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)

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 2.4G mode

Channel	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm²)	Limit (mW/cm²)	Result
802.11b	16.567	45.3628	0.01590	1.0	PASS
802.11g	13.112	20.4739	0.00718	1.0	PASS
802.11n HT20	14.186	26.2180	0.00919	1.0	PASS
802.11n HT40	13.528	22.5320	0.00790	1.0	PASS

Remark: antenna gain=2.46dBi

wifi 5G mode:

Band	Channel	Output power to antenna (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm²)	Limit (mW/cm²)	Result
Band 1	802.11a	8.573	7.1995	0.00277	1.0	PASS
	802.11n HT20	8.722	7.4508	0.00286	1.0	PASS
	802.11n HT40	8.166	6.5554	0.00252	1.0	PASS
	802.11ac HT20	8.668	7.3587	0.00283	1.0	PASS
	802.11ac HT40	8.237	6.6635	0.00256	1.0	PASS
	802.11ac HT80	8.214	6.6283	0.00255	1.0	PASS
Band 4	802.11a	9.949	9.8833	0.00380	1.0	PASS
	802.11n HT20	10.115	10.2683	0.00395	1.0	PASS
	802.11n HT40	10.032	10.0740	0.00387	1.0	PASS
	802.11ac HT20	10.006	10.0138	0.00385	1.0	PASS
	802.11ac HT40	9.868	9.7006	0.00373	1.0	PASS
	802.11ac HT80	9.941	9.8651	0.00379	1.0	PASS

Remark: antenna gain=2.86dBi

EIRP=EMeas+20log(dMeas)-104.7

EIRP   is the equivalent isotropically radiated power, in dBm

EMeas   is the field strength of the emission at the measurement distance, in dB μV/m

dMeas   is the measurement distance, in m

For BT

Field strength (dBuV/m)	EIRP (dBm)	Max tune-up (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
84.66	-10.5	0.0891	0.00003	1.0	PASS

Remark: antenna gain=2.46dBi

For Simultaneous transmitting, 1): The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits =0.01590/1 + 0.00387/1 + 0.00003/1 = 0.0198< 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.