



# TEST REPORT

**Report Reference No.** .....: **TRE1703021301** R/C.....: 25512

**FCC ID** .....: **2ALJN-CL-M706**

**Applicant's name** .....: **Shenzhen Cardlan Technology Co.,Ltd**

**Address** .....: 3F, 1Bldg, Liantang industrial Park, Kangzheng Rd, Longgang Dist, Shenzhen, China

**Manufacturer**.....: Shenzhen Cardlan Technology Co.,Ltd

**Address**.....: 3F, 1Bldg, Liantang industrial Park, Kangzheng Rd, Longgang Dist, Shenzhen, China

**Test item description** .....: **Card Reader Writer**

**Trade Mark**.....: -

**Model/Type reference** .....: CL-M706

**Listed Model(s)**.....: -

**Standard**.....: **FCC CFR Title 47 Part 15 Subpart C Section 15.225**

**Date of receipt of test sample**.....: Mar. 22, 2017

**Date of testing**.....: Mar. 22, 2017 - Apr. 12, 2017

**Date of issue**.....: Apr. 12, 2017

**Result** .....: **PASS**

Compiled by  
( position+printedname+signature) ..: File administrators Becky Liang

Supervised by  
( position+printed name+signature) ..: Project Engineer Lion Cai

Approved by  
( position+printed name+signature) ..: RF Manager 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

**Shenzhen Huatongwei International Inspection Co., Ltd. All rights reserved.**

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen Huatongwei International Inspection Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen Huatongwei International Inspection Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

## Contents

|                  |                                                       |                  |
|------------------|-------------------------------------------------------|------------------|
| <b><u>1.</u></b> | <b><u>TEST STANDARDS AND REPORT VERSION</u></b>       | <b><u>3</u></b>  |
| 1.1.             | Applicable Standards                                  | 3                |
| 1.2.             | Report version                                        | 3                |
| <b><u>2.</u></b> | <b><u>TEST DESCRIPTION</u></b>                        | <b><u>4</u></b>  |
| <b><u>3.</u></b> | <b><u>SUMMARY</u></b>                                 | <b><u>5</u></b>  |
| 3.1.             | Client Information                                    | 5                |
| 3.2.             | Product Description                                   | 5                |
| 3.3.             | Operation state                                       | 5                |
| 3.4.             | EUT configuration                                     | 5                |
| 3.5.             | Modifications                                         | 5                |
| <b><u>4.</u></b> | <b><u>TEST ENVIRONMENT</u></b>                        | <b><u>6</u></b>  |
| 4.1.             | Address of the test laboratory                        | 6                |
| 4.2.             | Test Facility                                         | 6                |
| 4.3.             | Equipments Used during the Test                       | 7                |
| 4.4.             | Environmental conditions                              | 8                |
| 4.5.             | Statement of the measurement uncertainty              | 8                |
| <b><u>5.</u></b> | <b><u>TEST CONDITIONS AND RESULTS</u></b>             | <b><u>9</u></b>  |
| 5.1.             | Antenna requirement                                   | 9                |
| 5.2.             | Conducted Emission (AC Main)                          | 10               |
| 5.3.             | 20dB bandwidth                                        | 13               |
| 5.4.             | Radiated Emission                                     | 14               |
| 5.5.             | Frequency stability                                   | 17               |
| <b><u>6.</u></b> | <b><u>TEST SETUP PHOTOS OF THE EUT</u></b>            | <b><u>18</u></b> |
| <b><u>7.</u></b> | <b><u>EXTERNAL AND INTERNAL PHOTOS OF THE EUT</u></b> | <b><u>19</u></b> |

## 1. Test standards and Report version

### 1.1. Applicable Standards

The tests were performed according to following standards:

[FCC Rules Part 15.225](#): Operation within the band 13.110-14.010 MHz.

[ANSI C63.10-2013](#): American National Standard for Testing Unlicensed Wireless Devices

### 1.2. Report version

| Version No. | Date of issue | Description |
|-------------|---------------|-------------|
| 00          | Apr. 12, 2017 | Original    |
|             |               |             |
|             |               |             |
|             |               |             |
|             |               |             |

## **2. Test Description**

| ReportSection | Test Item                                                   | FCC Rule                  | Result |
|---------------|-------------------------------------------------------------|---------------------------|--------|
| 4.1           | Antenna requirement                                         | 15.203                    | Pass   |
| 4.2           | Line Conducted Emission (AC Main)                           | 15.207                    | Pass   |
| 4.3           | 20dB Bandwidth                                              | 15.215                    | Pass   |
| 4.4           | Radiated Emissions& Field Strength of Fundamental Emissions | 15.225(a)(b)(c)(d)/15.209 | Pass   |
| 4.5           | Frequency Stability                                         | 15.225e                   | Pass   |

Remark: The measurement uncertainty is not included in the test result.

