RF Exposure Evaluation Report

Application No.:	SZCR2310003229AT
Applicant:	Vision IOT Inc
Address of Applicant:	22994 Lavender Valley CT Ashburn, Virginia20148, United States
Manufacturer:	Vision IOT Inc
Address of Manufacturer:	22994 Lavender Valley CT ASHBURN, VA 20148
Factory:	SHI JIAZHUANG OURPCB Tech. Ltd
Address of Factory:	3RD FLOOR NANHAI PLAZA, NO.505 XINHUA ROAD, XINHUA DISTRICT, SHIJIAZHUANG, HEBEI, CHINA
Product Name:	Smart HUB
Model No.:	SHET53211G
Trade Mark:	Vision IOT
FCC ID:	2BBDSSHET53211G
Standards:	47 CFR Part 1.1307 47 CFR Part 1.1310 47 CFR Part 2.1091
Date of Receipt:	2023-10-07
Date of Test:	2023-10-08 to 2023-10-27
Date of Issue:	2023-10-27
Test Result :	**PASS***

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

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1 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2023-10-27		Original

Authorized for issue by:				
		Edison Li **Edison Li /Project Engineer**		
		Eric Fu **Eric Fu /Reviewer**		

2 Contents

3 General Information

3.1 General Description

Power supply:	AC 85V-264V, 50Hz Backup battery 3.7V 550mAh rechargeable backup battery
For BLE:	
Frequency Range:	2402MHz to 2480MHz
Bluetooth Version:	V5.0
Modulation Type:	GFSK
Number of Channels:	40
Sample Type:	Fixed device
Antenna Type:	PCB Antenna
Antenna Gain:	2.96dBi
For 2.4G WiFi:	
Type of Modulation:	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n (HT20): OFDM (64QAM, 16QAM, QPSK, BPSK)
Operating Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz
Channel Number:	802.11b/g/11n(HT20): 11 Channels
Channels Step:	Channels with 5MHz step
Sample Type:	Fixed devices
Antenna Type:	Chip Antenna
Antenna Gain:	4.25dBi
Details of LTE module*:	
Operation Frequency Band:	LTE Band 2,4,5,12,13,25, 26
Modulation Type:	LTE: QPSK, 16QAM
LTE Category:	4
Antenna Type:	External Antenna
Antenna Gain:	3dBi

*: The LTE single module approval by FCC(FCC ID:XMR202008EG91NAXD), Grant at 09/09/2020.

3.2 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China

518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

3.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• VCCI

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1178

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

3.4 Deviation from Standards

None.

3.5 Abnormalities from Standard Conditions

None.

3.6 Other Information Requested by the Customer

None.

4 RF Exposure Evaluation

4.1 RF Exposure Compliance Requirement

4.1.1 Limits

According to FCC Part1.1310: 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 part1.1307(b)

TABLE 1—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 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

F= Frequency in MHz

Friis Formula

Friis transmission formula: Pd = (Pout*G)/(4* Pi * R^2)

Where

Pd = power density in mW/cm^2

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

For Uncontrolled Environment, the MPE limit of 300MHz to 1500MHz is f/1500 mW/cm^2 , the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm^2 . If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

4.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

4.1.3 EUT RF Exposure Evaluation

1) Test Results

Note: the BLE/WiFi and LTE can synchronous transmission at the same time.

For BLE

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)	MPE Ratios	Result
1	2.96	1.98	-1.36	0.73	0.0003	1.0000	0.0003	PASS

Note: Refer to report No. SZCR231000322902 or EUT test Max Conducted Peak Output Power value.
The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement, the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm^2.

2.4G WiFi

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Antenna	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)	Limit (mW/cm^2)	MPE Ratios	Result
1	4.25	2.66	15.65	36.73	0.0194	1.0000	0.0194	PASS

Note: Refer to report No. SZCR231000322903 or EUT test Max Conducted Peak Output Power value.
The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement, the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm^2.

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For WCDMA/LTE module:

The max tune-up tolerance power Into Antenna & RF Exposure Evaluation Distance:

Type	Test Freq. (MHz)	Max Antenna Gain (dBi)	Max Antenna Gain (Numeric)	Max tune-up tolerance power (dBm)	Max tune-up Tolerance power to Antenna (mW)	Power Density at R=20cm (mW/cm^2)	Limit (mW/cm^2)	MPE Ratios	Result
LTE Band2	1850.7	3	2.00	24.5	281.84	0.1119	1	0.1119	PASS
LTE Band4	1710.7	3	2.00	24.5	281.84	0.1119	1	0.1119	PASS
LTE Band5	824.7	3	2.00	24.5	281.84	0.1119	0.5498	0.2035	PASS
LTE Band12	699.7	3	2.00	24.5	281.84	0.1119	0.4665	0.2398	PASS
LTE Band13	779.5	3	2.00	24.5	281.84	0.1119	0.5197	0.2153	PASS
LTE Band25	1850.7	3	2.00	25	316.23	0.1255	1	0.1255	PASS
LTE Band26	814.7	3	2.00	25	316.23	0.1255	0.5431	0.2311	PASS

Note: Refer to report No. R1907A0406-M1 or EUT test Max Conducted Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

the MPE limit of 300MHz to 1500MHz is f/1500 mW/cm^2, the MPE limit of 1500MHz to 100000MHz is 1.0 mW/cm^2.

The simultaneous transmission result between of BLE/WiFi and LTE module:

The SAR Exclusion Threshold Level:

=CPD1 / LPD1 + CPD2 / LPD2

(CPD = Calculation power density, LPD = Limit of power density)

= (0.0194/1) +(0.1119/0.4665) = 0.2593 < 1

Since the SAR Exclusion Threshold Level is well below the SAR low threshold level, so the EUT is considered to comply w ith SAR requirement without testing.

-End of Report-