

# Global EMC Inc. Labs

## EMC & RF Test Report

As per  
**GLOBAL**  
**EMC**  
RSS 210 Issue 8:2010  
&  
**FCC Part 15 Subpart C:2015**  
**Unlicensed Intentional Radiators**  
on the  
**PPG Sensor**



Min Xie  
Project Engineer  
Global EMC Inc.  
11 Gordon Collins Dr.  
Gormley, ON  
L0H 1G0, Canada  
Ph: (905) 883-8189

Testing produced for



See Appendix A for full customer & EUT details.



LAB REGISTRATION #6844A-3



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



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| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## Report Scope

This report addresses the EMC testing and test results of the PPG Sensor, model 13117, from PPG Technologies. 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:

RSS 210 Issue 8:2010  
 FCC Part 15 Subpart C: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      | PPG Technologies                                     |
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| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## Summary

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

|  |                                |
|--|--------------------------------|
| EUT FCC Certification #, FCC ID:         | 2AEAC-PPG042                   |
| EUT Industry Canada Certification #, IC: | 12388A-PPG042                  |
| EUT Passed all tests performed.          | Yes (see test results summary) |
| Tests conducted by                       | Min Xie                        |

|             |  |
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## Test Results Summary

| Standard/Method                     | Description                                | Class/Limit        | Result                     |
|-------------------------------------|--|--------------------|----------------------------|
| FCC 15.203                          | Antenna Requirement                        | Unique             | Pass<br>See Justification  |
| FCC 15.205<br>RSS 210 (Table 1)     | Restricted Bands for intentional operation | QuasiPeak Average  | Pass                       |
| FCC 15.209<br>RSS-210 (Table 2)     | Spurious Radiated emissions                | QuasiPeak Average  | Pass                       |
| FCC 15.247(a)2<br>RSS-210 A8.2(a)   | 6 dB Bandwidth                             | > 500 kHz          | Pass                       |
| FCC 15.247(b)3<br>RSS-210 A8.4(4)   | Max output power                           | < 1 Watt           | Pass                       |
| FCC 15.247(b)(4)<br>RSS-210 A8.4(5) | Antenna Gain                               | < 6 dBi            | Pass<br>See Justifications |
| FCC 15.247(d)<br>RSS-210 A8.5       | Antenna conducted spurious                 | < 20 dBc           | Pass                       |
| FCC 15.247(e)<br>RSS-210 A8.2(b)    | Spectral Density                           | < 8 dBm (3 kHz BW) | Pass                       |
| FCC 15.247(i)<br>IC Safety code 6   | RF Energy Levels                           | Per requirements   | Pass<br>See Justifications |
| <b>Overall Result</b>               |  |                    | <b>PASS</b>                |

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All tests were performed by Min Xie.

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. A 'PASS' / 'FAIL' grade within measurement uncertainty is marked with a '\*'.

### ***Justifications, Descriptions, or Deviations***

The following justifications for tests not performed or deviations from the above listed specifications apply:

For the antenna requirement specified in FCC 15.203 (RSS 210 section 5.5), the antenna used is a ceramic chip antenna soldered onto the PCB, all of which is located inside 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 0.5 dBi max,

The EUT only operates using an internal battery. It does not have the means to plug into mains.

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 - 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, Issue 4 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

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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 -    March 16, 2015  
Initial release.

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|-------------|--|
| Client      | PPG Technologies                                     |
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| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## 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 is 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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| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## 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 –

| Date             | Test | Init. | Temperature (°C) | Humidity (%) | Pressure (kPa) |
|------------------|------|-------|------------------|--------------|----------------|
| Mar. 2 – 6, 2015 | All  | MX    | 20-25°C          | 30-45%       | 100 -103kPa    |

|             |  |
|-------------|--|
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| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |

The logo for Global EMC Inc. features the word "GLOBAL" in a blue sans-serif font at the top, with a small red star above the letter "O". Below it, the word "EMC" is in a large, bold, blue sans-serif font, and "INC." is in a smaller, blue sans-serif font at the bottom right. To the left of the text, there is a stylized graphic of a globe with red and blue lines representing latitude and longitude.

## Detailed Test Results Section

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## ***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 and RSS 210.

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 750 kHz.

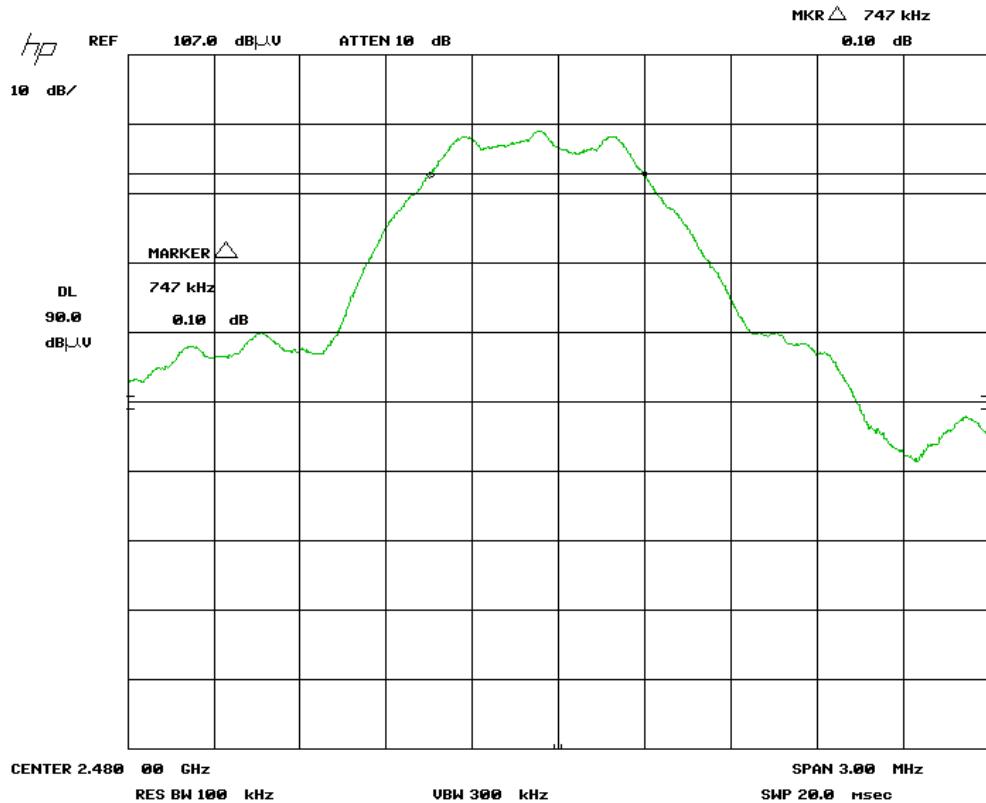
|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## 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 = 747 kHz

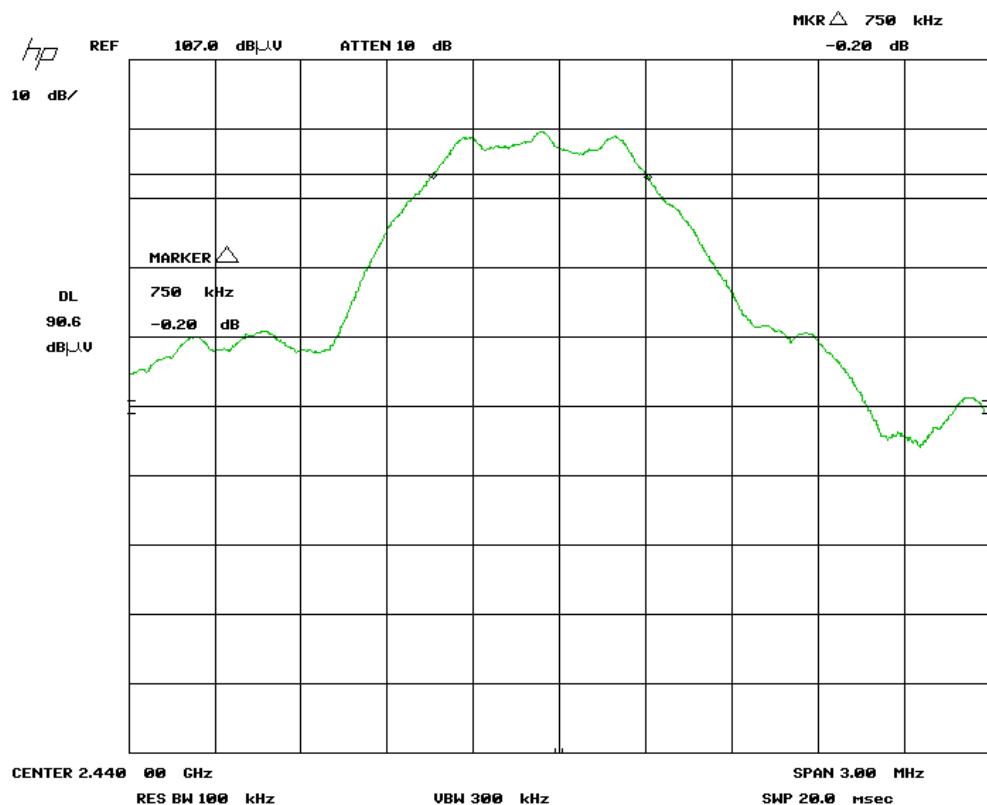


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| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



Mid Channel (2.440 GHz)

6 dB BW = 750 kHz

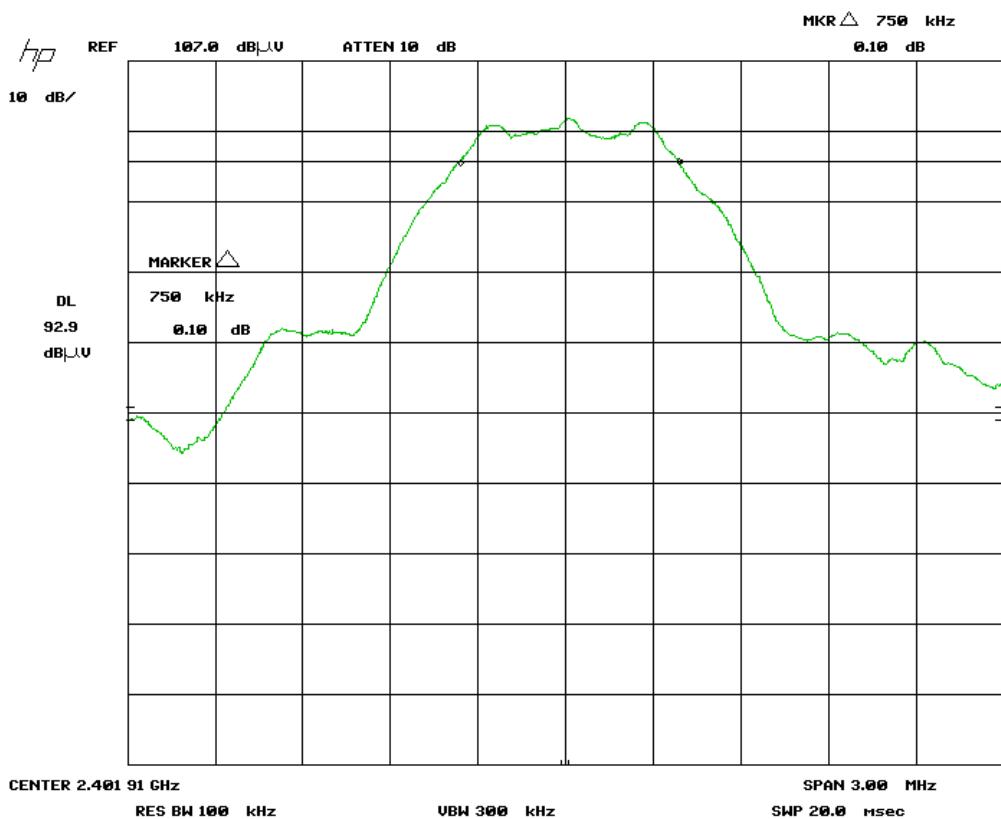


|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



Low Channel (2.402 GHz)

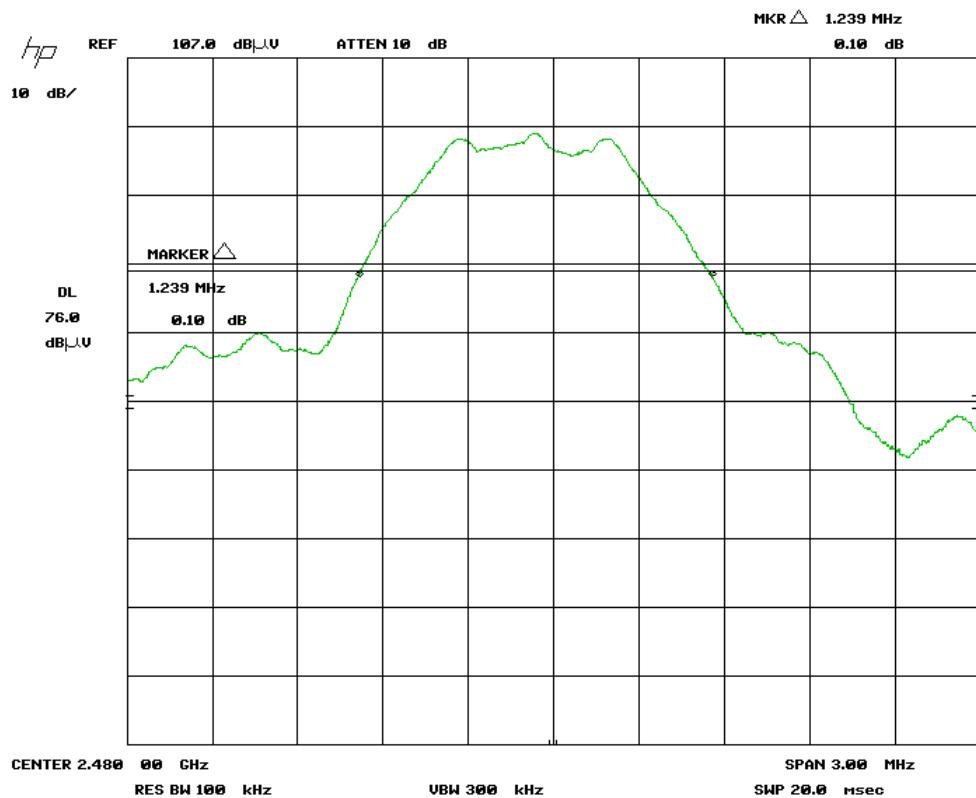
6 dB BW = 750 kHz



|             |  |
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| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



For information purposes, maximum 20 dB bandwidth is 1.239 MHz.



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

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## 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 - 26.5 GHz | HP 8449B  | HP           | Sept 09, 2014         | Sept 09, 2016             | GEMC 6351 |

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

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## ***Maximum Peak Envelope Conducted Power - DM***

### **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 210.

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 3.5 dBm (2.2 mW).

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## Table(s)

The table below shows the measured peak power output of the device. Peak measurements were made with a 1 MHz resolution bandwidth, during transmit operation of the EUT with continuous modulated data (>98%). Worst case plots are shown.