### 3. SUMMARY

#### 3.1. Client Information

|               |                                                                                   |
|---------------|-----------------------------------------------------------------------------------|
| Applicant:    | Shenzhen Cardlan Technology Co.,Ltd                                               |
| Address:      | 3F, 1Bldg, Liantang industrial Park, Kangzheng Rd, Longgang Dist, Shenzhen, China |
| Manufacturer: | Shenzhen Cardlan Technology Co.,Ltd                                               |
| Address:      | 3F, 1Bldg, Liantang industrial Park, Kangzheng Rd, Longgang Dist, Shenzhen, China |

#### 3.2. Product Description

|                      |                    |
|----------------------|--------------------|
| Name of EUT:         | Card Reader Writer |
| Trade Mark:          | -                  |
| Model No.:           | CL-M706            |
| Listed Model(s):     | -                  |
| Power supply:        | DC 5V              |
| Adapter information: | -                  |
| <b>NFC</b>           |                    |
| Modulation:          | FSK                |
| Operation frequency: | 13.56MHz           |
| Channel number:      | 1                  |
| Antenna type:        | Integral Antenna   |

#### 3.3. Operation state

##### ◆ Test mode

For RF test items:

The engineering test program was provided and enabled to make EUT continuous transmit

For AC power line conducted emissions:

The EUT was set to connect with the NFC under large package sizes transmission.

#### 3.4. EUT configuration

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

● - supplied by the manufacturer

○ - supplied by the lab

|  |                |   |
|--|----------------|---|
|  | Length (m) :   | / |
|  | Shield :       | / |
|  | Detachable :   | / |
|  | Manufacturer : | / |
|  | Model No. :    | / |

#### 3.5. Modifications

No modifications were implemented to meet testing criteria.

## **4. TEST ENVIRONMENT**

### **4.1. 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

Phone: 86-755-26748019 Fax: 86-755-26748089

### **4.2. 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, Date of Registration: February 28, 2015. Valid time is until February 27, 2018.

#### **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. Valid time is until April 30, 2017.

#### **FCC-Registration No.: 317478**

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 317478, Renewal date Jul. 18, 2014, valid time is until Jul. 18, 2017.

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

Two 3m Alternate Test Site of Shenzhen Huatongwei International Inspection Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 5377B on Dec.03, 2014, valid time is until Dec.03, 2017.

#### **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.

### 4.3. Equipments Used during the Test

| Conducted Emission (AC Main) |                   |               |             |            |            |
|------------------------------|-------------------|---------------|-------------|------------|------------|
| Item                         | Test Equipment    | Manufacturer  | Model No.   | Serial No. | Last Cal.  |
| 1                            | Artificial Mains  | Rohde&Schwarz | ESH2-Z5     | 100028     | 2016/11/13 |
| 2                            | EMI Test Receiver | Rohde&Schwarz | ESCI3       | 100038     | 2016/11/13 |
| 3                            | Pulse Limiter     | Rohde&Schwarz | ESHSZ2      | 100044     | 2016/11/13 |
| 4                            | EMI Test Software | Rohde&Schwarz | ES-K1 V1.71 | N/A        | N/A        |

| Radiated Emission |                         |                              |                    |            |            |
|-------------------|-------------------------|------------------------------|--------------------|------------|------------|
| Item              | Test Equipment          | Manufacturer                 | Model No.          | Serial No. | Last Cal.  |
| 1                 | Ultra-Broadband Antenna | ShwarzBeck                   | VULB9163           | 538        | 2016/11/13 |
| 2                 | EMI TEST RECEIVER       | Rohde&Schwarz                | ESI 26             | 100009     | 2016/11/13 |
| 3                 | EMI TEST Software       | Audix                        | E3                 | N/A        | N/A        |
| 4                 | TURNTABLE               | ETS                          | 2088               | 2149       | N/A        |
| 5                 | ANTENNA MAST            | ETS                          | 2075               | 2346       | N/A        |
| 6                 | EMI TEST Software       | Rohde&Schwarz                | ESK1               | N/A        | N/A        |
| 7                 | HORNANTENNA             | ShwarzBeck                   | 9120D              | 1011       | 2016/11/13 |
| 8                 | Amplifer                | Sonoma                       | 310N               | E009-13    | 2016/11/13 |
| 9                 | JS amplifer             | Rohde&Schwarz                | JS4-00101800-28-5A | F201504    | 2016/11/13 |
| 10                | High pass filter        | Compliance Direction systems | BSU-6              | 34202      | 2016/11/13 |
| 11                | HORNANTENNA             | ShwarzBeck                   | 9120D              | 1012       | 2016/11/13 |
| 12                | Amplifer                | Compliance Direction systems | PAP1-4060          | 120        | 2016/11/13 |
| 13                | Loop Antenna            | Rohde&Schwarz                | HFH2-Z2            | 100020     | 2016/11/13 |
| 14                | TURNTABLE               | MATURO                       | TT2.0              | ----       | N/A        |
| 15                | ANTENNA MAST            | MATURO                       | TAM-4.0-P          | ----       | N/A        |

| Conducted test |                   |               |           |              |            |
|----------------|-------------------|---------------|-----------|--------------|------------|
| Item           | Test Equipment    | Manufacturer  | Model No. | Serial No.   | Last Cal.  |
| 1              | Spectrum Analyzer | Rohde&Schwarz | FSP       | 1164.4391.40 | 2016/11/13 |

The Cal.Interval was one year.

