

Global EMC Inc. Labs EMC & RF Test Report

As per

RSS 210 Issue 8:2010

&

FCC Part 15 Subpart C:2011

Unlicensed Intentional Radiators

on the

**4iii Innovations
Sport-iiis SP200**



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Testing produced for



See **Appendix A** for full customer & EUT details.



Client	4iiii Innovations Inc.	
Product	SP200	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Table of Contents

Table of Contents	2
Report Scope	3
Summary	4
Test Results Summary	5
Justifications, Descriptions, or Deviations.....	6
Applicable Standards, Specifications and Methods.....	7
Sample calculation(s).....	8
Document Revision Status	8
Definitions and Acronyms	9
Testing Facility	10
Calibrations and Accreditations.....	10
Testing Environmental Conditions and Dates	11
Detailed Test Results Section	12
Radiated Emissions.....	13
Appendix A – EUT Summary.....	32
Appendix B – EUT and Test Setup Photographs.....	33

Client	4iiii Innovations Inc.	
Product	SP200	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Report Scope

This report addresses the EMC verification testing and test results of the 4iiii Innovations Sport iiiis SP200, 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 15:2011

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.

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Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

Summary

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

EUT FCC Certification #, FCC ID:	ZZNSP200
EUT Industry Canada Certification #, IC:	9896A-SP200
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Raymond Lee Au

Client	4iiii Innovations Inc.	
Product	SP200	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	

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 RSS 210	Power Line Conducted Emissions	QuasiPeak Average	Pass See Justifications
FCC 15.209 RSS-210 (Table 2)	Spurious Radiated emissions	QuasiPeak Average	Pass
FCC 15.249(a) RSS-210 A2.9(a)	Fundamental/Harmonic limits	Peak Average	Pass
Overall Result			PASS

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All tests were performed by Raymond Lee Au.

If the product as tested or otherwise complies with the specification, the EUT is deemed to comply with the requirement and is deemed a 'PASS' grade. If not 'FAIL' grade will be issued. Note that 'PASS' / 'FAIL' grade is independent of any measurement uncertainties. 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), this device uses a wire antenna soldered onto the PCB inside the enclosure, and has no provisions for end-user replacement.

For the Restricted Bands of operation, the EUT is designed to only operate between 2.4 to 2.4835 GHz band.

The EUT does not transmit while connected via USB. A separate letter of attestation for declaration of conformity compliance has been submitted.


For the power line conducted emissions requirements, the EUT is powered by a non-user replaceable internal battery, charged by USB while the wireless is not operating. This test does not apply as part of the wireless certification.

For maximum permissible exposure, this device does not exceed the $60 / f$ (GHz) in mW limit as per FCC KDB 447498 2(a)(i), so it is allowable to be used in portable exposure conditions with no restrictions on host platforms.

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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 22:2008 - 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
- FCC KDB 558074 - FCC KDB 558074 Digital Transmission Systems, measurements and procedures (Revision 2)
- RSS 210:2010 - Issue 8: Spectrum Management and Telecommunications Radio Standards Specification Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

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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

Revision 1 - November 28, 2012

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Definitions and Acronyms

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

AE – Auxillary Equipment.

BW – Bandwidth. Unless otherwise stated, this 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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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)
Nov. 12-13, 2012	All	RA	20-25°C	30-45%	100 -103kPa

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Detailed Test Results Section

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Radiated Emissions

Purpose

The purpose of these tests is to ensure that the RF energy 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. RF energy unintentionally emitted from the EUT, and the intentionally emitted fundamental and its harmonics, have limits as shown below.

Limit(s) and Method

The method is as defined in ANSI C63.4:2003 and as per applicable standards.

For the fundamental and harmonics, the limits are as defined in FCC Part 15, Section 15.249 (at 3 m):

Fundamental frequency	Field strength limit of fundamental ²	Field strength limit of harmonics ²
2400-2483.5 MHz	50 mV/m (93.97 dBuV/m)	500 uV/m (53.87 dBuV/m)


For other spurious emissions, the limits are as defined in FCC Part 15, Section 15.209:

30 MHz – 88 MHz, 100 uV/m (40.0 dBuV/m¹) at 3 m
88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m¹) at 3 m
216 MHz – 960 MHz, 200 uV/m (46.4 dBuV/m¹) at 3 m
Above 960 MHz, 500 uV/m (54.0 dBuV/m¹) at 3 m
Above 1000 MHz, 500 uV/m (54 dBuV/m²) at 3m

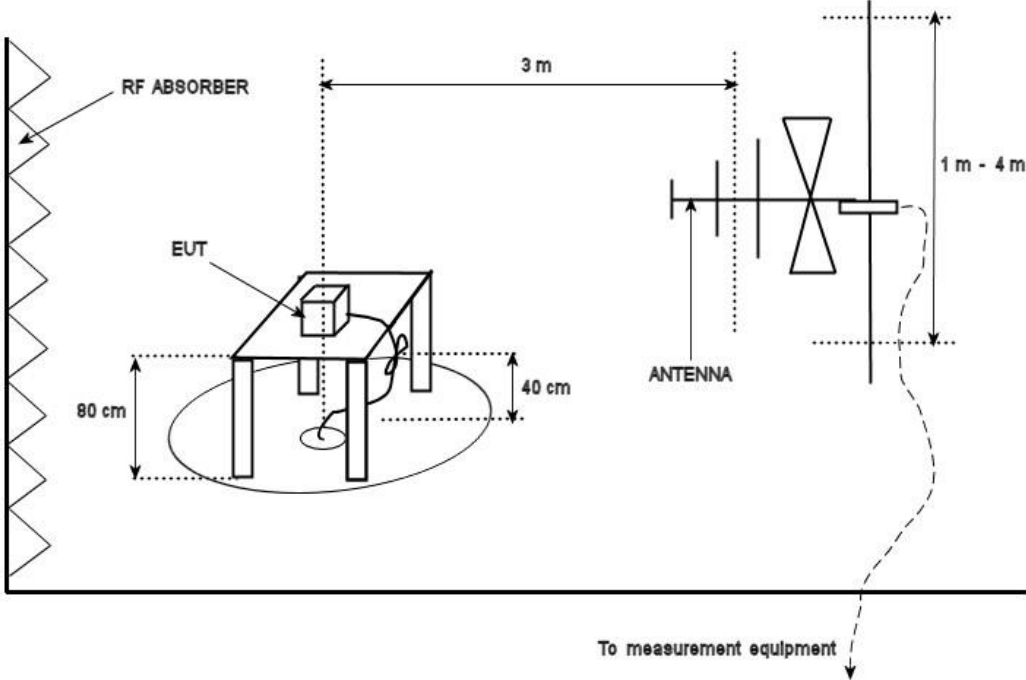
Peak field strengths are limited to be at most 20 dB above the average limits as defined above at the corresponding frequencies.


¹Limit is with 120 kHz measurement bandwidth and a using a Quasi Peak detector.

²Limit is with 1 MHz measurement bandwidth and using an Average detector. Where an average detector is stated, a peak limit of 20 dB higher additionally applies.

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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


The graphs shown below are peak scans 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 10th harmonic (a minimum of 26 GHz). No emissions were detected above 18GHz.

