

# Global EMC Inc. Labs

## EMC & RF Test Report

As per

RSS 210 Issue 8:2010

&

FCC Part 15 Subpart C:2010

Unlicensed Intentional Radiators

on the

Savant Remote (SSR-2000)

  
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Testing produced for  
  
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See Appendix A for full customer & EUT details.



LAB REGISTRATION #6844A-2



Client	<b>Savant Technologies</b>
Product	<b>Savant Remote ( SSR-2000)</b>
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



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Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## Report Scope

This report addresses the EMC verification testing and test results of the Savant Remote, herein referred to as EUT (Equipment Under Test) 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 15:2010

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	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## Summary

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

EUT FCC Certification #, FCC ID:	ASU- SSR2000
EUT Industry Canada Certification #, IC:	10052A- SSR2000
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Scott Drysdale

Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## **Test Results Summary**

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.205 RSS 210 (Table 1)	Restricted Bands for intentional operation	QuasiPeak Average	Pass
FCC 15.207	Power line conducted emissions	QuasiPeak Average	Pass
FCC 15.209 RSS-210 (Table 2)	Spurious Radiated emissions	QuasiPeak Average	Pass
FCC 15.247(a)2 RSS-210 A8.2(a)	6 dB Bandwidth	> 500 kHz	Pass
FCC 15.247(b)2 RSS-210 A8.4(4)	Max output power	< 1 Watt	Pass
FCC 15.247(b)(4) RSS-210 A8.4(5)	Antenna Gain	< 6 dBi	Pass See Justifications
FCC 15.247(d) RSS-210 A8.5	Antenna conducted spurious	< 20 dBc	Pass
FCC 15.247(e) RSS-210 A8.2(b)	Spectral Density	< 8 dBm (3 kHz BW)	Pass
FCC 15.247(i) IC Safety code 6	Maximum Permissible Exposure / Specific Absorption Rate	MPE	Pass See separate MPE exhibit
<b>Overall Result</b>			<b>PASS</b>

All tests were performed by Scott Drysdale.

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.

Client	<b>Savant Technologies</b>
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### ***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), this device incorporates an internal U.FL connector, connected to an internal dipole. This connection is generally not accessible to the end user.

For the Restricted Bands of operation, the EUT is designed to only operate between 2400 and 2483.5 MHz

For the Antenna gain, this device has less than 6 dBi gain.

As this device is handheld, it was scanned in three orthogonal axis for the applicable radiated emissions and worst case results are presented in this test report.

For maximum permissible exposure, this device operates in Digitally modulated mode at -6.5 dBm (0.22 mW) at 2.4 GHz, in both portable and mobile conditions, less than the 20 mW level and is therefore exempt from SAR evaluation.

Client	<b>Savant Technologies</b>	
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## ***Applicable Standards, Specifications and Methods***

ANSI C63.4:2003 - 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 22:1997 - Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement

ICES-003:2004 - 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 210:2010 - Issue 8: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power Licence-Exempt Radiocommunication Devices

Client	<b>Savant Technologies</b>
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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 = 8.5 dB

## ***Document Revision Status***

Revision 1 - April 18, 2012

Revision 2 - April 23, 2012 – Added comment on three orthogonal axis on justifications and deviations section.

Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## 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

Client	<b>Savant Technologies</b>	
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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 –

Date	Test	Initials	Temperature (°C)	Humidity (%)	Pressure (kPa)
Mar 23, 2012	RE	SD	20-25°C	30-45%	100 -103 kPa
Mar 22, 2012	PLCE	SD	20-25°C	30-45%	100 -103 kPa
Mar 26, 2012	Antenna conducted	SD	20-25°C	30-45%	100 -103 kPa

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The logo for Global EMC Inc. features the word "GLOBAL" in blue capital letters at the top, with a red globe graphic behind it. Below "GLOBAL" is a red star. The word "EMC" is in large blue capital letters, and "INC" is in smaller blue capital letters to the right of "EMC".

## **Detailed Test Results Section**

Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## ***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 are as defined in 47 CFR FCC Part 15 Section 15.207

Method is as defined in ANSI C64:2003

Average Limits		QuasiPeak Limits	
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.

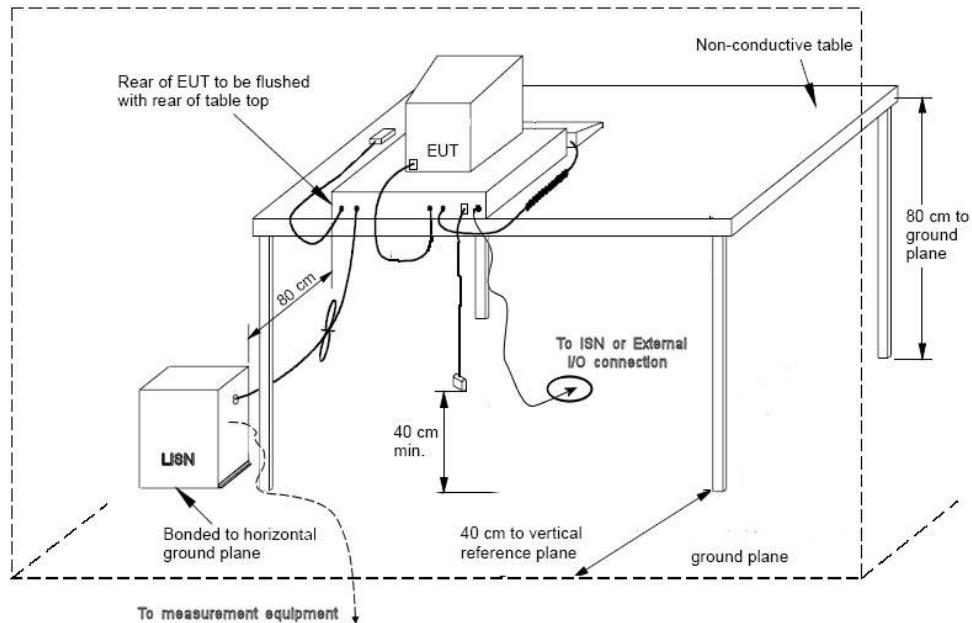
Note: If the Peak or Quasi Peak detector measurements do not exceed the Average limits, then the EUT is deemed to have passed the requirements.

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

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### Typical Setup Diagram



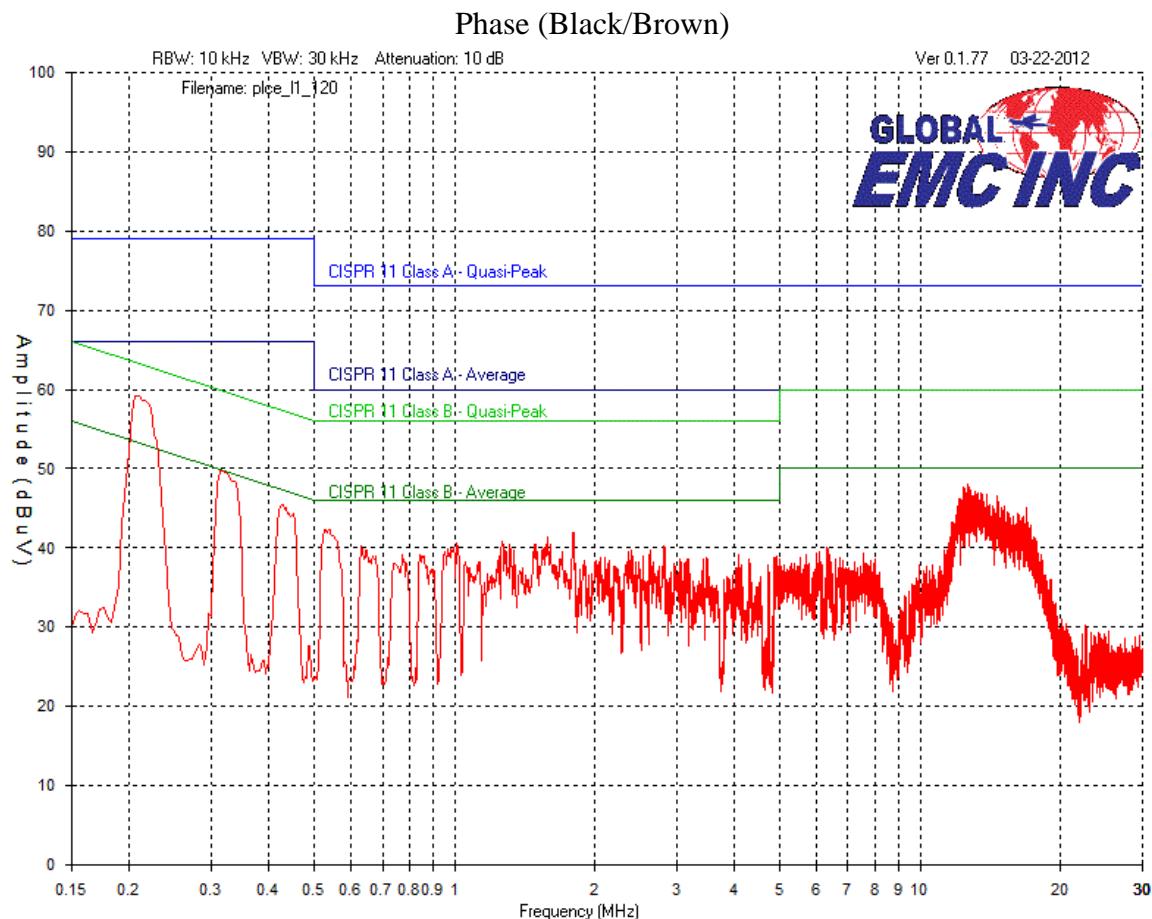
### Measurement Uncertainty

The expanded measurement uncertainty is calculated in accordance with CISPR 16-4-2 and is +/-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 graph shown below is a peak measurement graph, 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.