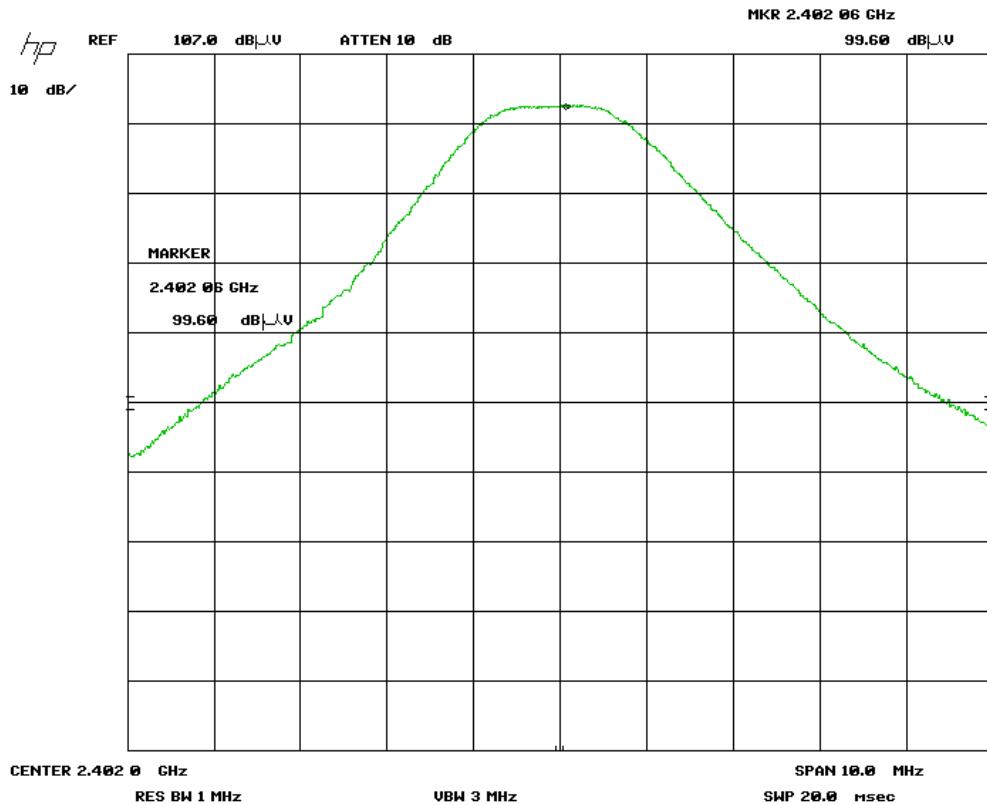
**Maximum Peak Envelope Conducted Power – Table 1**

| Test Frequency (MHz) | Detection mode | Antenna polarity (Horz/Vert) | Raw signal dB(µV) | Antenna factor dB | Cable loss dB + Preselecor | Attenuator dB | Pre-Amp Gain dB | Received signal dB(µV/m) at 3m distance | Output Power (dBm) | Result |
|----------------------|----------------|------------------------------|-------------------|-------------------|----------------------------|---------------|-----------------|---|--------------------|--------|
| Low Channel          |                |                              |                   |                   |                            |               |                 |   |                    |        |
| 2402                 | Peak           | Horz                         | 99.6              | 30.8              | 4.1                        | 0.0           | 35.8            | 98.7                                    | 3.5                | Pass   |
| 2402                 | Peak           | Vert                         | 98.1              | 30.8              | 4.1                        | 0.0           | 35.8            | 97.2                                    | 2.0                | Pass   |
| Mid Channel          |                |                              |                   |                   |                            |               |                 |   |                    |        |
| 2440                 | Peak           | Horz                         | 99.3              | 30.8              | 4.1                        | 0.0           | 35.8            | 98.4                                    | 3.2                | Pass   |
| 2440                 | Peak           | Vert                         | 98.8              | 30.8              | 4.1                        | 0.0           | 35.8            | 97.9                                    | 2.7                | Pass   |
| High Channel         |                |                              |                   |                   |                            |               |                 |   |                    |        |
| 2480                 | Peak           | Horz                         | 97.3              | 30.8              | 4.1                        | 0.0           | 35.8            | 96.4                                    | 1.2                | Pass   |
| 2480                 | Peak           | Vert                         | 96.3              | 30.8              | 4.1                        | 0.0           | 35.8            | 95.4                                    | 0.2                | Pass   |

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



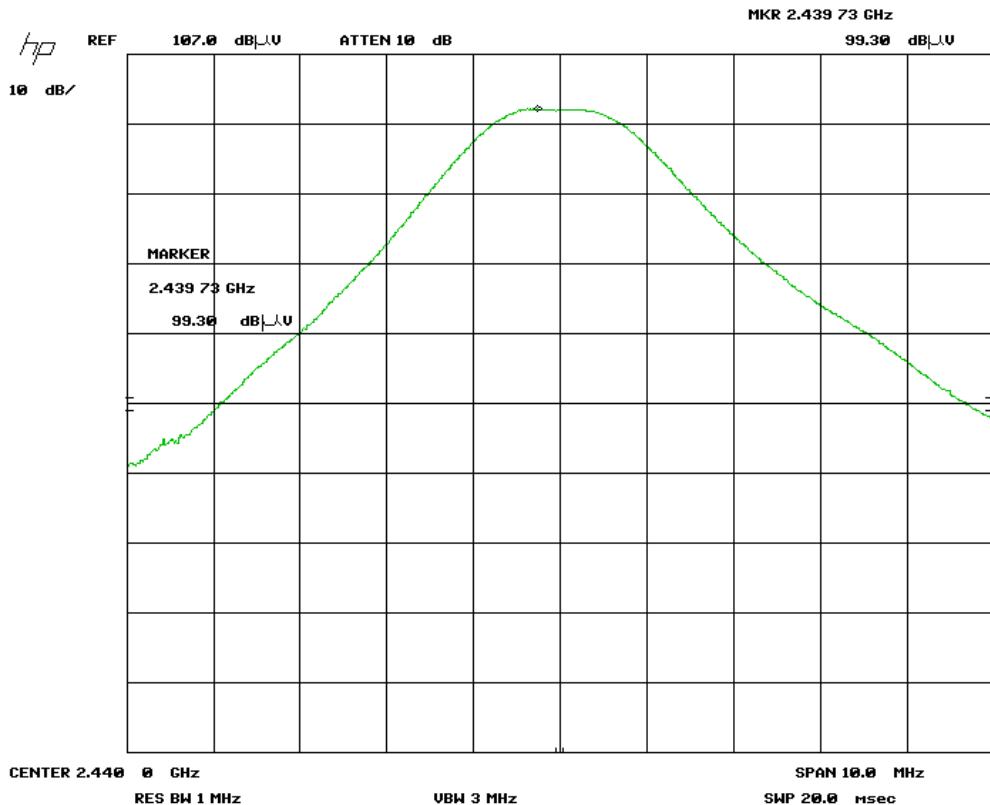
### Low Channel



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



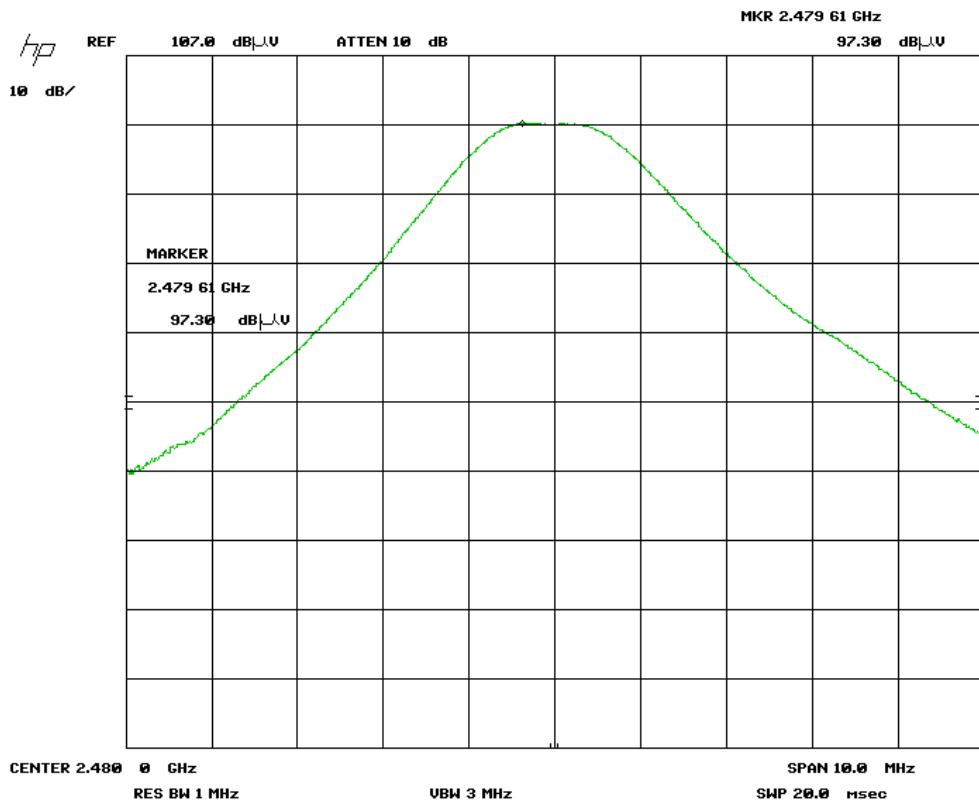
### Mid Channel



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



### High Channel



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

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## Test Equipment List

| Equipment            | Model No. | Manufacturer | Last calibration date | Next calibration due date | Asset #   |
|----------------------|-----------|--------------|-----------------------|---------------------------|-----------|
| 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   |
| 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 - 26.5 GHz | HP 8449B  | HP           | Sept 09, 2014         | Sept 09, 2016             | GEMC 6351 |

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

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## ***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 15.247(d). 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 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.

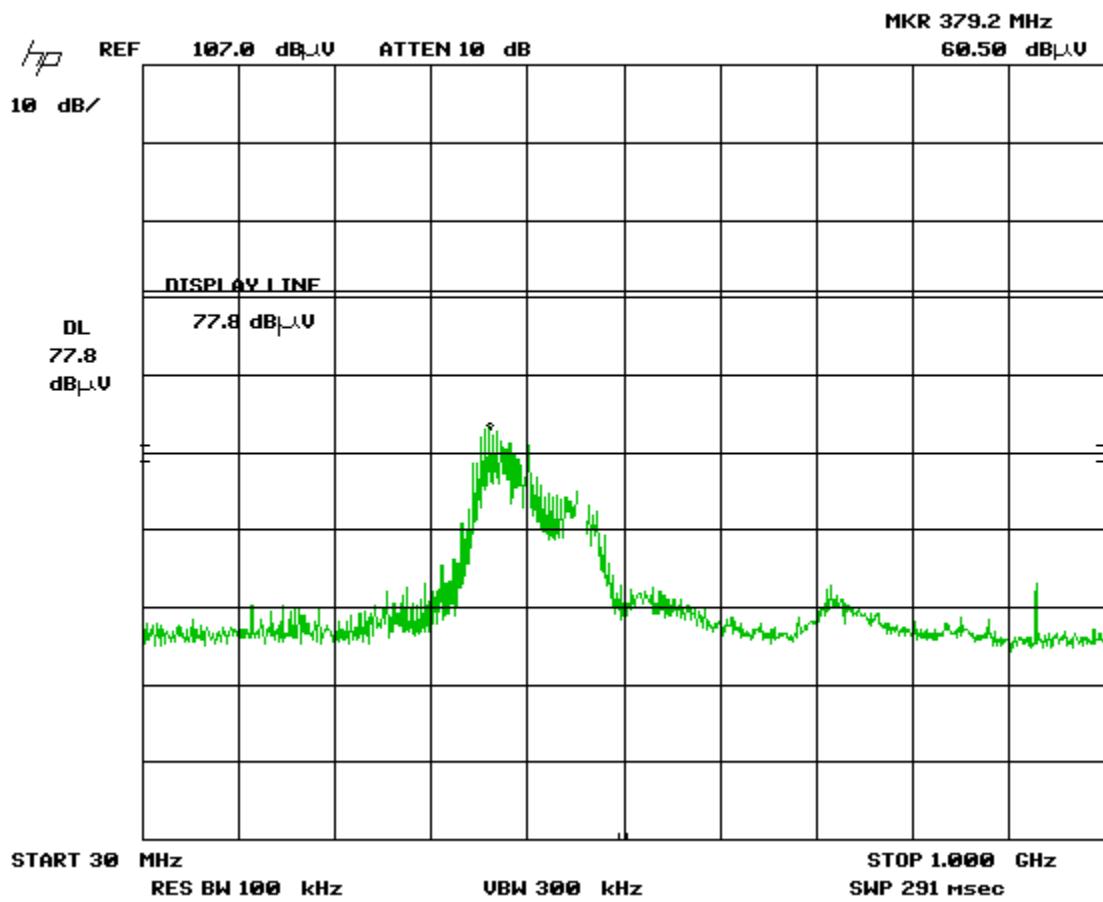
|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## Graph(s)

The graphs shown below displays a line 20dB below the peak power output detected from the device during transmit operation of the EUT, and compares the peak emissions other than the fundamental to this limit. Worst cases shown across the frequencies.

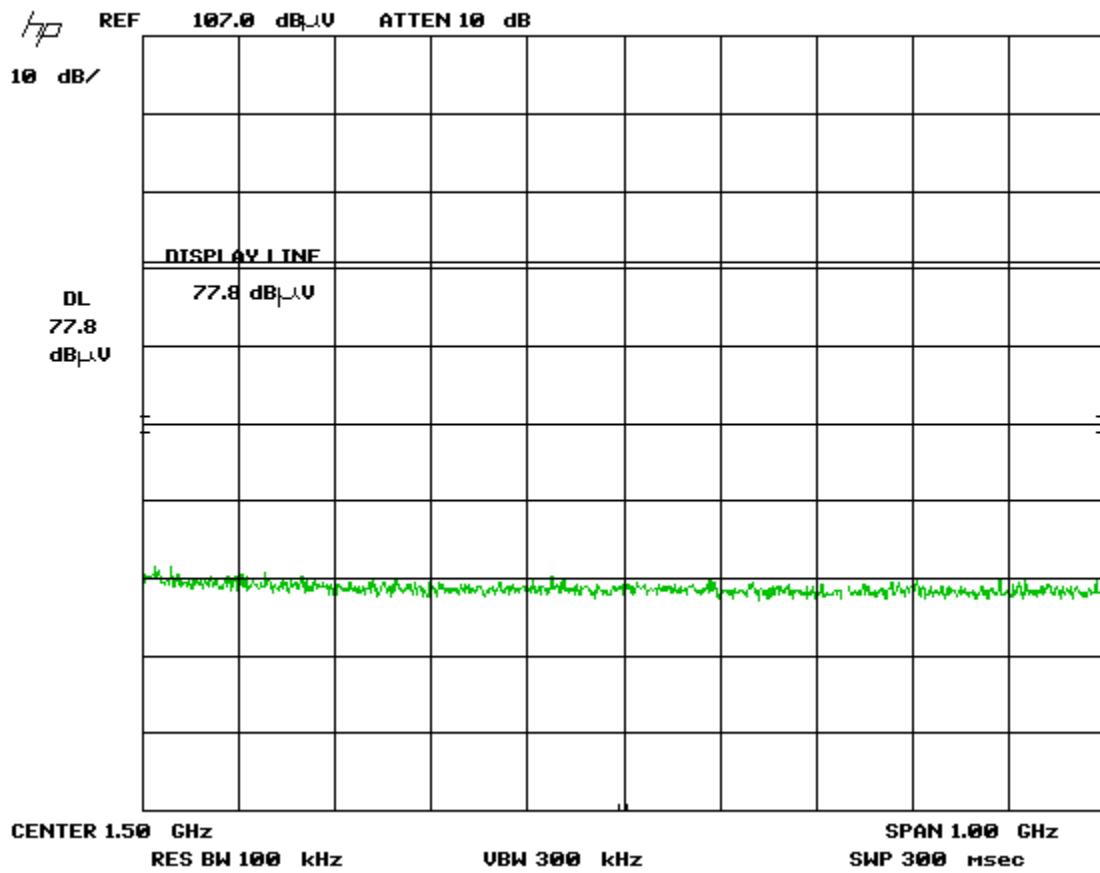
30 MHz – 1 GHz



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| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



