



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: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$

Where

P_d = power density in mW/cm², P_{out} = 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

P_d is 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

BT Mode						
Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Antenna Gain (dBi)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
GFSK	1.781	1.51	5.21	0.000997	1.0	PASS
$\pi/4$ -DQPSK	-0.981	0.80	5.21	0.000527	1.0	PASS
8-DPSK	-2.039	0.63	5.21	0.000416	1.0	PASS

5.8G WI-FI Mode						
Mode	Output power to antenna (dBm)	Output power to antenna (mW)	Antenna Gain (dBi)	Power Density at R=20cm (mW/cm ²)	Limit (mW/cm ²)	Result
802.11a	13.695	23.42	5.19	0.015393	1.0	PASS
802.11n20	13.294	21.35	5.19	0.014032	1.0	PASS
802.11ac20	13.214	20.96	5.19	0.013776	1.0	PASS

FM Mode				
Channel (MHz)	Electric Field (dBuV/m)	Electric Field (V/m)	Limit of Electric field strength (V/m)	Result
88.10	57.30	0.0007	27.5	PASS

Remark: Test data from page 24 of the FM report.

Remark: dBuV/m to V/m , V/m = $10^{\{[(\text{dBmV/m}) - 120] / 20\}}$;

The device can not transmit with BT and 5G WI-FI simultaneously;

But FM can be transmitted simultaneously with one of the (BT / 5G WI-FI), since the FM transmission power is too low, the simultaneous transmission passes by default.