#### 4.4. Environmental conditions

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

|                    |             |
|--------------------|-------------|
| Temperature:       | 15~35°C     |
| Relative Humidity: | 30~60 %     |
| Air Pressure:      | 950~1050mba |

#### 4.5. 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 according 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 according 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)   |
| Conducted spurious emission 9KHz-40 GHz | 1.60 dB                 | (1)   |
| Radiated spurious emission 9KHz-40 GHz  | 2.20 dB                 | (1)   |
| Conducted Emission 9KHz-30MHz           | 3.39 dB                 | (1)   |
| Radiated Emission 30~1000MHz            | 4.24 dB                 | (1)   |
| Occupied Bandwidth                      | -----                   | (1)   |

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

## 5. TEST CONDITIONS AND RESULTS

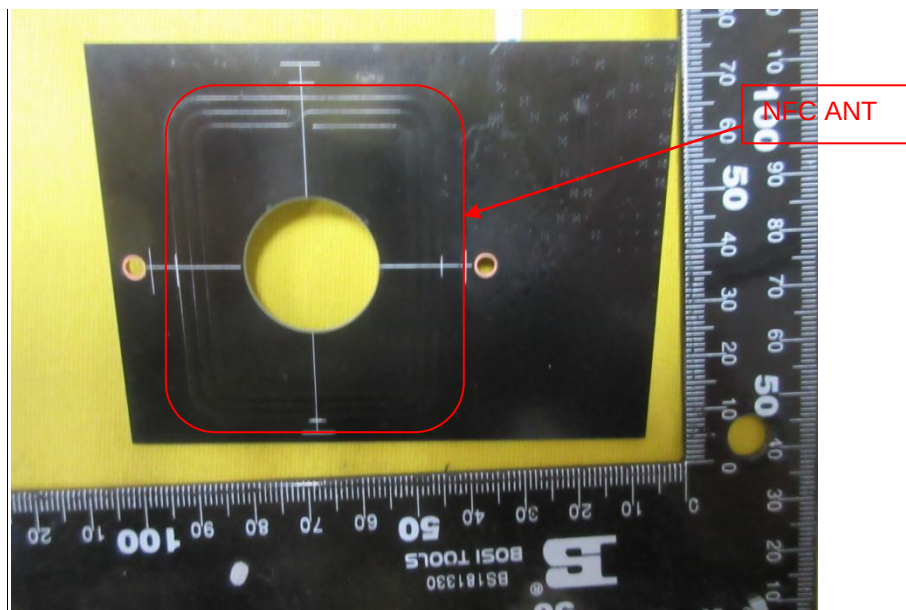
### 5.1. Antenna requirement

#### Requirement

##### **FCC CFR Title 47 Part 15 Subpart C Section 15.203:**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### Test Result:



## 5.2. Conducted Emission (AC Main)

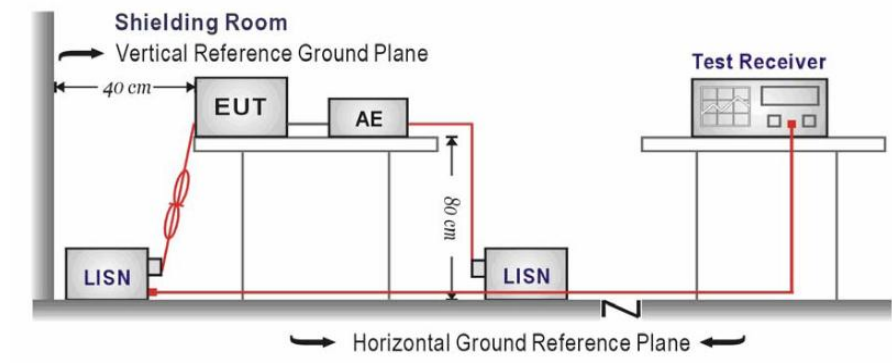
### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

| Frequency range (MHz) | Limit (dBuV) |           |
|-----------------------|--------------|-----------|
|                       | Quasi-peak   | Average   |
| 0.15-0.5              | 66 to 56*    | 56 to 46* |
| 0.5-5                 | 56           | 46        |
| 5-30                  | 60           | 50        |

\* Decreases with the logarithm of the frequency.

