

# Global EMC Inc. Labs

## EMC & RF Test Report

As per  
**FCC Part 15 Subpart C:2015**  
&  
**RSS 247:2015**  
**Unlicensed Intentional Radiators**  
on the  
**S6 Mobile Credit Card Reader**




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Testing produced for



See Appendix A for full customer & EUT details.



|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

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|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |

## Report Scope

This report addresses the EMC testing and test results of the S6 Mobile Credit Card Reader from Square Inc. This unit is herein referred to as EUT (Equipment Under Test). Testing is performed at Global EMC Labs.

The EUT was tested for compliance against the following standards:

FCC Part 15 Subpart C:2015  
RSS 247:2015

Test procedures, results, justifications, and engineering considerations, if any, follow later in this report.

The results contained in this report relate only to the item(s) tested.

This report does not imply product endorsement by A2LA or any other accreditation agency, any government, or Global EMC Inc.


Opinions/interpretations expressed in this report, if any, are outside the scope of Global EMC Inc accreditation. Any opinions expressed do not necessarily reflect the opinions of Global EMC Inc, unless otherwise stated.

|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |

## Summary

The results contained in this report relate only to the item(s) tested.

|                                  |                                |
|----------------------------------|--------------------------------|
| EUT FCC Certification #, FCC ID: | 2AF3K-1SQHW                    |
| EUT Passed all tests performed.  | Yes (see test results summary) |
| Tests conducted by               | Raymond Lee Au                 |

|             |  |   |
|-------------|--|---|
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| Product     | S6 Mobile Credit Card Reader                 |   |
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## Test Results Summary

| Standard/Method                         | Description                                | Class/Limit           | Result      |
|---|--|-----------------------|-------------|
| FCC 15.203                              | Antenna Requirement                        | Unique                | Pass        |
| FCC 15.205<br>RSS-Gen 8.10 (Table 6)    | Restricted Bands for intentional operation | QuasiPeak Average     | Pass        |
| FCC 15.209<br>RSS-Gen 8.9 (Table 4 & 5) | Spurious Radiated emissions                | QuasiPeak Average     | Pass        |
| FCC 15.247(a)2<br>RSS-247 5.2(1)        | 6 dB Bandwidth                             | > 500 kHz             | Pass        |
| FCC 15.247(b)3<br>RSS-247 5.4(4)        | Max output power                           | < 1 Watt              | Pass        |
| FCC 15.247(b)(4)<br>RSS-247 5.4(6)(ii.) | Antenna Gain                               | < 6 dBi               | Pass        |
| FCC 15.247(d)<br>RSS-247 5.5            | Antenna conducted spurious                 | < 20 dBc              | Pass        |
| FCC 15.247(e)<br>RSS-247 5.2(2)         | Spectral Density                           | < 8 dBm<br>(3 kHz BW) | Pass        |
| FCC 15.247(i)<br>IC Safety code 6       | RF Energy Levels                           | Per requirements      | Pass        |
| <b>Overall Result</b>                   |  |                       | <b>PASS</b> |

See the following *Notes, Justifications, or Deviations* section for important information regarding these tests.

All tests were performed by Raymond Lee Au.

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties.

|             |  |   |
|-------------|--|---|
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### ***Notes, Justifications, or Deviations***

The following are justifications for tests not performed, deviations from the above listed specifications, and notes regarding the product or the testing.

The EUT is a portable credit card reader with BLE (2.402 – 2.480 MHz) and NFC RFID (13.56 MHz) capabilities. This report deals with the BLE characteristics and the device as a whole. See report # GEMC-FCC-23230BR1 for the report regarding the RFID characteristics.

All testing is performed with the RFID activated and constantly transmitting modulated data at its maximum power.

For the antenna requirement specified in FCC 15.203, the BLE antenna used is an Inverted F antenna soldered onto the PCB, which will be sealed within the unit's enclosure. It is not meant to be replicable by the user.

For the Restricted Bands of operation, the transmitter is designed to operate between 2.402 GHz and 2.480 GHz.

The EUT is not a hybrid system; FCC 15.247 (f) does not apply.


The EUT was tested in the three orthogonal axes. The worst case results are obtained with the EUT upright. Worst case results are presented for all tests.

The antenna gain for the 15.247 transmitter is 4 dBi.

The EUT operates using an internal battery rechargeable by USB. It does not have the means to plug into mains directly.


See separate RF Exposure Exhibit for this unit regarding the permissible RF exposure levels.

Testing of the 15.247 transmitter is performed according to procedures documented in FCC KDB Publication No. 558074 - Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247).

|             |  |   |
|-------------|--|---|
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## ***Applicable Standards, Specifications and Methods***

|                    |   |
|--------------------|---|
| ANSI C63.4:2009    | - Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz          |
| ANSI C63.10:2009   | - American national standard for testing unlicensed wireless devices  |
| CFR 47 FCC 15:2015 | - Code of Federal Regulations – Radio Frequency Devices   |
| CISPR 22:2008      | - Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement                                      |
| FCC KDB 558074     | - FCC KDB 558074 Digital Transmission Systems, measurements and procedures  |
| ICES-003:2012      | - Digital Apparatus - Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard                                 |
| ISO 17025:2005     | - General Requirements for the competence of testing and calibration laboratories   |
| RSS-Gen:2014       | - General Requirements and Information for the Certification of Radio Apparatus   |
| RSS 210:2010       | - Issue 8: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power Licence-Exempt Radiocommunication Devices |
| RSS 247:2015       | - Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices                  |

|             |  |   |
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### ***Sample calculation(s)***

Margin = limit – (received signal + antenna factor + cable loss – pre-amp gain)

Margin = 50.5dBuV/m – (50dBuV + 10dB + 2.5dB – 20dB)

Margin = 8 dB

### ***Document Revision Status***

Release 1      - November 29, 2015  
Initial release.



|             |  |  |
|-------------|--|--|
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## Definitions and Acronyms

The following definitions and acronyms are applicable in this report.  
See also ANSI C63.14.

**AE** – Auxillary Equipment.

**BW** – Bandwidth. Unless otherwise stated, this refers to the 6 dB bandwidth.

**EMC** – Electro-Magnetic Compatibility

**EMI** – Electro-Magnetic Immunity

**EUT** – Equipment Under Test

**ITE** – Information Technology Equipment with a primary function(s) of entry, storage, display, retrieval, transmission, processing, switching, or control, of data.

**LISN** – Line impedance stabilization network

**NCR** – No Calibration Required

**RF** – Radio Frequency


|             |  |  |
|-------------|--|--|
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## Testing Facility

Testing for EMC on the EUT was carried out at Global EMC labs in Toronto, Ontario, Canada. The testing lab consists of a 3m semi-anechoic chamber calibrated to be able to allow measurements on an EUT with a maximum width or length of up to 2m and height up to 3m. The chamber is equipped with a turn table that is capable of testing devices up to 3300lb in weight. This facility is capable of testing products that are rated for 120 Vac and 240Vac single phase, or 208 Vac 3 phase input. DC capability is also available. The chamber is equipped with an antenna mast that controls polarization and height from the control room adjoining the shielded chamber. Radiated emissions measurements are performed using a Bilog, and Horn antenna where applicable. Conducted emissions, unless otherwise stated, are performed using a LISN.

## Calibrations and Accreditations


The measurement site used is registered with Federal Communications Commission (FCC) and Industry Canada (IC). This site is calibrated for Normalized Site Attenuation (NSA) using test procedures outlined in ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz”. The semi-anechoic chamber is lined with ferrite tiles and absorption cones to minimize any undesired reflections. All measuring equipment is calibrated on an annual or bi-annual basis as listed for each respective test.

|             |  |   |
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## ***Testing Environmental Conditions and Dates***

Following were the environmental conditions in the facility during time of testing –

| <b>Date</b>   | <b>Test</b>                     | <b>Init.</b> | <b>Temperature (°C)</b> | <b>Humidity (%)</b> | <b>Pressure (kPa)</b> |
|---------------|---------------------------------|--------------|-------------------------|---------------------|-----------------------|
| Nov. 9, 2015  | Restricted Band Edges           | RA           | 20-25°C                 | 30-45%              | 100 -103kPa           |
| Nov. 9, 2015  | Spurious Radiated Emissions     | RA           | 20-25°C                 | 30-45%              | 100 -103kPa           |
| Nov. 12, 2015 | Bandwidth                       | RA           | 20-25°C                 | 30-45%              | 100 -103kPa           |
| Nov. 9, 2015  | Max Output Power                | RA           | 20-25°C                 | 30-45%              | 100 -103kPa           |
| Nov. 12, 2015 | Antenna Conducted Spurious      | RA           | 20-25°C                 | 30-45%              | 100 -103kPa           |
| Nov. 12, 2015 | Spectral Density                | RA           | 20-25°C                 | 30-45%              | 100 -103kPa           |
| Nov. 13, 2015 | Power Lines Conducted Emissions | RA           | 20-25°C                 | 30-45%              | 100 -103kPa           |

|             |  |   |
|-------------|--|---|
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## Detailed Test Results Section

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
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| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## ***6 dB Bandwidth of Digitally Modulated Systems***

### **Purpose**

The purpose of this test is to ensure that the bandwidth occupied exceeds a stated minimum. This helps ensure the utilization of the frequency allocation is sufficiently wide. This also helps prevent corruption of data by ensuring adequate data separation to distinguish the reception of the intended information.


### **Limits**

The Limit is as specified in FCC Part 15.247(a)2 and RSS-247 5.2.

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

### **Results**

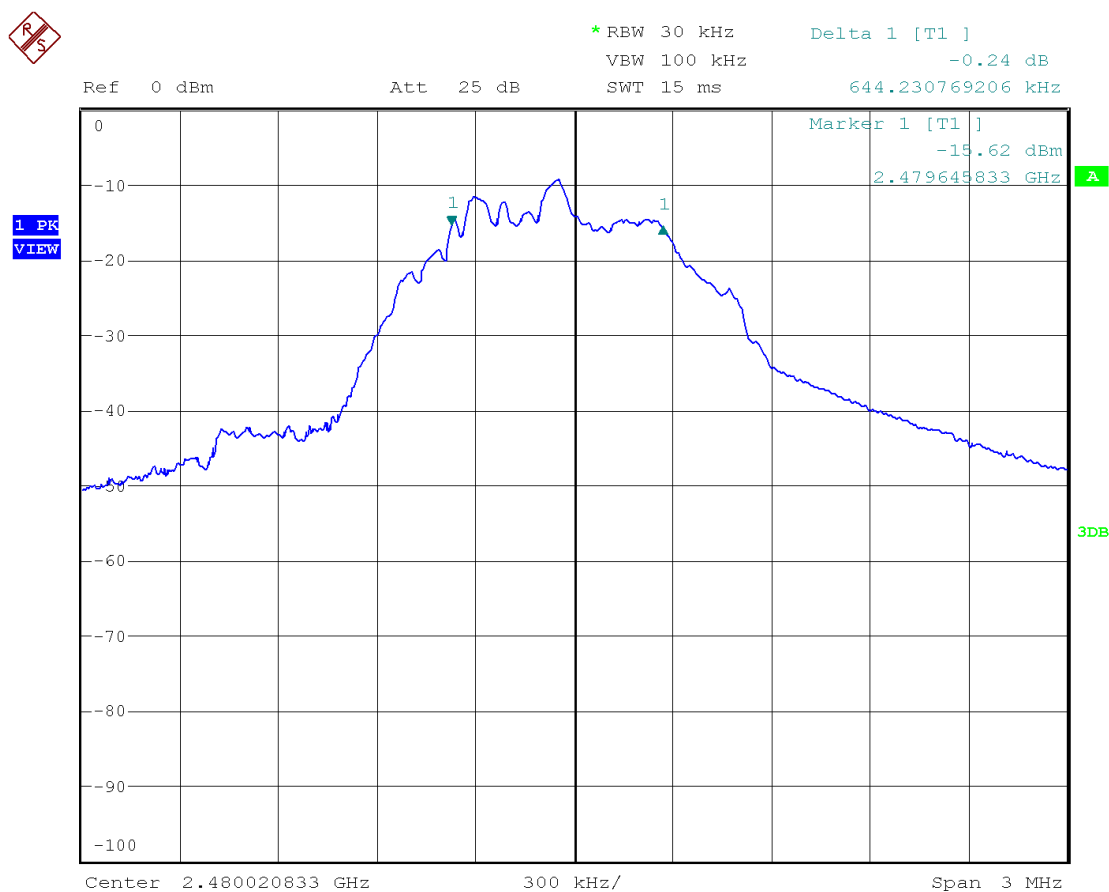
The EUT passed. The minimum 6 dB BW measured was 644 kHz.


|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Graph(s)

The graphs below show the 6dB bandwidth during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the 6 dB bandwidth of a channel during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less than 1 minute. Worst case results obtained are shown.

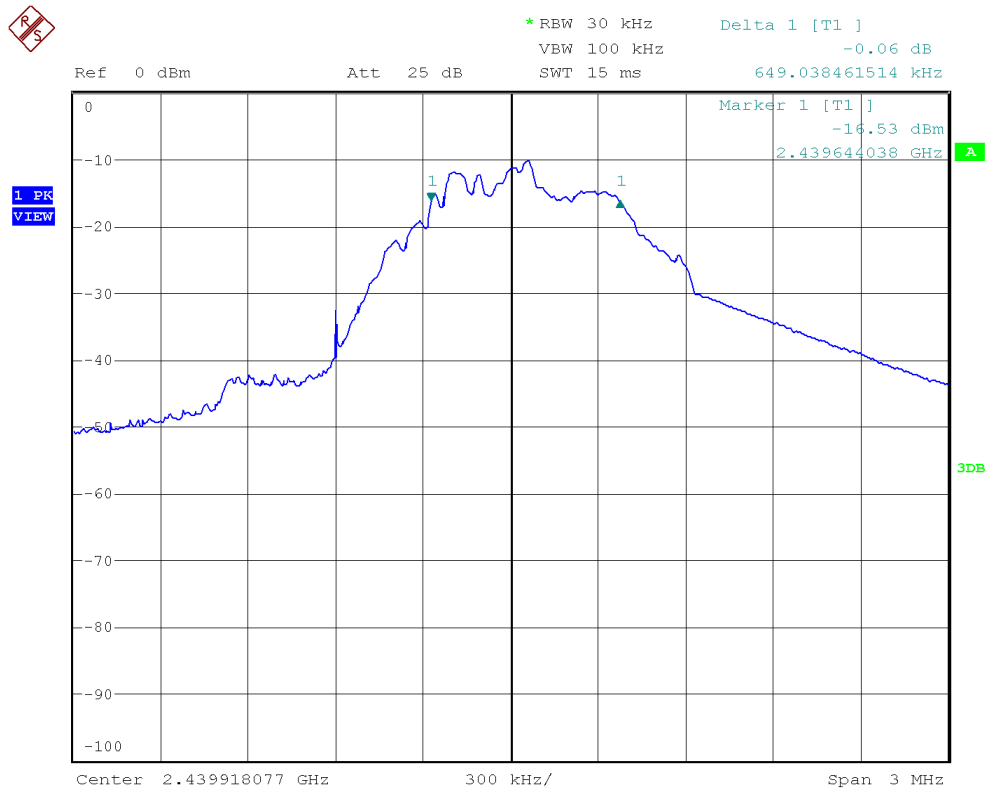
High Channel (2.480 GHz)  
6 dB BW = 644.2 kHz




|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
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| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

Middle Channel (2.440 GHz)

6 dB BW = 649.0 kHz




|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

Low Channel (2.402 GHz)

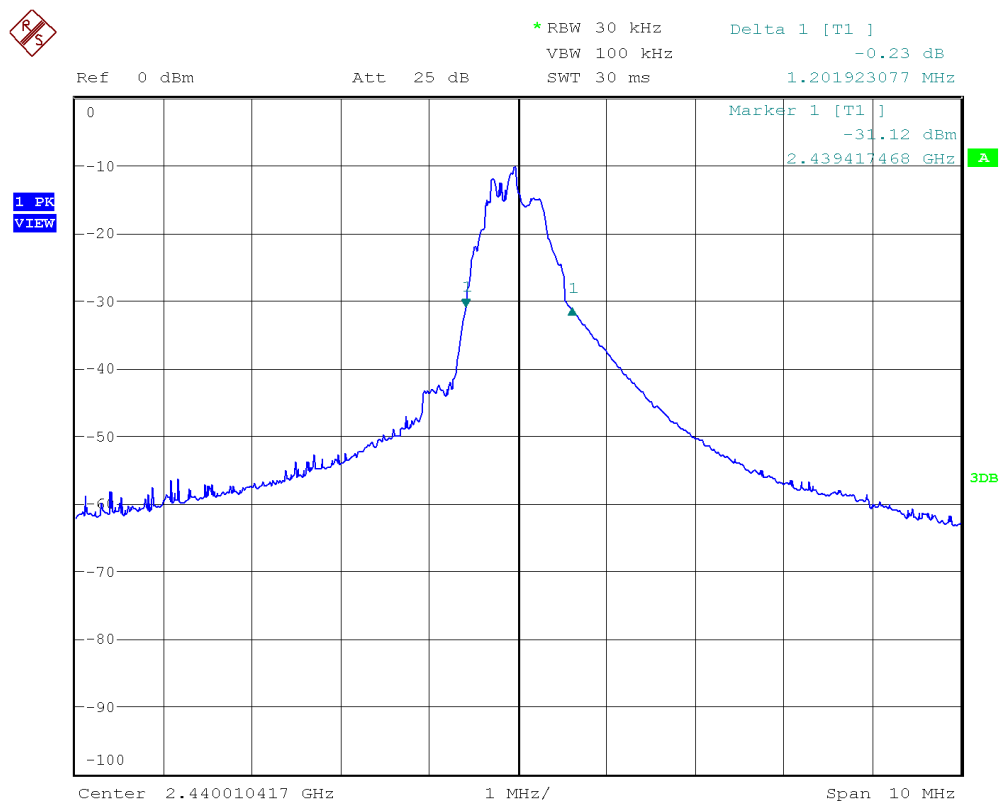
6 dB BW = 653.8 kHz





|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

For information purposes, maximum 20 dB bandwidth is 1.202 MHz.



Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.

|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |

## Test Equipment List

| Equipment         | Model No. | Manufacturer    | Last calibration date | Next calibration due date | Asset #  |
|-------------------|-----------|-----------------|-----------------------|---------------------------|----------|
| Spectrum Analyzer | FSU       | Rohde & Schwarz | Jan. 19, 2015         | Jan. 19, 2017             | GEMC 198 |

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |

## ***Maximum Peak Conducted Power - Digital Modulation***

### **Purpose**


The purpose of this test is to ensure that the maximum power conducted to the radiating element does not exceed the limits specified. This ensures that if the end-user replaces the antenna, that the maximum power does not exceed an amount which may create an excessive power level.

### **Limits**

The limits are defined in FCC Part 15.247(b) and RSS-247 5.4(4).  
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands, the peak limit is 1 watt (or 30 dBm = 125.2 dB $\mu$ V at 3m distance).

### **Results**

The EUT passed. The peak power output is -6.98 dBm (0.2 mW).


|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

### Table(s)

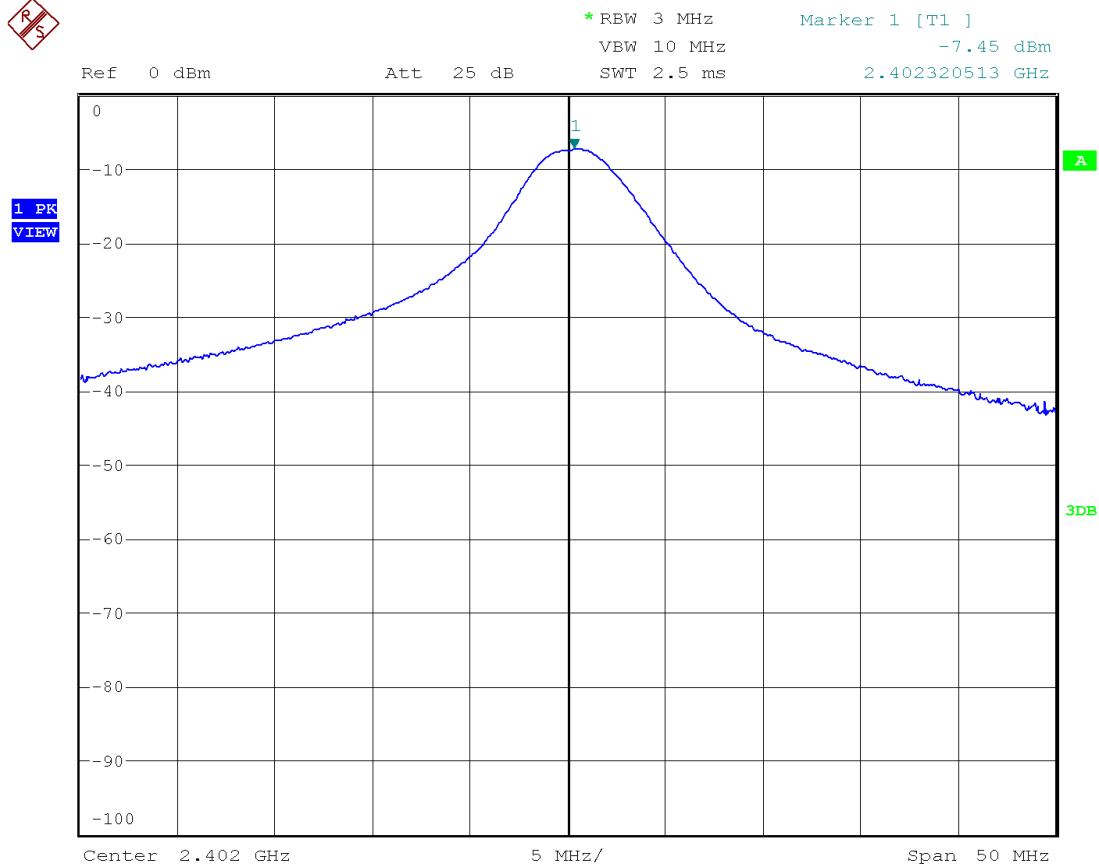
The table below shows the measured peak power output of the device. Peak measurements were made with a 3 MHz resolution bandwidth, during transmit operation of the EUT with continuous modulated data (>98%). Worst case plots are shown.


