

# FCC RADIO TEST REPORT

according to

47 CFR FCC Part 15 Subpart C § 15.225

**Equipment** : Point of Sales Terminal  
**Brand Name** : VeriFone  
**Model No.** : VX685  
**Filing Type** : New Application  
**Applicant** : VeriFone, Inc.  
1400 West Stanford Ranch Road Suite 200 Rocklin CA 95765 USA  
**FCC ID** : B32VX685GC  
**Manufacturer** :  
1. **Sanmina-SCI Systems (Kunshan) Co., Ltd.**  
312, Qingyang South Road, Economics & Technical  
Development Zone, Kunshan, Jiangsu Province, 215300,  
China  
2. **Inventec Appliances (Pudong) Co., Ltd.**  
No. 789, Pu Xing Road, Shanghai, P.R.C.  
3. **Flextronics Computing (Suzhou) Co., Ltd.**  
No. 1 Guanpu Road, Guoxiang Street, Wuzhong District,  
Suzhou, Jiangsu, China  
**Received Date** : Jan. 30, 2014  
**Final Test Date** : Feb. 20, 2014

## Statement

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.4-2003** and **47 CFR FCC Part 15 Subpart C**.

The test equipment used to perform the test is calibrated and traceable to NML/ROC.



**SPORTON INTERNATIONAL INC.**

**No. 52, Hwa Ya 1<sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.**

## Table of Contents

|                                                                        |           |
|------------------------------------------------------------------------|-----------|
| <b>1. SUMMARY OF THE TEST RESULT .....</b>                             | <b>1</b>  |
| <b>2. GENERAL INFORMATION.....</b>                                     | <b>2</b>  |
| 2.1 Product Details.....                                               | 2         |
| 2.2 Table for Test Modes .....                                         | 2         |
| 2.3 Table for Testing Locations .....                                  | 3         |
| 2.4 Table for Supporting Units .....                                   | 3         |
| 2.5 Test Configurations.....                                           | 3         |
| <b>3. TEST RESULT .....</b>                                            | <b>5</b>  |
| 3.1 AC Power Line Conducted Emissions Measurement .....                | 5         |
| 3.2 Field Strength of Fundamental Emissions and Mask Measurement ..... | 10        |
| 3.3 20dB Spectrum Bandwidth Measurement .....                          | 14        |
| 3.4 Radiated Emissions Measurement .....                               | 16        |
| 3.5 Frequency Stability Measurement .....                              | 23        |
| 3.6 Antenna Requirements.....                                          | 26        |
| <b>4. LIST OF MEASURING EQUIPMENT .....</b>                            | <b>27</b> |
| <b>5. TEST LOCATION.....</b>                                           | <b>28</b> |
| <b>6. TAF CERTIFICATE OF ACCREDITATION.....</b>                        | <b>29</b> |
| <b>APPENDIX A. SETUP PHOTOGRAPHS</b>                                   |           |

## REVISION HISTORY

| REPORT NO. | VERSION | DESCRIPTION             | ISSUED DATE   |
|------------|---------|-------------------------|---------------|
| FR413003   | Rev. 01 | Initial issue of report | Apr. 22, 2015 |
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# CERTIFICATE OF COMPLIANCE

according to

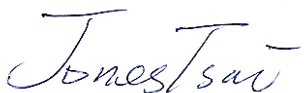
47 CFR FCC Part 15 Subpart C § 15.225

**Equipment** : Point of Sales Terminal  
**Brand Name** : VeriFone  
**Model No.** : VX685  
**VeriFone, Inc.**  
**Applicant** : 1400 West Stanford Ranch Road Suite 200 Rocklin CA  
95765 USA

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Jan. 30, 2014 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager

**SPORTON INTERNATIONAL INC.**

No. 52, Hwa Ya 1<sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

SPORTON INTERNATIONAL INC.

Report Format Version: a

Report Template No.: BU5-FR15CNFC Version 1.0

## 1. SUMMARY OF THE TEST RESULT

| Applied Standard: 47 CFR FCC Part 15 Subpart C |                     |           |                                         |          |                      |
|------------------------------------------------|---------------------|-----------|-----------------------------------------|----------|----------------------|
| Part                                           | FCC Rule            | IC Rule   | Description of Test                     | Result   | Under Limit          |
| 3.1                                            | 15.207              | Gen 7.2.4 | AC Power Line Conducted Emissions       | Complies | 12.40dB at 0.518MHz  |
| 3.2                                            | 15.225(a)(b)(c)     | A2.6      | Field Strength of Fundamental Emissions | Complies | 42.22dB at 13.560MHz |
| 3.3                                            | 2.1049              | -         | 20dB Spectrum Bandwidth                 | Complies | -                    |
| 3.4                                            | 15.225(d)<br>15.209 | A2.6      | Radiated Emissions                      | Complies | 3.79dB at 31.620MHz  |
| 3.5                                            | 15.225(e)           | A2.6      | Frequency Stability                     | Complies | -                    |
| 3.6                                            | 15.203              | -         | Antenna Requirements                    | Complies | -                    |

| Test Items                                    | Uncertainty           | Remark                   |
|-----------------------------------------------|-----------------------|--------------------------|
| AC Power Line Conducted Emissions             | ±2.3dB                | Confidence levels of 95% |
| Field Strength of Fundamental Emissions       | ±0.8dB                | Confidence levels of 95% |
| 20dB Spectrum Bandwidth / Frequency Stability | ±8.5×10 <sup>-8</sup> | Confidence levels of 95% |
| Radiated / Band Edge Emissions (9kHz~30MHz)   | ±0.8dB                | Confidence levels of 95% |
| Radiated Emissions (30MHz~1000MHz)            | ±1.9dB                | Confidence levels of 95% |
| Temperature                                   | ±0.7°C                | Confidence levels of 95% |
| Humidity                                      | ±3.2%                 | Confidence levels of 95% |
| DC / AC Power Source                          | ±1.4%                 | Confidence levels of 95% |

## 2. GENERAL INFORMATION

### 2.1 Product Details

For more detailed features description, please refer to the manufacturer's specifications or user's manual.

| Items                   | Description        |
|-------------------------|--------------------|
| Power Type              | 5Vdc from Adapter  |
| Modulation              | ASK                |
| Channel Number          | 1                  |
| Channel Bandwidth (99%) | 2.240kHz           |
| Max. Field Strength     | 81.78dB $\mu$ V/m  |
| Test Freq. Range        | 13.553 ~ 13.567MHz |
| Carrier Frequencies     | 13.56 MHz (Ch. 1)  |
| Antenna                 | Loop Antenna       |

### 2.2 Table for Test Modes

Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

| Test Items                                                               | Mode          | Channel |
|--------------------------------------------------------------------------|---------------|---------|
| AC Power Line Conducted Emissions                                        | CTX           | -       |
| Field Strength of Fundamental Emissions                                  | CTX           | 1       |
| 20dB Spectrum Bandwidth                                                  | CTX           | 1       |
| Radiated Emissions 9kHz~30MHz                                            | CTX           | 1       |
| Radiated Emissions 9kHz~10 <sup>th</sup> Harmonic<br>Band Edge Emissions | CTX           | 1       |
| Frequency Stability                                                      | Un-modulation | 1       |

Note:

1. CTX=continuously transmitting.
2. The EUT choose "Run EMC Test", "All Off", and then choose "Carrier on". Then, the EUT will get into the engineering modes to continuously transmit at 13.56MHz.

