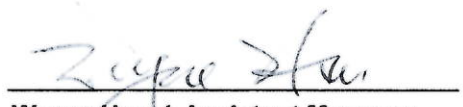
# FCC Test Report

| | | |
|---|---|---|
| **Equipment** | : | **7" Rugged Tablet Computer** |
| **Brand Name** | : | **AAEON** |
| **Model Name** | : | **xxxRTC-700C-TAy-WBGzxxx-xxxx**<br>1. xxx=TF-(TF: Toxic Free) or blank<br>2. y is for Touch version , ex: A=rev1, x:A~Z<br>3. z is blank or H, blank means without 3G function; H means with 3G function<br>4. xxx is for marketing purpose<br>5. xxxx=SW revision, ex: 1110=rev1, x:0~9 |
| **FCC ID** | : | **OHBRTC700CWBGB** |
| **Standard** | : | **47 CFR FCC Part 15.225** |
| **Operating Band** | : | **13.110 – 14.010 MHz (channel freq. 13.56 MHz)** |
| **FCC Classification** | : | **DXX** |
| **Applicant**<br>**Manufacturer** | : | **AAEON Technology Inc.**<br>5F, No. 135, Lane 235, Pao Chiao Rd.,<br>Hsin-Tien Dist., New Taipei City,<br>Taiwan, R.O.C |

**The product sample received on Jul. 14, 2014 and completely tested on Aug. 11, 2014. We, SPORTON, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2009 and shown compliance with the applicable technical standards.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.**

**Reviewed by:**



**Wayne Hsu / Assistant Manager**

Testing Laboratory
1190

# Table of Contents

# Summary of Test Result

| Conformance Test Specifications | | | | | |
|---|---|---|---|---|---|
| **Report Clause** | **Ref. Std. Clause** | **Description** | **Measured** | **Limit** | **Result** |
| 1.1.2 | 15.203 | Antenna Requirement | Antenna connector mechanism complied | FCC 15.203 | Complied |
| 3.1 | 15.207 | AC Power-line Conducted Emissions | [dBuV]: 0.187385MHz<br>39.51 (Margin 14.64dB) - AV<br>51.10 (Margin 13.05dB) - QP | FCC 15.207 | Complied |
| 3.2 | 15.215(c) | Emission Bandwidth | 20dB Bandwidth 2.74 [kHz]<br>FL: 13.55952 MHz<br>FH: 13.56226 MHz | Fall in band<br>$F_L \geq 13.553$ MHz<br>$F_H \leq 13.567$ MHz | Complied |
| 3.3 | 15.225(a)~(d) | Field Strength of Fundamental Emissions and Spectrum Mask | Fundamental Emissions peak:55.59 dBuV/m at 3m<br>Device complies with spectrum mask – refer to test data | 124 dBuV/m at 3 | Complied |
| 3.4 | 15.225(d) | Transmitter Radiated Unwanted Emissions | [dBuV/m at 3m]: 40.67MHz<br>33.73 (Margin 6.27dB) - Peak | FCC 15.209 | Complied |
| 3.5 | 15.225(e) | Frequency Stability | 72.27 ppm | ± 0.01% (100ppm) | Complied |

# Revision History

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FR463028AR | Rev. 01 | Initial issue of report | Aug. 27, 2014 |
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# 1 General Description

## 1.1 Information

### 1.1.1 RF General Information

| RF General Information | | | | |
|---|---|---|---|---|
| **Frequency Range** | **Modulation** | **Ch. Frequency (MHz)** | **Channel Number** | **Field Strength (dBuV/m)** |
| 13.110 – 14.010 MHz | ISO 14443-2 (ASK) | 13.56 | 1 | 55.59 |
| Note 1: Field strength performed peak level at 3m. | | | | |

### 1.1.2 Antenna Information

| Antenna Category | |
|---|---|
| ☐ | Equipment placed on the market without antennas |
| ☒ | Integral antenna (antenna permanently attached) |
| ☐ | External antenna (dedicated antennas) |

### 1.1.3 Type of EUT

| Identify EUT | |
|---|---|
| EUT Serial Number | N/A |
| Presentation of Equipment | ☒ Production ; ☐ Pre-Production ; ☐ Prototype |
| **Type of EUT** | |
| ☒ | Stand-alone |
| ☐ | Combined (EUT where the radio part is fully integrated within another device)<br>Combined Equipment - Brand Name / Model No.: |
| ☐ | Plug-in radio (EUT intended for a variety of host systems)<br>Host System - Brand Name / Model No.: |
| ☐ | Other: |

### 1.1.4 Test Signal Duty Cycle

| Duty Cycle Operation Restriction | | | |
|---|---|---|---|
| The transmitter is used for | | The transmitter is operated | |
| ☒ | Inductive applications | ☒ | Automatically triggered |
| ☐ | Duty cycle fixed mode | ☒ | Duty cycle random mode |
| **Duty cycle mode - ISO 14443 Type A** | | | |
| Declare transmitter duty cycle / 1 hour = | | 100% | |
| Duty cycle Limit | | | |
| ☐ | Class 1 - < 0.1 % | ☐ | Class 2 - < 1.0 % |
| ☐ | Class 3 - < 10 % | ☒ | Class 4 - Up to 100 % |
| **Duty cycle mode - ISO 14443 Type B** | | | |
| Declare transmitter duty cycle / 1 hour = | | 100% | |
| Duty cycle Limit | | | |
| ☐ | Class 1 - < 0.1 % | ☐ | Class 2 - < 1.0 % |
| ☐ | Class 3 - < 10 % | ☒ | Class 4 - Up to 100 % |
| **Duty cycle mode - NFC-F** | | | |
| Declare transmitter duty cycle / 1 hour = | | 100% | |
| Duty cycle Limit | | | |
| ☐ | Class 1 - < 0.1 % | ☐ | Class 2 - < 1.0 % |
| ☐ | Class 3 - < 10 % | ☒ | Class 4 - Up to 100 % |
| Remark: Type F was the worst case and it was recorded in this report. | | | |

| Operated Mode for Worst Duty Cycle | |
|---|---|
| ☒ Operated test mode for worst duty cycle | |
| **Test Signal Duty Cycle (x)** | **Voltage Duty Factor [dB] – (20 log 1/x)** |
| ☒ 100% | 0 |

### 1.1.5 EUT Operational Condition

| | | | |
|---|---|---|---|
| **Supply Voltage** | ☒ AC mains | ☒ DC | ☐ System |
| **Type of DC Source** | ☐ Internal DC supply | ☒ From adapter | ☒ Battery |

## 1.2 Accessories

| Accessories | | | | |
|---|---|---|---|---|
| AC Adapter | Brand Name | LTE | Model Name | LTE24E-S2-2 |
| | Power Rating | I/P: 100-240V⎓1A ; O/P: 12V⎓2A | | |
| | DC Power Cable | 1.8 meter, non-shielded cable, without ferrite core | | |
| Battery | Brand Name | JHT | Model Name | J1067 |
| | Power Rating | 7.4 Vdc, 3700 mAh | Type | Li-ion |
| LCD Panel | Brand Name | CHIMEI | Model Name | N070ICG-LD1 |

Reminder: Regarding to more detail and other information, please refer to user manual.

## 1.3 Support Equipment

| Support Equipment - AC Conduction & Radiated Emission | | | |
|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** |
| 1 | Identity Badge | - | - |

## 1.4 Testing Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR FCC Part 15
- ANSI C63.10-2009
- FCC KDB 174176

## 1.5 Testing Location Information

| Testing Location | | | | | |
|---|---|---|---|---|---|
| ☒ | HWA YA | ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.<br>TEL : 886-3-327-3456 FAX : 886-3-327-0973 | | | |
| **Test Condition** | | **Test Site No.** | **Test Engineer** | **Test Environment** | |
| AC Conduction | | CO04-HY | Zeus | 25°C / 46% | |
| RF Conducted | | TH01-HY | Howard | 24°C / 63% | |
| Radiated Emission | | 03CH02-HY | Hunter | 24.6°C / 60% | |

## 1.6 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

| Measurement Uncertainty | | |
|---|---|---|
| **Test Item** | | **Uncertainty** |
| AC power-line conducted emissions | | ±2.2 dB |
| Emission bandwidth | | ±1.4 % |
| Unwanted emissions, conducted | 9 – 150 kHz | ±0.3 dB |
| | 0.15 – 30 MHz | ±0.4 dB |
| | 30 – 1000 MHz | ±0.5 dB |
| All emissions, radiated | 9 – 150 kHz | ±2.4 dB |
| | 0.15 – 30 MHz | ±2.2 dB |
| | 30 – 1000 MHz | ±2.5 dB |
| Temperature | | ±0.8 °C |
| Humidity | | ±3 % |
| DC and low frequency voltages | | ±3 % |
| Time | | ±1.4 % |
| Duty Cycle | | ±1.4 % |