1 GHz – 2 GHz

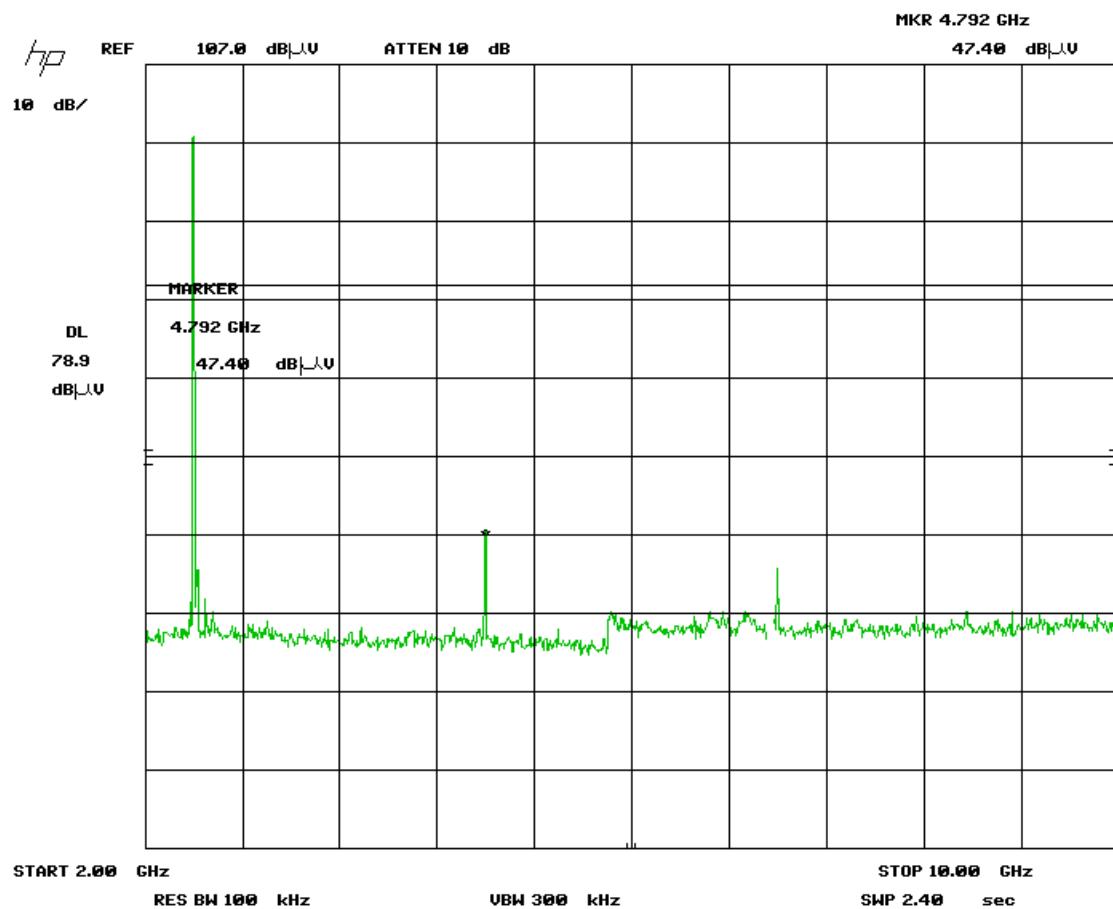


|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



2 GHz – 10 GHz

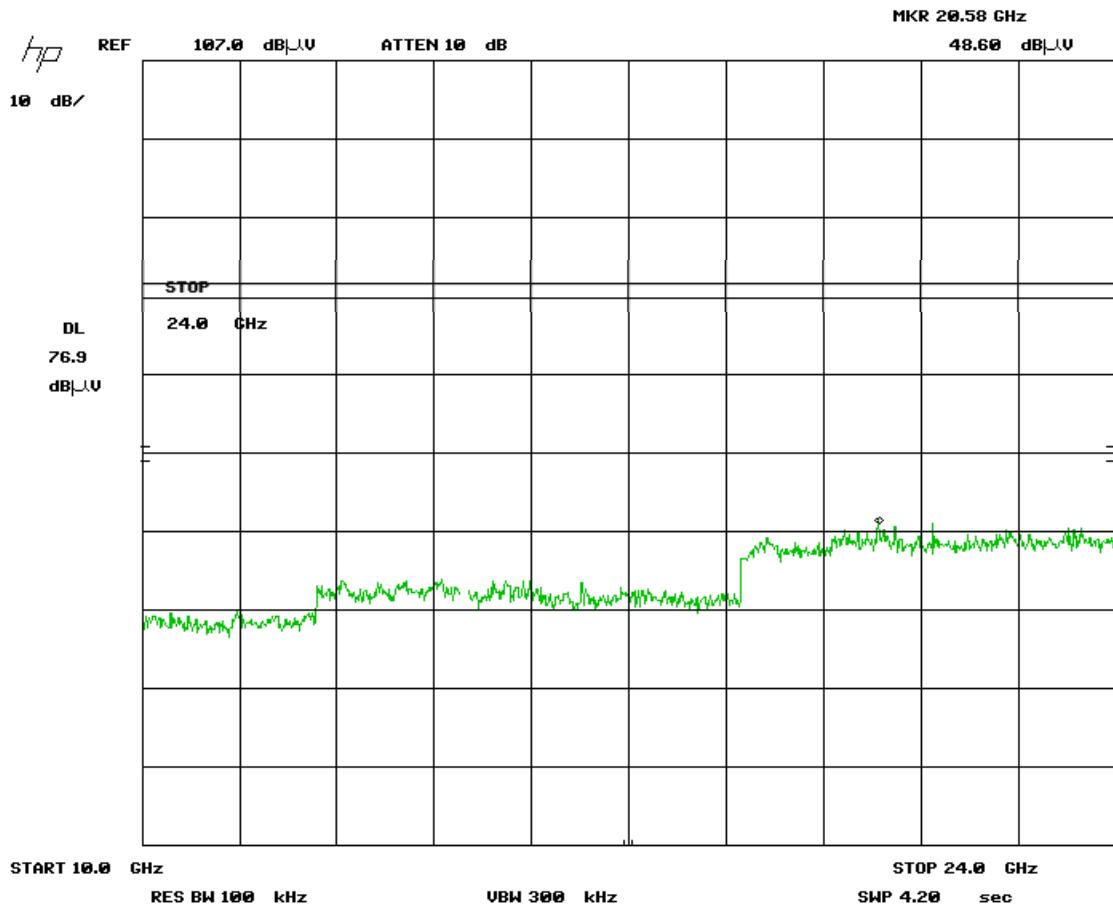
Note: 1<sup>st</sup> peak is max fundamental



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| Client      | PPG Technologies                                     |
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| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



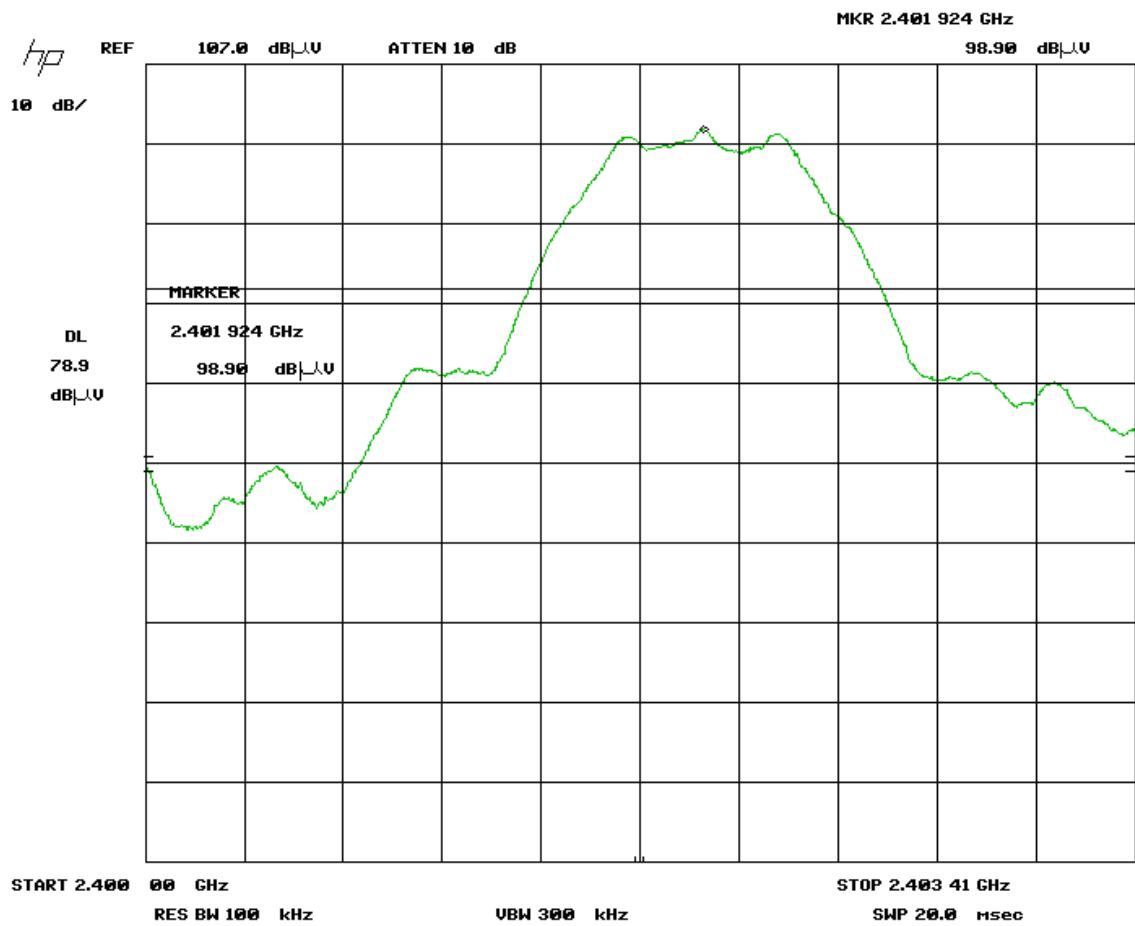
10 GHz – 24 GHz



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| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



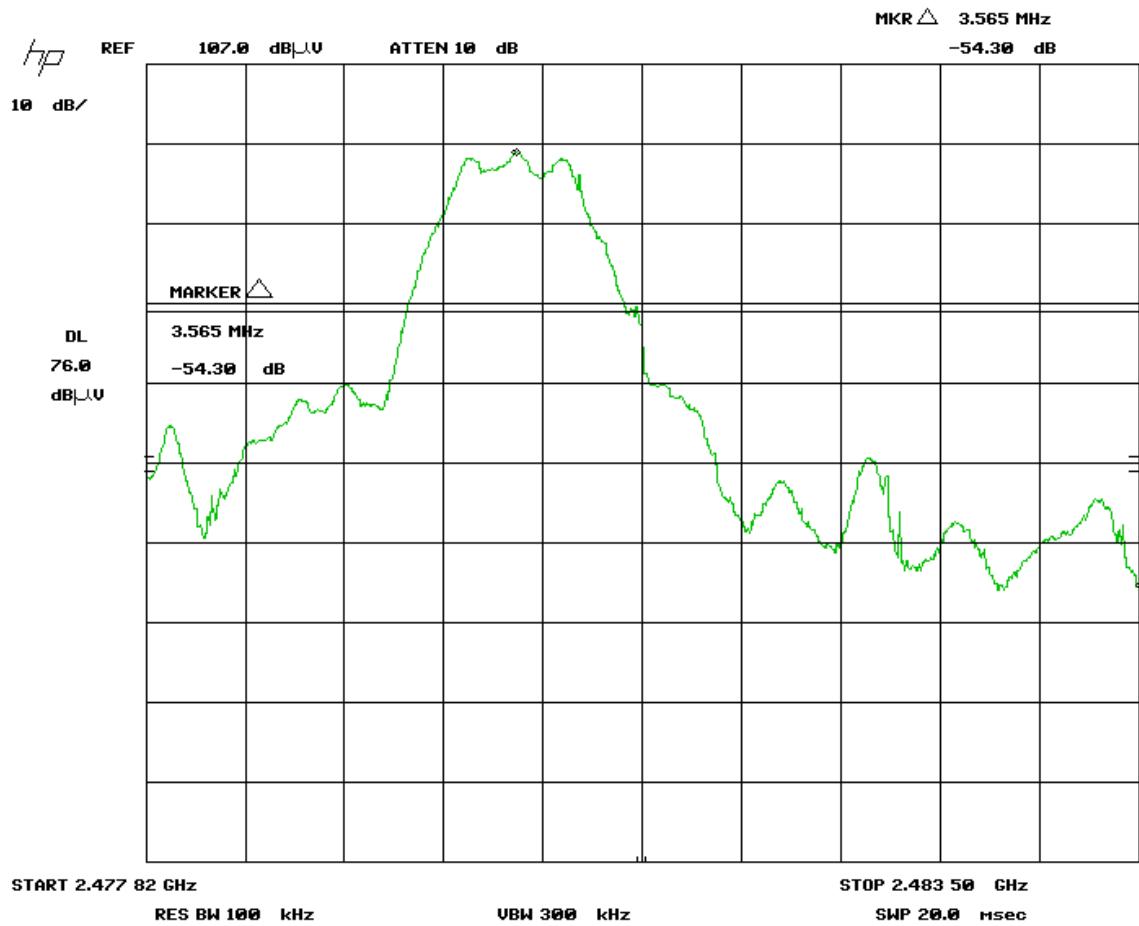
Low Channel, Lower Band Edge  
2.4 GHz – 2.403 GHz



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|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



High Channel, Upper Band Edge  
2.478 GHz – 2.4835 GHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## 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 - 26.5 GHz | HP 8449B  | HP           | Sept 09, 2014         | Sept 09, 2016             | GEMC 6351 |

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

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## Power Spectral Density - DM

### 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 15.247(e).

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.

| Test Frequency (MHz) | Detection mode | Antenna polarity (Horz/Vert) | Raw signal dB(µV) | Antenna factor dB | Cable loss dB + Preselecor | Attenuator dB | Pre-Amp Gain dB | Received signal dB(µV/m) at 3m distance | Output Power (dBm) | Result |
|----------------------|----------------|------------------------------|-------------------|-------------------|----------------------------|---------------|-----------------|---|--------------------|--------|
| Low Channel          |                |                              |                   |                   |                            |               |                 |   |                    |        |
| 2402                 | Peak           | Horz                         | 83.6              | 30.8              | 4.1                        | 0.0           | 35.8            | 82.7                                    | -12.5              | Pass   |
| 2402                 | Peak           | Vert                         | 82.7              | 30.8              | 4.1                        | 0.0           | 35.8            | 81.8                                    | -13.4              | Pass   |
| Mid channel          |                |                              |                   |                   |                            |               |                 |   |                    |        |
| 2440                 | Peak           | Horz                         | 81.3              | 30.8              | 4.1                        | 0.0           | 35.8            | 80.4                                    | -14.8              | Pass   |
| 2440                 | Peak           | Vert                         | 82.9              | 30.8              | 4.1                        | 0.0           | 35.8            | 82.0                                    | -13.2              | Pass   |
| High channel         |                |                              |                   |                   |                            |               |                 |   |                    |        |
| 2480                 | Peak           | Horz                         | 81.6              | 30.8              | 4.1                        | 0.0           | 35.8            | 80.7                                    | -14.5              | Pass   |
| 2480                 | Peak           | Vert                         | 80.7              | 30.8              | 4.1                        | 0.0           | 35.8            | 79.8                                    | -15.4              | Pass   |

