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)

According to KDB 447498 D01 General RF Exposure Guidance v06, Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Test Exclusion Threshold condition(s), listed below, is (are) satisfied.

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

Channel	Frequency (MHz)	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	2412	13.56	22.70	0.0045	1.0	PASS
	2437	13.86	24.32	0.0048	1.0	PASS
	2462	13.63	23.07	0.0046	1.0	PASS
802.11g	2412	14.32	27.04	0.0054	1.0	PASS
	2437	14.48	28.05	0.0056	1.0	PASS
	2462	14.63	29.04	0.0058	1.0	PASS
802.11n (HT20)	2412	15.68	36.98	0.0074	1.0	PASS
	2437	15.21	33.19	0.0066	1.0	PASS
	2462	15.32	34.04	0.0068	1.0	PASS
802.11n (HT40)	2422	15.54	35.81	0.0071	1.0	PASS
	2437	15.69	37.07	0.0074	1.0	PASS
	2452	16.13	41.02	0.0082	1.0	PASS

Remark: antenna gain=-0.58 dBi

WiFi module and 433.92MHz module cannot transmit signals simultaneously.

EUT's module is more than 20cm away from the human body.

For 433.92MHz Measurement Data

Frequency (MHz)	Field strength (dBuV/m@3)	EIRP (dBm)	Max tune-up (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
433.92	71.13	-24.03	0.004	0.0000008	1.0	PASS

$EIRP=E_{Meas}+20\log(d_{Meas})-104.7$

EIRP is the equivalent isotropically radiated power, in dBm

E_{Meas} is the field strength of the emission at the measurement distance, in dBuV/m

d_{Meas} is the measurement distance, in m

EIRP=E+20log(d)-104.7=71.13+9.54-104.7=-24.03dBm

Conclusion: No SAR is required.