# 2 Test Configuration of EUT

## 2.1 The Worst Case Modulation Configuration

| Modulation Used for Conformance Testing | |
|---|---|
| **Modulation Mode** | **Field Strength (dBuV/m at 3 m)** |
| NFC-Read/Write | 55.59 |

## 2.2 Test Channel Frequencies Configuration

| Test Channel Frequencies Configuration | |
|---|---|
| **Modulation Mode** | **Test Channel Frequencies (MHz) – FX (Frequencies Abbreviations)** |
| NFC-Read/Write | 13.56-(F1) |

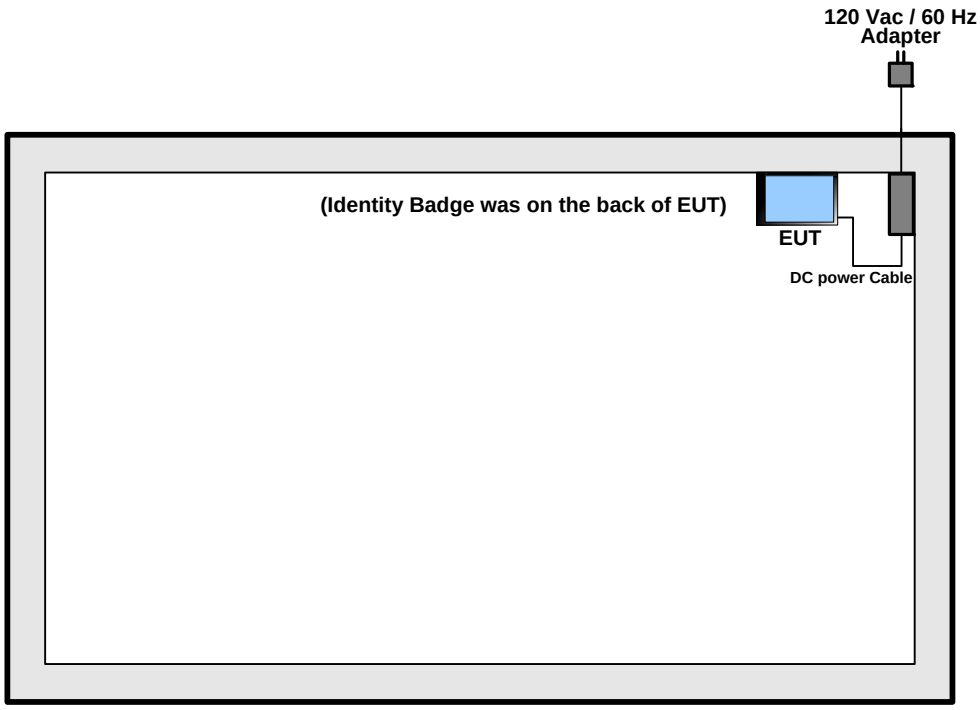
## 2.3 The Worst Case Measurement Configuration

| The Worst Case Mode for Following Conformance Tests | |
|---|---|
| **Tests Item** | AC power-line conducted emissions |
| **Condition** | AC power-line conducted measurement for line and neutral<br>Test Voltage: 120Vac / 60Hz |
| **Operating Mode** | Operating Mode Description |
| **1** | EUT with adapter & transmitting |

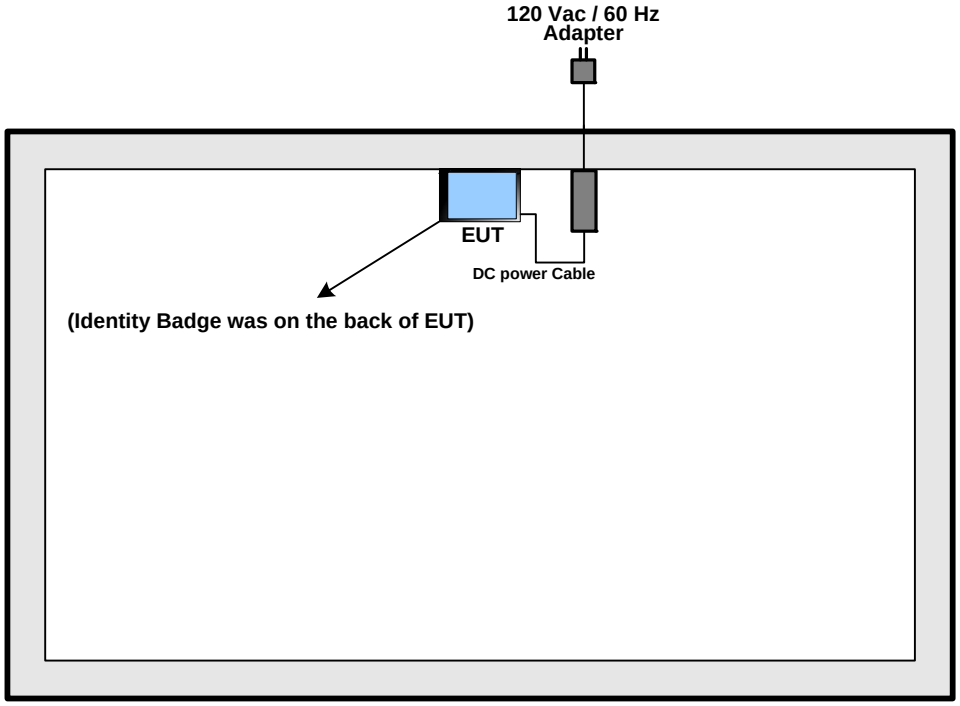
| The Worst Case Mode for Following Conformance Tests | | | |
|---|---|---|---|
| **Tests Item** | Emission Bandwidth, Field Strength of Fundamental Emissions<br>Spectrum Mask, Transmitter Radiated Unwanted Emissions<br>Frequency Stability | | |
| **Test Condition** | Radiated measurement | | |
| **User Position** | ☐ EUT will be placed in fixed position. | | |
| | ☐ EUT will be placed in mobile position and operating multiple positions. EUT shall be performed two orthogonal planes. | | |
| | ☒ EUT will be a hand-held or body-worn battery-powered devices and operating multiple positions. EUT shall be performed three orthogonal planes. The worst plane is Y. | | |
| **Operating Mode** | Operating Mode Description | | |
| **1** | EUT with adapter & transmitting | | |
| **Remark** | NFC Type A, B, F were all evaluated here. Type F was the worst case so it was recorded in this report. | | |
| **Modulation Mode** | NFC-Read/Write | | |
| **Orthogonal Planes of EUT** | **X Plane** | **Y Plane** | **Z Plane** |
| |  |  |  |

## 2.4 Test Setup Diagram

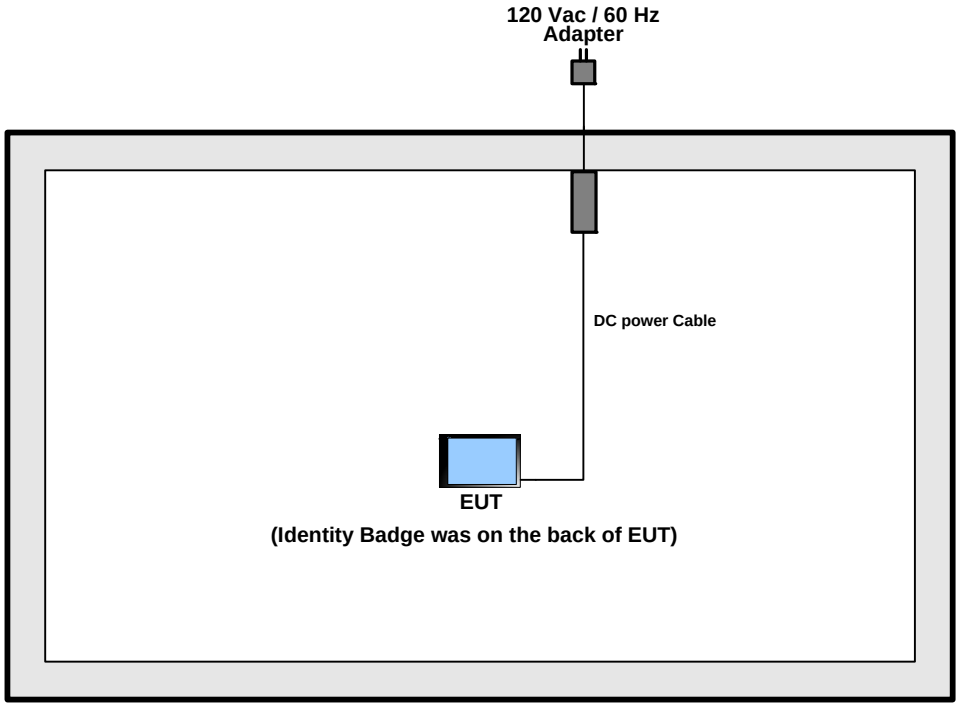
**Test Setup Diagram - AC Line Conducted Emission Test**



