Report No.: GZ11041190-1

# TEST REPORT

| | | |
|---|---|---|
| Applicant Name & Address | : | Hong Kong China Electric Manufacture Co., Ltd<br>12/F Mongkok Harbour Centre, 638 Shanghai Street, Hong Kong |
| Manufacturing Site | | Zhongshan Kong Luen Electrical Appliance<br>Science And Technology Development Zone, Ming Zhong Town, Zhong Shan City |
| Sample Description | | |
| Product | : | Ceiling suspended fan |
| Model No. | : | DCM70-5B/2L |
| Electrical Rating | : | 12V dc |
| FCC ID | : | ZJF-HH-YK-A008 |
| Date Received | : | 25 April 2011 |
| Date Test Conducted | : | 07 May 2011 - 27 June 2011 |
| Test standards | : | **FCC Part 15.231** |
| Test Result | : | Pass |
| Conclusion | : | The submitted samples complied with the above rules/standards. |
| Remark | | None. |

**********End of Page**********

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***14 July 2011 Date***



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# *1* General Description

## *1.1* Product Description

The equipment under test (EUT) is a transmitter for Ceiling suspended fan with RF at 315.00 MHz. The EUT is powered by 12V DC.
During normal use, it sends the message to control the fan and light. The duration of each transmission is less than 1s.

Antenna Type: Integral wire antenna.

For electronic filing, the brief circuit description is saved in the filename: Technical Description.pdf.

## *1.2* Related Submittal(s) Grants

The receiver option of this transmitter is subject to Certification procedure.

## *1.3* Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (2009). Radiated Emission measurement was performed in a Semi-anechoic chamber. Preliminary scans were performed in the Semi-anechoic chamber only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the “Justification Section” of this Application.

## *1.4* Test Facility

The Semi-Anechoic Chamber facility used to collect the radiated data is Intertek Testing Services Shenzhen ltd. Kejiyuan Branch and located at 6F, Block D, Huahan Building, Langshan Road, Nanshan District Shenzhen, P.R.China. This test facility and site measurement data have been fully placed on file with File Number 242492.

# 2 System Test Configuration

## 2.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it), and in the confines as outlined in ANSI C63.4 (2009).

The EUT was powered by 12V DC.

For maximizing emission at and above 30 MHz, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.3.

The unit was operated standalone and placed in the center of the turntable.

The equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). The EUT was placed on turntable, which enabled the engineer to maximize emissions through its placement in the three orthogonal axes.

## 2.2 EUT Exercising Software

There was no special software to exercise the device.

## 2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

## 2.4 Equipment Modification

Any modifications installed previous to testing by Hong Kong China Electric Manufacture Co., Ltd will be incorporated in each production model sold/leased in the United States. No modifications were installed by Intertek Testing Services Shenzhen Ltd. Guangzhou Branch.

### *2.5 Measurement Uncertainty*

When determining the test conclusion, the Measurement Uncertainty of test has been considered.

### *2.6 Support Equipment List and Description*

N/A

## *3* Radiated Emission Results

Data is included worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

### *3.1 Field Strength Calculation*

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any), Average Factor (optional) from the measured reading. The basic equation with a sample calculation is as follows:
FS = RA + AF + CF - AG - AV
where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB
AV = Average Factor in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:
FS = RR + LF
where FS = Field Strength in dBμV/m
RR = RA - AG - AV in dBμV
LF = CF + AF in dB

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB and average factor of 5 dB are subtracted, giving a field strength of 27 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV/m
AF = 7.4 dB RR = 18.0 dBμV
CF = 1.6 dB LF = 9.0 dB
AG = 29.0 dB
AV = 5.0 dB
FS = RR + LF
FS = 18 + 9 = 27 dBμV/m

Level in μV/m = Common Antilogarithm [(27 dBμV/m)/20] = 22.4 μV/m

### *3.2 Radiated Emission Configuration Photograph*

Worst Case Radiated Emission at 2205.6MHz
For electronic filing, the worst case radiated emission configuration photographs are saved with filename: radiated photos.pdf.

### *3.3 Radiated and Spurious Emission Data*

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.
Judgement: Passed by 1.5 dB

Applicant: Hong Kong China Electric Manufacture Co., Ltd.
Date of test: 21 June 2011

## Radiated Emissions
**Pursuant to FCC 15.109: Emissions Requirement**

| Polarization | Frequency (MHz) | QP Level at 3m (dBμV/m) | Limit at 3m (dBμV/m) | Margin |
|---|---|---|---|---|
| H | 31.294 | 21.6 | 40.0 | -18.4 |
| H | 42.378 | 12.4 | 40.0 | -27.6 |
| H | 58.245 | 11.2 | 40.0 | -28.8 |
| V | 31.058 | 21.5 | 40.0 | -18.5 |
| V | 43.551 | 13.2 | 40.0 | -26.8 |
| V | 55.365 | 11.7 | 40.0 | -28.3 |

