Shenzhen Huatongwei International Inspection Co., Ltd.
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# MPE TEST REPORT

| | |
|---|---|
| **Report Reference No. ..... :** | **TRE1808021804** **R/C…….: 12556** |
| **FCC ID ..... :** | **Q5EDM58801** |
| **Applicant's name ..... :** | **Shenzhen Kirisun Communications Co.,Ltd.** |
| Address.....: | 3rd Floor, Building A, Tongfang Information Habour, No.11 Langshan Road, Nanshan District, Shenzhen 518057,P.R.China |
| Manufacturer.....: | Shenzhen Kirisun Communications Co.,Ltd. |
| Address.....: | 3rd Floor, Building A, Tongfang Information Habour, No.11 Langshan Road, Nanshan District, Shenzhen 518057,P.R.China |
| **Test item description ..... :** | **DMR Mobile Radio** |
| Trade Mark .....: | KIRISUN |
| Model/Type reference.....: | DM588-01 |
| Listed Model(s) .....: | - |
| **Standard ..... :** | **FCC Per 47 CFR 2.1091(b)；KDB447498 v06** |
| Date of receipt of test sample……...: | Aug 30, 2018 |
| Date of testing……..…: | Aug 30, 2018- Sep 17, 2018 |
| Date of issue……..: | Sep 19, 2018 |
| **Result……...:** | **PASS** |

| | | |
|---|---|---|
| Compiled by ( position+printed name+signature)..: | File administrators Fanghui Zhu | Fanghui Zhu |
| Supervised by ( position+printed name+signature)..: | Project Engineer Jerry Wang | Jerry Wang |
| Approved by ( position+printed name+signature)..: | RF Manager Hans Hu | Hans Hu |

| | |
|---|---|
| **Testing Laboratory Name ..... :** | **Shenzhen Huatongwei International Inspection Co., Ltd** |
| Address.....: | 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China |

# Contents

# 1 TEST STANDARDS AND REPORT VERSION

## 1.1. Test Standards

The tests were performed according to following standards:
FCC Rules Part 1.1310: Radiofrequency radiation exposure limits.
FCC Rules Part 1.1307: Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.
FCC Rules Part 2.1091: Radiofrequency radiation exposure evaluation: mobile devices.
KDB447498 v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
IEEE Std C95.1: 2005: "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz".
FCC OET Bulletin 65, Edition 97-01: "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields".
FCC Supplement C to OET Bulletin 65, Edition 01-01: "Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emission".
IEEE Std C95.3: 2002: "IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields with Respect to Human Exposure to Such Fields,100 kHz – 300 GHz",

## 1.2. Report revised information

| Revised No. | Date of issued | Description |
|---|---|---|
| N/A | 2018-09-19 | Original |
| | | |
| | | |
| | | |
| | | |

# 3. SUMMARY

## 3.1. Client Information

| | |
|---|---|
| Applicant: | Shenzhen Kirisun Communications Co.,Ltd. |
| Address: | 3rd Floor, Building A, Tongfang Information Habour, No.11 Langshan Road, Nanshan District, Shenzhen 518057, P.R.China |
| Manufacturer: | Shenzhen Kirisun Communications Co.,Ltd. |
| Address: | 3rd Floor, Building A, Tongfang Information Habour, No.11 Langshan Road, Nanshan District, Shenzhen 518057, P.R.China |

## 3.2. Product Description

| | | |
|---|---|---|
| Name of EUT: | DMR Mobile Radio | |
| Trade mark: | KIRISUN | |
| Model/Type reference: | DM588-01 | |
| Listed mode(s): | - | |
| Power supply: | DC 13.8V | |
| Hardware version: | B | |
| Software version: | V1.0.0.5 | |
| **RF Specification** | | |
| Support Frequency Range: | 136MHz~174MHz | |
| Permitted frequency range: *1 | 136MHz~174MHz | |
| Rated Output Power: | ☒ High Power: 25W | ☒ Low Power: 10W |
| Modulation Type: | Analog: | FM |
| | Digital : | 4FSK |
| Supported Digital Protocol: *2 | DMR | |
| Channel Separation: | Analog: | ☒ 12.5kHz |
| | Digital : | ☐ 6.25kHz ☒ 12.5kHz |
| Emission Designator: *3 | Analog: | 11K0F3E |
| | Digital: | 7K60FXW, 7K60FXD |
| Support data rate: | 9.6kbps | |
| Antenna Type: | External | |

