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

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# RF Exposure Evaluation Report

| | |
|---|---|
| **Application No.:** | SZEM1707007782CR |
| **Applicant:** | Creative Labs Inc. |
| **Manufacturer:** | Creative Labs Pte. Ltd. |
| **Product Name:** | Creative X-Fi Sonic Carrier |
| **Model No.(EUT):** | MF8235 |
| **FCC ID:** | IBAMF8235 |
| **Standards:** | 47 CFR Part 1.1307 (2016)<br>47 CFR Part 1.1310 (2016) |
| **Date of Receipt:** | 2017-07-31 |
| **Date of Test:** | 2017-08-09 to 2017-08-28 |
| **Date of Issue:** | 2017-08-29 |
| **Test Result :** | **PASS*** |

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

Jack Zhang
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.

# 2 Version

| Revision Record | | | | |
|---|---|---|---|---|
| **Version** | **Chapter** | **Date** | **Modifier** | **Remark** |
| *01* | | *2017-08-29* | | *Original* |
| | | | | |
| | | | | |

| | | | | |
|---|---|---|---|---|
| **Authorized for issue by:** | | | | |
| **Tested By** | | Vincent Chen<br>**Vincent Chen /Project Engineer** | | |
| **Checked By** | | Eric Fu<br>**Eric Fu /Reviewer** | | |

# 3 Contents

# 4 General Information

## 4.1 Client Information

| | |
|---|---|
| Applicant: | Creative Labs Inc. |
| Address of Applicant: | 1901 McCarthy Blvd., Milpitas, California United States |
| Manufacturer: | Creative Labs Pte. Ltd. |
| Address of Manufacturer: | 31 International Business Park #03-01 CREATIVE RESOURCE SINGAPORE 609921 |

## 4.2 General Description of EUT

| | |
|---|---|
| Product Name: | Creative X-Fi Sonic Carrier |
| Model No.: | MF8235 |
| Trade mark: | CREATIVE |
| For BLE: | |
| Operation Frequency: | 2402MHz~2480MHz |
| Bluetooth Version: | V 4.0 Dual mode +EDR (CDW-B18821A-00) |
| | This report is for BLE |
| Modulation Type: | GFSK |
| Number of Channel: | 40 |
| Antenna Type: | PIFA*1 |
| Antenna Gain: | 3.0dBi |
| For BT: | |
| Operation Frequency: | 2402MHz~2480MHz |
| Bluetooth Version: | V 4.1 single mode +EDR (BM880)<br>V 4.0 Dual mode +EDR (CDW-B18821A-00) |
| Modulation Technique: | Frequency Hopping Spread Spectrum(FHSS) |
| Modulation Type: | GFSK, π/4DQPSK, 8DPSK |
| Number of Channel: | 79 |
| Hopping Channel Type: | Adaptive Frequency Hopping systems |
| Antenna Type: | PIFA |
| Antenna Gain: | 3dBi |
| For 2.4G proprietry (DWAM83): | |
| Operation Frequency: | 2412MHz~2464MHz |
| Modulation Type: | DSSS |
| Number of Channel: | 3 |
| Channel Separation: | 26MHz |
| Sample Type: | Fixed production |
| Antenna Type: | Internal*2 |

| | |
|---|---|
| Antenna Gain: | 2.0dBi |
| For 2.4G wifi:<br>(LS9-AC11DBT, CDW-B18821A-00) | |
| Operation Frequency: | IEEE 802.11b/g/n(HT20): 2412MHz to 2462MHz<br>IEEE 802.11n(HT40): 2422MHz to 2452MHz |
| Channel Numbers: | IEEE 802.11b/g, IEEE 802.11n HT20: 11 Channels<br>IEEE 802.11n HT40: 7 Channels |
| Channel Separation: | 5MHz |
| Type of Modulation: | IEEE for 802.11b: DSSS(CCK,DQPSK,DBPSK)<br>IEEE for 802.11g : OFDM(64QAM, 16QAM, QPSK, BPSK)<br>IEEE for 802.11n(HT20 and HT40) : OFDM (64QAM, 16QAM, QPSK,BPSK) |
| Antenna Type: | PIFA |
| Antenna Gain: | 3.0dBi |
| For 5G wifi:<br>(LS9-AC11DBT, CDW-B18821A-00) | |
| Operation Frequency: | Band / Mode / Frequency Range(MHz) / Number of channels<br>UNII Band I – IEEE 802.11a – 5180-5240 – 4<br>IEEE 802.11n/ac 20MHz – 5180-5240 – 4<br>IEEE 802.11n/ac 40MHz – 5190-5230 – 2<br>IEEE 802.11ac 80MHz – 5210 – 1<br>UNII Band III – IEEE 802.11a – 5745-5825 – 5<br>IEEE 802.11n/ac 20MHz – 5745-5825 – 5<br>IEEE 802.11n/ac 40MHz – 5755-5795 – 2<br>IEEE 802.11ac 80MHz – 5775 – 1 |
| Type of Modulation: | IEEE 802.11a: OFDM(BPSK/QPSK/16QAM/64QAM)<br>IEEE 802.11n: OFDM(BPSK/QPSK/16QAM/64QAM)<br>IEEE 802.11ac: OFDM (BPSK/QPSK/16QAM/64QAM/256QAM) |
| Antenna type: | PIFA |
| Antenna gain: | 4dBi |
| For Define 5.8GHz (DWAM83): | |
| Frequency range | 5736 MHz -5814 MHz |
| Channel Numbers: | Define 5.8GHz |
| Modulation Type | DSSS |
| Sample Type: | Fixed production |
| Antenna type: | internal |
| Antenna gain: | 3dBi |

## 4.3 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.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

## 4.4 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 10m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 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.