#### Maximum Peak Conducted Power

| Channel | Test Frequency (MHz) | Detection mode | Output Power (dBm) | Emission limit (dBm) | Margin (dB) | Result |
|---------|----------------------|----------------|--------------------|----------------------|-------------|--------|
| Low     | 2.402                | Peak           | -7.45              | 30.00                | 37.45       | Pass   |
| Middle  | 2.440                | Peak           | -6.98              | 30.00                | 36.98       | Pass   |
| High    | 2.480                | Peak           | -7.01              | 30.00                | 37.01       | Pass   |

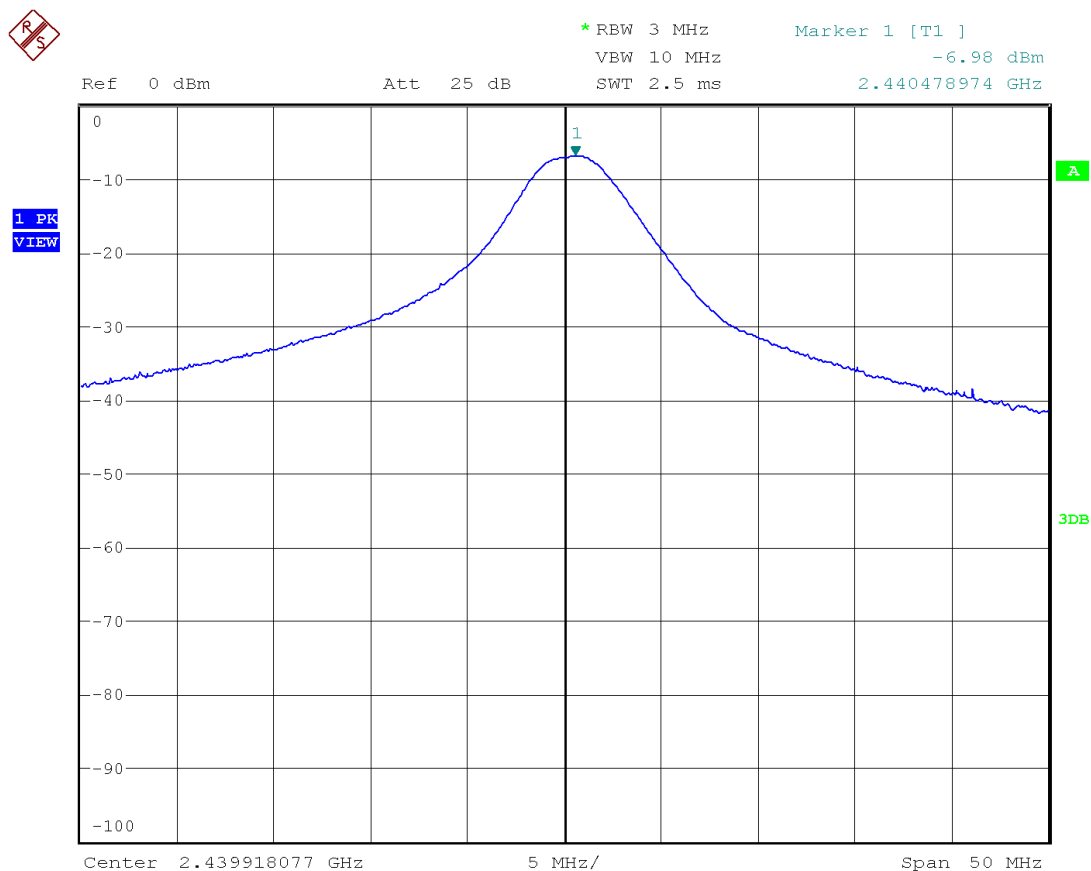
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


## Low Channel



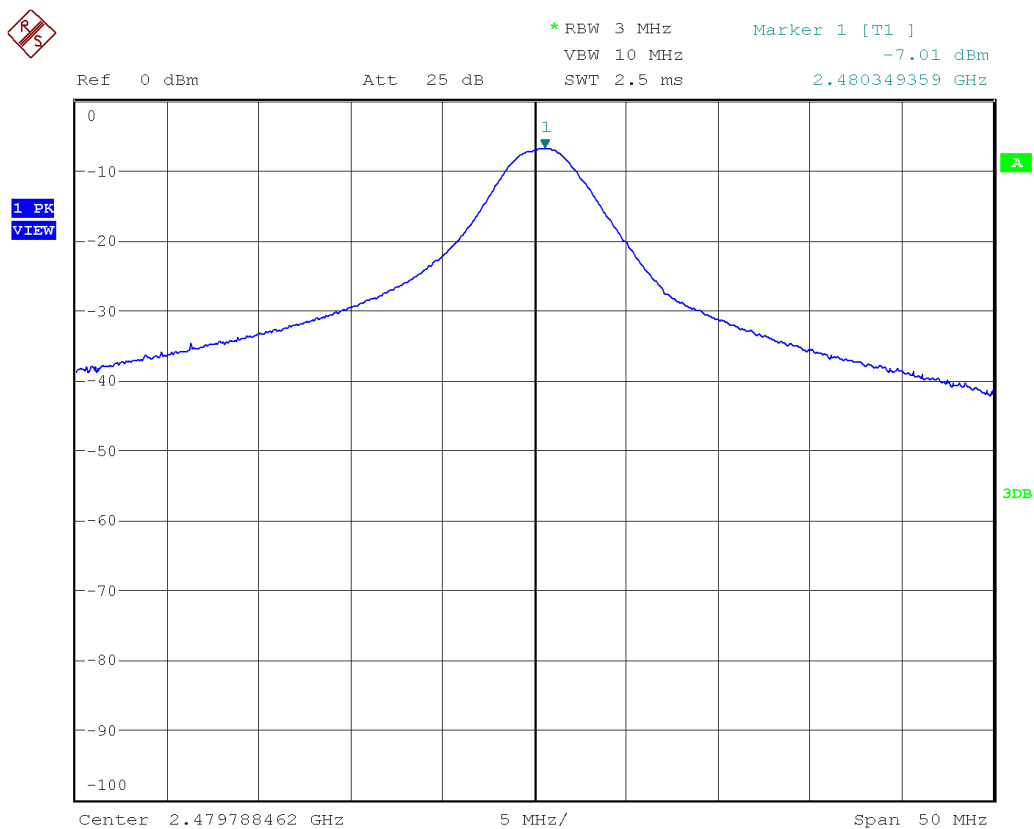
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Middle Channel




|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

### High Channel



Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.


|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Test Equipment List

| Equipment         | Model No. | Manufacturer    | Last calibration date | Next calibration due date | Asset #  |
|-------------------|-----------|-----------------|-----------------------|---------------------------|----------|
| Spectrum Analyzer | FSU       | Rohde & Schwarz | Jan. 19, 2015         | Jan. 19, 2017             | GEMC 198 |
| Power Head        | PH 2000   | AR              | Jan. 22, 2015         | Jan. 22, 2017             | GEMC 15  |
| Power meter       | PM 2002   | AR              | Jan. 21, 2015         | Jan. 21, 2017             | GEMC 16  |

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"



|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## ***Maximum Peak Radiated Power - Digital Modulation***

### **Purpose**

The purpose of this test is to ensure that the maximum power output of the EUT does not exceed the limits specified, and allows verification that the antenna gain is < 6dBi.


### **Limits**

The limits are defined in FCC Part 15.247(b) and RSS-247 5.4(4).

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands, the peak limit is 1 watt (or 30 dBm = 125.2 dB $\mu$ V at 3m distance).

### **Results**

The EUT passed. The peak radiated power output at 3 meters is 92.2 dB $\mu$ V/m. The antenna gain does not exceed 6 dBi.


|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Table(s)

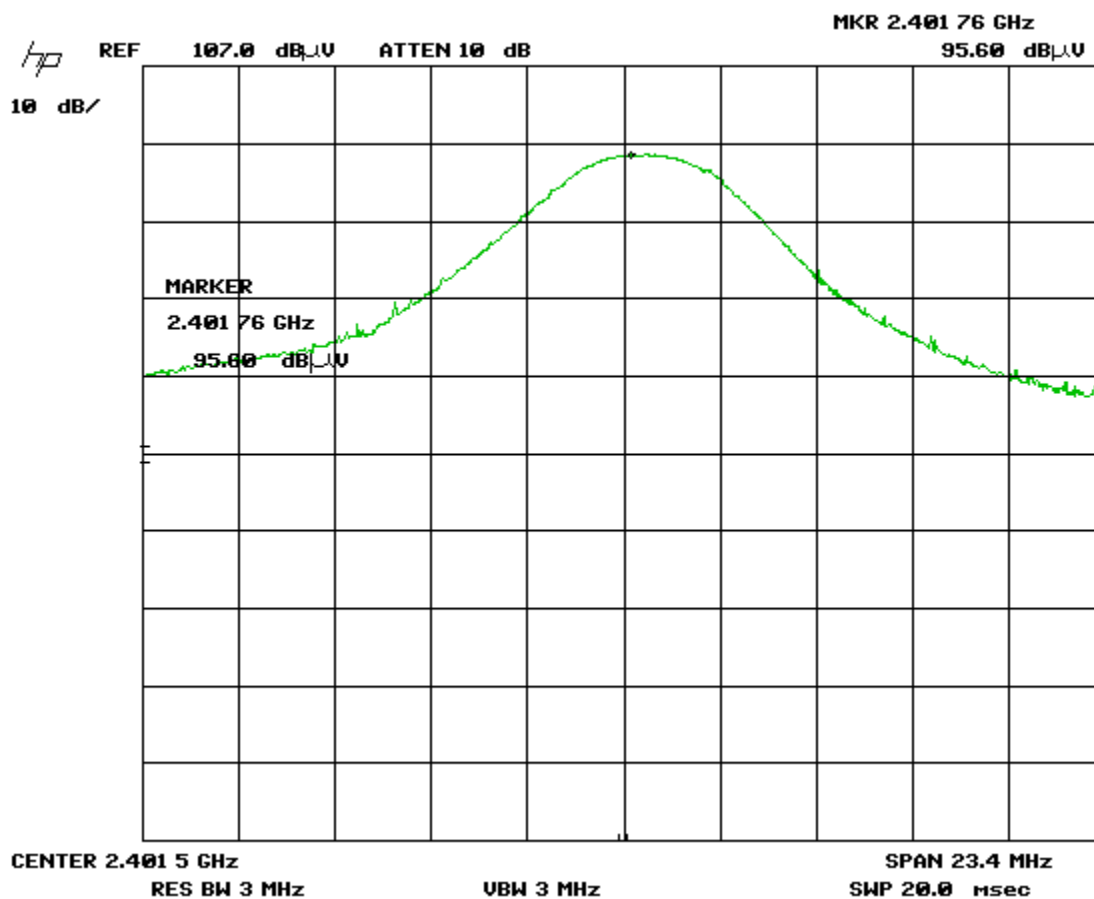
The table below shows the measured radiated peak power output of the device. Peak measurements were made with a 3 MHz resolution bandwidth, during transmit operation of the EUT with continuous modulated data (>98%). Worst case plots are shown.


### Maximum Peak Radiated Power

| Test Frequency (MHz) | Channel | Detection mode | Antenna polarity (Horz/Vert) | Raw signal dB(μV) | Antenna factor dB | Cable loss dB + Pre-selector | Pre-Amp Gain dB | Received signal dB(μV/m) | Emission limit (dBm) | Margin (dB) | Result |
|----------------------|---------|----------------|------------------------------|-------------------|-------------------|------------------------------|-----------------|--------------------------|----------------------|-------------|--------|
| 2.402                | Low     | Peak           | Vert                         | 95.6              | 26.1              | 4.1                          | 33.8            | 92.0                     | 125.2                | 33.2        | Pass   |
| 2.402                | Low     | Peak           | Horz                         | 95.8              | 26.1              | 4.1                          | 33.8            | <b>92.2</b>              | 125.2                | 33.0        | Pass   |
| 2.446                | Middle  | Peak           | Vert                         | 94.2              | 26.1              | 4.1                          | 33.8            | 90.6                     | 125.2                | 34.6        | Pass   |
| 2.446                | Middle  | Peak           | Horz                         | 94.5              | 26.1              | 4.1                          | 33.8            | 90.9                     | 125.2                | 34.3        | Pass   |
| 2.48                 | High    | Peak           | Vert                         | 92.4              | 26.1              | 4.1                          | 33.8            | 88.8                     | 125.2                | 36.4        | Pass   |
| 2.48                 | High    | Peak           | Horz                         | 94.3              | 26.1              | 4.1                          | 33.8            | 90.7                     | 125.2                | 34.5        | Pass   |

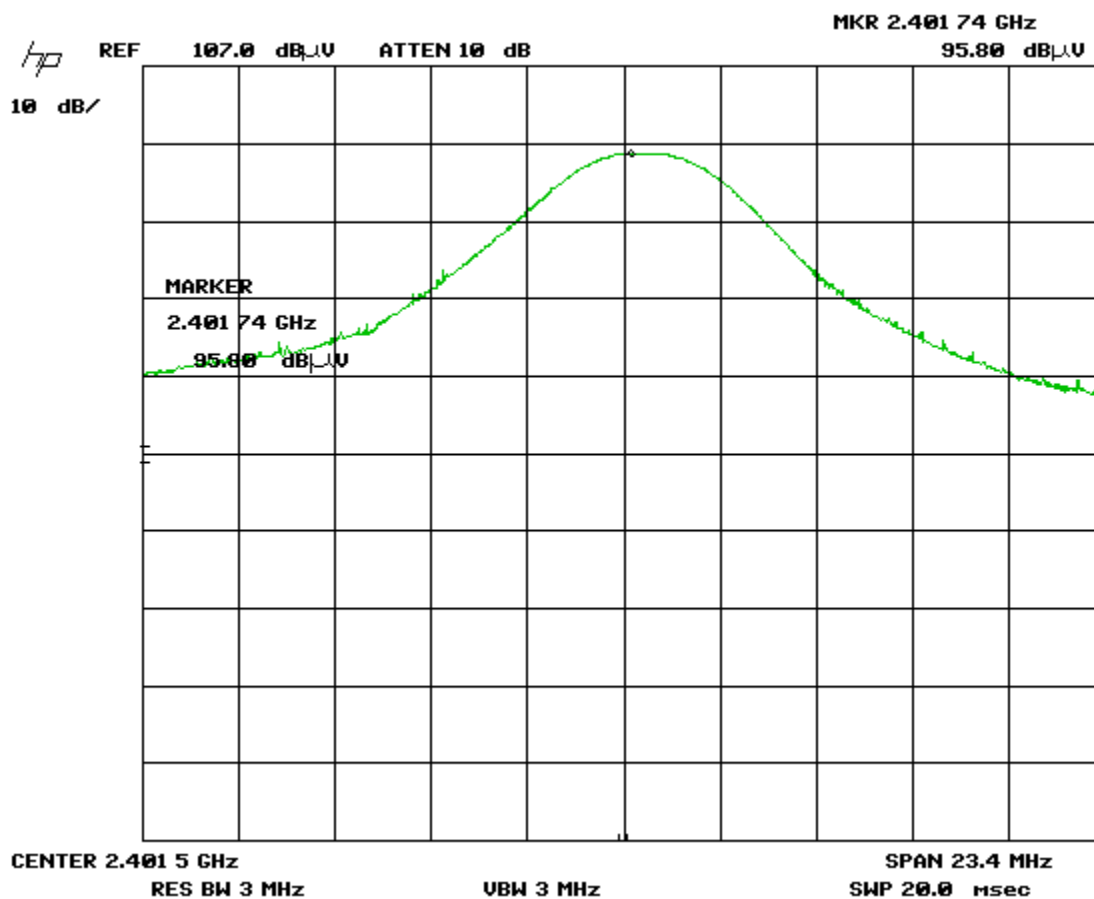
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
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Low Channel  
Vertical Antenna Polarity



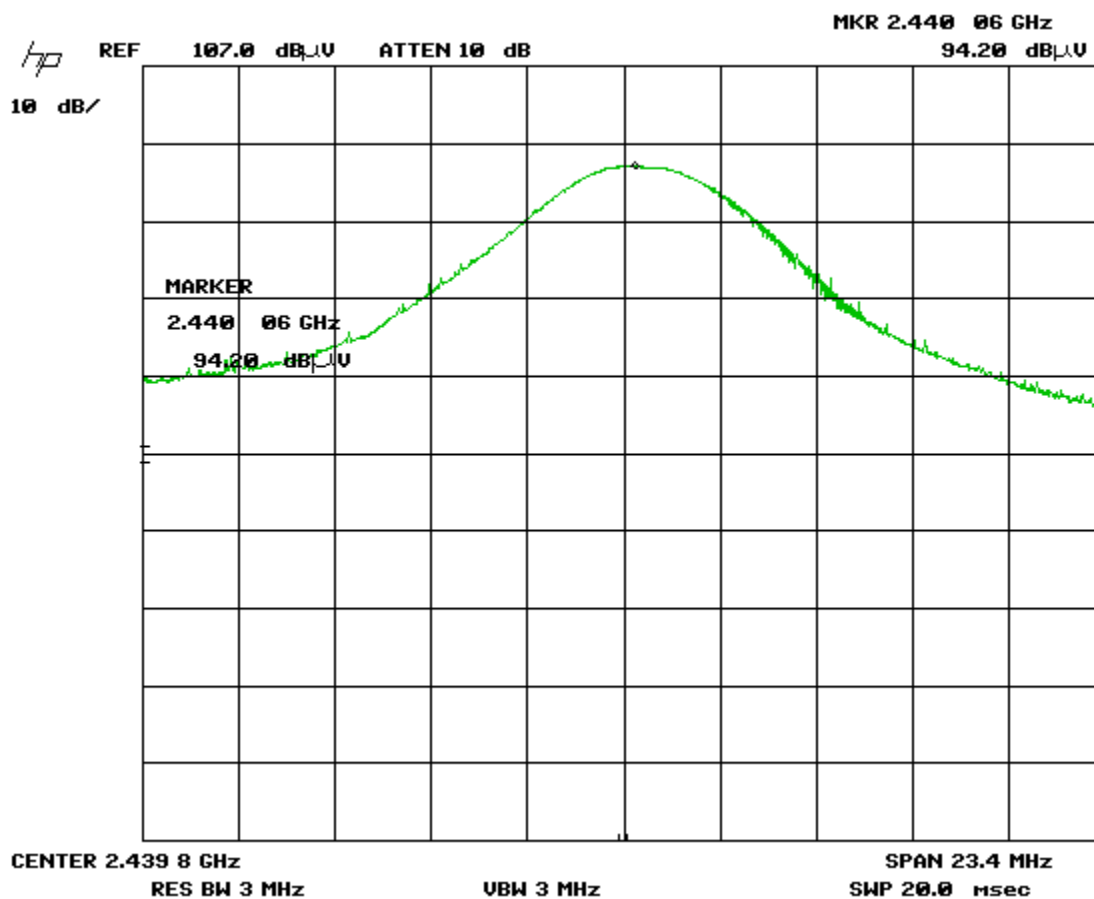
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Low Channel  
Horizontal Antenna Polarity



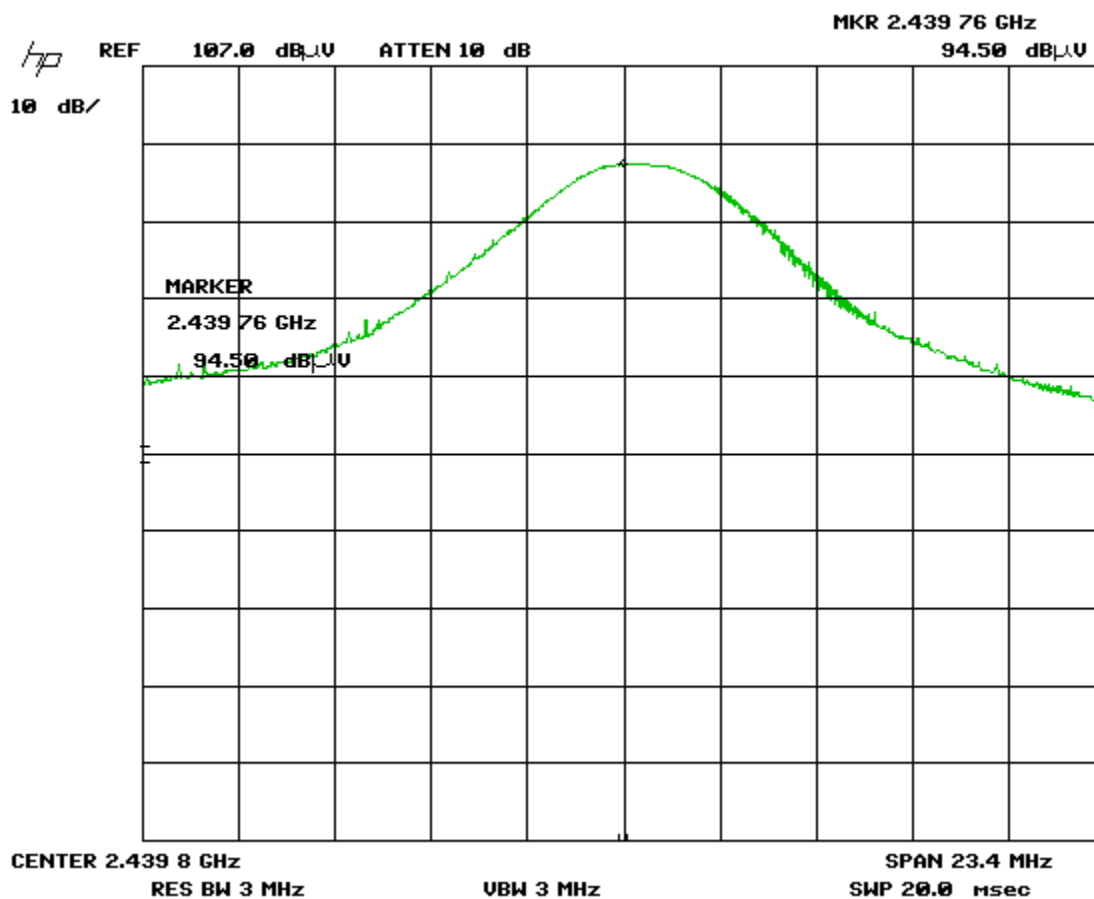
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|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
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Middle Channel  
Vertical Antenna Polarity



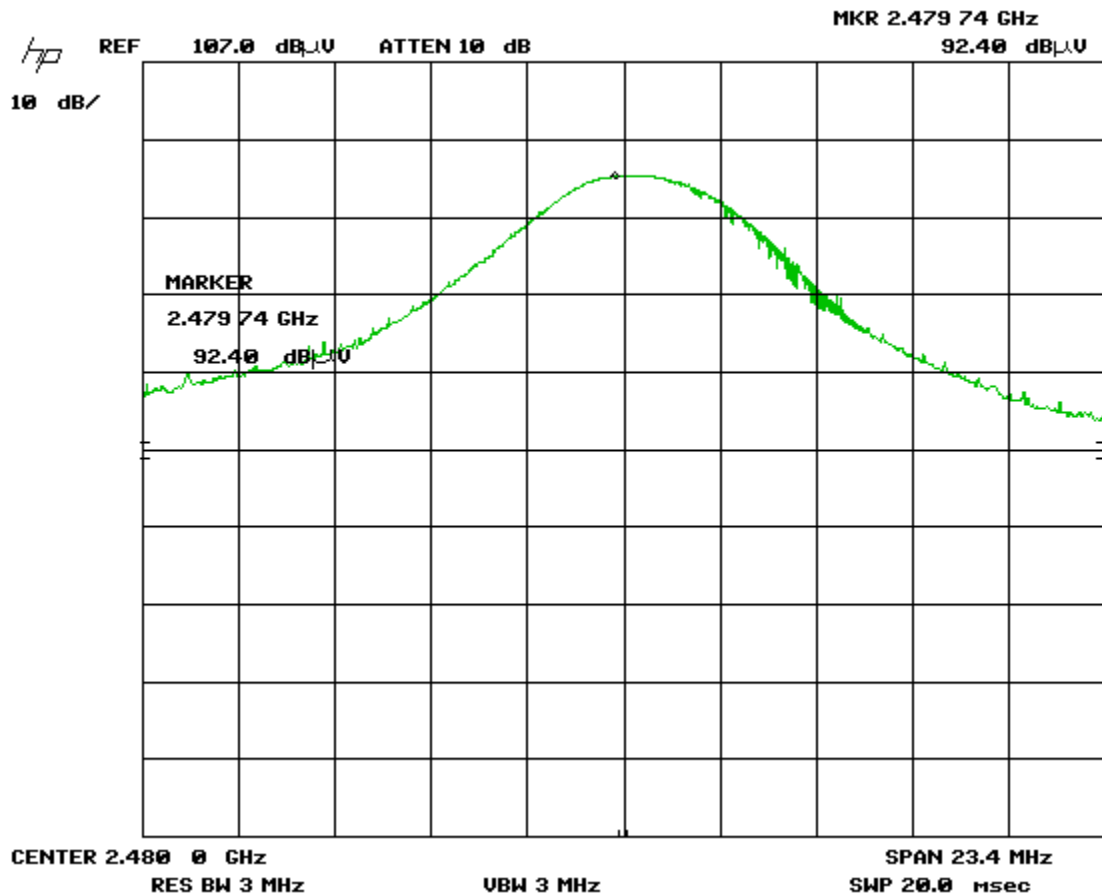
|             |  |   |
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Middle Channel  
Horizontal Antenna Polarity