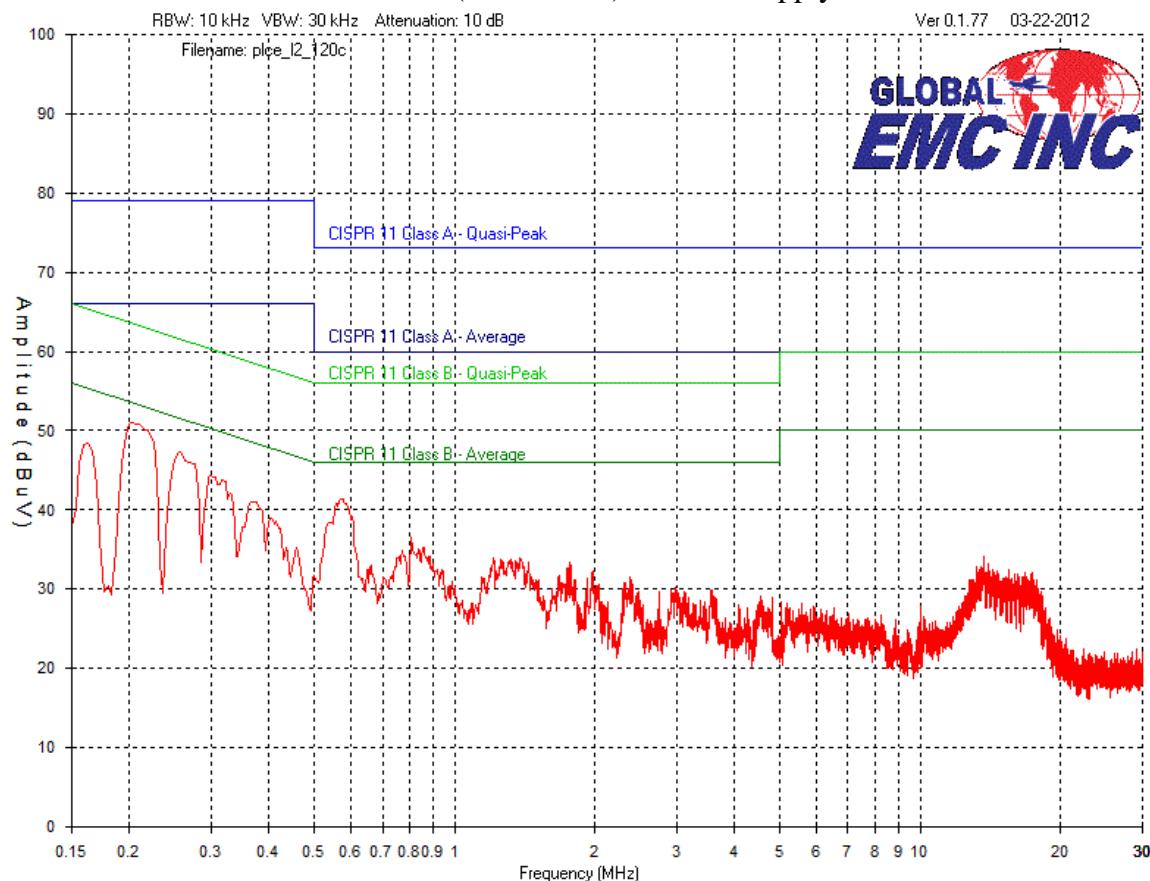
Client	<b>Savant Technologies</b>	
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### Neutral (White/Blue) – Power Supply



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## Final Measurements

Top 6 – Average – Line 1

Frequency	Raw AVG dBuV	Atten dBuV	Cable dB	LISN dB	AVG dBuV	Limit dBuV	Margin dB
0.20982	38.1	10	0.1	1	49.2	53.2	4
0.31617	29.1	10	0.1	0.5	39.7	49.8	10.1
0.42584	25.1	10	0.1	0.2	35.4	47.3	11.9
12.6789	27.4	10	0.3	0.3	38	50	12
12.4163	27.1	10	0.3	0.3	37.7	50	12.3
12.8185	26.7	10	0.3	0.3	37.3	50	12.7

Top 6 – Average – Line 2

Frequency	Raw AVG dBuV	Atten dBuV	Cable dB	LISN dB	AVG dBuV	Limit dBuV	Margin dB
0.20317	29.9	10	0.1	1	41	53.5	12.5
0.25635	26.4	10	0.1	0.7	37.2	51.5	14.3
0.57206	21.1	10	0.1	0.2	31.4	46	14.6
0.29955	23.8	10	0.1	0.5	34.4	50.3	15.9
0.16329	27	10	0.1	1.4	38.5	55.3	16.8
0.37266	20.7	10	0.1	0.3	31.1	48.4	17.3

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

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## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	ESL 6	Rohde & Schwarz	Oct-06, 2011	Oct-06, 2013	GEMC 160
LISN	FCC-LISN-50/250-16-2-01	FCC	Feb 03, 2011	Feb 03, 2013	GEMC 65
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
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"

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## **Radiated Emissions**

### **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:

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 (46.4 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

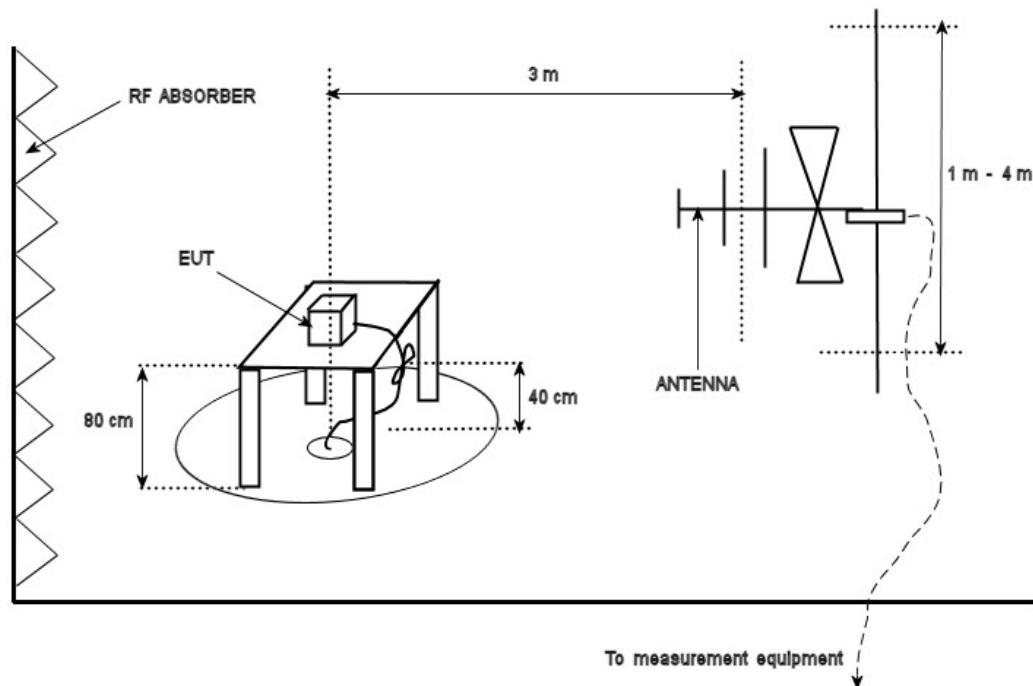
<sup>1</sup>Limit is with 120 kHz measurement bandwidth and a using a Quasi Peak detector.

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

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### Typical Radiated Emissions Setup



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## Measurement Uncertainty

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

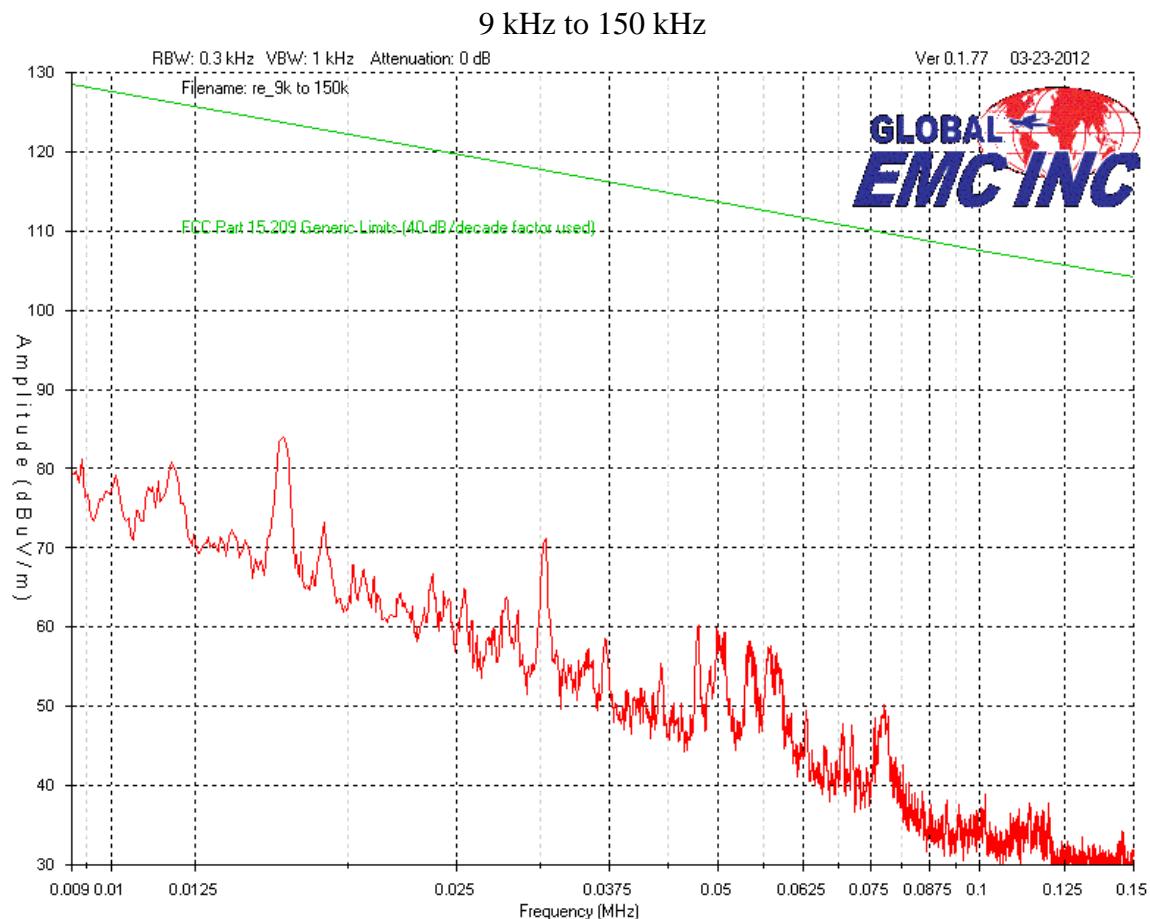
## Preliminary Graphs

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 graph shown below is a maximized peak measurement graph, measured with a resolution bandwidth greater than 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 ( a minimum of a 25 GHz).