## 2.3 Table for Testing Locations

| Test Site No. | Site Category | Location |
|---------------|---------------|----------|
| CO05-HY       | Conduction    | Hwa Ya   |
| TH02-HY       | OVEN Room     | Hwa Ya   |
| 03CH07-HY     | SAC           | Hwa Ya   |

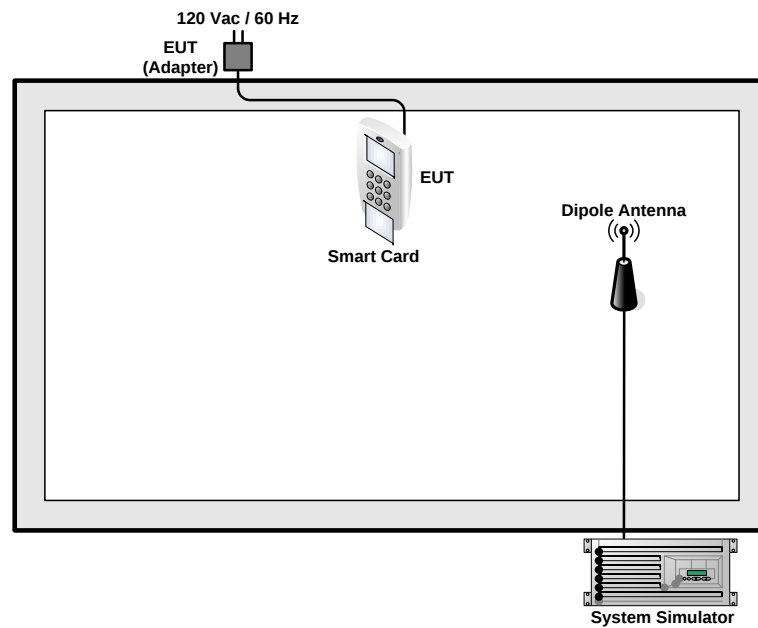
Semi Anechoic Chamber (SAC).

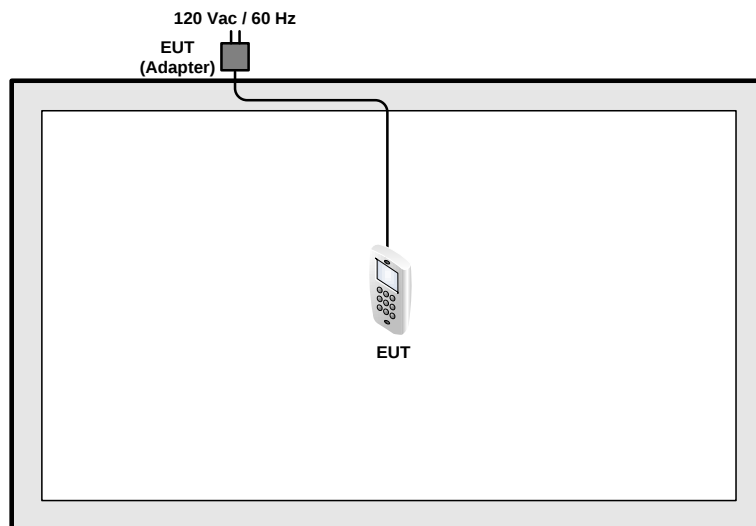
## 2.4 Table for Supporting Units

| Support Unit     | Manufacturer | Model   | FCC ID |
|------------------|--------------|---------|--------|
| System Simulator | R&S          | CMU 200 | N/A    |
| Smart Card       | N/A          | N/A     | N/A    |

## 2.5 Test Configurations

### <AC Conducted Emissions>



**Fundamental Emissions and Mask Measurement****For radiated emissions 9kHz~30MHz****For radiated emissions 30MHz~1GHz**

### 3. TEST RESULT

#### 3.1 AC Power Line Conducted Emissions Measurement

##### 3.1.1 Limit

For a Low-power Radio-frequency device which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

| Frequency (MHz) | QP Limit (dB $\mu$ V) | AV Limit (dB $\mu$ V) |
|-----------------|-----------------------|-----------------------|
| 0.15~0.5        | 66~56                 | 56~46                 |
| 0.5~5           | 56                    | 46                    |
| 5~30            | 60                    | 50                    |

##### 3.1.2 Measuring Instruments and Setting

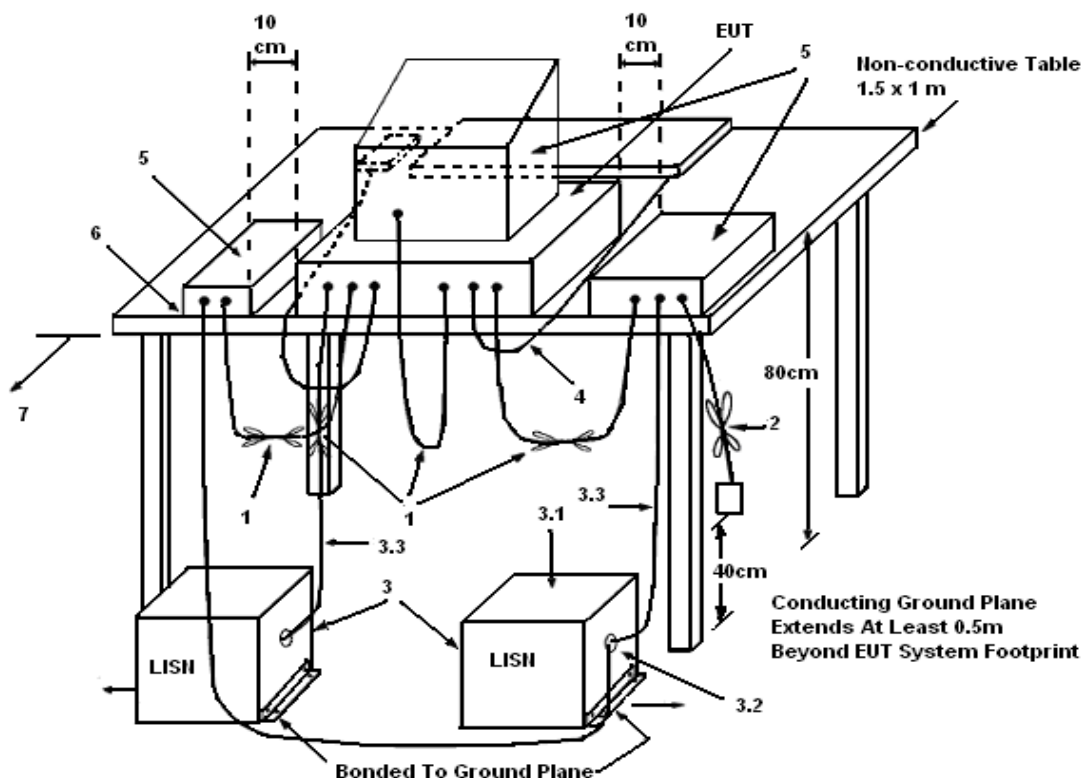
Please refer to section 4 of equipments list in this report. The following table is the setting of the receiver.

| Receiver Parameters | Setting  |
|---------------------|----------|
| Attenuation         | 10 dB    |
| Start Frequency     | 0.15 MHz |
| Stop Frequency      | 30 MHz   |
| IF Bandwidth        | 9 kHz    |

##### 3.1.3 Test Procedures

1. Configure the EUT according to ANSI C63.4. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

### 3.1.4 Test Setup Layout



LEGEND:

- (1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- (2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- (3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50  $\Omega$ . LISN can be placed on top of, or immediately beneath, reference ground plane.
  - (3.1) All other equipment powered from additional LISN(s).
  - (3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
  - (3.3) LISN at least 80 cm from nearest part of EUT chassis.
- (4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
- (5) Non-EUT components of EUT system being tested.
- (6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
- (7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

**3.1.5 Test Deviation**

There is no deviation with the original standard.

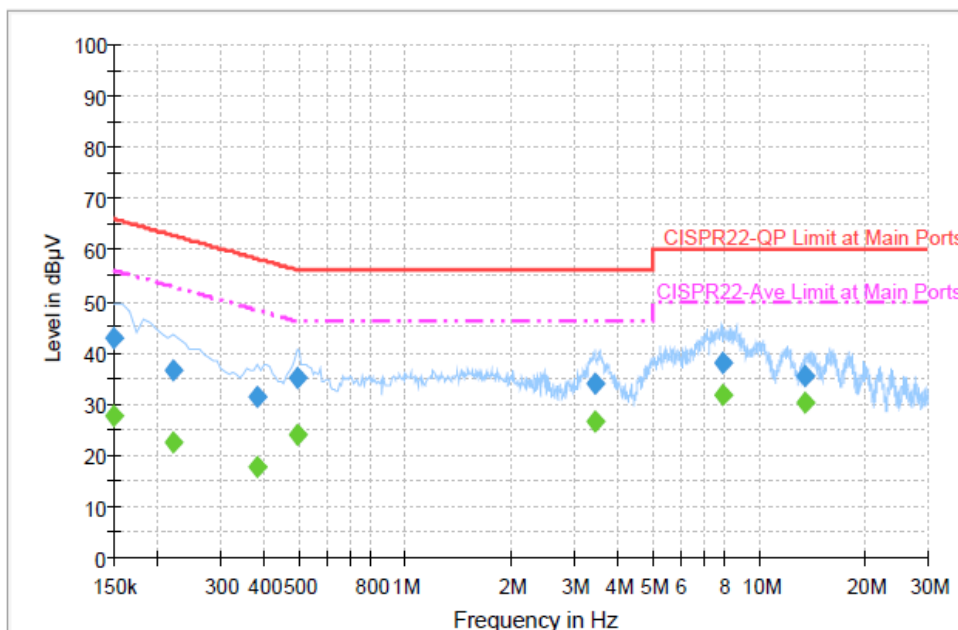
**3.1.6 EUT Operation during Test**

The EUT was placed on the test table and programmed in transmitting function.

