# RF TEST REPORT

SIEMIC
GLOBAL TESTING & CERTIFICATIONS
*YOUR CHOICE FOR- TCB FCB CB NB CAB RCB*

**Report No.: FCC_RF_SL15030801-JAD-006**
**Supersede Report No.: NONE**

| | | |
|---|---|---|
| **Applicant** | : | JADAK, LLC |
| **Product Name** | : | RFID module |
| **Serial No.** | | 160317-002 |
| **Model No.** | : | JDK-2254 |
| **Test Standard** | : | FCC 15.225 |
| **Test Method** | : | FCC 15.225<br>ANSI C63.10 2013 |
| **FCC ID** | : | 2AAVI-JDK2254 |
| **Dates of test** | : | 03/21/2016 to 03/29/2016 |
| **Issue Date** | : | 04/04/2016 |
| **Test Result** | : | ☒ Pass ☐ Fail |
| **Equipment complied with the specification** | | **[X ]** |
| **Equipment did not comply with the specification** | | **[ ]** |

| This Test Report is Issued Under the Authority of: | |
|---|---|
| Gary Chou | Chen Ge |
| **Gary Chou** | **Chen Ge** |
| Test Engineer | Engineer Reviewer |
| **This test report may be reproduced in full only**<br>**Test result presented in this test report is applicable to the tested sample only** | |

**Issued By:**
**SIEMIC Laboratories**
**775 Montague Expressway, Milpitas, CA 95035**

ilac-MRA
A2LA ACCREDITED
TESTING CERT # 2742-01

# Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.


In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

## Accreditations for Conformity Assessment

| Country/Region | Accreditation Body | Scope |
|---|---|---|
| USA | FCC, A2LA | EMC, RF/Wireless, Telecom |
| Canada | IC, A2LA, NIST | EMC, RF/Wireless, Telecom |
| Taiwan | BSMI, NCC, NIST | EMC, RF, Telecom, Safety |
| Hong Kong | OFTA, NIST | RF/Wireless, Telecom |
| Australia | NATA, NIST | EMC, RF, Telecom, Safety |
| Korea | KCC/RRA, NIST | EMI, EMS, RF, Telecom, Safety |
| Japan | VCCI, JATE, TELEC, RFT | EMI, RF/Wireless, Telecom |
| Mexico | NOM, COFETEL, Caniety | EMC, RF/Wireless, Telecom, Safety |
| Europe | A2LA, NIST | EMC, RF, Telecom, Safety |
| Israel | MOC, NIST | EMC, RF, Telecom, Safety |

## Accreditations for Product Certifications

| Country | Accreditation Body | Scope |
|---|---|---|
| USA | FCC TCB, NIST | EMC, RF, Telecom |
| Canada | IC FCB, NIST | EMC, RF, Telecom |
| Singapore | iDA, NIST | EMC, RF, Telecom |
| EU | NB | EMC & R&TTE Directive |
| Japan | MIC (RCB 208) | RF, Telecom |
| Hong Kong | OFTA (US002) | RF, Telecom |

## CONTENTS

# 1 Report Revision History

| Report No. | Report | Description | Issue Date |
|---|---|---|---|
| FCC_RF_SL15030801-JAD-006 | - | Original | 04/04/2016 |
| | | | |

## 2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: JADAK, LLC
Product: RFID module
Serial No. 160317-002
Model: JDK-2254

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

## 3 Customer information

| | |
|---|---|
| Applicant Name | JADAK LLC |
| Applicant Address | 7279 William Barry Blvd., N. Syracuse, NY 13212 |
| Manufacturer Name | JADAK LLC |
| Manufacturer Address | 7279 William Barry Blvd., N. Syracuse, NY 13212 |

## 4 Test site information

| | |
|---|---|
| Lab performing tests | SIEMIC Laboratories |
| Lab Address | 775 Montague Expressway, Milpitas, CA 95035 |
| FCC Test Site No. | 881796 |
| IC Test Site No. | 4842D-2 |
| VCCI Test Site No. | A0133 |

## 5 Modification

| Index | Item | Description | Note |
|---|---|---|---|
| - | - | - | - |

# 6 EUT Information

## 6.1 EUT Description

| | |
|---|---|
| Product Name | RFID module |
| Serial No. | 160317-002 |
| Model No. | JDK-2254 |
| Trade Name | JADAK |
| Input Power | 24VDC |
| Product SW/HW version | N/A |
| Radio SW/HW version | N/A |
| Test SW Version | N/A |
| Date of EUT received | 03/16/2016 |
| Equipment Class/ Category | DXX |
| Working Frequencies | 13.56MHz |
| Port/Connectors | I/O |

## 6.2 Radio Description

**Specifications for Radio:**

| Radio Type | RFID |
|---|---|
| Operating Frequency | 13.56MHz |
| Modulation | ASK (13.56MHz) |
| Channel Spacing | None |
| Antenna Type | Chip antenna |
| Antenna Gain | 0dBi |
| Antenna Connector Type | N/A |

**Channel List:**

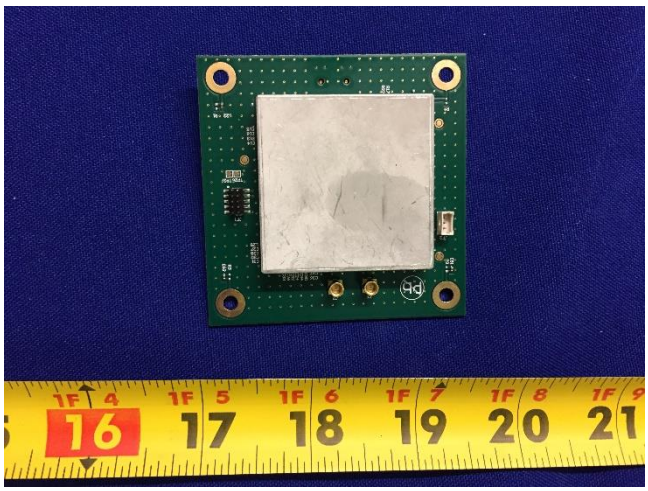
| Type | Mode | Channel No. | Frequency (MHz) | Available (Y/N) |
|---|---|---|---|---|
| RFID | 13.56MHz | 1 | 13.56 | Y |

## 6.3 EUT test modes/configuration Description

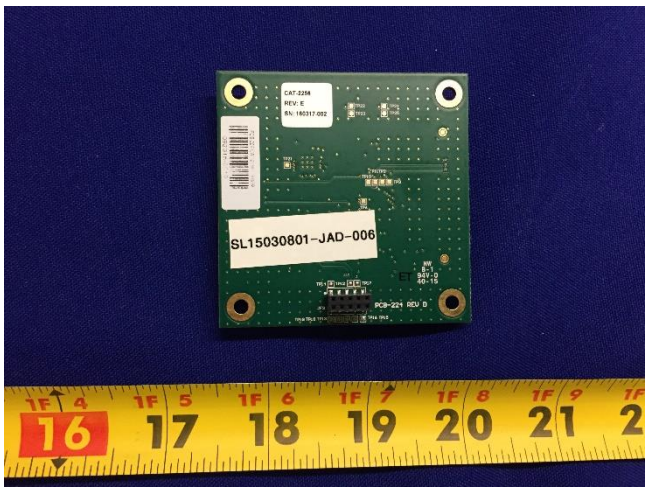
| Mode | Note |
|---|---|
| RF test | EUT is set to continuously transmit at 13.56MHz |
| | |
| | |
| **Note:** None | |

| Test Item | Operating mode | Tested antenna port | Test frequencies |
|---|---|---|---|
| Antenna Requirement | N/A | - | 13.56MHz |
| Conducted Emissions Voltage | Continuous Transmit | - | |
| Limit in the band of 13.553 – 13.567 MHz | Continuous Transmit | - | |
| Limit in the band of 13.410 – 13.553 MHz and 13.567 – 13.710 MHz | Continuous Transmit | - | |
| Limit in the band of 13.110 – 13.410 MHz and 13.710 – 14.010 MHz | Continuous Transmit | - | |
| Limit outside the band of 13.110 – 14.010 MHz | Continuous Transmit | - | |
| Frequency Stability | Continuous Transmit | - | |
| Occupied Bandwidth | Continuous Transmit | - | |
| **Note:** EUT uses a PCB trace antenna attached to the PCB board. Only radiated measurements were performed during the test. | | | |