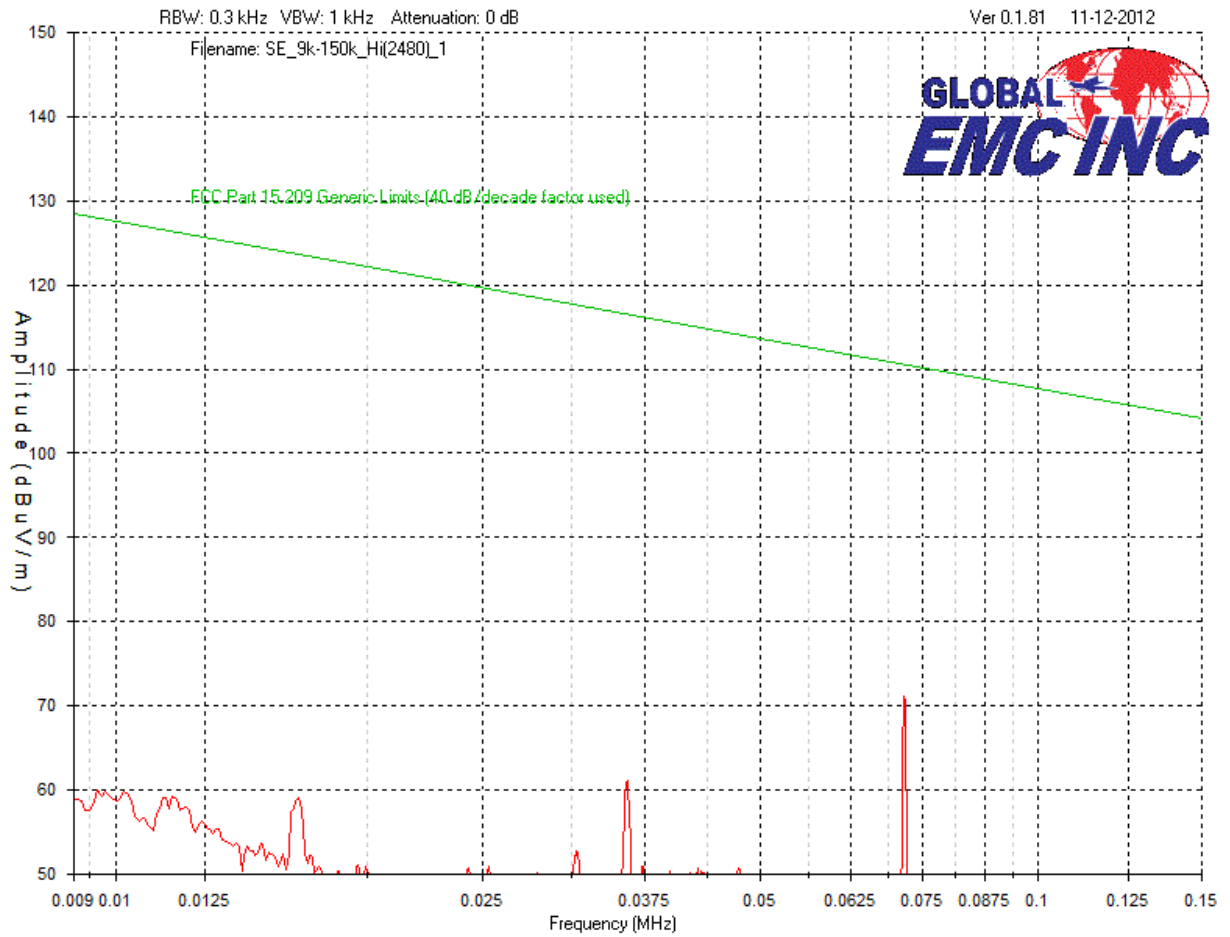
Low, middle, and high modes were investigated. The worst case graphs are presented.


Emissions are also verified at the band edges, and shown in the *Final Measurements* table.

Receiver mode was detected to be identical, with the exception of the fundamental.

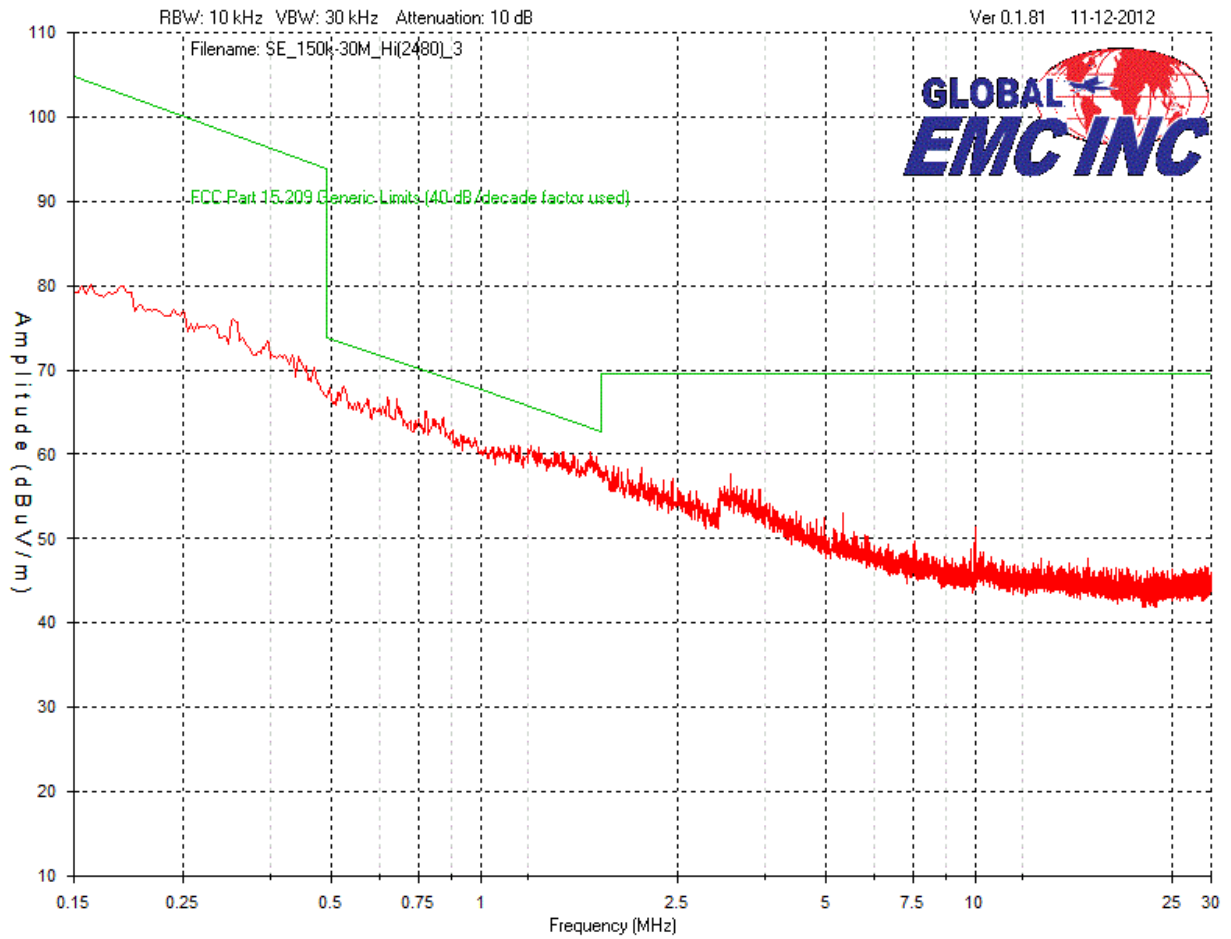
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Peak Emissions Graph – High Channel, 9 kHz – 150 kHz