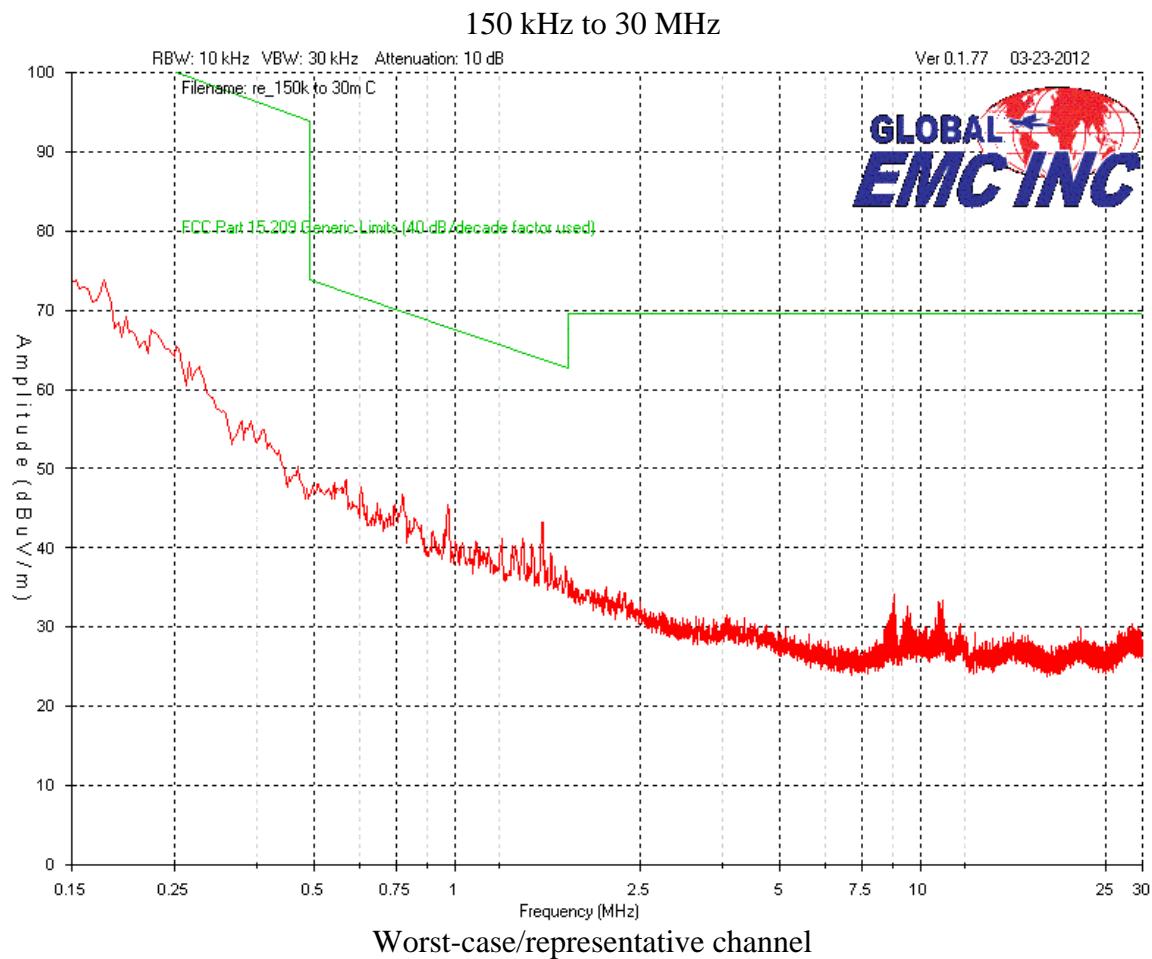
Devices scanned above 10 GHz were scanned at 1 meter test distance, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used.

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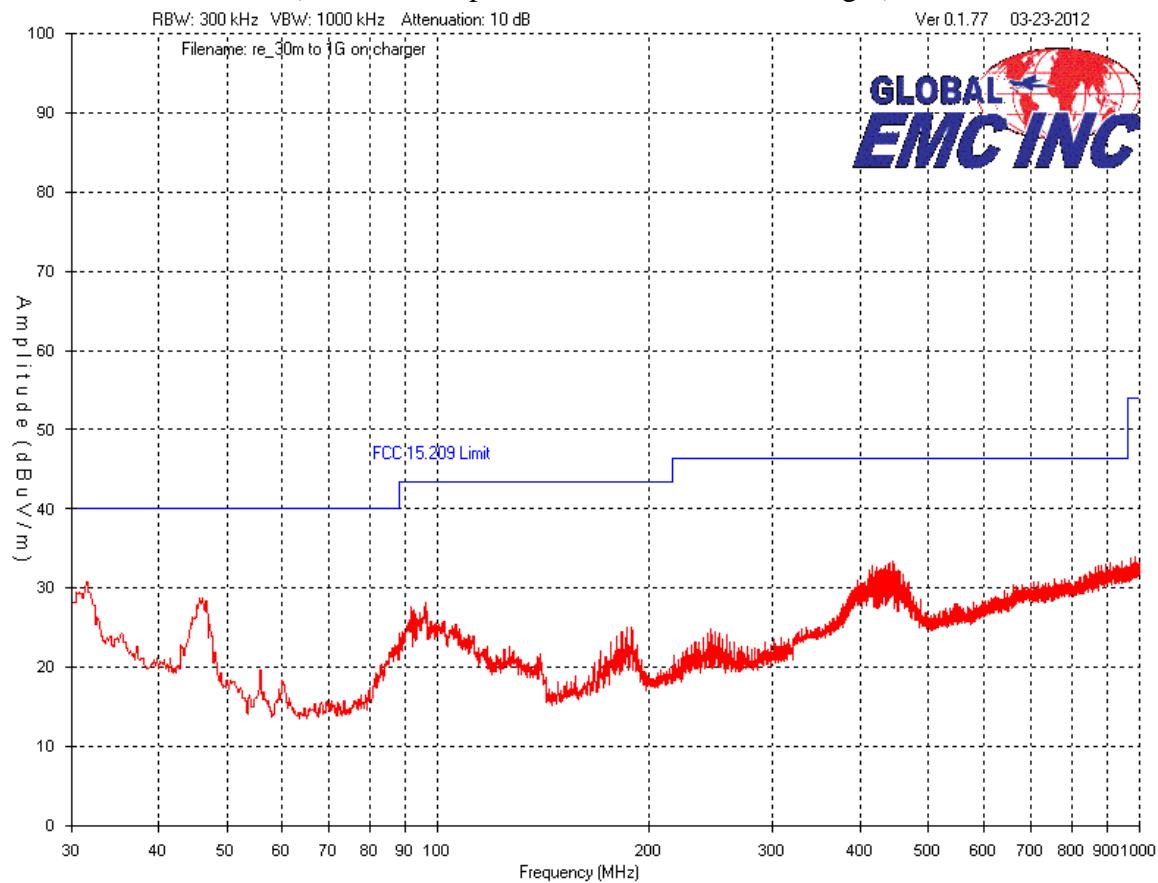
Worst-case/representative channel

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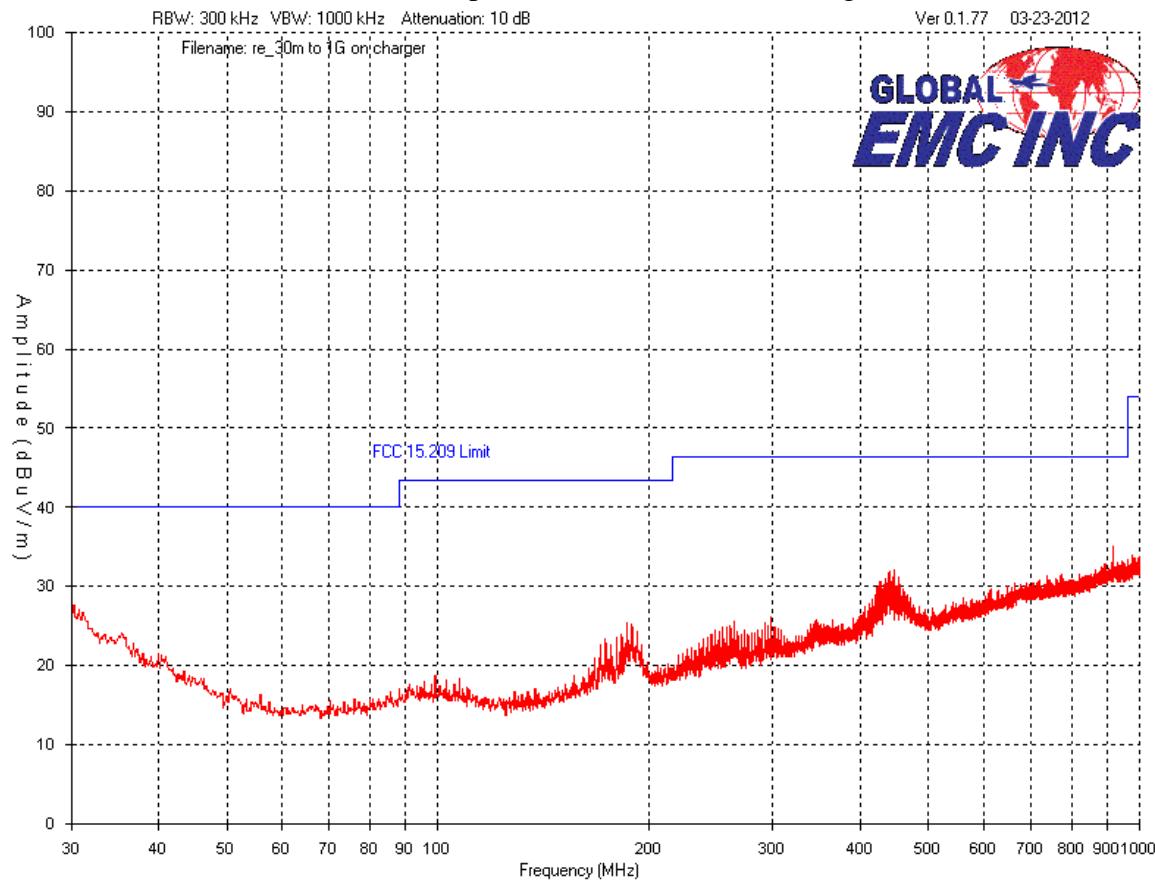
**Vertical – Peak Emissions Graph 30 MHz – 1 GHz**  
**(worst case/representative channel, on charger)**