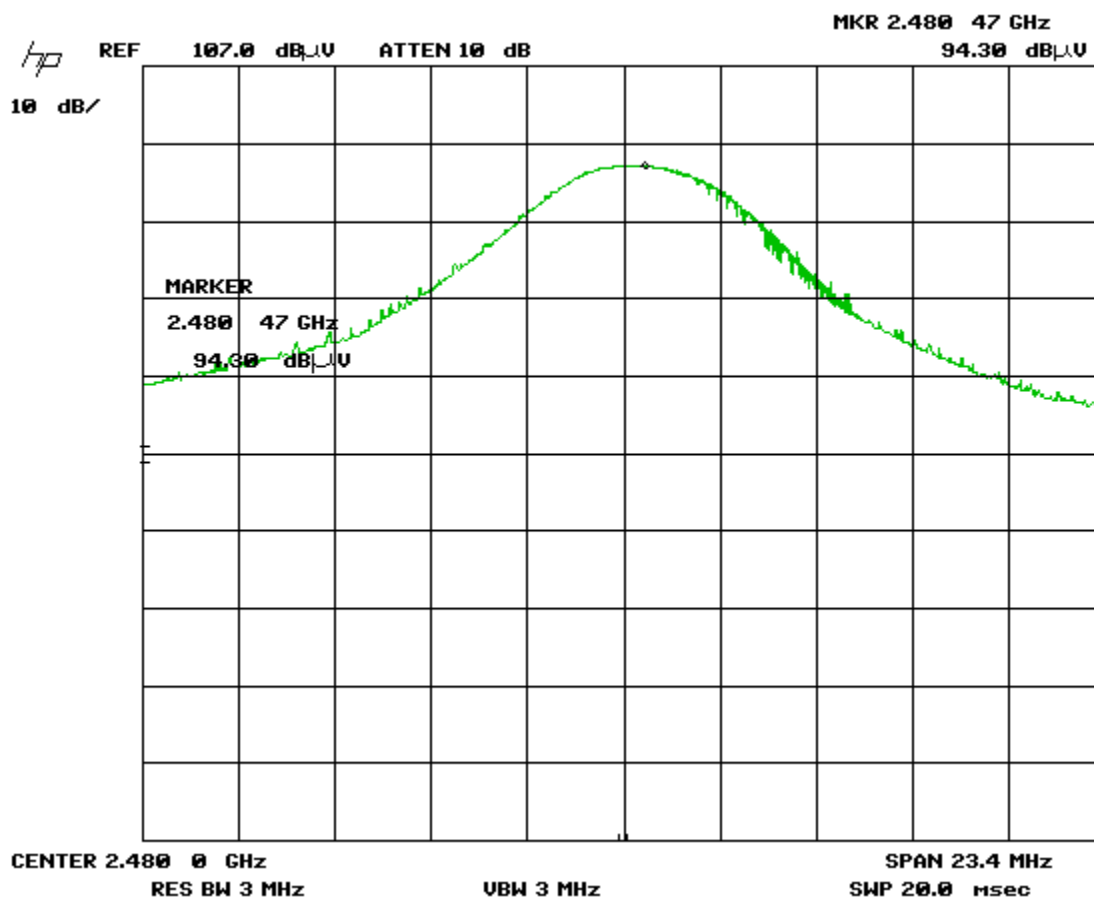
|             |  |   |
|-------------|--|---|
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High Channel  
Vertical Antenna Polarity




|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

High Channel  
Horizontal Antenna Polarity



Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.



|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Test Equipment List

| Equipment         | Model No.              | Manufacturer | Last calibration date | Next calibration due date | Asset #   |
|-------------------|------------------------|--------------|-----------------------|---------------------------|-----------|
| Spectrum Analyzer | 8566B                  | HP           | May 21, 2014          | May 21, 2016              | GEMC 193  |
| Horn Antenna      | 6878/24                | Q-par        | Sept 10, 2014         | Sept 10, 2016             | GEMC 6365 |
| Pre-amp 1-26GHz   | HP 8449B               | HP           | Sept. 9, 2014         | Sept. 9, 2016             | GEMC 6351 |
| RF Cable 7m       | LMR-400-7M-50OHM-MN-MN | LexTec       | NCR                   | NCR                       | GEMC 28   |
| RF Cable 1m       | LMR-400-1M-50OHM-MN-MN | LexTec       | NCR                   | NCR                       | GEMC 29   |

|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |

## ***Antenna Spurious Conducted Emissions (-20 dBc Requirement)***

### **Purpose**


The purpose of this test is to ensure that the maximum power conducted to the radiating element at frequencies outside of the authorized spectrum does not exceed the limits specified. This ensures that the only the intended signal is delivered to the radiating element.

### **Limits**

The limits are defined in FCC Part 15.247(d) and RSS-247 5.5. In any 100 kHz band, the peak spurious harmonics emissions must be at least 20 dB below the fundamental. Spurious Conducted emissions are to be evaluated up to the 10<sup>th</sup> harmonic. This -20 dBc requirement also applies at the 'band edge' or 2.4 GHz and 2.4835 GHz.

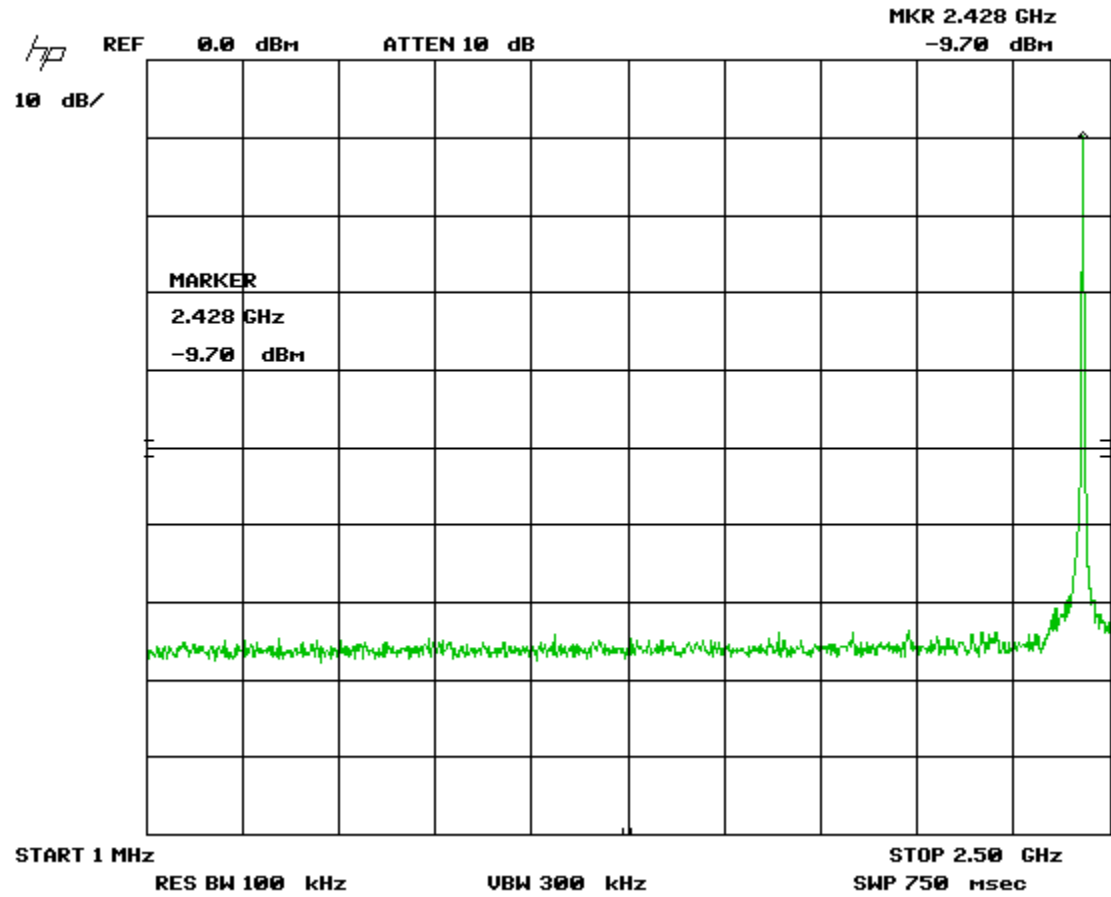
### **Results**


The EUT passes. Low, middle and high band was measured. The worst case is presented as a graph for the spectrum. The -20 dBc requirement is also shown for the lower band edge at 2.4 GHz in the low band, and for the high band edge at 2.4835 GHz in the high band.

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

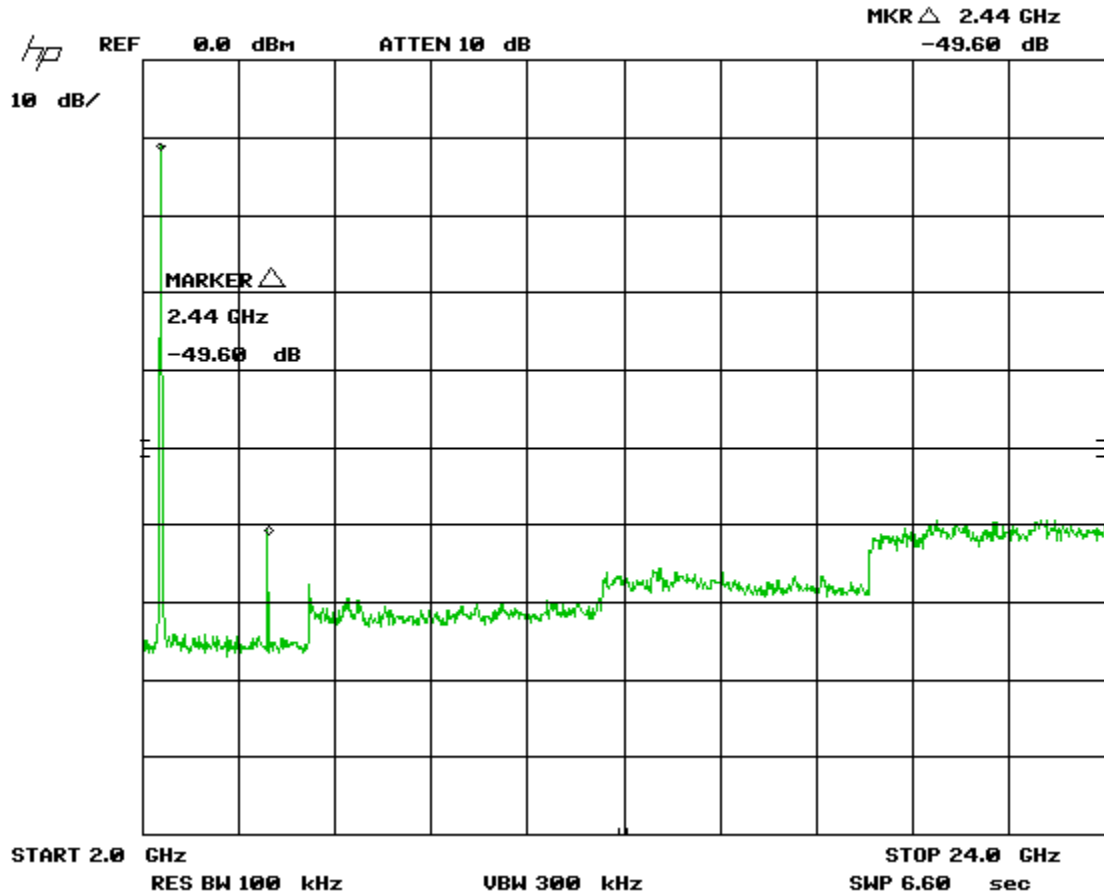
# Graph(s)


1 MHz – 2.5 GHz



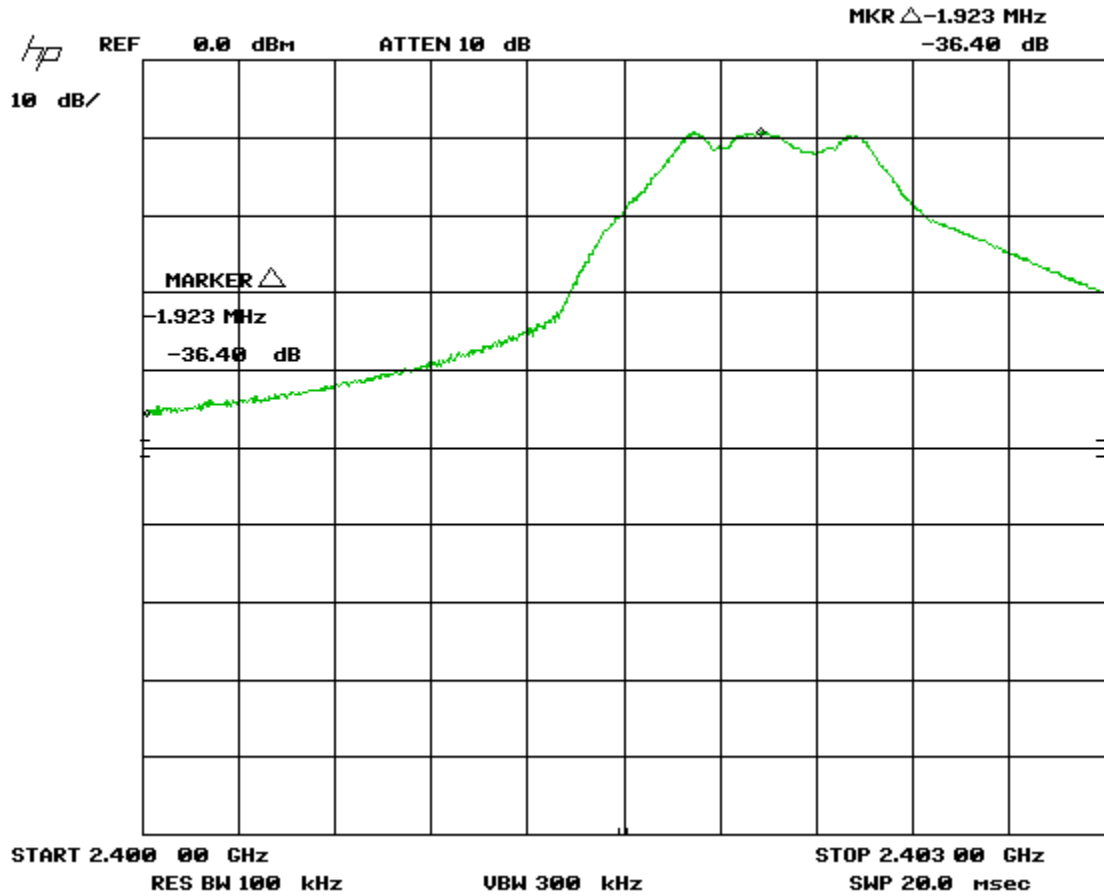
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


2 GHz – 24 GHz



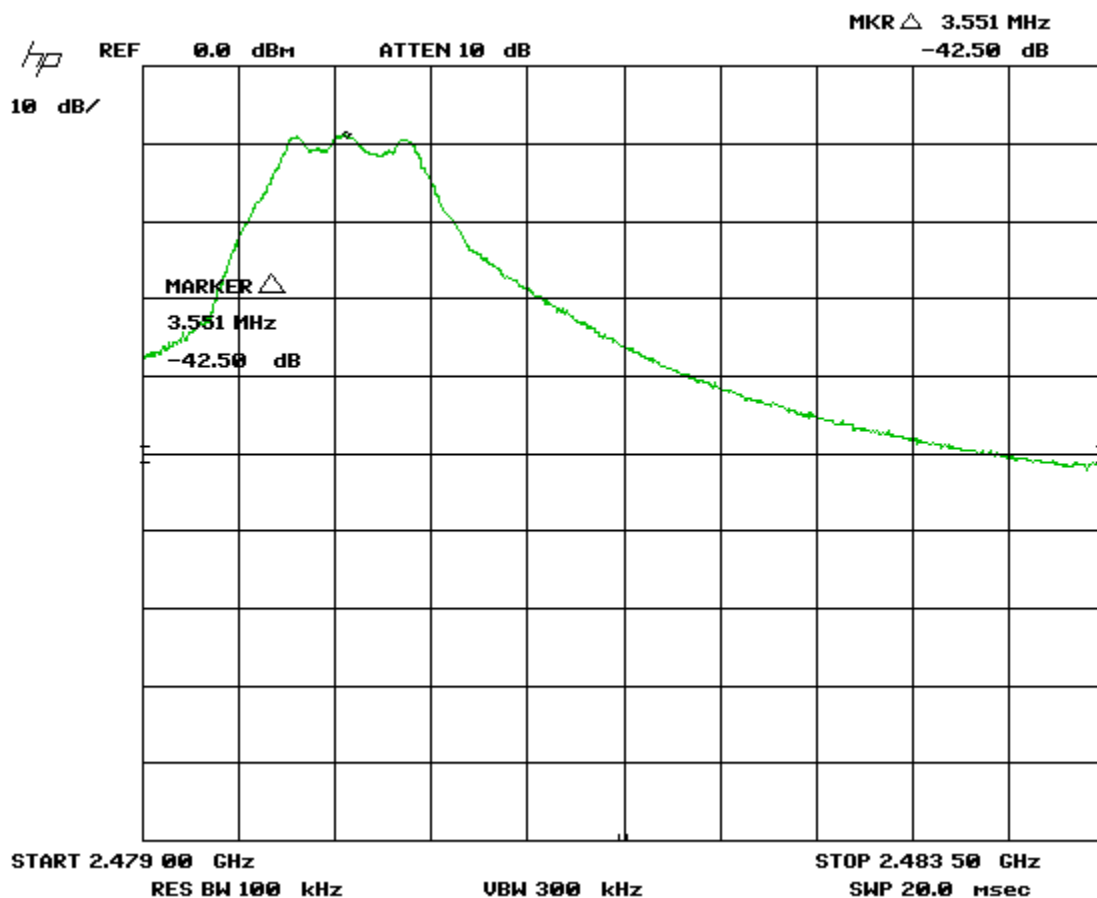
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

2.4 GHz – 2.403 GHz  
EUT transmitting at Low Channel  
-20 dBc requirement is met at low band edge



|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

2.479 GHz – 2.4835 GHz  
EUT transmitting at High Channel  
-20 dBc requirement is met at high band edge




|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |

## Test Equipment List

| Equipment         | Model No. | Manufacturer | Last calibration date | Next calibration due date | Asset #  |
|-------------------|-----------|--------------|-----------------------|---------------------------|----------|
| Spectrum Analyzer | 8566B     | HP           | May 21, 2014          | May 21, 2016              | GEMC 193 |

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## ***Power Spectral Density - Digital Modulation***

### **Purpose**

The purpose of this test is to ensure that the maximum power spectral density to the radiating element does not exceed the limits specified. This ensures that the modulation is significantly wide enough, or low enough in power that it will allow for co-operation of other wireless devices operating within this frequency allocation.

### **Limits**

The limits are defined in FCC Part 15.247(e) and RSS-247 5.2(2).

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

The method is given in Section 10.2 of FCC KDB 558074: June 5, 2014 (peak PSD).


### **Results**

The EUT passed. Low, middle, and high channel was tested. Peak measurements were made for each with a 3 kHz resolution bandwidth, during transmit operation of the EUT with continuous modulated data (>98%). The power spectral density is < 8dBm.