### TEST CONFIGURATION

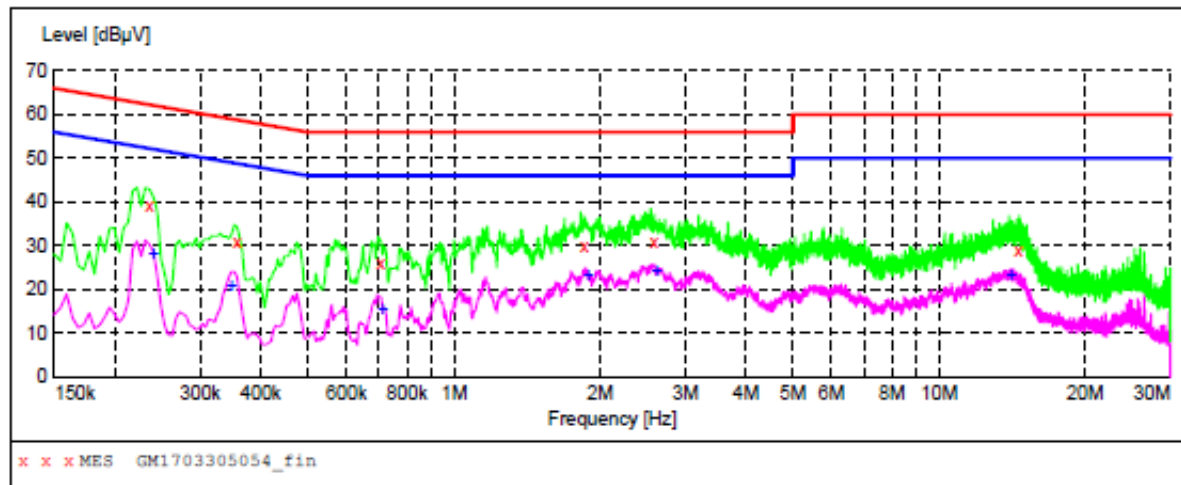


### TEST PROCEDURE

1. The EUT was setup and tested according to ANSI C63.10:2013 for compliance to FCC 47CFR 15.247 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment.
4. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
5. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
6. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
7. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

### TEST RESULTS

|                    |     |              |   |
|--------------------|-----|--------------|---|
| Test mode: AC 120V | NFC | Polarization | L |
|--------------------|-----|--------------|---|



#### MEASUREMENT RESULT: "GM1703305054\_fin"

3/30/2017 4:25PM

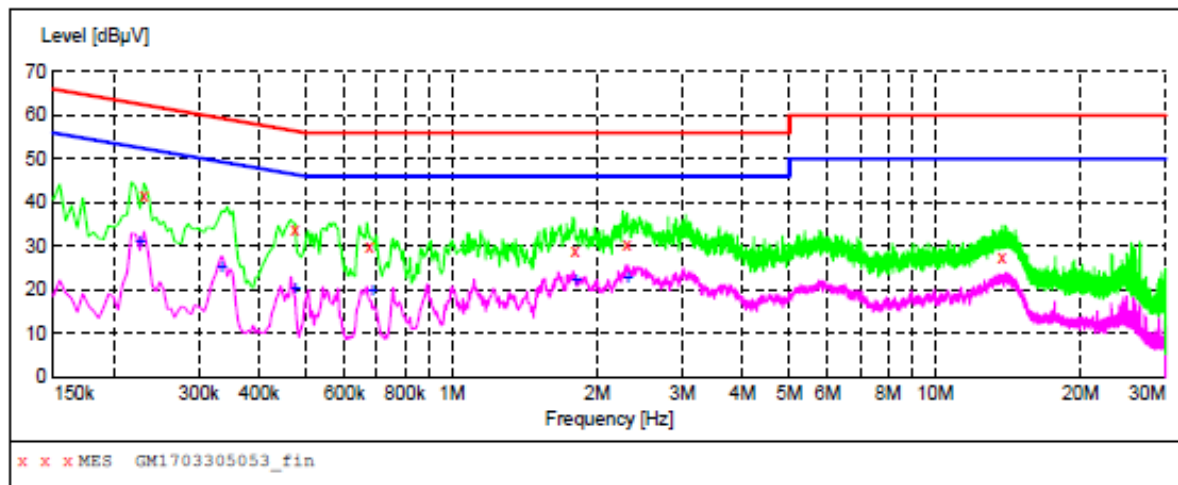
| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.235500         | 39.40         | 10.3         | 62            | 22.9         | QP       | L1   | GND |
| 0.357000         | 30.80         | 10.2         | 59            | 28.0         | QP       | L1   | GND |
| 0.708000         | 26.20         | 10.2         | 56            | 29.8         | QP       | L1   | GND |
| 1.860000         | 29.80         | 10.2         | 56            | 26.2         | QP       | L1   | GND |
| 2.589000         | 31.00         | 10.2         | 56            | 25.0         | QP       | L1   | GND |
| 14.599500        | 28.80         | 10.5         | 60            | 31.2         | QP       | L1   | GND |

#### MEASUREMENT RESULT: "GM1703305054\_fin2"

3/30/2017 4:25PM

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.240000         | 28.70         | 10.3         | 52            | 23.4         | AV       | L1   | GND |
| 0.348000         | 21.20         | 10.2         | 49            | 27.8         | AV       | L1   | GND |
| 0.712500         | 15.90         | 10.2         | 46            | 30.1         | AV       | L1   | GND |
| 1.891500         | 23.50         | 10.2         | 46            | 22.5         | AV       | L1   | GND |
| 2.616000         | 24.60         | 10.2         | 46            | 21.4         | AV       | L1   | GND |
| 14.068500        | 23.50         | 10.5         | 50            | 26.5         | AV       | L1   | GND |

|                    |     |              |   |
|--------------------|-----|--------------|---|
| Test mode: AC 120V | NFC | Polarization | N |
|--------------------|-----|--------------|---|



### MEASUREMENT RESULT: "GM1703305053\_fin"

3/30/2017 4:22PM

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.231000         | 41.50         | 10.3         | 62            | 20.9         | QP       | N    | GND |
| 0.474000         | 33.90         | 10.2         | 56            | 22.5         | QP       | N    | GND |
| 0.676500         | 30.10         | 10.2         | 56            | 25.9         | QP       | N    | GND |
| 1.801500         | 29.00         | 10.2         | 56            | 27.0         | QP       | N    | GND |
| 2.305500         | 30.60         | 10.2         | 56            | 25.4         | QP       | N    | GND |
| 13.762500        | 27.70         | 10.5         | 60            | 32.3         | QP       | N    | GND |