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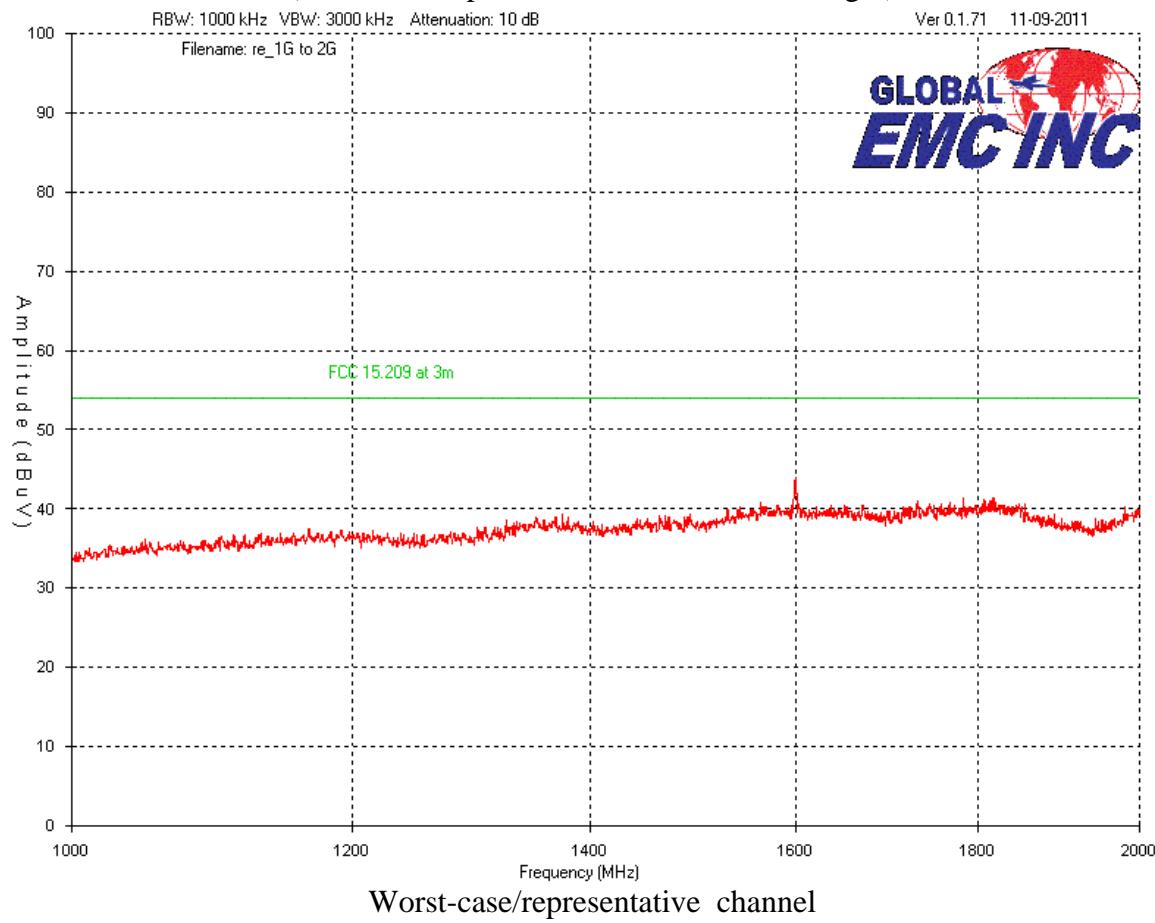


Horizontal – Peak Emissions Graph 30MHz to 1 GHz  
(worst case/representative channel, on charger)



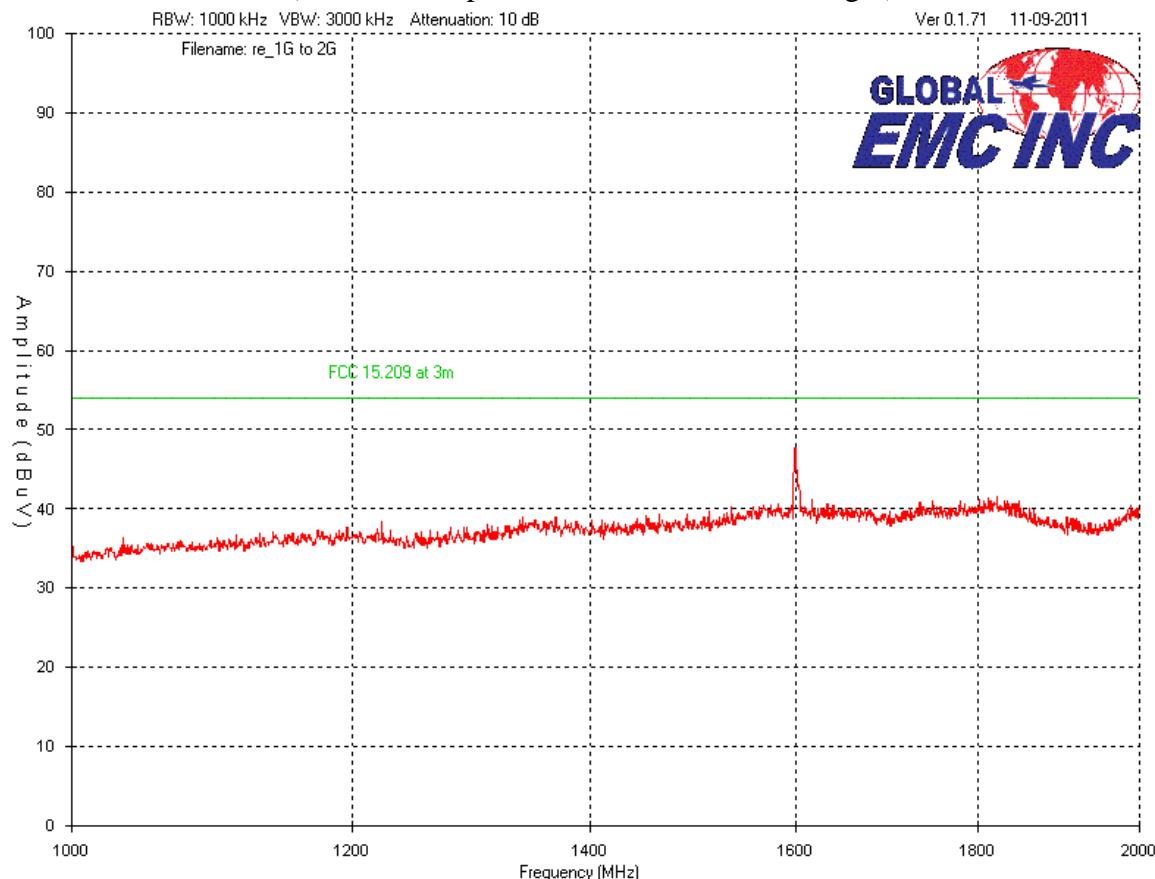
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**Vertical – 1GHz to 2 GHz**  
**(worst case/representative channel, off charger)**



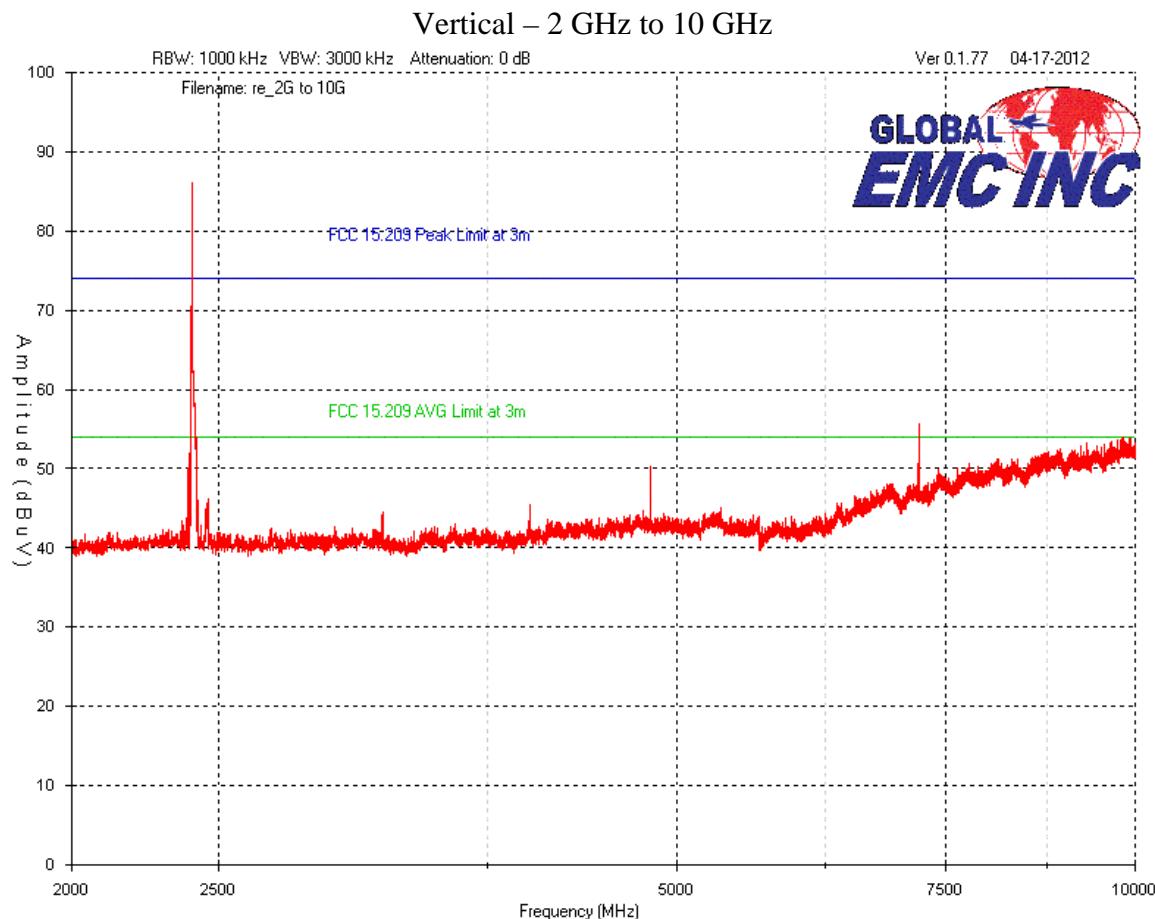
Client	<b>Savant Technologies</b>	
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**Horizontal – 1 GHz to 2 GHz**  
**(worst case/representative channel, off charger)**



Worst-case/representative channel

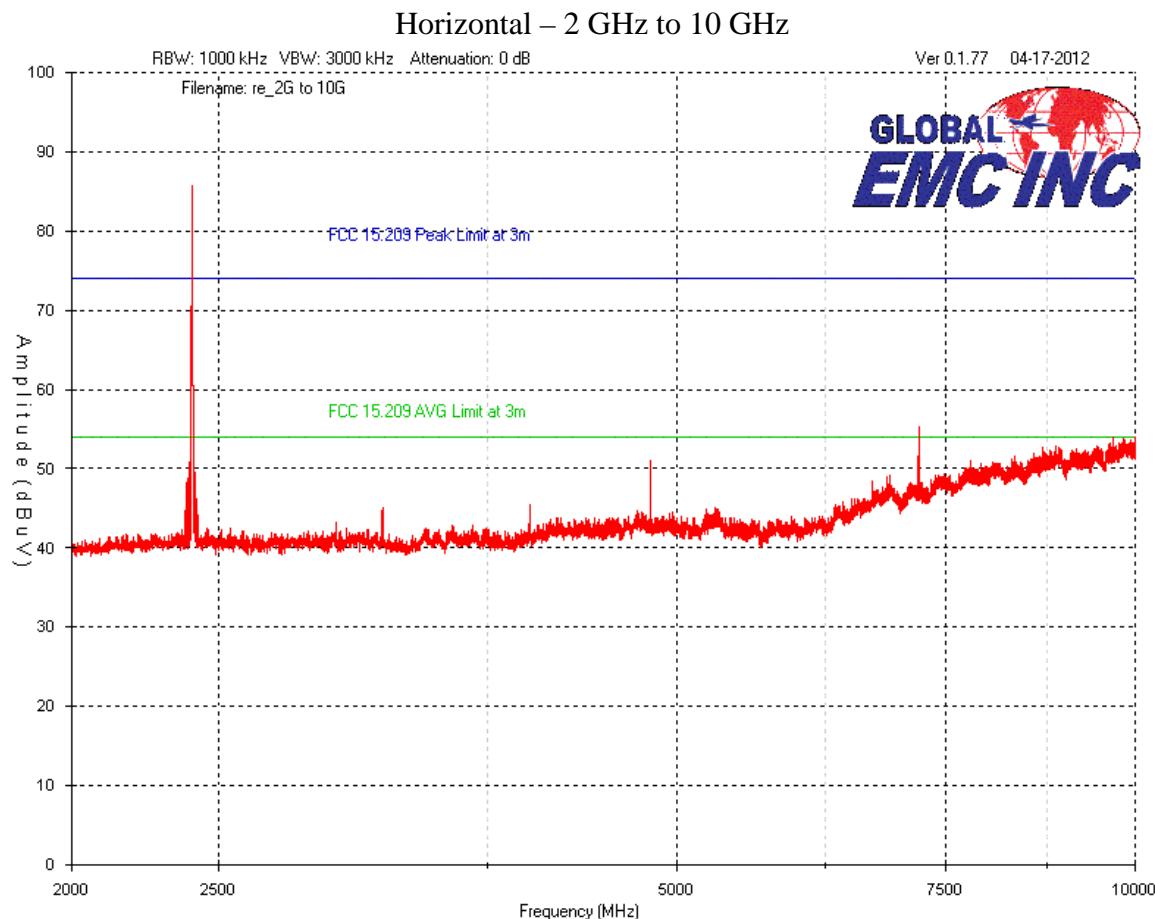
Client	<b>Savant Technologies</b>	
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The above graph represents low channel (channel 1) as representative of peak digital modulated emissions. See table for final maximized peak/average measurements.