#### **Maximum Power Spectral Density**

| Channel | Test Frequency (MHz) | Detection mode | Output Power (dBm) | Emission limit (dBm) | Margin (dB) | Result |
|---------|----------------------|----------------|--------------------|----------------------|-------------|--------|
| Lo      | 2.402                | Peak           | -22.44             | 8.0                  | 30.44       | Pass   |
| Mi      | 2.440                | Peak           | -22.71             | 8.0                  | 30.71       | Pass   |
| Hi      | 2.480                | Peak           | -21.43             | 8.0                  | 29.43       | Pass   |

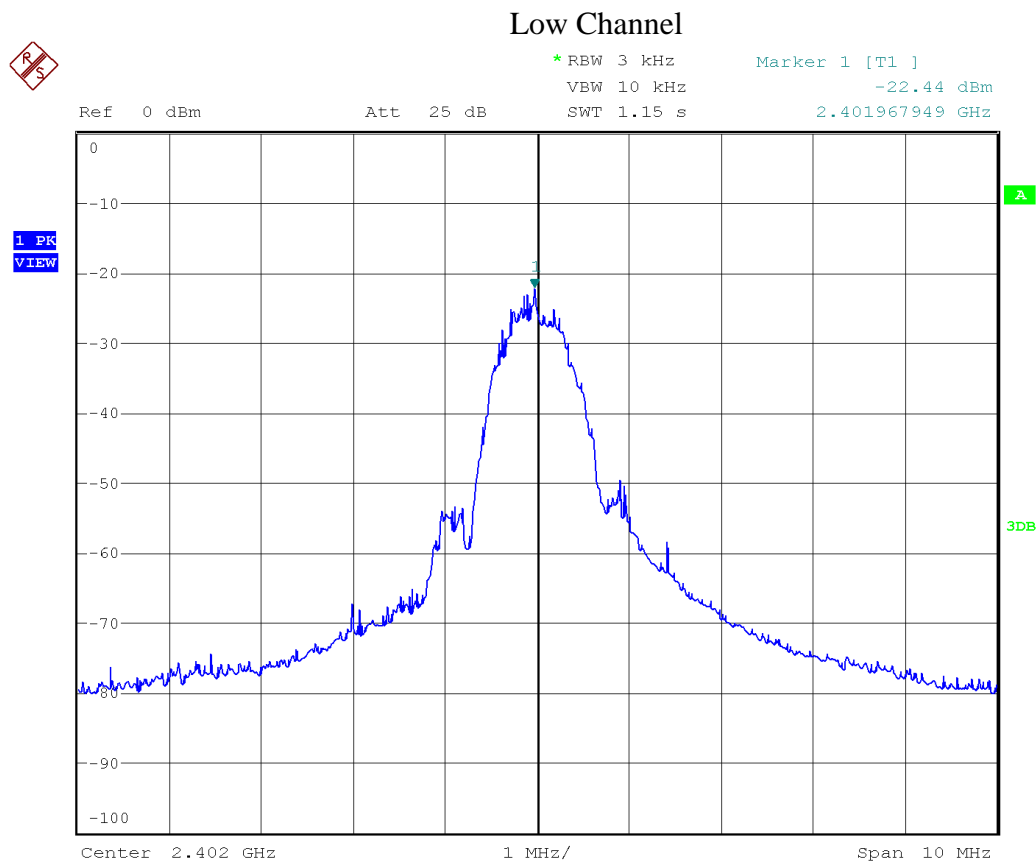



|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Graph(s)

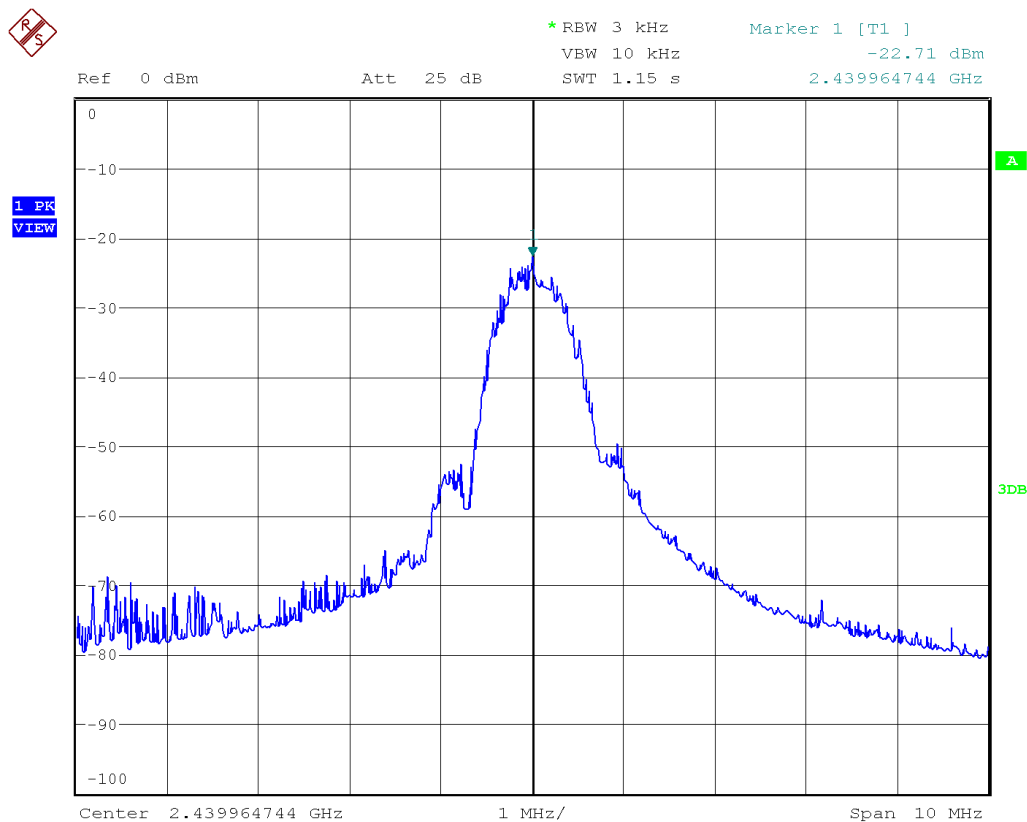
The graphs shown below show the power spectral density of the device during the operation of the EUT. Low, middle, and high channels were investigated, and worst cases are presented.


Note: See ‘Appendix B – EUT & Test Setup Photographs’ for photos showing the test set-up.



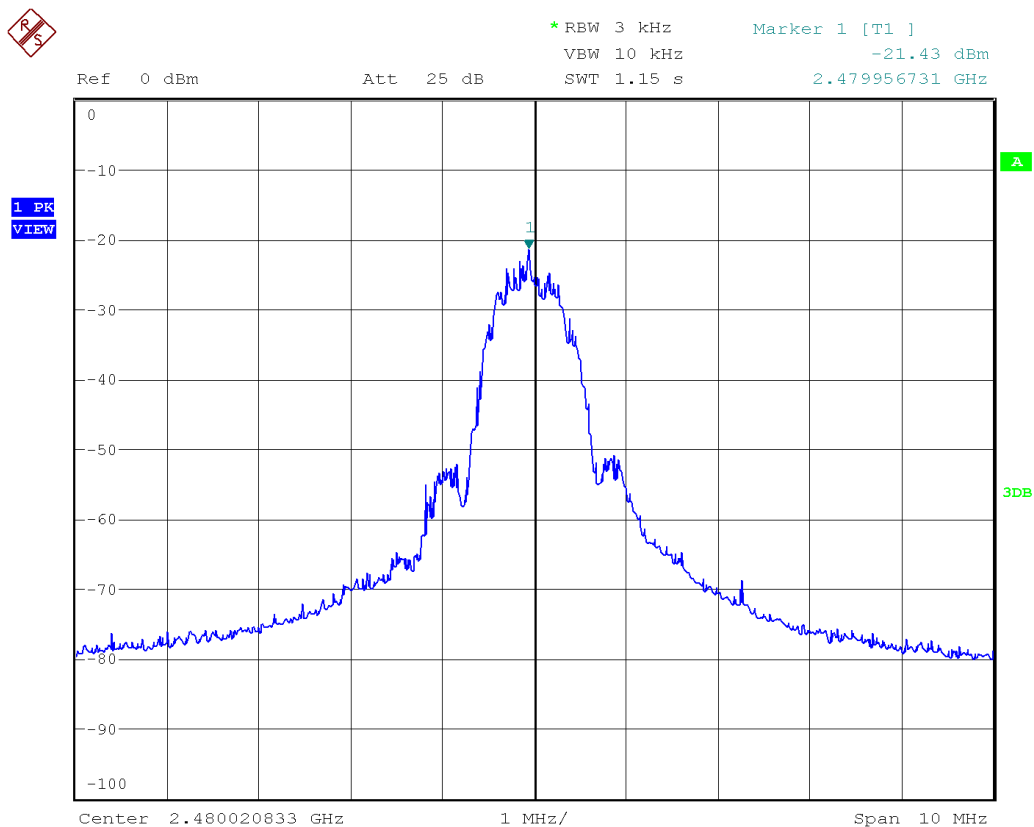
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

### Middle Channel



|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## High Channel




Date: 12.NOV.2015 20:09:29

|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |

## Test Equipment List

| Equipment         | Model No. | Manufacturer    | Last calibration date | Next calibration due date | Asset #  |
|-------------------|-----------|-----------------|-----------------------|---------------------------|----------|
| Spectrum Analyzer | FSU       | Rohde & Schwarz | Jan. 19, 2015         | Jan. 19, 2017             | GEMC 198 |

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## ***Radiated Emissions – 15.247, 15.209***

### **Purpose**

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT does not exceed the limits listed below as defined in the applicable test standard, as measured from a receiving antenna. This helps protect broadcast radio services such as television, FM radio, pagers, cellular telephones, emergency services, and so on, from unwanted interference.

### **Limit(s) and Method**

The method is as defined in ANSI C63.4:2009.

The limits are as defined in FCC Part 15, Section 15.209 and RSS-Gen 8.9 (Table 4 & 5):


The limits, as defined in FCC 15.247(d) for unintentional radiated emissions apply for those emissions that fall in the restricted bands, as defined in FCC Section 15.205(a). These emissions must comply with the radiated emission limits specified in Section 15.209(a).

0.009 MHz – 0.490 MHz, 2400/F(kHz) uV/m at 300 m<sup>1</sup>  
0.490 MHz – 1.705 MHz, 24000/F(kHz) uV/m at 30 m<sup>1</sup>  
1.705 MHz – 30 MHz, 30 uV/m at 30 m<sup>1</sup>  
30 MHz – 88 MHz, 100 uV/m (40.0 dBuV/m<sup>1</sup>) at 3 m  
88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m<sup>1</sup>) at 3 m  
216 MHz – 960 MHz, 200 uV/m (46.0 dBuV/m<sup>1</sup>) at 3 m  
Above 960 MHz, 500 uV/m (54.0 dBuV/m<sup>1</sup>) at 3 m  
Above 1000 MHz, 500 uV/m (54 dBuV/m<sup>2</sup>) at 3m  
Above 1000 MHz, 500 uV/m (74 dBuV/m<sup>3</sup>) at 3m

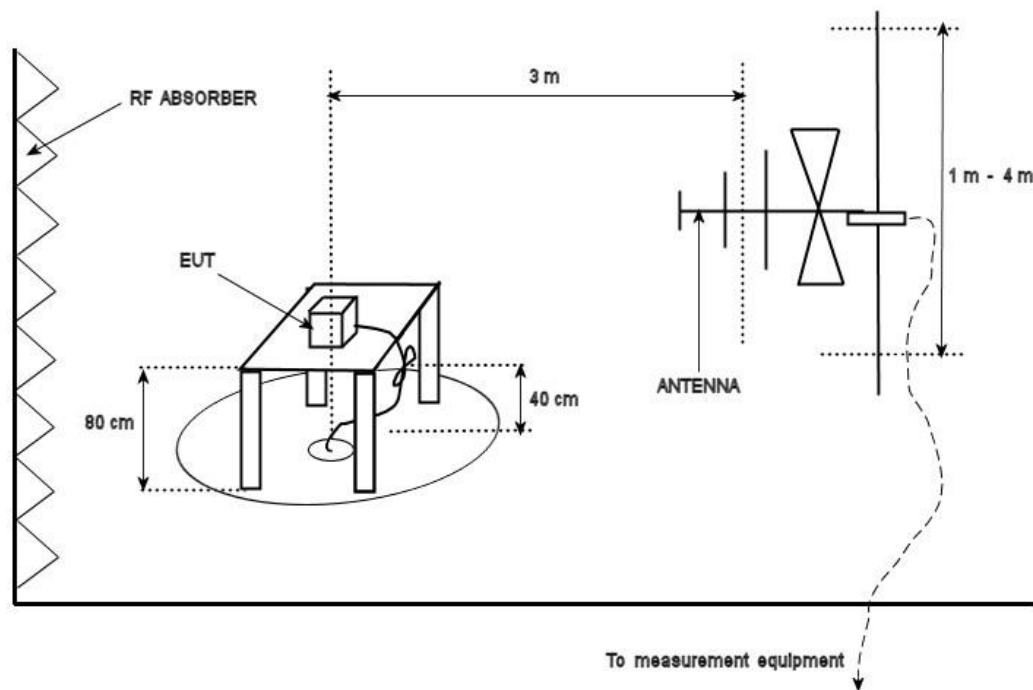
<sup>1</sup>Limit is with Quasi Peak detector with bandwidths as defined in CISPR-16-1-1.

<sup>2</sup>Limit is with 1 MHz measurement bandwidth and using an Average detector.

<sup>3</sup>Limit is with 1 MHz measurement bandwidth and using a Peak detector.

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Typical Radiated Emissions Setup



## Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is  $\pm 4.4$  dB with a 'k=2' coverage factor and a 95% confidence level.

## Preliminary Graphs

Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graphs shown below are maximized peak measurement graphs, measured with a resolution bandwidth greater than or equal to, the final required detector and over a full 0-360° rotation. This peaking process is done as a worst case measurement. This process enables the detection of frequencies of concern for final measurement, and provides considerable time savings.

In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to the 10<sup>th</sup> harmonic.

|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |


Devices scanned may be scanned at alternate test distances, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used above 30 MHz and 40 dB/decade below 30 MHz. For example for 1 meter measurements, an extrapolation factor 9.5 dB from 20 Log (1m/3m) is applied.

See final measurement section for all measurements.

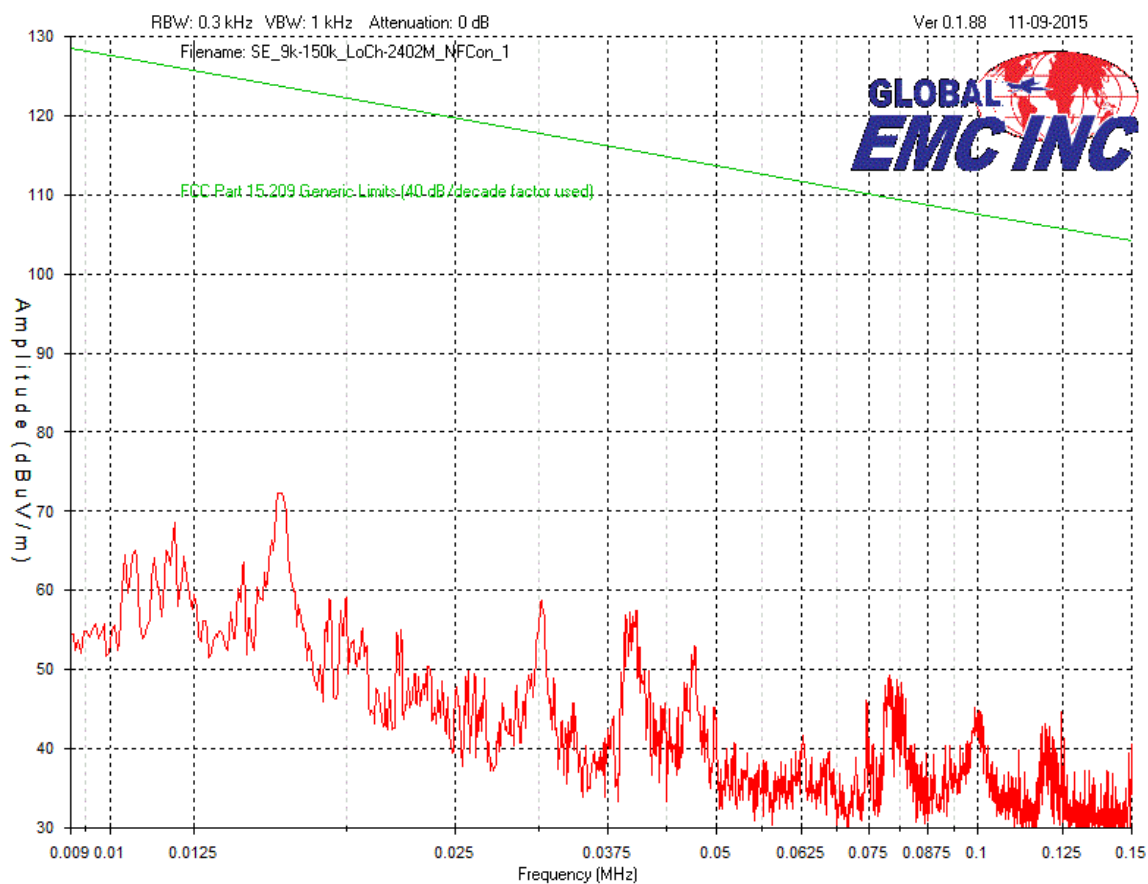
Low, middle, and high channels were scanned. Worst case is presented.

Both the BLE and the NFC transmitters are active and constantly transmitting modulated data at maximum power during testing.


Plots and measurements are made at a 3 meter distance.

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

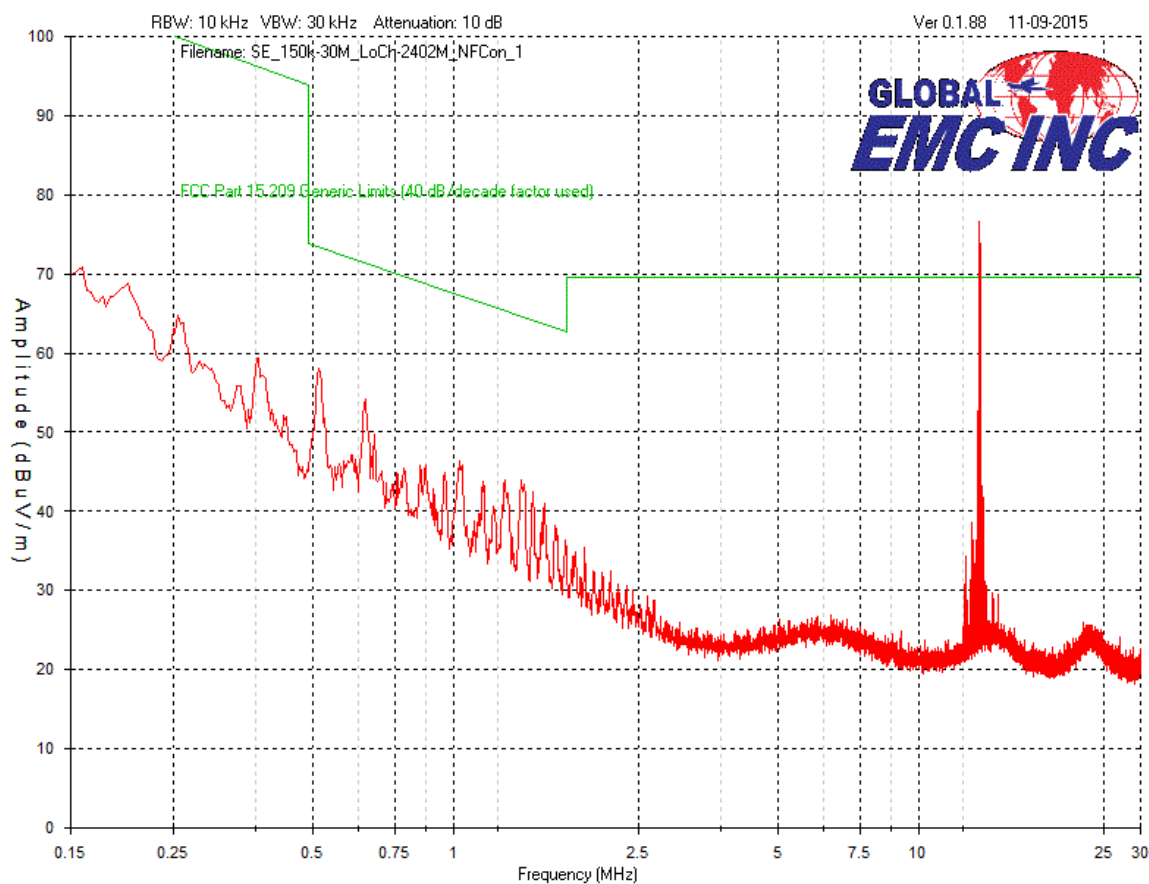
Peak Emissions Graph  
9 kHz to 150 kHz






|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

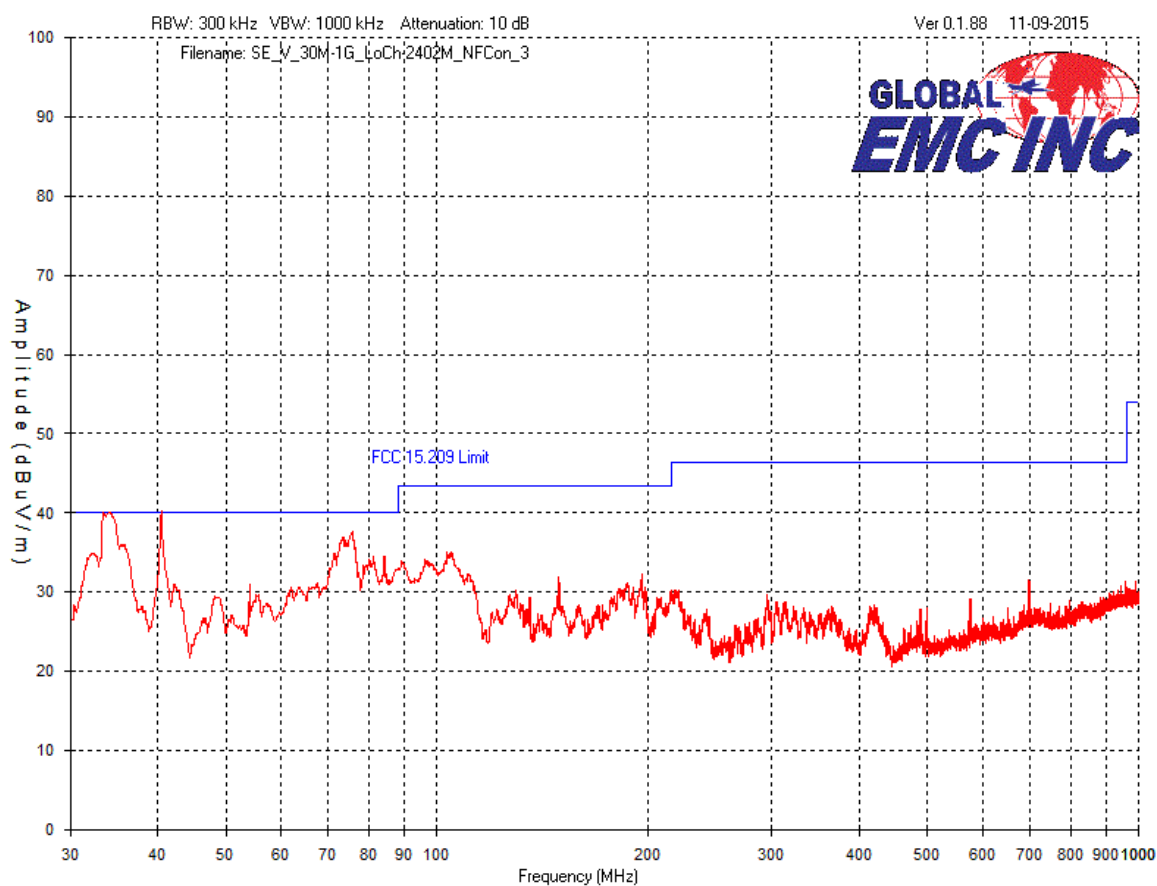
# Peak Emissions Graph 150 kHz to 30 MHz




Note: Peak between 10 MHz – 25 MHz is the intentional transmission from the 13.56 MHz RFID. This is addressed in report # GEMC-FCC-23230BR1.

