

RF Exposure Evaluation Report

APPLICANT : Volansys Technologies Pvt Ltd.
EQUIPMENT : Modular IoT Gateway
BRAND NAME : Volansys
MODEL NAME : VT-GTWY-6UL01-M2-M4
MARKETING NAME : Modular IoT Gateway
FCC ID : 2AKNO-GW6UL01M2M4
STANDARD : 47 CFR Part 2.1091

We, Sporton International (Shenzhen) Inc., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of Sporton International (Shenzhen) Inc., the test report shall not be reproduced except in full.



Approved by: Mark Qu / Manager



Sporton International (Shenzhen) Inc.

**1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City
Guangdong Province 518055 China**



Table of Contents

1. ADMINISTRATION DATA	4
1.1. Testing Laboratory	4
2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	5
3. MAXIMUM RF AVERAGE OUTPUT POWER AMONG PRODUCTION UNITS	6
4. RF EXPOSURE LIMIT INTRODUCTION	7
5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	8
5.1. Standalone Power Density Calculation	8
5.2. Collocated Power Density Calculation.....	9

**Revision History**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA771202	Rev. 01	Initial issue of report	Aug. 24, 2017



1. Administration Data

1.1. Testing Laboratory

Testing Laboratory	
Test Site	Sporton International (Shenzhen) Inc.
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan Shenzhen City Guangdong Province 518055 China TEL: +86-755-8637-9589 FAX: +86-755-8637-9595

Applicant	
Company Name	Volansys Technologies Pvt Ltd.
Address	Block A-7th Floor, Safal Profitaire, Corporate Road, Prahaladnagar, Ahmedabad-380 015, Gujarat. India

Manufacturer	
Company Name	Volansys Technologies Pvt Ltd.
Address	Block A-7th Floor, Safal Profitaire, Corporate Road, Prahaladnagar, Ahmedabad-380 015, Gujarat. India

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	Modular IoT Gateway
Brand Name	Volansys
Model Name	VT-GTWY-6UL01-M2-M4
Marketing Name	Modular IoT Gateway
FCC ID	2AKNO-GW6UL01M2M4
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz Thread : 2405 MHz ~ 2480 MHz Zigbee : 2405 MHz ~ 2480 MHz NFC : 13.56 MHz
Mode	802.11b/g/n HT20 Bluetooth BLE Thread Zigbee NFC
Antenna Type	WLAN: Whip/Tilt Antenna Bluetooth 4.1 LE: Whip/Tilt Antenna Thread /Bluetooth 4.2 LE: Chip Antenna Zigbee: PCB Antenna NFC: PCB Antenna
HW Version	1.0
SW Version	test 1.2.0
EUT Stage	Production Unit
Bluetooth 4.1 LE and WLAN share the same antenna . Bluetooth 4.2 LE and Thread share the same antenna. NFC is an independent antenna. Zigbee is an independent antenna.	

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

3. Maximum RF average output power among production units

<2.4GHz WLAN>

Mode		Maximum Average Power (dBm)
WLAN 2.4GHz	802.11b	14.00
	802.11g	10.00
	802.11n-HT20	10.00

<Bluetooth BLE>

Mode		Maximum Average Power (dBm)
Bluetooth BLE	Bluetooth 4.1 LE	8.00
	Bluetooth 4.2 LE	3.50

<Thread>

Mode	Maximum Average Power (dBm)
Thread	3.50

<Zigbee>

Mode	Maximum Average Power (dBm)
Zigbee	10.00

4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

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 Exposures				
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
(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
300-1500			f/1500	30
1500-100,000			1.0	30

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna



5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
WLAN2.4GHz 802.11b	2412	2.15	14.00	16.15	41.21	0.008	1.000	0.008
WLAN2.4GHz 802.11g	2412	2.15	10.00	12.15	16.41	0.003	1.000	0.003
WLAN2.4GHz 802.11n-HT20	2412	2.15	10.00	12.15	16.41	0.003	1.000	0.003
Bluetooth 4.1 LE	2402	2.15	8.00	10.15	10.35	0.002	1.000	0.002
Bluetooth 4.2 LE	2402	2.00	3.50	5.50	3.55	0.001	1.000	0.001
Thread	2405	2.00	3.50	5.50	3.55	0.001	1.000	0.001
Zigbee	2405	1.00	10.00	11.00	12.59	0.003	1.000	0.003

Note: For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band

5.2. Collocated Power Density Calculation

Power Density / Limit					Σ (Power Density / Limit) of		
1	2	3	4	5	1+3+5	1+4+5	2+4+5
2.4GHz WLAN	Bluetooth 4.1 LE	Bluetooth 4.2 LE	Thread	Zigbee			
0.008	0.002	0.001	0.001	0.003	0.012	0.012	0.006

Note:

1. Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)].
2. For the simultaneously analysis, since the SAR summation of 3 transmitters can cover others combination of 2 transmitters, therefore in this section did not additional to evaluate 2TX combination of simultaneously transmission.
3. Bluetooth 4.1 LE and WLAN share the same antenna and can't transmit simultaneously.
4. Bluetooth 4.2 LE and Thread share the same antenna and can't transmit simultaneously.
5. The device is capable of switching between Bluetooth 4.1 LE and Bluetooth 4.2 LE based on signal strength and can't transmit simultaneously.

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.