Frequency range was scanned to 25 GHz, with no emissions detected above 10 GHz.

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The above graph represents low channel (channel 1) as representative of peak digital modulated emissions. See table for final maximized peak/average measurements.

Frequency range was scanned to 25 GHz, with no emissions detected above 10 GHz.

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## Final Measurements

### Average / Peak above 1 GHz

Note 1: 2398 MHz was worst-case emission between 2300 MHz and 2398 MHz.

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)	Emission limit dB(µV/m)	Margin dB(µV)	Result
Low Channel (1 – 2402)											
2402	Peak	Horz	89.3	30.6	2.2	0.0	36.2	85.9			PASS
2402	Avg	Horz	59.0	30.6	2.2	0.0	36.2	55.6			PASS
2402	Peak	Vert	89.4	30.6	2.2	0.0	36.2	86.0			PASS
2402	Avg	Vert	58.4	30.6	2.2	0.0	36.2	55.0			PASS
2400	Peak	Horz	56.6	30.6	2.2	0.0	36.2	53.2	74.0	20.8	PASS
2400	Avg	Horz	40.5	30.6	2.2	0.0	36.2	37.1	54.0	16.9	PASS
2400	Peak	Vert	57.1	30.6	2.2	0.0	36.2	53.7	74.0	20.3	PASS
2400	Avg	Vert	40.5	30.6	2.2	0.0	36.2	37.1	54.0	16.9	PASS
2398	Peak	Horz	75.8	30.6	2.2	0.0	36.2	72.4	74.0	1.6	PASS
2398	Avg	Horz	42.2	30.6	2.2	0.0	36.2	38.8	54.0	15.2	PASS
2398	Peak	Vert	76.2	30.6	2.2	0.0	36.2	72.8	74.0	1.2	PASS
2398	Avg	Vert	42.9	30.6	2.2	0.0	36.2	39.5	54.0	14.5	PASS
4804	Peak	Horz	48.7	33.7	2.9	0.0	35.7	49.6	74.0	24.4	PASS
4804	Avg	Horz	40.5	33.7	2.9	0.0	35.7	41.4	54.0	12.6	PASS
4804	Peak	Vert	49.4	33.7	2.9	0.0	35.7	50.3	74.0	23.7	PASS
4804	Avg	Vert	40.5	33.7	2.9	0.0	35.7	41.4	54.0	12.6	PASS
Mid Channel (39 – 2440)											
2440	Peak	Horz	88.2	30.6	2.2	0.0	36.2	84.8			PASS
2440	Avg	Horz	57.3	30.6	2.2	0.0	36.2	53.9			PASS
2440	Peak	Vert	88.1	30.6	2.2	0.0	36.2	84.7			PASS
2440	Avg	Vert	56.9	30.6	2.2	0.0	36.2	53.5			PASS
4880	Peak	Horz	48.2	33.7	2.9	0.0	35.7	49.1	74.0	24.9	PASS
4880	Avg	Horz	40.5	33.7	2.9	0.0	35.7	41.4	54.0	12.6	PASS
4880	Peak	Vert	49.3	33.7	2.9	0.0	35.7	50.2	74.0	23.8	PASS
4880	Avg	Vert	40.5	33.7	2.9	0.0	35.7	41.4	54.0	12.6	PASS
7320	Peak	Vert	48.7	37.9	4.3	0.0	35.9	55.0	74.0	19.0	PASS
7320	Avg	Vert	40.5	37.9	4.3	0.0	35.9	46.8	54.0	7.2	PASS
7320	Peak	Horz	48.3	37.9	4.3	0.0	35.9	54.6	74.0	19.4	PASS
7320	Avg	Horz	40.5	37.9	4.3	0.0	35.9	46.8	54.0	7.2	PASS

Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

High Channel (79 – 2480)										
2480	Peak	Horz	88.1	30.6	2.2	0.0	36.2	84.7		PASS
2480	Avg	Horz	56.8	30.6	2.2	0.0	36.2	53.4		PASS
2480	Peak	Vert	87.4	30.6	2.2	0.0	36.2	84.0		PASS
2480	Avg	Vert	56.3	30.6	2.2	0.0	36.2	52.9		PASS
2483.5	Peak	Horz	62.5	30.6	2.2	0.0	36.2	59.1	74.0	14.9
2483.5	Avg	Horz	40.5	30.6	2.2	0.0	36.2	37.1	54.0	16.9
2483.5	Peak	Vert	62.7	30.6	2.2	0.0	36.2	59.3	74.0	14.7
2483.5	Avg	Vert	40.5	30.6	2.2	0.0	36.2	37.1	54.0	16.9
4960	Peak	Horz	47.2	33.7	2.9	0.0	35.7	48.1	74.0	25.9
4960	Avg	Horz	40.5	33.7	2.9	0.0	35.7	41.4	54.0	12.6
4960	Peak	Vert	47.3	33.7	2.9	0.0	35.7	48.2	74.0	25.8
4960	Avg	Vert	40.5	33.7	2.9	0.0	35.7	41.4	54.0	12.6
7440	Peak	Vert	48.3	37.9	4.3	0.0	35.9	54.6	74.0	19.4
7440	Avg	Vert	40.5	37.9	4.3	0.0	35.9	46.8	54.0	7.2
7440	Peak	Horz	47.4	37.9	4.3	0.0	35.9	53.7	74.0	20.3
7440	Avg	Horz	40.5	37.9	4.3	0.0	35.9	46.8	54.0	7.2

Note 2: Frequency was scanned to 25 GHz.

Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Loop Antenna	EM 6871	Electro-Metrics	2011-01-31	2013-01-31	70
Loop Antenna	EM 6872	Electro-Metrics	2011-01-31	2013-01-31	71
Spectrum Analyzer	ESL6	Rohde & Schwarz	26-Oct-11	26-Oct-13	160
Quasi Peak Adapter	85650A	HP	2011-12-21	2013-12-21	7
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	141
BiLog Antenna	3142-C	ETS	17-Jan-11	17-Jan-13	GEMC 137
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	8/25/2010	8/25/2012	GEMC 6403
Q-Par 1.5-18 GHz Horn	6878/24	Q-par	8/25/2010	8/25/2012	GEMC 65
1-26G pre-amp	HP 8449B	HP	8/25/2010	8/25/2012	GEMC 68
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	<b>Savant Technologies</b>
Product	<b>Savant Remote ( SSR-2000)</b>
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



## ***6dB 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. This should be measured with a 100 kHz RBW and a 300 kHz VBW.

### **Results**

The EUT passed. The minimum 6 dB BW measured was 876 kHz

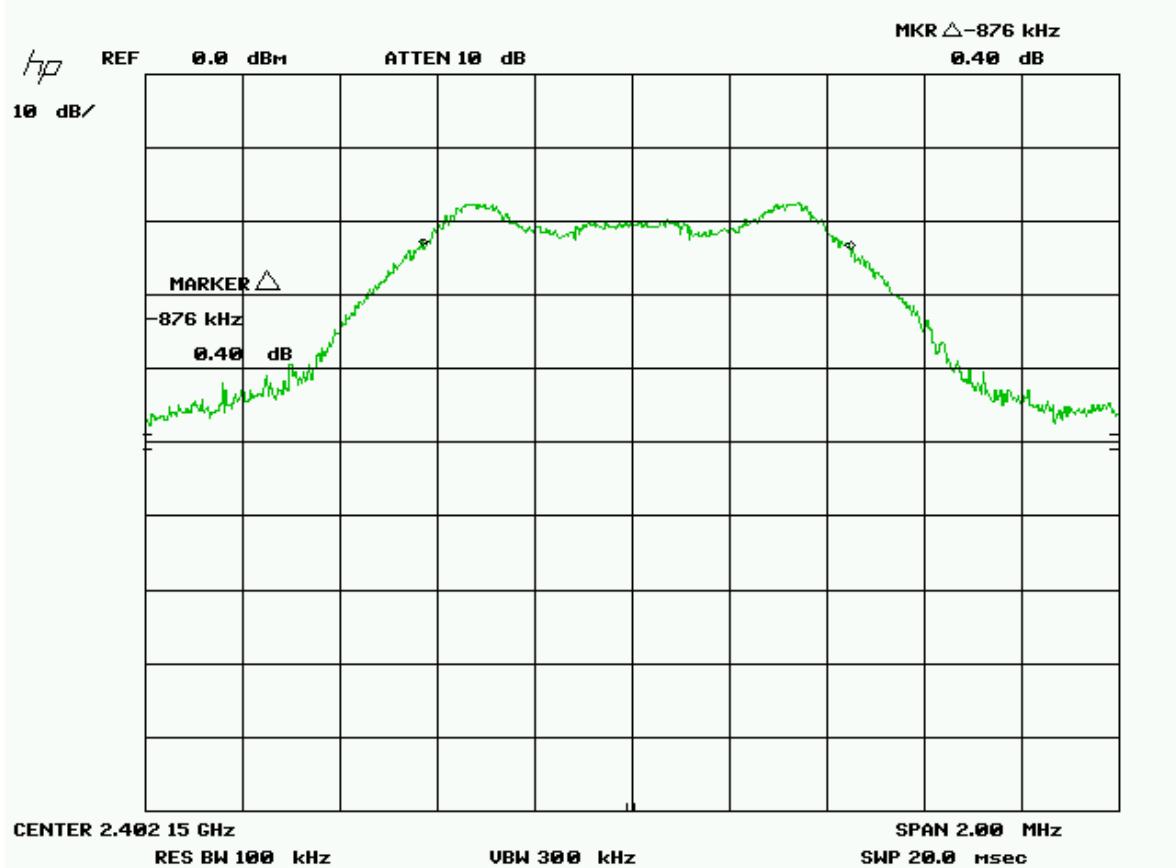
Client	Savant Technologies
Product	Savant Remote ( SSR-2000)
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



## Graph(s)

The graphs shown below shows the channel spacing 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 then 1 minute.

