

RF Exposure Evaluation

LIMIT

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 1.1310(e)

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

Note: f = frequency in MHz

EVALUATION METHOD

Transmission formula: $Pd = (Pout * G * \eta) / (4 * \pi * r^2)$

Where

Pd = power density in mW/cm², **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

η: duty cycle (decimal number)

TEST RESULT

Passed **Not Applicable**

According to RF test report, the results are as follow:

BT 3.0+EDR:

Channel	Output power (dBm)	Output power (mW)	Antenna Gain (linear scale)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
CH00	2.41	1.7418	1.8923	0.0007	1	Pass
CH39	2.66	1.8450	1.8923	0.0007	1	
CH78	2.45	1.7579	1.8923	0.0007	1	

BT 4.0+BLE:

Channel	Output power (dBm)	Output power (mW)	Antenna Gain (linear scale)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
CH00	-1.38	0.7278	1.8923	0.0003	1	Pass
CH19	-1.80	0.6607	1.8923	0.0002	1	
CH39	-3.45	0.4519	1.8923	0.0002	1	

Note: the below information is declared by the applicant:

- 1) Antenna Gain= 2.77dBi
- 2) The exposure safety distance is 20cm.
- 3) $\eta=1$.

PMR Analog Voice:

Test Frequency (MHz)	Minimum Separation Distance (cm)	Max Output Power (mW)	Antenna Gain (Numeric)	Power Density At 60cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
406.1125	60	54000	2.2387	1.3368	1.3537	PASS
413.05	60	54000	2.2387	1.3368	1.3768	
419.9875	60	54000	2.2387	1.3368	1.4000	
421.0125	60	54000	2.2387	1.3368	1.4034	
445	60	54000	2.2387	1.3368	1.4833	
469.9875	60	54000	2.2387	1.3368	1.5666	

PMR Digital Voice/Digital Data:

Test Frequency (MHz)	Minimum Separation Distance (cm)	Max Output Power (mW)	Antenna Gain (Numeric)	Power Density At 60cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
406.1125	60	54000	2.2387	1.3368	1.3537	PASS
413.05	60	54000	2.2387	1.3368	1.3768	
419.9875	60	54000	2.2387	1.3368	1.4000	
421.0125	60	54000	2.2387	1.3368	1.4034	
445	60	54000	2.2387	1.3368	1.4833	
469.9875	60	54000	2.2387	1.3368	1.5666	

Note: the below information is declared by the applicant:

- 1) Antenna Gain= 3.5dBi
- 2) The exposure safety distance is 60cm.
- 3) $\eta=0.5$.

KDB447498 D01 General RF Exposure KDB447498 D01 General RF Exposure Guidance v06, Clause 7.2

Transmitters used in mobile exposure conditions for simultaneous transmission operations:

- The $[\sum \text{of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance)} / 1.6 \text{ W/kg}] + [\sum \text{of MPE ratios}] \leq 1.0$.
- The SAR to peak location separation ratios of all simultaneous transmitting antenna pairs operating in portable exposure conditions are all ≤ 0.04 and the $[\sum \text{of MPE ratios}] \leq 1.0$.

$MPE(\text{the worst transmit})=(0.0007/1)+(1.3368/1.3537)=0.9882 < 1$