

RF TEST REPORT


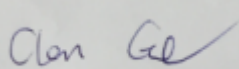


Report No.: RF_SL15081001-CPC-008-FCC-IC_RFID

Supersede Report No.: None

| | | |
|---|---|--|
| Applicant | : | ChargePoint, Inc. |
| Product Name | : | RFID Reader |
| Model No. | : | 28010087 |
| Test Standard | : | FCC 15.225 2014 RSS-210 Issue 8: 2010 |
| Test Method | : | FCC 15.225 2014 ANSI C63.10 2013 RSS Gen Issue 4 2014 |
| FCC ID | : | W38-28010087 |
| IC ID | : | 8854A-28010087 |
| Dates of test | : | August 24 th , 28 th , September 18 th , and 23 rd of 2015 |
| Issue Date | : | 9/24/2015 |
| Test Result | : | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |
| Equipment complied with the specification [X] | | |
| Equipment did not comply with the specification [] | | |

This Test Report is Issued Under the Authority of:

| | |
|--|--|
|  |  |
| Osvaldo Casorla | Chen Ge |
| Test Engineer | Engineer Reviewer |
| This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only | |

Issued By:
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|----------------|------------------------|-----------------------------------|
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| 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 |

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| Country | Accreditation Body | Scope |
|-----------|--------------------|-----------------------|
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| 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 |

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1 Report Revision History

| Report No. | Report | Description | Issue Date |
|-----------------------------------|--------|-------------|------------|
| RF_SL15081001-CPC-008-FCC-IC_RFID | - | Original | 9/24/2015 |

2 Executive Summary

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

Company: ChargePoint, Inc.
Product: RFID Reader
Model: 28010087

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 | : | ChargePoint, Inc. |
| Applicant Address | : | 254 E. Hacienda Ave Campbell, CA 95148 |
| Manufacturer Name | : | ChargePoint, Inc. |
| Manufacturer Address | : | 254 E. Hacienda Ave Campbell, CA 95148 |

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 Reader |
| Model No. | 28010087 |
| Trade Name | ChargePoint, Inc. |
| Serial Number | Prototype 1 |
| Input Power | 100-240VDC, 50/60Hz |
| Product Hardware version | 28-010087 |
| Product Software version | 4.0.1.100 |
| Radio Hardware version | 28-010087 |
| Radio Software version | 4.0.1.100 |
| Date of EUT received | 08/21/2015 |
| Equipment Class/ Category | DTS |
| Operating Frequencies | 13.56MHz |
| Port/Connectors | N/A |

6.2 Radio Description

Specifications for Radio:

| Radio Type | RFID |
|------------------------|------------------|
| Operating Frequency | 13.56MHz |
| Modulation | ASK |
| Channel Spacing | None |
| Antenna Type | PCB loop antenna |
| Antenna Gain | 0.5dBi |
| Antenna Connector Type | N/A |

Channel List:

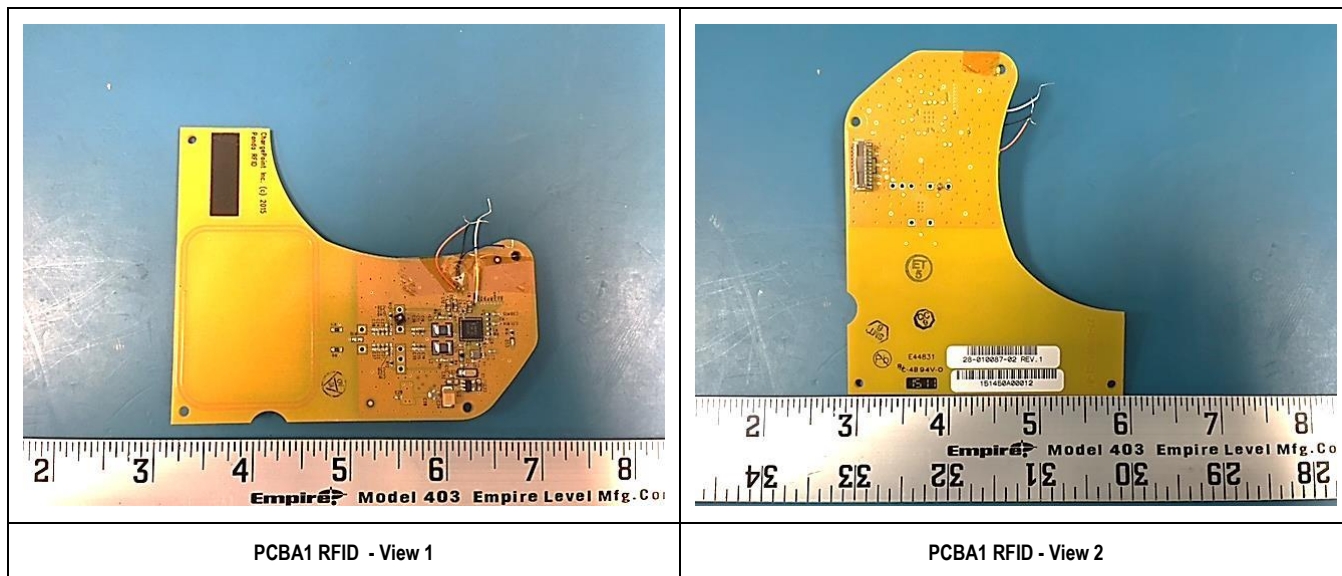
| Type | Mode | Channel No. | Frequency (MHz) | Available (Y/N) |
|------|----------|-------------|-----------------|-----------------|
| RFID | 13.56MHz | 1 | 13.56 | Y |

6.3 EUT test modes/configuration Description

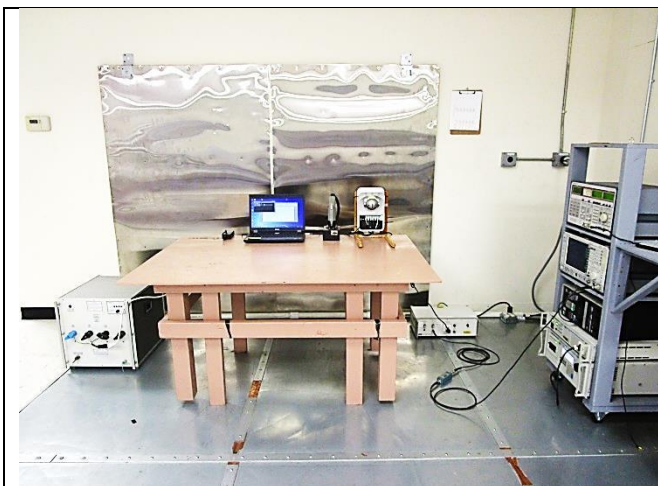
| Mode | Note |
|-------------------|--|
| RF test | EUT is set to continuously transmit at 13.56MHz when powered on. |
| Note: None | |