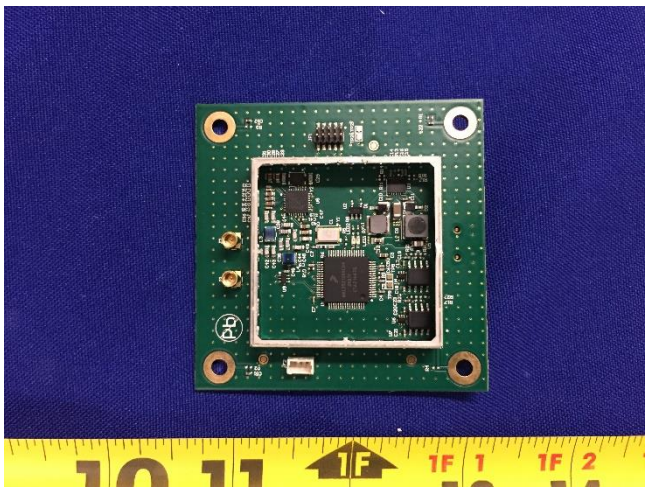
## 6.4 EUT Photos



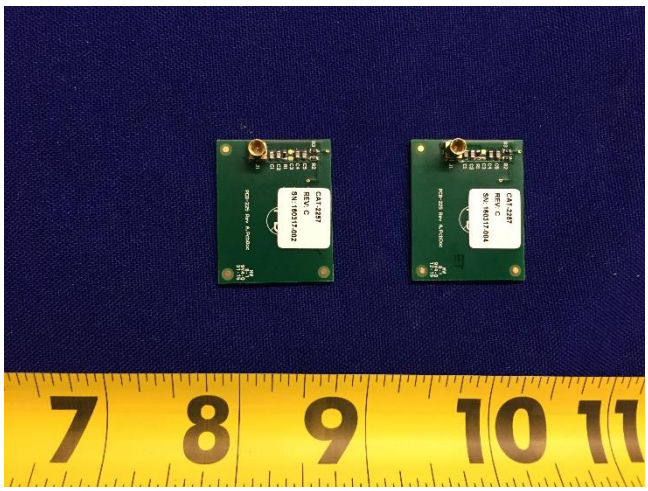
EUT – Top View



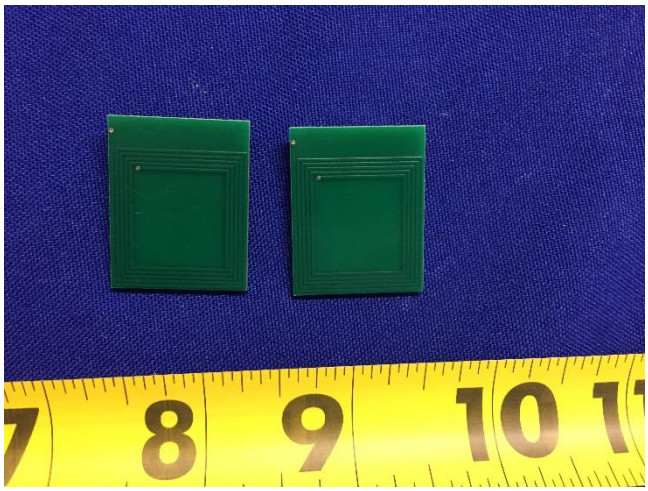

EUT – Bottom View



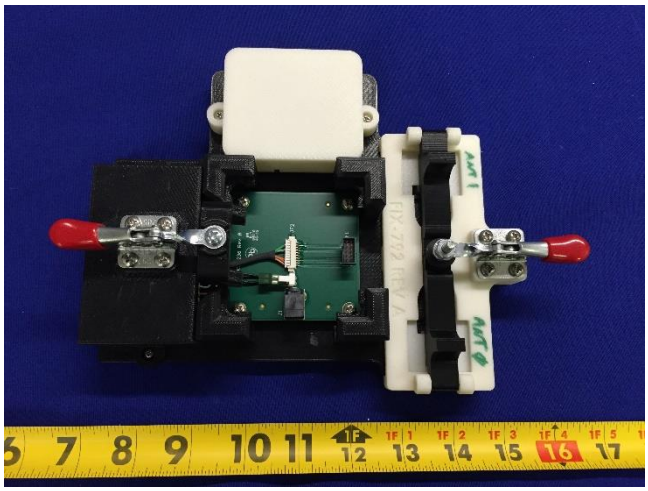
EUT – Top View without shielding



Antenna – Top View



Antenna – Bottom View



Support equipment View

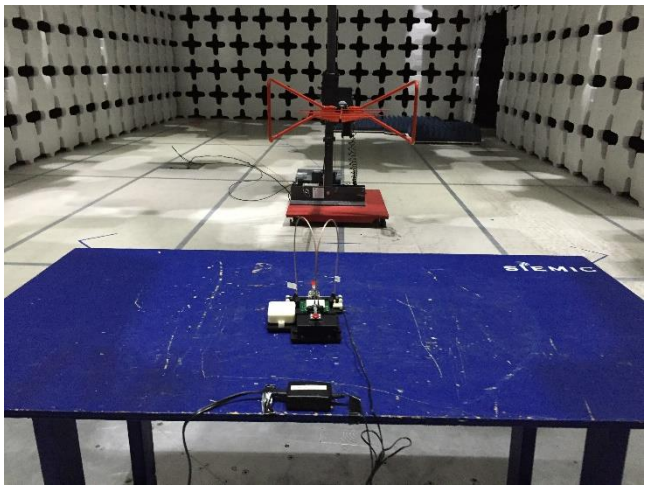
| | |
|---|---|
|  | |
| **AC adapter View** | **-** |