## Test Setup Diagram - Radiated Below 30MHz Test




## Test Setup Diagram - Radiated Above 30MHz Test



# 3 Transmitter Test Result

## 3.1 AC Power-line Conducted Emissions

### 3.1.1 AC Power-line Conducted Emissions Limit

| AC Power-line Conducted Emissions Limit | | |
|---|---|---|
| **Frequency Emission (MHz)** | **Quasi-Peak** | **Average** |
| 0.15-0.5 | 66 - 56 * | 56 - 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| Note 1: * Decreases with the logarithm of the frequency. | | |

### 3.1.2 Measuring Instruments

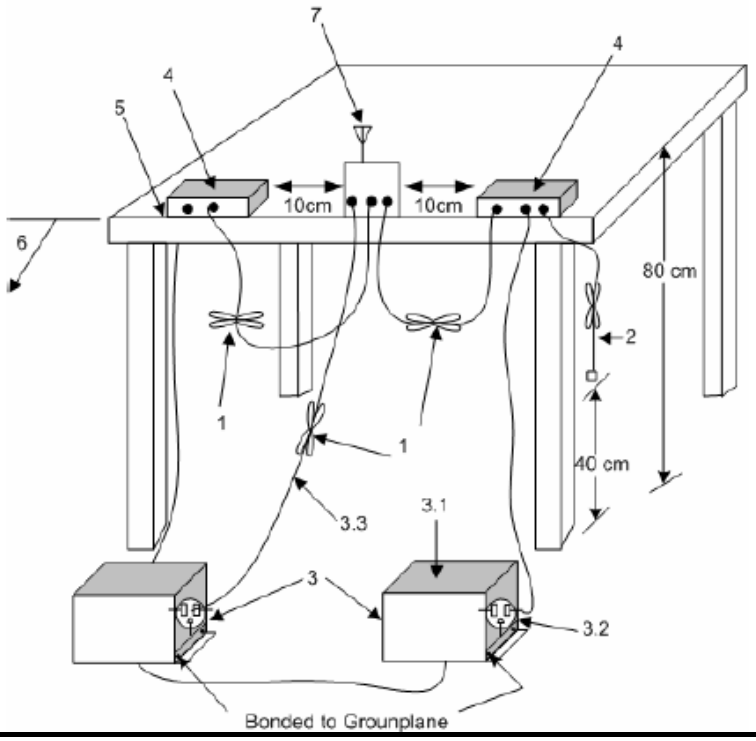
Refer a test equipment and calibration data table in this test report.

### 3.1.3 Test Procedures

| Test Method | |
|---|---|
| ☒ | Refer as ANSI C63.10-2009, clause 6.2 for AC power-line conducted emissions. |
| ☒ | If AC conducted emissions fall in operating band, then following below test method confirm final result. |
| ☐ | Accept measurements done with a suitable dummy load replacing the antenna under the following conditions:<br>(1) Perform the AC line conducted tests with the antenna connected to determine compliance with FCC 15.207 limits outside the transmitter's fundamental emission band;<br>(2) Retest with a dummy load to determine compliance with FCC 15.207 limits within the transmitter's fundamental emission band. |
| ☒ | For a device with a permanent antenna operating at or below 30 MHz, accept measurements done with a suitable dummy load, in lieu of the permanent antenna under the following conditions:<br>(1) Perform the AC line conducted tests with the permanent antenna to determine compliance with the FCC 15.207 limits outside the transmitter's fundamental emission band;<br>(2) Retest with a dummy load in lieu of the permanent antenna to determine compliance with the FCC 15.207 limits within the transmitter's fundamental emission band. |

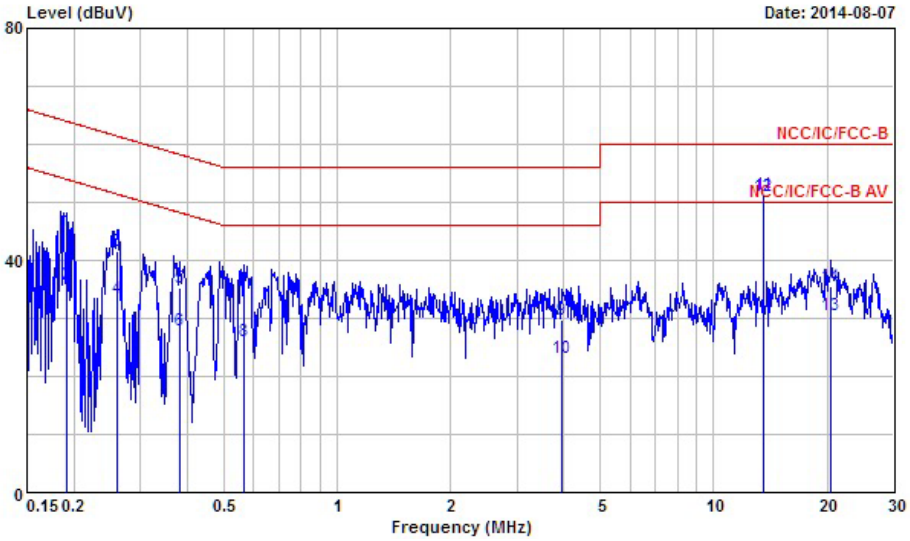
### 3.1.4 Test Setup

**AC Power-line Conducted Emissions**



### 3.1.5 Test Result of AC Power-line Conducted Emissions

| AC Power-line Conducted Emissions Result | | | |
|---|---|---|---|
| **Operating Mode** | 1 | **Power Phase** | Neutral |
| **Operating Function** | EUT with adapter & transmitting: NFC normal function with antenna | | |