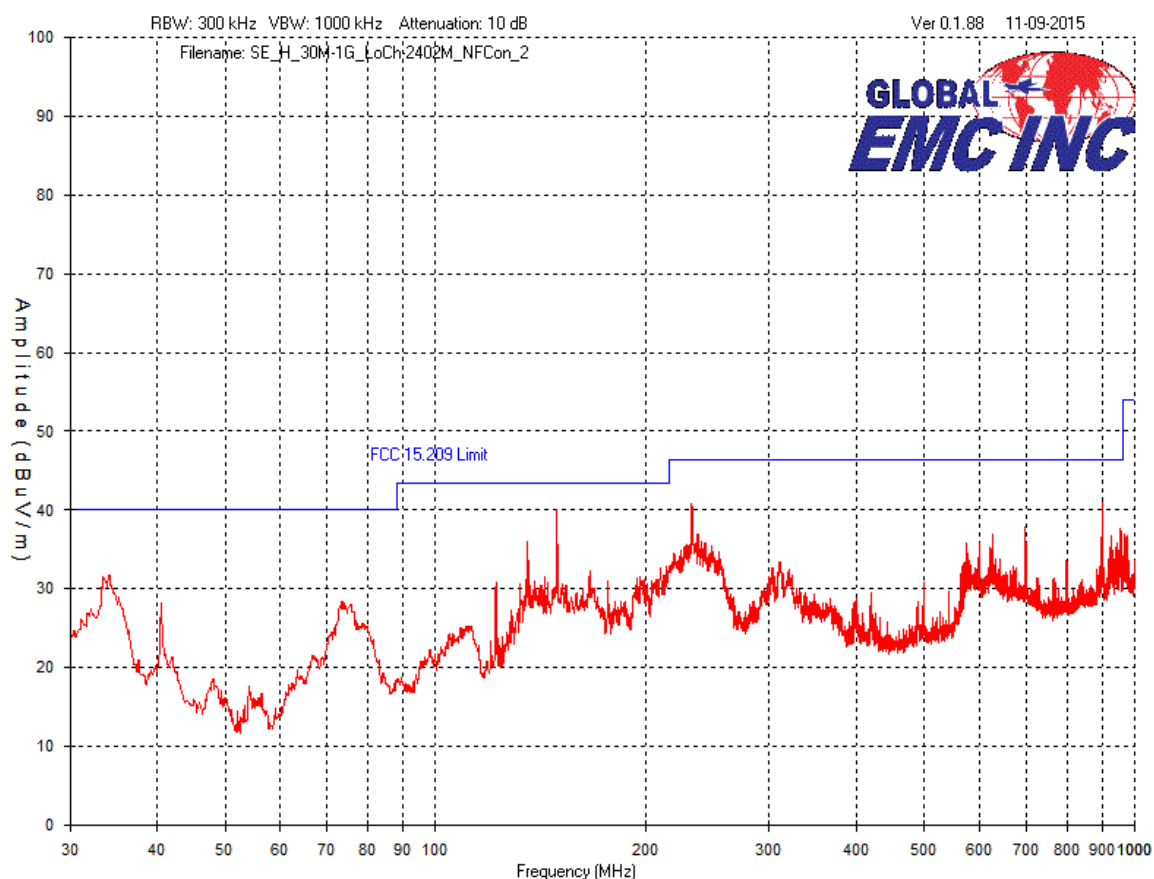
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Peak Emissions Graph  
Vertical Antenna Polarity  
30 MHz to 1 GHz



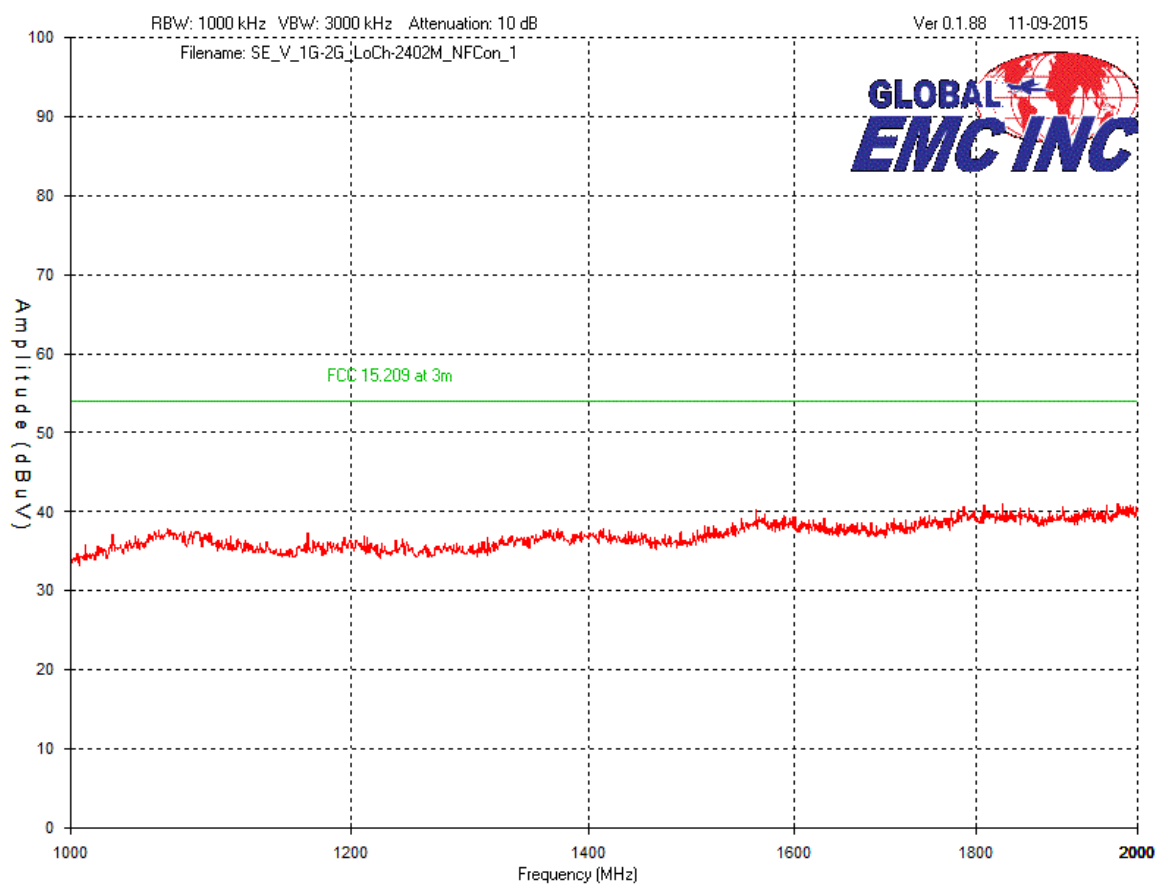
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Peak Emissions Graph  
Horizontal Antenna Polarity  
30 MHz to 1 GHz



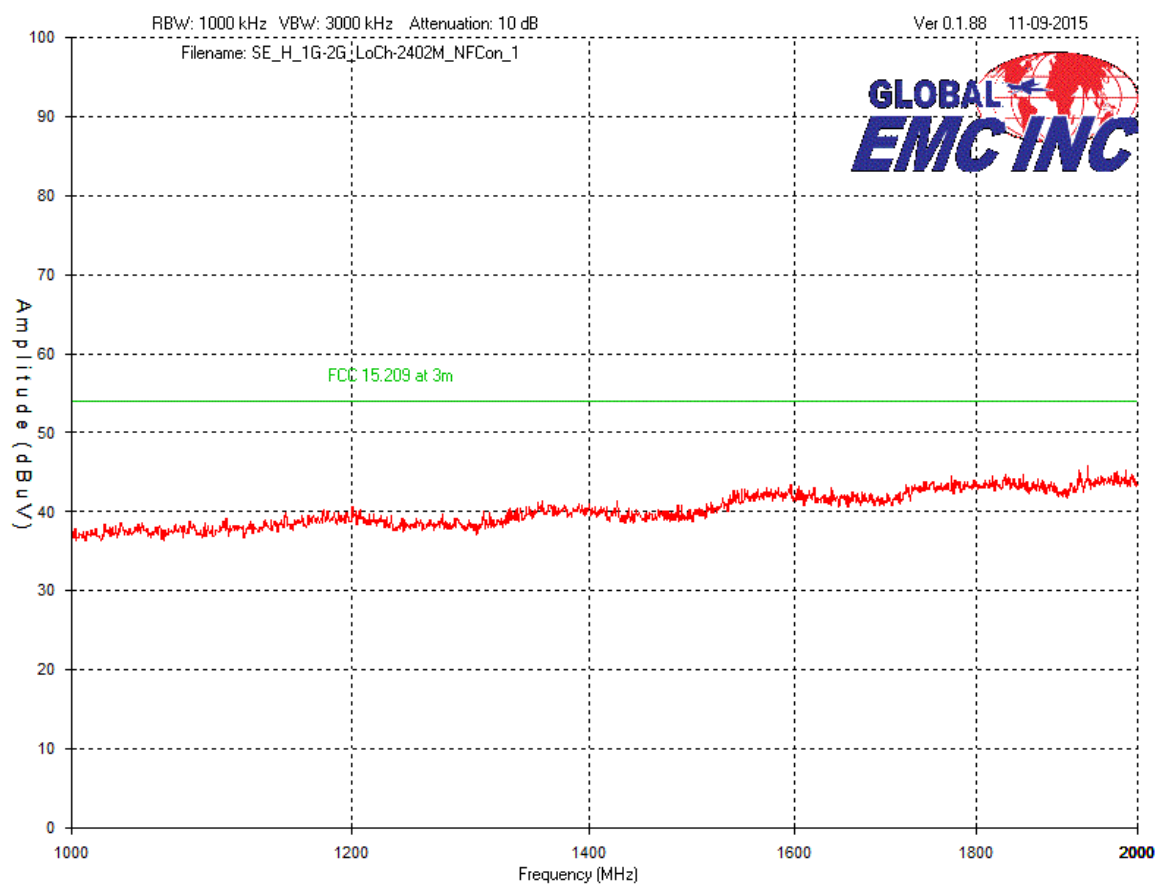
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Peak Emissions Graph  
Vertical Antenna Polarity  
1 GHz to 2 GHz



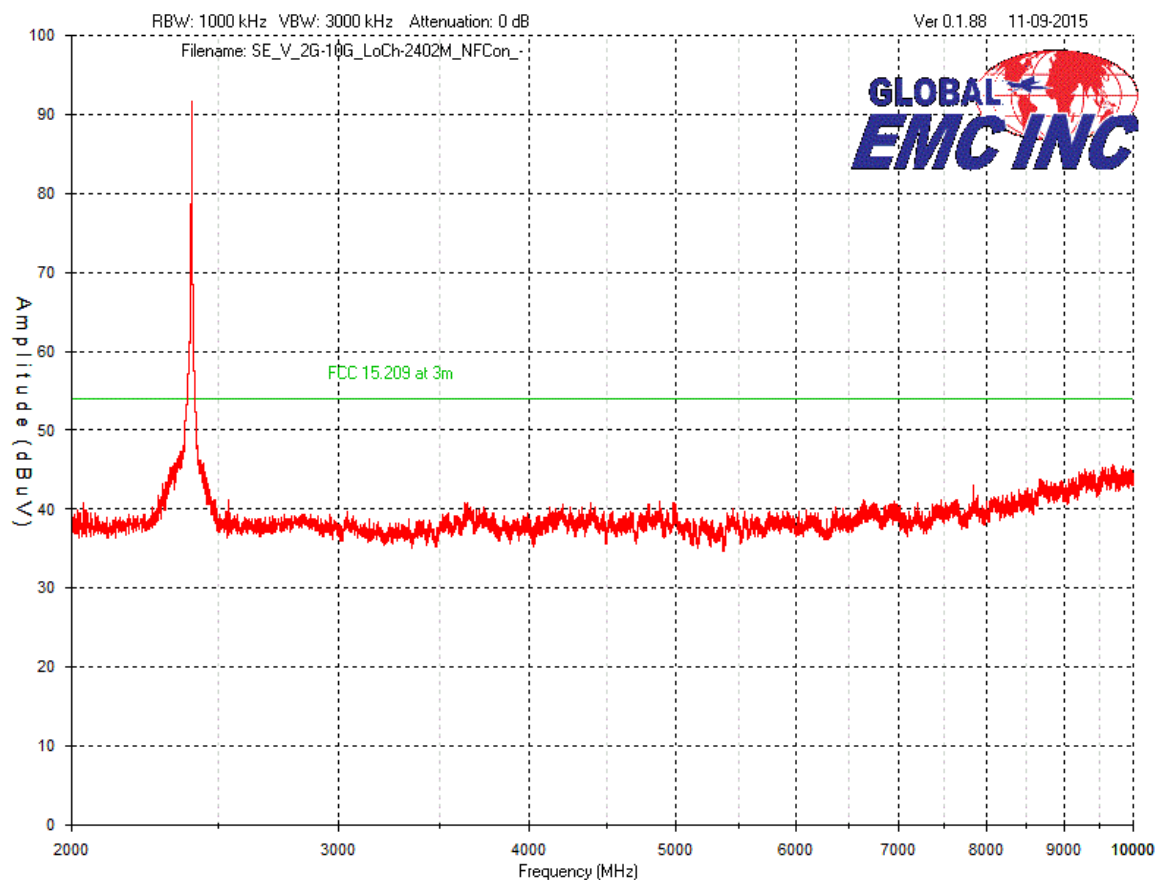
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

Peak Emissions Graph  
Horizontal Antenna Polarity  
1 GHz to 2 GHz




|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

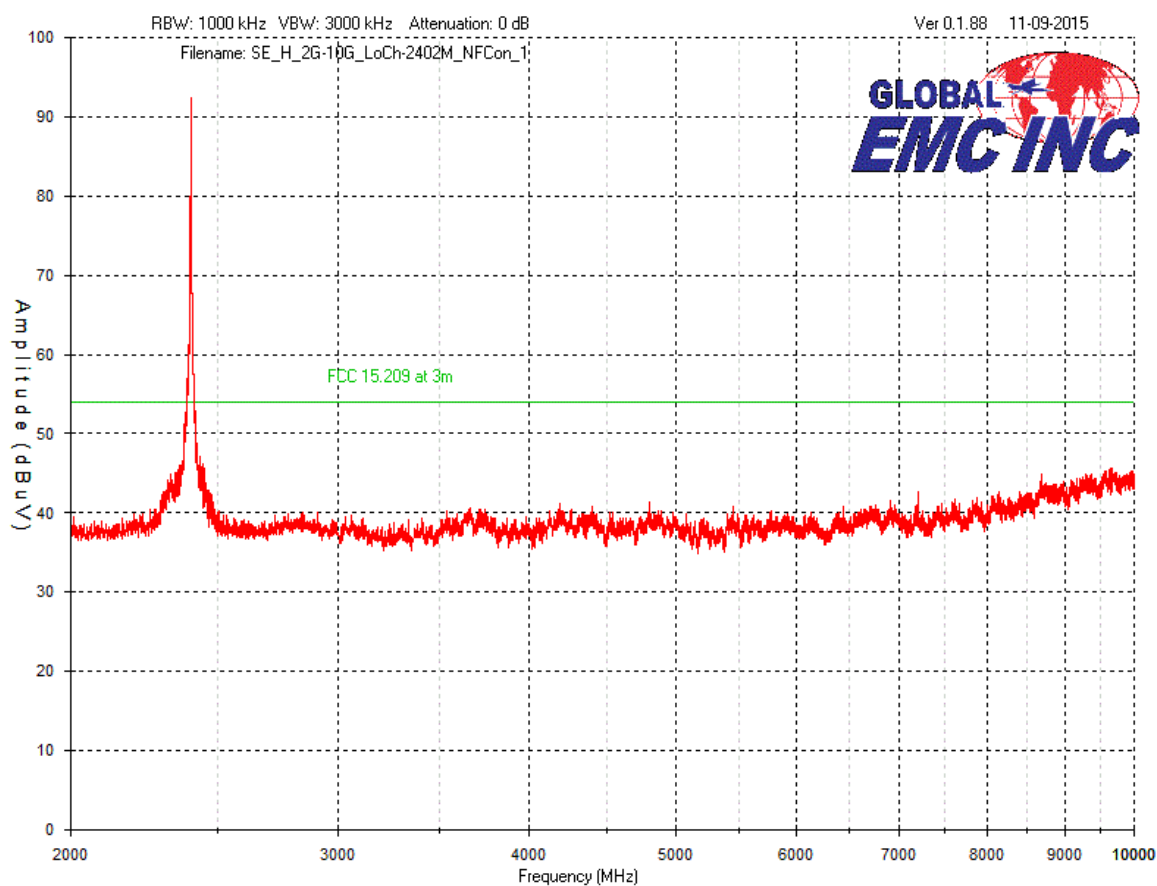
Peak Emissions Graph  
Vertical Antenna Polarity  
2 GHz to 10 GHz




Note: Peak between 2000 MHz and 3000 MHz is the intentional transmission of the BLE at 2.4 GHz.

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

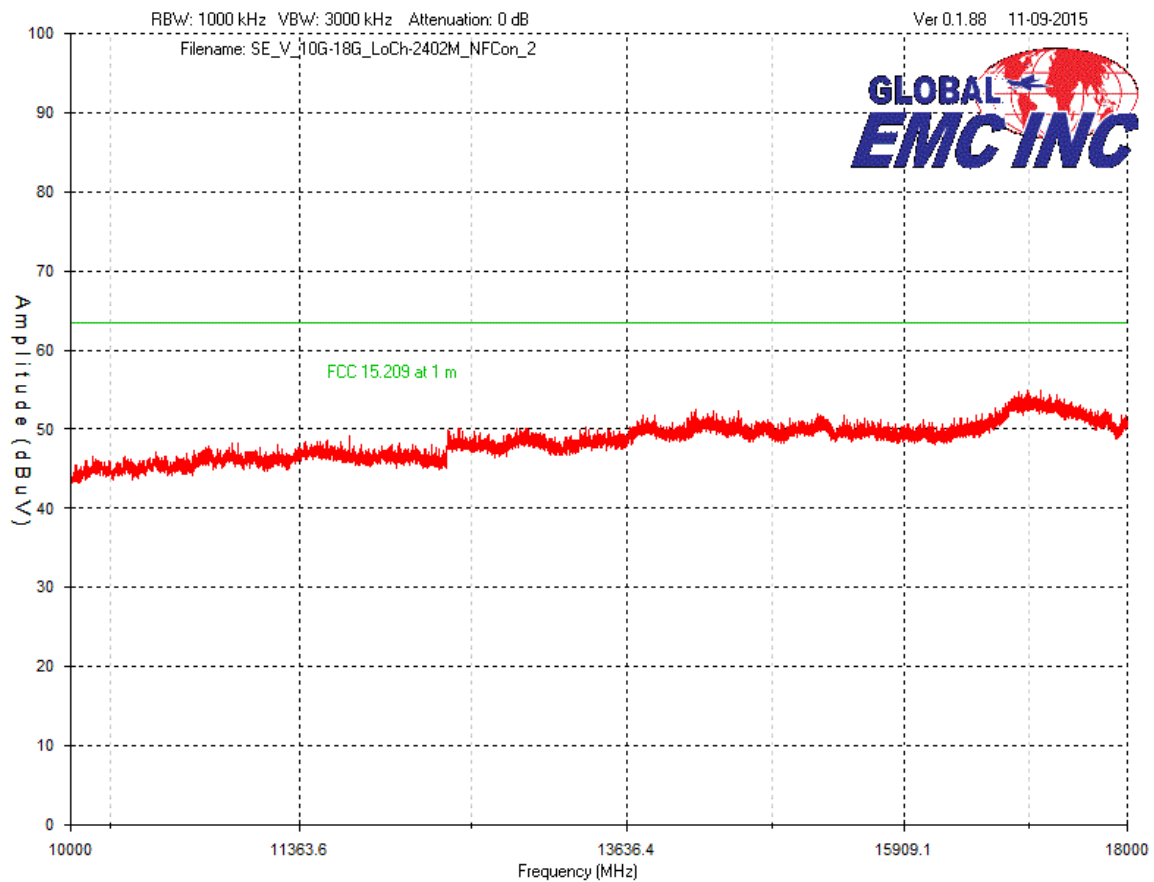
Peak Emissions Graph  
Horizontal Antenna Polarity  
2 GHz to 10 GHz




Note: Peak between 2000 MHz and 3000 MHz is the intentional transmission of the BLE at 2.4 GHz.

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

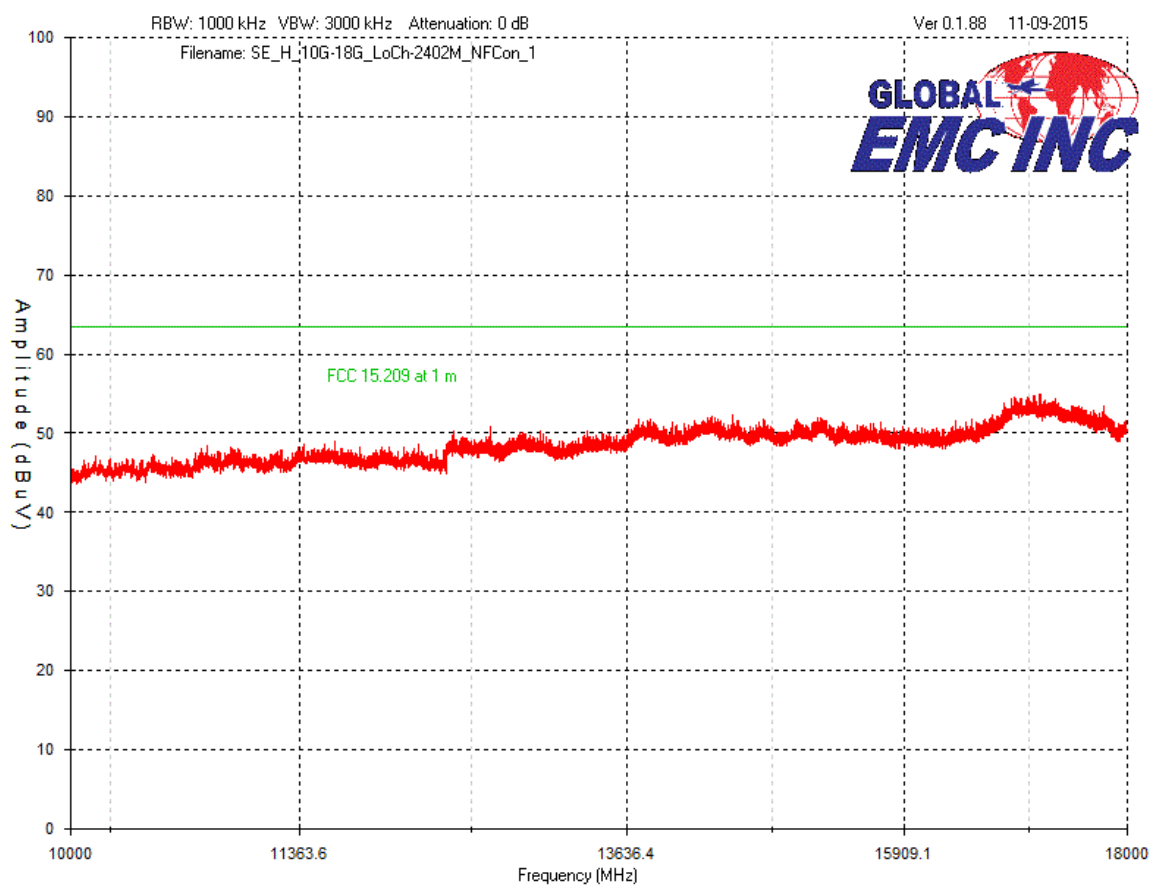
Peak Emissions Graph  
Vertical Antenna Polarity  
10 GHz to 18 GHz