## 6.5 EUT Test Setup Photos

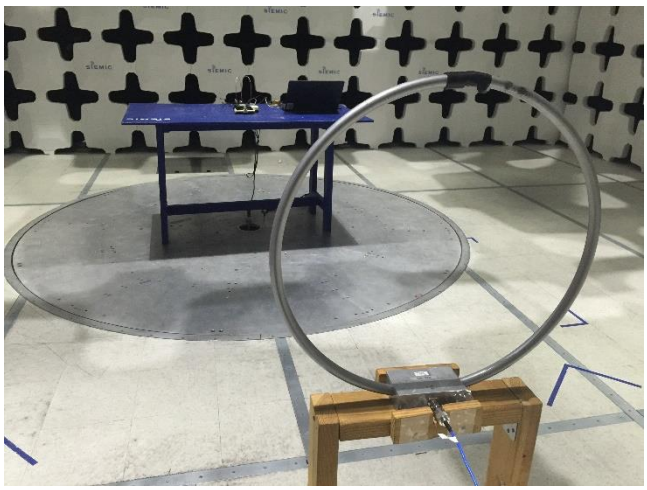
AC Line Conducted Emissions– Front View

AC Line Conducted Emissions– Rear View

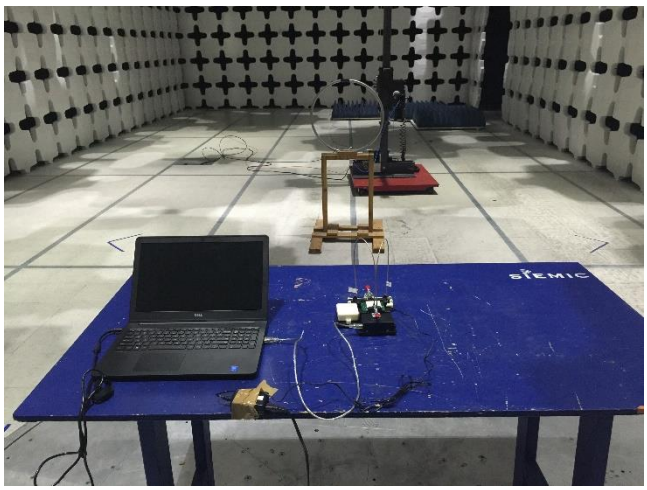
Radiated Emissions (<1GHz) – Front View



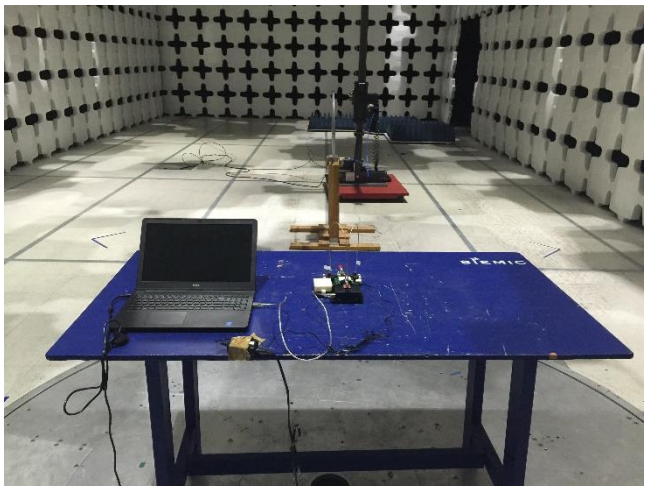
Radiated Emissions (<1GHz) – Rear View



Radiated Emissions (<30MHz) – Front View 0 Degree



Radiated Emissions (<30MHz) – Rear View 0 Degree

| | |
|---|---|
|  |  |
| **Radiated Emissions (<30MHz) – Front View 90 Degree** | **Radiated Emissions (<30MHz) – Rear View 90 Degree** |

# 7 Supporting Equipment/Software and cabling Description

## 7.1 Supporting Equipment

| Index | Supporting Equipment Description | Model | Serial No | Manufacturer | Note |
|---|---|---|---|---|---|
| 1 | DC Power supply | ETSA240050UD | N/A | CUI Inc. | - |
| 2 | Custom Test Fixture | FIX-792 REV A | N/A | JADAK LLC | - |

## 7.2 Cabling Description

| Name | Connection Start | | Connection Stop | | Length / shielding Info | | Note |
|---|---|---|---|---|---|---|---|
| | From | I/O Port | To | I/O Port | Length (m) | Shielding | |
| - | - | - | - | - | - | - | - |

## 7.3 Test Software Description

| Test Item | Software | Description |
|---|---|---|
| RF Testing | N/A | Set the EUT to transmit continuously at 13.56MHz |
| | | |

# 8 Test Summary

| Test Item | Test standard | | Test Method/Procedure | Pass / Fail |
|---|---|---|---|---|
| Antenna Requirement | FCC | 15.203 | ANSI C63.10 – 2013<br>558074 D01 DTS Meas. Guidance v03r02 | ☒ Pass<br>☐ N/A |
| AC Conducted Emissions Voltage | FCC | 15.225(a) | ANSI C63.10 2013 | ☒ Pass<br>☐ N/A |
| Remark | AC Line tests were performed on the support equipment's power adapter, laptop. | | | |

| Test Item | Test standard | | Test Method/Procedure | | Pass / Fail |
|---|---|---|---|---|---|
| Limit in the band of 13.553 – 13.567 MHz | FCC | 15.225(a) | FCC | ANSI C63.10 2013 | ☒ Pass<br>☐ N/A |
| Limit in the band of 13.410 – 13.553 MHz and 13.567 – 13.710 MHz | FCC | 15.225(b) | FCC | ANSI C63.10 2013 | ☒ Pass<br>☐ N/A |
| Limit in the band of 13.110 – 13.410 MHz and 13.710 – 14.010 MHz | FCC | 15.225(c) | FCC | ANSI C63.10 2013 | ☒ Pass<br>☐ N/A |
| Limit outside the band of 13.110 – 14.010 MHz | FCC | 15.225(d), 15.209 | FCC | ANSI C63.10 2013 | ☒ Pass<br>☐ N/A |
| Frequency Stability | FCC | 15.225(e) | FCC | - | ☒ Pass<br>☐ N/A |
| Occupied Bandwidth | FCC | - | FCC | - | ☒ Pass<br>☐ N/A |
| Remark | 1. All measurement uncertainties are not taken into consideration for all presented test result.<br>2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.<br>3. Test Method: ANSI C63.10: 2013 | | | | |

# 9 Measurement Uncertainty

| Test Item | Description | Uncertainty |
|---|---|---|
| AC Conducted Emissions Voltage | Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 | ±3.5dB |
| Limit in the band of 13.553 – 13.567 MHz | Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m) | +5.6dB/-4.5dB |
| Limit in the band of 13.410 – 13.553 MHz and 13.567 – 13.710 MHz | | +5.6dB/-4.5dB |
| Limit in the band of 13.110 – 13.410 MHz and 13.710 – 14.010 MHz | | +5.6dB/-4.5dB |
| Limit outside the band of 13.110 – 14.010 MHz | | +5.6dB/-4.5dB |
| Radiated Spurious Emissions | | +5.6dB/-4.5dB |

# 10 Measurements, examination and derived results

## 10.1 Antenna Requirement

| Spec | Requirement | Applicable |
|---|---|---|
| §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.<br><br>Antenna requirement must meet at least one of the following:<br><br>a) Antenna must be permanently attached to the device.<br>b) The antenna must use a unique type of connector to attach to the device.<br>c) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device. | ☒ |
| Remark | The RFID module is using a chip antenna with a unique type of connector which meets the requirement. | |
| Result | ☒ PASS ☐ FAIL | |

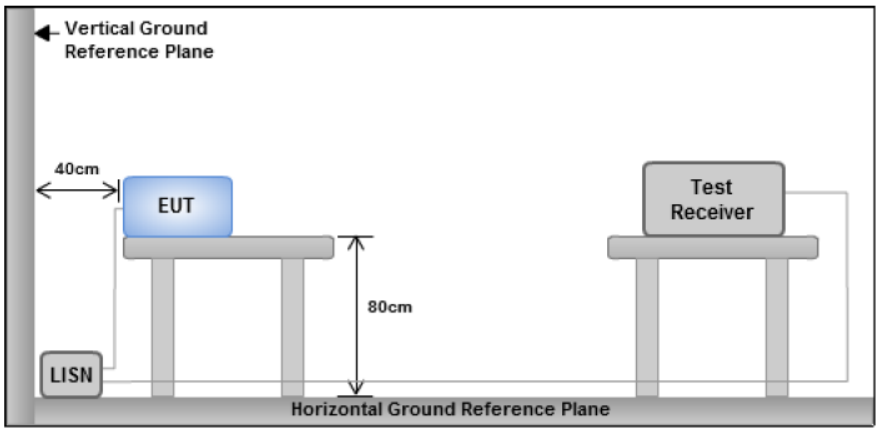
## 10.2 Conducted Emissions Test Result

**Conducted Emission Limit**

| Section | Frequency ranges (MHz) | Limit (dBuV) | |
|---|---|---|---|
| | | QP | Average |
| Class B devices | 0.15 ~ 0.5 | 66 – 56 | 56 – 46 |
| | 0.5 ~ 5 | 56 | 46 |
| | 5 ~ 30 | 60 | 50 |

| Spec | Item | Requirement | Applicable |
|---|---|---|---|
| § 15.207 | a) | For an intentional radiator that is designed to be connected to the public utility (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 the limits set in § 15.207, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN).<br>AC Line conducted emission within the band 150kHz to 30MHz | ☒ |

Test Setup




Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

Procedure

- The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B.
- The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.
- The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
- All other supporting equipment was powered separately from another main supply.

| Test Date | 03/24/2016 | Environmental conditions | Temperature 21°C<br>Relative Humidity 38 %<br>Atmospheric Pressure 1025 mbar |
|---|---|---|---|
| Remark | The EUT was tested at 120VAC, 60Hz. | | |
| Result | ☒ Pass ☐ Fail | | |