| 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. | | | |

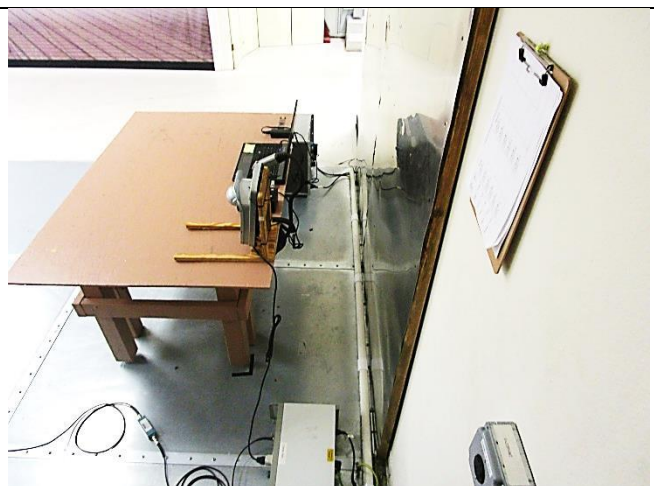
6.4 EUT Photos – External



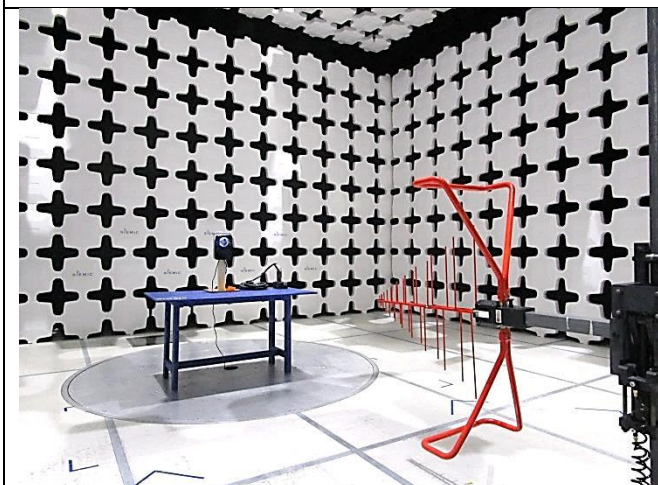
6.5 EUT Test Setup Photos



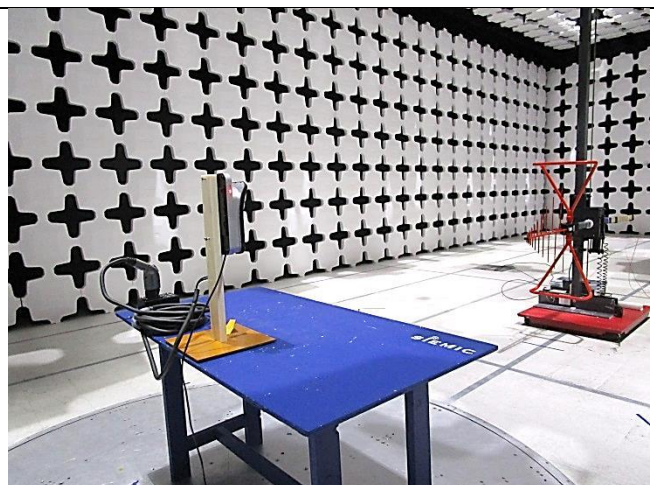
AC Line Conducted Emissions– Front View



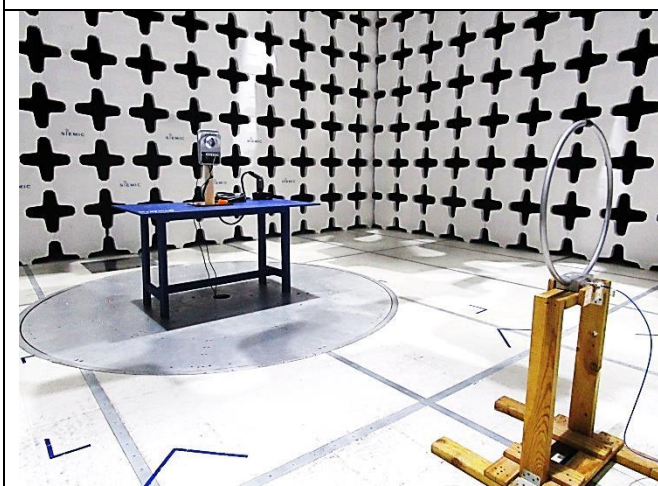
AC Line Conducted Emissions– Rear View



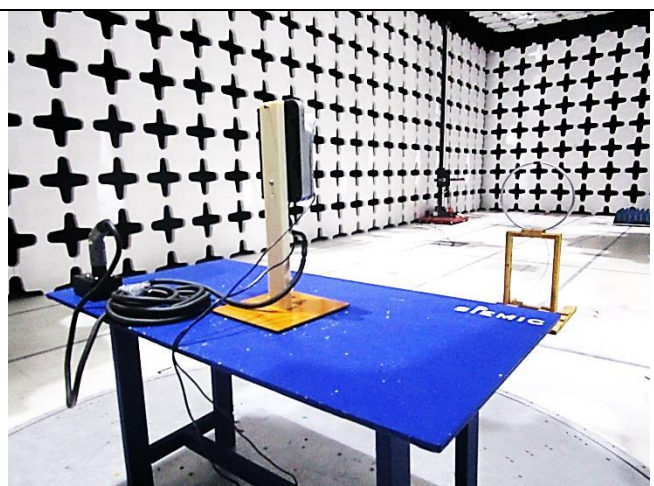
Radiated Emissions (<1GHz) – Front View



Radiated Emissions (<1GHz) – Rear View



Radiated Emissions (<30MHz) – Front View



Radiated Emissions (<30MHz) – Rear View

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

| Index | Supporting Equipment Description | Model | Serial No | Manu | Note |
|-------|----------------------------------|---------------------|-----------|------|------|
| 1 | Laptop | P05F Latitude E5510 | N/A | Dell | - |

7.2 Cabling Description

| Name | Connection Start | | Connection Stop | | Length / shielding Info | | Note |
|------|------------------|----------|-----------------|----------|-------------------------|------------|------|
| | From | I/O Port | To | I/O Port | Length (m) | Shielding | |
| USB | EUT | I/O Port | Laptop | USB | 2 | Unshielded | - |

7.3 Test Software Description

| Test Item | Software | Description |
|-----------------------------|-----------|--|
| Conducted Emissions | Tera Term | Set the EUT to transmit continuously in different test mode. Command used which turns on 13.56MHz TX continuously |
| Radiated Spurious Emissions | | |
| Frequency Stability | | |
| Occupied Bandwidth | | |