## 3.1.7 Results of AC Power Line Conducted Emissions Measurement

|                        |                                           |                      |                              |
|------------------------|-------------------------------------------|----------------------|------------------------------|
| <b>Final Test Date</b> | Feb. 20, 2014                             | <b>Test Site No.</b> | CO05-HY                      |
| <b>Temperature</b>     | 20~22°C                                   | <b>Humidity</b>      | 46~48%                       |
| <b>Test Engineer</b>   | Kai-Chun Chu                              | <b>Configuration</b> | Transmitting Mode (13.56MHz) |
| <b>Mode</b>            | NFC Tx + Smart Card + Battery + Adapter 1 |                      |                              |

Line



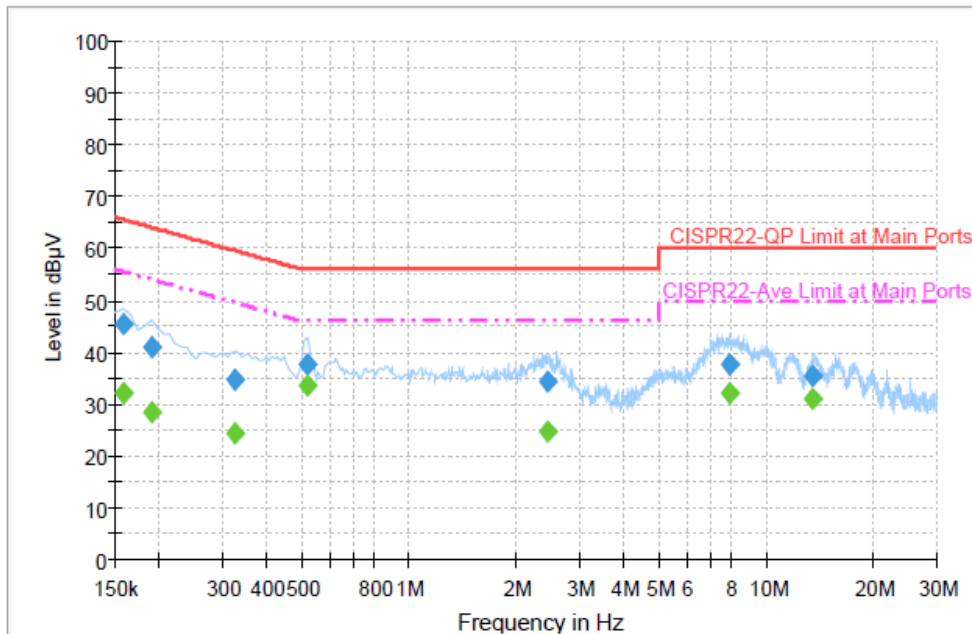
## Final Result: Quasi-Peak

| Frequency (MHz) | Quasi-Peak (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|-------------------|--------|------|------------|-------------|--------------|
| 0.150000        | 42.9              | Off    | L1   | 19.4       | 23.1        | 66.0         |
| 0.222000        | 36.6              | Off    | L1   | 19.3       | 26.1        | 62.7         |
| 0.382000        | 31.4              | Off    | L1   | 19.6       | 26.8        | 58.2         |
| 0.494000        | 35.0              | Off    | L1   | 19.5       | 21.1        | 56.1         |
| 3.438000        | 34.1              | Off    | L1   | 19.5       | 21.9        | 56.0         |
| 7.918000        | 38.1              | Off    | L1   | 19.6       | 21.9        | 60.0         |
| 13.558000       | 35.4              | Off    | L1   | 19.8       | 24.6        | 60.0         |

## Final Result: Average

| Frequency (MHz) | Average (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|----------------|--------|------|------------|-------------|--------------|
| 0.150000        | 27.5           | Off    | L1   | 19.4       | 28.5        | 56.0         |
| 0.222000        | 22.5           | Off    | L1   | 19.3       | 30.2        | 52.7         |
| 0.382000        | 17.8           | Off    | L1   | 19.6       | 30.4        | 48.2         |
| 0.494000        | 24.0           | Off    | L1   | 19.5       | 22.1        | 46.1         |
| 3.438000        | 26.7           | Off    | L1   | 19.5       | 19.3        | 46.0         |
| 7.918000        | 31.7           | Off    | L1   | 19.6       | 18.3        | 50.0         |
| 13.558000       | 30.2           | Off    | L1   | 19.8       | 19.8        | 50.0         |

Neutral



## Final Result: Quasi-Peak

| Frequency (MHz) | Quasi-Peak (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|-------------------|--------|------|------------|-------------|--------------|
| 0.158000        | 45.4              | Off    | N    | 19.3       | 20.2        | 65.6         |
| 0.190000        | 40.9              | Off    | N    | 19.4       | 23.1        | 64.0         |
| 0.326000        | 34.6              | Off    | N    | 19.5       | 25.0        | 59.6         |
| 0.518000        | 37.8              | Off    | N    | 19.6       | 18.2        | 56.0         |
| 2.446000        | 34.2              | Off    | N    | 19.6       | 21.8        | 56.0         |
| 7.878000        | 37.5              | Off    | N    | 19.6       | 22.5        | 60.0         |
| 13.558000       | 35.5              | Off    | N    | 19.8       | 24.5        | 60.0         |

## Final Result: Average

| Frequency (MHz) | Average (dBμV) | Filter | Line | Corr. (dB) | Margin (dB) | Limit (dBμV) |
|-----------------|----------------|--------|------|------------|-------------|--------------|
| 0.158000        | 32.3           | Off    | N    | 19.3       | 23.3        | 55.6         |
| 0.190000        | 28.4           | Off    | N    | 19.4       | 25.6        | 54.0         |
| 0.326000        | 24.3           | Off    | N    | 19.5       | 25.3        | 49.6         |
| 0.518000        | 33.6           | Off    | N    | 19.6       | 12.4        | 46.0         |
| 2.446000        | 24.8           | Off    | N    | 19.6       | 21.2        | 46.0         |
| 7.878000        | 31.9           | Off    | N    | 19.6       | 18.1        | 50.0         |
| 13.558000       | 30.8           | Off    | N    | 19.8       | 19.2        | 50.0         |

### 3.2 Field Strength of Fundamental Emissions and Mask Measurement

#### 3.2.1 Limit

Field strength of fundamental emissions limit:

The field strength of fundamental emissions shall not exceed 15848 microvolts/meter at 30 meters.