### MEASUREMENT RESULT: "GM1703305053\_fin2"

3/30/2017 4:22PM

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.226500         | 31.50         | 10.3         | 53            | 21.1         | AV       | N    | GND |
| 0.334500         | 25.60         | 10.2         | 49            | 23.7         | AV       | N    | GND |
| 0.474000         | 20.90         | 10.2         | 46            | 25.5         | AV       | N    | GND |
| 0.685500         | 20.10         | 10.2         | 46            | 25.9         | AV       | N    | GND |
| 1.806000         | 22.80         | 10.2         | 46            | 23.2         | AV       | N    | GND |
| 2.310000         | 23.20         | 10.2         | 46            | 22.8         | AV       | N    | GND |

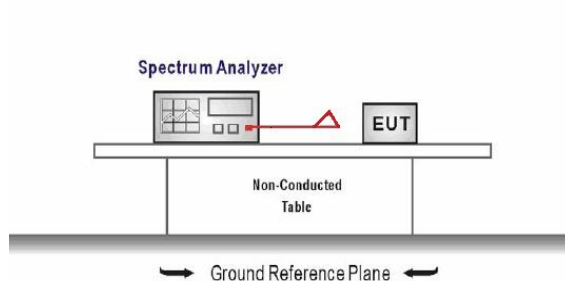
Remark: Transd=Cable lose+ PULSE LIMITER factor+ ARTIFICIAL MAINS factor; Margin= Limit -Level

### 5.3. 20dB bandwidth

#### LIMIT

Intentional radiators must be designed to ensure that the 20dB emission bandwidth in the specific band 13.553~13.567MHz.

#### TEST CONFIGURATION



#### TEST PROCEDURE

Configure the spectrum analyzer as shown below (enter all losses between the transmitter output and the spectrum analyzer).

Set the spectrum analyzer center frequency to the EUT nominal center frequency

RBW = 1 kHz, VBW  $\geq 3 \times$  RBW

Sweep time= auto couple

Detector = Peak

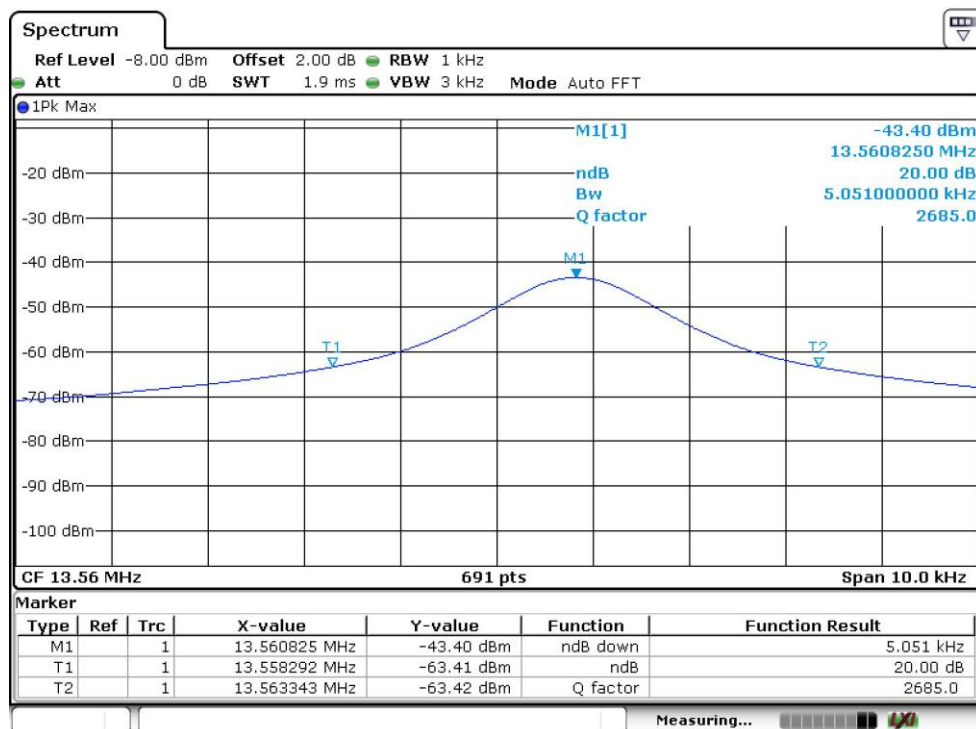
Trace mode = max hold

Measured the spectrum width with power higher than 20dB below carrier .