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |

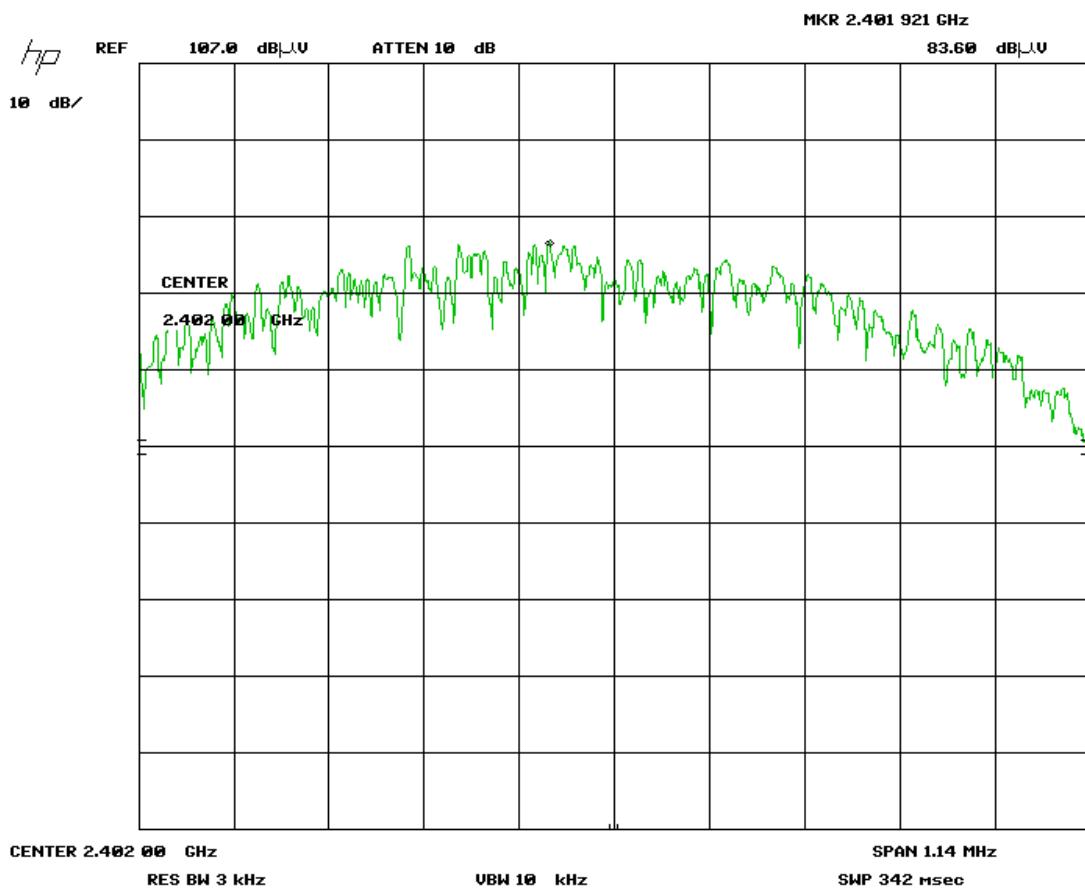


## Graph(s)

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

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

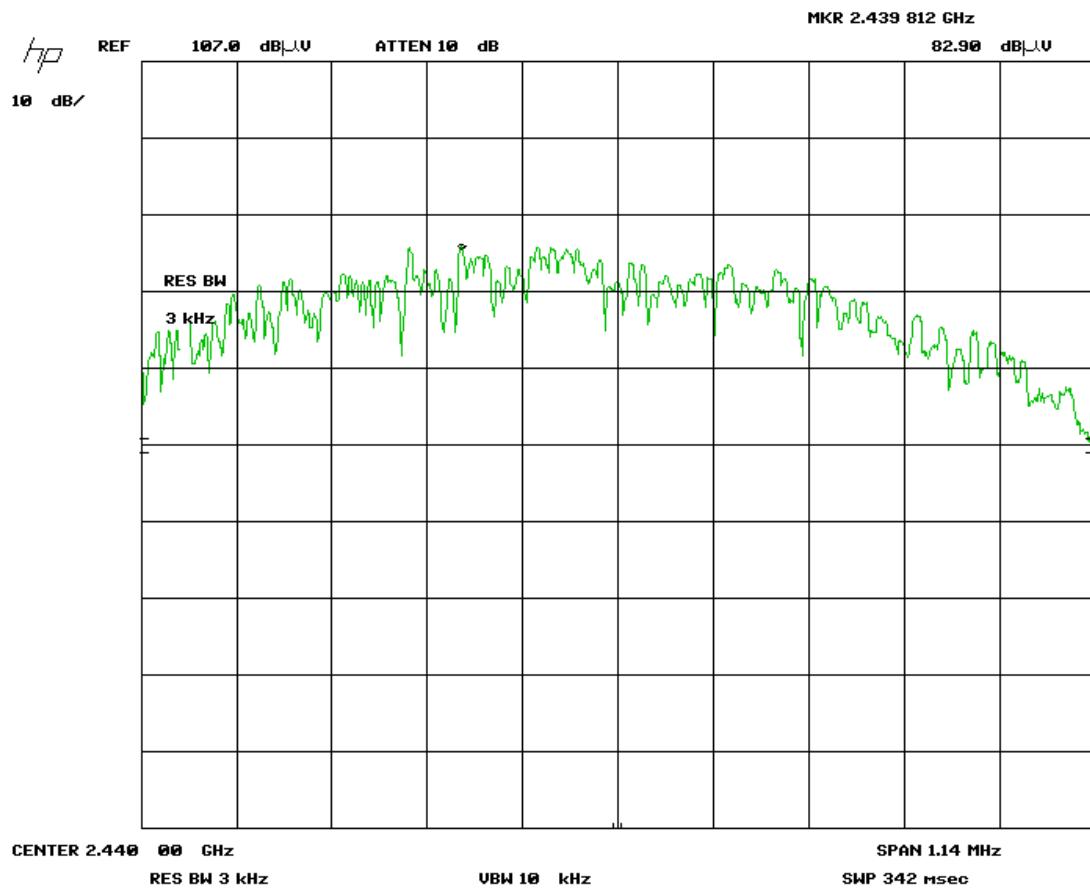
Low Channel



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



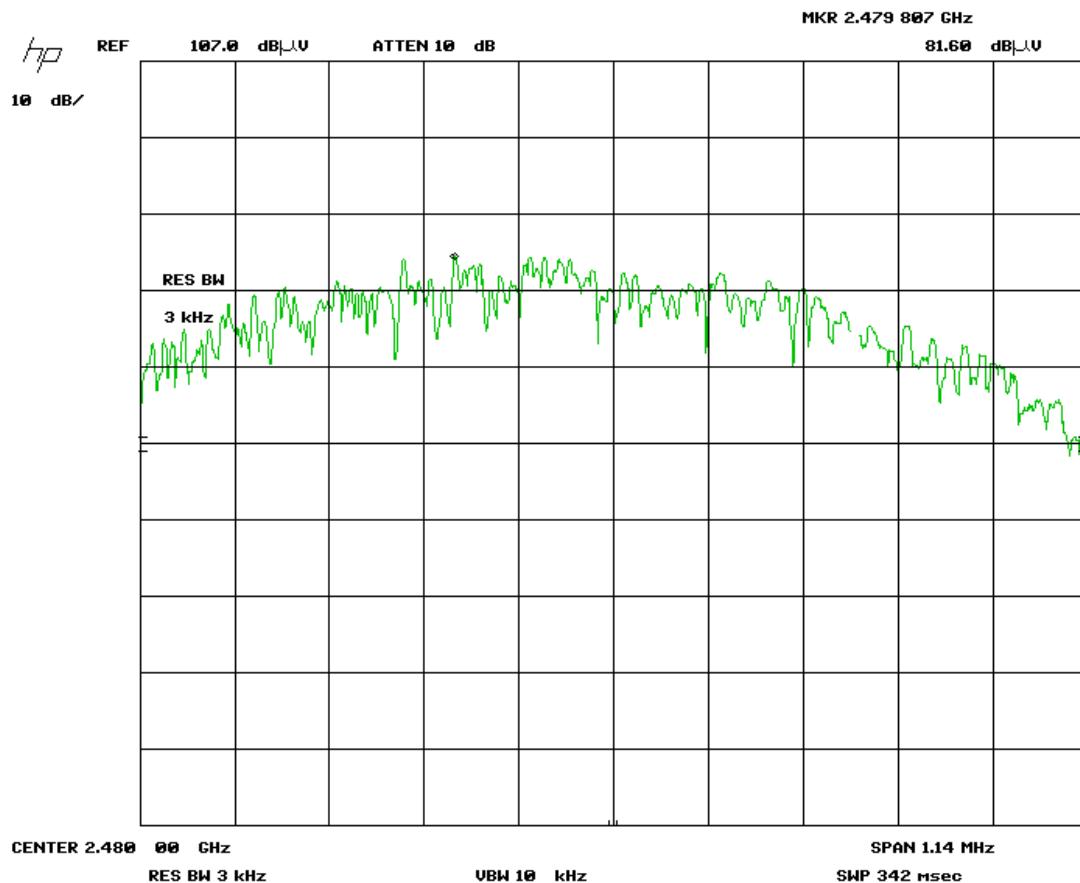
### Mid Channel



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



### High Channel



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## 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 - 26.5 GHz | HP 8449B  | HP           | Sept 09, 2014         | Sept 09, 2016             | GEMC 6351 |

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

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## ***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 C63.4:2003.

The limits are as defined in FCC Part 15, Section 15.209:

The limits, as defined in 15.247(d) for unintentional radiated emissions apply for those emissions that fall in the restricted bands, as defined in 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.

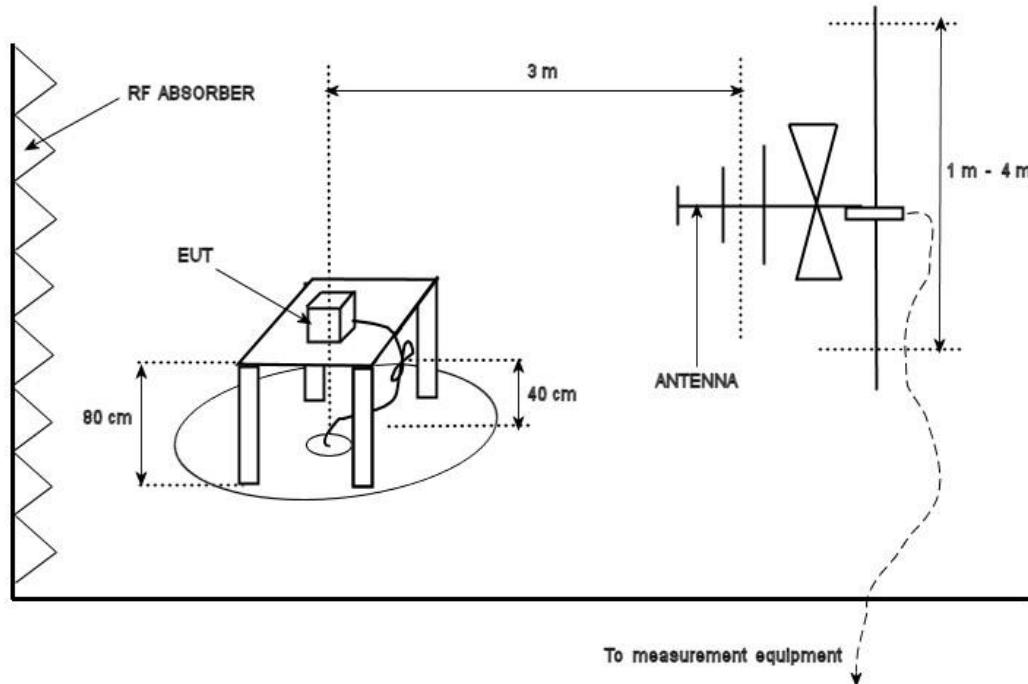
<sup>2</sup>Limit is with 1 MHz measurement bandwidth and using an Average detector.

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

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## 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      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



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.

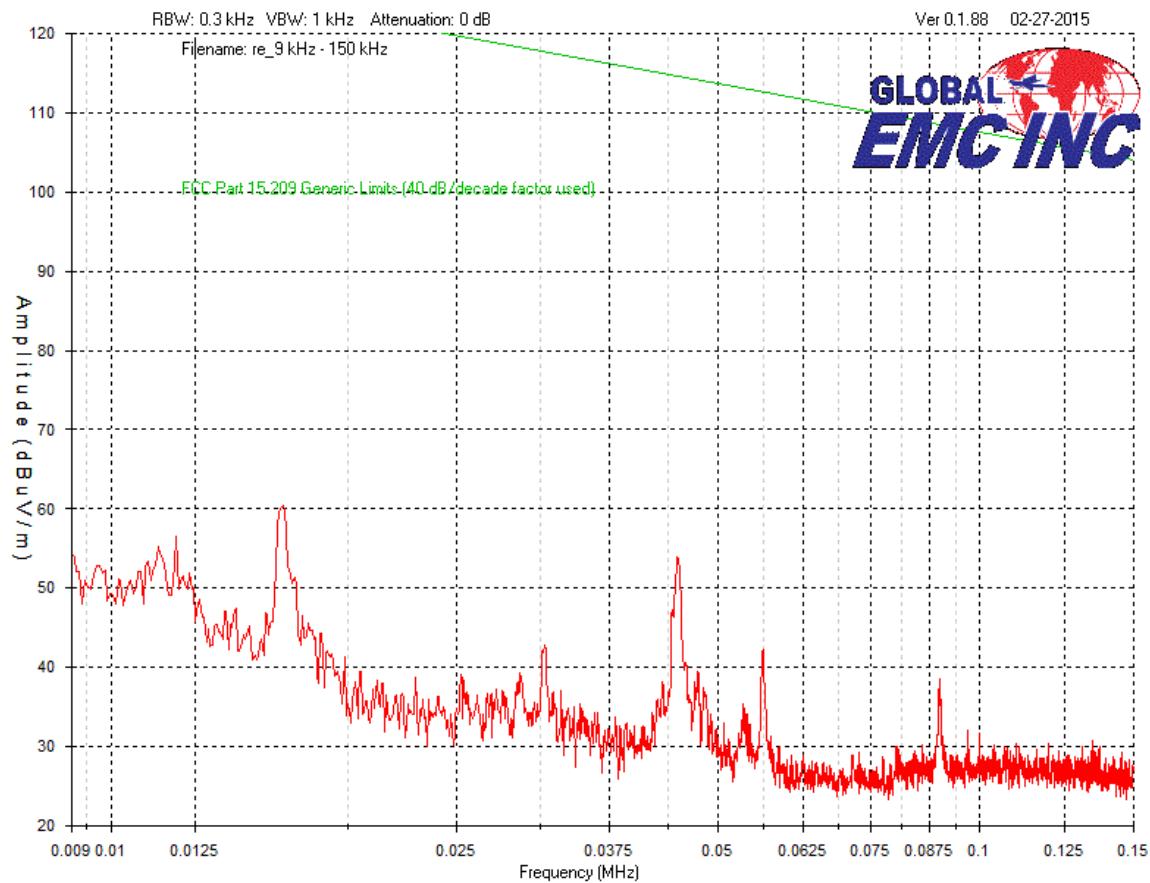
See final measurement section for all measurements.

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

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



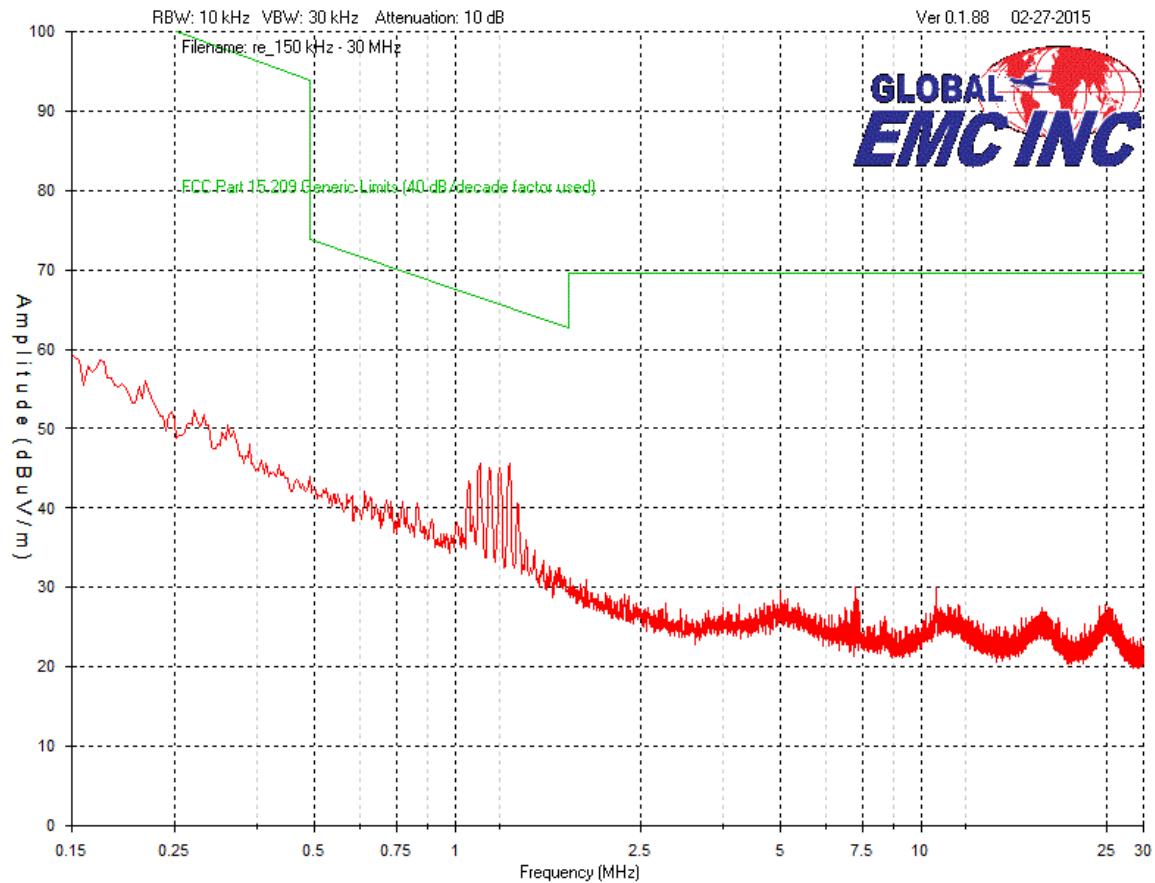
Peak Emissions Graph  
9 kHz to 150 kHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



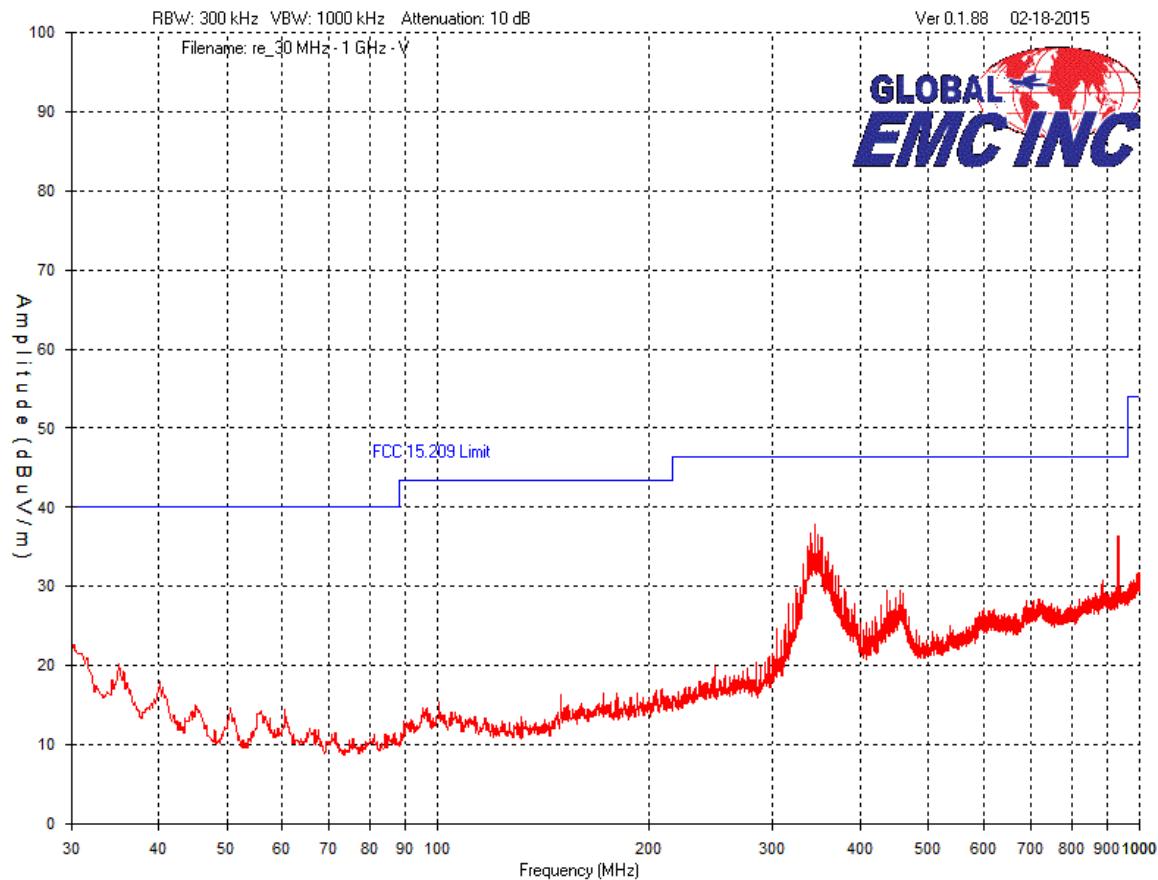
Peak Emissions Graph  
150 kHz to 30 MHz



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| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



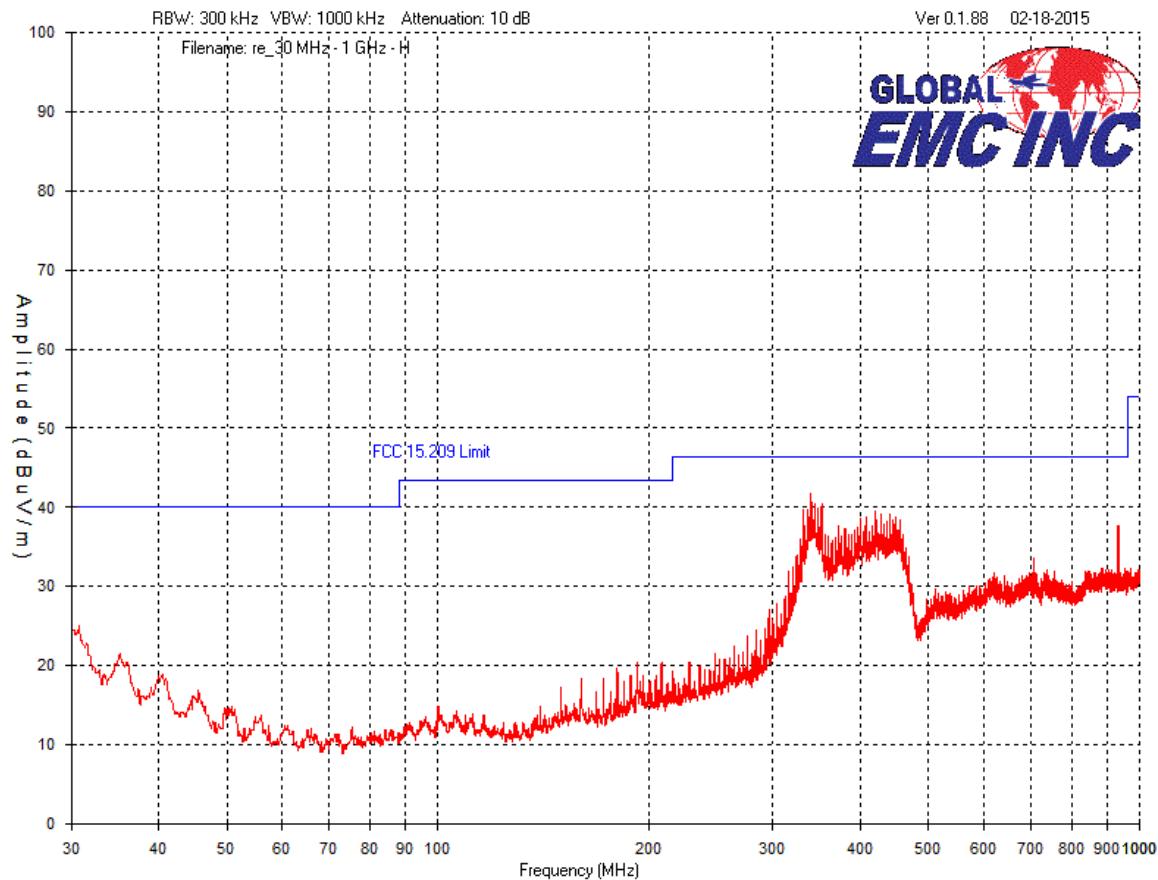
Peak Emissions Graph  
 Vertical Antenna Polarity  
 30 MHz to 1 GHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