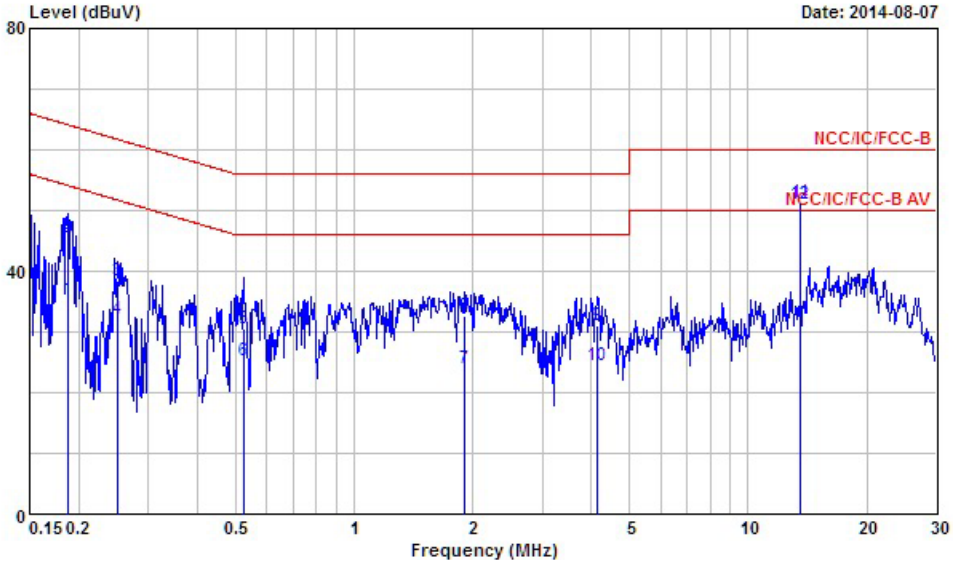



| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.1913990 | 44.98 | -19.00 | 63.98 | 44.75 | 0.02 | 0.21 | QP |
| 2 | 0.1913990 | 35.69 | -18.29 | 53.98 | 35.46 | 0.02 | 0.21 | Average |
| 3 | 0.2602550 | 41.45 | -19.97 | 61.42 | 41.23 | 0.02 | 0.20 | QP |
| 4 | 0.2602550 | 33.47 | -17.95 | 51.42 | 33.25 | 0.02 | 0.20 | Average |
| 5 | 0.3811300 | 35.28 | -22.97 | 58.25 | 35.05 | 0.03 | 0.20 | QP |
| 6 | 0.3811300 | 28.01 | -20.24 | 48.25 | 27.78 | 0.03 | 0.20 | Average |
| 7 | 0.5670870 | 34.53 | -21.47 | 56.00 | 34.33 | 0.04 | 0.16 | QP |
| 8 | 0.5670870 | 25.97 | -20.03 | 46.00 | 25.77 | 0.04 | 0.16 | Average |
| 9 | 3.940 | 29.82 | -26.18 | 56.00 | 29.63 | 0.09 | 0.10 | QP |
| 10 | 3.940 | 23.18 | -22.82 | 46.00 | 22.99 | 0.09 | 0.10 | Average |
| 11 @ | 13.560 | 51.39 | 1.39 | 50.00 | 50.87 | 0.25 | 0.27 | Average |
| 12 @ | 13.560 | 51.11 | -8.89 | 60.00 | 50.59 | 0.25 | 0.27 | QP |
| 13 | 20.490 | 30.42 | -19.58 | 50.00 | 29.84 | 0.33 | 0.25 | Average |
| 14 | 20.490 | 35.44 | -24.56 | 60.00 | 34.86 | 0.33 | 0.25 | QP |

→ This frequency is NFC signal.

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

| AC Power-line Conducted Emissions Result | | | |
|---|---|---|---|
| **Operating Mode** | 1 | **Power Phase** | Line |
| **Operating Function** | EUT with adapter & transmitting: NFC normal function with antenna | | |

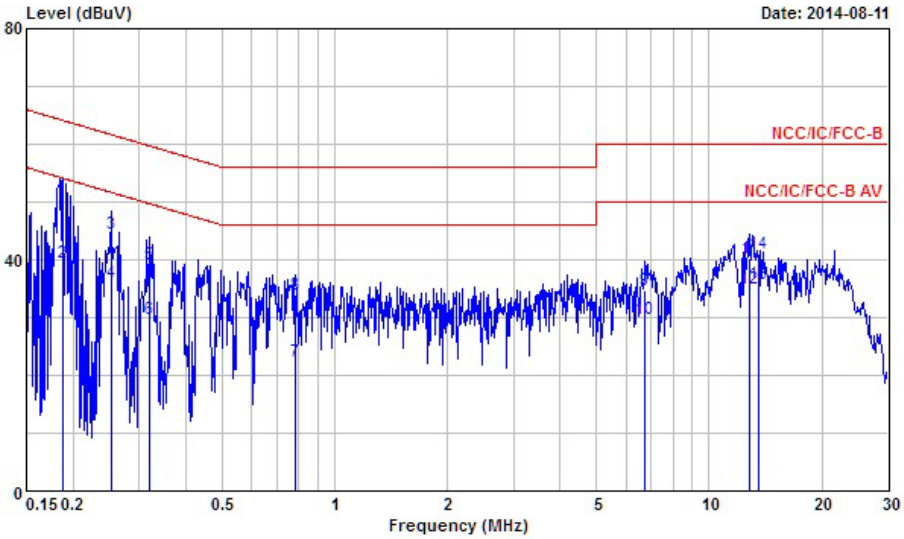



| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.1873850 | 35.39 | -18.76 | 54.15 | 35.15 | 0.03 | 0.21 | Average |
| 2 | 0.1873850 | 45.62 | -18.53 | 64.15 | 45.38 | 0.03 | 0.21 | QP |
| 3 | 0.2507790 | 38.39 | -23.34 | 61.73 | 38.16 | 0.03 | 0.20 | QP |
| 4 | 0.2507790 | 32.07 | -19.66 | 51.73 | 31.84 | 0.03 | 0.20 | Average |
| 5 | 0.5237620 | 30.46 | -25.54 | 56.00 | 30.25 | 0.04 | 0.17 | QP |
| 6 | 0.5237620 | 25.18 | -20.82 | 46.00 | 24.97 | 0.04 | 0.17 | Average |
| 7 | 1.900 | 23.97 | -22.03 | 46.00 | 23.61 | 0.07 | 0.29 | Average |
| 8 | 1.900 | 32.60 | -23.40 | 56.00 | 32.24 | 0.07 | 0.29 | QP |
| 9 | 4.140 | 31.13 | -24.87 | 56.00 | 30.93 | 0.10 | 0.10 | QP |
| 10 | 4.140 | 24.43 | -21.57 | 46.00 | 24.23 | 0.10 | 0.10 | Average |
| 11 @ | 13.560 | 51.21 | -8.79 | 60.00 | 50.70 | 0.24 | 0.27 | QP |
| 12 @ | 13.560 | 51.05 | 1.05 | 50.00 | 50.54 | 0.24 | 0.27 | Average |

→This frequency is NFC signal.

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

| AC Power-line Conducted Emissions Result | | | |
|---|---|---|---|
| **Operating Mode** | 1 | **Power Phase** | Neutral |
| **Operating Function** | EUT with adapter & transmitting: the NFC is normal function with antenna terminal | | |

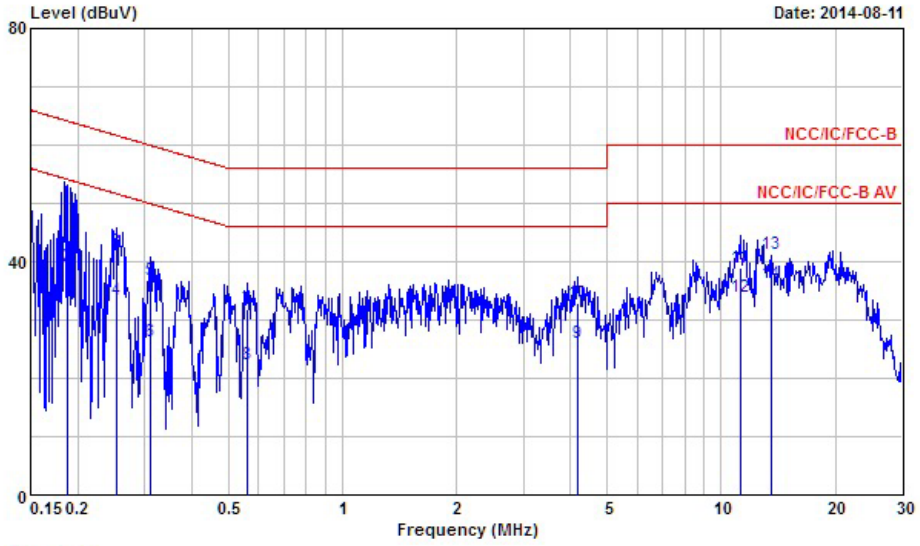



| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | @0.1873850 | 51.10 | -13.05 | 64.15 | 50.87 | 0.02 | 0.21 | QP |
| 2 | 0.1873850 | 39.51 | -14.64 | 54.15 | 39.28 | 0.02 | 0.21 | Average |
| 3 | 0.2521110 | 44.48 | -17.21 | 61.69 | 44.26 | 0.02 | 0.20 | QP |
| 4 | 0.2521110 | 36.06 | -15.63 | 51.69 | 35.84 | 0.02 | 0.20 | Average |
| 5 | 0.3199920 | 39.21 | -20.50 | 59.71 | 38.98 | 0.03 | 0.20 | QP |
| 6 | 0.3199920 | 29.61 | -20.10 | 49.71 | 29.38 | 0.03 | 0.20 | Average |
| 7 | 0.7834520 | 22.26 | -23.74 | 46.00 | 22.09 | 0.04 | 0.13 | Average |
| 8 | 0.7834520 | 33.96 | -22.04 | 56.00 | 33.79 | 0.04 | 0.13 | QP |
| 9 | 6.730 | 34.81 | -25.19 | 60.00 | 34.50 | 0.15 | 0.16 | QP |
| 10 | 6.730 | 29.78 | -20.22 | 50.00 | 29.47 | 0.15 | 0.16 | Average |
| 11 | 12.850 | 40.37 | -19.63 | 60.00 | 39.87 | 0.24 | 0.26 | QP |
| 12 | 12.850 | 34.91 | -15.09 | 50.00 | 34.41 | 0.24 | 0.26 | Average |
| 13 | 13.560 | 35.75 | -14.25 | 50.00 | 35.23 | 0.25 | 0.27 | Average |
| 14 | 13.560 | 41.10 | -18.90 | 60.00 | 40.58 | 0.25 | 0.27 | QP |

→ This frequency is NFC signal.