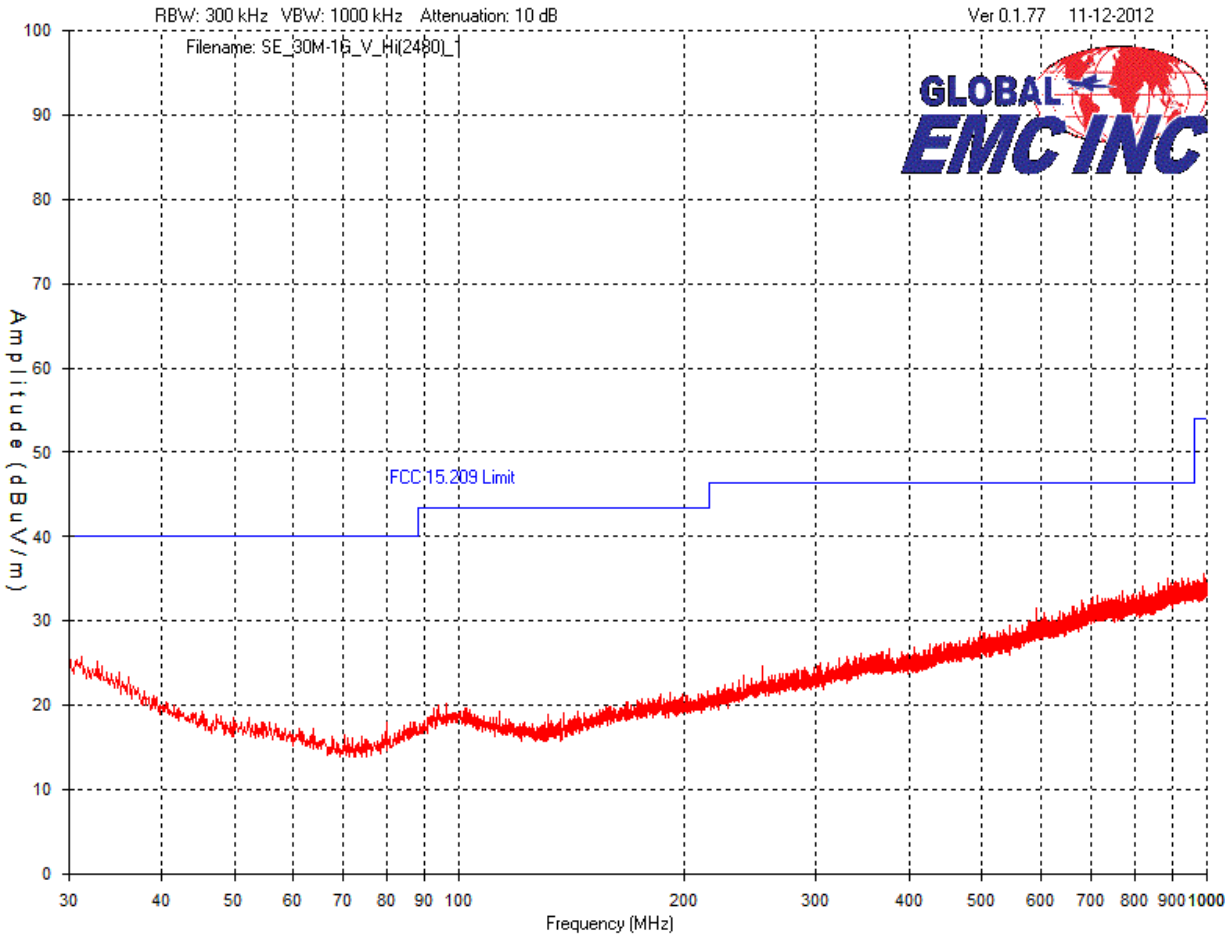
Client	4iiii Innovations Inc.	
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Peak Emissions Graph – High Channel, 150 kHz – 30 MHz



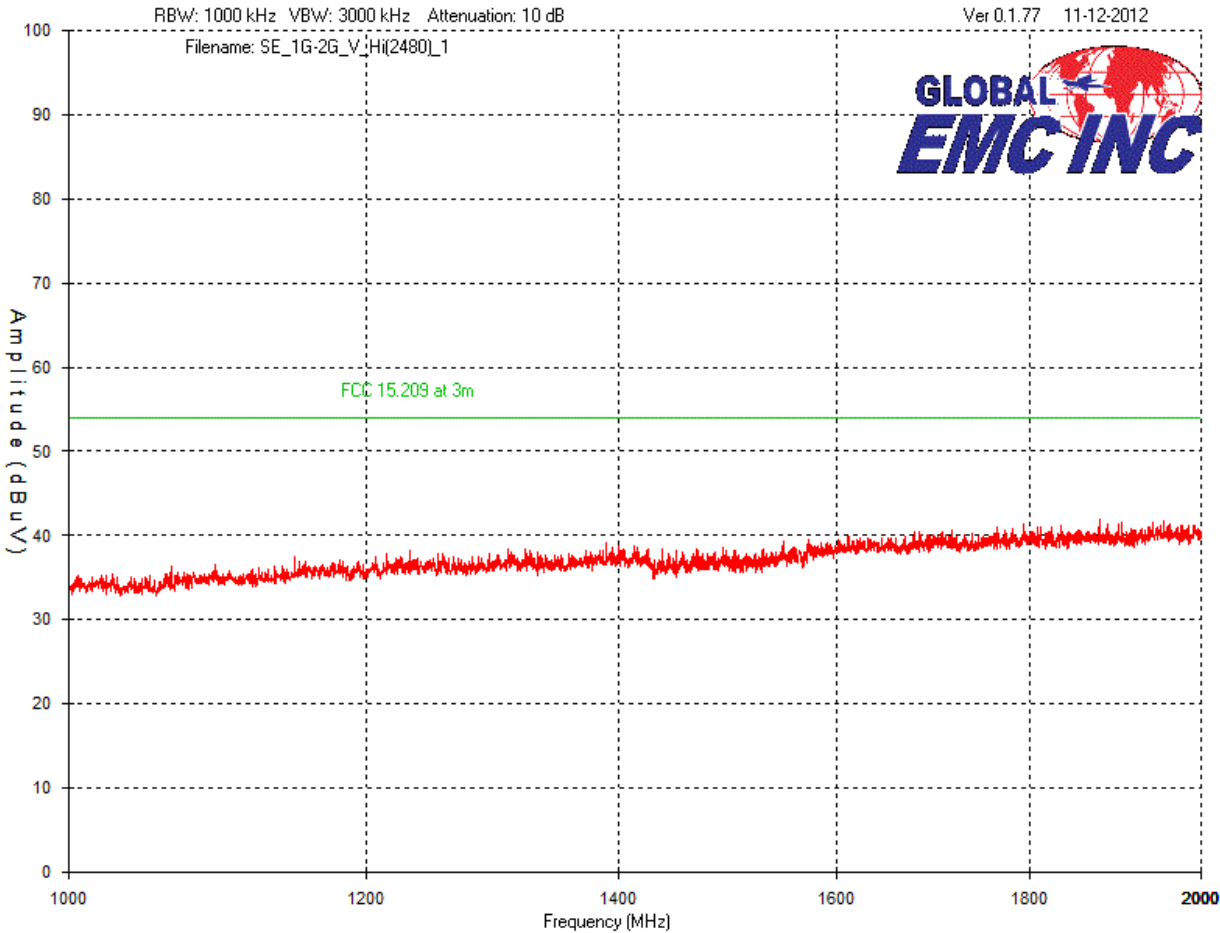
Client	4iiii Innovations Inc.	
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Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Vertical – Peak Emissions Graph – High Channel, 30 MHz – 1 GHz



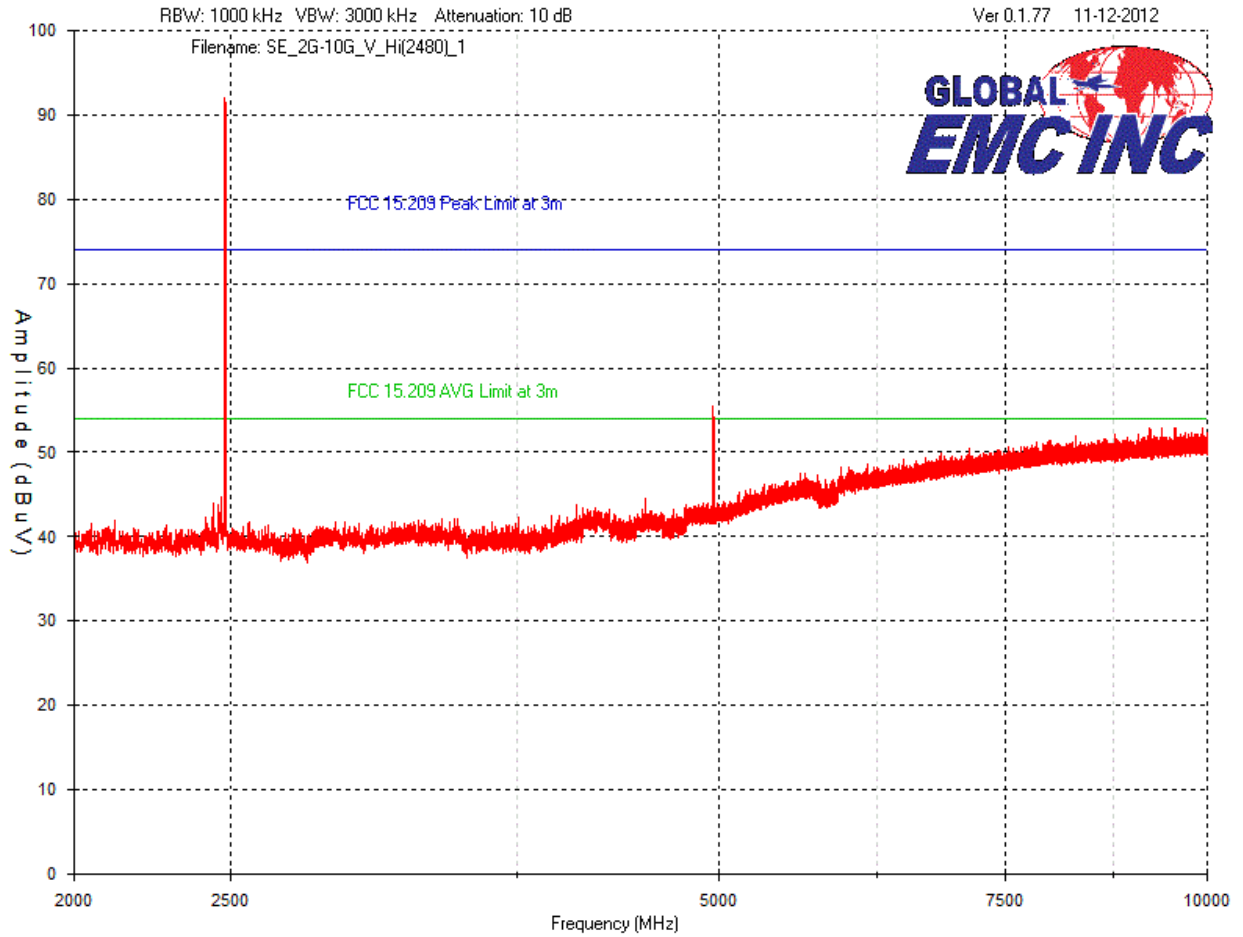
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Vertical – Peak Emissions Graph – High Channel, 1 GHz – 2 GHz