## Radiated Emissions
**Pursuant to FCC 15.231(a): Emissions Requirement**

| Polarization | Frequency (MHz) | Reading (dBμV) | Pre-amp Gain (dB) | Antenna Factor (dB) | Average Factor (dB) | Net at 3m (dBμV/m) | Limit at 3m (dBμV/m) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|
| H | 315.093 | 55.1 | - | 15.3 | - | 70.4 | 75.6 | -5.2 |
| H | 1890.720 | 70.2 | 36.6 | 29.3 | -10.1 | 52.8 | 55.6 | -2.8 |
| H | 2520.860 | 67.3 | 36.6 | 32.7 | -10.1 | 53.3 | 55.6 | -2.3 |
| V | 945.289 | 28.2 | - | 24.2 | - | 52.4 | 55.6 | -3.2 |
| V | 1890.600 | 68.6 | 36.6 | 29.3 | -10.1 | 51.2 | 55.6 | -4.4 |
| V | 2205.600 | 68.0 | 36.6 | 31.2 | -10.1 | 52.5 | 54.0 | -1.5 |

Notes:

1. At frequencies equal to or less than 1000MHz, quasi-peak detector was used, Above 1000MHz, peak detectors was used.
2. All measurements were made at 3 meter.
3. Negative value in the margin column shows emission below limit.
4. Horn antenna is used for the emission over 1000MHz.

## *4* Equipment photo

For electronic filing, the photographs are saved with filename: external photos.pdf and internal photos.pdf.

## *5* Product Labelling

For electronics filing, the FCC ID label artwork and the label location are saved with filename: Label and Location.pdf.

## *6* Technical Specifications

For electronic filing, the block diagram and schematic of the tested EUT are saved with filename: Block Diagram.pdf and Circuit diagram.pdf

## 7 Instruction Manual

For electronic filing, a preliminary copy of the Instruction Manual is saved with filename: User Manual.pdf. This manual will be provided to the end-user with each unit sold/leased in the United States

## 8 Miscellaneous Information

This miscellaneous information includes details of the measured bandwidth, the test procedure and calculation of factors such as pulse desensitization and averaging factor.

### *8.1 Bandwidth Plot*

For electronic filing, the plot shows the fundamental emission when modulated is saved with filename: Bandwidth Plot.pdf. From the plot, the bandwidth is observed to be 500 kHz, at 20 dB where the bandwidth limit is 787.675 kHz.

### *8.2 Discussion of Pulse Desensitization*

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF.*

The effective period (Teff) was approximately 260us for a digital "1" bit, as shown in the plots of 8.3. With a resolution bandwidth (3 dB) of 100 kHz, the pulse desensitivity factor was 0 dB.

### *8.3 Calculation of Average Factor*

Averaging factor in dB = 20 log (duty cycle)

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero scan (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

A plot of the worst-case duty cycle as detected in this manner is shown below.

The duty cycle is simply the on-time divided by the period:

The duration of one cycle =39.20ms
Effective period of the cycle = 12.26ms

DC =12.26/39.20=0.3128 or 31.28%

Thererfor, the averaging factor is found by 20lg0.3128=-10.1dB

## *8.4 Emissions Test Procedures*

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under Part 15, Subpart C rules.
The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 2003.
The transmitting equipment under test (EUT) is placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The EUT is adjusted through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are varied during the testing to search for maximum signal levels.
Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.
The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower.

## *8.5 Emissions Test Procedures (cont'd)*

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

The IF bandwidth used for measurement of radiated signal strength was 10 kHz for emission below 30 MHz and 120 KHz for emission from 30 MHz to 1000 MHz. Where transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the restricted bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, but those measurements taken at a closer distance are so marked.

## *9* **Equipment list**

1) Radiated Emission test

| Equipment No. | Equipment | Manufacturer | Model No. | Serial No. | Cal. Date | Due Date |
|---|---|---|---|---|---|---|
| SZ061-03 | BiConiLog Antenna | ETS | 3142C | 00066460 | 02-Jul-09 | 02-Jul-11 |
| SZ185-01 | EMI Receiver | R&S | ESCI | 100547 | 08-Mar-11 | 08-Mar-12 |
| SZ061-08 | Horn Antenna | ETS | 3115 | 00092346 | 15-Mar-10 | 15-Sep-11 |
| SZ056-03 | Spectrum Analyzer | R&S | FSP 30 | 101148 | 18-Mar-11 | 18-Mar-12 |
| SZ188-01 | Anechoic Chamber | ETS | RFD-F/A-100 | 4102 | 06-Mar-11 | 06-Mar-12 |
| SZ062-04 | RF Cable | RADIALL | RG 213U | -- | 25-Mar-11 | 25-Sep-11 |
| SZ062-06 | RF Cable | RADIALL | 0.04-26.5GHz | -- | 16-Sep-10 | 16-Sep-11 |