## 3.3. Test frequency list

According to ANSI C63.26 section 5.1.2.1:

Measurements of transmitters shall be performed and, if required, reported for each frequency band in which the EUT can be operated with the device transmitting at the number of frequencies in each band specified in Table 2.

| Frequency range over which EUT operates | Number of frequencies | Location in frequency range of operation |
|---|---|---|
| 1 MHz or less | 1 | Middle |
| 1 MHz to 10 MHz | 2 | 1 near top and 1 near bottom |
| More than 10 MHz | 3 | 1 near top, 1 near middle, and 1 near bottom |

| Frequency Bands (MHz) | Test Frequency (MHz) | |
|---|---|---|
| 136MHz ~ 174MHz | $CH_L$ | 136.0125 |
| | $CH_{M2}$ | 155.0125 |
| | $CH_H$ | 173.9875 |

## 3.4. Operation mode

| Test mode | Transmitting | Receiving | Digital | Analog | Power level | |
|---|---|---|---|---|---|---|
| | | | 12.5kHz | 12.5kHz | High | Low |
| TX-DNH | √ | | √ | | √ | |
| TX-DNL | √ | | √ | | | √ |
| TX-ANH | √ | | | √ | √ | |
| TX-ANL | √ | | | √ | | √ |
| RX-DN | | √ | √ | | | |
| RX-AN | | √ | | √ | | |

## 3.5. EUT configuration

**The following peripheral devices and interface cables were connected during the measurement:**

● - supplied by the manufacturer

○ - supplied by the lab

| | | | |
|---|---|---|---|
| ● | Power Cable | Length (m) : | 3.00 |
| | | Shield : | Unshielded |
| | | Detachable : | Undetachable |
| ○ | Multimeter | Manufacturer : | / |
| | | Model No. : | / |
| ○ | Antenna | Model No. : | TQC-136FC |
| | | Antenna Gain. : | 3.5dBi |

# 4. TEST ENVIRONMENT

## 3.1 Address of the test laboratory

Laboratory: Shenzhen Huatongwei International Inspection Co., Ltd.
Address: 1/F, Bldg 3, Hongfa Hi-tech Industrial Park, Genyu Road, Tianliao, Gongming, Shenzhen, China

## 3.2 Test Facility

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

**CNAS-Lab Code: L1225**

Shenzhen Huatongwei International Inspection Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

**A2LA-Lab Cert. No. 3902.01**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

**FCC-Registration No.: 762235**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Registration 762235.

**IC-Registration No.: 5377B-1**

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered byCertification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B-1.

**ACA**

Shenzhen Huatongwei International Inspection Co., Ltd. EMC Laboratory can also perform testing for the Australian C-Tick mark as a result of our A2LA accreditation.

## 4.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Temperature: | 15-35 ° C |
| Humidity: | 30-60 % |
| Atmospheric pressure: | 950-1050mbar |

## 4.2. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen Huatongwei International Inspection Co., Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Shenzhen Huatongwei laboratory is reported:

| Test Items | Measurement Uncertainty | Notes |
|---|---|---|
| Transmitter power conducted | 0.57 dB | (1) |
| Transmitter power Radiated | 2.20 dB | (1) |

(1)This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=1.96.

## 4.3. Equipments Used during the Test

| Name of Equipment | Manufacturer | Model | Serial Number | Last Cal. |
|---|---|---|---|---|
| Field Probe | ETS-LINDGREN | HI-6005 | 00064170 | 2017/11/13 |
| Field Meter | AR | FM 5004 | 300239 | 2017/11/13 |

The calibration interval was one year.

