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.

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

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/cm^2)	Limit (mW/cm^2)	Result
802.11b	16.931	49.3287	0.01644	1.0	PASS
802.11g	13.594	22.8770	0.00762	1.0	PASS
802.11n HT20	14.592	28.7872	0.00959	1.0	PASS
802.11n HT40	13.542	22.6048	0.00753	1.0	PASS

Remark: antenna gain=2.24dBi

wifi 5G mode:

Band	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	10.747	11.8768	0.00489	1.0	PASS
	802.11n HT20	10.699	11.7463	0.00484	1.0	PASS
	802.11n HT40	10.157	10.3681	0.00427	1.0	PASS
	802.11ac HT20	10.814	12.0615	0.00497	1.0	PASS
	802.11ac HT40	9.724	9.3843	0.00386	1.0	PASS
	802.11ac HT80	9.396	8.7016	0.00358	1.0	PASS
Band 4	802.11a	13.592	22.8665	0.00942	1.0	PASS
	802.11n HT20	13.317	21.4635	0.00884	1.0	PASS
	802.11n HT40	13.608	22.9509	0.00945	1.0	PASS
	802.11ac HT20	13.463	22.1973	0.00914	1.0	PASS
	802.11ac HT40	13.705	23.4693	0.00967	1.0	PASS
	802.11ac HT80	13.522	22.5009	0.00927	1.0	PASS

Remark: antenna gain=3.16dBi

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
84.68	-10.5	0.0891	0.00003	1.0	PASS

Remark: antenna gain=2.24dBi

For Simultaneous transmitting, 1): The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits =0.01644/1 +0.00967/1 + 0.00003/1 = 0.02614< 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.