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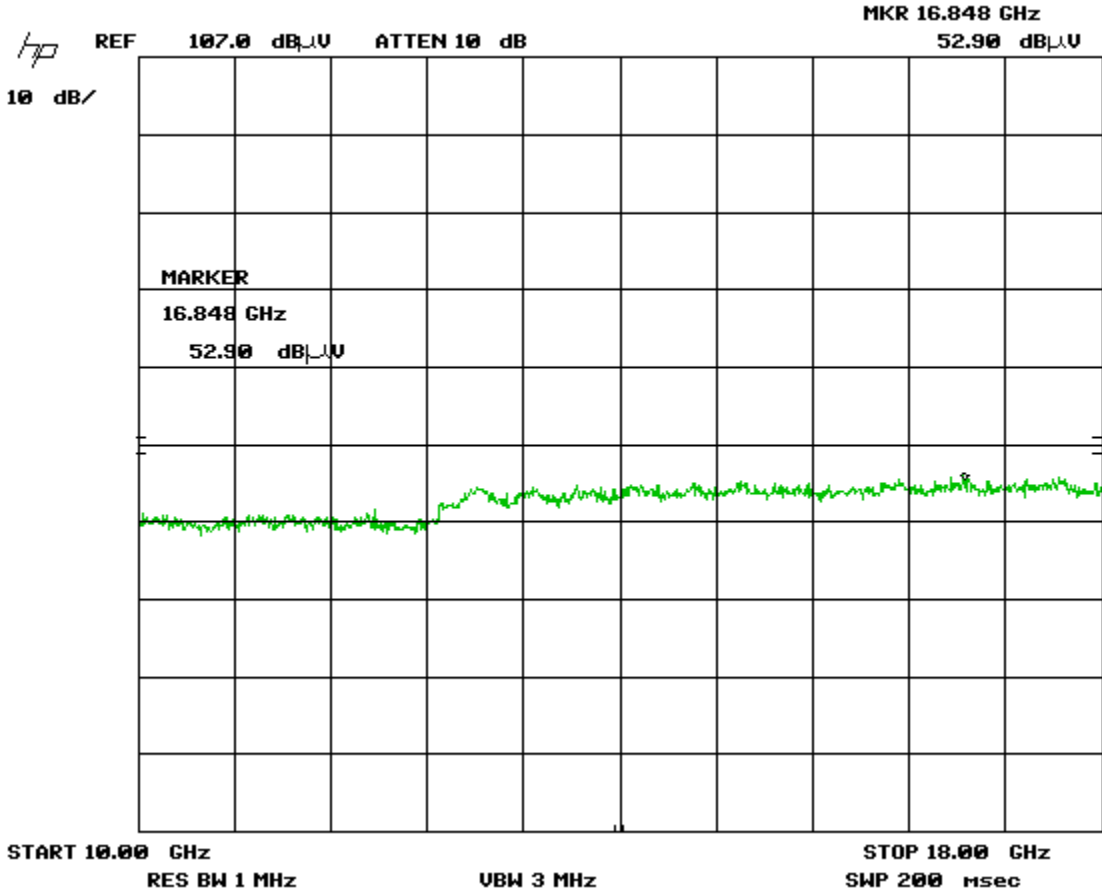
Vertical – Peak Emissions Graph – High Channel, 2 GHz – 10 GHz




Receiver mode was detected to be identical, with the exception of the fundamental and related harmonic.

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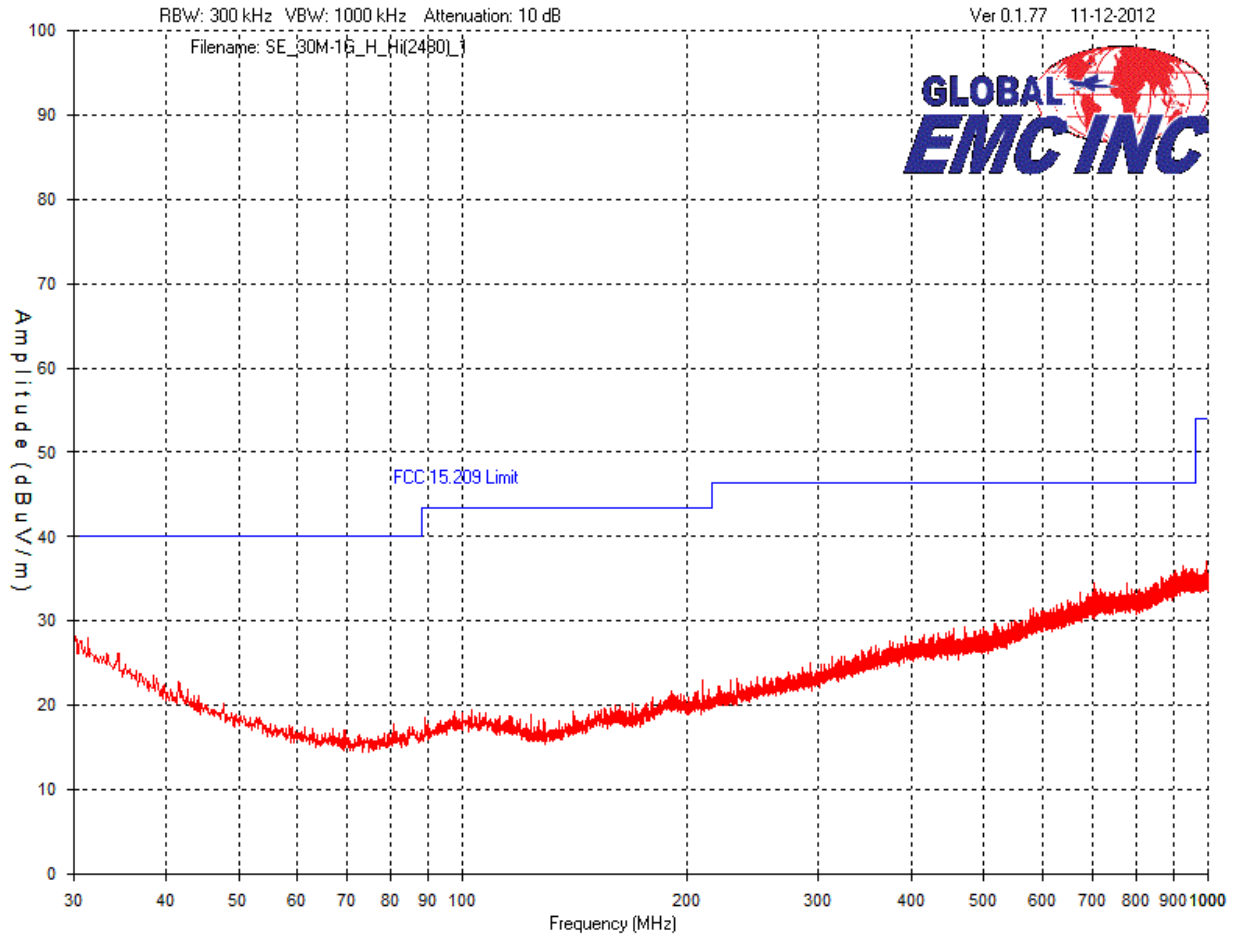
Vertical – Peak Emissions Graph – High Channel, 10 GHz – 18 GHz




Additionally the device was scanned to 26 GHz. No emissions above 18 GHz were detected.