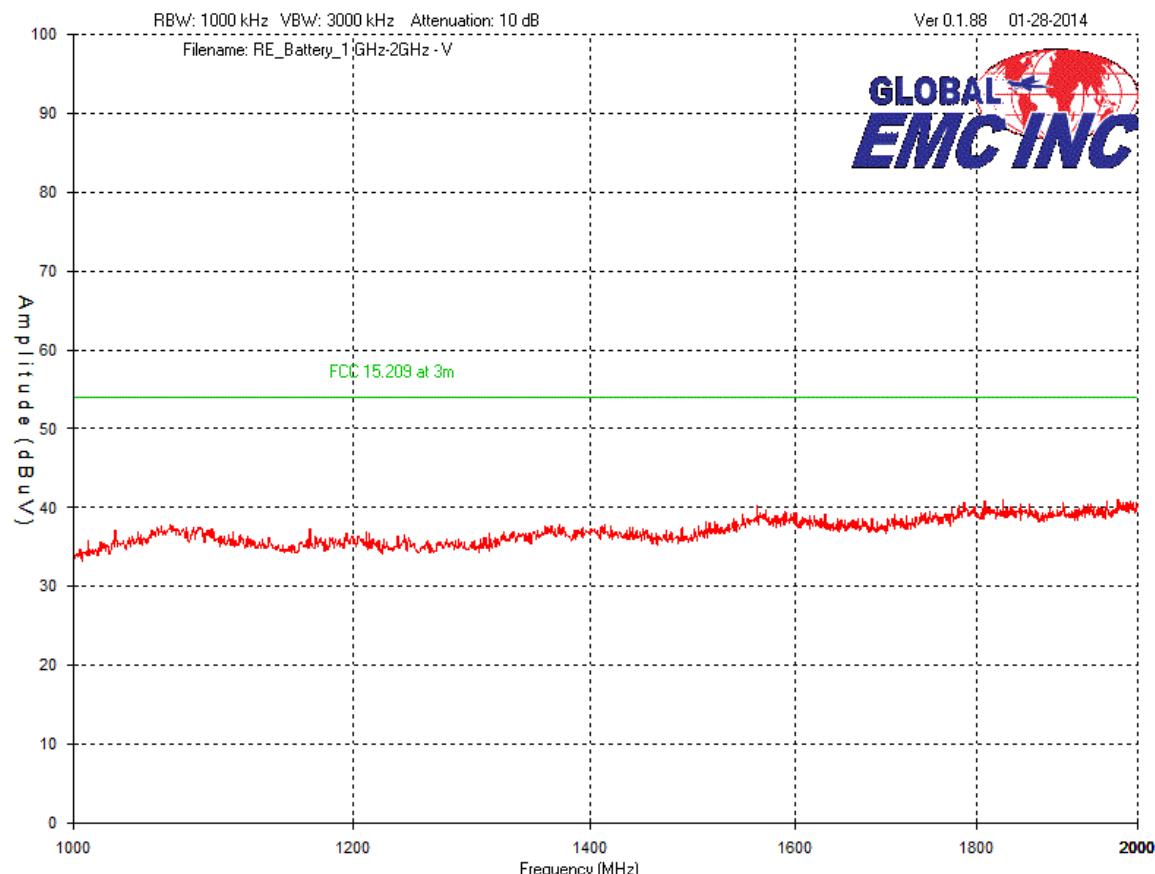
Peak Emissions Graph  
 Horizontal Antenna Polarity  
 30 MHz to 1 GHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



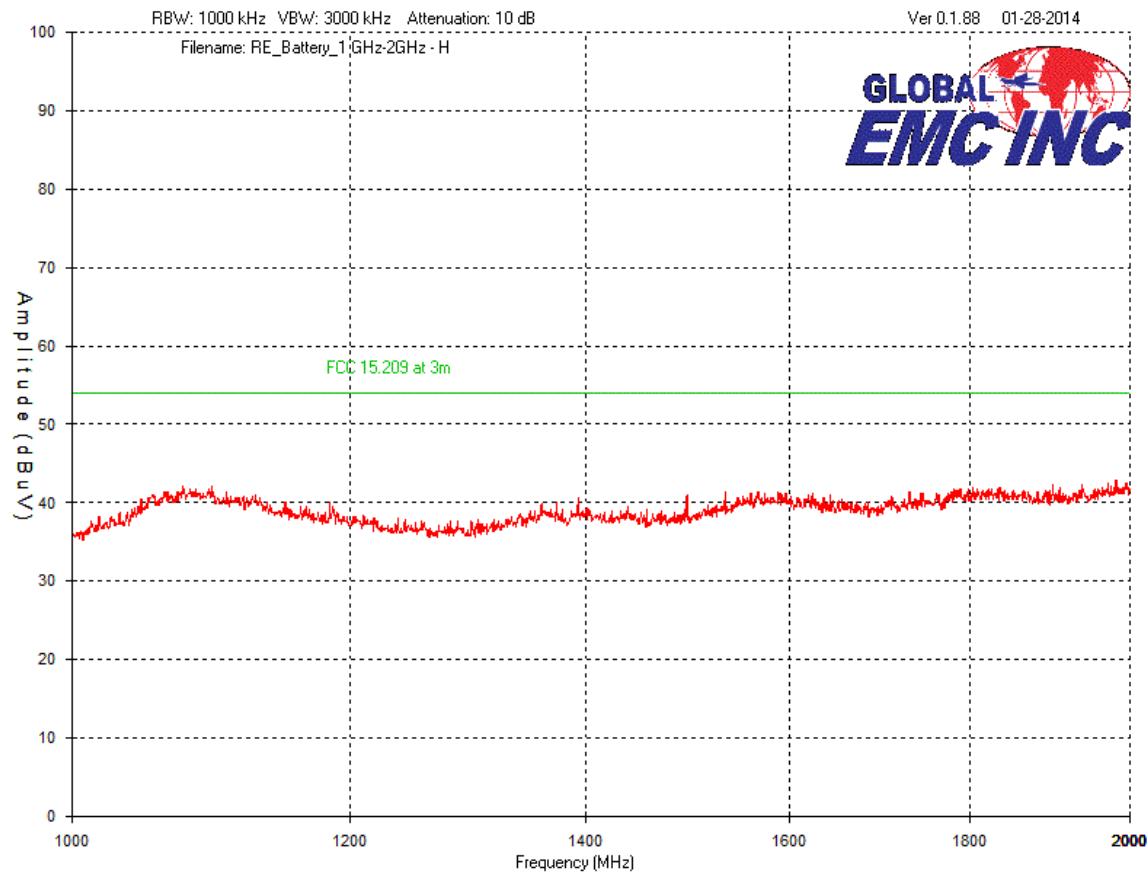
Peak Emissions Graph  
 Vertical Antenna Polarity  
 1 GHz to 2 GHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



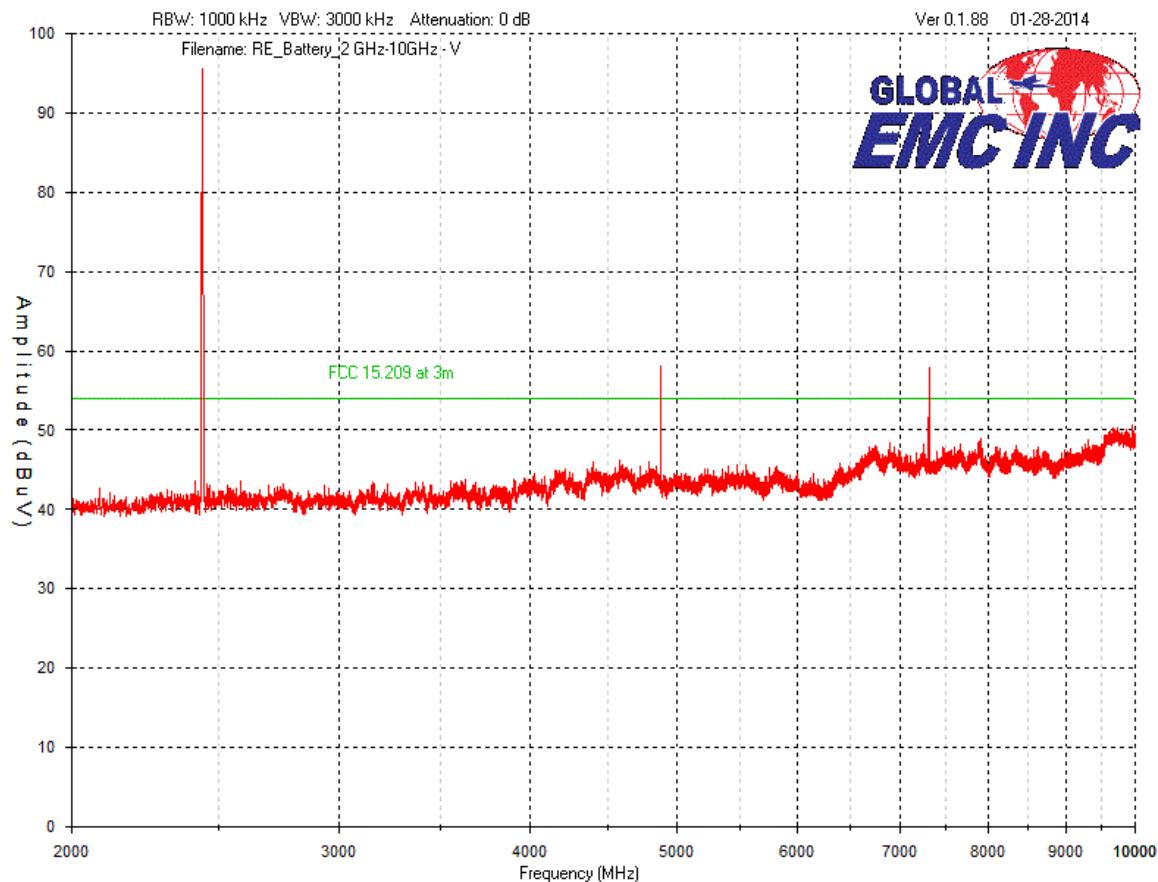
Peak Emissions Graph  
 Horizontal Antenna Polarity  
 1 GHz to 2 GHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



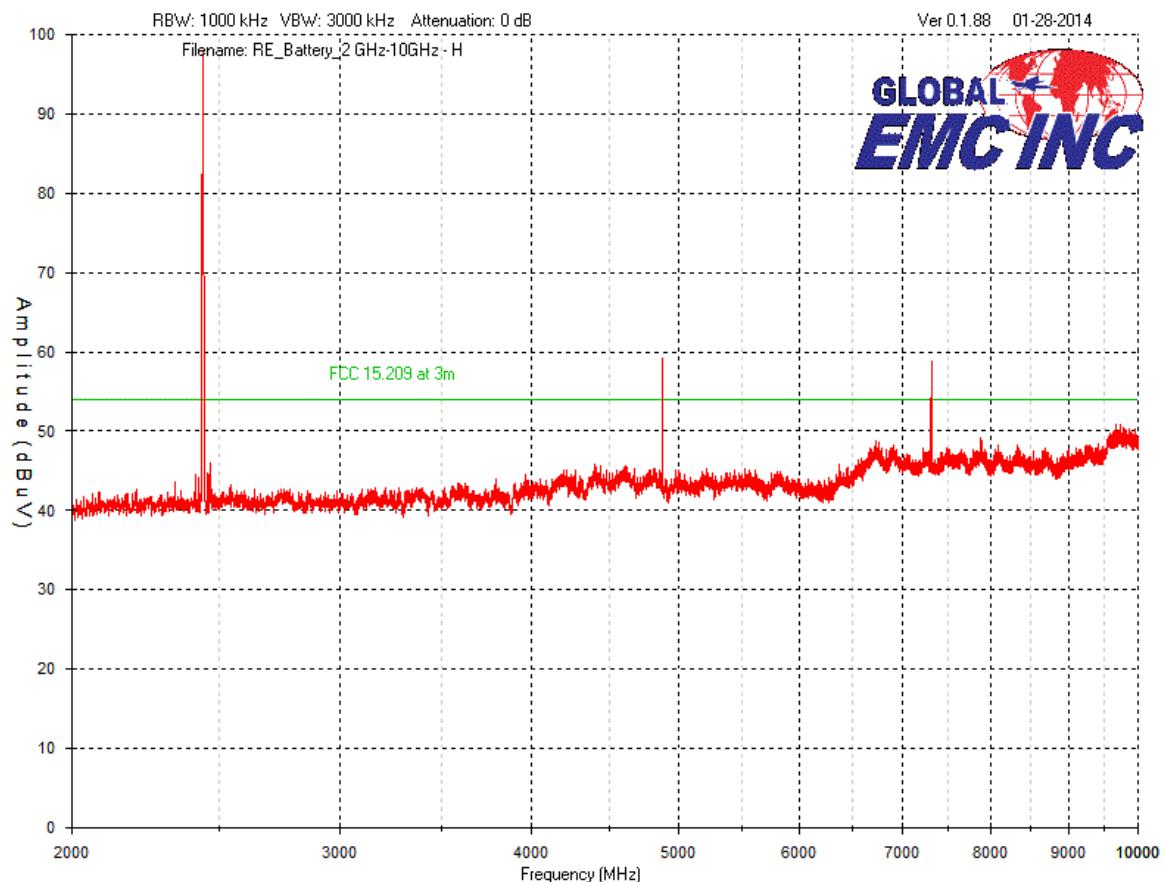
Peak Emissions Graph  
 Vertical Antenna Polarity  
 2 GHz to 10 GHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



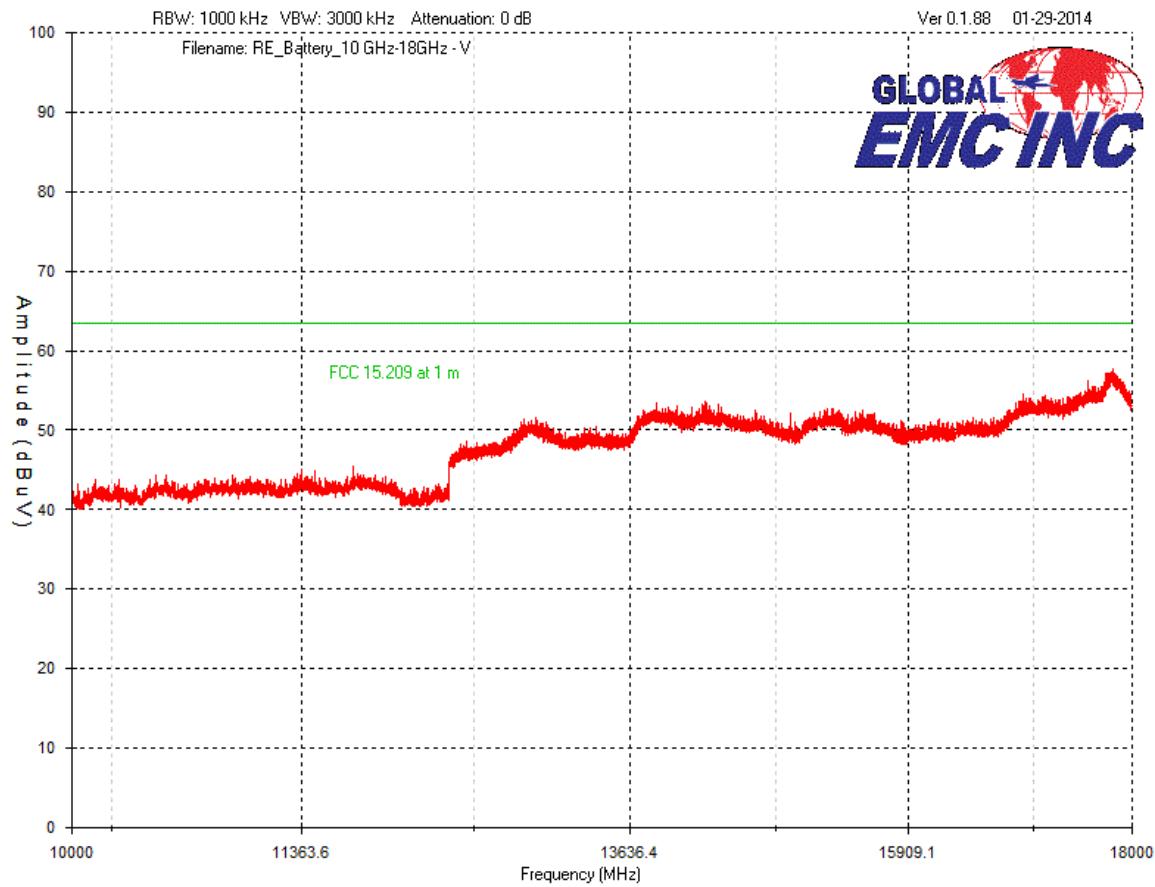
Peak Emissions Graph  
 Horizontal Antenna Polarity  
 2 GHz to 10 GHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



