



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

No. 1 Workshop, M-10, Middle section, Science & Technology Park,
Shenzhen, Guangdong, China 518057
Telephone: +86 (0) 755 2601 2053
Fax: +86 (0) 755 2671 0594
Email: ee.shenzhen@sgs.com

Report No.: SZEM180300192007
Page: 1 of 11

RF Exposure Evaluation Report

Application No.: SZEM1803001920CR
Applicant: Seeed Technology Co., Ltd.
Address of Applicant: 1F, Tower B, Building 2, Shangshui Building, NanshanYungu Innovation Industry Park, Liuxian Ave, Shenzhen, China
Manufacturer: Seeed Technology Co., Ltd.
Address of Manufacturer: 1F, Tower B, Building 2, Shangshui Building, NanshanYungu Innovation Industry Park, Liuxian Ave, Shenzhen, China
Factory: Seeed Technology Co., Ltd.
Address of Factory: 1F, Tower B, Building 2, Shangshui Building, NanshanYungu Innovation Industry Park, Liuxian Ave, Shenzhen, China
Equipment Under Test (EUT):
EUT Name: IoT Development Platform
Model No.: Eagleye 530s
FCC ID: Z4T-EAGLEYE530S
Trade mark: Seeedstudio
Standard(s) : 47 CFR Part 1.1307
47 CFR Part 1.1310
Date of Receipt: 2018-03-15
Date of Test: 2018-03-22 to 2018-03-28
Date of Issue: 2018-04-13

| | |
|---------------------|--------------|
| Test Result: | Pass* |
|---------------------|--------------|

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



Keny Xu
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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

Report No.: SZEM180300192007
Page: 2 of 11

2 Version

| <i>Revision Record</i> | | | | |
|------------------------|----------------|-------------|-----------------|---------------|
| <i>Version</i> | <i>Chapter</i> | <i>Date</i> | <i>Modifier</i> | <i>Remark</i> |
| 01 | | 2018-04-13 | | Original |
| | | | | |
| | | | | |

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|---------------------------------|--|---|--|
| Authorized for issue by: | | | |
| | |  | |
| | | <hr/> | |
| | | Harry Wu /Project Engineer | |
| | |  | |
| | | <hr/> | |
| | | Eric Fu /Reviewer | |



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

Report No.: SZEM180300192007
Page: 3 of 11

3 Contents

| | Page |
|---|-------------|
| 1 COVER PAGE | 1 |
| 2 VERSION | 2 |
| 3 CONTENTS | 3 |
| 4 GENERAL INFORMATION | 4 |
| 4.1 GENERAL DESCRIPTION OF EUT | 4 |
| 4.2 TEST LOCATION | 6 |
| 4.3 TEST FACILITY | 6 |
| 4.4 DEVIATION FROM STANDARDS | 7 |
| 4.5 ABNORMALITIES FROM STANDARD CONDITIONS | 7 |
| 4.6 OTHER INFORMATION REQUESTED BY THE CUSTOMER | 7 |
| 5 RF EXPOSURE EVALUATION | 8 |
| 5.1 RF EXPOSURE COMPLIANCE REQUIREMENT | 8 |
| 5.1.1 <i>Limits</i> | 8 |
| 5.1.2 <i>Test Procedure</i> | 8 |
| 4.1.3 EUT RF EXPOSURE EVALUATION | 9-11 |



4 General Information

4.1 General Description of EUT

| | |
|-----------------------------|--|
| Power supply: | DC 5V |
| For BT: | |
| Antenna Gain | 3dBi |
| Antenna Type | Chip Antenna |
| Channel Spacing | 1MHz |
| Modulation Type | GFSK, $\pi/4$ DQPSK, 8DPSK |
| Number of Channels | 79 |
| Operation Frequency | 2402MHz to 2480MHz |
| Power Class | <10mW |
| Spectrum Spread Technology: | Frequency Hopping Spread Spectrum(FHSS) |
| For BLE: | |
| Antenna Gain | 3dBi |
| Antenna Type | Chip Antenna |
| Channel Spacing | 2MHz |
| Modulation Type | GFSK |
| Number of Channels | 40 |
| Operation Frequency | 2402MHz to 2480MHz |
| Power Class | <10mW |
| For Wifi 2.4G: | |
| Antenna Gain: | 3dBi |
| Antenna Type: | Chip Antenna |
| Channel Spacing: | 5MHz |
| Modulation Type: | 802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n(HT20 and HT40): |
| Number of Channels: | 802.11b/g/n(HT20): 13 802.11n(HT40):9 |
| Operation Frequency: | 802.11b/g/n(HT20): 2412MHz to 2472MHz 802.11n(HT40): 2422MHz to 2462MHz |



