0.07993	1.0	PASS
	802.11 ax20 ANT1+2	21.37	137.09	0.08644	1.0	PASS
	802.11 ax40 ANT1+2	21.24	133.05	0.08389	1.0	PASS
	802.11 ax80 ANT1+2	21.67	146.89	0.09263	1.0	PASS
	802.11 n20 ANT1+2	21.20	131.83	0.08312	1.0	PASS
	802.11 n40 ANT1+2	21.04	127.06	0.08012	1.0	PASS
Band 2	802.11a ANT1	18.07	64.12	0.02022	1.0	PASS
	802.11a ANT2	18.43	69.66	0.02196	1.0	PASS
	802.11 ac20 ANT1+2	21.72	148.59	0.09370	1.0	PASS
	802.11 ac40 ANT1+2	21.28	134.28	0.08467	1.0	PASS
	802.11 ac80 ANT1+2	20.98	125.31	0.07902	1.0	PASS
	802.11 ax20 ANT1+2	20.88	122.46	0.07722	1.0	PASS
	802.11 ax40 ANT1+2	21.26	133.66	0.08428	1.0	PASS
	802.11 ax80 ANT1+2	21.00	125.89	0.07938	1.0	PASS
	802.11 n20 ANT1+2	20.60	114.82	0.07240	1.0	PASS
	802.11 n40 ANT1+2	21.33	135.83	0.08565	1.0	PASS
Band 3	802.11a ANT1	17.99	62.95	0.01985	1.0	PASS
	802.11a ANT2	18.43	69.66	0.02196	1.0	PASS
	802.11 ac20 ANT1+2	21.13	129.72	0.08180	1.0	PASS
	802.11 ac40 ANT1+2	20.71	117.76	0.07426	1.0	PASS
	802.11 ac80 ANT1+2	21.09	128.53	0.08105	1.0	PASS
	802.11 ax20 ANT1+2	20.31	107.40	0.06772	1.0	PASS
	802.11 ax40 ANT1+2	20.71	117.76	0.07426	1.0	PASS
	802.11 ax80 ANT1+2	20.61	115.08	0.07257	1.0	PASS
	802.11 n20 ANT1+2	20.34	108.14	0.06819	1.0	PASS
	802.11 n40 ANT1+2	20.48	111.69	0.07043	1.0	PASS
Band 4	802.11a ANT1	18.39	69.02	0.02176	1.0	PASS
	802.11a ANT2	17.88	61.38	0.01935	1.0	PASS
	802.11 ac20 ANT1+2	21.27	133.97	0.08448	1.0	PASS
	802.11 ac40 ANT1+2	20.81	120.50	0.07599	1.0	PASS
	802.11 ac80 ANT1+2	20.66	116.41	0.07341	1.0	PASS
	802.11 ax20 ANT1+2	21.16	130.62	0.08236	1.0	PASS
	802.11 ax40 ANT1+2	21.14	130.02	0.08198	1.0	PASS
	802.11 ax80 ANT1+2	21.83	152.41	0.09610	1.0	PASS
	802.11 n20 ANT1+2	21.26	133.66	0.08428	1.0	PASS
	802.11 n40 ANT1+2	20.91	123.31	0.07776	1.0	PASS

For Simultaneous transmitting, 1): The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = $0.023590/1 + 0.024475/1 = 0.048065 < 1$ Since the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in the device is ≤ 1.0 , the EUT is considered to satisfy MPE compliance for simultaneous transmission operations.