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: **$Pd = (Pout*G)/(4*pi*r^2)$**

Where

Pd = power density in mW/cm^2, **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 id the limit of MPE, 1 mW/cm^2. 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

wifi 2.4Gmode: ANT1&ANT2 SISO

Channel	Output power to antenna (dBm)		Output power to antenna (mW)		Power Density at R=20cm (mW/cm^2)		Limit (mW/cm^2)	Result
	ANT1	ANT2	ANT1	ANT2	ANT1	ANT2		
802.11b	16.18	16.45	40.50	44.16	0.01339	0.01425	1.0	PASS
802.11g	12.98	13.06	19.86	20.23	0.00641	0.00653	1.0	PASS
802.11n HT20	13.95	14.09	24.83	25.64	0.00801	0.00827	1.0	PASS
802.11n HT40	13.36	13.46	21.68	22.18	0.00700	0.00716	1.0	PASS

Remark: antenna 1 gain=2.1dBi, antenna 2 gain=2.1dBi

wifi 5G mode: ANT1&ANT2 SISO

Band 1

Channel	Output power to antenna (dBm)		Output power to antenna (mW)		Power Density at R=20cm (mW/cm^2)		Limit (mW/cm^2)	Result
	Antenna1	Antenna2	Antenna1	Antenna2	Antenna1	Antenna2		
802.11a	9.255	9.544	8.424	9.003	0.00334	0.00274	1.0	PASS
802.11ac HT20	9.010	9.300	7.962	8.511	0.00316	0.00258	1.0	PASS
802.11ac HT40	8.659	9.049	7.343	8.033	0.00291	0.00229	1.0	PASS
802.11n HT20	9.278	9.489	8.468	8.890	0.00336	0.00269	1.0	PASS
802.11n HT40	8.657	9.230	7.340	8.375	0.00291	0.00227	1.0	PASS
802.11ac HT80	8.521	8.552	7.114	7.165	0.00282	0.00223	1.0	PASS

Band 4

Channel	Output power to antenna (dBm)		Output power to antenna (mW)		Power Density at R=20cm (mW/cm^2)		Limit (mW/cm^2)	Result
	Antenna1	Antenna2	Antenna1	Antenna2	Antenna1	Antenna2		
802.11a	8.397	10.978	6.914	12.526	0.00274	0.00497	1.0	PASS
802.11ac HT20	8.126	10.758	6.495	11.907	0.00258	0.00473	1.0	PASS
802.11ac HT40	7.611	10.751	5.769	11.888	0.00229	0.00472	1.0	PASS
802.11n HT20	8.312	10.885	6.780	12.260	0.00269	0.00487	1.0	PASS
802.11n HT40	7.566	10.823	5.710	12.086	0.00227	0.00480	1.0	PASS
802.11ac HT80	7.502	10.400	5.626	10.965	0.00223	0.00435	1.0	PASS

Remark: antenna 1 gain=3.0dBi, antenna 2 gain=3.0dBi

For Simultaneous transmitting, 1): The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = 0.00801/1+0.00827/1+0.00269/1+0.00487/1= 0.02384< 1 Since the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in the device is $\leqslant$ 1.0, the EUT is considered to satisfy MPE compliance for simultaneous transmission operations.