8 Test Summary

| Test Item | Test standard | | Test Method/Procedure | Pass / Fail |
|--------------------------------|---------------|-----------------|--|--|
| Antenna Requirement | FCC | 15.203 | ANSI C63.10 – 2013 558074 D01 DTS Meas. Guidance v03r02 | <input checked="" type="checkbox"/> Pass |
| | IC | | | <input type="checkbox"/> N/A |
| AC Conducted Emissions Voltage | FCC | 15.225(a) | ANSI C63.10 2013 RSS Gen. 8.8 | <input checked="" type="checkbox"/> Pass |
| | IC | RSS Gen (7.2.2) | | <input type="checkbox"/> N/A |

| 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 | <input checked="" type="checkbox"/> Pass |
| | IC | RSS210(A2.6) | IC | RSS Gen 6.13 | <input type="checkbox"/> 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 | <input checked="" type="checkbox"/> Pass |
| | IC | RSS210(A2.6) | IC | RSS Gen 6.13 | <input type="checkbox"/> 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 | <input checked="" type="checkbox"/> Pass |
| | IC | RSS210(A2.6) | IC | RSS Gen 6.13 | <input type="checkbox"/> N/A |
| Limit outside the band of 13.110 – 14.010 MHz | FCC | 15.225(d), 15.209 | FCC | ANSI C63.10 2013 | <input checked="" type="checkbox"/> Pass |
| | IC | RSS210(A2.6) | IC | RSS Gen 6.13 | <input type="checkbox"/> N/A |
| Receiver Spurious Emission | IC | - | IC | RSS Gen 7.1 | <input type="checkbox"/> Pass <input checked="" type="checkbox"/> N/A |
| Frequency Stability | FCC | 15.225(e) | FCC | - | <input checked="" type="checkbox"/> Pass |
| | IC | RSS210(A2.6) | IC | RSS Gen 6.11 | <input type="checkbox"/> N/A |
| Occupied Bandwidth | FCC | - | FCC | - | <input checked="" type="checkbox"/> Pass |
| | IC | RSS-210(5.9.1) | IC | RSS Gen 6.6 | <input type="checkbox"/> N/A |
| Remark | <ol style="list-style-type: none"> All measurement uncertainties are not taken into consideration for all presented test result. 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. Test Method: ANSI C63.10: 2013 / RSS – Gen Issue 4: November 2014. | | | | |

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 | $\pm 3.5\text{dB}$ |
| 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

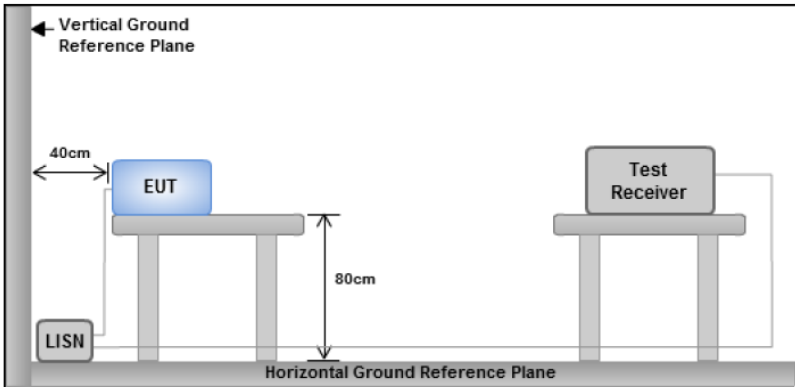
10.1 Antenna Requirement

| Specification(s) | Requirement | Applicable |
|------------------|--|-------------------------------------|
| §15.203 | <p>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.</p> <p>Antenna requirement must meet at least one of the following:</p> <p>a) Antenna must be permanently attached to the device. b) The antenna must use a unique type of connector to attach to the device. c) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.</p> | <input checked="" type="checkbox"/> |
| Remark | The RFID antenna is integral to the PCB board permanently to the device which meets the requirement (See Internal Photographs submitted as another Exhibit). | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> 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 |

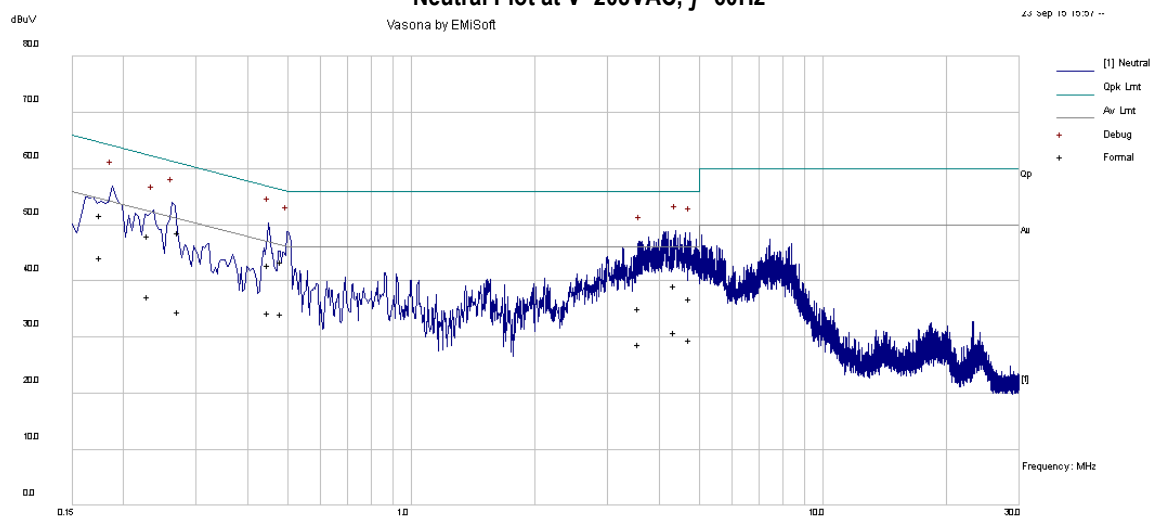
| Specification(s) | Item | Requirement | Applicable |
|------------------------|--|---|--|
| § 15.207, RSS210(A8.1) | a) | For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on 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 μ H/50 ohms line impedance stabilization network (LISN). AC Line conducted emission within the band 150kHz to 30MHz | <input checked="" type="checkbox"/> |
| Test Setup | |  <p>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</p> | |
| Procedure | | <ul style="list-style-type: none"> - 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 | 09/23/2015 | Environmental conditions | Temperature 22°C Relative Humidity 36 % Atmospheric Pressure 1026 mbar |
| Remark | The EUT was tested at 208V _{AC} , 60Hz | | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | | |

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

| | | | | |
|---------------------------|---------------------------|----------|---------|---|
| Test specification: | Conducted Emissions | | | |
| Environmental Conditions: | Temp(°C): | 20.1°C | Result: | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |
| | Humidity (%): | 36% | | |
| | Atmospheric(mbar): | 1026mbar | | |
| Mains Power: | 208V _{AC} , 60Hz | | | |
| Tested by: | Osvaldo Casorla | | | |
| Test Date: | 09/23/2015 | | | |
| Remarks: | LMA 13.56MHz RFID TX | | | |