#### TEST RESULTS

| Frequency | 20dB Bandwidth(KHz) |
|-----------|---------------------|
| 13.56MHz  | 5.05                |

Test plot as follows:



## 5.4. Radiated Emission

### LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.209

| Frequency         | Limit (uV/m) | Measurement Distance(meters) |
|-------------------|--------------|------------------------------|
| 0.009MHz-0.490MHz | 2400/F(kHz)  | 300                          |
| 0.490MHz-1.705MHz | 24000/F(kHz) | 30                           |
| 1.705MHz-30MHz    | 30           | 30                           |
| 30MHz-88MHz       | 100          | 3                            |
| 88MHz-216MHz      | 150          | 3                            |
| 216MHz- 960MHz    | 200          | 3                            |
| Above 960MHz      | 500          | 3                            |

FCC CFR Title 47 Part 15 Subpart C Section 15.225

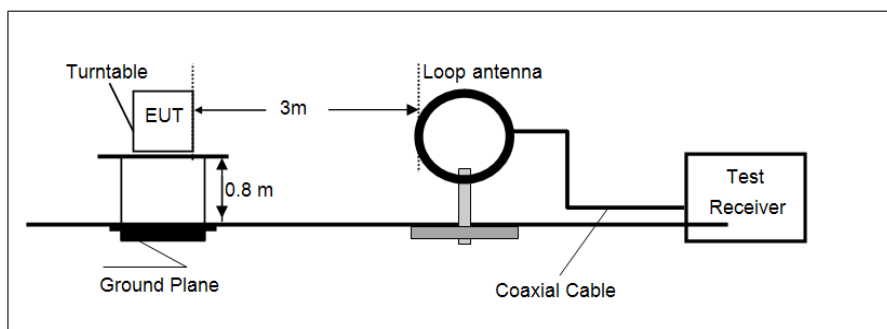
| Field Strength of Fundamental Emissions Limit |                           |                             |                            |
|-----------------------------------------------|---------------------------|-----------------------------|----------------------------|
| Frequency                                     | Field Strength (uV/m)@30m | Field Strength (dBuV/m)@30m | Field Strength (dBuV/m)@3m |
| 1.705MHz-13.110MHz                            | 30                        | 29.5                        | 69.5                       |
| 13.110MHz-13.410MHz                           | 106                       | 40.5                        | 80.5                       |
| 13.410MHz-13.553MHz                           | 334                       | 50.5                        | 90.5                       |
| 13.553MHz-13.567MHz                           | 15848                     | 84                          | 124.0                      |
| 13.567MHz-13.710MHz                           | 334                       | 50.5                        | 90.5                       |
| 13.710MHz-14.010MHz                           | 106                       | 40.5                        | 80.5                       |
| 14.010MHz-30MHz                               | 30                        | 29.5                        | 69.5                       |

$\text{dB}\mu\text{V/m} = 20\log(\mu\text{V/m})$

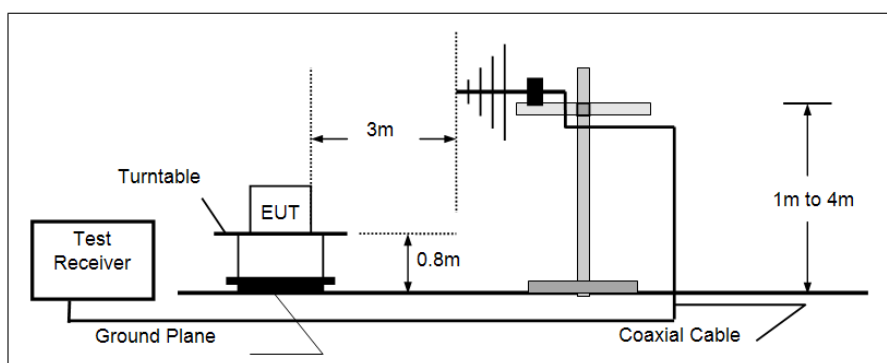
$3\text{m Limit}(\text{dB}\mu\text{V/m}) = 10\text{m Limit}(\text{dB}\mu\text{V/m}) + 40\log(10/3)$

### TEST CONFIGURATION

- 9KHz ~30MHz



- 30MHz ~ 1GHz



**TEST PROCEDURE**

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the loop receiving antenna mounted antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the receiving antenna was fixed at one meter above ground to find the maximum emissions field strength.
4. For Fundamental emissions, use the receiver to measure QP reading.
5. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
6. Compliance with the spectrum mask is tested with RBW set to 9kHz for below 30MHz, and 100kHz for 30MHz-1000MHz..

Note: Emission level (dB $\mu$ V/m) = 20 log Emission level ( $\mu$ V/m).

**TEST RESULTS**

All Measurements were performed using a loop antenna. The antenna was positioned in three orthogonal positions (X front, Y side, Z top) and the position with the highest emission level was recorded (X).

**Radiated Emission Measurement data:**

| Frequency MHz | Level dB $\mu$ V/m | Transd dB | Limit (dB $\mu$ V/m @3m) | Margin dB | Det. | Result |
|---------------|--------------------|-----------|--------------------------|-----------|------|--------|
| 0.03          | 43.61              | 22.15     | 118.06                   | -74.45    | QP   | Pass   |
| 0.05          | 34.58              | 22.15     | 113.63                   | -79.05    | QP   | Pass   |
| 0.28          | 30.15              | 22.22     | 98.66                    | -68.51    | QP   | Pass   |
| 1.02          | 30.47              | 22.22     | 67.43                    | -36.96    | QP   | Pass   |
| 5.61          | 30.26              | 22.32     | 69.50                    | -39.24    | QP   | Pass   |
| 21.39         | 30.38              | 22.47     | 69.50                    | -39.12    | QP   | Pass   |