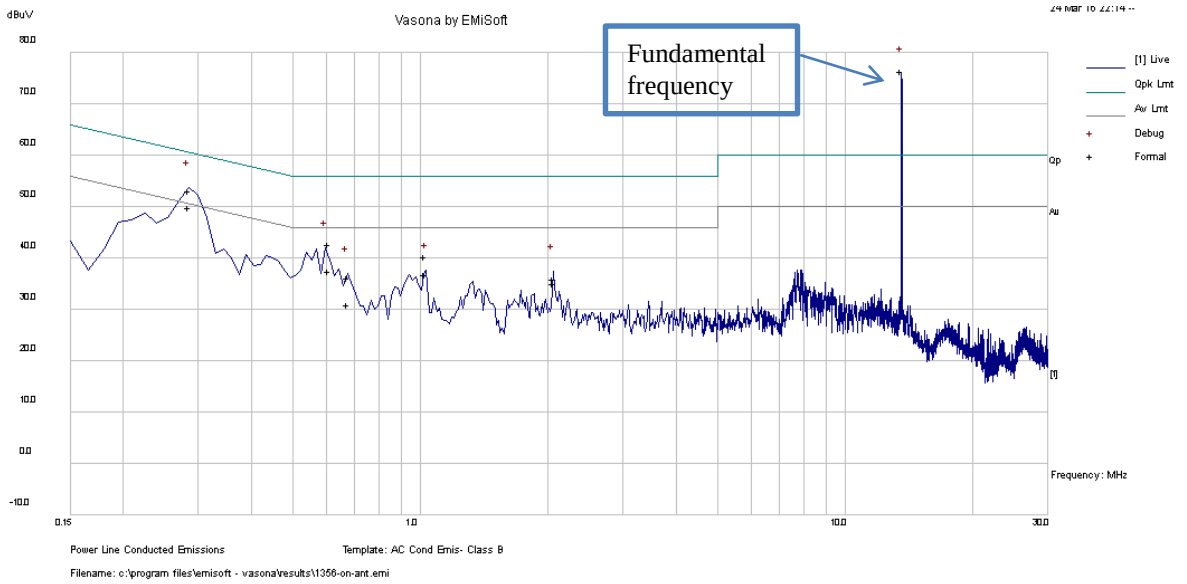
**Test Data** ☒ Yes ☐ N/A

**Test Plot** ☒ Yes ☐ N/A

**Test was done by Gary Chou at Conducted Emission test site.**

| Test specification: | Conducted Emissions | | | |
|---|---|---|---|---|
| Mains Power: | 120VAC, 60Hz | | Result: | ☒ Pass ☐ Fail |
| Tested by: | Gary Chou | | | |
| Test Date: | 03/25/2016 | | | |
| Remarks: | AC Line @ Line | | | |

**Neutral Plot at V=120VAC, *f*=60Hz**




**With antenna:**

**Live Measurements**

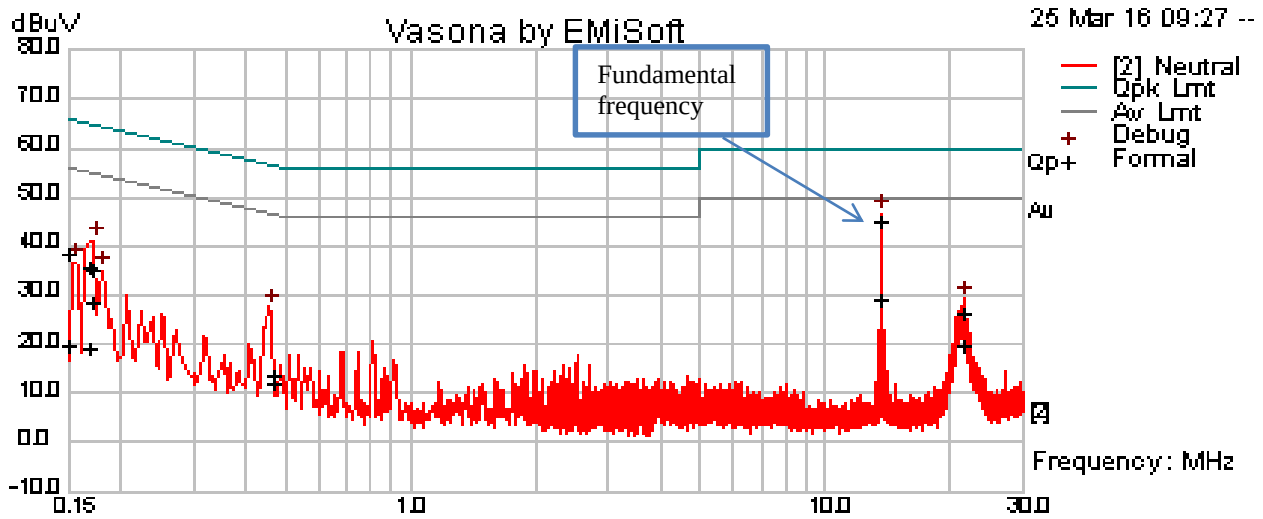
| Frequency MHz | Raw dBuV | Cable Loss | Factors dB | Level dBuV | Measurement Type | Line/ Neutral | Limit dBuV | Margin dB | Pass /Fail |
|---|---|---|---|---|---|---|---|---|---|
| 0.29 | 42.18 | 10 | 0.95 | 53.14 | Quasi Peak | Live | 60.65 | -7.51 | Pass |
| 0.61 | 32.15 | 10.01 | 0.64 | 42.8 | Quasi Peak | Live | 56 | -13.2 | Pass |
| 1.03 | 29.71 | 10.02 | 0.58 | 40.3 | Quasi Peak | Live | 56 | -15.7 | Pass |
| 2.06 | 24.56 | 10.02 | 0.55 | 35.14 | Quasi Peak | Live | 56 | -20.86 | Pass |
| 0.68 | 25.69 | 10.01 | 0.62 | 36.32 | Quasi Peak | Live | 56 | -19.68 | Pass |
| 0.29 | 38.9 | 10 | 0.95 | 49.86 | Average | Live | 50.65 | -0.79 | Pass |
| 0.61 | 26.97 | 10.01 | 0.64 | 37.61 | Average | Live | 46 | -8.39 | Pass |
| 1.03 | 26.39 | 10.02 | 0.58 | 36.99 | Average | Live | 46 | -9.01 | Pass |
| 2.06 | 25.56 | 10.02 | 0.55 | 36.14 | Average | Live | 46 | -9.86 | Pass |
| 0.68 | 20.36 | 10.01 | 0.62 | 30.99 | Average | Live | 46 | -15.01 | Pass |

**With 50Ohm dummy load for 13.56MHz:**

| Frequency MHz | Raw dBuV | Cable Loss | Factors dB | Level dBuV | Measurement Type | Line/ Neutral | Limit dBuV | Margin dB | Pass /Fail |
|---|---|---|---|---|---|---|---|---|---|
| 13.56 | 23.95 | 10.06 | 0.59 | 34.59 | Quasi Peak | Live | 60 | -25.41 | Pass |
| 13.56 | 23.28 | 10.06 | 0.59 | 33.92 | Average | Live | 50 | -16.08 | Pass |

| Test specification: | Conducted Emissions | | | |
|---|---|---|---|---|
| Mains Power: | 120VAC, 60Hz | | Result: | ☒ Pass ☐ Fail |
| Tested by: | Gary Chou | | | |
| Test Date: | 03/25/2016 | | | |
| Remarks: | AC Line @ Neutral | | | |

**Line Plot at V=120VAC, *f*=60Hz**




**With antenna:**

**Neutral Measurements**

| Frequency MHz | Raw dBµV | Cable Loss | Factors dB | Level dBµV | Measurement Type | Line/ Neutral | Limit dBµV | Margin dB | Pass /Fail |
|---|---|---|---|---|---|---|---|---|---|
| 0.28 | 41.23 | 10 | 0.96 | 52.19 | Quasi Peak | Neutral | 60.7 | -8.51 | Pass |
| 0.57 | 30.04 | 10.01 | 0.65 | 40.7 | Quasi Peak | Neutral | 56 | -15.3 | Pass |
| 1.03 | 29.65 | 10.02 | 0.58 | 40.24 | Quasi Peak | Neutral | 56 | -15.76 | Pass |
| 2.06 | 25.94 | 10.02 | 0.55 | 36.52 | Quasi Peak | Neutral | 56 | -19.48 | Pass |
| 1.31 | 21.83 | 10.02 | 0.57 | 32.42 | Quasi Peak | Neutral | 56 | -23.58 | Pass |
| 0.28 | 38.45 | 10 | 0.96 | 49.41 | Average | Neutral | 50.7 | -1.29 | Pass |
| 0.57 | 25.63 | 10.01 | 0.65 | 36.29 | Average | Neutral | 46 | -9.71 | Pass |
| 1.03 | 26.48 | 10.02 | 0.58 | 37.08 | Average | Neutral | 46 | -8.92 | Pass |
| 2.06 | 25.87 | 10.02 | 0.55 | 36.45 | Average | Neutral | 46 | -9.55 | Pass |
| 1.31 | 14.45 | 10.02 | 0.57 | 25.03 | Average | Neutral | 46 | -20.97 | Pass |