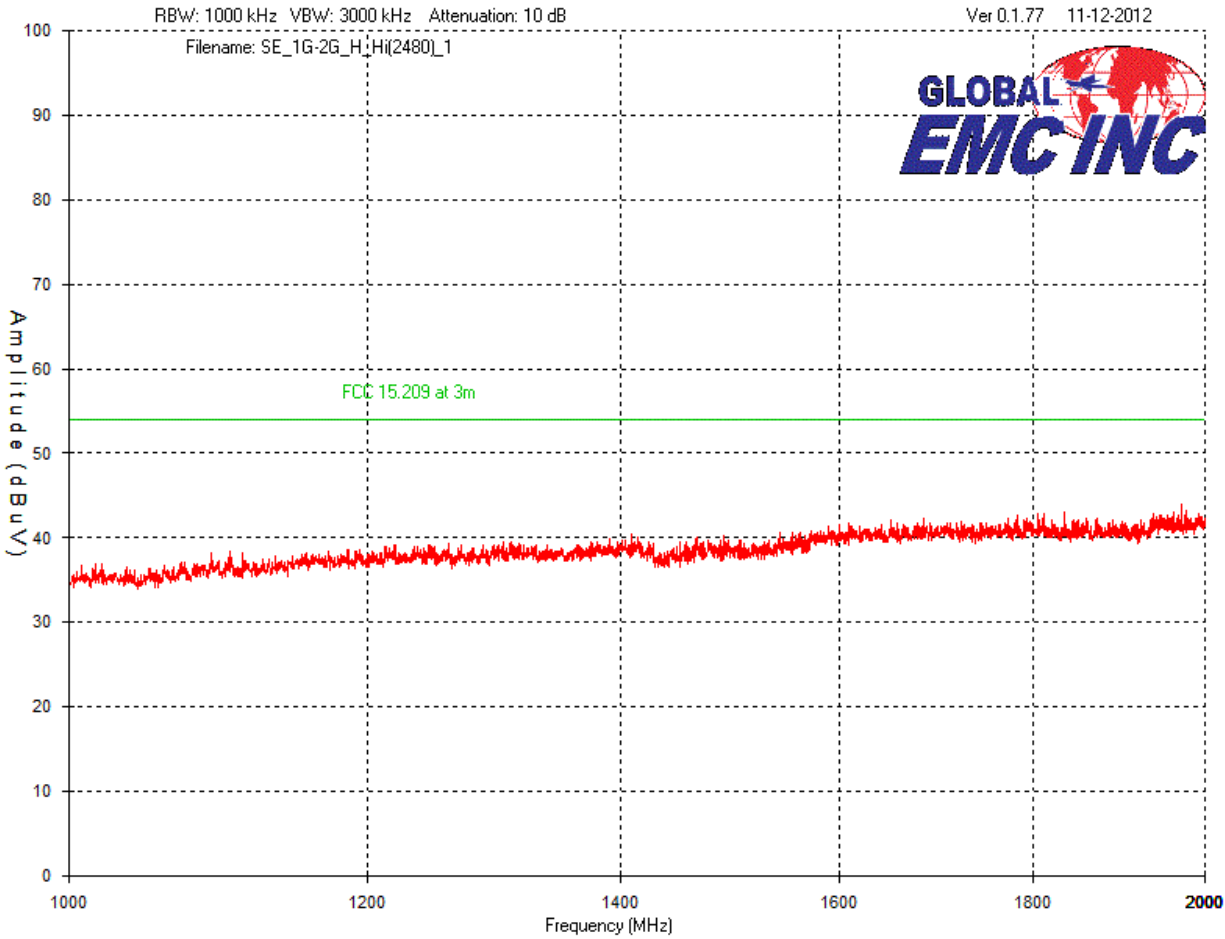
Client	4iiii Innovations Inc.	
Product	SP200	
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Horizontal – Peak Emissions Graph – High Channel, 30 MHz – 1 GHz



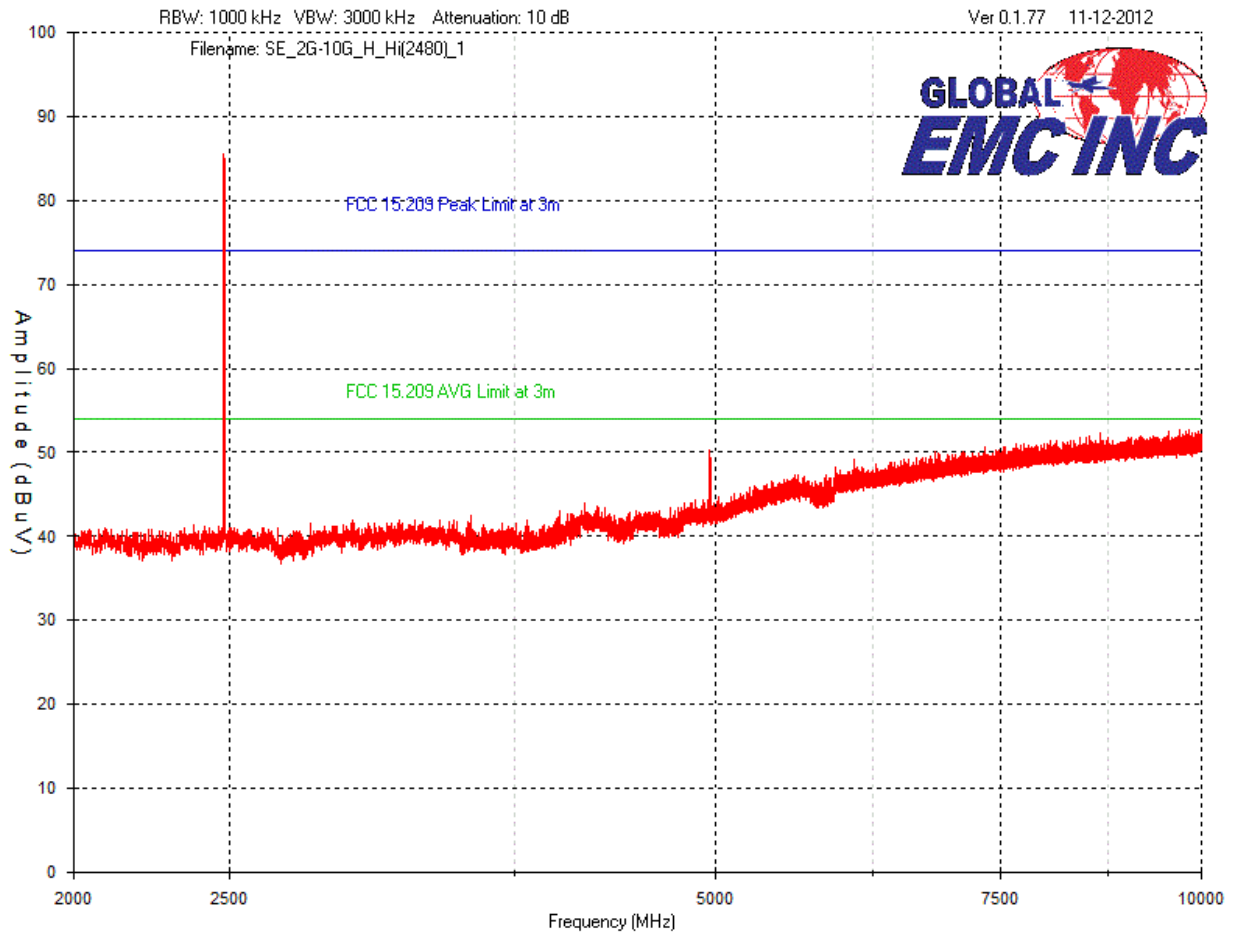
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Horizontal – Peak Emissions Graph – High Channel, 1 GHz – 2 GHz