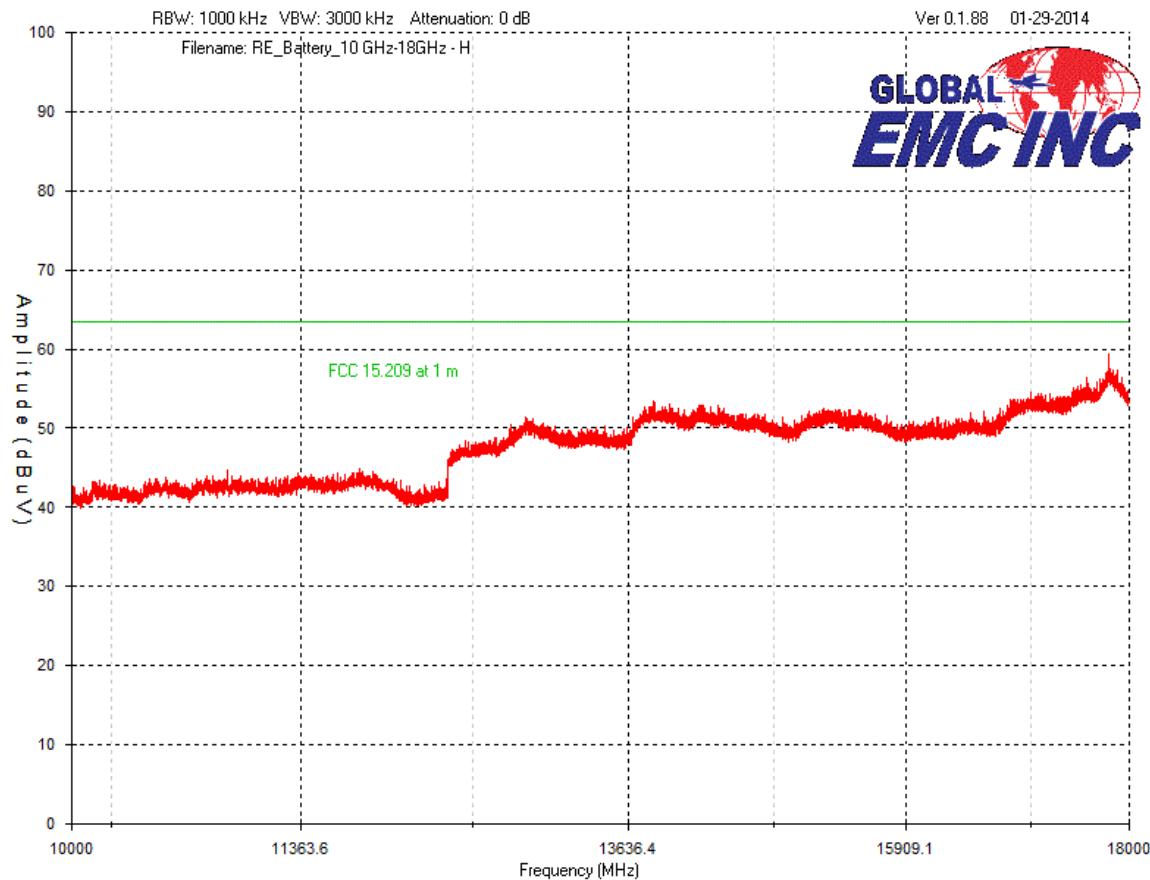
Peak Emissions Graph  
 Vertical Antenna Polarity  
 10 GHz to 18 GHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



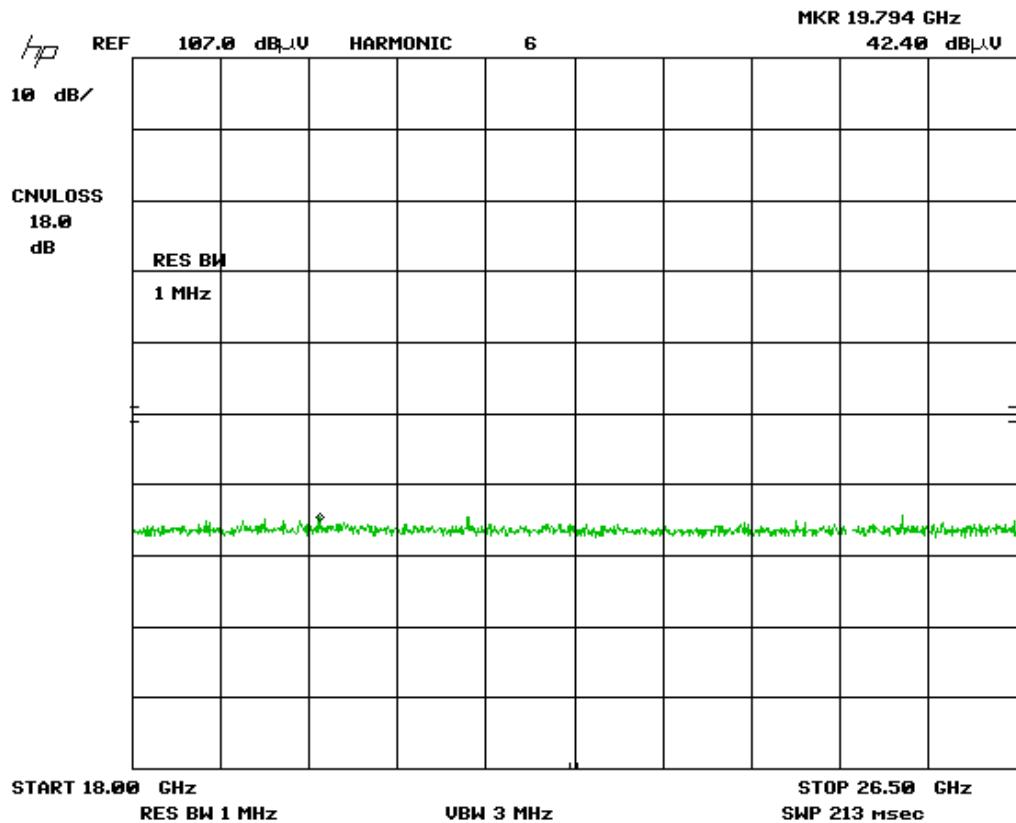
Peak Emissions Graph  
 Horizontal Antenna Polarity  
 10 GHz to 18 GHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



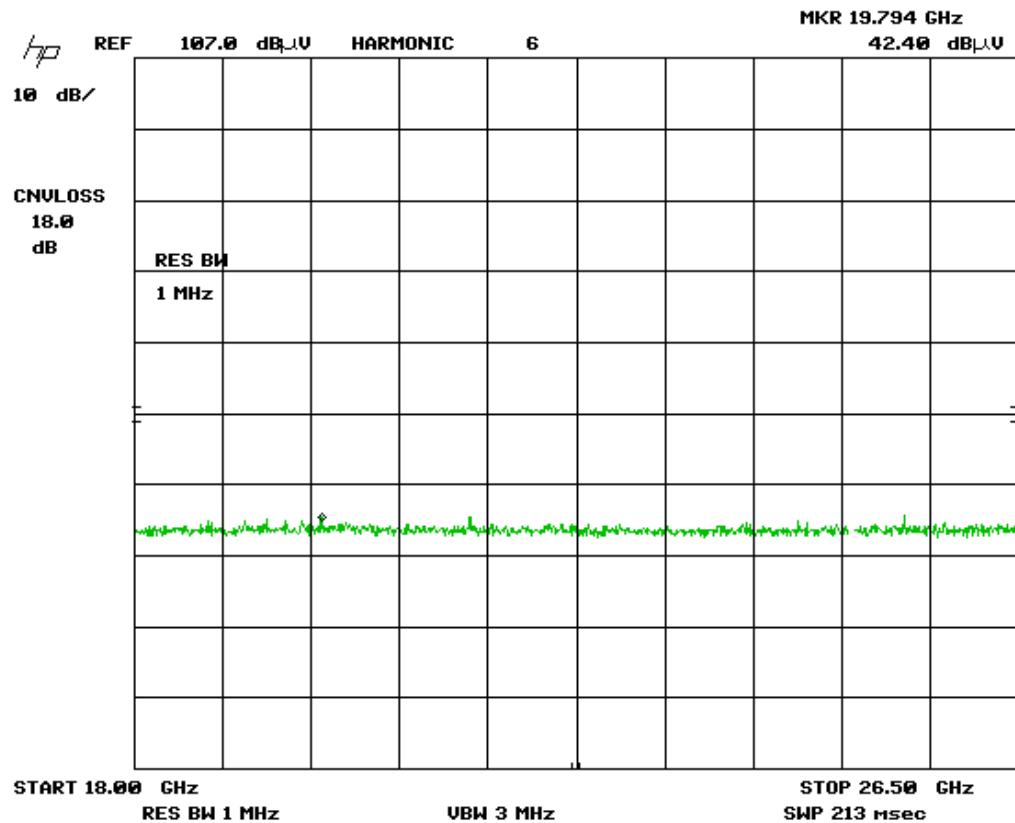
Peak Emissions Graph  
 Vertical Antenna Polarity  
 18 GHz to 26.5 GHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



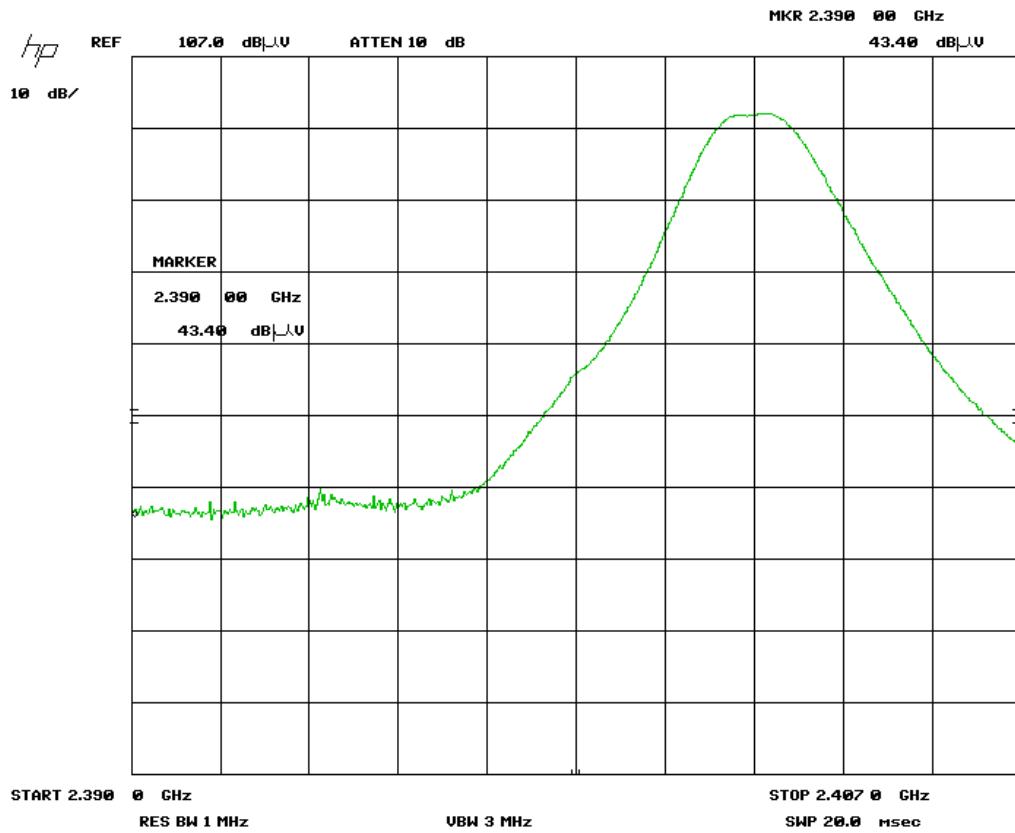
Peak Emissions Graph  
 Horizontal Antenna Polarity  
 18 GHz to 26.5 GHz



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



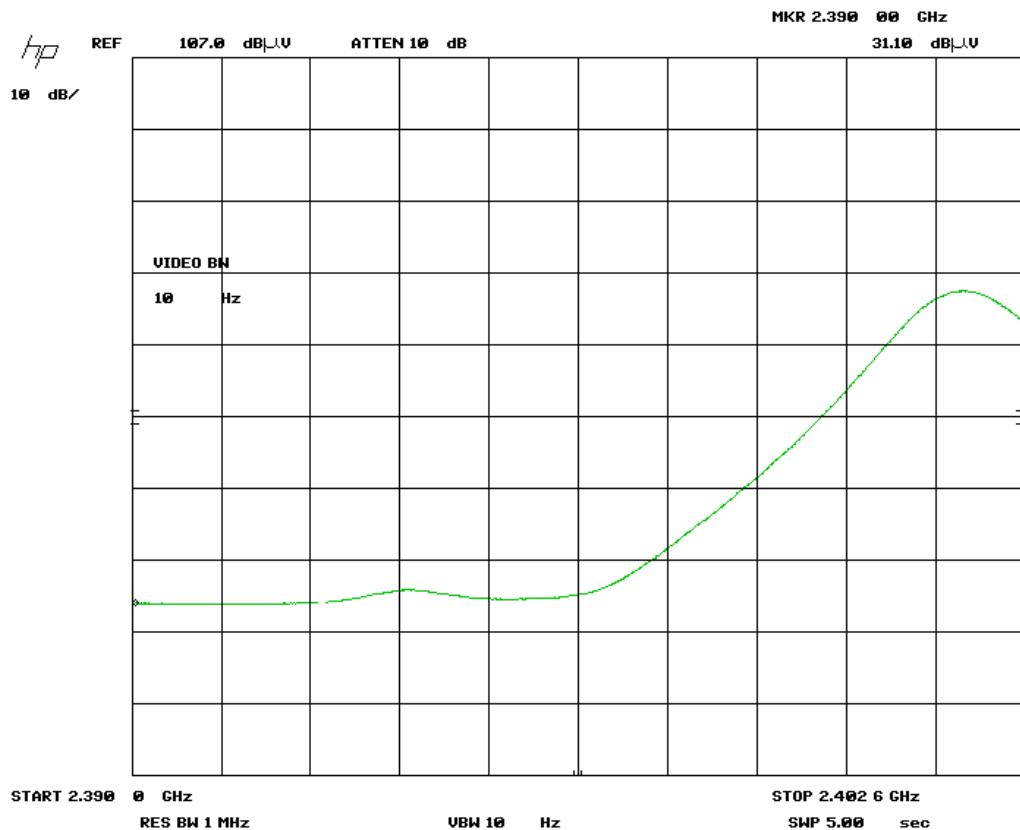
Restricted Band Edges Emissions Graph (Peak)  
 At 2.390 GHz, Horizontal Antenna Polarity  
 Low Channel1 (2402 MHz)



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



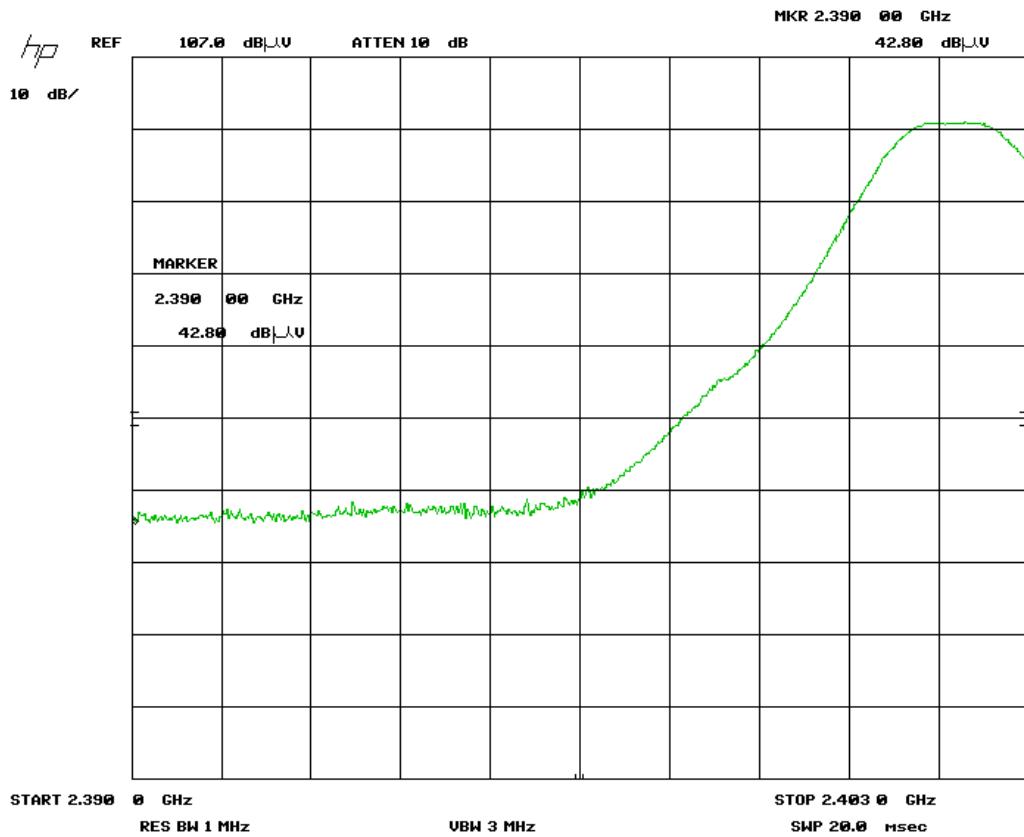
Restricted Band Edges Emissions Graph (Average)  
 At 2.390 GHz, Horizontal Antenna Polarity  
 Low Channel1 (2402 MHz)