**With 50Ohm dummy load for 13.56MHz:**

| Frequency MHz | Raw dBuV | Cable Loss | Factors dB | Level dBuV | Measurement Type | Line/ Neutral | Limit dBuV | Margin dB | Pass /Fail |
|---|---|---|---|---|---|---|---|---|---|
| 13.56 | 25.01 | 10.06 | 0.59 | 35.66 | Quasi Peak | Neutral | 60 | -24.34 | Pass |
| 13.56 | 24.23 | 10.06 | 0.59 | 34.88 | Average | Neutral | 50 | -15.12 | Pass |

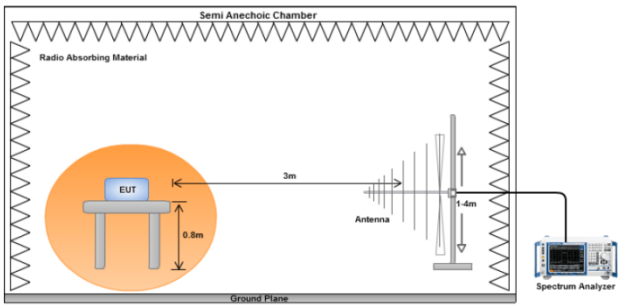
## 10.3 Radiated Measurements below 1GHz (>30MHz)

**Requirement(s):**

| Spec | Requirement | Applicable |
|---|---|---|
| 47 CFR §15.225 | Operation within the band 13.110–14.010 MHz:<br>(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.<br>(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.<br>(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.<br>(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209. | ☒ |

| Frequency range (MHz) | Field Strength (uV/m) |
|---|---|
| 30 – 88 | 100 |
| 88 – 216 | 150 |
| 216 960 | 200 |
| Above 960 | 500 |

Test Setup




Procedure

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. A Quasi-peak measurement was then made for that frequency point.
4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

| Test Date | 03/25/2016 | Environmental conditions | Temperature 20.1°C<br>Relative Humidity 36%<br>Atmospheric Pressure 1026mbar |
|---|---|---|---|
| Remark | All orientations for the EUT are investigated, the result shows the worst case only. | | |
| Result | ☒ Pass ☐ Fail | | |

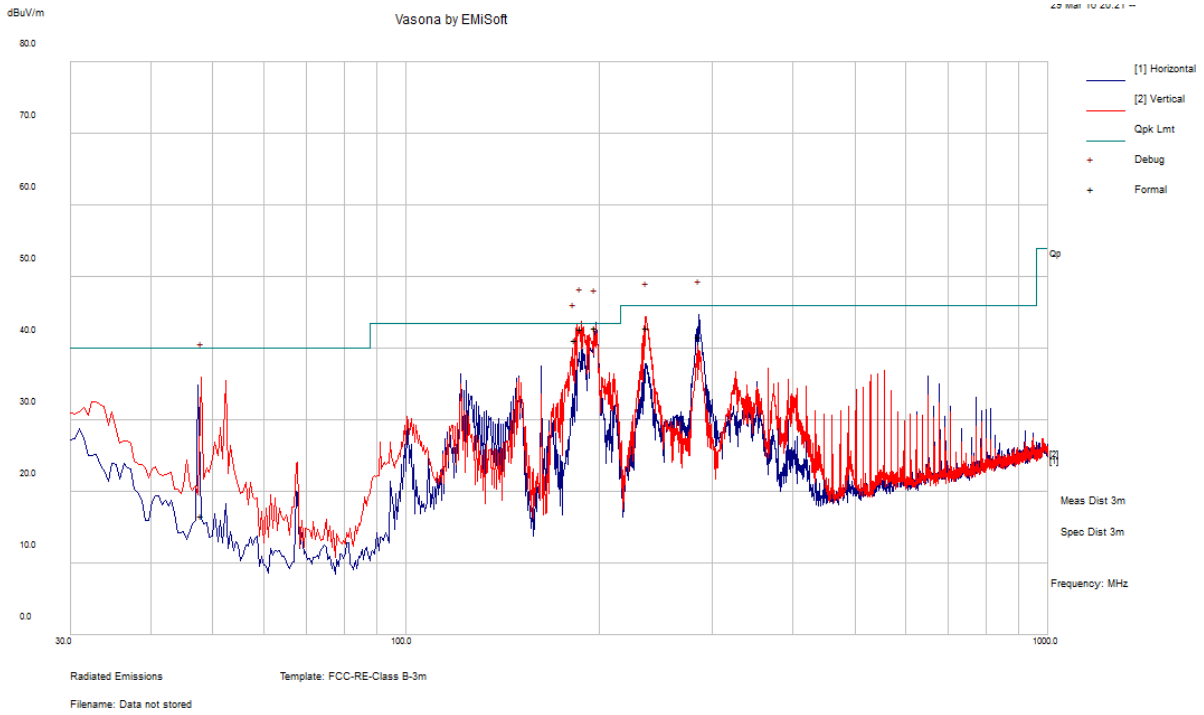
**Test Data** ☒ Yes (See below) ☐ N/A

**Test Plot** ☒ Yes (See below) ☐ N/A

**Test was done by Chen Ge at 10 meter chamber.**

| Test specification: | Radiated Emissions | | | |
|---|---|---|---|---|
| Mains Power: | 120VAC, 60Hz | | Result: | ☒ Pass ☐ Fail |
| Tested by: | Chen Ge | | | |
| Test Date: | 03/29/2016 | | | |
| Remarks: | N/A | | | |

**$f$=30MHz – 1000MHz plot at V=120VAC, $f$=60Hz and 3 meter distance**




**$f$=30MHz – 1000MHz Measurements**

| Frequency MHz | Raw dBµV/m | Cable Loss | AF dB | Level dBµV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBµV/m | Margin dB | Pass /Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 187.16 | 69.04 | 2.04 | -28.3 | 42.79 | Quasi Max | V | 101 | 126 | 43.52 | -0.73 | Pass |
| 197.41 | 67.49 | 2.09 | -26.71 | 42.87 | Quasi Max | H | 107 | 130 | 43.52 | -0.65 | Pass |
| 285.66 | 65.36 | 2.6 | -26.27 | 41.68 | Quasi Max | H | 103 | 106 | 46.02 | -4.34 | Pass |
| 236.55 | 68.31 | 2.33 | -27.72 | 42.92 | Quasi Max | V | 186 | 197 | 46.02 | -3.1 | Pass |
| 183.02 | 67.55 | 2.02 | -28.46 | 41.11 | Quasi Max | V | 101 | 127 | 43.52 | -2.41 | Pass |
| 48.10 | 44.52 | 1.06 | -29 | 16.58 | Quasi Max | V | 128 | 70 | 40 | -23.42 | Pass |

## 10.4 Radiated Measurements below 30MHz

**Requirement(s):**

| Spec | Requirement | Applicable |
|---|---|---|
| 47 CFR §15.225 | Operation within the band 13.110–14.010 MHz<br>(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.<br>(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.<br>(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.<br>(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209. | ☒ |