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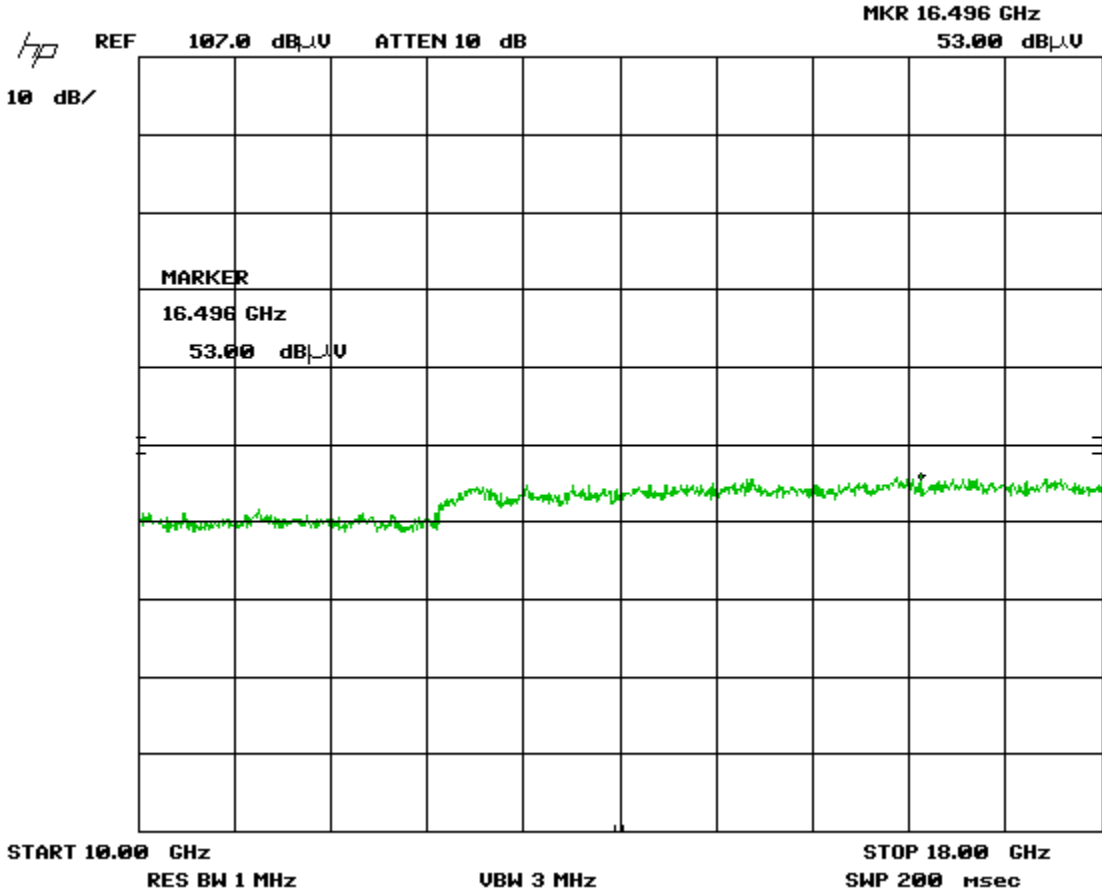
Horizontal – Peak Emissions Graph – High Channel, 2 GHz – 10 GHz




Receiver mode was detected to be identical, with the exception of the fundamental and related harmonic.

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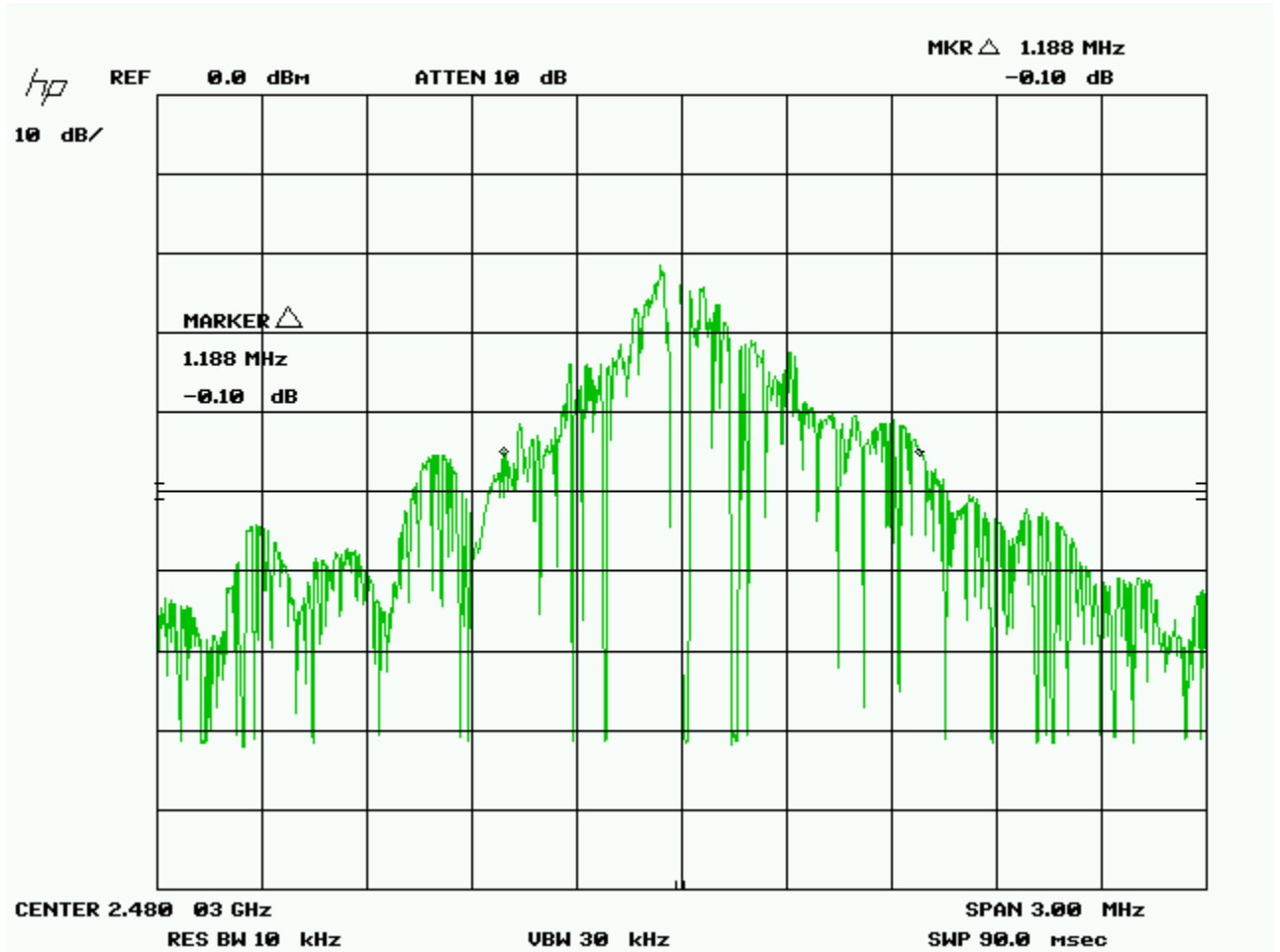
Horizontal – Peak Emissions Graph – High Channel, 10 GHz – 18 GHz




Additionally, the device was scanned to 26 GHz. No emissions above 18 GHz were detected.

