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 KDB 447498 D01 V06 and 1.1307(b)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	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/f²)	30				
30–300	27.5	0.073	0.2	30				
300–1500			f/1500	30				
1500–100,000			1.0	30				

Limits for Maximum Permissible Exposure (MPE)

f = frequency in MHz

Friis transmission formula: Pd = (Pout*G)/(4*pi*r²)

Where

Pd = power density in mW/cm², Pout = output power to antenna in mW;

G = gain of antenna in linear scale, Pi = 3.1416;

 \mathbf{R} = distance between observation point and center of the radiator in cm

Pd id 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

Channel	Output power to antenna (dBm)		Output power to antenna (mW)		Power Density at R=20cm (mW/cm ²)		Limit	Result
	Antenna1	Antenna2	Antenna1	Antenna2	Antenna1	Antenna2	(IIIVV/CIII)	
802.11b	15.117	15.249	32.4863	33.4888	0.01515	0.01562	1.0	PASS
802.11g	13.544	13.625	22.6152	23.0409	0.01055	0.01075	1.0	PASS
802.11n20	14.364	14.652	27.3149	29.1877	0.01274	0.01361	1.0	PASS
802.11n40	13.79	13.963	23.9332	24.9058	0.01116	0.01162	1.0	PASS

wifi 2.4Gmode: ANT1&ANT2 MIMO

Remark: antenna gain=3.7dBi

wifi 5G mode: ANT3&ANT4 MIMO

Channel	Output power to antenna (dBm)		Output power to antenna (mW)		Power Density at R=20cm (mW/cm ²)		Limit	Result
	Antenna3	Antenna4	Antenna3	Antenna4	Antenna3	Antenna4	(IIIVV/CIII ⁻)	
802.11a	11.696	11.97	14.7775	15.7398	0.00600	0.00639	1.0	PASS
802.11n HT20	11.647	12.112	14.6117	16.2630	0.00594	0.00661	1.0	PASS
802.11n HT40	11.438	11.253	13.9252	13.3444	0.00566	0.00542	1.0	PASS
802.11ac HT20	11.586	11.482	14.4079	14.0670	0.00585	0.00571	1.0	PASS
802.11ac HT40	11.394	11.692	13.7848	14.7639	0.00560	0.00600	1.0	PASS
802.11ac HT80	11.259	11.47	13.3629	14.0281	0.00543	0.00570	1.0	PASS

Remark: antenna gain=3.1dBi

For Simultaneous transmitting, 1): The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = 0.01515/1 + 0.01562/1 + 0.00600/1 + 0.00661/1 = 0.04338 < 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.