The emissions limit in this paragraph is based on measurement instrumentation employing a QP detector.

| Frequencies (MHz)  | Field Strength (microvolts/meter) | Field Strength (dBμV/m) at 10m | Field Strength (dBμV/m) at 3m |
|--------------------|-----------------------------------|--------------------------------|-------------------------------|
| 13.553 ~ 13.567MHz | 15848 at 30m                      | 103.08 (QP)                    | 124 (QP)                      |

Mask limit:

| Rules and specifications | CFR 47 Part 15 section 15.225(a)-(d)                                                                                       |                              |                                |                                |                               |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------------|--------------------------------|-------------------------------|
| Description              | Compliance with the spectrum mask is tested using a spectrum analyzer with RBW set to a 9kHz for the band 13.553~13.567MHz |                              |                                |                                |                               |
| Limit                    | Freq. of Emission (MHz)                                                                                                    | Field Strength (μV/m) at 30m | Field Strength (dBμV/m) at 30m | Field Strength (dBμV/m) at 10m | Field Strength (dBμV/m) at 3m |
|                          | 1.705~13.110                                                                                                               | 30                           | 29.5                           | 48.58                          | 69.5                          |
|                          | 13.110~13.410                                                                                                              | 106                          | 40.5                           | 59.58                          | 80.5                          |
|                          | 13.410~13.553                                                                                                              | 334                          | 50.5                           | 69.58                          | 90.5                          |
|                          | 13.553~13.567                                                                                                              | 15848                        | 84.0                           | 103.08                         | 124.0                         |
|                          | 13.567~13.710                                                                                                              | 334                          | 50.5                           | 69.58                          | 90.5                          |
|                          | 13.710~14.010                                                                                                              | 106                          | 40.5                           | 59.58                          | 80.5                          |
|                          | 14.010~30.000                                                                                                              | 30                           | 29.5                           | 48.58                          | 69.5                          |

#### 3.2.2 Measuring Instruments and Setting

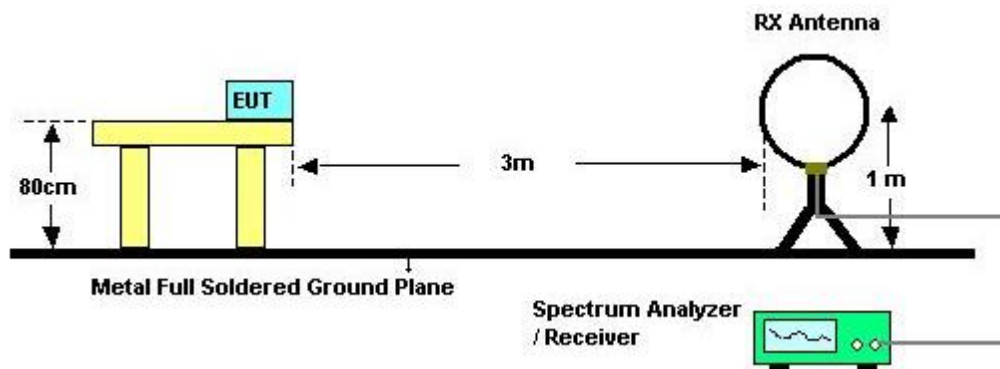
Please refer to section 4 of equipments list in this report. The following table is the setting of the receiver.

| Receiver Parameter | Setting               |
|--------------------|-----------------------|
| Attenuation        | Auto                  |
| Center Frequency   | Fundamental Frequency |
| RBW                | 9 kHz                 |
| Detector           | QP                    |

### 3.2.3 Test Procedures

1. Configure the EUT according to ANSI C63.4. 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 using a spectrum analyzer with RBW set to a 9kHz for the band 13.553~13.567MHz.

### 3.2.4 Test Setup Layout



### 3.2.5 Test Deviation

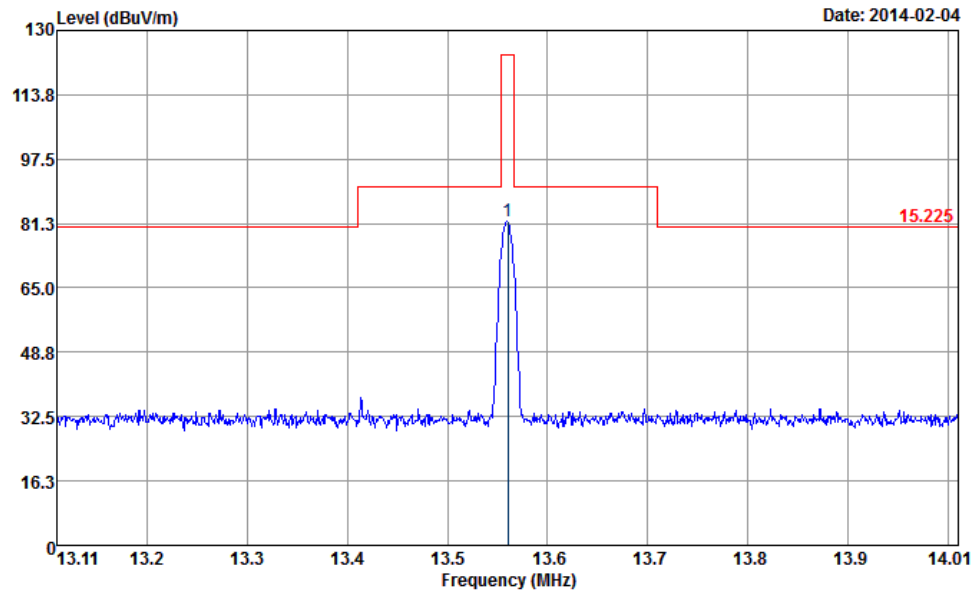
There is no deviation with the original standard.

### 3.2.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

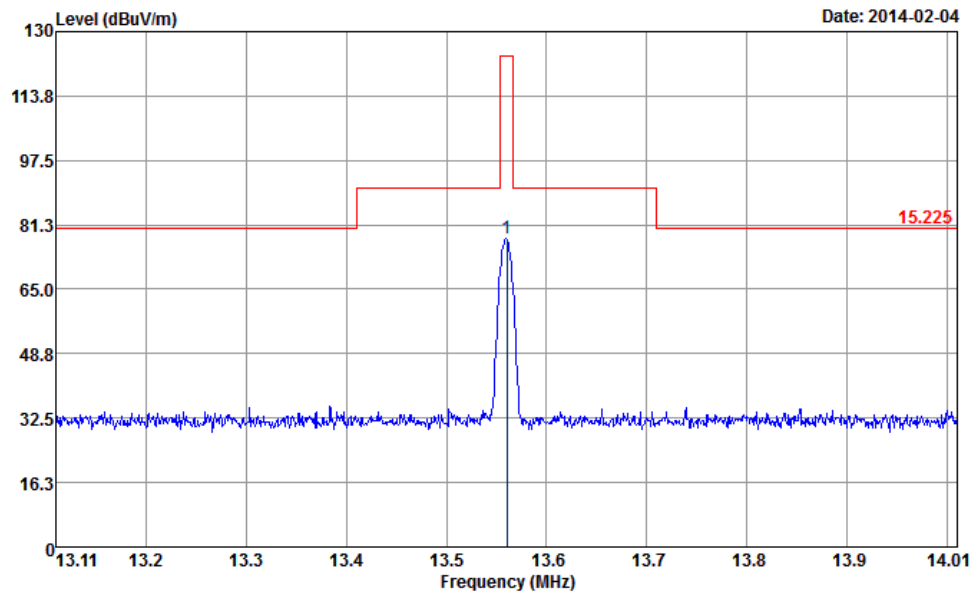
## 3.2.7 Test Result of Field Strength of Fundamental Emissions

|                 |               |                |           |
|-----------------|---------------|----------------|-----------|
| Final Test Date | Feb. 04, 2014 | Test Site No.  | 03CH07-HY |
| Temperature     | 20~22°C       | Humidity       | 49~51%    |
| Test Engineer   | Eric Shih     | Configurations | Ch. 1     |



Site : 03CH07-HY  
Condition : 15.225 3m NFC FACTOR(120912)-H HORIZONTAL  
Project : FR 413003  
Mode : 1

|   | Freq  | Level  | Over   | Limit  | ReadAntenna | Cable | A/Pos | T/Pos | Remark |
|---|-------|--------|--------|--------|-------------|-------|-------|-------|--------|
|   | MHz   | dBuV/m | dB     | dBuV/m | dBuV        | dB/m  | dB    | cm    | deg    |
| 1 | 13.56 | 81.78  | -42.22 | 124.00 | 61.63       | 19.75 | 0.40  | 100   | 185 QP |



Site : 03CH07-HY  
Condition : 15.225 3m NFC FACTOR(120912)-V VERTICAL  
Project : FR 413003  
Mode : 1

|   | Freq  | Level  | Over   | Limit  | ReadAntenna | Cable | A/Pos | T/Pos | Remark |
|---|-------|--------|--------|--------|-------------|-------|-------|-------|--------|
|   | MHz   | dBuV/m | dB     | dBuV/m | dBuV        | dB/m  | dB    | cm    | deg    |
| 1 | 13.56 | 77.70  | -46.30 | 124.00 | 57.55       | 19.75 | 0.40  | 100   | 276 QP |

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Measured distance is 3m.