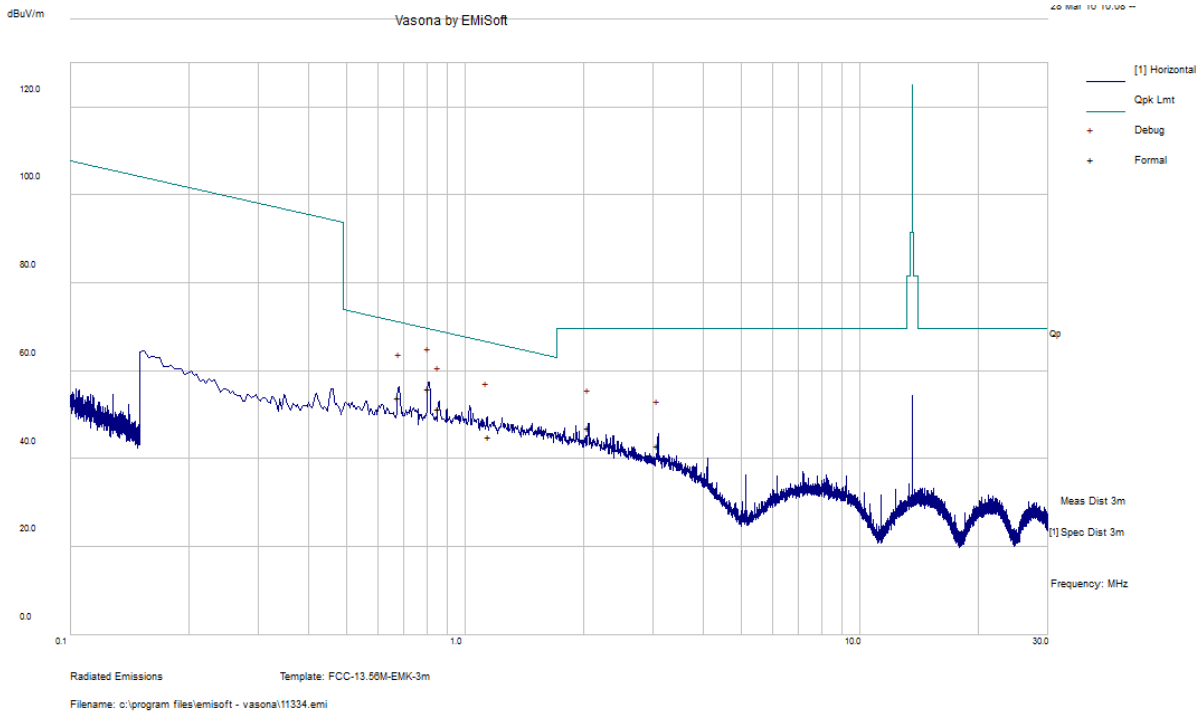
| | | | | |
|---|---|---|---|---|
| Test Setup | 1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.<br>2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.<br>3. The relevant loop antenna was set at the required test distance away from the EUT and supporting equipment boundary. | | | |
| Procedure | For < 30MHz, Radiated emissions were measured according to ANSI C63.10. The EUT was set to transmit at the highest output power.<br>The EUT was set 3 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the centre of the loop. The measuring bandwidth was set to 10 kHz.<br>The limit is converted from microvolt/meter to decibel microvolt/meter. | | | |
| Test Date | 03/28/2016 | Environmental conditions | Temperature<br>Relative Humidity<br>Atmospheric Pressure | 22°C<br>40%<br>1026mbar |
| Remark | All orientations for the EUT are investigated, the result shows the worst case only. | | | |
| Result | ☒ Pass ☐ Fail | | | |

**Test Data** ☒ Yes (See below) ☐ N/A

**Test Plot** ☒ Yes (See below) ☐ N/A

**Test was done by Chen Ge at 10 meter chamber.**

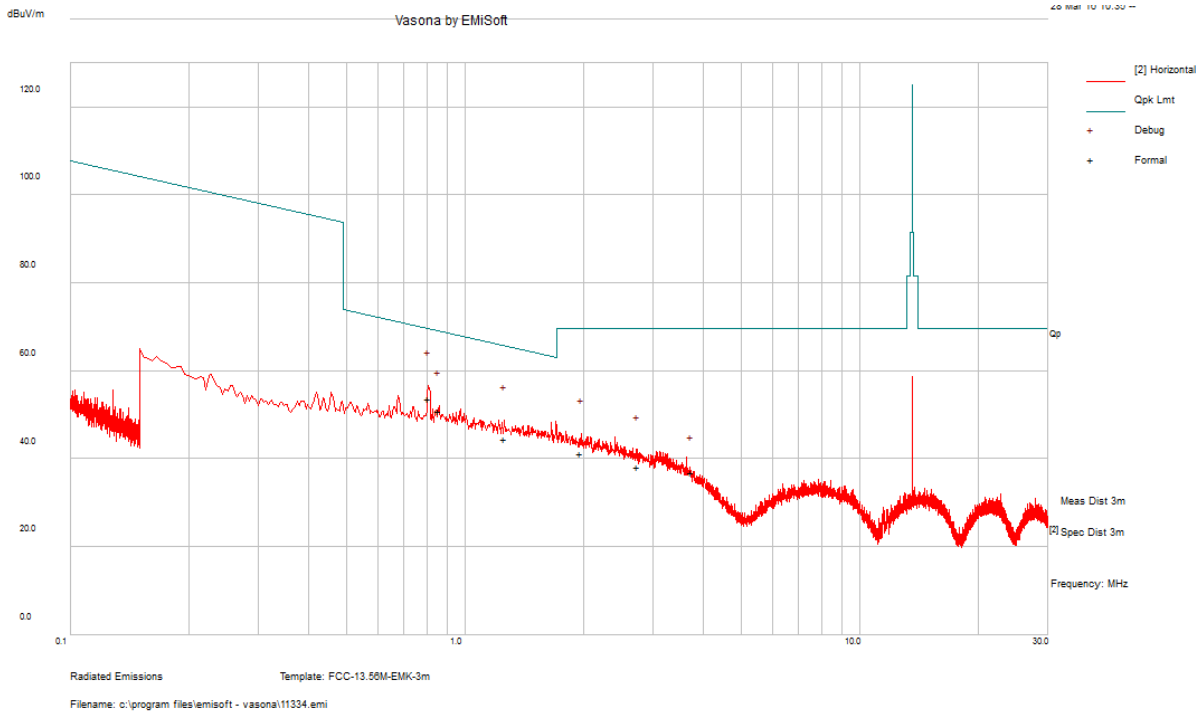
| Test specification: | Radiated Spurious Emissions | | | |
|---|---|---|---|---|
| Mains Power: | 120VAC, 60Hz | | Result: | ☒ Pass ☐ Fail |
| Tested by: | Chen Ge | | | |
| Test Date: | 03/24//2016 | | | |
| Remarks: | ***f*= 100kHz – 30MHz plot, and loop antenna at 0 degree** | | | |




***Quasi Max Measurement***

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.81 | 41.87 | 0.2 | 13.88 | 55.96 | Quasi Max | H | 100 | 329 | 69.43 | -13.48 | Pass |
| 0.68 | 38.52 | 0.19 | 15.28 | 53.99 | Quasi Max | H | 100 | 79 | 70.98 | -16.99 | Pass |
| 0.86 | 37.7 | 0.21 | 13.43 | 51.34 | Quasi Max | H | 100 | 114 | 68.92 | -17.58 | Pass |
| 1.15 | 34.26 | 0.22 | 10.6 | 45.08 | Quasi Max | H | 100 | 13 | 66.41 | -21.33 | Pass |
| 2.06 | 41.04 | 0.29 | 5.86 | 47.19 | Quasi Max | H | 100 | 128 | 69.54 | -22.35 | Pass |
| 3.08 | 39.88 | 0.31 | 2.79 | 42.98 | Quasi Max | H | 100 | 157 | 69.54 | -26.56 | Pass |

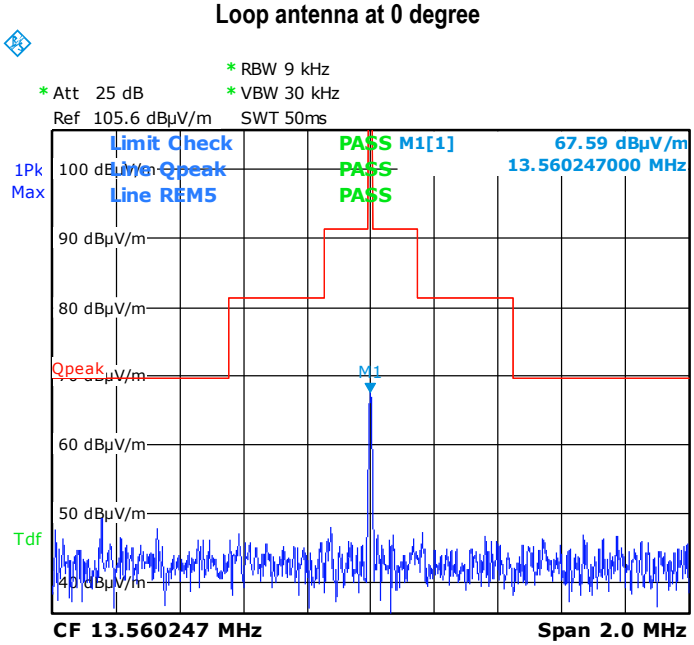
| Test specification: | Radiated Spurious Emissions | | | |
|---|---|---|---|---|
| Mains Power: | 110VAC, 60Hz | | Result: | ☒ Pass ☐ Fail |
| Tested by: | Chen Ge | | | |
| Test Date: | 03/24/2016 | | | |
| Remarks: | **$f$= 100kHz – 30MHz plot, and loop antenna at 90 degree** | | | |




