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

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

EIRP   is the equivalent isotropically radiated power, in dBm

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

d_{Meas} is the measurement distance, in m

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/cm^2)	Limit (mW/cm^2)	Result
802.11b	20.316	107.5474	0.03718	1.0	PASS
802.11g	19.167	82.5468	0.02854	1.0	PASS
802.11n HT20	20.296	107.0533	0.03701	1.0	PASS
802.11n HT40	18.776	75.4397	0.02608	1.0	PASS

BT mode

Field strength (dBuV/m)	EIRP (dBm)	Output power to antenna (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	Result
84.96	-10.2	0.0955	0.00003	1.0	PASS

Remark: antenna gain=2.4dBi

wifi 5G 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
Band 1	802.11a	18.734	74.7137	0.03566	1.0	PASS
	802.11n HT20	18.637	73.0634	0.03487	1.0	PASS
	802.11n HT40	14.207	26.3451	0.01257	1.0	PASS
Band 4	802.11a	18.032	63.5624	0.03033	1.0	PASS
	802.11n HT20	18.288	67.4217	0.03218	1.0	PASS
	802.11n HT40	16.877	48.7192	0.02325	1.0	PASS

Remark: antenna gain=3.8dBi

For Simultaneous transmitting, 1): The sum of the ratios of the spatially averaged results to the applicable frequency dependent MPE limits = 0.03718/1 + 0.03566/1 = 0.07284< 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.