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



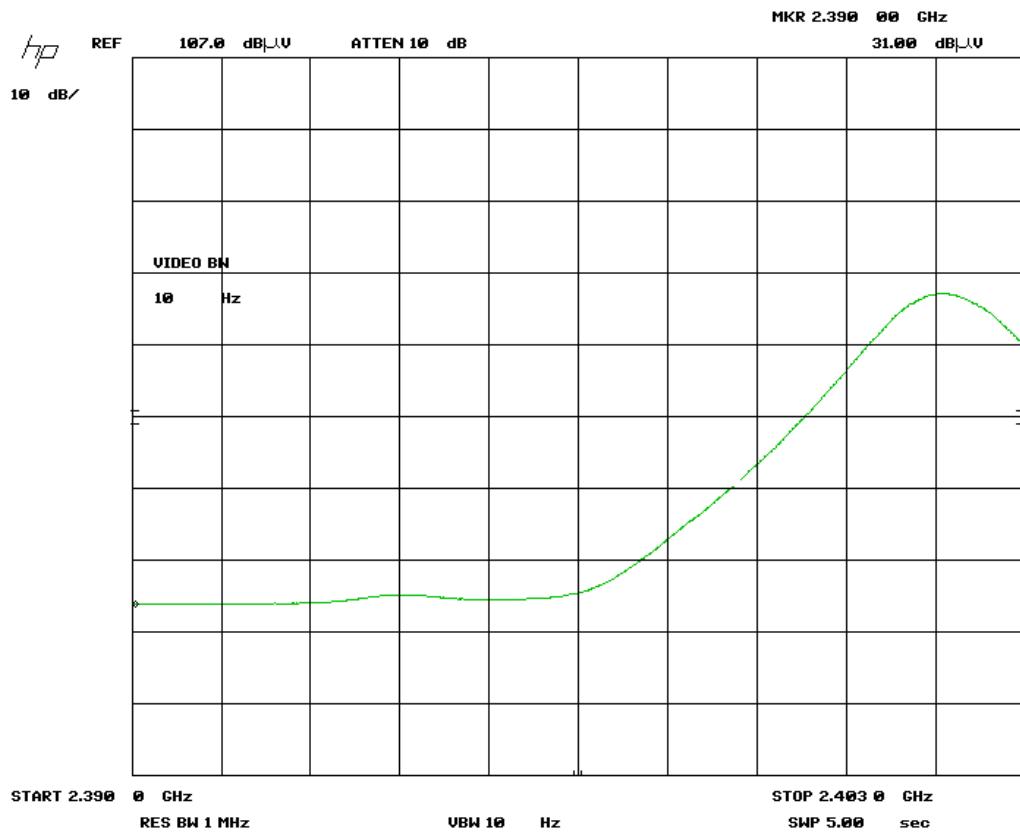
Restricted Band Edges Emissions Graph (Peak)  
At 2.390 GHz, Vertical Antenna Polarity  
Low Channel1 (2402 MHz)



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



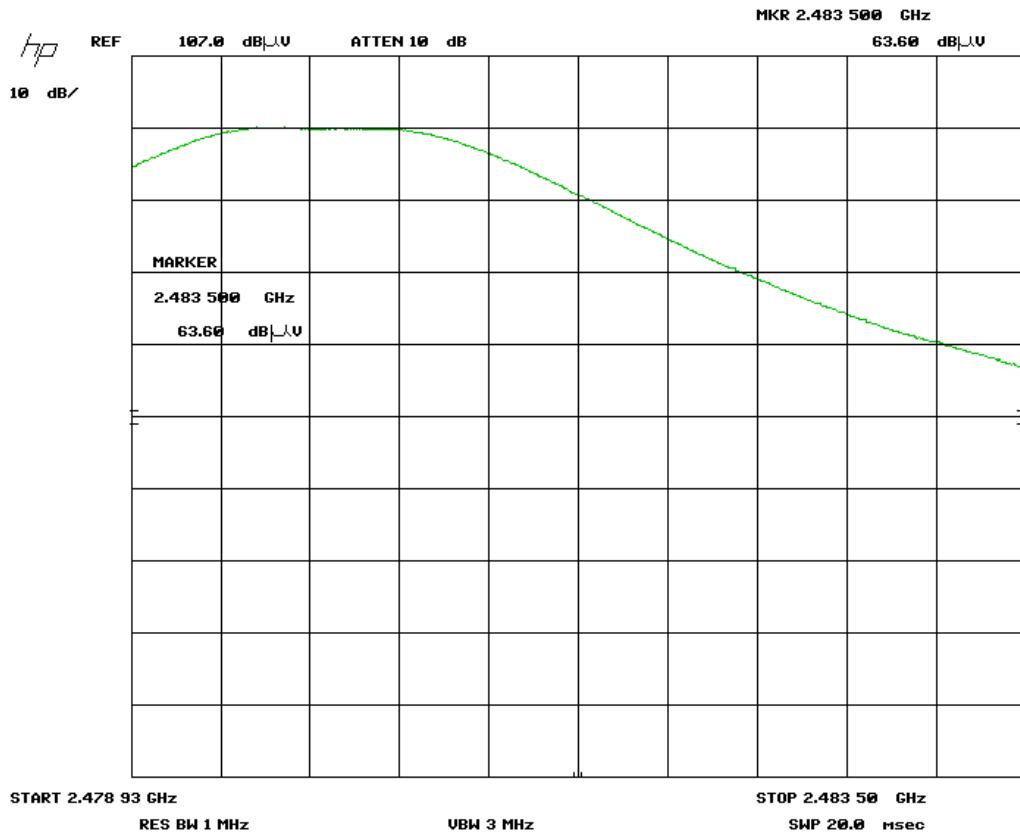
Restricted Band Edges Emissions Graph (Average)  
 At 2.390 GHz, Vertical Antenna Polarity  
 Low Channel1 (2402 MHz)



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



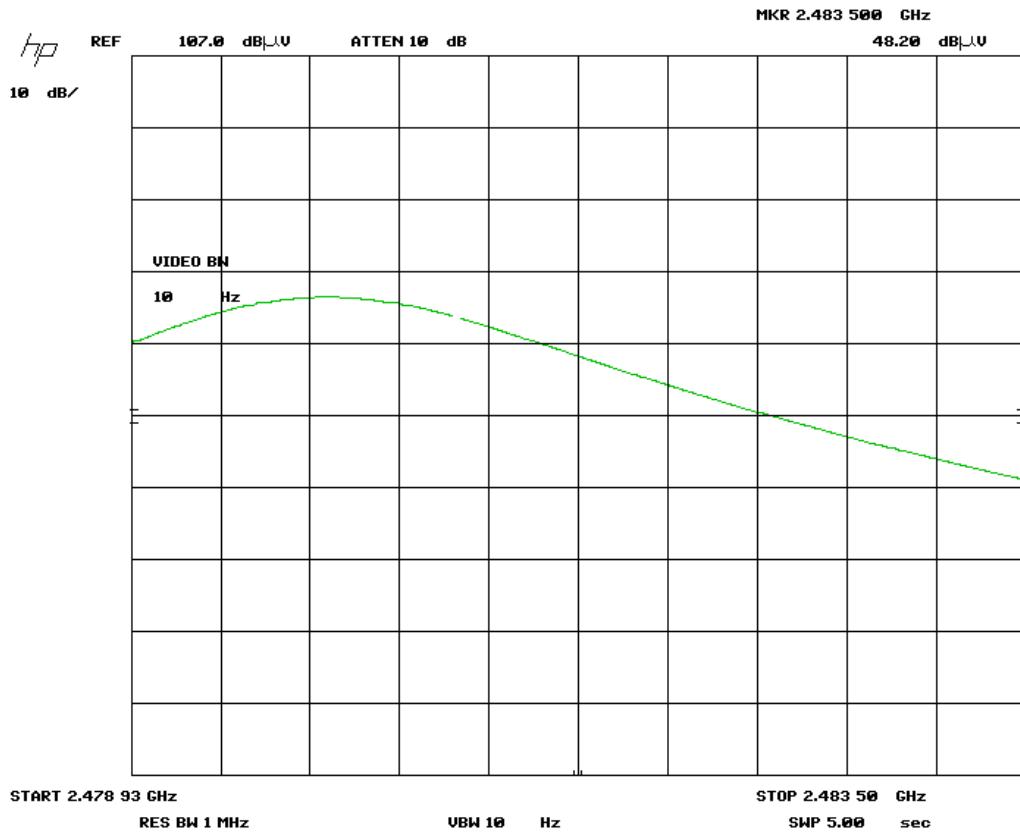
Restricted Band Edges Emissions Graph (Peak)  
 At 2.4835 GHz, Horizontal Antenna Polarity  
 High Channel 1 (2480 MHz)



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



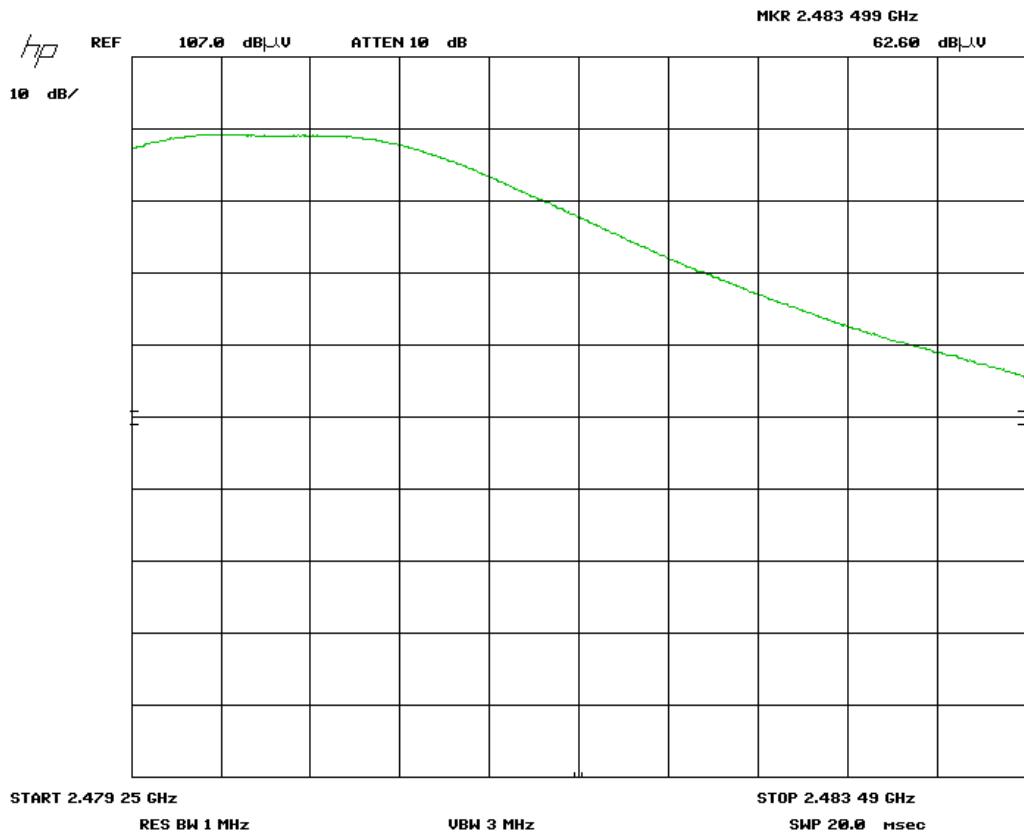
Restricted Band Edges Emissions Graph (Average)  
 At 2.4835 GHz, Horizontal Antenna Polarity  
 High Channel 1 (2480 MHz)



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



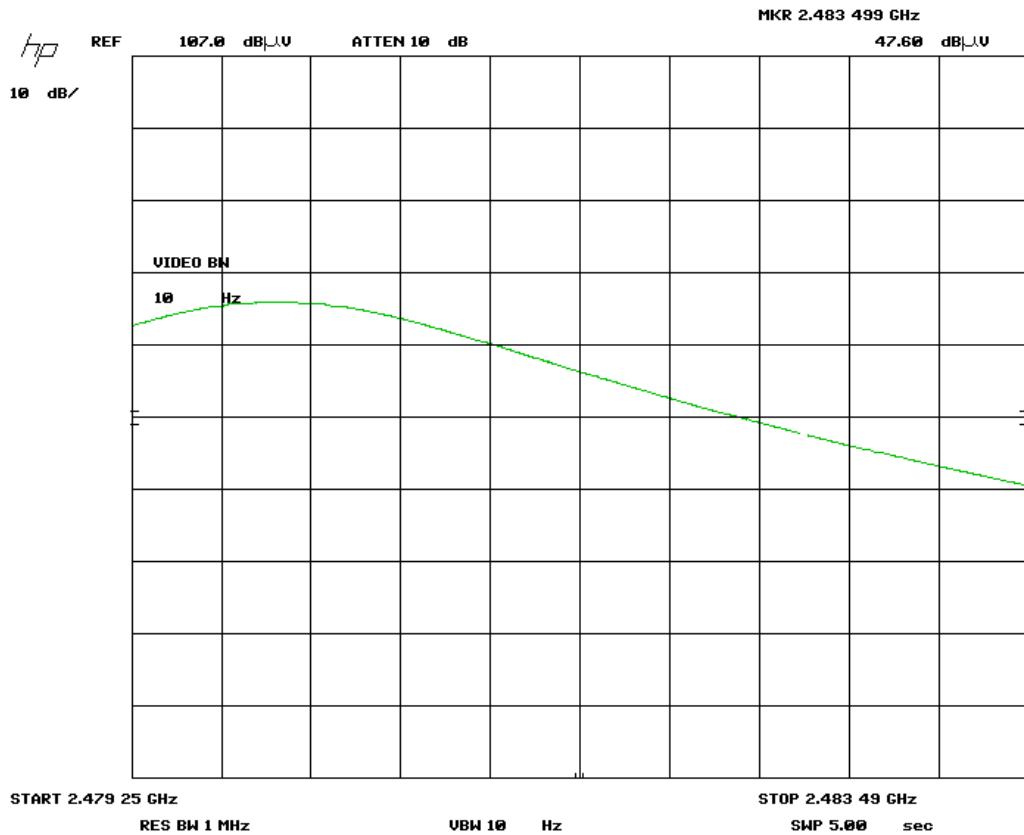
Restricted Band Edges Emissions Graph (Peak)  
 At 2.4835 GHz, Vertical Antenna Polarity  
 High Channel 1 (2480 MHz)



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



Restricted Band Edges Emissions Graph (Average)  
 At 2.4835 GHz, Vertical Antenna Polarity  
 High Channel 1 (2480 MHz)



|             |  |   |
|-------------|--|---|
| Client      | PPG Technologies                                     |  |
| Product     | PPG Sensor   |   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |   |