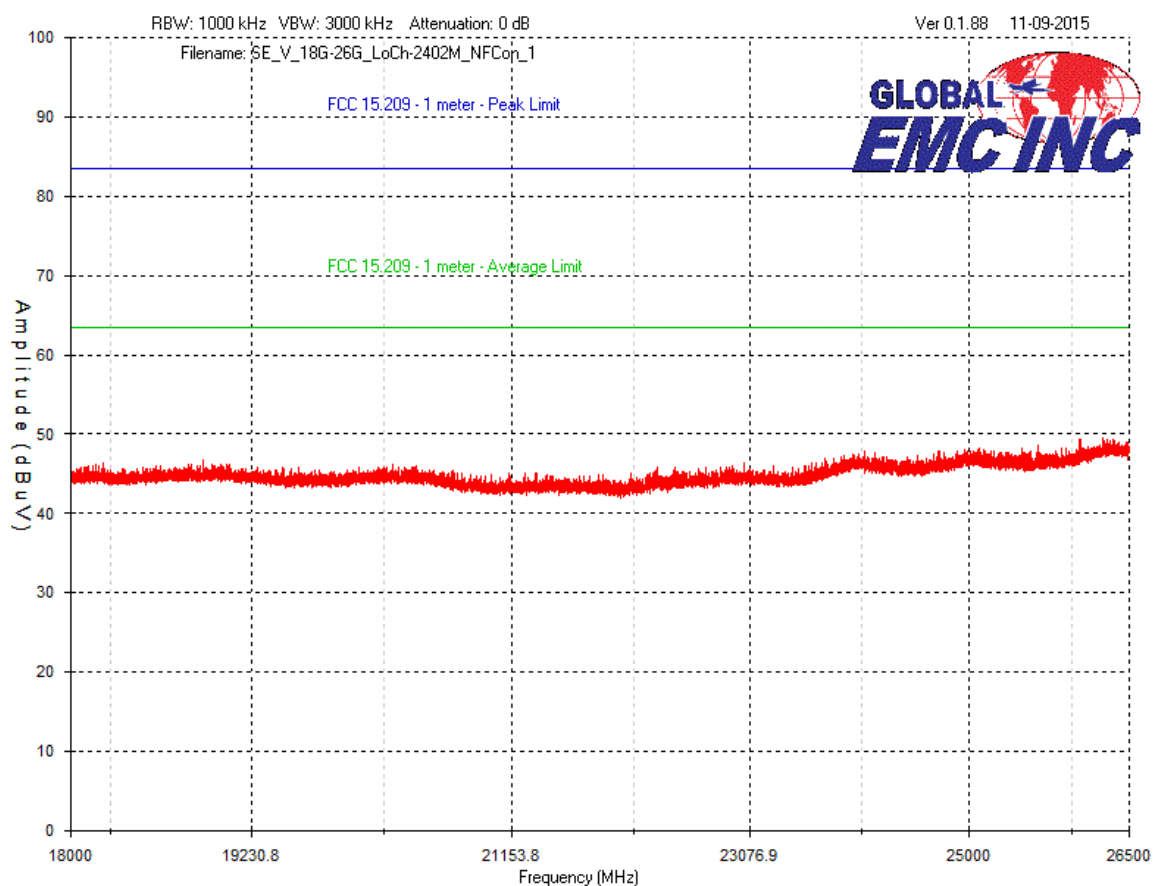
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Peak Emissions Graph  
Horizontal Antenna Polarity  
10 GHz to 18 GHz



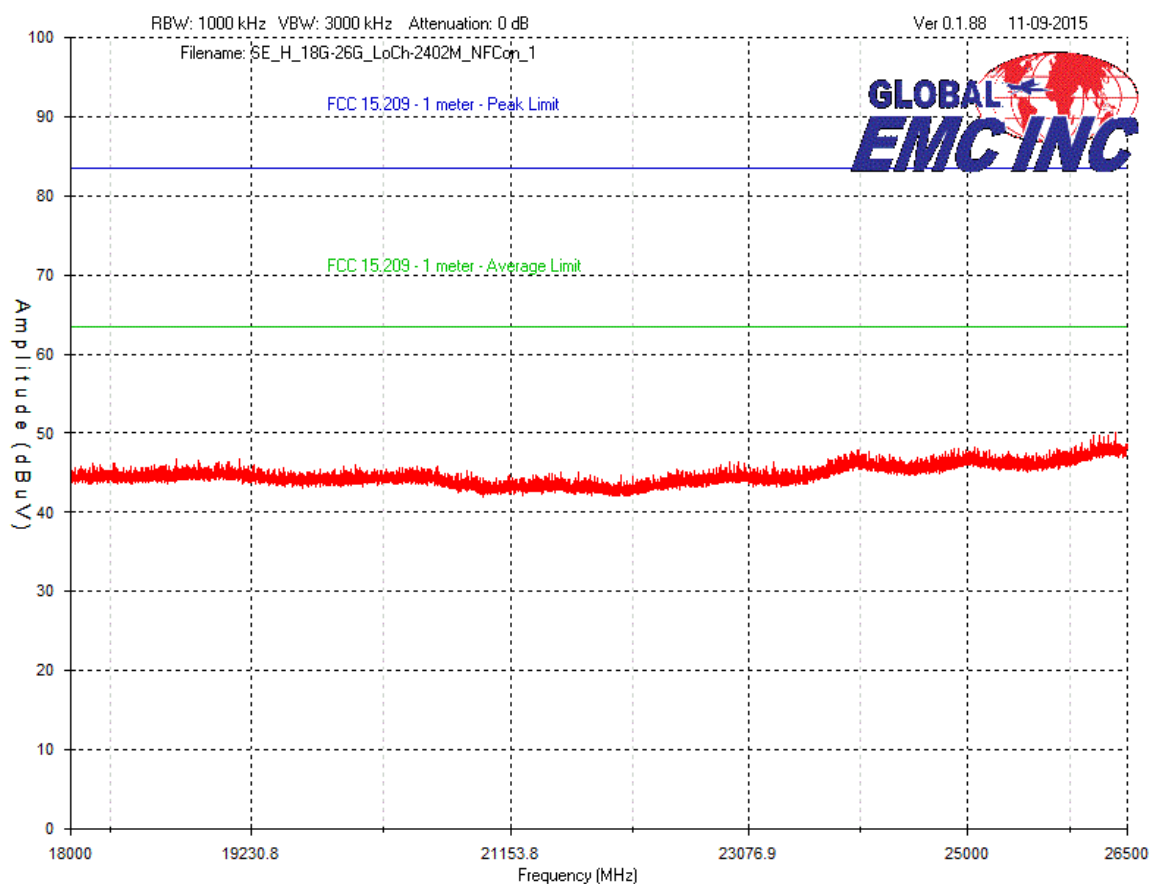
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Peak Emissions Graph  
Vertical Antenna Polarity  
18 GHz to 26.5 GHz



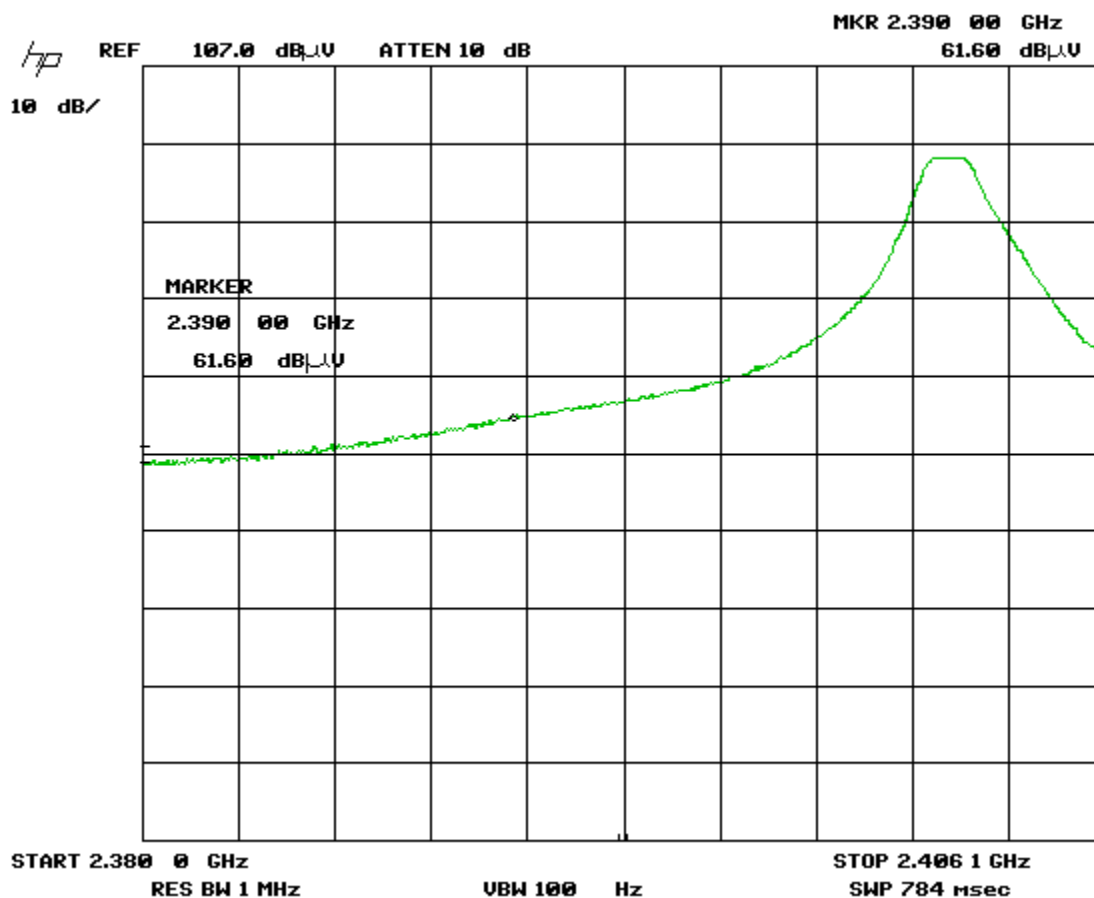
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Peak Emissions Graph  
Horizontal Antenna Polarity  
18 GHz to 26.5 GHz



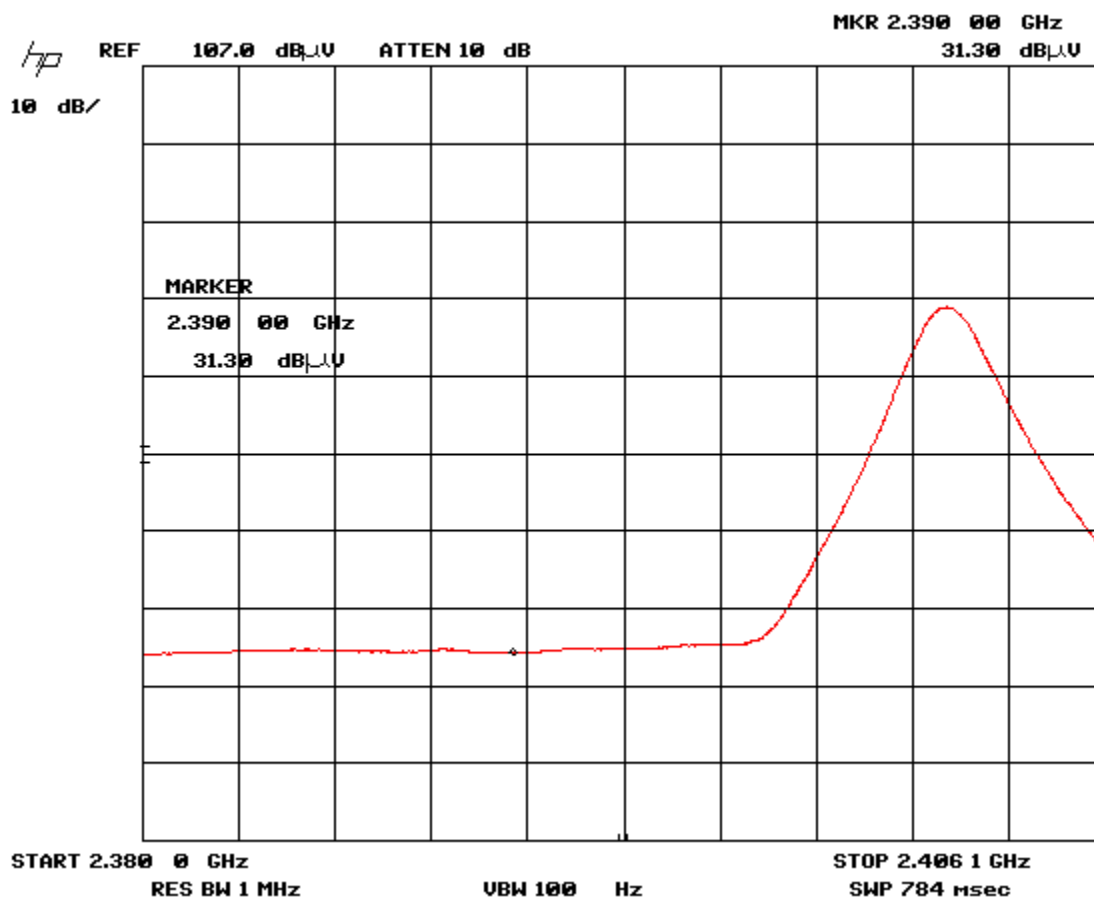
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Restricted Band Edges Emissions Graph (Peak)  
At 2.390 GHz, Horizontal Antenna Polarity  
Low Channel1 (2402 MHz)



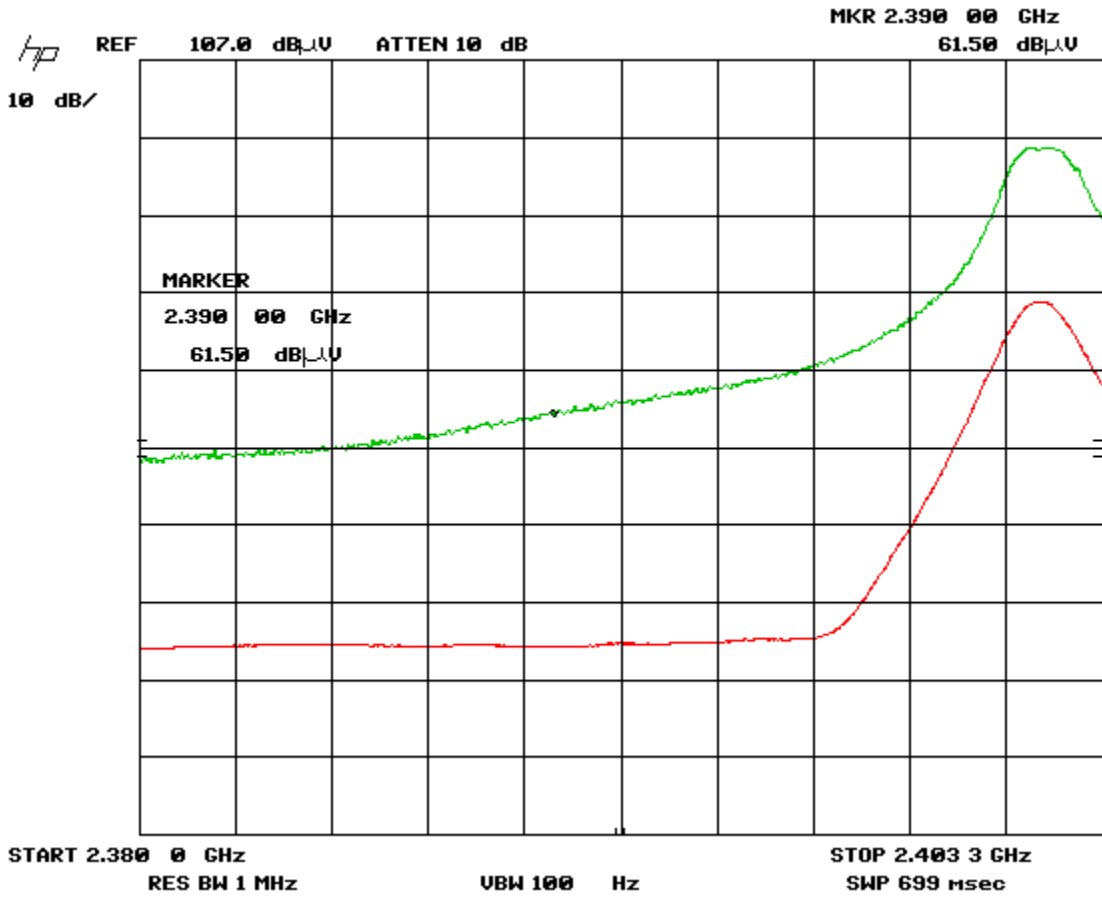
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Restricted Band Edges Emissions Graph (Average)  
At 2.390 GHz, Horizontal Antenna Polarity  
Low Channel1 (2402 MHz)



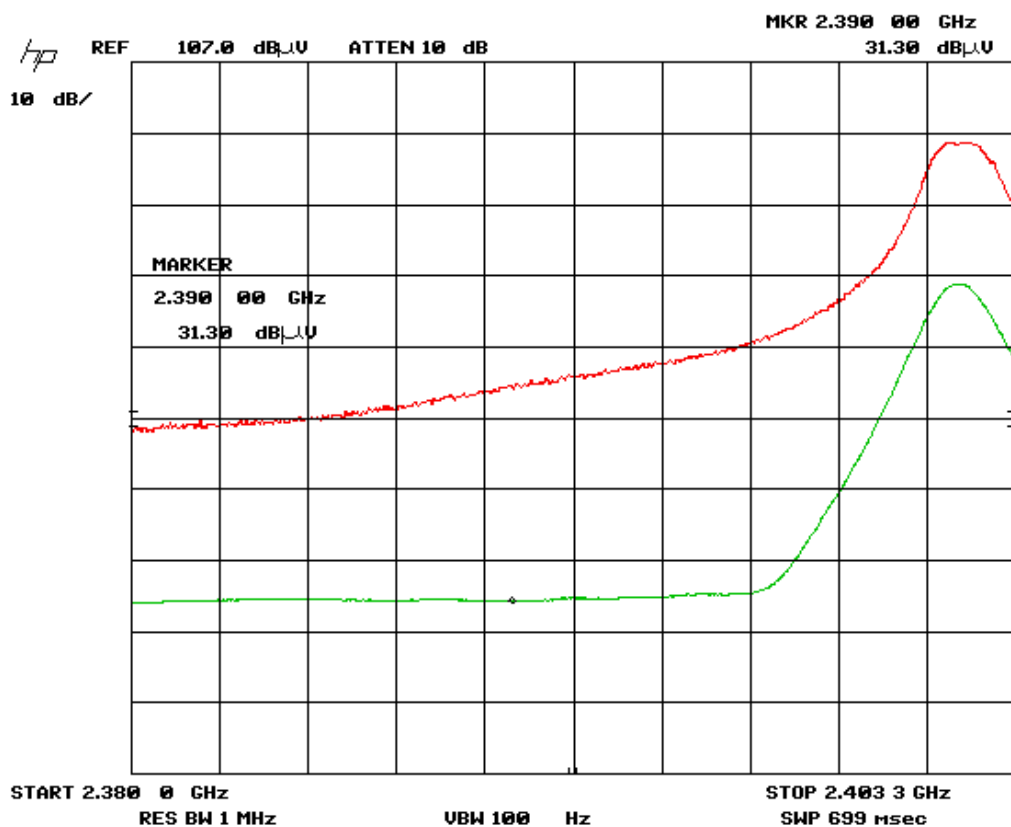
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Restricted Band Edges Emissions Graph (Peak)  
At 2.390 GHz, Vertical Antenna Polarity  
Low Channel1 (2402 MHz)



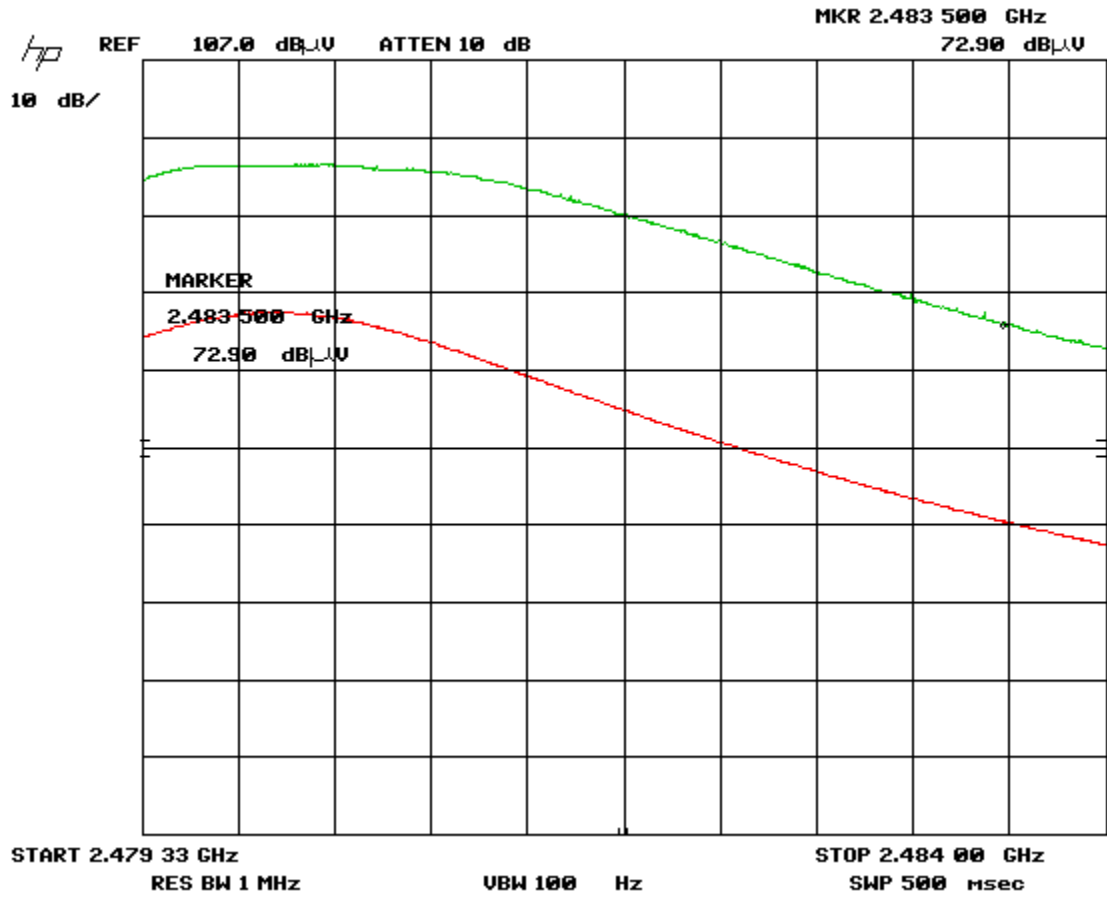
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

