

RF EXPOSURE EVALUATION

According to FCC 1.1310: 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)

CFR Title 47 §2.1091(b): (b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

FCC ID: **2BUJ4-BJ-PL05**

EUT Specification

EUT	Automatic Self-Cleaning Cat Litter Box
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.18GHz ~ 5.24GHz WLAN: ☐ 5.745GHz ~ 5.825GHz Others: ☒ 2.402GHz~2.480GHz BLE 5.750GHz~5.850GHz Radar ☐ NFC: 13.56MHz ☐ RFID: 125kHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others ____
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm ²) ☒ General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation

Limits for Maximum Permissible Exposure(MPE)

TABLE 1 TO § 1.1310(E)(1)—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)
(i) LIMITS FOR OCCUPATIONAL/CONTROLLED EXPOSURE				
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
300-1,500			f/300	<6
1,500-100,000			5	<6
(ii) 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
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

Note: Emissions between 100 kHz to 300 kHz should be assessed versus the limits at 300 kHz in Table 1 of Section 1.1310: 614 V/m and 1.63 A/m. AKDB inquiry is required to determine the applicable exposure limits below 100 kHz.

Friis transmission formula: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = Power density in mW/cm²

P_{out} = output power to antenna in Mw

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d the limit of MPE, 1mW/cm². If we know the maximum gain of the antenna and total power input to the antenna, through the calculation, we will know the distance where the MPE limit is reached.

Measurement Result

BLE worst case:

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits (mW/cm ²)
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm ²)	
1M	2480	-1.66	-1.66±1	-0.66	2.54	0.0003	1

2.4GHz WiFi worst case:

Operating Mode	Channel Frequency	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits (mW/cm ²)
	(MHz)	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm ²)	
802.11b	2412	13.19	13.19±1	14.19	2.54	0.0094	1

5.8G Radar worst case:

Channel Frequency	Field Strength	Measured Power	Tune up tolerance	Max. Tune up Power	Antenna Gain	Power density at 20cm	Power density Limits (mW/cm ²)
(MHz)	dBμV/m	(dBm)	(dBm)	(dBm)	(dBi)	(mW/ cm ²)	
5800	87.74	-3.77	-3.77±1	-2.77	5	0.0003	1

Note: $E = \text{EIRP} - 20 \log D = 104.8$

Where:

E=electric field strength in dBμV/m

EIRP=equivalent isotropic radiated power in dBm

D=specified measurement distance in meters

Note: BLE, WiFi and 5.8G radar cannot support simultaneous transmission.

Test Result: Pass