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

| AC Power-line Conducted Emissions Result | | | |
|---|---|---|---|
| **Operating Mode** | 1 | **Power Phase** | Line |
| **Operating Function** | EUT with adapter & transmitting: the NFC is normal function with antenna terminal | | |




| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.1883800 | 50.38 | -13.73 | 64.11 | 50.14 | 0.03 | 0.21 | QP |
| 2 | 0.1883800 | 39.12 | -14.99 | 54.11 | 38.88 | 0.03 | 0.21 | Average |
| 3 | 0.2521110 | 41.87 | -19.82 | 61.69 | 41.64 | 0.03 | 0.20 | QP |
| 4 | 0.2521110 | 33.43 | -18.26 | 51.69 | 33.20 | 0.03 | 0.20 | Average |
| 5 | 0.3099790 | 36.89 | -23.08 | 59.97 | 36.66 | 0.03 | 0.20 | QP |
| 6 | 0.3099790 | 26.41 | -23.56 | 49.97 | 26.18 | 0.03 | 0.20 | Average |
| 7 | 0.5611100 | 31.86 | -24.14 | 56.00 | 31.66 | 0.04 | 0.16 | QP |
| 8 | 0.5611100 | 22.38 | -23.62 | 46.00 | 22.18 | 0.04 | 0.16 | Average |
| 9 | 4.160 | 25.93 | -20.07 | 46.00 | 25.73 | 0.10 | 0.10 | Average |
| 10 | 4.160 | 32.97 | -23.03 | 56.00 | 32.77 | 0.10 | 0.10 | QP |
| 11 | 11.200 | 39.07 | -20.93 | 60.00 | 38.63 | 0.21 | 0.23 | QP |
| 12 | 11.200 | 33.96 | -16.04 | 50.00 | 33.52 | 0.21 | 0.23 | Average |
| 13 | 13.560 | 41.42 | -18.58 | 60.00 | 40.91 | 0.24 | 0.27 | QP |
| 14 @ | 13.560 | 36.36 | -13.64 | 50.00 | 35.85 | 0.24 | 0.27 | Average |

→ This frequency is NFC signal.

Note 1: “>20dB” means emission levels that exceed the level of 20 dB below the applicable limit.
Note 2: “N/F” means Nothing Found emissions (No emissions were detected.)

# 3.2 Emission Bandwidth

## 3.2.1 Emission Bandwidth Limit

| 20dB Bandwidth Limit |
|---|
| ☒ Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (13.110 – 14.010 MHz). |

## 3.2.2 Measuring Instruments

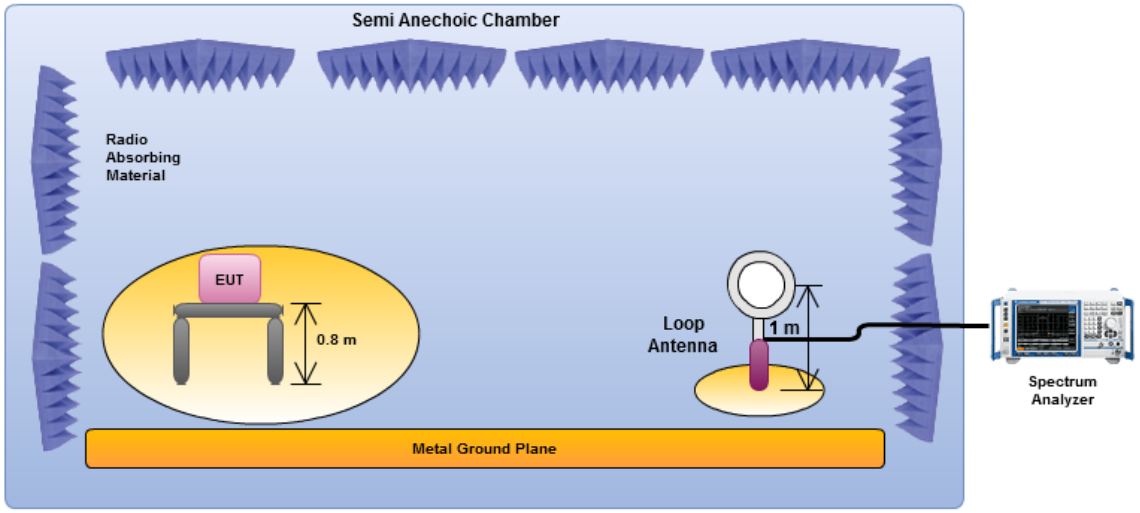
Refer a test equipment and calibration data table in this test report.

## 3.2.3 Test Procedures

| Test Method |
|---|
| ☒ For the emission bandwidth refer ANSI C63.10, clause 6.9.1 for occupied bandwidth testing. |
| ☒ For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level. |

## 3.2.4 Test Setup

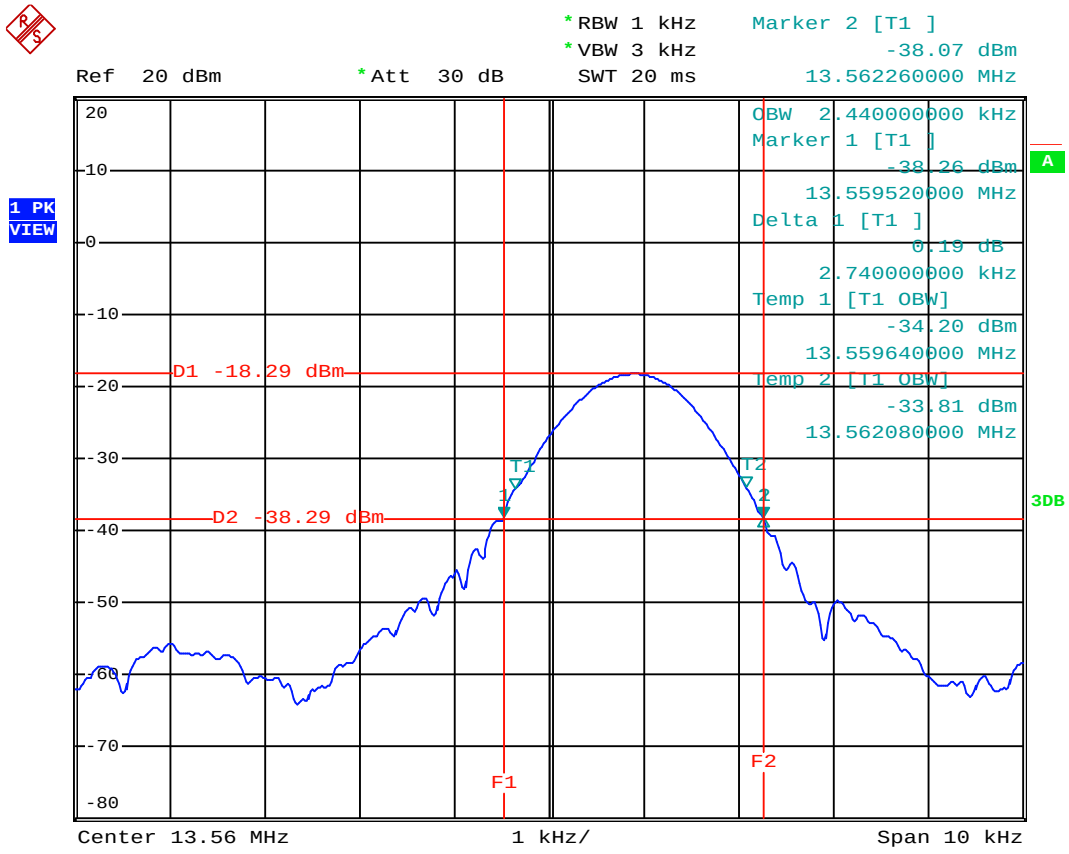
**Emission Bandwidth**



### 3.2.5 Test Result of Emission Bandwidth

| Occupied Channel Bandwidth Result | | | | | |
|---|---|---|---|---|---|
| Modulation Mode | Frequency (MHz) | 20dB Bandwidth (kHz) | $F_L$ at 20dB BW (MHz) | $F_H$ at 20dB BW (MHz) | 99% Bandwidth (kHz) |
| NFC-Read/Write | 13.56 | 2.74000 | 13.55952 | 13.56226 | 2.44000 |
| **Limit** | | **N/A** | **13.110** | **14.010** | **N/A** |
| **Result** | | **Complied** | | | |