## 4.5 Deviation from Standards

None.

## 4.6 Abnormalities from Standard Conditions

None.

## 4.7 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 id 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.

### 4.1.3 EUT RF Exposure Evaluation

**For BLE / BT (CDW-B18821A-00)**

Antenna Gain: 3.00dBi

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 | MPE Ratios | Result |
|---|---|---|---|---|---|---|---|
| Low | 2402MHz | 4.0 | 2.51 | 0.001 | 1.0 | 0.001 | PASS |

Note: Refer to report No. SZEM170700778201 and SZEM170700778202 for 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.

**For BT (DM880)**

Antenna Gain: 3.00dBi

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 | MPE Ratios | Result |
|---|---|---|---|---|---|---|---|
| High | 2480MHz | 4.0 | 2.51 | 0.001 | 1.0 | 0.001 | PASS |

Note: Refer to report No. SZEM170700778201 for 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.

**For 2.4G proprietry (DWAM83)**

Antenna Gain: 2.00dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.58 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 | MPE Ratios | Result |
|---|---|---|---|---|---|---|---|
| Lowest | 2412MHz | 17.0 | 50.10 | 0.016 | 1.0 | 0.016 | PASS |

Note: Refer to report No. SZEM170700778204 for 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.

**For 2.4G WIFI (CDW-B18821A-00)**

Antenna Gain: 3.00dBi

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 | MPE Ratios | Result |
|---|---|---|---|---|---|---|---|
| High | 2462MHz | 18.0 | 63.10 | 0.025 | 1.0 | 0.025 | PASS |

Note: Refer to report No. SZEM170700778203 for 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.

**For 2.4G WIFI (LS9-AC11DBT)**

Antenna Gain: 3.00dBi

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 | MPE Ratios | Result |
|---|---|---|---|---|---|---|---|
| High | 2452MHz | 20.0 | 100.00 | 0.040 | 1.0 | 0.040 | PASS |

Note: Refer to report No. SZEM170700778203 for 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.

**For 5.8GHz ( Model:MF8235)**

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:

| Frequency (MHz) | Max Conducted Peak Output Power (dBm) | Output Power to Antenna (mW) | Power Density at R = 20 cm ($mW/cm^2$) | Limit | MPE Ratios | Result |
|---|---|---|---|---|---|---|
| 5736 | 5.0 | 3.16 | 0.001 | 1.0 | 0.001 | PASS |

Note: Refer to report No. SZEM170700778207 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.

**For 5GHz (CDW-B18821A-00)**

Antenna Gain: 4.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.51 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

**Band I**

| Channel | Frequency (MHz) | Max Conducted Peak Output Power (dBm) | Output Power to Antenna (mW) | Power Density at R = 20 cm ($mW/cm^2$) | Limit | MPE Ratios | Result |
|---|---|---|---|---|---|---|---|
| 48 | 5230 MHz | 14.0 | 25.1 | 0.013 | 1.0 | 0.013 | PASS |

Note: Refer to report No. SZEM170700778205 for 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.

**Band III**

| Channel | Frequency (MHz) | Max Conducted Peak Output Power (dBm) | Output Power to Antenna (mW) | Power Density at R = 20 cm ($mW/cm^2$) | Limit | MPE Ratios | Result |
|---|---|---|---|---|---|---|---|
| 165 | 5825 MHz | 12.0 | 14.8 | 0.008 | 1.0 | 0.008 | PASS |

Note: Refer to report No. SZEM170700778205 for 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.

**For 5GHz (LS9-AC11DBT)**

Antenna Gain: 4.0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.51 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

**Band I**

| Channel | Frequency (MHz) | Max Conducted Peak Output Power (dBm) | Output Power to Antenna (mW) | Power Density at R = 20 cm ($mW/cm^2$) | Limit | MPE Ratios | Result |
|---|---|---|---|---|---|---|---|
| 48 | 5230 MHz | 18.0 | 63.1 | 0.032 | 1.0 | 0.032 | PASS |

Note: Refer to report No. SZEM170700778205 for 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.

**Band III**

| Channel | Frequency (MHz) | Max Conducted Peak Output Power (dBm) | Output Power to Antenna (mW) | Power Density at R = 20 cm ($mW/cm^2$) | Limit | MPE Ratios | Result |
|---|---|---|---|---|---|---|---|
| 153 | 5755 MHz | 18.0 | 63.1 | 0.032 | 1.0 | 0.032 | PASS |

Note: Refer to report No. SZEM170700778205 for 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.

## 1）． exposure conditions for simultaneous transmission operations

Simultaneous transmission MPE test is not required, because the Max. sum of the MPE ratios for BT/BLE, 2.4G proprietry, 2.4G WIFI and 5G WIFI is 0.001+0.001+0.016+0.040+0.025+0.001+0.013+0.032=0.129＜1