

# RF Exposure evaluation

FCC ID	2AXS5-FLC5330XSA-A
Product Name	2.4GHz WLAN/Bluetooth Module
Model/Type reference	FLC5330XSA-A
Listed Model(s)	--
Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Mobile Device

## 1. Reference

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

FCC CFR 47 part1 1.1310: Radio frequency radiation exposure limits.

FCC CFR 47 part2 2.1091: Radio frequency radiation exposure evaluation: mobile devices

## 2. Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f <sup>2</sup> )*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500–100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f <sup>2</sup> )*	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

\*=Plane-wave equivalent power density

### 3. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S=PG/4\pi R^2$$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

### 4. Antenna Information

FLW8189FSA7-A WiFi module can only use antennas certificated as follows provided by manufacturer;

Antenna No.	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
Antenna	Metal Antenna	3.1dBi	2402-2480MHz

### 5. Manufacturing Tolerance

#### BLE

BLE 1M			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	9	6	6
Tolerance $\pm$ (dB)	1.0	1.0	1.0
BLE 2M			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	7	9	8
Tolerance $\pm$ (dB)	1.0	1.0	1.0

#### 2.4GWIFI

IEEE 802.11b			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	18	18	17
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	18	18	17

Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n_20			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	18	18	18
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n_40			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	17	17	16
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11ax_20			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	17	17	17
Tolerance $\pm$ (dB)	1.0	1.0	1.0

## 6. Standalone MPE Result

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance,  $r=20\text{cm}$ , as well as the gain of the used antenna is 2.54dBi, the RF power density can be obtained.

Mode	Output power		Antenna Gain (dBi)	Antenna Gain(linear)	MPE (mW/cm <sup>2</sup> )	MPE Limits (mW/cm <sup>2</sup> )
	dBm	mW				
BLE	10	10.00	3.1	2.04	0.00406	1.0000
2.4GWIFI	19	79.43	3.1	2.04	0.03226	1.0000

Remark:

1. Output power (Peak) including turn-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer.

## 7. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

-----End of the report-----