Test Graph



$$6 \text{ dB BW} = 876 \text{ kHz}$$

$$20 \text{ dB BW} = 1.25 \text{ MHz}$$

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

Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	141
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

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

Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## ***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.

### **Results**

The EUT passed. The peak power measured was -6.5 dBm (0.22 mW)

Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## Table(s)

The tables shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT.

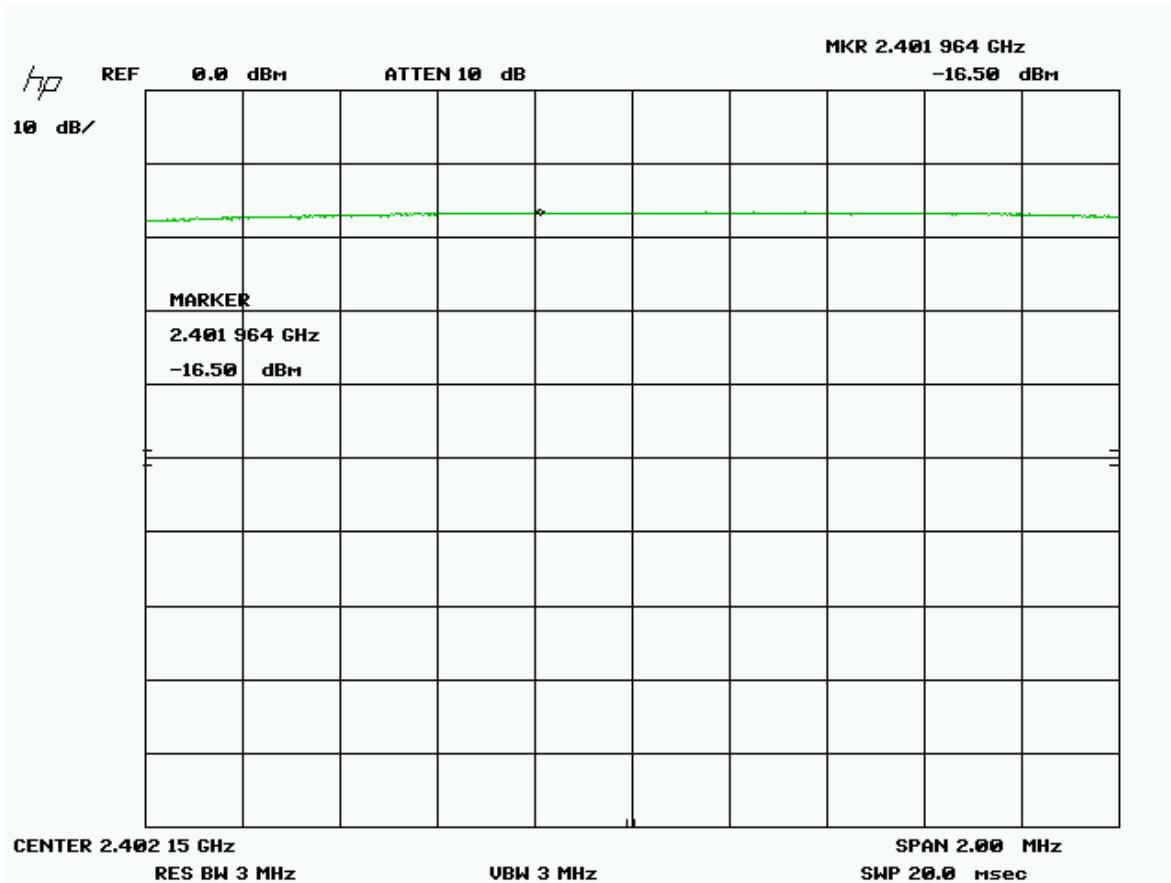
Band	Channel	Frequency (GHz)	Reading (dBm)
Low	1	2.402	-6.5
Medium	40	2.440	-8.1
High	79	2.480	-8.4

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

Client	Savant Technologies
Product	Savant Remote ( SSR-2000)
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



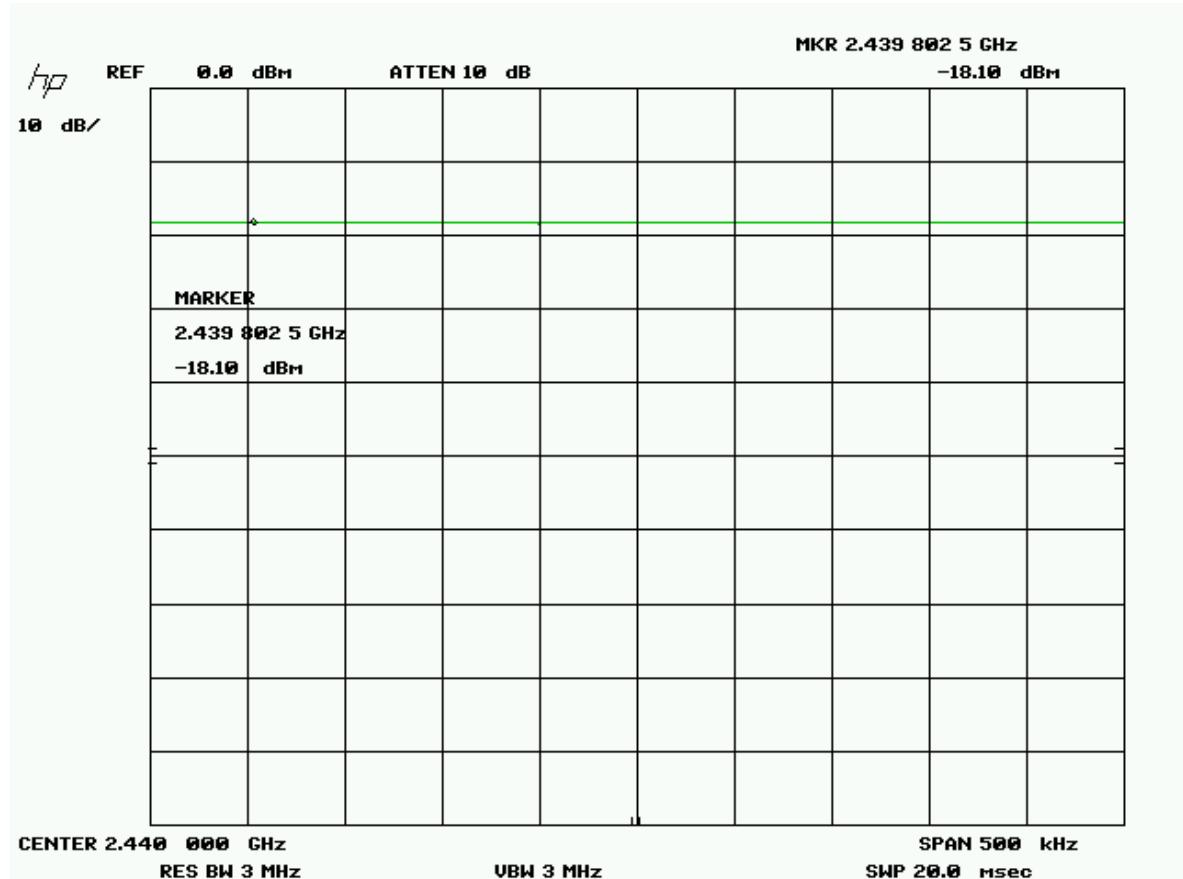
Low



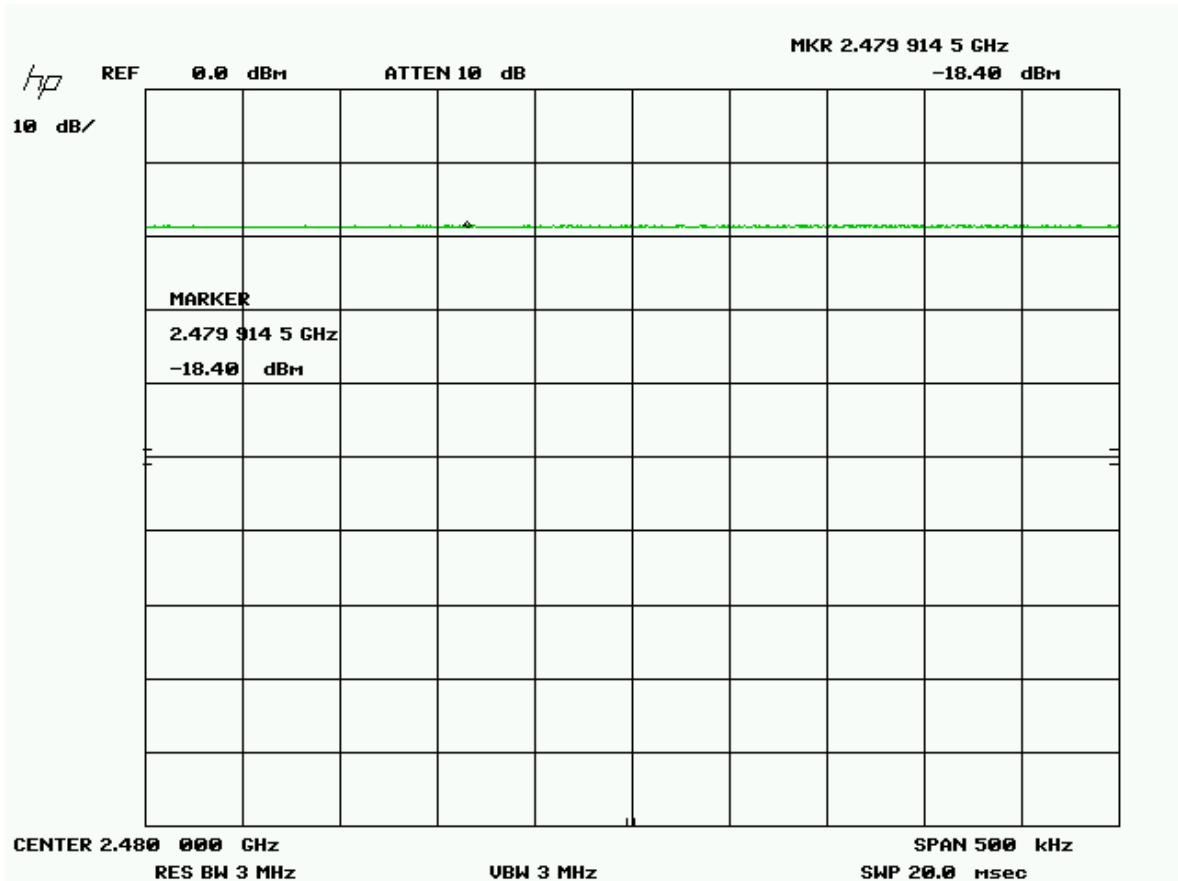
Client	Savant Technologies
Product	Savant Remote ( SSR-2000)
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