## Final Measurements

Table 1: Radiated Emissions  
Harmonics/Spurious emissions  
3m measurement distance

| Test Frequency (MHz)  | Detection mode | Antenna polarity (Horz/Vert) | Raw signal dB(µV) | Antenna factor dB | Cable loss dB + Preselecor | Pre-Amp Gain dB | Received signal dB(µV/m) | Emission limit dB(µV/m) | Margin dB(µV) | Result |
|---|----------------|------------------------------|-------------------|-------------------|----------------------------|-----------------|--------------------------|-------------------------|---------------|--------|
| Low Channel   |                |                              |                   |                   |                            |                 |                          |                         |               |        |
| 4804  | Peak           | Horz                         | 56.8              | 33.5              | 5.9                        | 35.2            | 61.0                     | 74.0                    | 13.0          | Pass   |
| 4804  | Avg            | Horz                         | 44.9              | 33.5              | 5.9                        | 35.2            | 49.1                     | 54.0                    | 4.9           | Pass   |
| 4804  | Peak           | Vert                         | 57.9              | 33.5              | 5.9                        | 35.2            | 62.1                     | 74.0                    | 11.9          | Pass   |
| 4804  | Avg            | Vert                         | 45.6              | 33.5              | 5.9                        | 35.2            | 49.8                     | 54.0                    | 4.2           | Pass   |
| 7206  | Peak           | Vert                         | 51.7              | 38.6              | 7.4                        | 35.6            | 62.1                     | 74.0                    | 11.9          | Pass   |
| 7206  | Avg            | Vert                         | 39.0              | 38.6              | 7.4                        | 35.6            | 49.4                     | 54.0                    | 4.6           | Pass   |
| 7206  | Peak           | Horz                         | 51.7              | 38.6              | 7.4                        | 35.6            | 62.1                     | 74.0                    | 11.9          | Pass   |
| 7206  | Avg            | Horz                         | 38.6              | 38.6              | 7.4                        | 35.6            | 49.0                     | 54.0                    | 5.0           | Pass   |
| Harmonics above the 3 <sup>rd</sup> are under the noise floor |                |                              |                   |                   |                            |                 |                          |                         |               |        |
| Mid channel   |                |                              |                   |                   |                            |                 |                          |                         |               |        |
| 4880  | Peak           | Horz                         | 55.7              | 33.5              | 5.9                        | 35.2            | 59.9                     | 74.0                    | 14.1          | Pass   |
| 4880  | Avg            | Horz                         | 43.9              | 33.5              | 5.9                        | 35.2            | 48.1                     | 54.0                    | 5.9           | Pass   |
| 4880  | Peak           | Vert                         | 53.4              | 33.5              | 5.9                        | 35.2            | 57.6                     | 74.0                    | 16.4          | Pass   |
| 4880  | Avg            | Vert                         | 40.9              | 33.5              | 5.9                        | 35.2            | 45.1                     | 54.0                    | 8.9           | Pass   |
| 7320  | Peak           | Vert                         | 49.5              | 37.9              | 9.6                        | 35.2            | 61.8                     | 74.0                    | 12.2          | Pass   |
| 7320  | Avg            | Vert                         | 36.6              | 37.9              | 9.6                        | 35.2            | 48.9                     | 54.0                    | 5.1           | Pass   |
| 7320  | Peak           | Horz                         | 53.6              | 37.9              | 9.6                        | 35.2            | 65.9                     | 74.0                    | 8.1           | Pass   |
| 7320  | Avg            | Horz                         | 41.1              | 37.9              | 9.6                        | 35.2            | 53.4                     | 54.0                    | 0.6           | Pass   |
| Harmonics above the 3 <sup>rd</sup> are under the noise floor |                |                              |                   |                   |                            |                 |                          |                         |               |        |
| High channel  |                |                              |                   |                   |                            |                 |                          |                         |               |        |
| 4960  | Peak           | Horz                         | 55.5              | 33.5              | 5.9                        | 35.2            | 59.7                     | 74.0                    | 14.3          | Pass   |
| 4960  | Avg            | Horz                         | 43.7              | 33.5              | 5.9                        | 35.2            | 47.9                     | 54.0                    | 6.1           | Pass   |
| 4960  | Peak           | Vert                         | 51.4              | 33.5              | 5.9                        | 35.2            | 55.6                     | 74.0                    | 18.4          | Pass   |
| 4960  | Avg            | Vert                         | 40.2              | 33.5              | 5.9                        | 35.2            | 44.4                     | 54.0                    | 9.6           | Pass   |
| 7440  | Peak           | Vert                         | 51.1              | 38.6              | 7.4                        | 35.6            | 61.5                     | 74.0                    | 12.5          | Pass   |
| 7440  | Avg            | Vert                         | 40.1              | 38.6              | 7.4                        | 35.6            | 50.5                     | 54.0                    | 3.5           | Pass   |
| 7440  | Peak           | Horz                         | 52.2              | 38.6              | 7.4                        | 35.6            | 62.6                     | 74.0                    | 11.4          | Pass   |
| 7440  | Avg            | Horz                         | 39.8              | 38.6              | 7.4                        | 35.6            | 50.2                     | 54.0                    | 3.8           | Pass   |
| Harmonics above the 3 <sup>rd</sup> are under the noise floor |                |                              |                   |                   |                            |                 |                          |                         |               |        |

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



Table 2: Radiated Emissions  
Band Edge emissions  
3m measurement distance

| Test Frequency (MHz)    | 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 dB(µV/m) | Margin dB | Result |
|-------------------------|----------------|------------------------------|-------------------|-------------------|------------------------------|-----------------|--------------------------|-------------------------|-----------|--------|
| Low Channel Band Edges  |                |                              |                   |                   |                              |                 |                          |                         |           |        |
| 2390                    | Peak           | Horz                         | 43.4              | 30.8              | 4.1                          | 35.8            | 42.5                     | 74.0                    | 31.5      | Pass   |
| 2390                    | Avg            | Horz                         | 31.1              | 30.8              | 4.1                          | 35.8            | 30.2                     | 54.0                    | 23.8      | Pass   |
| 2390                    | Peak           | Vert                         | 42.8              | 30.8              | 4.1                          | 35.8            | 41.9                     | 74.0                    | 32.1      | Pass   |
| 2390                    | Avg            | Vert                         | 31.0              | 30.8              | 4.1                          | 35.8            | 30.1                     | 54.0                    | 23.9      | Pass   |
| High channel Band Edges |                |                              |                   |                   |                              |                 |                          |                         |           |        |
| 2483.5                  | Peak           | Horz                         | 63.6              | 30.8              | 4.1                          | 35.8            | 62.7                     | 74.0                    | 11.3      | Pass   |
| 2483.5                  | Avg            | Horz                         | 48.2              | 30.8              | 4.1                          | 35.8            | 47.3                     | 54.0                    | 6.7       | Pass   |
| 2483.5                  | Peak           | Vert                         | 62.6              | 30.8              | 4.1                          | 35.8            | 61.7                     | 74.0                    | 12.3      | Pass   |
| 2483.5                  | Avg            | Vert                         | 47.6              | 30.8              | 4.1                          | 35.8            | 46.7                     | 54.0                    | 7.3       | Pass   |

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



### Radiated Emissions - 15.247 - Table 3

Other spurious measurements

3m measurement distance

| Test Frequency (MHz)        | Detection mode | Raw signal dB(µV) | Antenna factor dB | Cable loss dB + Pre-selector | Pre-Amp Gain dB | Received signal dB(µV/m) | Emission limit dB(µV/m) | Margin dB | Result |
|-----------------------------|----------------|-------------------|-------------------|------------------------------|-----------------|--------------------------|-------------------------|-----------|--------|
| Vertical Antenna Polarity   |                |                   |                   |                              |                 |                          |                         |           |        |
| 344.2                       | Peak           | 55.1              | 15.1              | 1.4                          | -33.8           | 37.8                     | 46.4                    | 8.6       | Pass   |
| 931.6                       | Peak           | 43.1              | 22.7              | 2.3                          | -31.7           | 36.4                     | 46.4                    | 10        | Pass   |
| 436.1                       | Peak           | 45.8              | 16                | 1.6                          | -33.9           | 29.5                     | 46.4                    | 16.9      | Pass   |
| 30.2                        | Peak           | 39                | 16.3              | 0.5                          | -33.1           | 22.7                     | 40                      | 17.3      | Pass   |
| 316.2                       | Peak           | 46.1              | 14                | 1.4                          | -33.7           | 27.8                     | 46.4                    | 18.6      | Pass   |
| 304.0                       | Peak           | 42.8              | 14.3              | 1.3                          | -33.7           | 24.7                     | 46.4                    | 21.7      | Pass   |
| Horizontal Antenna Polarity |                |                   |                   |                              |                 |                          |                         |           |        |
| 339.9                       | Peak           | 59.1              | 15.1              | 1.4                          | -33.8           | 41.8                     | 46.4                    | 4.6       | Pass   |
| 352.2                       | Peak           | 57.2              | 15.6              | 1.4                          | -33.8           | 40.4                     | 46.4                    | 6         | Pass   |
| 332.0                       | Peak           | 57.1              | 14.9              | 1.4                          | -33.7           | 39.7                     | 46.4                    | 6.7       | Pass   |
| 420.6                       | Peak           | 55.3              | 16.7              | 1.6                          | -34             | 39.6                     | 46.4                    | 6.8       | Pass   |
| 372.3                       | Peak           | 53.8              | 16.2              | 1.5                          | -33.8           | 37.7                     | 46.4                    | 8.7       | Pass   |
| 931.6                       | Peak           | 43.5              | 23.5              | 2.3                          | -31.7           | 37.6                     | 46.4                    | 8.8       | Pass   |

|             |  |   |
|-------------|--|---|
| Client      | PPG Technologies                                     |  |
| Product     | PPG Sensor   |   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |   |

## 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   |
| RF Cable 0.5M                  | LMR-400-0.5M-50OHM-MN-MN | LexTec          | NCR                   | NCR                       | GEMC 31   |

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

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



## Appendix A – EUT Summary

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

### General EUT Description

| Client Details                          |   |
|---|---|
| Organization / Address                  | PPG Technologies  |
| Contact                                 | Gord Parke  |
| Phone                                   | 601-316-4462  |
| Email                                   | <a href="mailto:grparke@gmail.com">grparke@gmail.com</a>  |
| EUT (Equipment Under Test) Details      |   |
| EUT Name                                | PPG Sensor  |
| EUT Model                               | 13117   |
| EUT is powered using                    | Li-poly battery   |
| Input voltage range(s) (V)              | 3.0 - 4.275 VDC   |
| Rated input current (A)                 | 0.05  |
| Nominal power consumption (W)           | 0.04  |
| Basic EUT functionality description     | This product fits inside a baseball pitcher's compression sleeve and measures the motion of the arm during a pitch. It saves this data and transfers it to a smartphone, where it is reconstructed and analyzed, providing analytic feedback to the user. |
| Modes of operation                      | On mode only.   |
| Frequency of all clocks present in EUT  | 26 MHz  |
| I/O cable description (length and type) | None  |
| Available connectors on EUT             | None  |
| Dimensions of product                   | L: 45.1 mm<br>W: 25.3 mm<br>H: 16.1 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      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |

The logo for Global EMC Inc. features the word "GLOBAL" in blue capital letters at the top, with a small red star above the letter "O". Below "GLOBAL" is a stylized red globe with white latitude and longitude lines. Underneath the globe, the letters "EMC" are written in large, bold, blue capital letters, with "INC" in smaller blue capital letters to the right.

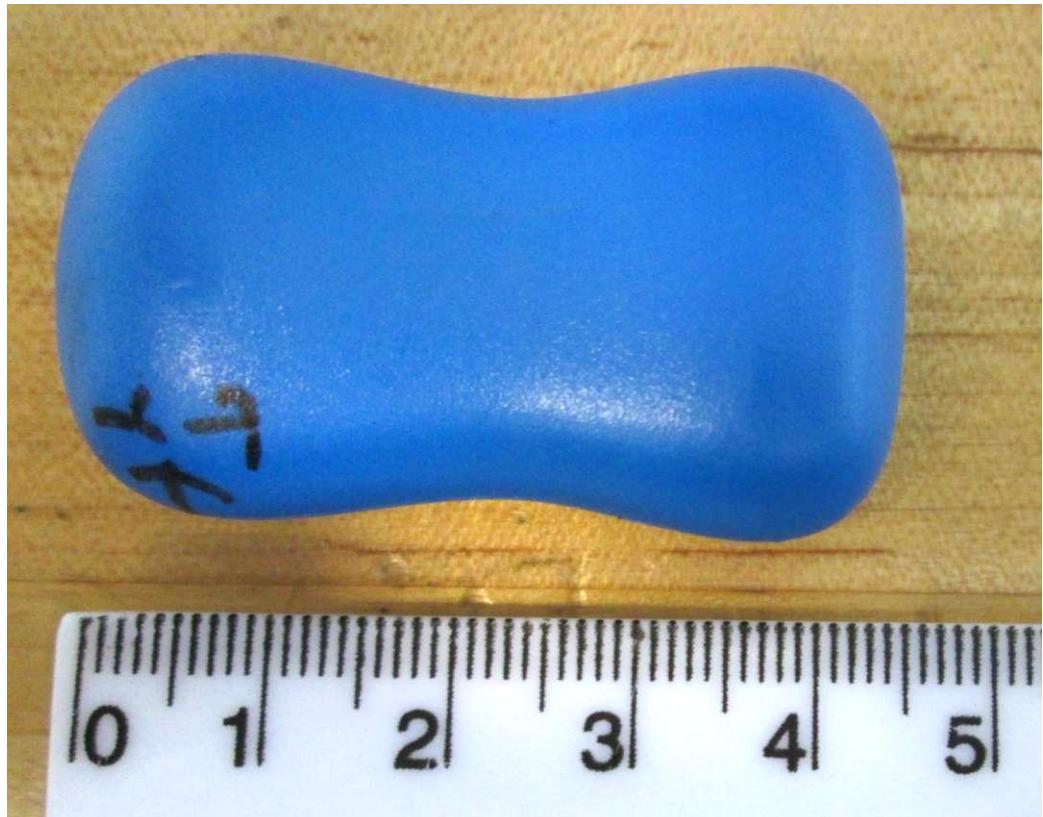
## Appendix B – EUT and Test Setup Photographs

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

|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



EUT – External view 1



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



EUT – External view 2



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



### EUT – Internal view 1

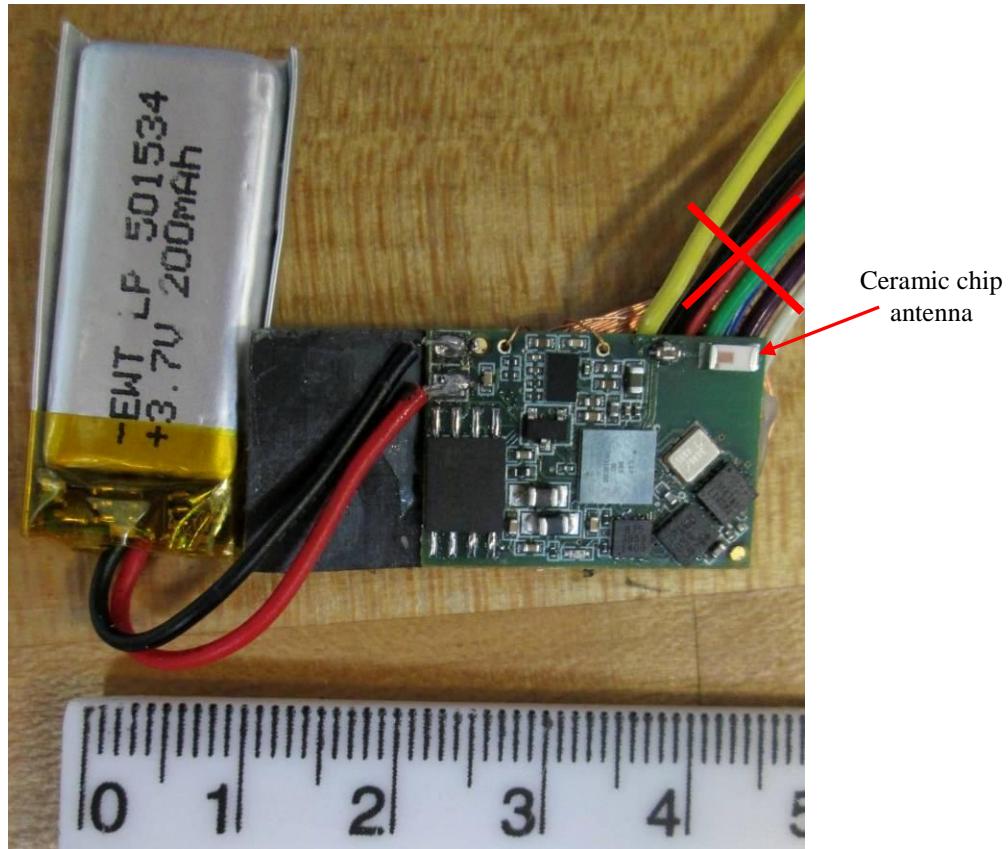
Note: Colored wires on the right-hand side are soldered onto the PCB for programming and testing purposes only. They are not part of the EUT



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



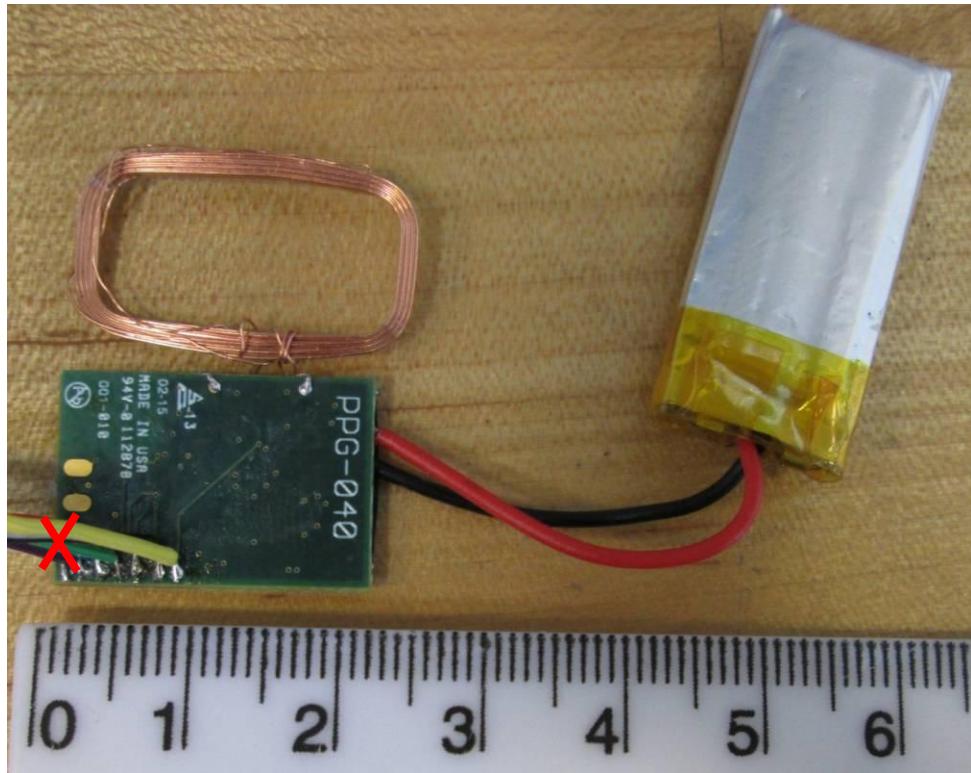
EUT – Internal view 2  
PCB, side 1



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



EUT – Internal view 3  
PCB, side 2



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



Radiated Emissions Photo 1



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



Radiated Emissions Photo 2



|             |  |
|-------------|--|
| Client      | PPG Technologies                                     |
| Product     | PPG Sensor   |
| Standard(s) | RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2015 |



Radiated Emissions Photo 3