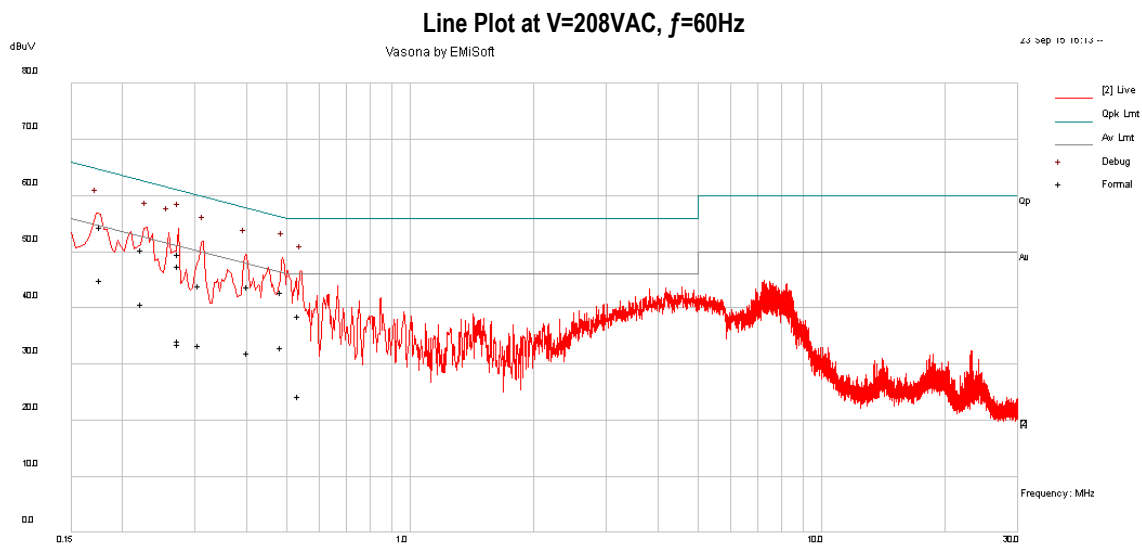
Neutral Plot at V=208VAC, f=60Hz



Neutral Measurements

| Frequency MHz | Raw dBuV | Cable Loss | Factors dB | Level dBuV | Measurement Type | Line/ Neutral | Limit dBuV | Margin dB | Pass /Fail |
|---------------|----------|------------|------------|------------|------------------|---------------|------------|-----------|------------|
| 0.18 | 40.17 | 10.00 | 1.50 | 51.67 | Quasi Peak | Neutral | 64.68 | -13.01 | Pass |
| 0.23 | 36.89 | 10.00 | 1.16 | 48.05 | Quasi Peak | Neutral | 62.47 | -14.42 | Pass |
| 0.27 | 37.58 | 10.00 | 0.99 | 48.58 | Quasi Peak | Neutral | 61.07 | -12.50 | Pass |
| 0.45 | 32.19 | 10.01 | 0.71 | 42.91 | Quasi Peak | Neutral | 56.85 | -13.94 | Pass |
| 0.48 | 32.79 | 10.01 | 0.69 | 43.49 | Quasi Peak | Neutral | 56.29 | -12.80 | Pass |
| 3.58 | 24.58 | 10.03 | 0.55 | 35.17 | Quasi Peak | Neutral | 56.00 | -20.83 | Pass |
| 4.37 | 28.53 | 10.03 | 0.55 | 39.11 | Quasi Peak | Neutral | 56.00 | -16.89 | Pass |
| 4.75 | 26.31 | 10.04 | 0.55 | 36.89 | Quasi Peak | Neutral | 56.00 | -19.11 | Pass |
| 0.18 | 32.62 | 10.00 | 1.50 | 44.12 | Average | Neutral | 54.68 | -10.56 | Pass |
| 0.23 | 26.17 | 10.00 | 1.16 | 37.33 | Average | Neutral | 52.47 | -15.14 | Pass |
| 0.27 | 23.46 | 10.00 | 0.99 | 34.46 | Average | Neutral | 51.07 | -16.62 | Pass |
| 0.45 | 23.69 | 10.01 | 0.71 | 34.41 | Average | Neutral | 46.85 | -12.44 | Pass |
| 0.48 | 23.46 | 10.01 | 0.69 | 34.16 | Average | Neutral | 46.29 | -12.13 | Pass |
| 3.58 | 18.10 | 10.03 | 0.55 | 28.68 | Average | Neutral | 46.00 | -17.32 | Pass |
| 4.37 | 20.20 | 10.03 | 0.55 | 30.78 | Average | Neutral | 46.00 | -15.22 | Pass |
| 4.75 | 18.86 | 10.04 | 0.55 | 29.45 | Average | Neutral | 46.00 | -16.55 | Pass |

| | | | | |
|---------------------------|---------------------------|----------|---------|---|
| Test specification: | Conducted Emissions | | | |
| Environmental Conditions: | Temp(°C): | 20.1°C | Result: | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |
| | Humidity (%): | 36% | | |
| | Atmospheric(mbar): | 1026mbar | | |
| Mains Power: | 208V _{AC} , 60Hz | | | |
| Tested by: | Osvaldo Casorla | | | |
| Test Date: | 09/23/2015 | | | |
| Remarks: | LMA 13.56MHz RFID TX | | | |



Line Measurements

| Frequency MHz | Raw dBμV | Cable Loss | Factors dB | Level dBμV | Measurement Type | Line/ Neutral | Limit dBμV | Margin dB | Pass /Fail |
|---------------|----------|------------|------------|------------|------------------|---------------|------------|-----------|------------|
| 0.18 | 42.89 | 10.00 | 1.49 | 54.38 | Quasi Peak | Line | 64.60 | -10.23 | Pass |
| 0.22 | 39.16 | 10.00 | 1.19 | 50.36 | Quasi Peak | Line | 62.73 | -12.37 | Pass |
| 0.27 | 36.56 | 10.00 | 0.99 | 47.55 | Quasi Peak | Line | 61.02 | -13.47 | Pass |
| 0.27 | 38.66 | 10.00 | 0.98 | 49.65 | Quasi Peak | Line | 61.00 | -11.35 | Pass |
| 0.31 | 33.13 | 10.00 | 0.89 | 44.03 | Quasi Peak | Line | 60.04 | -16.02 | Pass |
| 0.40 | 32.99 | 10.01 | 0.75 | 43.74 | Quasi Peak | Line | 57.76 | -14.02 | Pass |
| 0.49 | 32.24 | 10.01 | 0.69 | 42.94 | Quasi Peak | Line | 56.20 | -13.26 | Pass |
| 0.54 | 27.87 | 10.01 | 0.66 | 38.54 | Quasi Peak | Line | 56.00 | -17.46 | Pass |
| 0.18 | 33.57 | 10.00 | 1.49 | 45.06 | Average | Line | 54.60 | -9.54 | Pass |
| 0.22 | 29.56 | 10.00 | 1.19 | 40.75 | Average | Line | 52.73 | -11.98 | Pass |
| 0.27 | 23.08 | 10.00 | 0.99 | 34.07 | Average | Line | 51.02 | -16.94 | Pass |
| 0.27 | 22.59 | 10.00 | 0.98 | 33.58 | Average | Line | 51.00 | -17.42 | Pass |
| 0.31 | 22.42 | 10.00 | 0.89 | 33.32 | Average | Line | 50.04 | -16.72 | Pass |
| 0.40 | 21.29 | 10.01 | 0.75 | 32.04 | Average | Line | 47.76 | -15.72 | Pass |
| 0.49 | 22.25 | 10.01 | 0.69 | 32.95 | Average | Line | 46.20 | -13.25 | Pass |
| 0.54 | 13.61 | 10.01 | 0.66 | 24.28 | Average | Line | 46.00 | -21.72 | Pass |