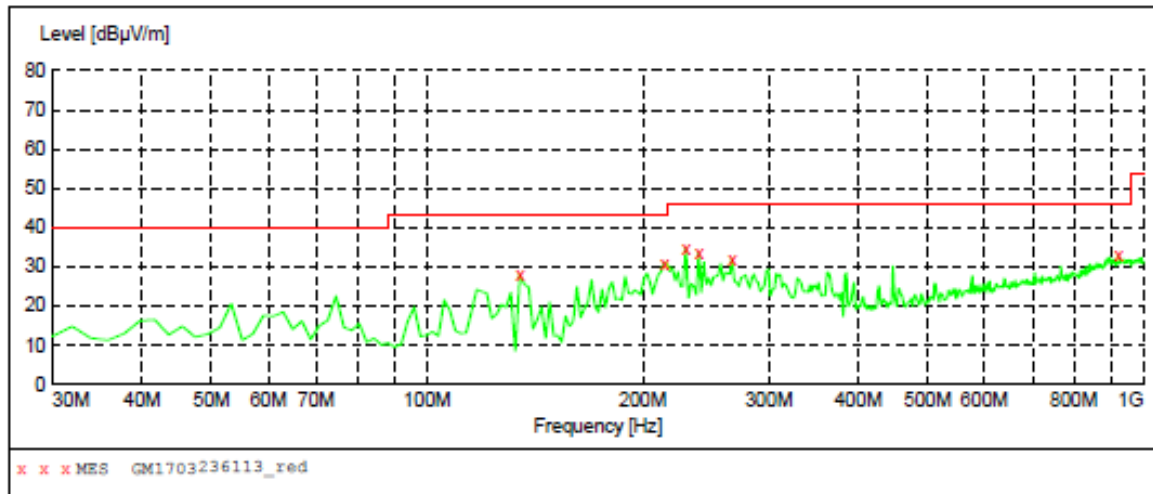
1. Level = Receiver Read level + Transd
2. Transd = Antenna Factor + Cable Loss

**Field Strength of Fundamental Emissions , etc Measurement data:**

| Mea.Frequency MHz | Test result (dB $\mu$ V/m@3m) | Limit (dB $\mu$ V/m @3m) | Margin dB | Det. | Result |
|-------------------|-------------------------------|--------------------------|-----------|------|--------|
| 13.349            | 47.24                         | 69.50                    | -22.26    | QP   | Pass   |
| 13.485            | 46.69                         | 69.50                    | -22.81    | QP   | Pass   |
| 13.581            | 46.92                         | 69.50                    | -22.58    | QP   | Pass   |
| 13.56             | 85.47                         | 124.00                   | -38.53    | QP   | Pass   |
| 13.658            | 46.91                         | 69.50                    | -22.59    | QP   | Pass   |
| 13.773            | 46.75                         | 69.50                    | -22.75    | QP   | Pass   |

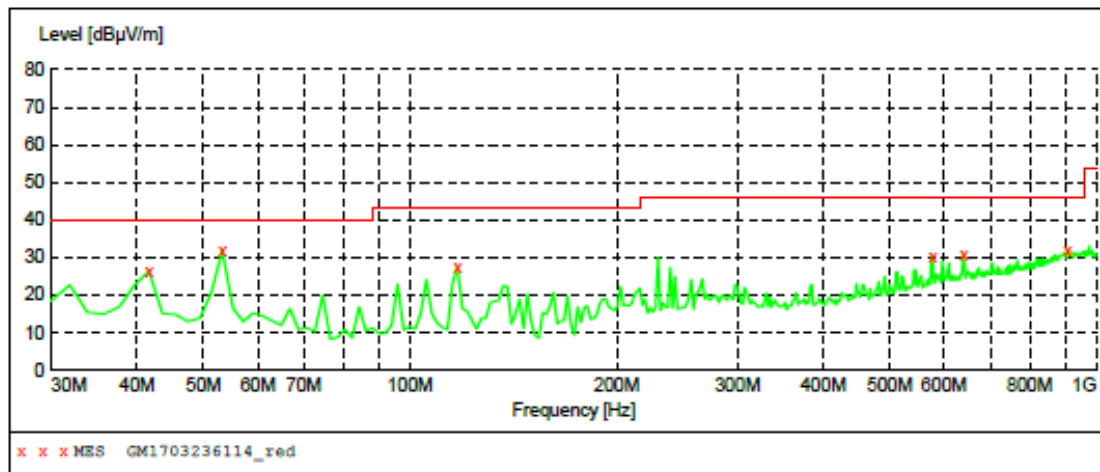
**Radiated Emission Measurement data:**

30MHz ~ 1GHz

**MEASUREMENT RESULT: "GM1703236113\_red"**

3/23/2017 7:30PM

| Frequency<br>MHz | Level<br>dBμV/m | Transd<br>dB | Limit<br>dBμV/m | Margin<br>dB | Det. | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------|--------------|-----------------|--------------|------|--------------|----------------|--------------|
| 134.760000       | 27.90           | -19.9        | 43.5            | 15.6         | QP   | 300.0        | 31.00          | HORIZONTAL   |
| 214.300000       | 30.80           | -15.5        | 43.5            | 12.7         | QP   | 100.0        | 72.00          | HORIZONTAL   |
| 229.820000       | 34.70           | -15.0        | 46.0            | 11.3         | QP   | 100.0        | 289.00         | HORIZONTAL   |
| 239.520000       | 33.50           | -14.6        | 46.0            | 12.5         | QP   | 100.0        | 311.00         | HORIZONTAL   |
| 266.680000       | 31.90           | -13.8        | 46.0            | 14.1         | QP   | 100.0        | 83.00          | HORIZONTAL   |
| 924.340000       | 32.80           | 1.4          | 46.0            | 13.2         | QP   | 100.0        | 132.00         | HORIZONTAL   |