***Quasi Max Measurement***

| Frequency MHz | Raw dBuV | Cable Loss | AF dB | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.81 | 39.56 | 0.2 | 13.9 | 53.67 | Quasi Max | H | 100 | 296 | 69.46 | -15.8 | Pass |
| 0.86 | 37.16 | 0.21 | 13.43 | 50.8 | Quasi Max | H | 100 | 252 | 68.92 | -18.12 | Pass |
| 1.26 | 34.49 | 0.23 | 9.81 | 44.54 | Quasi Max | H | 100 | 24 | 65.57 | -21.04 | Pass |
| 1.97 | 34.86 | 0.28 | 6.2 | 41.34 | Quasi Max | H | 100 | 192 | 69.54 | -28.2 | Pass |
| 2.73 | 34.11 | 0.31 | 3.68 | 38.1 | Quasi Max | H | 100 | 268 | 69.54 | -31.44 | Pass |
| 3.74 | 35.03 | 0.31 | 1.56 | 36.9 | Quasi Max | H | 100 | 239 | 69.54 | -32.64 | Pass |

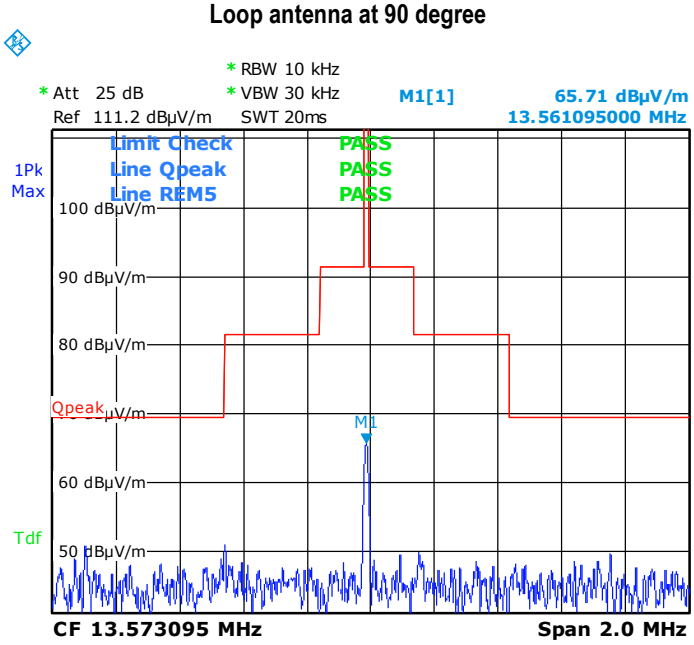
**Loop antenna at 0 degree**




Date: 28.MAR.2016 20:02:47

| Frequency (MHz) | Amplitude (dBµV/m) |
|---|---|
| 13.56 | 67.59 |

**Loop antenna at 90 degree**

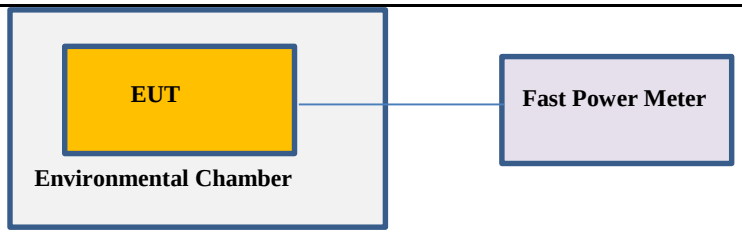



Date: 28.MAR.2016 20:17:40

| Frequency (MHz) | Amplitude (dBµV/m) |
|---|---|
| 13.56 | 65.71 |

## 10.5 Frequency Stability

**Requirement(s):**

| Spec | Requirement | | | Applicable |
|---|---|---|---|---|
| 47 CFR §15.225 e) | Limit: ±0.01% of 13.56 MHz = 1356 Hz | | | ☒ |
| Test Setup |  <br>1. The EUT was set up inside an environmental chamber.<br>2. The EUT was placed in the centre of the environmental. | | | |
| Procedure | Frequency Stability was measured according to 47 CFR §2.1055. Measurement was taken with spectrum analyzer. The spectrum analyzer bandwidth and span was set to read in hertz. A voltmeter was used to monitor when varying the voltage. | | | |
| Test Date | 03/29/2016 | Environmental conditions | Temperature<br>Relative Humidity<br>Atmospheric Pressure | 20°C<br>41%<br>1026mbar |
| Remark | None | | | |
| Result | ☒ Pass ☐ Fail | | | |

**Test Data** ☒ Yes (See below) ☐ N/A

**Test Plot** ☒ Yes (See below) ☐ N/A

**Test was done by Chen Ge at RF test site.**

## Test Result for 13.56MHz Radio

**Frequency Stability versus Temperature:** The Frequency tolerance of the carrier signal shall be maintained within ± 0.01% of the operating frequency over a temperature variation of -20ºC to +50ºC at normal supply voltage.

Reference Frequency: 13.561214 MHz at 20°C at 12VDC

| Temperature (ºC) | Measured Freq. (MHz) | Freq. Drift (Hz) | Freq. Deviation (Limit: 0.01%) | Pass/Fail |
|---|---|---|---|---|
| 50 | 13.561108 | -106 | <0.01 | Pass |
| 40 | 13.561108 | -106 | <0.01 | Pass |
| 30 | 13.561224 | 10 | <0.01 | Pass |
| 20 | Reference (13.561214 MHz) | | | |
| 10 | 13.561222 | 8 | <0.01 | Pass |
| 0 | 13.561425 | 211 | <0.01 | Pass |
| -10 | 13.561425 | 211 | <0.01 | Pass |
| -20 | 13.561432 | 218 | <0.01 | Pass |

**Frequency Stability versus Input Voltage:** The Frequency tolerance of the carrier signal shall be maintained within ± 0.01%, the frequency of the transmitter was measured at 85% and at 115% of the rated power supply voltage at a 20ºC environmental temperature.

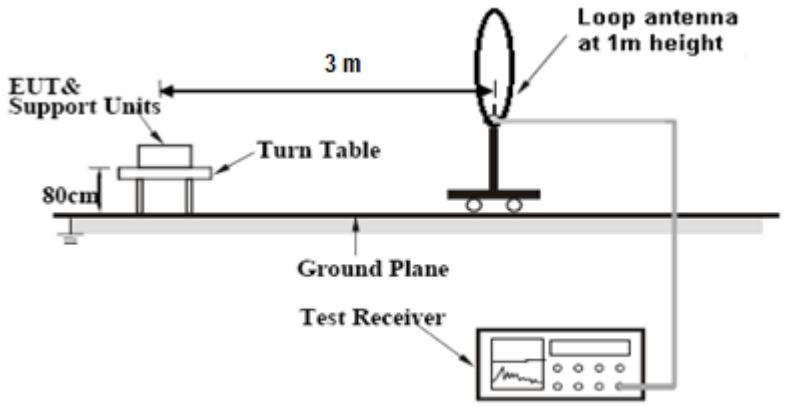
Carrier Frequency: 13.561214 at 20°C at 24VDC

| Measured Voltage ±15% of nominal (AC) | Measured Freq. (MHz) | Freq. Drift (Hz) | Freq. Deviation (Limit: 0.01%) | Pass/Fail |
|---|---|---|---|---|
| 27.60 | 13.561214 | 0.00 | <0.01 | Pass |
| 20.40 | 13.561214 | 0.00 | <0.01 | Pass |