Middle



Client	Savant Technologies
Product	Savant Remote ( SSR-2000)
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



Client	Savant Technologies	
Product	Savant Remote ( SSR-2000)	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	141
Power Head	PH 2000	AR	2011-01-31	2013-01-31	GEMC 15
Power meter	PM 2002	AR	2011-01-31	2013-01-31	GEMC 16
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29

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

Client	<b>Savant Technologies</b>
Product	<b>Savant Remote ( SSR-2000)</b>
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



## ***Spurious Conducted Emissions***

### **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.

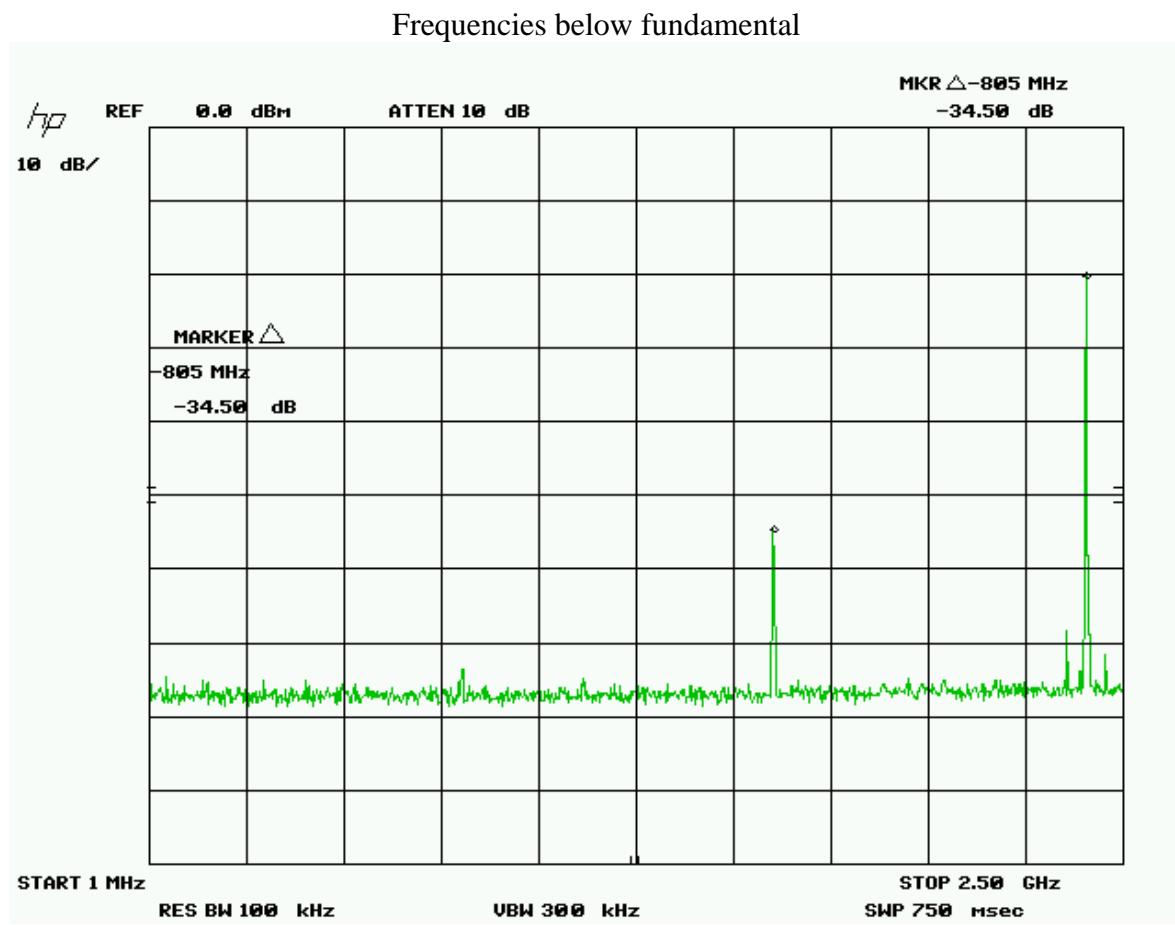
### **Results**

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

Client	Savant Technologies	
Product	Savant Remote ( SSR-2000)	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## Graph(s)

The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. Note there was 20 dB of external attenuation taken during this measurement.



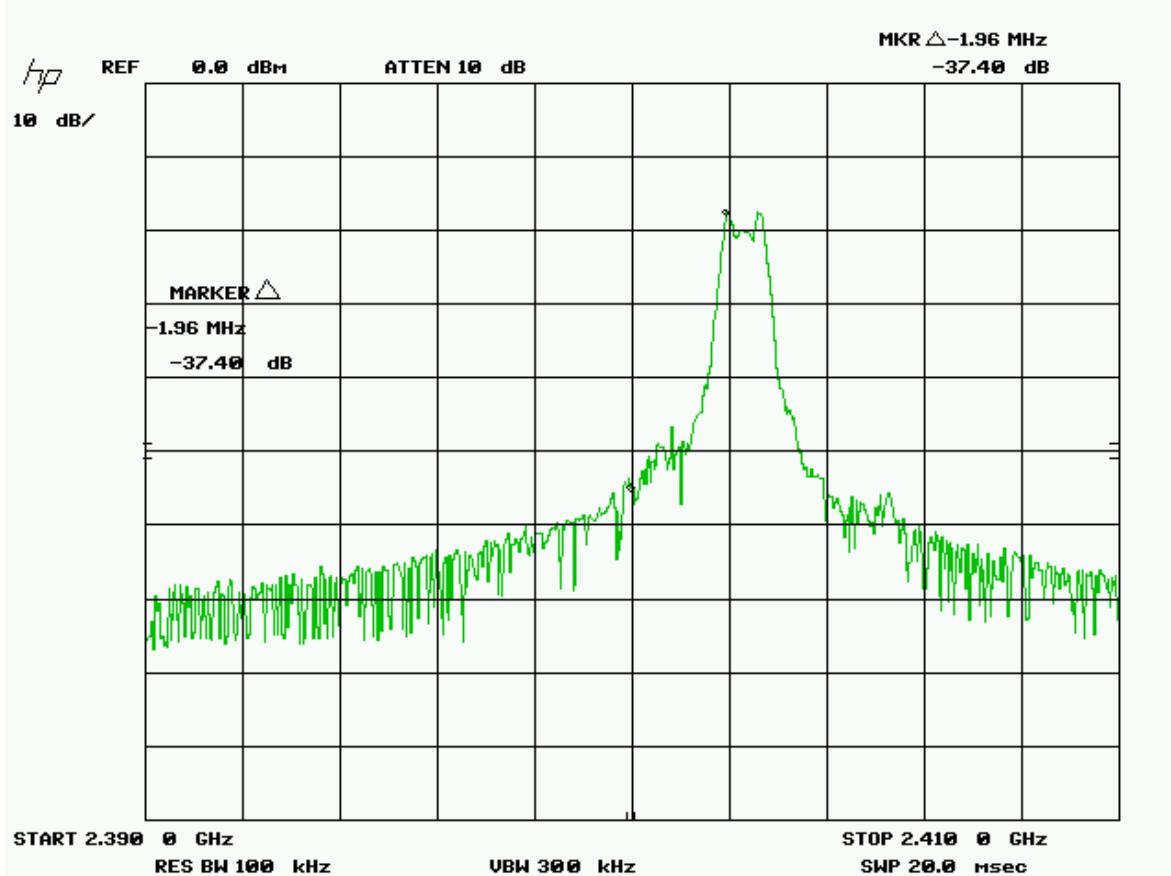
(Low channel – worst case)

Client	Savant Technologies
Product	Savant Remote ( SSR-2000)
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



Frequencies below fundamental

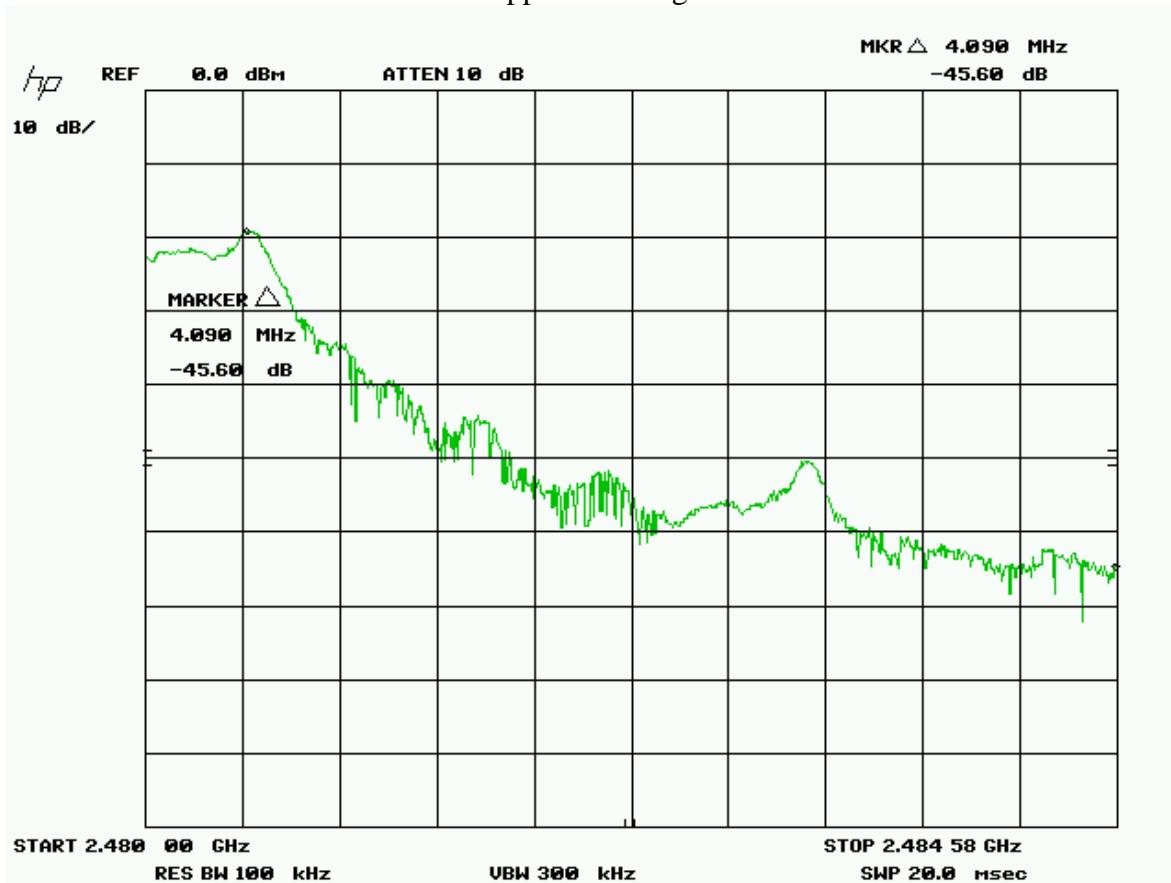
lower band edge



Client	Savant Technologies
Product	Savant Remote ( SSR-2000)
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