**Emission Bandwidth Plot**




Date: 26.JUL.2014 23:30:54

# 3.3 Field Strength of Fundamental Emissions and Spectrum Mask

## 3.3.1 Field Strength of Fundamental Emissions and Spectrum Mask Limit

| Field Strength of Fundamental Emissions | | | | | |
|---|---|---|---|---|---|
| **Emissions** | **(uV/m)@30m** | **(dBuV/m)@30m** | **(dBuV/m)@10m** | **(dBuV/m)@3m** | **(dBuV/m)@1m** |
| **Fundamental** | 15848 | 84.0 | 103.1 | 124.0 | 143.1 |
| Quasi peak measurement of the fundamental. | | | | | |

| Spectrum Mask | | | | | |
|---|---|---|---|---|---|
| **Freq. of Emission (MHz)** | **(uV/m)@30m** | **(dBuV/m)@30m** | **(dBuV/m)@10m** | **(dBuV/m)@3m** | **(dBuV/m)@1m** |
| 1.705~13.110 | 30 | 29.5 | 48.6 | 69.5 | 88.6 |
| 13.110~13.410 | 106 | 40.5 | 59.6 | 80.5 | 99.6 |
| 13.410~13.553 | 334 | 50.5 | 69.6 | 90.5 | 109.6 |
| 13.553~13.567 | 15848 | 84.0 | 103.1 | 124.0 | 143.1 |
| 13.567~13.710 | 334 | 50.5 | 69.6 | 90.5 | 109.6 |
| 13.710~14.010 | 106 | 40.5 | 59.6 | 80.5 | 99.6 |
| 14.010~30.000 | 30 | 29.5 | 48.6 | 69.5 | 88.6 |

## 3.3.2 Measuring Instruments

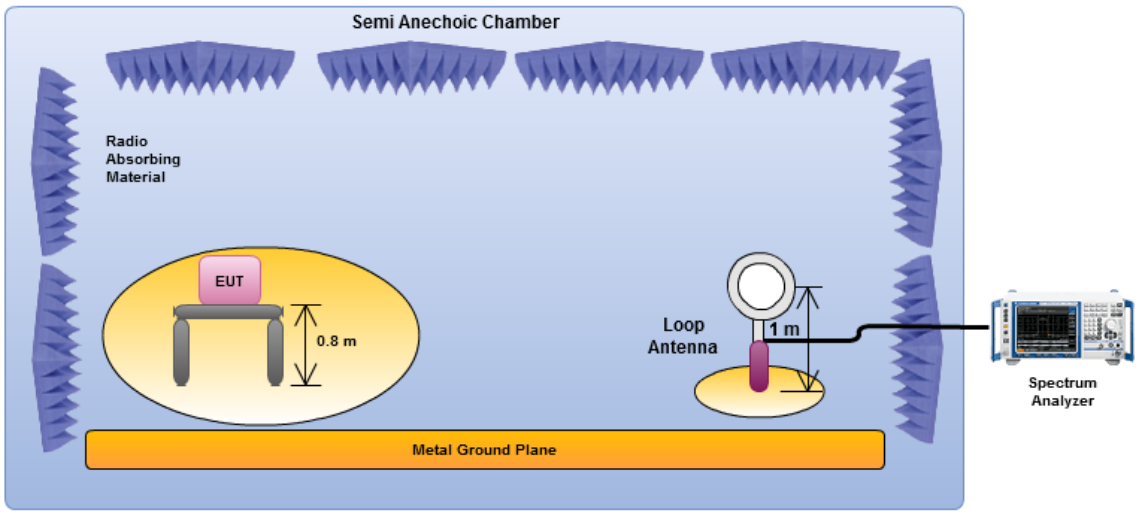
Refer a test equipment and calibration data table in this test report.

## 3.3.3 Test Procedures

| Test Method | |
|---|---|
| ☒ | Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m. |
| ☒ | At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be following below methods. |
| ☐ | The results shall be extrapolated to the specified distance by making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor. |
| ☒ | The results shall be by using the square of an inverse linear distance extrapolation factor (40 dB/decade). |
| ☒ | For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level. |

### 3.3.4 Test Setup

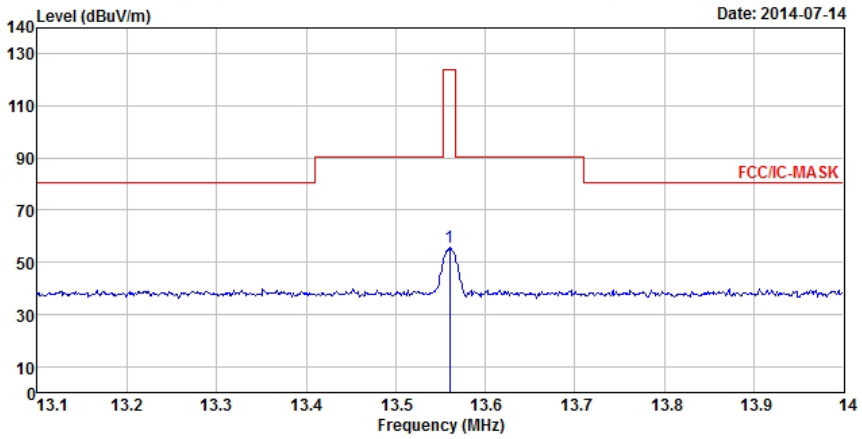
**Field Strength of Fundamental Emissions and Spectrum Mask**




### 3.3.5 Test Result of Field Strength of Fundamental Emissions and Spectrum Mask

| Field Strength of Fundamental Emissions Result | | | | | |
|---|---|---|---|---|---|
| **Modulation Mode** | **Frequency (MHz)** | **Fundamental (dBuV/m)@3m** | **Polarization** | **Margin (dB)** | **Limit (dBuV/m)@3m** |
| NFC-Read/Write | 13.56 | 55.59 | H | 68.41 | 124.00 |
| **Result** | | **Complied** | | | |
| Note 1: Measurement worst emissions of receive antenna polarization: H (Horizontal). | | | | | |

**Spectrum Mask Plot**



# 3.4 Transmitter Radiated Unwanted Emissions

## 3.4.1 Transmitter Radiated Unwanted Emissions Limit

| Transmitter Radiated Unwanted Emissions Limit | | | |
|---|---|---|---|
| **Frequency Range (MHz)** | **Field Strength (uV/m)** | **Field Strength (dBuV/m)** | **Measure Distance (m)** |
| 0.009~0.490 | 2400/F(kHz) | 48.5 - 13.8 | 300 |
| 0.490~1.705 | 24000/F(kHz) | 33.8 - 23 | 30 |
| 1.705~30.0 | 30 | 29 | 30 |
| 30~88 | 100 | 40 | 3 |
| 88~216 | 150 | 43.5 | 3 |
| 216~960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

## 3.4.2 Measuring Instruments

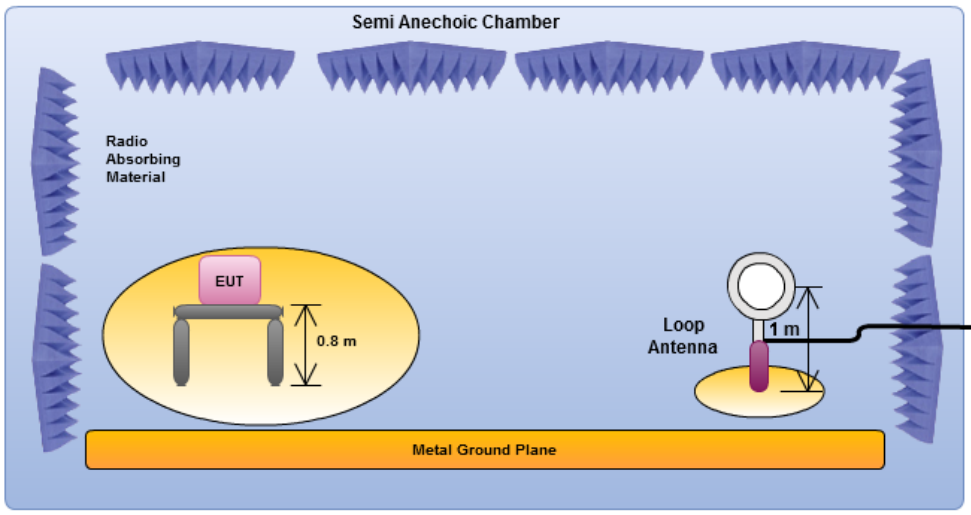
Refer a test equipment and calibration data table in this test report.

