

FCC ID: 2AJ7E-HLC610-Z

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 §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 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
(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
300-1,500			f/1500	30
1,500-100,000			1.0	30

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

MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d}$$

$$\text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 * P * G}{377 * D^2}$$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

MAX OUTPUT POWER

Zigbee:

Test Channel	Frequency (MHz)	Power Setting	Peak Output Power (dBm)	LIMIT (dBm)	Verdict
1Mbps					
1	2405	Default	-1.499	30	PASS
8	2440	Default	-1.611	30	PASS
16	2480	Default	-2.040	30	PASS

Measurement Result

Operation Frequency: BLE 2405MHz~2480MHz

Power density limited: $1\text{mW}/\text{cm}^2$

Antenna Type: External Antenna

Antenna gain: 2.0dBi,

R=20cm

Zigbee DTS:

Channel Freq. (MHz)	modulation	conducted power	Tune-up power (dBm)	Max		Antenna		Evaluation result	Power density
		(dBm)		tune-up power		Gain			
				(dBm)	(mW)	(dBi)	Numeric	(mW/cm2)	(mW/cm2)
2405	GFSK	-1.499	-2±1	-1	0.794	2.00	1.58	0.0003	1
2440		-1.611	-2±1	-1	0.794	2.00	1.58	0.0003	1
2480		-2.04	-2±1	-1	0.794	2.00	1.58	0.0003	1

Conclusion:

For the max result : $0.0003 \leq 1.0$ for 1g SAR, No SAR is required.

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Signature:

Date: 2017-4-22

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