All emissions emit form non-NFC function of digital unintentional emissions. All NFC's spurious emissions are below 20dB of limits.

### 3.3 20dB Spectrum Bandwidth Measurement

#### 3.3.1 Limit

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

#### 3.3.2 Measuring Instruments and Setting

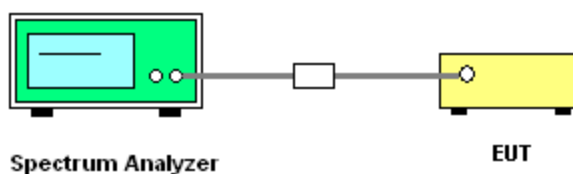
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

| Spectrum Parameters | Setting          |
|---------------------|------------------|
| Attenuation         | Auto             |
| Span Frequency      | > 20dB Bandwidth |
| RBW                 | 1 kHz            |
| VBW                 | 3 kHz            |
| Detector            | Peak             |
| Trace               | Max Hold         |
| Sweep Time          | Auto             |

#### 3.3.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The resolution bandwidth of 1kHz and the video bandwidth of 3kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.

#### 3.3.4 Test Setup Layout



#### 3.3.5 Test Deviation

There is no deviation with the original standard.

#### 3.3.6 EUT Operation during Test

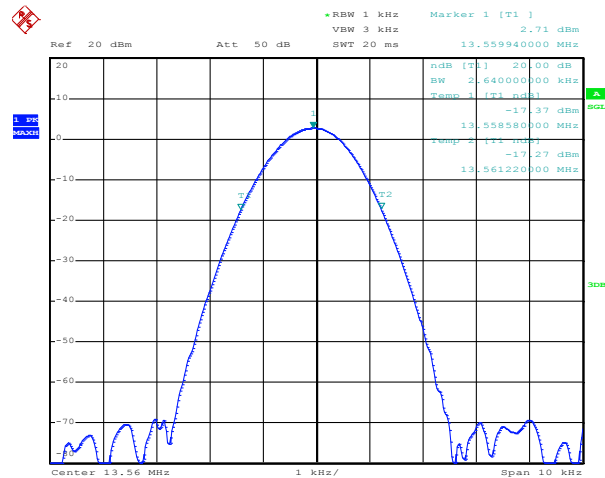
The EUT was programmed to be in continuously transmitting mode.

## 3.3.7 Test Result of 20dB Spectrum Bandwidth

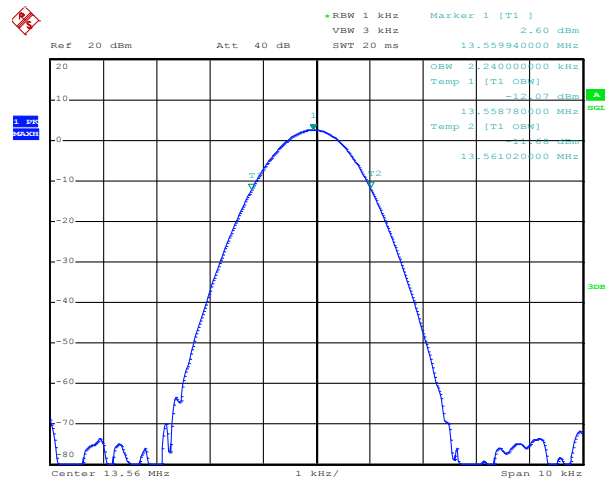
|                 |               |                |         |
|-----------------|---------------|----------------|---------|
| Final Test Date | Feb. 06, 2014 | Test Site No.  | TH02-HY |
| Temperature     | 22~24°C       | Humidity       | 53~55%  |
| Test Engineer   | Tommy Lee     | Configurations | Ch. 1   |

| Frequency | 20dB BW (kHz) | 99% OBW (kHz) | Frequency range (MHz)<br>$f_L > 13.553\text{MHz}$ | Frequency range (MHz)<br>$f_H < 13.567\text{MHz}$ | Test Result |
|-----------|---------------|---------------|---------------------------------------------------|---------------------------------------------------|-------------|
| 13.56 MHz | 2.640         | 2.240         | 13.55858                                          | 13.56122                                          | Complies    |

## 20 dB / 99% Bandwidth Plot on 13.56 MHz



Date: 6.FEB.2014 09:40:28



Date: 6.FEB.2014 10:49:06

### 3.4 Radiated Emissions Measurement

#### 3.4.1 Limit

The field strength of any emissions which appear outside of 13.553 ~ 13.567MHz band shall not exceed the general radiated emissions limits.

| Frequencies<br>(MHz) | Field Strength<br>( $\mu$ V/m) | Measurement Distance<br>(meters) |
|----------------------|--------------------------------|----------------------------------|
| 0.009~0.490          | 2400/F(kHz)                    | 300                              |
| 0.490~1.705          | 24000/F(kHz)                   | 30                               |
| 1.705~30.0           | 30                             | 30                               |
| 30~88                | 100                            | 3                                |
| 88~216               | 150                            | 3                                |
| 216~960              | 200                            | 3                                |
| Above 960            | 500                            | 3                                |

#### 3.4.2 Measuring Instruments and Setting

Please refer to section 4 of equipment list in this report. The following table is the setting of receiver.

| Receiver Parameter     | Setting                             |
|------------------------|-------------------------------------|
| Attenuation            | Auto                                |
| Start ~ Stop Frequency | 9kHz~150kHz / RBW 200Hz for QP      |
| Start ~ Stop Frequency | 150kHz~30MHz / RBW 9kHz for QP      |
| Start ~ Stop Frequency | 30MHz~1000MHz / RBW 120kHz for Peak |

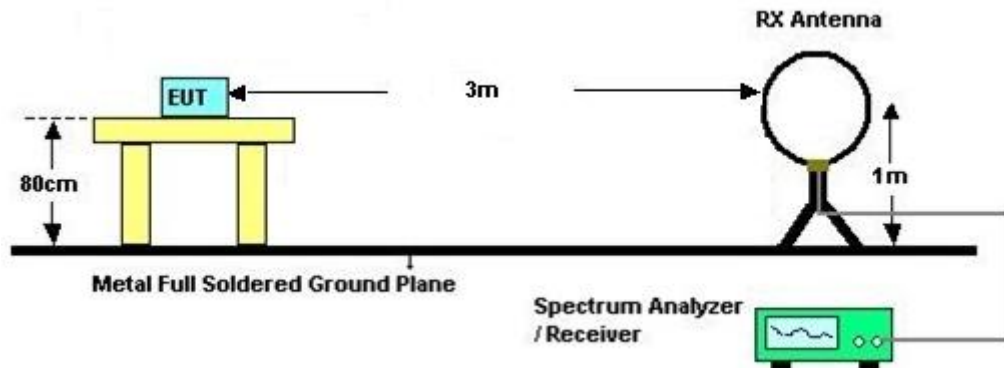
**Note:** The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

**3.4.3 Test Procedures**

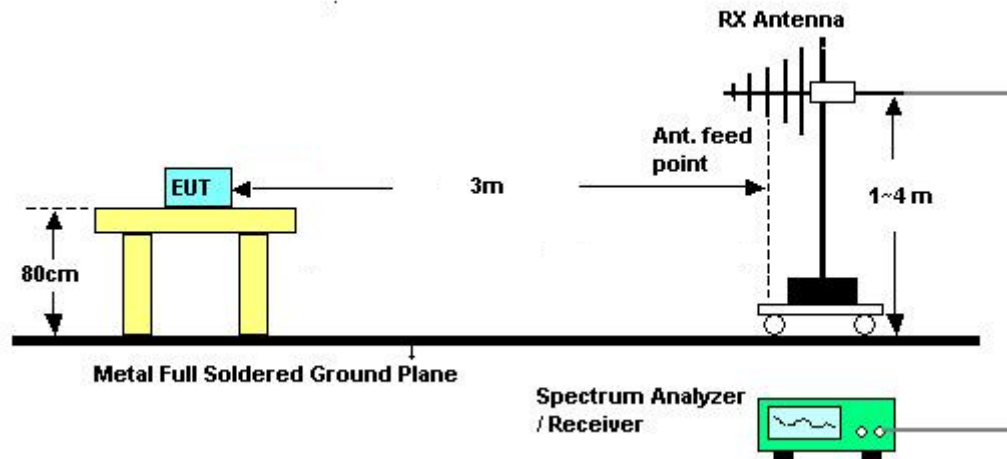
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. 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.
7. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

### 3.4.4 Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



### 3.4.5 Test Deviation

There is no deviation with the original standard.

