

RF Exposure evaluation

FCC ID	VA8-FLAMELOGIC
Product Name	FlameLogic Control Board
Model/Type reference	FlameLogic Plus with IoT & BLE Module

1. Reference

ANSI C95.1–2019: 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/f ²)*	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/f ²)*	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

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

Antenna No.	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
ANT1	Internal Antenna	2.30dBi	2400-2500MHz
ANT2	Internal Antenna	2.30dBi	2400-2500MHz

5. Conducted Output Power

ANT1

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)
GFSK	BLE 1M	0	2.46	1.76
		19	2.19	1.66
		39	1.33	1.36
	BLE 2M	0	2.52	1.79
		19	2.27	1.69
		39	1.42	1.39

ANT2

Modulation	Packet Type	Channel	Peak Output Power (dBm)	Peak Output Power (mW)
GFSK	BLE 1M	0	-3.2	0.48
		19	-4.09	0.39
		39	-2.76	0.53
	BLE 2M	0	-3.19	0.48
		19	-4.09	0.39
		39	-5.59	0.28

WiFi2.4G

Modulation	Channel	Output Power (dBm)	Output Power (mW)
802.11b	1	3.27	2.12
	6	2.99	1.99
	11	2.71	1.87
802.11g	1	3.27	2.12
	6	2.99	1.99
	11	2.65	1.84
802.11n (HT20)	1	3.1	2.04
	6	2.89	1.95
	11	2.52	1.79
802.11n (HT40)	3	3.21	2.09
	6	3.06	2.02
	9	2.88	1.94

6. Manufacturing Tolerance

BLE ANT1			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	2	2	1
Tolerance $\pm$ (dB)	1.0	1.0	1.0
BLE ANT2			
Channel	Channel 0	Channel 19	Channel 39
Target (dBm)	-3	-4	-2
Tolerance $\pm$ (dB)	1.0	1.0	1.0

WiFi2.4G			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	3	2	2
Tolerance $\pm$ (dB)	1.0	1.0	1.0
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	3	3	2
Tolerance $\pm$ (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, $r=20\text{cm}$, as well as the gain of the used antenna is 2.08dBi and 3.03, 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				
BLE-ANT1	3	2.00	2.30	1.70	0.00067	1.0000
BLE-ANT2	-1	0.79	2.30	1.70	0.00027	1.0000
2.4GWIFI	4	2.51	2.30	1.70	0.00085	1.0000

Remark:

1. Output power including turn-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer.
3. SimultaneousTransmitting:

WIFI2.4G+BLE ANT1 = $0.00085/1 + 0.00067/1 = 0.00152 < 1.0$ for 1g SAR, No SAR is required

So a SAR test is not required.

8. 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-----