**MEASUREMENT RESULT: "GM1703236114\_red"**

3/23/2017 7:33PM

| Frequency<br>MHz | Level<br>dBμV/m | Transd<br>dB | Limit<br>dBμV/m | Margin<br>dB | Det. | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------|--------------|-----------------|--------------|------|--------------|----------------|--------------|
| 41.640000        | 26.50           | -16.8        | 40.0            | 13.5         | QP   | 100.0        | 341.00         | VERTICAL     |
| 53.280000        | 31.90           | -16.5        | 40.0            | 8.1          | QP   | 100.0        | 318.00         | VERTICAL     |
| 117.300000       | 27.50           | -18.2        | 43.5            | 16.0         | QP   | 100.0        | 341.00         | VERTICAL     |
| 577.080000       | 30.40           | -5.4         | 46.0            | 15.6         | QP   | 100.0        | 0.00           | VERTICAL     |
| 641.100000       | 30.90           | -4.1         | 46.0            | 15.1         | QP   | 100.0        | 0.00           | VERTICAL     |
| 908.820000       | 32.00           | 1.2          | 46.0            | 14.0         | QP   | 100.0        | 354.00         | VERTICAL     |

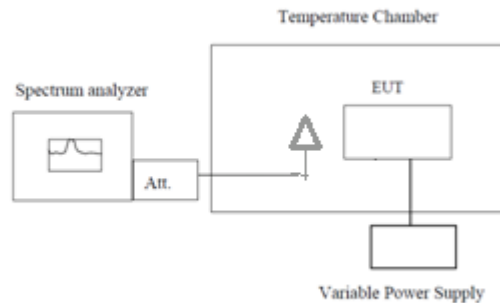
Remark: Transd=Cable lose+ Antenna factor- Pre-amplifier;Margin=Limit -Level

## 5.5. Frequency stability

### LIMIT

2.5ppm

### TEST CONFIGURATION



**Note :** Measurement setup for testing on Antenna connector

### TEST PROCEDURE

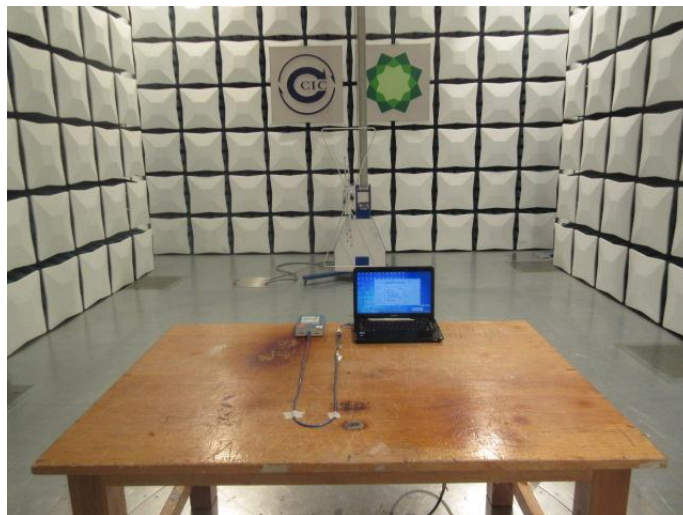
1. The equipment under test was connected to an external DC power supply and input rated voltage.
2. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators.
3. The EUT was placed inside the temperature chamber.
4. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 25°C operating frequency as reference frequency.
5. Turn EUT off and set the chamber temperature to -20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency.
6. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

### TEST RESULTS

| NFC 13.56MHz       |            |          |                 |              |                |                            |
|--------------------|------------|----------|-----------------|--------------|----------------|----------------------------|
| Voltage(%)         | Power(VDC) | TEMP(°C) | Meas.Freq.(MHz) | Freq.Dev(Hz) | Deviation(ppm) | Limit(ppm)                 |
| 100%               | 5.00       | -30      | 13.560825       | 825          | 60.8407        | -100><br>Deviation<br>>100 |
| 100%               |            | -20      | 13.560823       | 823          | 60.6932        |                            |
| 100%               |            | -10      | 13.560759       | 759          | 55.9735        |                            |
| 100%               |            | 0        | 13.560858       | 858          | 63.2743        |                            |
| 100%               |            | 10       | 13.560813       | 813          | 59.9558        |                            |
| 100%               |            | 20       | 13.560814       | 814          | 60.0295        |                            |
| 100%               |            | 30       | 13.560825       | 825          | 60.8407        |                            |
| 100%               |            | 40       | 13.560843       | 843          | 62.1681        |                            |
| 100%               |            | 50       | 13.560816       | 816          | 60.1770        |                            |
| Low Battery power  | 4.25       | 20       | 13.560814       | 814          | 60.0295        | -100><br>Deviation<br>>100 |
| High Battery power | 5.75       | 20       | 13.560858       | 858          | 63.2743        |                            |

## 6. Test Setup Photos of the EUT

### Radiated Emission



### Conducted Emission (PC Charge)