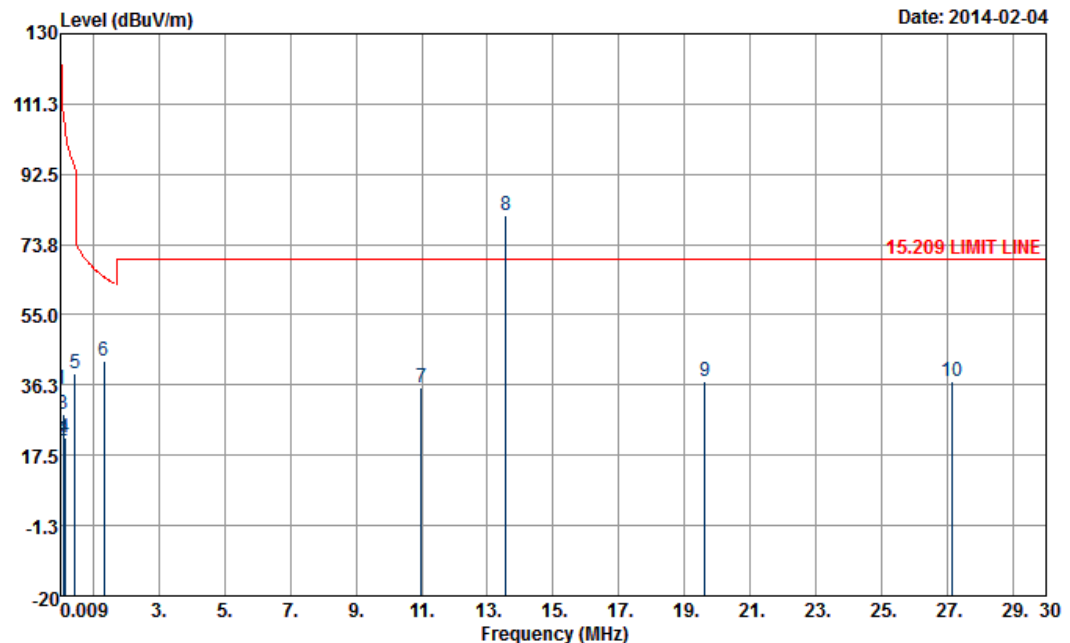
### 3.4.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

## 3.4.7 Results of Radiated Emissions (9kHz~30MHz)

|                 |               |                |           |
|-----------------|---------------|----------------|-----------|
| Final Test Date | Feb. 04, 2014 | Test Site No.  | 03CH07-HY |
| Temperature     | 20~22°C       | Humidity       | 49~51%    |
| Test Engineer   | Eric Shih     | Configurations | Ch. 1     |

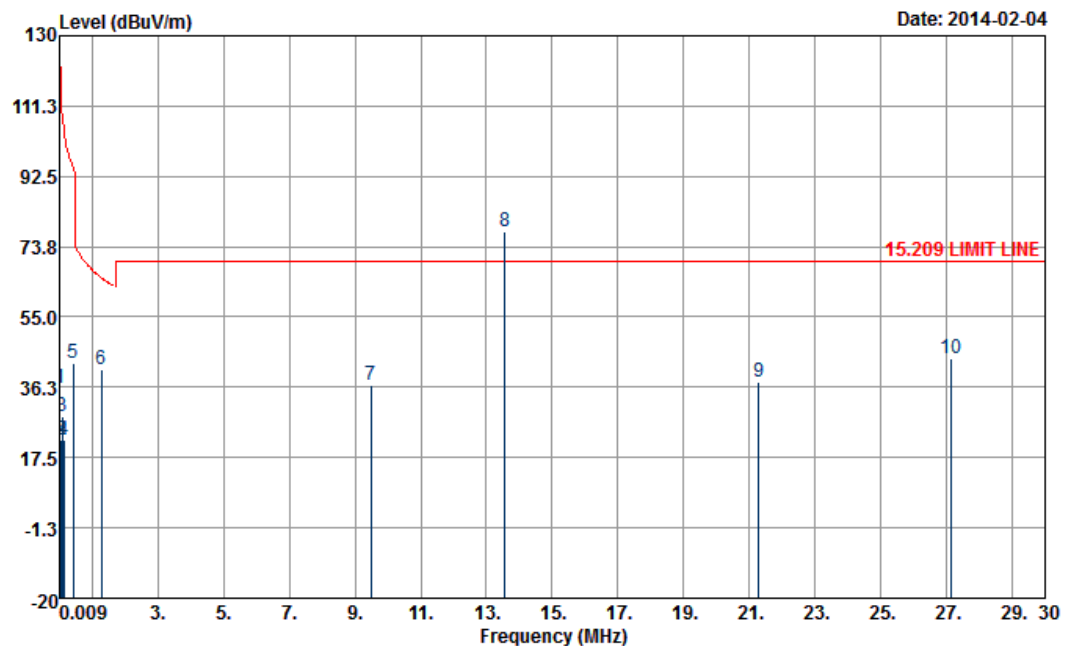
## Horizontal



Site : 03CH07-HY  
Condition : 15.209 LIMIT LINE 3m NFC FACTOR(120912)-H HORIZONTAL  
Project : FR 413003  
Mode : 1

|     | Freq  | Level  | Over   | Limit  | ReadAntenna | Cable  | A/Pos | T/Pos | Remark  |
|-----|-------|--------|--------|--------|-------------|--------|-------|-------|---------|
|     | MHz   | dBuV/m | dB     | dBuV/m | Level       | Factor | Loss  | cm    | deg     |
| 1   | 0.02  | 35.27  | -87.24 | 122.51 | 14.72       | 20.26  | 0.29  | ---   | Average |
| 2   | 0.09  | 21.47  | -87.49 | 108.96 | 1.11        | 20.07  | 0.29  | ---   | Average |
| 3   | 0.10  | 28.59  | -78.66 | 107.25 | 8.23        | 20.07  | 0.29  | ---   | QP      |
| 4   | 0.14  | 22.19  | -82.34 | 104.53 | 1.84        | 20.06  | 0.29  | ---   | Average |
| 5   | 0.45  | 39.37  | -55.18 | 94.55  | 19.08       | 20.00  | 0.29  | ---   | Average |
| 6   | 1.32  | 42.47  | -22.70 | 65.17  | 22.15       | 20.01  | 0.31  | 100   | 164 QP  |
| 7   | 10.99 | 35.53  | -34.47 | 70.00  | 15.37       | 19.77  | 0.39  | ---   | QP      |
| 8 * | 13.56 | 81.66  |        |        | 61.51       | 19.75  | 0.40  | ---   | QP      |
| 9   | 19.63 | 37.19  | -32.81 | 70.00  | 16.66       | 20.10  | 0.43  | ---   | QP      |
| 10  | 27.12 | 37.24  | -32.76 | 70.00  | 16.38       | 20.38  | 0.48  | ---   | QP      |

## Vertical



Site : 03CH07-HY  
 Condition : 15.209 LIMIT LINE 3m NFC FACTOR(120912)-V VERTICAL  
 Project : FR 413003  
 Mode : 1

|     | Freq  | Level  | Over   | Limit  | ReadAntenna | Cable  | A/Pos | T/Pos | Remark  |
|-----|-------|--------|--------|--------|-------------|--------|-------|-------|---------|
|     | MHz   | dBuV/m | Limit  | Line   | Level       | Factor | Loss  |       |         |
|     |       |        | dB     | dBuV/m | dBuV        | dB/m   | dB    | cm    | deg     |
| 1   | 0.02  | 36.14  | -86.35 | 122.49 | 15.59       | 20.26  | 0.29  | ---   | Average |
| 2   | 0.06  | 22.18  | -89.43 | 111.61 | 1.78        | 20.11  | 0.29  | ---   | Average |
| 3   | 0.10  | 28.48  | -78.81 | 107.29 | 8.12        | 20.07  | 0.29  | ---   | QP      |
| 4   | 0.15  | 22.10  | -82.27 | 104.37 | 1.77        | 20.04  | 0.29  | ---   | Average |
| 5   | 0.44  | 42.67  | -52.12 | 94.79  | 22.38       | 20.00  | 0.29  | ---   | Average |
| 6   | 1.29  | 40.84  | -24.58 | 65.42  | 20.52       | 20.01  | 0.31  | 100   | 293 QP  |
| 7   | 9.49  | 36.83  | -33.17 | 70.00  | 16.70       | 19.75  | 0.38  | ---   | QP      |
| 8 * | 13.56 | 77.57  |        |        | 57.42       | 19.75  | 0.40  | ---   | QP      |
| 9   | 21.28 | 37.73  | -32.27 | 70.00  | 17.04       | 20.26  | 0.43  | ---   | QP      |
| 10  | 27.12 | 44.05  | -25.95 | 70.00  | 23.19       | 20.38  | 0.48  | ---   | QP      |