upper band edge

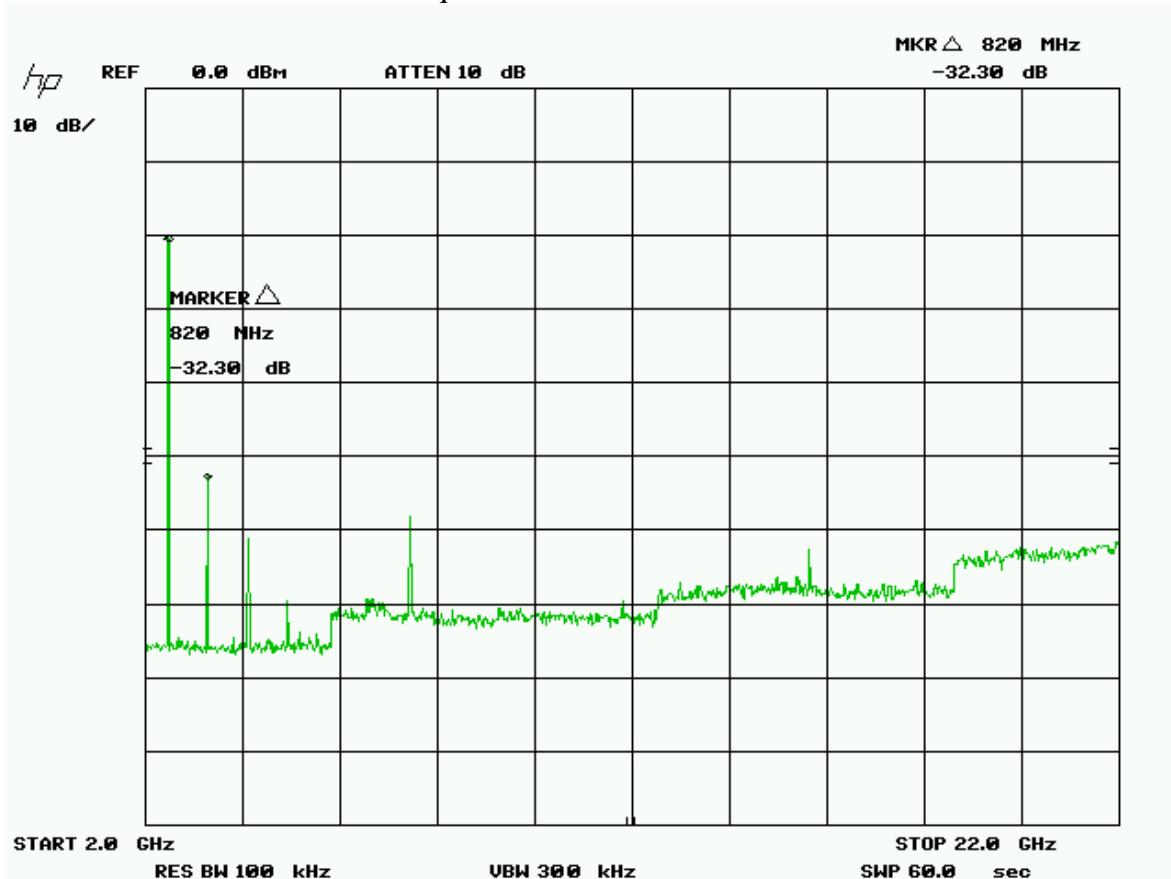


Note: 2483.5 MHz can be determined to be more than -20 dBc from the graph above. The approximate minimum level of -30 dBc for all frequencies exceeding 2482 MHz is shown above.

Client	Savant Technologies
Product	Savant Remote ( SSR-2000)
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



### Frequencies above fundamental



### High channel – Worst case

The frequency range of 22 – 25 GHz, the 10<sup>th</sup> harmonic and 9<sup>th</sup> harmonic where applicable, was additionally scanned. No emissions were detected at the 9<sup>th</sup> and 10<sup>th</sup> harmonic.

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

Client	Savant Technologies	
Product	Savant Remote ( SSR-2000)	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 1 dB	FP-50-1	Trilithic	NCR	NCR	GEMC 38
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Attenuator 6 dB	FP-50-6	Trilithic	NCR	NCR	GEMC 41
Attenuator 10 dB	FP-50-10	Trilithic	NCR	NCR	GEMC 42
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	141
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

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

Client	<b>Savant Technologies</b>
Product	<b>Savant Remote ( SSR-2000)</b>
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



## ***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.

### **Results**

The EUT passed. Each mode was tested at low, medium, and high band. The worst case value is -27.1 dBm as measured with a 3 kHz resolution bandwidth (peak power). Note that the peak power does not exceed 8 dBm.

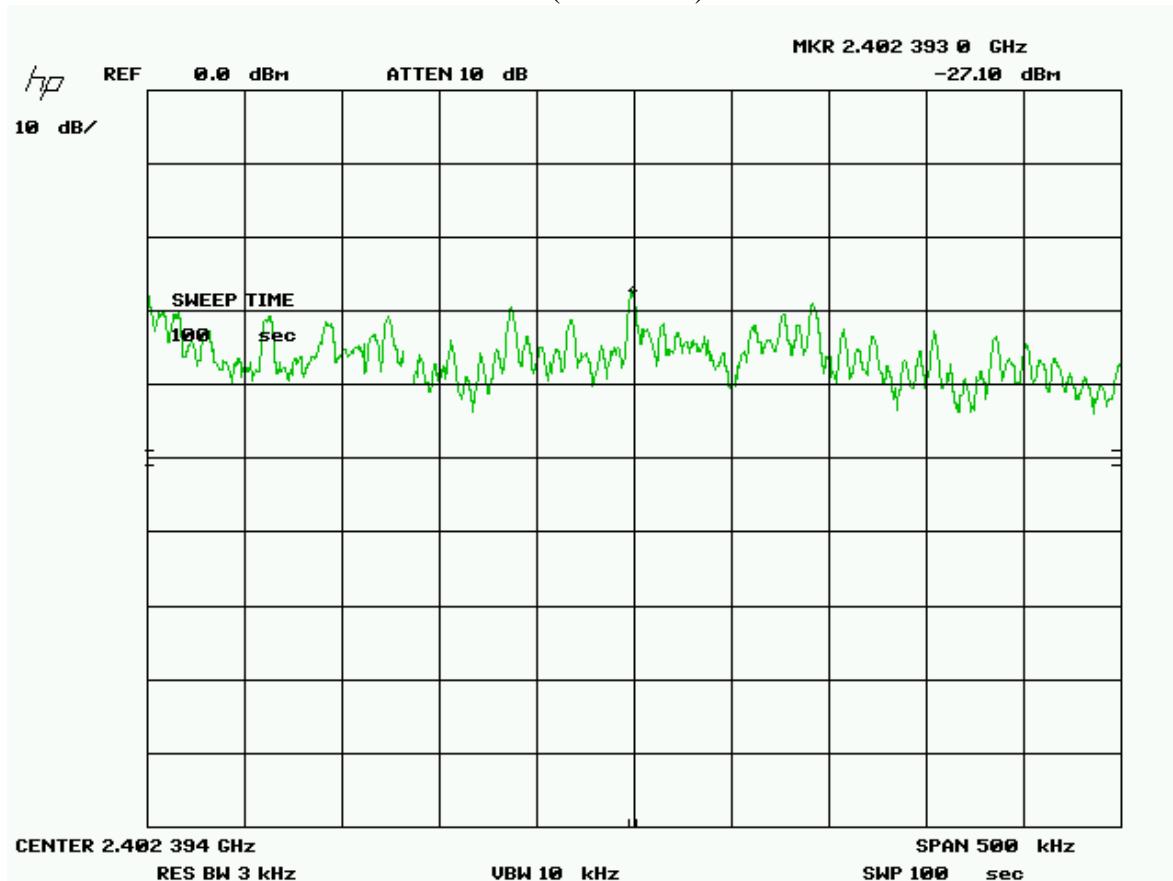
### **Graph(s)**

The graphs shown below show the power spectral density of the device during the conducted measurement operation of the EUT. Low, middle, and high channel was investigated in each mode, with the worst case being presented.

Client	Savant Technologies
Product	Savant Remote ( SSR-2000)
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



Low (worst case)



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

Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	141
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

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

Client	Savant Technologies	
Product	Savant Remote ( SSR-2000)	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

## Appendix A – EUT Summary

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

### General EUT Description

<b>Manufacturer</b>	Savant Technologies
<b>EUT Name</b>	Remote
<b>FCCID</b>	ASU- SSR2000
<b>IC #</b>	10052A- SSR2000
<b>Approximate Size (LxWxH)</b>	
<b>Equipment Category (Commercial / Residential / Medical)</b>	Residential
<b>Input Voltage and Frequency</b>	5Vdc, 1A
<b>Intentional RF ( If yes describe )</b>	Yes – Proprietary Digital modulation
<b>Table Top / Wall mount / Floor standing (choose table top if unsure)</b>	Portable
<b>I/O Connectors available on EUT</b>	
<b>Peripherals required for test</b>	n/a
<b>Minimum Separation distance from operator</b>	n/a
<b>Types and lengths of all I/O cables</b>	

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	<b>Savant Technologies</b>
Product	<b>Savant Remote ( SSR-2000)</b>
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



The logo for Global EMC Inc. features the word "GLOBAL" in blue capital letters at the top, with a red globe icon containing a white star and a blue "EMC" in the center. Below "EMC" is the word "INC" in blue capital letters.

## **Appendix B – EUT and Test Setup Photographs**

Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

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

#### Power Line Conducted Emissions - 1



Client	<b>Savant Technologies</b>
Product	<b>Savant Remote ( SSR-2000)</b>
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



## Power Line Conducted Emissions - 2



Client	<b>Savant Technologies</b>	
Product	<b>Savant Remote ( SSR-2000)</b>	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

### Radiated Emissions - 9 kHz to 30 MHz



Client	<b>Savant Technologies</b>
Product	<b>Savant Remote ( SSR-2000)</b>
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



### Radiated Emissions – 30 MHz to 2 GHz



Client	<b>Savant Technologies</b>
Product	<b>Savant Remote ( SSR-2000)</b>
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



Radiated Emissions – Close up



Client	<b>Savant Technologies</b>
Product	<b>Savant Remote ( SSR-2000)</b>
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010



Antenna Conducted Measurements.