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

Report No.: SZEM180300192007

Page: 5 of 11

| | | | | |
|----------------------|--|-----------------|----------------------|--------------------|
| For Wifi 5G: | | | | |
| Antenna Gain | 4.2dBi | | | |
| Antenna Type | Chip Antenna | | | |
| DFS Function | Slave without Radar detection | | | |
| TPC Function | Not Support | | | |
| Operation Frequency: | Band | Mode | Frequency Range(MHz) | Number of channels |
| | Band 1 | 802.11a/n(HT20) | 5180-5240 | 4 |
| | | 802.11n(HT40) | 5190-5230 | 2 |
| | Band 4 | 802.11a/n(HT20) | 5745-5825 | 5 |
| 802.11n(HT40) | | 5755-5795 | 2 | |
| Modulation Type: | 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) | | | |
| Channel Spacing: | 802.11a/n(HT20): 20MHz 802.11n(HT40): 40MHz | | | |
| For Zigbee: | | | | |
| Antenna Gain: | 3dBi | | | |
| Antenna Type: | Dedicated Antenna | | | |
| Channel Spacing: | 5MHz | | | |
| Modulation Type: | O-QPSK | | | |
| Number of Channels | 16 | | | |
| Operation Frequency: | 2405MHz to 2480MHz | | | |



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

Report No.: SZEM180300192007

Page: 6 of 11

4.2 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, Shenzhen, Guangdong, China
518057

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

No tests were sub-contracted.

4.3 Test Facility

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

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **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.

- **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.



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

Report No.: SZEM180300192007

Page: 7 of 11

4.4 Deviation from Standards

None.

4.5 Abnormalities from Standard Conditions

None.

4.6 Other Information Requested by the Customer

None.



5 RF Exposure Evaluation

5.1 RF Exposure Compliance Requirement

5.1.1 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/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, 1 mW/cm². 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.

5.1.2 Test Procedure

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



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

Report No.: SZEM180300192007
Page: 9 of 11

4.1.3 EUT RF Exposure Evaluation

For BT:

Antenna Gain: 3.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.00 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

| Channel | Frequency (MHz) | Max Conducted Peak Output Power (dBm) | Output Power to Antenna (mW) | Power Density at R = 20 cm (mW/cm ²) | Limit | Result |
|---------|-----------------|---------------------------------------|------------------------------|--|-------|--------|
| Lowest | 2402 | 7.58 | 5.73 | 0.002 | 1.0 | PASS |

Note: Refer to report No. SZEM180300192002 for EUT test Max Conducted Peak Output Power value. The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For BLE:

Antenna Gain: 3.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.00 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

| Channel | Frequency (MHz) | Max Conducted Peak Output Power (dBm) | Output Power to Antenna (mW) | Power Density at R = 20 cm (mW/cm ²) | Limit | Result |
|---------|-----------------|---------------------------------------|------------------------------|--|-------|--------|
| Lowest | 2402 | 6.65 | 4.62 | 0.002 | 1.0 | PASS |

Note: Refer to report No. SZEM180300192003 for EUT test Max Conducted Peak Output Power value. The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.



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

Report No.: SZEM180300192007

Page: 10 of 11

For Wifi 2.4G:

Antenna Gain: 3dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.00 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

| Channel | Frequency (MHz) | Max Conducted Peak Output Power (dBm) | Output Power to Antenna (mW) | Power Density at R = 20 cm (mW/cm ²) | Limit | Result |
|---------|-----------------|---------------------------------------|------------------------------|--|-------|--------|
| Lowest | 2412 | 22.40 | 173.78 | 0.069 | 1.0 | PASS |

Note: Refer to report No. SZEM180300192004 for EUT test Max Conducted Peak Output Power value. The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For Wifi 5G:

Antenna Gain: 4.2dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.63 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

| Channel | Frequency (MHz) | Max Conducted Peak Output Power (dBm) | Output Power to Antenna (mW) | Power Density at R = 20 cm (mW/cm ²) | Limit | Result |
|---------|-----------------|---------------------------------------|------------------------------|--|-------|--------|
| Lowest | 5190 | 13.88 | 24.43 | 0.013 | 1.0 | PASS |

Note: Refer to report No. SZEM180300192005 for EUT test Max Conducted Peak Output Power value. The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For Zigbee:

Antenna Gain: 3.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.00 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

| Channel | Frequency (MHz) | Max Conducted Peak Output Power (dBm) | Output Power to Antenna (mW) | Power Density at R = 20 cm (mW/cm ²) | Limit | Result |
|---------|-----------------|---------------------------------------|------------------------------|--|-------|--------|
| Lowest | 2405 | 16.16 | 41.31 | 0.016 | 1.0 | PASS |



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

Report No.: SZEM180300192007
Page: 11 of 11

Note: Refer to report No. SZEM180300192006 for EUT test Max Conducted Peak Output Power value.
The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

Simultaneous transmission:(Worst Case)

| | Antenna1 | Antenna2 | Sum | Limit | Result |
|-----------|----------|----------|-------|-------|--------|
| MPE Ratio | 0.069 | 0.016 | 0.085 | 1 | PASS |

According to 447498 D01, Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0 .

- End of the Report -