## Note:

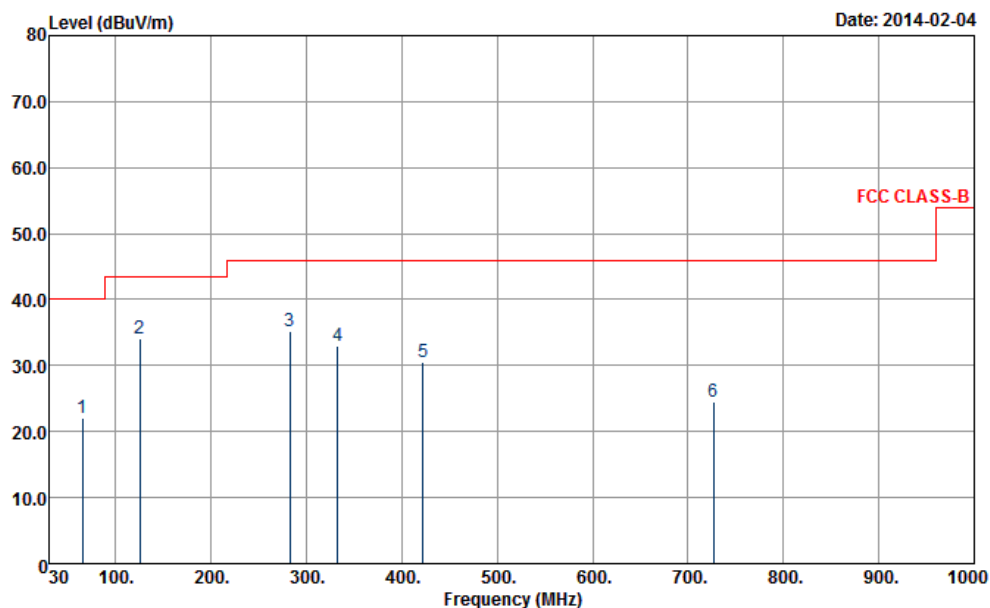
- Remark 8 is transmitter's fundamental signal.
- The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

## 3.4.8 Results for Radiated Emissions (30MHz~1GHz)

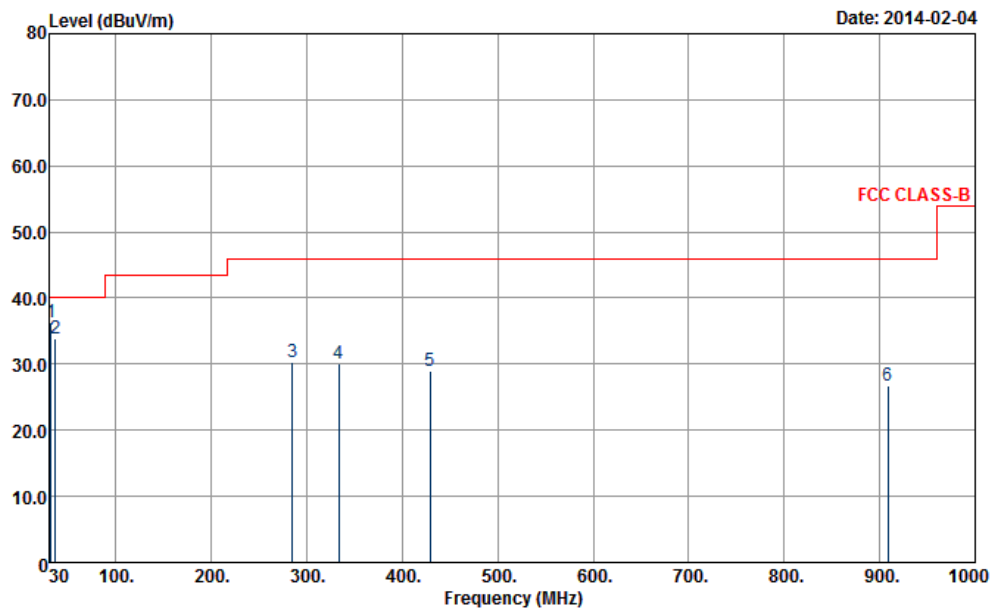
|                 |               |                |           |
|-----------------|---------------|----------------|-----------|
| Final Test Date | Feb. 04, 2014 | Test Site No.  | 03CH07-HY |
| Temperature     | 20~22°C       | Humidity       | 49~51%    |
| Test Engineer   | Eric Shih     | Configurations | Ch. 1     |

**Horizontal**

Site : 03CH07-HY  
Condition : FCC CLASS-B 3m LF-ANT(131102) HORIZONTAL  
Project : FR 413003  
Mode : 1

|   | Freq   | Level  | Over   | Limit  | ReadAntenna | Cable  | Preamp | A/Pos  | T/Pos | Remark |
|---|--------|--------|--------|--------|-------------|--------|--------|--------|-------|--------|
|   | MHz    | dBuV/m | Limit  | Line   | Level       | Factor | Loss   | Factor |       |        |
|   |        |        | dB     | dBuV/m | dBuV        | dB/m   | dB     | dB     | cm    | deg    |
| 1 | 64.83  | 21.98  | -18.02 | 40.00  | 46.38       | 6.00   | 0.80   | 31.20  | ---   | ---    |
| 2 | 125.04 | 34.06  | -9.44  | 43.50  | 52.44       | 11.60  | 1.12   | 31.10  | 138   | 37     |
| 3 | 282.18 | 35.20  | -10.80 | 46.00  | 51.63       | 12.86  | 1.65   | 30.94  | ---   | ---    |
| 4 | 332.90 | 33.04  | -12.96 | 46.00  | 48.30       | 13.88  | 1.86   | 31.00  | ---   | ---    |
| 5 | 421.80 | 30.58  | -15.42 | 46.00  | 42.41       | 16.74  | 2.22   | 30.79  | ---   | ---    |
| 6 | 727.00 | 24.62  | -21.38 | 46.00  | 30.17       | 21.84  | 3.01   | 30.40  | ---   | ---    |

## Vertical



Site : 03CH07-HY  
 Condition : FCC CLASS-B 3m LF-ANT(131102) VERTICAL  
 Project : FR 413003  
 Mode : 1

|   | Freq   | Level  | Over   | Limit | Read  | Antenna | Cable | Preamp | A/Pos | T/Pos | Remark |
|---|--------|--------|--------|-------|-------|---------|-------|--------|-------|-------|--------|
|   | MHz    | dBuV/m | Limit  | Line  | Level | Factor  | Loss  | Factor | cm    | deg   |        |
| 1 | 31.62  | 36.21  | -3.79  | 40.00 | 49.32 | 17.76   | 0.55  | 31.42  | 178   | 257   | Peak   |
| 2 | 36.48  | 33.92  | -6.08  | 40.00 | 49.26 | 15.32   | 0.60  | 31.26  | ---   | ---   | Peak   |
| 3 | 285.15 | 30.41  | -15.59 | 46.00 | 46.80 | 12.95   | 1.66  | 31.00  | ---   | ---   | Peak   |
| 4 | 333.60 | 30.19  | -15.81 | 46.00 | 45.42 | 13.91   | 1.86  | 31.00  | ---   | ---   | Peak   |
| 5 | 428.80 | 28.93  | -17.07 | 46.00 | 40.57 | 16.88   | 2.24  | 30.76  | ---   | ---   | Peak   |
| 6 | 909.00 | 26.76  | -19.24 | 46.00 | 30.25 | 23.47   | 3.36  | 30.32  | ---   | ---   | Peak   |

## Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor= Level.