10.3 Radiated Measurements

10.3.1 Radiated Measurements below 1GHz

Requirement(s):

| Specification(s) | Requirement | Applicable | | | | | | | | |
|----------------------------------|---|------------|-----------------------|-----------------------|---------|-----|----------|-----|---------|-----|
| 47 CFR §15.225 RSS-210 (A2.6) | Operation within the band 13.110–14.010 MHz: | ☒ | | | | | | | | |
| | (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. | | | | | | | | | |
| | (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. | | | | | | | | | |
| | (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. | | | | | | | | | |
| | (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. | | | | | | | | | |
| | <table><tr><th>Frequency range (MHz)</th><th>Field Strength (µV/m)</th></tr><tr><td>30 – 88</td><td>100</td></tr><tr><td>88 – 216</td><td>150</td></tr><tr><td>216 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></table> | | Frequency range (MHz) | Field Strength (µV/m) | 30 – 88 | 100 | 88 – 216 | 150 | 216 960 | 200 |
| Frequency range (MHz) | Field Strength (µV/m) | | | | | | | | | |
| 30 – 88 | 100 | | | | | | | | | |
| 88 – 216 | 150 | | | | | | | | | |
| 216 960 | 200 | | | | | | | | | |
| Above 960 | 500 | | | | | | | | | |

| | |
|------------|--|
| Test Setup | |
|------------|--|

| | |
|-----------|--|
| Procedure | <ol style="list-style-type: none"> The EUT was switched on and allowed to warm up to its normal operating condition. 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: <ol style="list-style-type: none"> Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. The EUT was then rotated to the direction that gave the maximum emission. Finally, the antenna height was adjusted to the height that gave the maximum emission. A Quasi-peak measurement was then made for that frequency point. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured. |
|-----------|--|

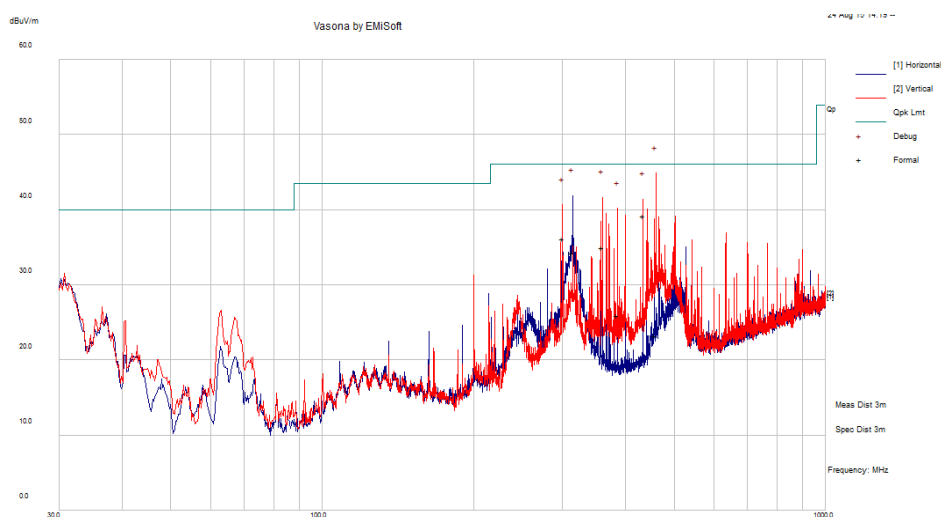
| | | | |
|-----------|--|--------------------------|--|
| Test Date | 08/24/2015 | Environmental conditions | Temperature 20.1°C Relative Humidity 36% Atmospheric Pressure 1026mbar |
| Remark | - | | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | | |

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

| | | | | |
|---------------------------|---------------------------|----------|---------|---|
| Test specification: | Radiated Measurements | | | |
| Environmental Conditions: | Temp(°C): | 20.1°C | Result: | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |
| | Humidity (%): | 36% | | |
| | Atmospheric(mbar): | 1026mbar | | |
| Mains Power: | 208V _{AC} , 60Hz | | | |
| Tested by: | Osvaldo Casorla | | | |
| Test Date: | 08/24/2015 | | | |
| Remarks: | Tx mode | | | |

f=30MHz – 1000MHz plot at V=208VAC, f=60Hz and 3 meter distance

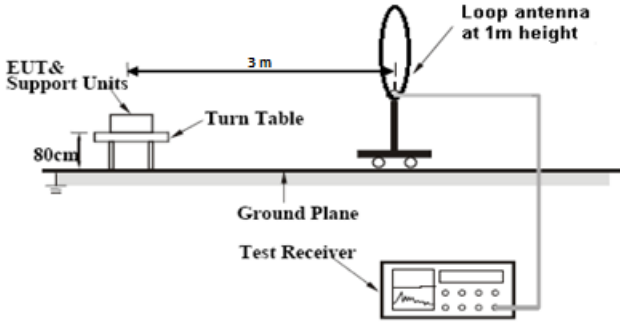


f=30MHz – 1000MHz Measurements

| 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 |
|---------------|------------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 300.01 | 58.17 | 3.26 | -25.34 | 36.10 | Quasi Max | H | 263.00 | 156.00 | 46.02 | -9.92 | Pass |
| 314.25 | 55.59 | 3.40 | -24.70 | 34.30 | Quasi Max | H | 349.00 | 91.00 | 46.02 | -11.72 | Pass |
| 359.93 | 55.00 | 3.68 | -23.65 | 35.04 | Quasi Max | V | 131.00 | 41.00 | 46.02 | -10.98 | Pass |
| 385.68 | 45.40 | 3.84 | -23.34 | 25.90 | Quasi Max | V | 266.00 | 35.00 | 46.02 | -20.12 | Pass |
| 433.32 | 57.20 | 4.05 | -22.09 | 39.15 | Quasi Max | V | 94.00 | 344.00 | 46.02 | -6.87 | Pass |
| 460.09 | 41.06 | 4.15 | -21.98 | 23.22 | Quasi Max | V | 142.00 | 164.00 | 46.02 | -22.80 | Pass |

10.3.2 Radiated Measurements below 30MHz

Requirement(s):