## 10.6 Occupied bandwidth

**Requirement(s):**

| Spec | Requirement | Applicable |
|---|---|---|
| RSS-Gen 4.6.1 | The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyser shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual. The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth. | ☒ |

| | | | |
|---|---|---|---|
| Test Setup |  | | |
| Procedure | 1. The EUT was switched on and allowed to warm up to its normal operating condition.<br>2. To measure conducted, a SMA cable was used to replace the EUT antenna. To measure radiated, an external antenna was used to detect EUT transmission signal.<br>3. Measurement of the 99% Occupied Bandwidth of EUT transmission signal and make record. | | |
| Test Date | 03/24/2016 | Environmental conditions | Temperature 22°C<br>Relative Humidity 39%<br>Atmospheric Pressure 1025mbar |
| Remark | - | | |
| Result | ☒ Pass ☐ Fail | | |

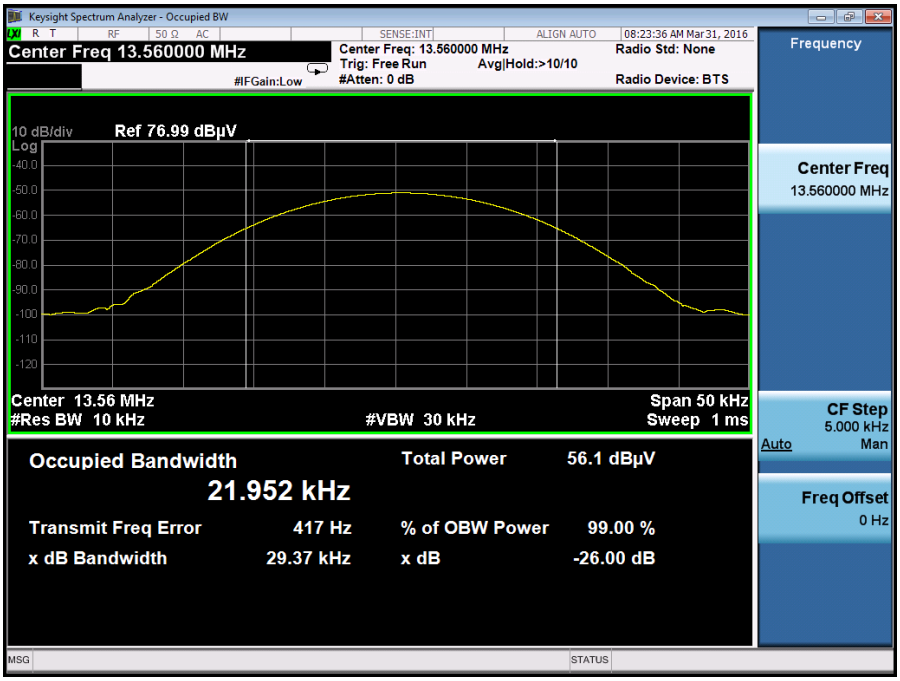
**Test Data** ☒ Yes (See below) ☐ N/A

**Test Plot** ☒ Yes (See below) ☐ N/A

**Test was done by Chen Ge at 10 meter chamber.**

## Test results:

### 13.56 MHz




| Frequency (MHz) | Occupied Bandwidth (KHz) |
|---|---|
| 13.56 | 21.95 |

# Annex A. TEST INSTRUMENT

| Instrument | Model | Serial # | Cal Date | Cal Cycle | Cal Due | In use |
|---|---|---|---|---|---|---|
| **Conducted Emissions** | | | | | | |
| R & S Receiver | ESIB 40 | 100179 | 05/23/2015 | 1 Year | 05/23/2016 | ☑ |
| CHASE LISN | MN2050B | 1018 | 08/07/2015 | 1 Year | 08/07/2016 | ☑ |
| **Radiated Emissions** | | | | | | |
| R & S Receiver | ESL6 | 100178 | 05/27/2015 | 1 Year | 05/27/2016 | ☑ |
| R & S Receiver | ESIB 40 | 100179 | 05/23/2015 | 1 Year | 05/23/2016 | ☑ |
| Pre-Amplifier (1-26.5GHz) | 8449B | 3008A00715 | 03/04/2016 | 1 Year | 03/04/2017 | ☐ |
| Preamplifier (100KHz-7GHz) | LPA-6-30 | 11140711 | 02/19/2016 | 1 Year | 02/19/2017 | ☑ |
| ETS-Lingren Loop Antenna | 6512 | 00049120 | 05/12/2015 | 1 Year | 05/12/2016 | ☑ |
| Bi-Log antenna (30MHz~2GHz) | JB1 | A030702 | 08/12/2015 | 1 Year | 08/12/2016 | ☑ |
| Horn Antenna (1-26.5GHz) | 3115 | 10SL0059 | 08/25/2015 | 1 Year | 08/25/2016 | ☐ |
| Tuned Dipole Antenna 30 - 1000 MHz (4pcs set) | AD-100 | 40133 | 10/02/2015 | 1 Year | 10/02/2016 | ☐ |
| 3 Meters SAC | 3M | N/A | 08/08/2015 | 1 Year | 08/08/2016 | ☑ |
| 10 Meters SAC | 10M | N/A | 09/05/2015 | 1 Year | 09/05/2016 | ☐ |
| **RF Conducted Measurement** | | | | | | |
| Spectrum Analyzer | N9010A | 10SL0219 | 08/20/2015 | 1 Year | 08/20/2016 | ☑ |
| Agilent Signal Generator | MXG N5182A | MY47071065 | 04/06/2015 | 1 Year | 04/06/2016 | ☐ |
| R & S Receiver | ESIB 40 | 100179 | 05/23/2015 | 1 Year | 05/23/2016 | ☐ |
| Test Equity Environment Chamber | 1007H | 61201 | 07/31/2015 | 1 Year | 07/31/2016 | ☑ |
| USB RF Power Sensor | 7002-006 | 10SL0190 | 09/03/2015 | 1 Year | 09/03/2016 | ☐ |

## Test Software Version

| Test Item | Vendor | Software | Version |
|---|---|---|---|
| Radiated Emission | EMISoft | EMISoft Vasona | V5.0 |
| Conducted Emission | EMISoft | EMISoft Vasona | V5.0 |

# Annex B. SIEMIC Accreditation

| Accreditations | Document | Scope / Remark |
|---|---|---|
| ISO 17025 (A2LA) | | Please see the documents for the detailed scope |
| ISO Guide 65 (A2LA) | | Please see the documents for the detailed scope |
| TCB Designation | | A1, A2, A3, A4, B1, B2, B3, B4, C |
| FCC DoC Accreditation | | FCC Declaration of Conformity Accreditation |
| FCC Site Registration | | 3 meter site |
| FCC Site Registration | | 10 meter site |
| IC Site Registration | | 3 meter site |
| IC Site Registration | | 10 meter site |
| EU NB | | **Radio & Telecommunications Terminal Equipment:** EN45001 – EN ISO/IEC 17025 |
| | | **Electromagnetic Compatibility:** EN45001 – EN ISO/IEC 17025 |
| Singapore iDA CB(Certification Body) | | Phase I, Phase II |
| Vietnam MIC CAB Accreditation | | Please see the document for the detailed scope |
| Hong Kong OFCA | | **(Phase II)** OFCA Foreign Certification Body for Radio and Telecom |
| | | **(Phase I)** Conformity Assessment Body for Radio and Telecom |
| Industry Canada CAB | | **Radio:** Scope A – All Radio Standard Specification in Category I |
| | | **Telecom:** CS-03 Part I, II, V, VI, VII, VIII |

| | | |
|---|---|---|
| Japan Recognized Certification Body Designation | | **Radio**: A1. Terminal equipment for purpose of calling<br>**Telecom**: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law |
| Korea CAB Accreditation | | **EMI:** KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI<br>KN22: Test Method for EMI<br>**EMS:** KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS<br>KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS |
| | | **Radio:** RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68 |
| | | **Telecom:** President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4 |
| Taiwan NCC CAB Recognition | | LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08 |
| Taiwan BSMI CAB Recognition | | CNS 13438 |
| Japan VCCI | | R-3083: Radiation 3 meter site<br>C-3421: Main Ports Conducted Interference Measurement<br>T-1597: Telecommunication Ports Conducted Interference Measurements |
| Australia CAB Recognition | | **EMC:** AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4 |
| | | **Radio communications:** AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771 |
| | | **Telecommunications:** AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1 |
| Australia NATA Recognition | | AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016,AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2 |