Restricted Band Edges Emissions Graph (Average)  
At 2.390 GHz, Vertical Antenna Polarity  
Low Channel1 (2402 MHz)




|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

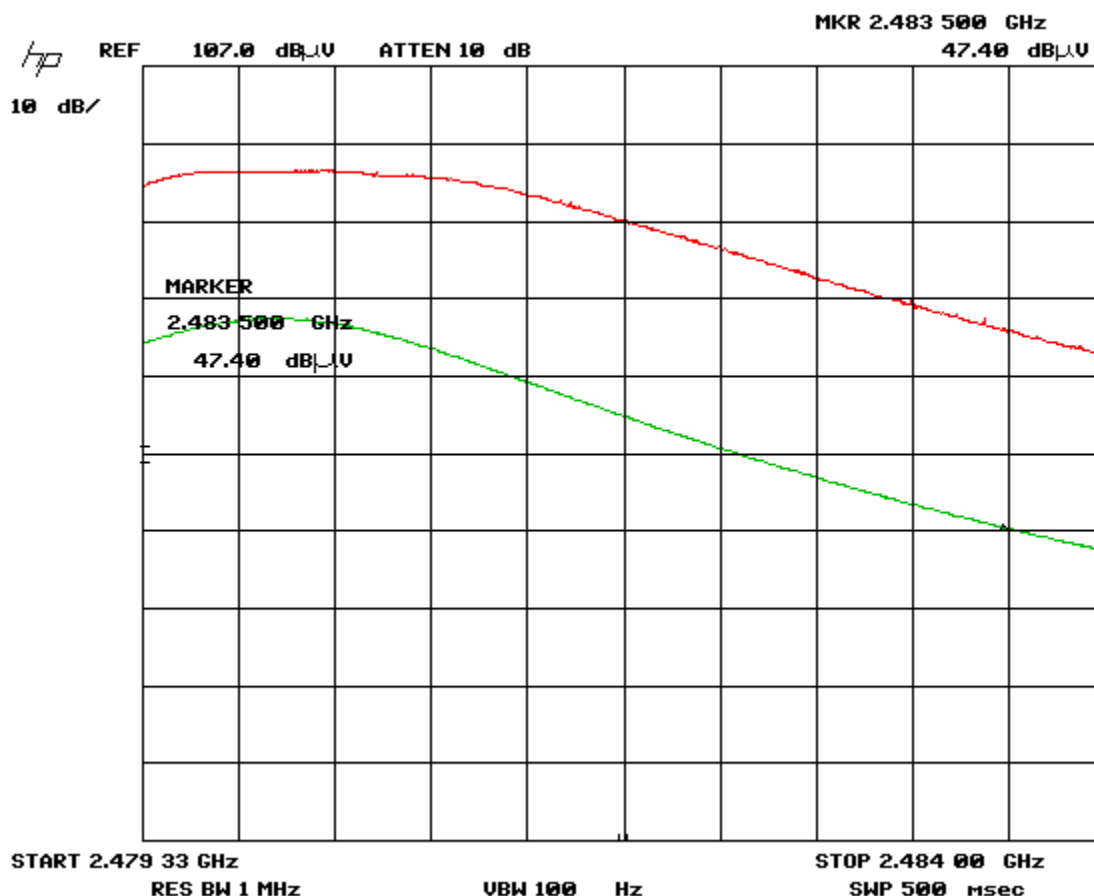
Restricted Band Edges Emissions Graph (Peak)  
At 2.4835 GHz, Horizontal Antenna Polarity  
High Channel1 (2480 MHz)






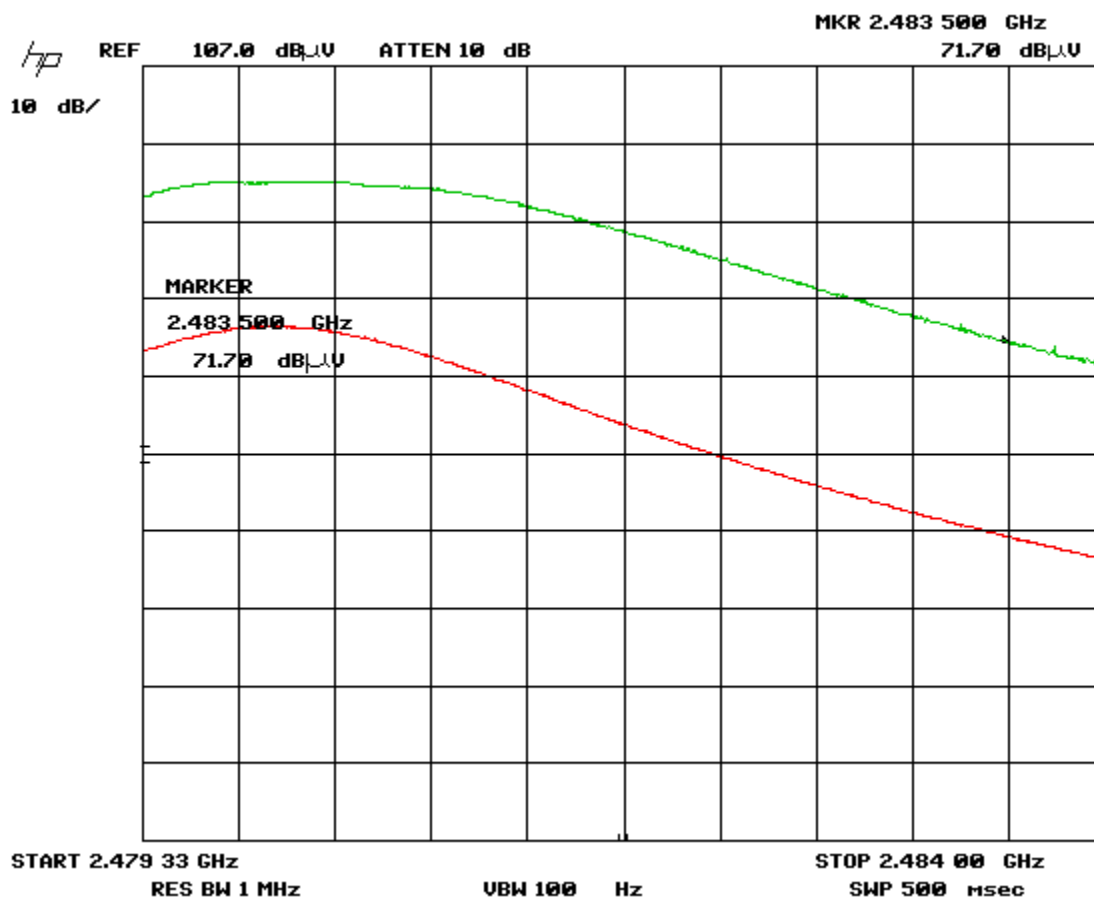
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Restricted Band Edges Emissions Graph (Average)  
At 2.4835 GHz, Horizontal Antenna Polarity  
High Channel1 (2480 MHz)



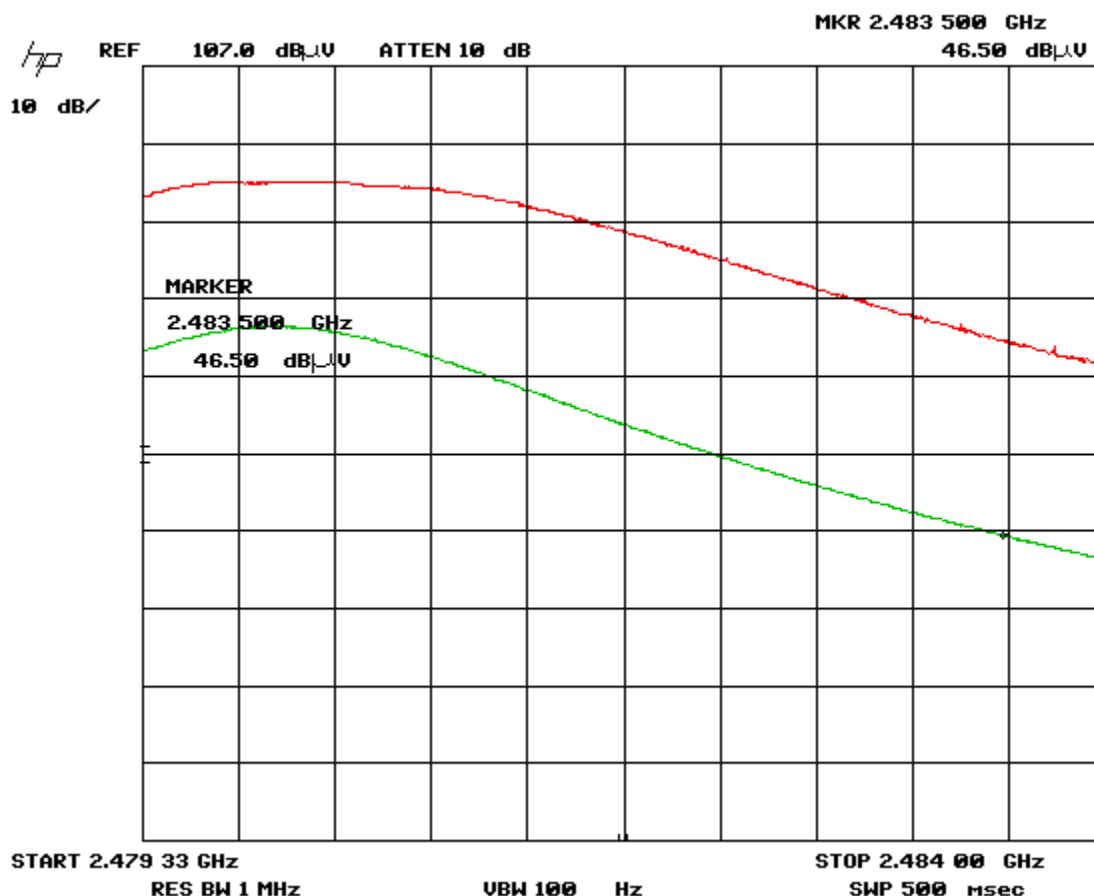
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Restricted Band Edges Emissions Graph (Peak)  
At 2.4835 GHz, Vertical Antenna Polarity  
High Channel1



|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

Restricted Band Edges Emissions Graph (Average)  
At 2.4835 GHz, Vertical Antenna Polarity  
High Channel1 (2480 MHz)



|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Final Measurements

Table 1: Radiated Emissions  
Spurious emissions  
3m measurement distance

| Test Frequency (MHz)        | Detection mode | Raw signal dB(μV) | Antenna factor dB | Cable loss dB + Preselector | Pre-Amp Gain dB | Received signal dB(μV/m) | Emission limit dB(μV/m) | Margin dB(μV) | Result |
|-----------------------------|----------------|-------------------|-------------------|-----------------------------|-----------------|--------------------------|-------------------------|---------------|--------|
| Vertical Antenna Polarity   |                |                   |                   |                             |                 |                          |                         |               |        |
| 40.5                        | QP             | 56.55             | 10.2              | 0.5                         | -33.1           | 34.15                    | 40                      | 5.85          | Pass   |
| 33.5                        | QP             | 48.6              | 13.5              | 0.5                         | -33.1           | 29.5                     | 40                      | 10.5          | Pass   |
| 75.7                        | QP             | 52.61             | 5.9               | 0.7                         | -33.2           | 26.01                    | 40                      | 13.99         | Pass   |
| 195.9                       | Peak           | 54.3              | 10.3              | 1.1                         | -33.4           | 32.3                     | 43.5                    | 11.2          | Pass   |
| 149.1                       | Peak           | 55.3              | 8.9               | 0.9                         | -33.2           | 31.9                     | 43.5                    | 11.6          | Pass   |
| 129.5                       | Peak           | 54.8              | 7.8               | 0.9                         | -33.3           | 30.2                     | 43.5                    | 13.3          | Pass   |
| Horizontal Antenna Polarity |                |                   |                   |                             |                 |                          |                         |               |        |
| 149.0                       | Peak           | 63.4              | 9                 | 0.9                         | -33.2           | 40.1                     | 43.5                    | 3.4           | Pass   |
| 898.0                       | Peak           | 47                | 23.6              | 2.3                         | -31.8           | 41.1                     | 46.4                    | 5.3           | Pass   |
| 232.2                       | Peak           | 61.3              | 11.9              | 1.2                         | -33.5           | 40.9                     | 46.4                    | 5.5           | Pass   |
| 135.4                       | Peak           | 60.7              | 7.6               | 0.9                         | -33.2           | 36                       | 43.5                    | 7.5           | Pass   |
| 34.1                        | Peak           | 48.2              | 16.2              | 0.5                         | -33.1           | 31.8                     | 40                      | 8.2           | Pass   |
| 950.5                       | Peak           | 43.3              | 23.6              | 2.4                         | -31.5           | 37.8                     | 46.4                    | 8.6           | Pass   |


|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

Table 2: Radiated Emissions  
Spurious emissions at restricted band edges  
3m measurement distance

| Test Frequency (MHz)        | Detection mode | Raw signal dB(μV) | Antenna factor dB | Cable loss dB + Preselector | Pre-Amp Gain dB | Received signal dB(μV/m) | Average Emission limit dB(μV/m) | Peak Emission limit dB(μV/m) | Average Margin dB(μV) | Peak Margin dB(μV) | Result |
|-----------------------------|----------------|-------------------|-------------------|-----------------------------|-----------------|--------------------------|---------------------------------|------------------------------|-----------------------|--------------------|--------|
| Horizontal Antenna Polarity |                |                   |                   |                             |                 |                          |                                 |                              |                       |                    |        |
| 2390                        | Peak           | 61.6              | 26.1              | 4                           | -33.8           | 57.9                     | ---                             | 74                           | ---                   | 16.1               | Pass   |
| 2390                        | Avg.           | 31.3              | 26.1              | 4                           | -33.8           | 27.6                     | 54                              | ---                          | 26.4                  | ---                | Pass   |
| 2483.5                      | Peak           | 72.9              | 26.1              | 4.1                         | -33.8           | 69.3                     | ---                             | 74                           | ---                   | 4.7                | Pass   |
| 2483.5                      | Avg.           | 47.4              | 26.1              | 4.1                         | -33.8           | 43.8                     | 54                              | ---                          | 10.2                  | ---                | Pass   |
| Vertical Antenna Polarity   |                |                   |                   |                             |                 |                          |                                 |                              |                       |                    |        |
| 2390                        | Peak           | 61.5              | 26.1              | 4                           | -33.8           | 57.8                     | ---                             | 74                           | ---                   | 16.2               | Pass   |
| 2390                        | Avg.           | 31.3              | 26.1              | 4                           | -33.8           | 27.6                     | 54                              | ---                          | 26.4                  | ---                | Pass   |
| 2483.5                      | Peak           | 71.7              | 26.1              | 4.1                         | -33.8           | 68.1                     | ---                             | 74                           | ---                   | 5.9                | Pass   |
| 2483.5                      | Avg.           | 46.5              | 26.1              | 4.1                         | -33.8           | 42.9                     | 54                              | ---                          | 11.1                  | ---                | Pass   |

Notes.


All harmonics are under the limits defined in FCC 15.209.

Peak = Peak measurement

QP = Quasi-Peak measurement

Avg. = Average measurement


Where peak values are under the quasi-peak and/or average limit, the emission passes the corresponding limit, and no measurement with the respective detector is required.

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Test Equipment List

| Equipment                      | Model No.              | Manufacturer    | Last calibration date | Next calibration due date | Asset #   |
|--------------------------------|------------------------|-----------------|-----------------------|---------------------------|-----------|
| Spectrum Analyzer              | 8566B                  | HP              | May 21, 2014          | May 21, 2016              | GEMC 193  |
| Quasi-Peak Adapter             | 85650A                 | HP              | May 22, 2014          | May 22, 2016              | GEMC 194  |
| Loop Antenna 30Hz – 1MHz       | EM 6871                | Electro-Metrics | Feb. 3, 2015          | Feb. 3, 2017              | GEMC 70   |
| Loop Antenna 100kHz – 30MHz    | EM 6872                | Electro-Metrics | Feb. 3, 2015          | Feb. 3, 2017              | GEMC 71   |
| BiLog Antenna                  | 3142-C                 | ETS             | Feb. 10, 2015         | Feb. 10, 2017             | GEMC 137  |
| Horn Antenna                   | 6878/24                | Q-par           | Sept 10, 2014         | Sept 10, 2016             | GEMC 6365 |
| Horn Antenna 18 GHz - 26.5 GHz | SAS-572                | A.H. Systems    | Sept. 9, 2014         | Sept. 9, 2016             | GEMC 6371 |
| 18.0-26.5 GHz Harmonic Mixer   | 11970K                 | HP              | Jan 28, 2014          | Jan 28, 2016              | GEMC 158  |
| Preamp 9kHz - 2 GHz            | CPA9231A               | Chase           | Sept. 9, 2014         | Sept. 9, 2016             | GEMC 6403 |
| Pre-amp 1-26GHz                | HP 8449B               | HP              | Sept. 9, 2014         | Sept. 9, 2016             | GEMC 6351 |
| RF Cable 7m                    | LMR-400-7M-50OHM-MN-MN | LexTec          | NCR                   | NCR                       | GEMC 28   |
| RF Cable 1m                    | LMR-400-1M-50OHM-MN-MN | LexTec          | NCR                   | NCR                       | GEMC 29   |

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions\_Rev1.doc"

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## ***Power Line Conducted Emissions***

### **Purpose**

The purpose of this test is to ensure that the RF energy unintentionally emitted from the EUT's power line does not exceed the limits listed below as defined in the applicable test standard, as measured from a LISN. This helps protect lower frequency radio services such as AM radio, shortwave radio, amateur radio operators, maritime radio, CB radio, and so on, from unwanted interference.

### **Limits & Method**


The limits and method are as defined in 47 CFR FCC Part 15 Section 15.207, and RSS-Gen 8.8, Table 3.

| <u>Average Limits</u> |               | <u>QuasiPeak Limits</u> |               |
|-----------------------|---------------|-------------------------|---------------|
| 150 kHz – 500 kHz     | 56 to 46 dBuV | 150 kHz – 500 kHz       | 66 to 56 dBuV |
| 500 kHz – 5 MHz       | 46 dBuV       | 500 kHz – 5 MHz         | 56 dBuV       |
| 5 MHz – 30 MHz        | 50 dBuV       | 500 kHz – 30 MHz        | 60 dBuV       |

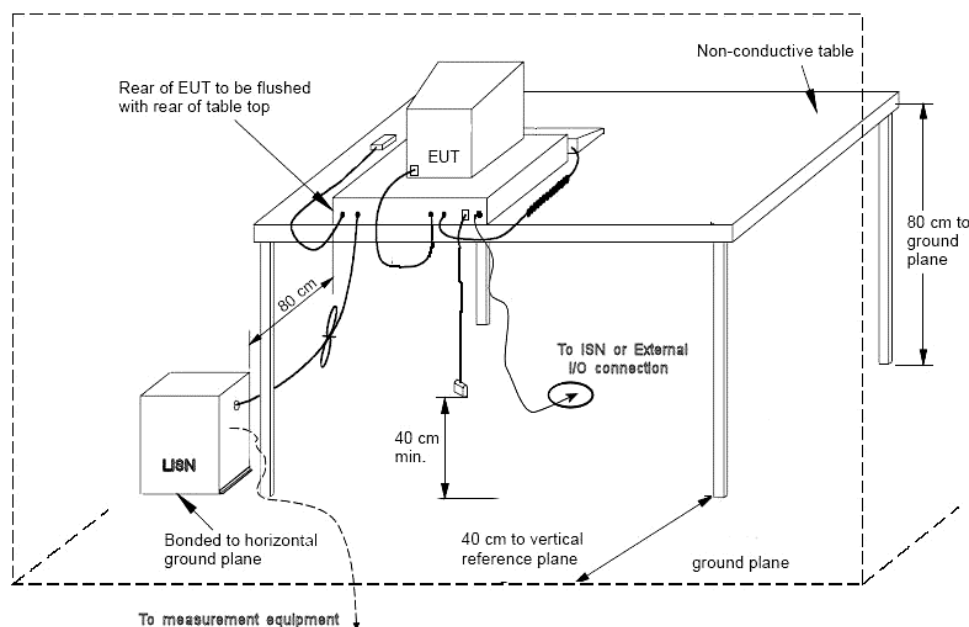
The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

Note: If the Peak or Quasi Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

Both limits are applicable, and each is specified as being measured with a 9 kHz measurement bandwidth.

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

### Typical Setup Diagram




### Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is  $\pm 3.6$  dB with a 'k=2' coverage factor and a 95% confidence level.

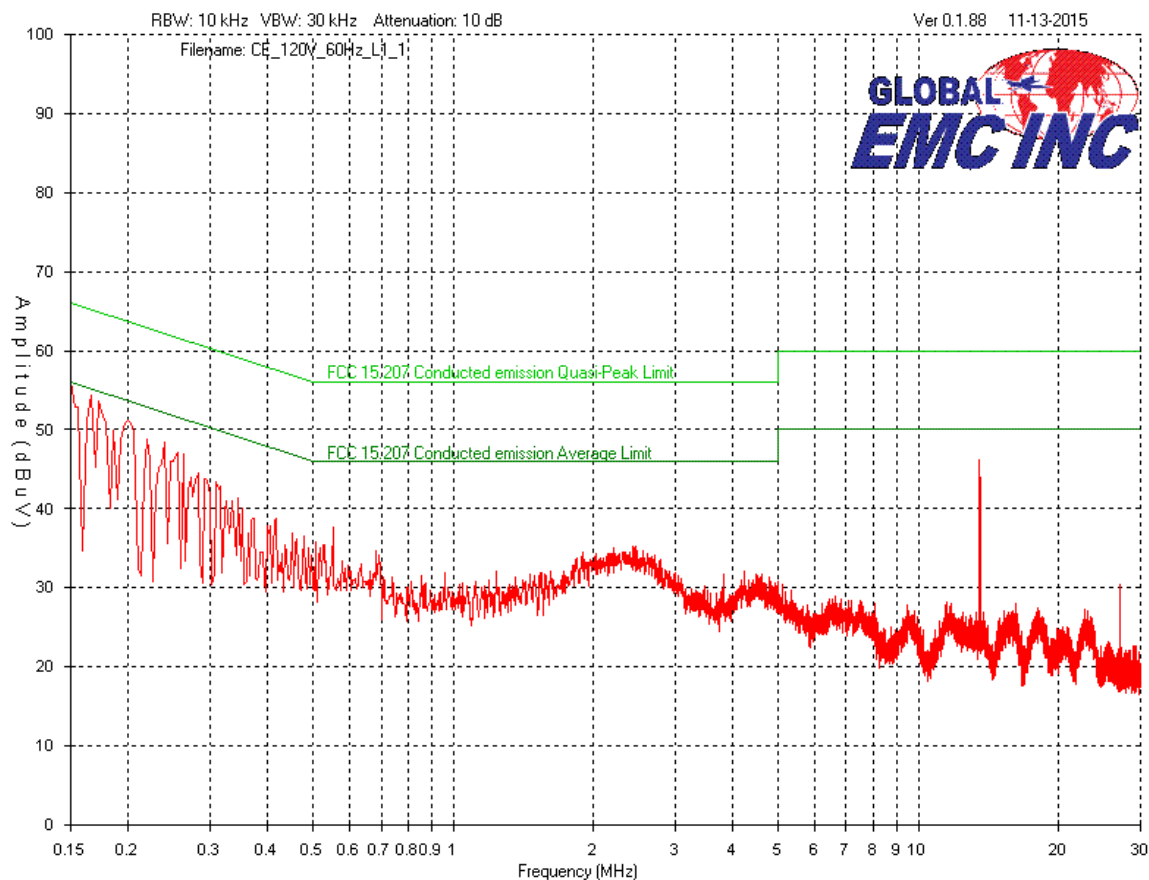
### Preliminary Graphs


Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector where applicable, please refer to the table. The graphs shown below are peak measurement graphs, measured with a resolution bandwidth greater than or equal to the final required detector. These graphs are performed as a worst case measurement to enable the detection of frequencies of concern and for considerable time savings. Power line conducted emissions is performed with the BLE and NFC transmitters transmitting with constant modulated data at maximum output power.