## 4.4. Limit

FCC Part 1.1310(e):

| 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 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 |
| 300-1,500 | | | f/300 | 6 |
| 1,500-100,000 | | | 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 |
| 300-1,500 | | | f/1500 | 30 |
| 1,500-100,000 | | | 1.0 | 30 |

f=frequency in MHz
*=Plane-wave equivalent power density

## 4.5. Calculating the Safe Distance

Before starting EME measurements, we calculated the safe distance, $R_{safe}$ using the following formula:

$$Rsafe = \sqrt{\frac{P\max \cdot Gn \cdot \eta}{4\pi \cdot S}}$$

$G_n$: antenna gain (numeric)
$P_{max}$: maximum power input to the antenna (mW)
$S$: power density limit ($mW/m^2$) respectively
$\eta$: duty cycle (decimal number), for these measurements $\eta = 0.5$

The results of $R_{safe}$ calculations:

FCC Part 2.1091:
RF Field Strength Limits for Occupational/Controlled Exposure

| TX-DNH | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Frequency (MHz) | Conducted Output Power (dBm) | Tolerance (dB) | Max Output Power (dBm) | Max Output Power (mW) | Antenna Gain (Numeric) | Power Density ($mW/cm^2$) | Safe Distance (m) |
| 136.0125 | 43.6 | 1.0 | 44.6 | 28840.32 | 2.24 | 1.00 | 0.51 |
| 155.0125 | 43.5 | 1.0 | 44.5 | 28183.83 | 2.24 | 1.00 | 0.50 |
| 173.9875 | 43.6 | 1.0 | 44.6 | 28840.32 | 2.24 | 1.00 | 0.51 |

| TX-ANH | | | | | | | |
|---|---|---|---|---|---|---|---|
| Test Frequency (MHz) | Conducted Output Power (dBm) | Tolerance (dB) | Max Output Power (dBm) | Max Output Power (mW) | Antenna Gain (Numeric) | Power Density ($mW/cm^2$) | Safe Distance (m) |
| 136.0125 | 43.4 | 1.0 | 44.4 | 27542.29 | 2.24 | 1.00 | 0.50 |
| 155.0125 | 43.4 | 1.0 | 44.4 | 27542.29 | 2.24 | 1.00 | 0.50 |
| 173.9875 | 43.5 | 1.0 | 44.5 | 28183.83 | 2.24 | 1.00 | 0.50 |

Note:
Max Output Power(dBm)= Rated Output Power(dBm)+Tolerance(dB)

## 4.6. Antenna Information

| | | |
|---|---|---|
| Model and Frequency: | TQC-136FC | 136MHz-174MHz |
| Antenna Type: | External (Whip Antenna) | |
| Antenna Gain: | 3.5dBi | |

## 4.7. Measurement Procedure

1. Polarization of the EUT's antenna was vertical, which is its polarization in actual use.
2. The EUT at the chosen modulation was set to transmit at the chosen frequency at maximum RF power and at 50% duty cycle (50% duty cycle is simulated either by lowering the radio's power by 3dB or by using a 3 dB pad on the output of the radio). During preliminary measurements, we set the distance between the power density probe and the investigated EUT's antenna equal to the average calculated Rsafe applicable either for controlled or uncontrolled environments.
3. Power density measurements were taken at different heights of the probe from the ground (0.1 to 2 meters) while rotating versus azimuth (from 0° to 360°) the antenna.
4. The azimuth between the probe and the antenna position corresponding to the highest MPE level was chosen as the "worst case" position for the final measurements.
5. For the final measurements, we adjusted the distance between the test probe and the tested antenna to the real safe distance, Rreal, such that the measured highest power density in the "worst case" position was the same or slightly less than the test limit.
6. The measurement results of final measurements conducted at the chosen azimuth and different heights of the probe above the ground.
7. Average values of power density were calculated for the imaginary whole human body (0.1–2.0 m), for the lower part of the body (0.1–0.9 m) and for the upper part of the body (1.0–2.0 m).