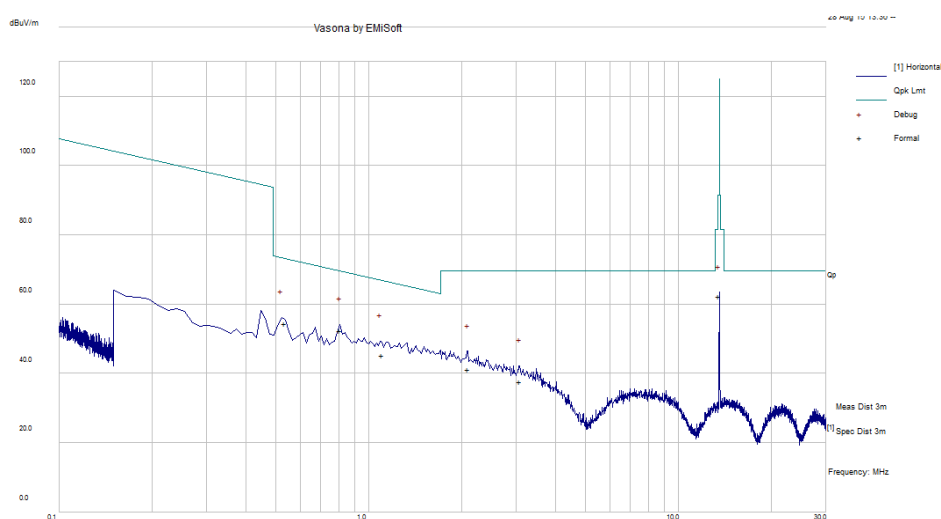
| Specification(s) | Requirement | Applicable | | | | | | | | | |
|----------------------------------|--|---|--------------------------|-------------|------|--|-------------------|-----|--|----------------------|----------|
| 47 CFR §15.225 RSS-210 (A2.6) | <p>Operation within the band 13.110–14.010 MHz</p> <p>(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.</p> <p>(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.</p> <p>(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.</p> <p>(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.</p> | ☒ | | | | | | | | | |
| Test Setup |  | | | | | | | | | | |
| Test Setup | <ol style="list-style-type: none"> 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. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable. The relevant loop antenna was set at the required test distance away from the EUT and supporting equipment boundary. | | | | | | | | | | |
| Procedure | <p>For < 30MHz, Radiated emissions were measured according to ANSI C63.10. The EUT was set to transmit at the highest output power.</p> <p>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.</p> <p>The limit is converted from microvolt/meter to decibel microvolt/meter.</p> | | | | | | | | | | |
| Test Date | 08/28/2015 | <table border="1"> <tr> <td>Environmental conditions</td> <td>Temperature</td> <td>22°C</td> </tr> <tr> <td></td> <td>Relative Humidity</td> <td>40%</td> </tr> <tr> <td></td> <td>Atmospheric Pressure</td> <td>1027mbar</td> </tr> </table> | Environmental conditions | Temperature | 22°C | | Relative Humidity | 40% | | Atmospheric Pressure | 1027mbar |
| Environmental conditions | Temperature | 22°C | | | | | | | | | |
| | Relative Humidity | 40% | | | | | | | | | |
| | Atmospheric Pressure | 1027mbar | | | | | | | | | |
| Remark | - | | | | | | | | | | |
| Result | ☒ Pass ☐ Fail | | | | | | | | | | |

Test Data ☐ Yes (See below) ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

| | | | | |
|---------------------------|---------------------------|----------|---------|---|
| Test specification: | Radiated Measurements | | | |
| Environmental Conditions: | Temp(°C): | 20.1°C | Result: | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail |
| | Humidity (%): | 36% | | |
| | Atmospheric(mbar): | 1027mbar | | |
| Mains Power: | 208V _{AC} , 60Hz | | | |
| Tested by: | Osvaldo Casorla | | | |
| Test Date: | 08/28/2015 | | | |
| Remarks: | Tx mode | | | |

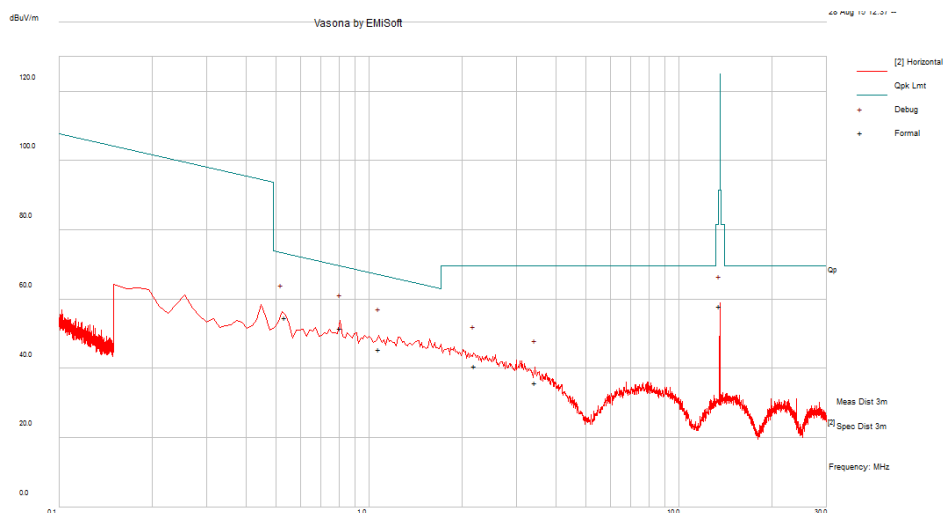
f= 100kHz – 30MHz plot, and loop antenna at 0 degree



f= 100kHz – 30MHz Measurements

| Frequency MHz | Raw dBμV | Cable Loss | AF dB | Level dBμV/m | Measurement Type | Degree | Hgt cm | Azt Deg | Limit dBμV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|-------|--------------|------------------|--------|--------|---------|--------------|-----------|------------|
| 0.54 | 37.05 | -0.18 | 17.59 | 54.46 | Quasi Max | 0 | 100.00 | 29.00 | 72.96 | -18.50 | Pass |
| 0.81 | 38.30 | -0.20 | 14.28 | 52.38 | Quasi Max | 0 | 100.00 | 167.00 | 69.43 | -17.05 | Pass |
| 1.10 | 33.69 | -0.22 | 11.83 | 45.30 | Quasi Max | 0 | 100.00 | 350.00 | 66.78 | -21.48 | Pass |
| 2.10 | 34.37 | -0.29 | 7.03 | 41.11 | Quasi Max | 0 | 100.00 | 133.00 | 69.54 | -28.43 | Pass |
| 3.07 | 33.58 | -0.31 | 4.37 | 37.65 | Quasi Max | 0 | 100.00 | 207.00 | 69.54 | -31.89 | Pass |
| 13.56 | 63.10 | -0.62 | -0.16 | 62.33 | Quasi Max | 0 | 100.00 | 182.00 | 123.99 | -61.66 | Pass |

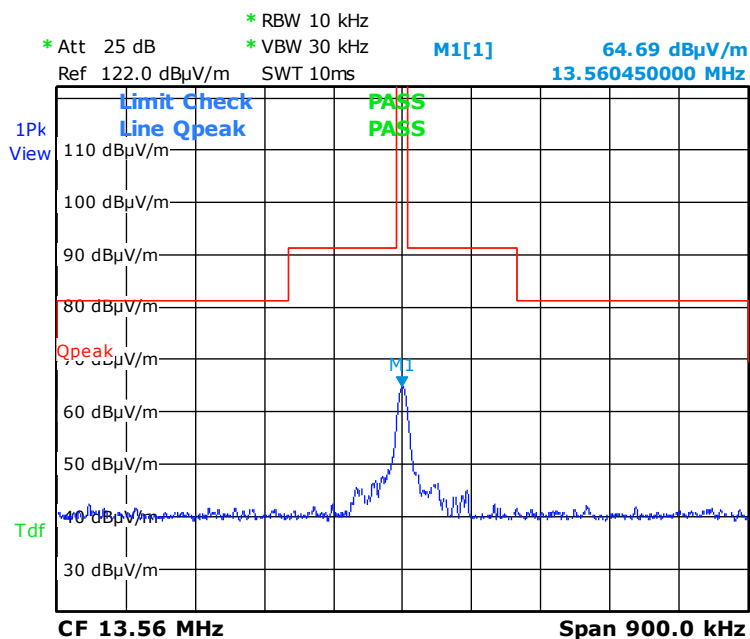
$f = 100\text{kHz} - 30\text{MHz}$ plot, and loop antenna at 90 degree