### 3.4.3 Test Procedures

| Test Method | |
|---|---|
| ☒ | Refer as ANSI C63.10, clause 6.5 for radiated emissions from 30 MHz to 1 GHz and test distance is 3m. |
| ☒ | Refer as ANSI C63.10, clause 6.4 for radiated emissions from below 30 MHz and test distance is 3m. |
| ☒ | At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the requirements; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be following below methods. |
| | ☐ The results shall be extrapolated to the specified distance by making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor. |
| | ☒ The results shall be by using the square of an inverse linear distance extrapolation factor (40 dB/decade). |
| ☒ | For radiated measurement. Loop antenna was rotated about the horizontal and vertical axis and the equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted field strength level. |
| ☒ | The any unwanted emissions level shall not exceed the fundamental emission level. |
| ☒ | All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported. |

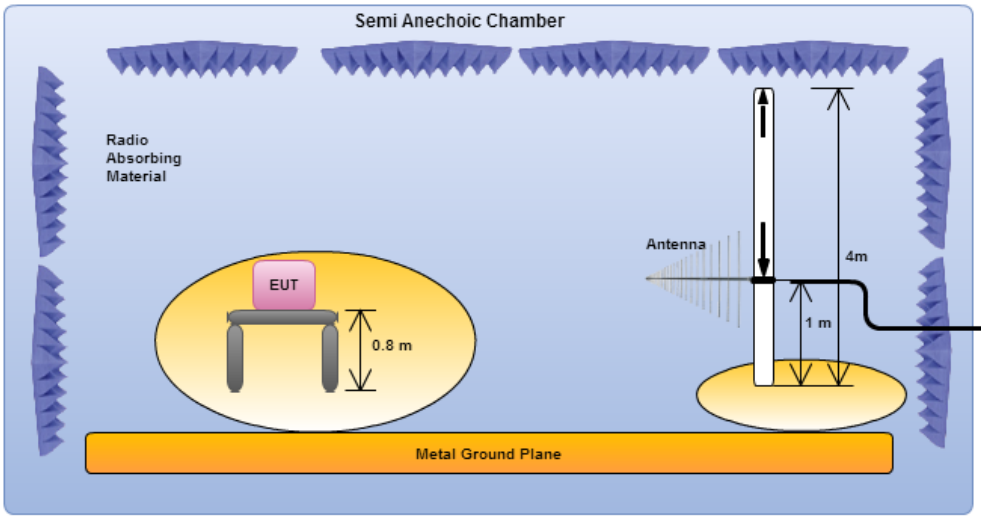
### 3.4.4 Test Setup

**Transmitter Radiated Unwanted Emissions**




Magnetic field tests shall be performed in the frequency range of 9 kHz to 30 MHz using a calibrated loop antenna. The center of the loop shall be 1 m above the ground.

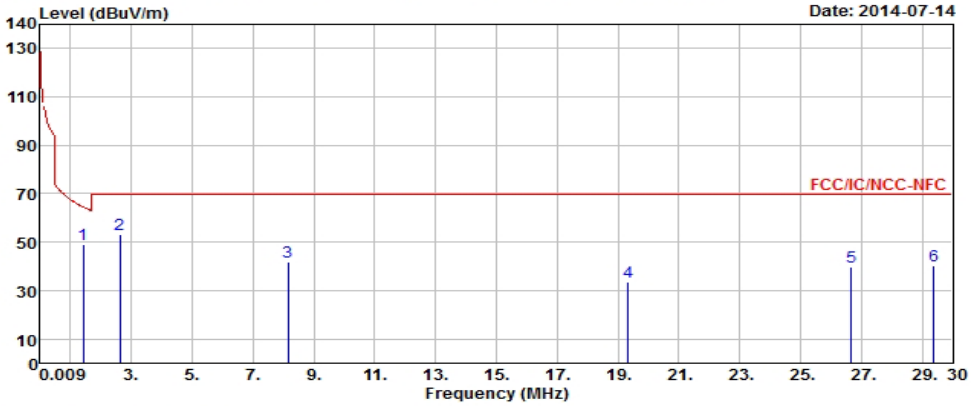
**Transmitter Radiated Unwanted Emissions**




Electric field tests shall be performed in the frequency range of 30 MHz to 1000 MHz using a calibrated bi-log antenna. the antenna height shall be varied from 1 m to 4 m.

### 3.4.5 Transmitter Radiated Unwanted Emissions (Below 30MHz)

| Transmitter Radiated Unwanted Emissions (9 kHz –30MHz) | | | |
|---|---|---|---|
| **Modulation Mode** | NFC-Read/Write | **Polarization** | H |
| **Operating Mode** | 1 | **Operating Function** | EUT with adapter & transmitting |

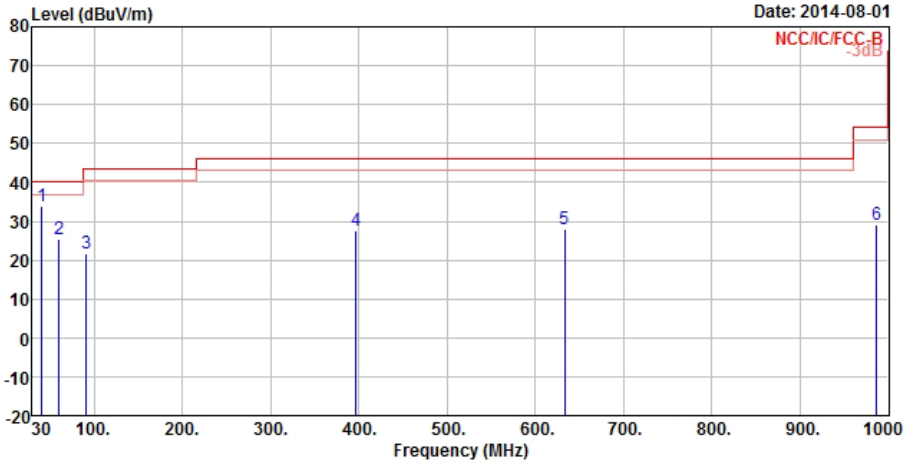



| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | A/Pos | T/Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 1.42 | 49.19 | -15.37 | 64.56 | 29.11 | 19.98 | 0.10 | 0.00 | Peak | --- | --- |
| 2 | 2.64 | 53.26 | -16.28 | 69.54 | 33.07 | 20.00 | 0.19 | 0.00 | Peak | --- | --- |
| 3 | 8.17 | 41.67 | -27.87 | 69.54 | 21.23 | 20.10 | 0.34 | 0.00 | Peak | --- | --- |
| 4 | 19.34 | 33.83 | -35.71 | 69.54 | 13.05 | 20.19 | 0.59 | 0.00 | Peak | --- | --- |
| 5 | 26.68 | 39.84 | -29.70 | 69.54 | 19.05 | 20.10 | 0.69 | 0.00 | Peak | --- | --- |
| 6 | 29.39 | 40.23 | -29.31 | 69.54 | 19.40 | 20.10 | 0.73 | 0.00 | Peak | --- | --- |

Note 1: “>20dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement worst emissions of receive antenna polarization: H (Horizontal).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