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Occupied Bandwidth

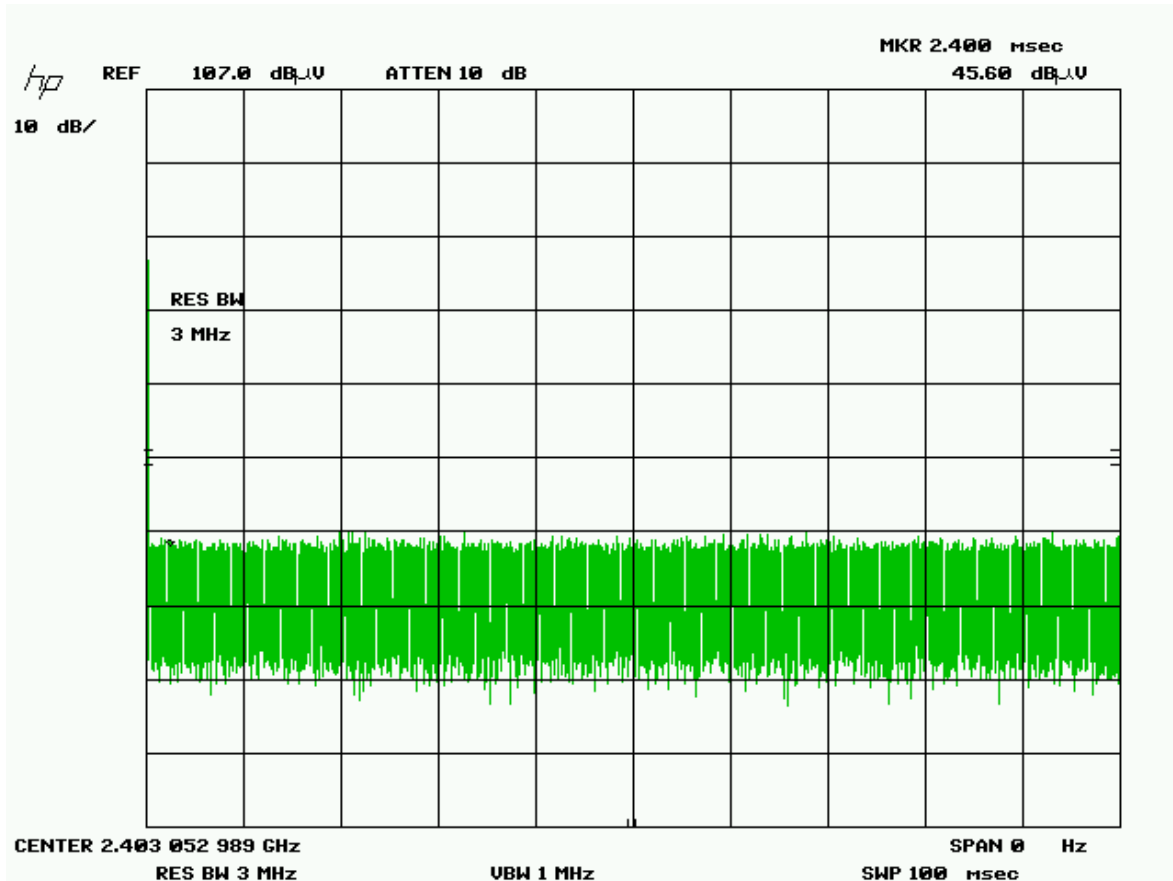



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Calculation of Average Value

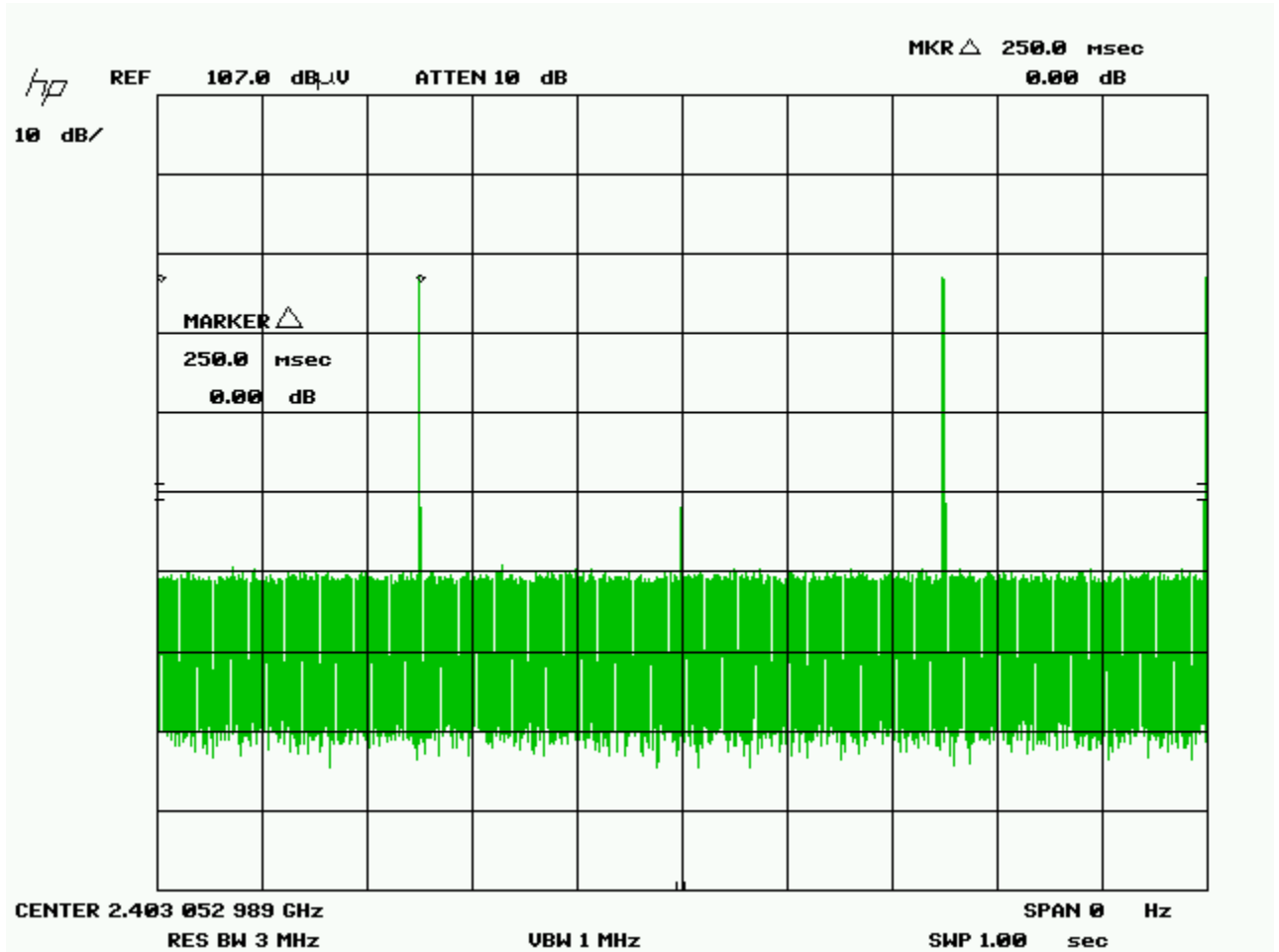
The averaging factor is to be calculated from the On Time per pulse train using $20\log(\text{On Time}/100\text{ms})$ as specified in ANSI C63.10. Each pulse train is $< 10\text{ms}$. Therefore a worst case maximum averaging factor of -20dB was applied to the peak.


Each pulse train is $< 10\text{ms}$



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Period of pulse train = 250mS



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Final Measurements

The fundamental was measured to be 93.1 dBuV/m at 3 meters.

The following measurements were made at the harmonics shown in the above graphs, and at the band edges. All emissions above the fourth harmonic are below the noise floor

Maximum of -20dB duty cycle correction factor is applicable for calculating the average emissions of this unit.

