RF Exposure evaluation

FCC ID	2AIT9-PG-105
Product Name	Alarm Host
Model/Type reference	PG-105
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^2)	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/f2)*	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^2)	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/f2)*	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:
2.4GWIFI	Metal antenna	3.1dBi	2400-2500MHz
433M	Metal antenna	-2.9dBi	

5. Conducted Peak Output Power

Mode	Channel	Peak Output Power (dBm)
11b	1	12.89
	6	12.71
	11	12.84
11g	1	12.8
	6	12.72
	11	12.74
11n(HT20)	1	12.76
	6	12.33
	11	12.09
11n(HT40)	3	11.19
	6	11.88
	9	11.72

TX frequency range: 433.92MHz
Device category: Portable device (Distance: 20cm) Max. Field Strength: 60.60dBuV/m @3m
EIRP=E-104.8+20logD=53.63-104.8+20log3=-41.63dBm
Maximum Conducted Output Power: -41.63dBm
Tune-up: -41±1

6. Manufacturing Tolerance

2.4GWIFI

Mode	11b		
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13	13	13
Tolerance ± (dB)	1.0	1.0	1.0
Mode	11g		
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13	13	13
Tolerance ± (dB)	1.0	1.0	1.0
Mode	11n(HT20)		
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	13	13	13
Tolerance ± (dB)	1.0	1.0	1.0
Mode	11n(HT40)		
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	12	12	12
Tolerance ± (dB)	1.0	1.0	1.0

7. 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 =20cm, as well as the gain of the used antenna is 3.1dBi, the RF power density can be obtained.

Mode	Output power		Antenna Gain (dBi)	Antenna Gain(linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW				
11b	14	25.12	3.1	2.04	0.01020	1.0000
11g	14	25.12	3.1	2.04	0.01020	1.0000
11n(HT20)	14	25.12	3.1	2.04	0.01020	1.0000
11n(HT40)	13	19.95	3.1	2.04	0.00810	1.0000

Remark:
1. Output power (Peak) including turn-up tolerance;

2. MPE evaluate distance is 20cm from user manual provide by manufacturer.

Band/Mode	f (GHz)	RF output power		Antenna Gain (dBi)	Antenna Gain(linear)	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
		dBm	mW				
ASK	0.433	-40	0.0001	-2.90	0.51	0.00000548	60.767

8. Simultaneous Transmission MPE Evaluation

The EUT equiped with one 2.4GWIFI antenna and one 433MHz antenna. so need consider simultaneous transmission;

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

$\sum\sum$of MPE ratios $\leqslant$ 1.0

Ant0: 2.4GWIFI MPE ratios	Ant1: 433M MPE ratios	$\sum$ MPE ratios	Limit	Results
0.01020	0.00000548	0.263760	1.0	Pass

9. 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------