$f = 100\text{kHz} - 30\text{MHz}$ Measurements

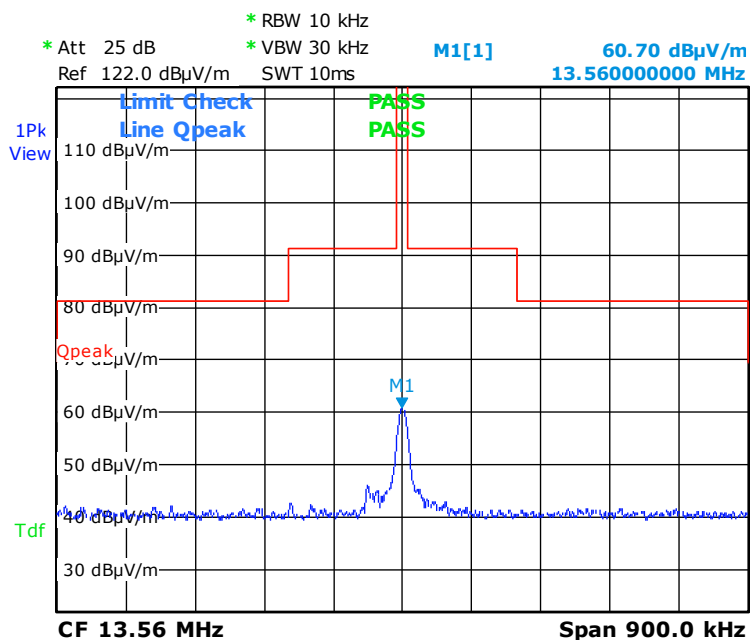
| Frequency MHz | Raw dBμV | Cable Loss | AF dB | Level dBμV/m | Measurement Type | Degree | Hgt cm | Azt Deg | Limit dBμV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|-------|--------------|------------------|--------|--------|---------|--------------|-----------|------------|
| 0.54 | 37.34 | -0.18 | 17.59 | 54.76 | Quasi Max | 90 | 100.00 | 234.00 | 72.96 | -18.20 | Pass |
| 0.81 | 37.66 | -0.20 | 14.29 | 51.74 | Quasi Max | 90 | 100.00 | 196.00 | 69.43 | -17.69 | Pass |
| 1.07 | 33.73 | -0.22 | 12.04 | 45.55 | Quasi Max | 90 | 100.00 | 220.00 | 67.02 | -21.47 | Pass |
| 2.19 | 34.28 | -0.29 | 6.73 | 40.72 | Quasi Max | 90 | 100.00 | 38.00 | 69.54 | -28.82 | Pass |
| 3.45 | 32.50 | -0.31 | 3.70 | 35.89 | Quasi Max | 90 | 100.00 | 243.00 | 69.54 | -33.65 | Pass |
| 13.56 | 58.67 | -0.62 | -0.16 | 57.89 | Quasi Max | 90 | 100.00 | 101.00 | 123.99 | -66.10 | Pass |

Loop antenna at 0 degree



| Frequency (MHz) | Amplitude (dBμV/m) | Azt Deg | Limit dBμV/m | Margin (dB) |
|-----------------|--------------------|---------|--------------|-------------|
| 13.56045 | 64.69 | 100.00 | 123.99 | -59.30 |

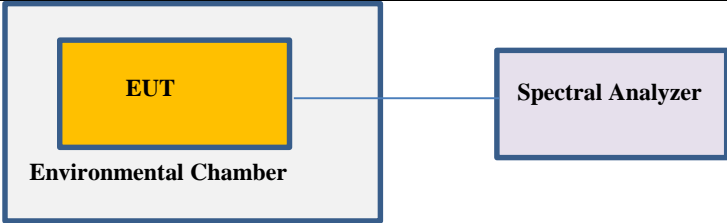
Loop antenna at 90 degree



| Frequency (MHz) | Amplitude (dBμV/m) | Azt Deg | Limit dBμV/m | Margin (dB) |
|-----------------|--------------------|---------|--------------|-------------|
| 13.56000 | 60.70 | 101.00 | 123.99 | -63.29 |

10.3.3 Frequency Stability

Requirement(s):

| Specification(s) | Requirement | Applicable | | | | | | | | | |
|-------------------------------------|--|---|--------------------------|-------------|------|--|-------------------|-----|--|----------------------|----------|
| 47 CFR §15.225 e) RSS-210 (A2.6) | Limit: $\pm 0.01\%$ of 13.56 MHz = 1356 Hz | <input checked="" type="checkbox"/> | | | | | | | | | |
| Test Setup |  <p>1. The EUT was set up inside an environmental chamber. 2. The EUT was placed in the centre of the environmental.</p> | | | | | | | | | | |
| 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 | 09/18/2015 | <table border="1"> <tr> <td>Environmental conditions</td> <td>Temperature</td> <td>20°C</td> </tr> <tr> <td></td> <td>Relative Humidity</td> <td>41%</td> </tr> <tr> <td></td> <td>Atmospheric Pressure</td> <td>1025mbar</td> </tr> </table> | Environmental conditions | Temperature | 20°C | | Relative Humidity | 41% | | Atmospheric Pressure | 1025mbar |
| Environmental conditions | Temperature | 20°C | | | | | | | | | |
| | Relative Humidity | 41% | | | | | | | | | |
| | Atmospheric Pressure | 1025mbar | | | | | | | | | |
| Remark | None | | | | | | | | | | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | | | | | | | | | | |

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test results:

Frequency Stability versus Temperature: The Frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20°C to $+50^{\circ}\text{C}$ at normal supply voltage.

Reference Frequency: 13.56059118 MHz at 20°C at 208V_{AC} , 60Hz

| Temperature ($^{\circ}\text{C}$) | Measured Freq. (MHz) | Freq. Drift (Hz) | Freq. Deviation (Limit: 0.01%) | Pass/Fail |
|------------------------------------|-----------------------------|------------------|--------------------------------|-----------|
| 50 | 13.56051102 | -80.16 | <0.01 | Pass |
| 40 | 13.56053106 | -60.12 | <0.01 | Pass |
| 30 | 13.56057114 | -20.04 | <0.01 | Pass |
| 20 | Reference (13.56059118 MHz) | | | |
| 10 | 13.56061122 | 20.04 | <0.01 | Pass |
| 0 | 13.56061121 | 20.03 | <0.01 | Pass |
| -10 | 13.56061122 | 20.04 | <0.01 | Pass |
| -20 | 13.56061120 | 20.02 | <0.01 | Pass |

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

Carrier Frequency: 13.56059118 MHz at 20°C at 208V_{AC} , 60Hz

| Measured Voltage $\pm 15\%$ of nominal (AC) | Measured Freq. (MHz) | Freq. Drift (Hz) | Freq. Deviation (Limit: 0.01%) | Pass/Fail |
|---|----------------------|------------------|--------------------------------|-----------|
| 239.2 | 13.56059410 | 2.92 | <0.01 | Pass |
| 176.8 | 13.56059111 | -0.07 | <0.01 | Pass |