Project Name / Number	4iiii Innovation SP200 / 21129										
Test Frequency (MHz)	Detection mode (Q-Peak)	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselector	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
Low Channel											
2403	Peak	Horz	83.1	30.6	2.2	0.0	36.2	79.7	113.97	34.3	Pass
2403	Avg	Horz	63.1	30.6	2.2	0.0	36.2	59.7	93.97	34.3	Pass
2403	Peak	Vert	91.4	30.6	2.2	0.0	36.2	88.0	113.97	25.9	Pass
2403	Avg	Vert	71.4	30.6	2.2	0.0	36.2	68.0	93.97	26.0	Pass
2400	Peak	Horz	59.9	30.6	2.2	0.0	36.2	56.5	74.0	17.5	Pass (Bandedge)
2400	Avg	Horz	39.9	30.6	2.2	0.0	36.2	36.5	54.0	17.5	Pass (Bandedge)
2400	Peak	Vert	62.0	30.6	2.2	0.0	36.2	58.6	74.0	15.4	Pass (Bandedge)
2400	Avg	Vert	42.0	30.6	2.2	0.0	36.2	38.6	54.0	15.4	Pass (Bandedge)
4806	Peak	Horz	50.5	33.7	2.9	0.0	35.7	51.4	73.97	22.6	Pass
4806	Avg	Horz	30.5	33.7	2.9	0.0	35.7	31.4	53.97	22.6	Pass
4806	Peak	Vert	56.3	33.7	2.9	0.0	35.7	57.2	73.97	16.8	Pass
4806	Avg	Vert	36.3	33.7	2.9	0.0	35.7	37.2	53.97	16.8	Pass
7209	Peak	Vert	45.4	37.9	4.3	0.0	35.9	51.7	73.97	22.3	Pass
7209	Avg	Vert	25.4	37.9	4.3	0.0	35.9	31.7	53.97	22.3	Pass
7209	Peak	Horz	49.0	37.9	4.3	0.0	35.9	55.3	73.97	18.7	Pass
7209	Avg	Horz	29.0	37.9	4.3	0.0	35.9	35.3	53.97	18.7	Pass
Mid channel											
2450	Peak	Horz	88.2	30.6	2.2	0.0	36.2	84.8	113.97	29.2	Pass


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2450	Avg	Horz	68.2	30.6	2.2	0.0	36.2	64.8	93.97	29.2	Pass
2450	Peak	Vert	96.1	30.6	2.2	0.0	36.2	92.7	113.97	21.3	Pass
2450	Avg	Vert	76.1	30.6	2.2	0.0	36.2	72.7	93.97	21.3	Pass
4900	Peak	Horz	51.1	33.7	2.9	0.0	35.7	52.0	73.97	22.0	Pass
4900	Avg	Horz	31.1	33.7	2.9	0.0	35.7	32.0	53.97	22.0	Pass
4900	Peak	Vert	55.3	33.7	2.9	0.0	35.7	56.2	73.97	17.8	Pass
4900	Avg	Vert	35.3	33.7	2.9	0.0	35.7	36.2	53.97	17.8	Pass
7350	Peak	Vert	48.2	37.9	4.3	0.0	35.9	54.5	73.97	19.5	Pass
7350	Avg	Vert	28.2	37.9	4.3	0.0	35.9	34.5	53.97	19.5	Pass
7350	Peak	Horz	48.2	37.9	4.3	0.0	35.9	54.5	73.97	19.5	Pass
7350	Avg	Horz	28.2	37.9	4.3	0.0	35.9	34.5	53.97	19.5	Pass
High channel											
2480	Peak	Horz	87.6	30.6	2.2	0.0	36.2	84.2	113.97	29.8	Pass
2480	Avg	Horz	67.7	30.6	2.2	0.0	36.2	64.3	93.97	29.7	Pass
2480	Peak	Vert	96.5	30.6	2.2	0.0	36.2	93.1	113.97	20.9	Pass
2480	Avg	Vert	76.5	30.6	2.2	0.0	36.2	73.1	93.97	20.9	Pass
2483.5	Peak	Horz	65.3	30.6	2.2	0.0	35.9	62.2	73.97	11.8	Pass (Bandedge)
2483.5	Avg	Horz	45.3	30.6	2.2	0.0	35.9	42.2	53.97	11.8	Pass (Bandedge)
2483.5	Peak	Vert	69.9	30.6	2.2	0.0	35.9	66.8	73.97	7.2	Pass (Bandedge)
2483.5	Avg	Vert	49.9	30.6	2.2	0.0	35.9	46.8	53.97	7.2	Pass (Bandedge)
4960	Peak	Horz	51.0	33.7	2.9	0.0	35.7	51.9	73.97	22.1	Pass
4960	Avg	Horz	31.0	33.7	2.9	0.0	35.7	31.9	53.97	22.1	Pass
4960	Peak	Vert	60.2	33.7	2.9	0.0	35.7	61.1	73.97	12.9	Pass
4960	Avg	Vert	40.2	33.7	2.9	0.0	35.7	41.1	53.97	12.9	Pass
7440	Peak	Vert	48.4	37.9	4.3	0.0	35.9	54.7	73.97	19.3	Pass
7440	Avg	Vert	28.4	37.9	4.3	0.0	35.9	34.7	53.97	19.3	Pass
7440	Peak	Horz	48.2	37.9	4.3	0.0	35.9	54.5	73.97	19.5	Pass
7440	Avg	Horz	28.2	37.9	4.3	0.0	35.9	34.5	53.97	19.5	Pass

Notes:

The measurement shown at 2400MHz is the worst case measurement between 2300 and 2400MHz.

The measurement shown at 2483.5MHz is the worst case measurement between 2483.5 and 2500MHz.

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Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Spectrum Analyzer	8566B	HP	Dec 21, 2011	Dec 21, 2013	GEMC 141
Quasi-Peak Adapter	85650A	HP	Dec 21, 2011	Dec 21 2013	GEMC 7
BiLog Antenna	3142-C	ETS	Jan 17, 2011	Jan 17, 2013	GEMC 8
Loop Antenna 30Hz – 1MHz	EM 6871	Electro-Metrics	Jan 31, 2011	Jan 31, 2013	GEMC 70
Loop Antenna 100kHz – 30MHz	EM 6872	Electro-Metrics	Jan 31, 2011	Jan 31, 2013	GEMC 71
Q-Par Horn 1.5GHz -18 GHz	6878/24	Q-par	Aug 23, 2012	Aug 23, 2014	GEMC 6365
Horn Antenna 18 GHz - 26.5 GHz	SAS-572	A.H. Systems	Aug 27, 2012	Aug 27, 2014	GEMC 6371
18.0-26.5 GHz Harmonic Mixer	11970K	HP	Dec 21, 2011	Dec 21 2013	GEMC 158
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	Aug 29, 2012	Aug 29, 2014	GEMC 6403
Pre-amp 1-26GHz	HP 8449B	HP	Aug 22, 2012	Aug 22, 2014	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	4iiii Innovations Inc.	
Product	SP200	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Appendix A – EUT Summary

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

General EUT Description


Client Details	
Organization / Address	4iiii Innovations 228 River Avenue Cochrane, AB T4C 2C1
Contact	Andrea Dukeshire
Phone	403-660-4240
Email	Andrea@4iiii.com
EUT (Equipment Under Test) Details	
EUT Name	SP200
EUT Model / SN (if known)	SP200
Equipment category	Athletic parameter LED display
EUT is powered using	Lithium Ion Battery
Input voltage range(s) (V)	5VDC via USB (power supply not included)
Rated input current (A)	200mA
Transmits RF energy? (describe)	Yes, Rx and Tx to sensors such as heart rate, speed, etc
Basic EUT functionality description	The Sportiiii (ZZNSP200) is a heads up display for fitness monitoring. It is a wireless device that monitors the statistics of various sensors to monitor performance metrics such as heart rate, speed and distance, and cadence.
EUT response time (ms)	<= 500 ms
Frequency of all clocks present in EUT	32MHz, 32.768KHz, 16MHz
Available connectors on EUT	Charges and downloads to a PC using a micro-usb port
Peripherals required to exercise EUT Ex. Signal generator	Heart rate monitor if require a Rx/Tx data transmission
Dimensions of product	L 130mm W 10mm H 20mm

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	4iiii Innovations Inc.	
Product	SP200	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	


Appendix B – EUT and Test Setup Photographs

These photos are for information purposes only.
 Also refer to photo documents that are separate from this test report.

Client	4iiii Innovations Inc.	
Product	SP200	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	



EUT – View 1

Client	4iiii Innovations Inc.	
Product	SP200	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	




EUT – View 2

Client	4iiii Innovations Inc.	
Product	SP200	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	



Radiated Emissions Photo 1

Client	4iiii Innovations Inc.	
Product	SP200	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	



Radiated Emissions Photo 2

Client	4iiii Innovations Inc.	
Product	SP200	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2011	



Radiated Emissions Photo 3