### 3.4.6 Transmitter Radiated Unwanted Emissions (Above 30MHz)

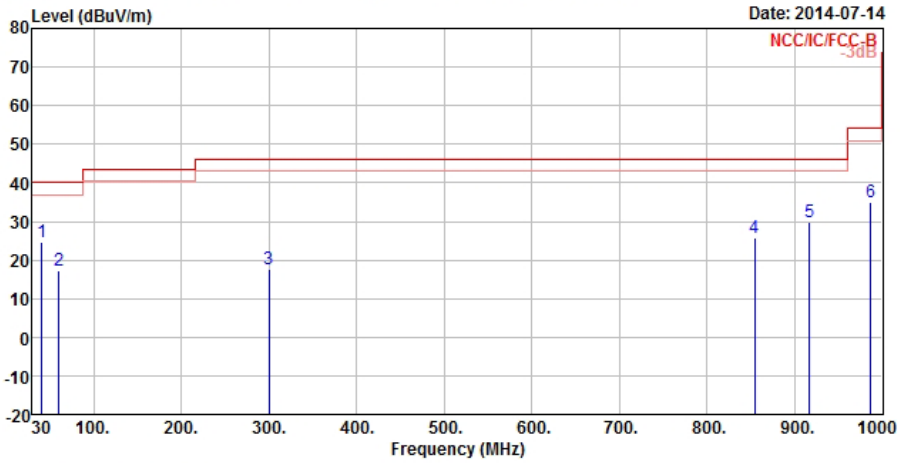
| Transmitter Radiated Unwanted Emissions | | | |
|---|---|---|---|
| **Modulation Mode** | NFC-Read/Write | **Polarization** | V |
| **Operating Mode** | 1 | **Operating Function** | EUT with adapter & transmitting |




| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | A/Pos | T/Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 40.67 | 33.73 | -6.27 | 40.00 | 48.08 | 12.43 | 0.86 | 27.64 | Peak | --- | --- |
| 2 | 60.07 | 25.53 | -14.47 | 40.00 | 45.26 | 6.75 | 1.07 | 27.55 | Peak | --- | --- |
| 3 | 91.11 | 21.84 | -21.66 | 43.50 | 39.23 | 8.97 | 1.35 | 27.71 | Peak | --- | --- |
| 4 | 396.66 | 27.46 | -18.54 | 46.00 | 36.74 | 15.69 | 2.91 | 27.88 | Peak | --- | --- |
| 5 | 633.34 | 28.04 | -17.96 | 46.00 | 33.56 | 19.11 | 3.80 | 28.43 | Peak | --- | --- |
| 6 | 986.42 | 29.03 | -24.97 | 54.00 | 30.64 | 21.22 | 4.83 | 27.66 | Peak | --- | --- |

Note 1: “>20dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement worst emissions of receive antenna polarization: V (Vertical).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

| Transmitter Radiated Unwanted Emissions | | | |
|---|---|---|---|
| **Modulation Mode** | NFC-Read/Write | **Polarization** | H |
| **Operating Mode** | 1 | **Operating Function** | EUT with adapter & transmitting |




| | Freq | Level | Over Limit | Limit Line | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Remark | A/Pos | T/Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB/m | dB | dB | | cm | deg |
| 1 | 40.67 | 24.81 | -15.19 | 40.00 | 39.16 | 12.43 | 0.86 | 27.64 | Peak | --- | --- |
| 2 | 60.07 | 17.26 | -22.74 | 40.00 | 36.99 | 6.75 | 1.07 | 27.55 | Peak | --- | --- |
| 3 | 299.66 | 17.52 | -28.48 | 46.00 | 28.91 | 13.25 | 2.51 | 27.15 | Peak | --- | --- |
| 4 | 854.50 | 25.62 | -20.38 | 46.00 | 28.64 | 20.37 | 4.52 | 27.91 | Peak | --- | --- |
| 5 | 916.58 | 29.68 | -16.32 | 46.00 | 32.19 | 20.63 | 4.61 | 27.75 | Peak | --- | --- |
| 6 | 986.42 | 34.97 | -19.03 | 54.00 | 36.58 | 21.22 | 4.83 | 27.66 | Peak | --- | --- |

Note 1: “>20dB” means spurious emission levels that exceed the level of 6 dB below the applicable limit.
Note 2: “N/F” means Nothing Found spurious emissions (No spurious emissions were detected.)
Note 3: Measurement worst emissions of receive antenna polarization: V (Vertical).
Note 4: No level of unwanted emissions exceeds the level of the fundamental emission.

# 3.5 Frequency Stability

## 3.5.1 Frequency Stability Limit

| Frequency Stability Limit |
|---|
| ☒ Carrier frequency stability shall be maintained to ±0.01% (±100 ppm). |

## 3.5.2 Measuring Instruments

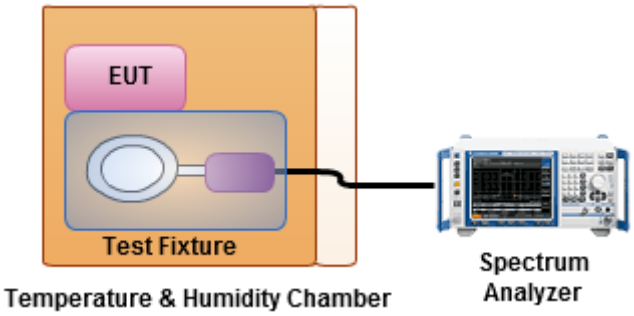
Refer a test equipment and calibration data table in this test report.

## 3.5.3 Test Procedures

| Test Method | |
|---|---|
| ☒ | Refer as ANSI C63.10, clause 6.8 for frequency stability tests |
| | ☒ Frequency stability with respect to ambient temperature |
| | ☒ Frequency stability when varying supply voltage |
| ☒ | For conducted measurement. |
| ☐ | For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level. |

## 3.5.4 Test Setup

**Frequency Stability**



### 3.5.5 Test Result of Frequency Stability

| Test date: Jul. 26, 2014 | | Frequency Stability Result |
|---|---|---|
| Power Level | 1 | Frequency Stability<br>Max. Deviation Limit < 100 ppm |
| Condition | Freq. (MHz) | 10 min |
| $T_{20°C}$Vmax | 13.56088 | 64.90 |
| $T_{20°C}$Vmin | 13.56090 | 66.37 |
| $T_{50°C}$Vnom | 13.56080 | 59.00 |
| $T_{40°C}$Vnom | 13.56082 | 60.47 |
| $T_{30°C}$Vnom | 13.56086 | 63.42 |
| $T_{20°C}$Vnom | 13.56090 | 66.37 |
| $T_{10°C}$Vnom | 13.56092 | 67.85 |
| $T_{0°C}$Vnom | 13.56094 | 69.32 |
| $T_{-10°C}$Vnom | 13.56098 | 72.27 |
| $T_{-20°C}$Vnom | 13.56098 | 72.27 |
| Result | | Complied |
| Note 1: Measure at 85 % [Vmin] and 115 % [Vmax] of the nominal voltage [Vnom]. The nominal voltage refer test report clause 1.1.5 for EUT operational condition. | | |

# 4 Test Equipment and Calibration Data

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| EMC Receiver | R&S | ESCS 30 | 100174 | 9kHz ~ 2.75GHz | Mar. 26, 2014 | AC Conduction |
| LISN | SCHWARZBECK MESS-ELEKTRONIK | NSLK 8127 | 8127-477 | 9kHz ~ 30MHz | Jan. 21, 2014 | AC Conduction |
| RF Cable-CON | HUBER+SUHNER | RG213/U | 0-7611832020001 | 9kHz ~ 30MHz | Oct. 30, 2013 | AC Conduction |
| EMI Filter | LINDGREN | LRE-2030 | 2651 | < 450 Hz | N/A | AC Conduction |

Note: Calibration Interval of instruments listed above is one year.

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| Spectrum | R&S | FSP40 | 100004 | 9kHz ~ 40GHz | Mar. 27, 2014 | RF Conducted |
| Temp. and Humidity Chamber | Giant Force | GTH-225-20-SP-SD | MAA1112-007 | -20 ~ 100℃ | Nov. 20, 2013 | RF Conducted |
| DC Power Source | G.W. | GPC-6030D | C671845 | DC 1V ~ 60V | Jun. 20, 2014 | RF Conducted |

Note: Calibration Interval of instruments listed above is one year.

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| Spectrum Analyzer | R&S | FSP40 | 100593 | 9kHz ~ 40GHz | Oct. 03, 2013 | Radiated Emission |
| 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH02-HY | 30MHz ~ 1GHz 3m | May 11, 2014 | Radiated Emission |
| RF Cable-R03m | Jye Bao | RG142 | CB021 | 9kHz ~ 1GHz | Nov. 09, 2013 | Radiated Emission |
| Bilog Antenna | SCHAFFNER | CBL61128 | 2723 | 30MHz ~ 2GHz | Oct. 10, 2013 | Radiated Emission |
| Turn Table | Chaintek Instruments | 3000 | MF7802058 | 0~ 360 degree | N/A | Radiated Emission |
| Antenna Mast | MF | MF7802 | MF780208205 | 1 ~ 4 m | N/A | Radiated Emission |

Note: Calibration Interval of instruments listed above is one year.

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|
| Loop Antenna | TESEQ | HLA 6120 | 31244 | 9kHz ~ 30MHz | Dec. 02, 2012 | Radiated Emission |

Note: Calibration Interval of instruments listed above is two years.