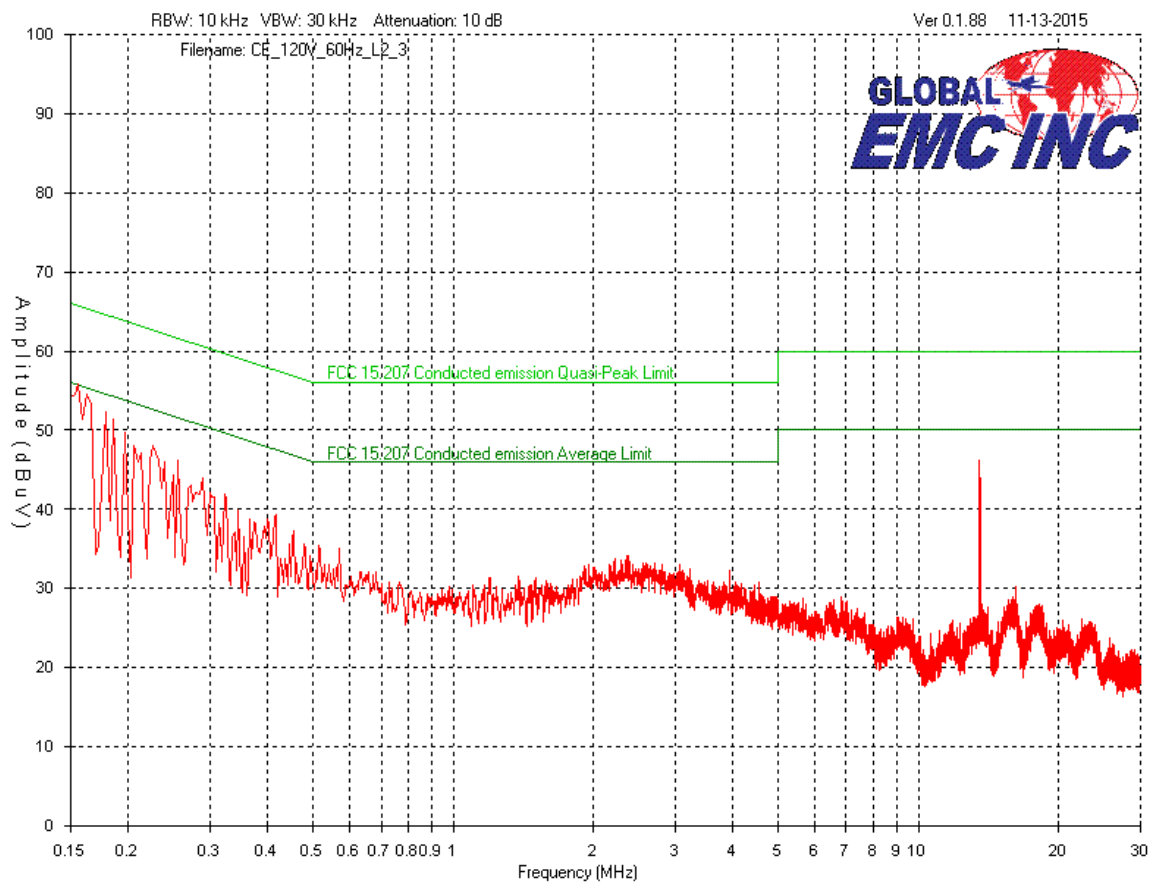
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


Peak Emissions Graph - Line 1  
120V, 60Hz



|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

Peak Emissions Graph - Line 2  
120V, 60Hz



|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Final Measurements

### Emissions Table 120V, 60Hz


| Test Frequency (MHz) | Detector | Received signal (dBμV) | Attenuator (dB) | Cable loss (dB) | LISN factor (dB) | Emission Level (dBμV) | Quasi-Peak Emission limit (dBμV) | Average Emission limit (dBμV) | Quasi-Peak Margin (dB) | Average Margin (dB) | Result |
|----------------------|----------|------------------------|-----------------|-----------------|------------------|-----------------------|----------------------------------|-------------------------------|------------------------|---------------------|--------|
| Line 1: Phase Line   |          |                        |                 |                 |                  |                       |                                  |                               |                        |                     |        |
| 0.167                | Peak     | 44.3                   | 10              | 0.1             | 0                | 54.4                  | 65.1                             | ---                           | 10.7                   | ---                 | Pass   |
| 0.167                | Avg.     | 28.42                  | 10              | 0.1             | 0                | 38.52                 | ---                              | 55.1                          | ---                    | 16.58               | Pass   |
| 0.173                | Peak     | 43.4                   | 10              | 0.1             | 0                | 53.5                  | 64.8                             | ---                           | 11.3                   | ---                 | Pass   |
| 0.173                | Avg.     | 26.02                  | 10              | 0.1             | 0                | 36.12                 | ---                              | 54.8                          | ---                    | 18.68               | Pass   |
| 13.56                | Peak     | 35.9                   | 10              | 0.2             | 0.1              | 46.2                  | 60                               | ---                           | 13.8                   | ---                 | Pass   |
| 13.56                | Avg.     | 35.72                  | 10              | 0.2             | 0.1              | 46.02                 | ---                              | 50                            | ---                    | 3.98                | Pass   |
| 0.200                | Peak     | 41                     | 10              | 0.1             | 0                | 51.1                  | 63.6                             | 53.6                          | 12.5                   | 2.5                 | Pass   |
| 0.153                | Peak     | 42.8                   | 10              | 0.1             | 0                | 52.9                  | 65.8                             | 55.8                          | 12.9                   | 2.9                 | Pass   |
| 0.240                | Peak     | 38.4                   | 10              | 0.1             | 0                | 48.5                  | 62.1                             | 52.1                          | 13.6                   | 3.6                 | Pass   |
| Line 2: Neutral Line |          |                        |                 |                 |                  |                       |                                  |                               |                        |                     |        |
| 0.157                | Peak     | 45.6                   | 10              | 0.1             | 0                | 55.7                  | 65.6                             | ---                           | 9.9                    | ---                 | Pass   |
| 0.157                | Avg.     | 28.77                  | 10              | 0.1             | 0                | 38.87                 | ---                              | 55.6                          | ---                    | 16.73               | Pass   |
| 0.180                | Peak     | 42.2                   | 10              | 0.1             | 0                | 52.3                  | 64.5                             | ---                           | 12.2                   | ---                 | Pass   |
| 0.180                | Avg.     | 25.18                  | 10              | 0.1             | 0                | 35.28                 | ---                              | 54.5                          | ---                    | 19.22               | Pass   |
| 13.56                | Peak     | 35.9                   | 10              | 0.2             | 0.1              | 46.2                  | 60                               | ---                           | 13.8                   | ---                 | Pass   |
| 13.56                | Avg.     | 36.16                  | 10              | 0.2             | 0.1              | 46.46                 | ---                              | 50                            | ---                    | 3.54                | Pass   |
| 0.187                | Peak     | 41.3                   | 10              | 0.1             | 0                | 51.4                  | 64.2                             | 54.2                          | 12.8                   | 2.8                 | Pass   |
| 0.196                | Peak     | 39.5                   | 10              | 0.1             | 0                | 49.6                  | 63.8                             | 53.8                          | 14.2                   | 4.2                 | Pass   |
| 0.226                | Peak     | 37.9                   | 10              | 0.1             | 0                | 48                    | 62.6                             | 52.6                          | 14.6                   | 4.6                 | Pass   |

Notes:

Peak = Peak measurement

Avg. = Average measurement


See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Test Equipment List

| Equipment         | Model No.               | Manufacturer    | Last calibration date | Next calibration due date | Asset #  |
|-------------------|-------------------------|-----------------|-----------------------|---------------------------|----------|
| Spectrum Analyzer | FSU                     | Rohde & Schwarz | Jan. 19, 2015         | Jan. 19, 2017             | GEMC 198 |
| LISN              | FCC-LISN-50/250-16-2-01 | FCC             | Jan. 15, 2015         | Jan. 15, 2017             | GEMC 65  |
| RF Cable 7m       | LMR-400-7M-50OHM-MN-MN  | LexTec          | NCR                   | NCR                       | GEMC 28  |
| Attenuator 10 dB  | FP-50-10                | Trilithic       | NCR                   | NCR                       | GEMC 42  |

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B\_Rev1"

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


## Appendix A – EUT Summary

For further details for filing purposes, refer to filing package.

### General EUT Description


| Client Details                         |   |
|--|---|
| Organization / Address                 | Square Inc.<br>1455 Market St. Suite 600<br>San Francisco, CA USA<br>95014  |
| Contact                                | Kevin Ng  |
| Phone                                  | 416-204-0032 x 85111  |
| Email                                  | kevinng@squareup.com  |
| EUT (Equipment Under Test) Details     |   |
| EUT Model / Name                       | S6 (R12) Mobile Credit Card Reader  |
| EUT is powered using                   | Internal Li-poly rechargeable battery or USB  |
| Input voltage range(s) (V)             | 5VDC +/- 10%  |
| Frequency range(s) (Hz)                | NFC (13.56 MHz),<br>Bluetooth Low Energy (2.402 GHz - 2.480 GHz)  |
| Rated input current (A)                | 500 mA  |
| Nominal power consumption (W)          | 1W (NFC radio on)   |
| Transmits RF energy? (describe)        | NFC and BLE. Both radios can transmit simultaneously  |
| Basic EUT functionality description    | Mobile credit card reader that can read contact and contactless cards. It connects to host devices via BLE or USB |
| Modes of operation                     | 1, on   |
| Frequency of all clocks present in EUT | 32.768 kHz, 13.56 MHz, 24 MHz   |
| I/O connectors description             | USB Micro-B connector   |
| Peripherals required to exercise EUT   | Laptop to issue commands to the unit to enable radios   |
| Dimensions of product                  | L: 68 mm<br>W: 68 mm<br>H: 11 mm  |

Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see ‘Appendix B – EUT & Test Setup Photographs’.

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


## Appendix B – EUT and Test Setup Photographs

Note: These photos are for information purposes only.  
Also refer to .PDF files that are separate from this test report.

|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

EUT – External view 1




|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

EUT – External view 2






|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

### EUT – External view 3




|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

EUT – Internal view 1  
Enclosure Cover removed


BLE antenna



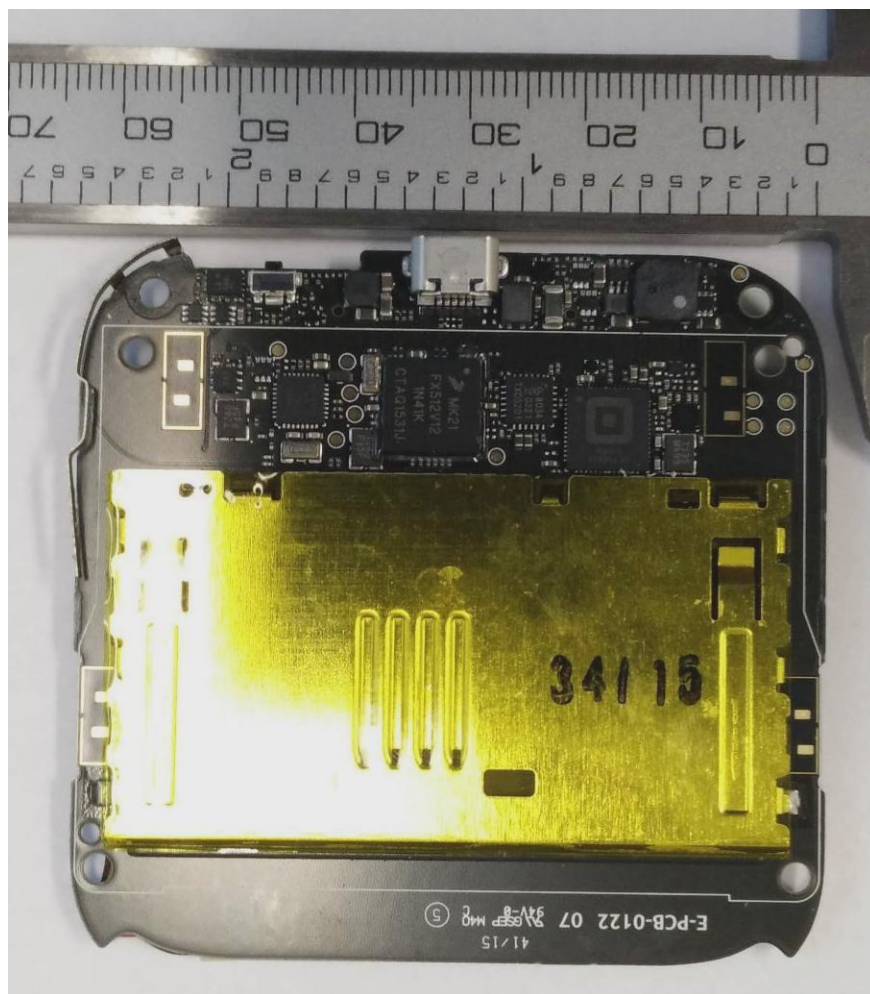
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |


EUT – Internal view 2  
PCB, side 1, with cage



|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

EUT – Internal view 3  
PCB, side 1, cage removed




|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

EUT – Internal view 4  
PCB, side 1, cage removed, alternate angle






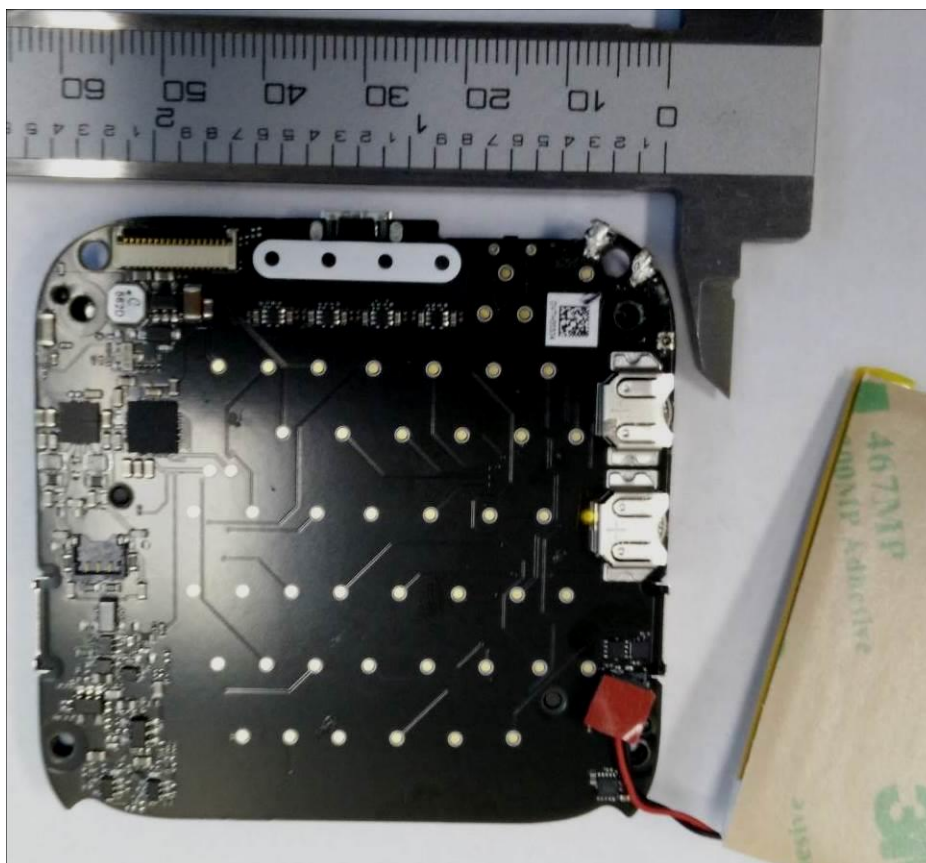
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

EUT – Internal view 5  
PCB, side 2, with battery in place



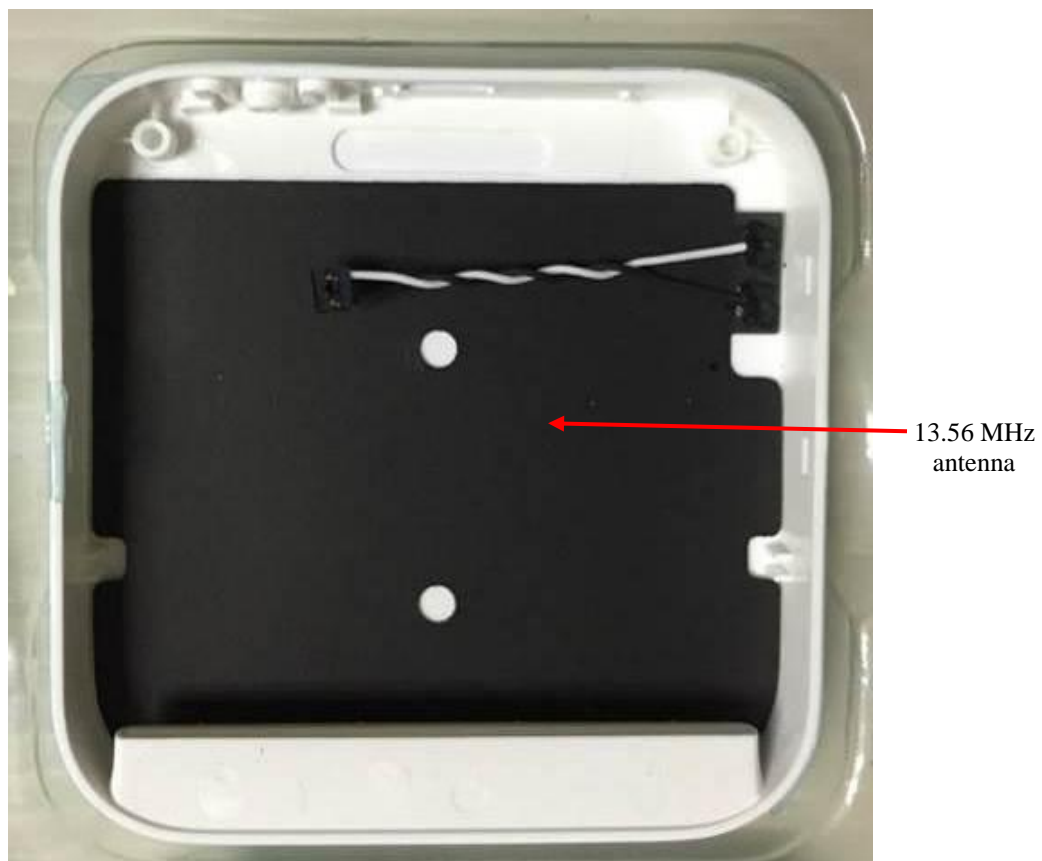
|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

EUT – Internal view 6  
PCB, side 2, battery removed



|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |

EUT – Internal view 7  
NFC antenna, mounted to housing





|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |

Radiated Emissions Photo 1



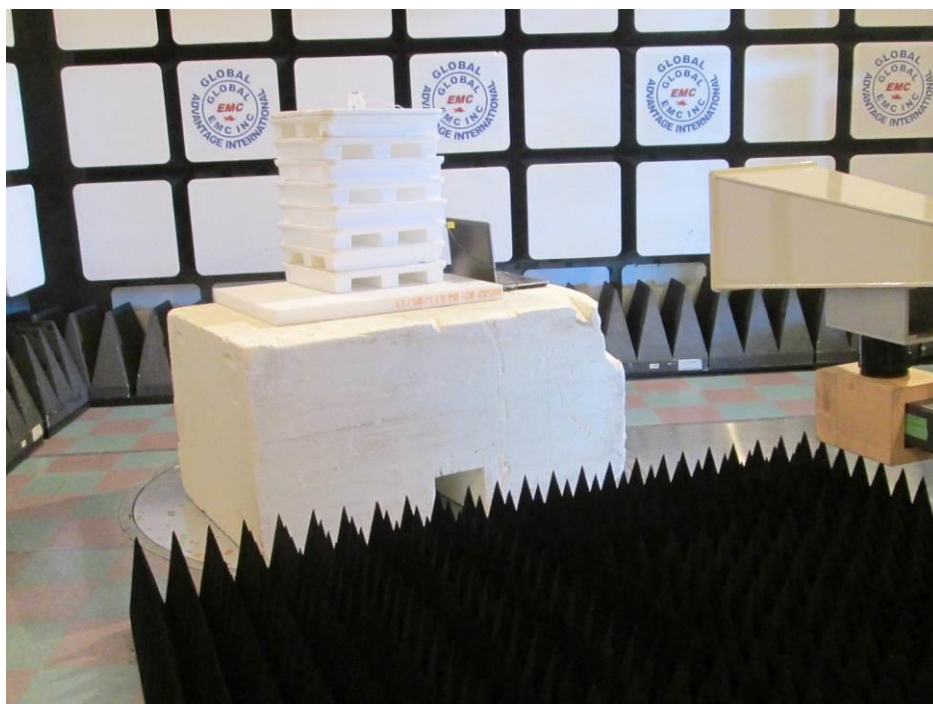
|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |

Radiated Emissions Photo 2



|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |


Radiated Emissions Photo 3



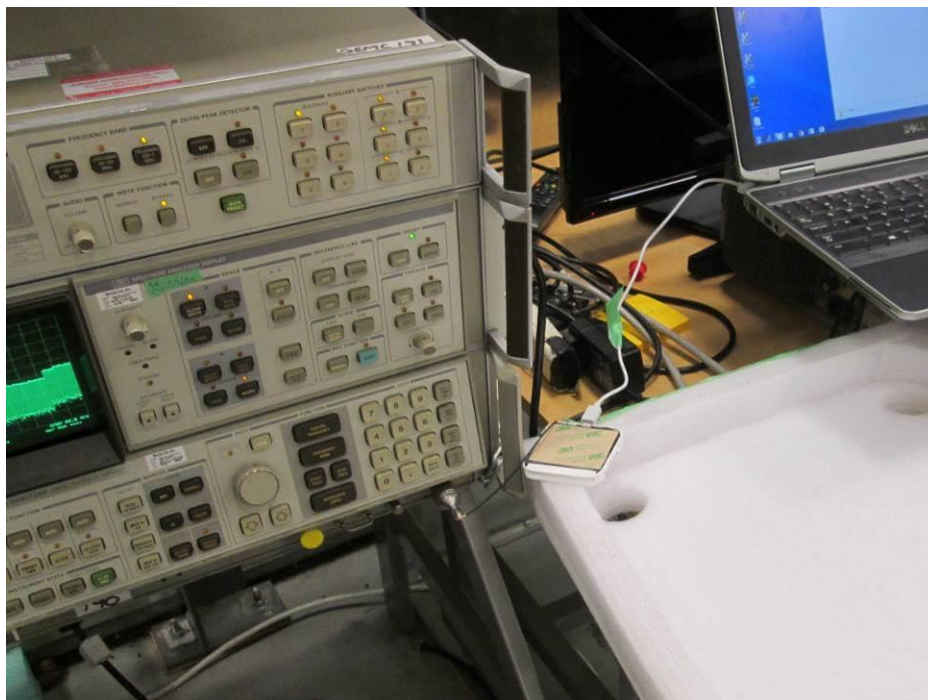
|             |  |  |
|-------------|--|--|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |  |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |  |

Radiated Emissions Photo 4




|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

## Conducted Measurements





|             |  |   |
|-------------|--|---|
| Client      | Square Inc.                                  |  |
| Product     | S6 Mobile Credit Card Reader                 |   |
| Standard(s) | FCC Part 15 Subpart C 15:2015 / RSS-247:2015 |   |

### Power Line Conducted Emissions