10.3.4 Occupied bandwidth

Requirement(s):

| Specification(s) | 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 analyzer 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. | <input checked="" type="checkbox"/> |
| Test Setup | 1. The EUT was set up inside a semi-anechoic chamber in accordance with the standard. 2. The EUT was placed on top of a 0.8m high, non-metallic table in a typical configuration. | |
| Procedure | 1. The EUT was switched on and allowed to warm up to its normal operating condition. 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. 3. Measurement of the 99% Occupied Bandwidth of EUT transmission signal and make record. | |
| Test Date | 09/18/2015 | Environmental conditions Temperature 22°C Relative Humidity 39% Atmospheric Pressure 1025mbar |
| Remark | - | |
| Result | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail | |

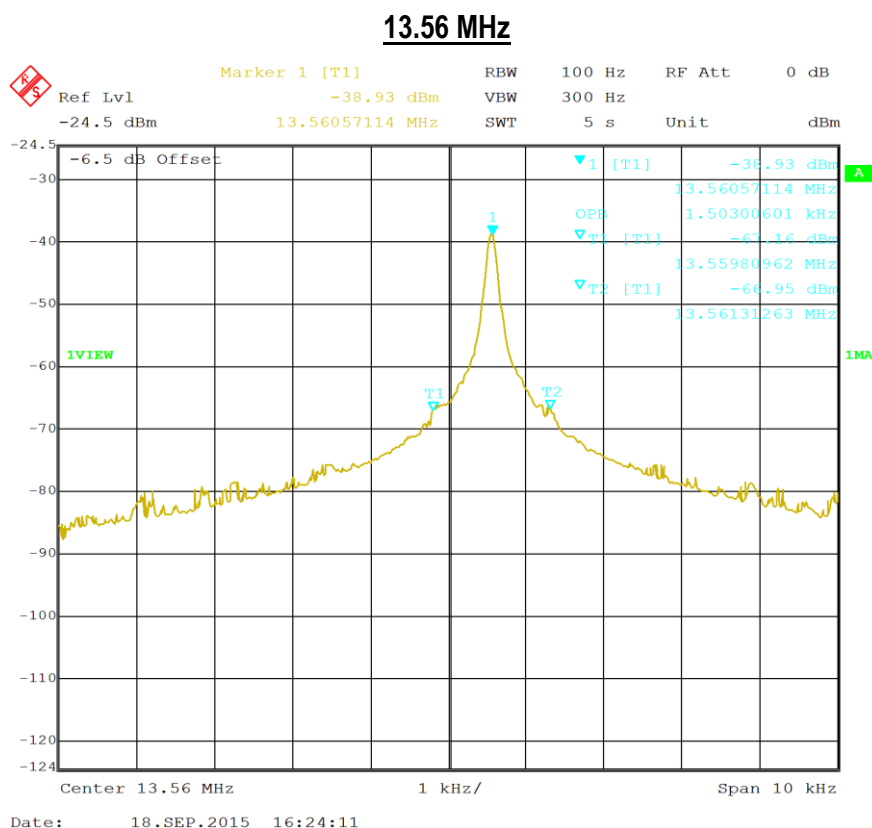
Test Data ☐ Yes (See below) ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test Results:

| Radio | Channel Frequency (MHz) | 99% Occupied BW (kHz) | Limit (MHz) |
|----------|-------------------------|-----------------------|-------------|
| 13.56MHz | 13.56057114 | 1.5030 | N/A |

Test Plot:


















Annex A. TEST INSTRUMENT








| Instrument | Model | Serial # | Cal Cycle | Cal Due | In use |
|--|-----------------|-------------|-----------|------------|-------------------------------------|
| Conducted Emissions | | | | | |
| R & S Receiver | ESHS10 | 830223/0009 | 1 Year | 06/24/2016 | <input checked="" type="checkbox"/> |
| Spectrum Analyzer | FSIQ7 | 825555/013 | 1 Year | 08/04/2016 | <input checked="" type="checkbox"/> |
| Schwarzbeck LISN | NNLK 8129 | 8129-190 | 1 Year | 08/21/2016 | <input type="checkbox"/> |
| CHASE LISN | MN2050B | 1018 | 1 Year | 08/07/2016 | <input checked="" type="checkbox"/> |
| Radiated Emissions | | | | | |
| EMI Test Receiver | ESL6 | 100178 | 1 Year | 05/27/2016 | <input checked="" type="checkbox"/> |
| ETS-Lingren Loop Antenna | 6512 | 00049120 | 1 Year | 08/20/2016 | <input checked="" type="checkbox"/> |
| Antenna - Biconlog (30 MHz – 2 GHz) | JB1 | A030702 | 1 Year | 08/15/2016 | <input checked="" type="checkbox"/> |
| DoubleRidged Waveguide Horn Antenna (1-18 GHz) | 3115 | 10SL0059 | 1 Year | 08/25/2016 | <input type="checkbox"/> |
| Horn Antenna (18 GHz - 40 GHz) | AH-840 | 101013 | 1 Year | 08/28/2016 | <input type="checkbox"/> |
| RF Pre-Amplifier | LPA-6-30 | 11140711 | 1 Year | 02/19/2016 | <input checked="" type="checkbox"/> |
| Microwave Preamplifier (18 GHz - 40 GHz) | PA-840 | 181251 | 1 Year | 02/19/2016 | <input type="checkbox"/> |
| 3 Meters SAC | 3M | N/A | 1 Year | 10/30/2016 | <input type="checkbox"/> |
| 10 Meters SAC | 10M | N/A | 1 Year | 05/06/2016 | <input checked="" type="checkbox"/> |
| Frequency tolerance | | | | | |
| Spectrum Analyzer | FSIQ7 | 825555/013 | 1 Year | 08/04/2016 | <input checked="" type="checkbox"/> |
| Test Equity Environment Chamber | 1007H | 61201 | 1 Year | 07/28/2016 | <input checked="" type="checkbox"/> |
| AC Power Source | 5001 iX-208-411 | 56615 | 1 Year | 07/15/2016 | <input checked="" type="checkbox"/> |
| RF Conducted Measurement | | | | | |
| Spectrum Analyzer | N9010A | MY50210206 | 1 Year | 08/20/2016 | <input type="checkbox"/> |

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 |  | <p>Radio: A1. Terminal equipment for purpose of calling</p> <p>Telecom: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law</p> |
| Korea CAB Accreditation |  | <p>EMI: KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI</p> <p>EMS: KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS</p> <p>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</p> <p>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</p> |
| Taiwan NCC CAB Recognition |  | LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08 |
| Taiwan BSMI CAB Recognition |  | CNS 13438 |
| Japan VCCI |  | <p>R-3083: Radiation 3 meter site</p> <p>C-3421: Main Ports Conducted Interference Measurement</p> <p>T-1597: Telecommunication Ports Conducted Interference Measurements</p> |
| Australia CAB Recognition |  | <p>EMC: AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4</p> <p>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</p> <p>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</p> |
| 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 |