### 3.5 Frequency Stability Measurement

#### 3.5.1 Limit

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% (100ppm) of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

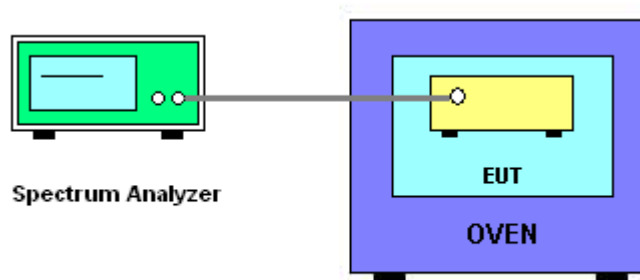
#### 3.5.2 Measuring Instruments and Setting

Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

| Spectrum Parameter | Setting                                          |
|--------------------|--------------------------------------------------|
| Attenuation        | Auto                                             |
| Span Frequency     | Entire absence of modulation emissions bandwidth |
| RBW                | 1 kHz                                            |
| VBW                | 3 kHz                                            |
| Sweep Time         | Auto                                             |

#### 3.5.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. EUT have transmitted absence of modulation signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire absence of modulation emissions bandwidth.
4. Set RBW = 1 kHz, VBW = 3 kHz with peak detector and maxhold settings.
5. fc is declaring of channel frequency. Then the frequency error formula is  $(f_c - f)/f_c \times 10^6$  ppm and the limit is less than  $\pm 100$ ppm.
6. The test extreme voltage is to change the primary supply voltage from 85 to 115 percent of the nominal value
7. Extreme temperature rule is -20°C~50°C.

**3.5.4 Test Setup Layout****3.5.5 Test Deviation**

There is no deviation with the original standard.

**3.5.6 EUT Operation during Test**

The EUT was programmed to be in continuously un-modulation transmitting mode.

## 3.5.7 Test Result of Frequency Stability

|                        |               |                       |         |
|------------------------|---------------|-----------------------|---------|
| <b>Final Test Date</b> | Feb. 06, 2014 | <b>Test Site No.</b>  | TH02-HY |
| <b>Temperature</b>     | 22~24°C       | <b>Humidity</b>       | 53~55%  |
| <b>Test Engineer</b>   | Tommy Lee     | <b>Configurations</b> | Ch. 1   |

## Voltage vs. Frequency Stability

| Voltage(V)           | Measurement Frequency (MHz) |
|----------------------|-----------------------------|
| 120                  | 13.559900                   |
| 102                  | 13.559900                   |
| 138                  | 13.559920                   |
| Max. Deviation (MHz) | -0.000100                   |
| Max. Deviation (ppm) | -7.3746                     |

## Temperature vs. Frequency Stability

| Temperature (°C)     | Measurement Frequency (MHz) |
|----------------------|-----------------------------|
| -20                  | 13.559910                   |
| -10                  | 13.559900                   |
| 0                    | 13.559910                   |
| 10                   | 13.559900                   |
| 20                   | 13.559900                   |
| 30                   | 13.559900                   |
| 40                   | 13.559920                   |
| 50                   | 13.559930                   |
| Max. Deviation (MHz) | -0.000100                   |
| Max. Deviation (ppm) | -7.3746                     |

### **3.6 Antenna Requirements**

#### **3.6.1 Limit**

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. 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 shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

#### **3.6.2 Antenna Connector Construction**

Embedded in Antenna.

## 4. LIST OF MEASURING EQUIPMENT

| Instrument                        | Manufacturer    | Model No.     | Serial No.  | Characteristics | Calibration Date | Test Date     | Due Date      | Remark                |
|-----------------------------------|-----------------|---------------|-------------|-----------------|------------------|---------------|---------------|-----------------------|
| Spectrum Analyzer                 | Rohde & Schwarz | FSP40         | 100055      | 9kHz~40GHz      | Jun. 07, 2013    | Feb. 06, 2014 | Jun. 06, 2014 | Conducted (TH02-HY)   |
| Thermal Chamber                   | Ten Billion     | TTH-D3SP      | TBN-930701  | N/A             | Jul. 19, 2013    | Feb. 06, 2014 | Jul. 18, 2014 | Conducted (TH02-HY)   |
| EMI Test Receiver                 | Rohde & Schwarz | ESCS 30       | 100356      | 9kHz ~ 2.75GHz  | Nov. 15, 2013    | Feb. 20, 2014 | Nov. 14, 2014 | Conduction (CO05-HY)  |
| LISN<br>(for auxiliary equipment) | Rohde & Schwarz | ENV216        | 100081      | 9kHz ~ 30MHz    | Dec. 12, 2013    | Feb. 20, 2014 | Dec. 11, 2014 | Conduction (CO05-HY)  |
| LISN                              | Rohde & Schwarz | ENV216        | 100080      | 9kHz ~ 30MHz    | Dec. 04, 2013    | Feb. 20, 2014 | Dec. 03, 2014 | Conduction (CO05-HY)  |
| AC Power Source                   | ChainTek        | APC-1000W     | N/A         | N/A             | N/A              | Feb. 20, 2014 | N/A           | Conduction (CO05-HY)  |
| EMI Test Receiver                 | Rohde & Schwarz | ESCI 7        | 100724      | 9kHz~7GHz       | Sep. 06, 2013    | Feb. 04, 2014 | Sep. 05, 2014 | Radiation (03CH07-HY) |
| Loop Antenna                      | Rohde & Schwarz | HFH2-Z2       | 860004/0001 | 9kHz~30 MHz     | Jul. 03, 2012    | Feb. 04, 2014 | Jul. 02, 2014 | Radiation (03CH07-HY) |
| Bilog Antenna                     | Schaffner       | CBL6111C      | 2726        | 30MHz ~ 1GHz    | Oct. 10, 2013    | Feb. 04, 2014 | Oct. 09, 2014 | Radiation (03CH07-HY) |
| Preamplifier                      | SONOMA          | 310N          | 187231      | 9kHz~1GHz       | May 15, 2013     | Feb. 04, 2014 | May 14, 2014  | Radiation (03CH07-HY) |
| Turn Table                        | ChainTek        | ChainTek 3000 | N/A         | 0 ~ 360 degree  | N/A              | Feb. 04, 2014 | N/A           | Radiation (03CH07-HY) |
| Antenna Mast                      | ChainTek        | ChainTek 3000 | N/A         | N/A             | N/A              | Feb. 04, 2014 | N/A           | Radiation (03CH07-HY) |

**5. TEST LOCATION**

|        |     |                                                                            |
|--------|-----|----------------------------------------------------------------------------|
| HWA YA | ADD | : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. |
|        | TEL | : 886-3-327-3456                                                           |
|        | FAX | : 886-3-318-0055                                                           |

## 6. TAF CERTIFICATE OF ACCREDITATION



Certificate No. : L1190-130110

財團法人全國認證基金會  
Taiwan Accreditation Foundation

## Certificate of Accreditation

This is to certify that

**Sporton International Inc.**  
**EMC & Wireless Communications Laboratory**  
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien,  
Taiwan, R.O.C.

**is accredited in respect of laboratory**

|                                       |                                                                                                                                                                                                                                                            |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Accreditation Criteria</b>         | : ISO/IEC 17025:2005                                                                                                                                                                                                                                       |
| <b>Accreditation Number</b>           | : 1190                                                                                                                                                                                                                                                     |
| <b>Originally Accredited</b>          | : December 15, 2003                                                                                                                                                                                                                                        |
| <b>Effective Period</b>               | : January 10, 2013 to January 09, 2016                                                                                                                                                                                                                     |
| <b>Accredited Scope</b>               | : Testing Field, see described in the Appendix                                                                                                                                                                                                             |
| <b>Specific Accreditation Program</b> | : Accreditation Program for Designated Testing Laboratory for Commodities Inspection<br>Accreditation Program for Telecommunication Equipment Testing Laboratory<br>Accreditation Program for BSMI Mutual Recognition Arrangement with Foreign Authorities |



Jay-San Chen  
President, Taiwan Accreditation Foundation  
Date: January 10, 2013

P1, total 20 pages

The Appendix forms an integral part of this Certificate, which shall be invalid when use without the Appendix