## 4.8. Test Results

EME Data:

| Measuring Antenna Height (cm) | FCC Part 2.1091 | | | |
|---|---|---|---|---|
| | Controlled RF Exposure(mW/cm$^2$) | | | |
| | 3.5dBi Antenna 51cm | 3.5dBi Antenna 61cm | 3.5dBi Antenna 71cm | 3.5dBi Antenna 81cm |
| 10 | 0.09 | 0.06 | 0.03 | 0.02 |
| 20 | 0.24 | 0.15 | 0.09 | 0.04 |
| 30 | 0.48 | 0.35 | 0.24 | 0.12 |
| 40 | 0.57 | 0.43 | 0.41 | 0.27 |
| 50 | 0.75 | 0.57 | 0.49 | 0.39 |
| 60 | 0.95 | 0.88 | 0.71 | 0.52 |
| 70 | 0.97 | 0.92 | 0.69 | 0.53 |
| 80 | 0.87 | 0.81 | 0.60 | 0.48 |
| 90 | 0.83 | 0.78 | 0.67 | 0.55 |
| 100 | 0.83 | 0.78 | 0.72 | 0.61 |
| 110 | 0.78 | 0.75 | 0.64 | 0.56 |
| 120 | 0.76 | 0.65 | 0.53 | 0.49 |
| 130 | 0.63 | 0.53 | 0.45 | 0.39 |
| 140 | 0.52 | 0.43 | 0.37 | 0.33 |
| 150 | 0.45 | 0.36 | 0.27 | 0.19 |
| 160 | 0.28 | 0.23 | 0.21 | 0.09 |
| 170 | 0.19 | 0.11 | 0.15 | 0.06 |
| 180 | 0.15 | 0.06 | 0.05 | 0.04 |
| 190 | 0.08 | 0.05 | 0.03 | 0.03 |
| 200 | 0.04 | 0.03 | 0.02 | 0.03 |

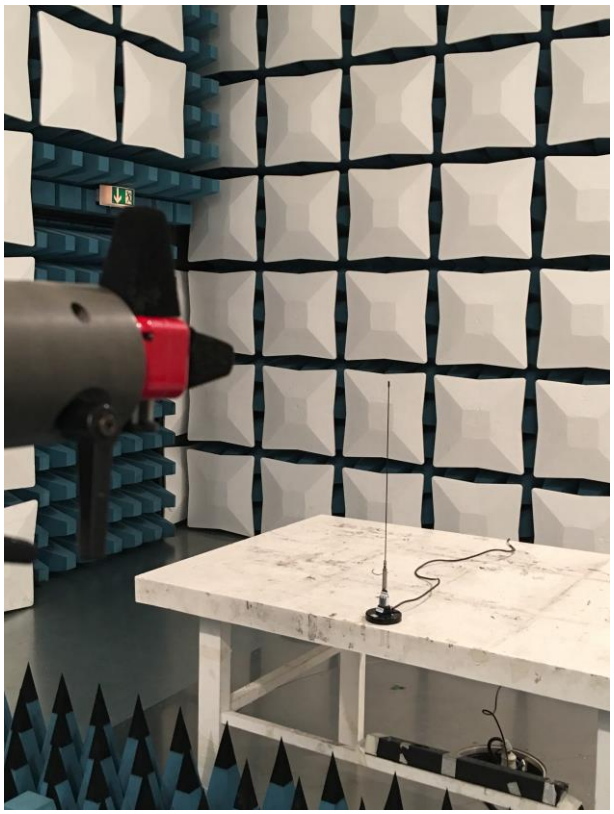
EME for Body Parts:

| Part of the body/averaging points (m) | FCC Part 2.1091 |
|---|---|
| | Controlled RF Exposure |
| | 3.5dBi Antenna 51cm (mW/cm$^2$) |
| Whole body (0.1 to 2.0 ) | 0.83 |
| Lower body (0.1 to 0.9) | 0.72 |
| Upper body (1.0 to 2.0 ) | 0.64 |

## 4.9. Conclusion

The User Manual shall include RF radiation safety warnings:
The antenna of this device must be installed on the roof or trunk of the vehicle. If the gain of the used antenna is 3.5dBi, the minimum mobile separation distance $R_{safe}$ =51cm.

## 4.10. Test Setup Photos of the EUT



----------End of Report----------