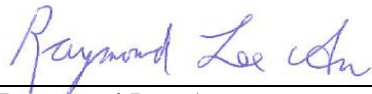


Global EMC Inc. Labs

EMC & RF Test Report

As per
RSS 210 Issue 8:2010
&
FCC Part 15 Subpart C:2010
Unlicensed Intentional Radiators
on the

4iiii Innovations
Sport-iiis SP100



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Testing produced for



See Appendix A for full customer & EUT details.




Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

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Client	4iiii Innovations Inc.	
Product	SP100	
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 4iiii Innovations Sport iiii SP100, 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	4iiii Innovations Inc.	
Product	SP100	
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:	ZZNSP100
EUT Industry Canada Certification #, IC:	9896A-SP100
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Raymond Lee Au

Client	4iiii Innovations Inc.	
Product	SP100	
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 15.209 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

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

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.

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

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
RSS 210:2010	- Issue 8: Spectrum Management and Telecommunications Radio Standards Specification Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

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 - November 3, 2011

Client	4iiii Innovations Inc.	
Product	SP100	
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 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	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

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.

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	


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)
Sept. 26-28, 2011	All	RA	20-25°C	30-45%	100 -103kPa

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

Detailed Test Results Section

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

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.

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

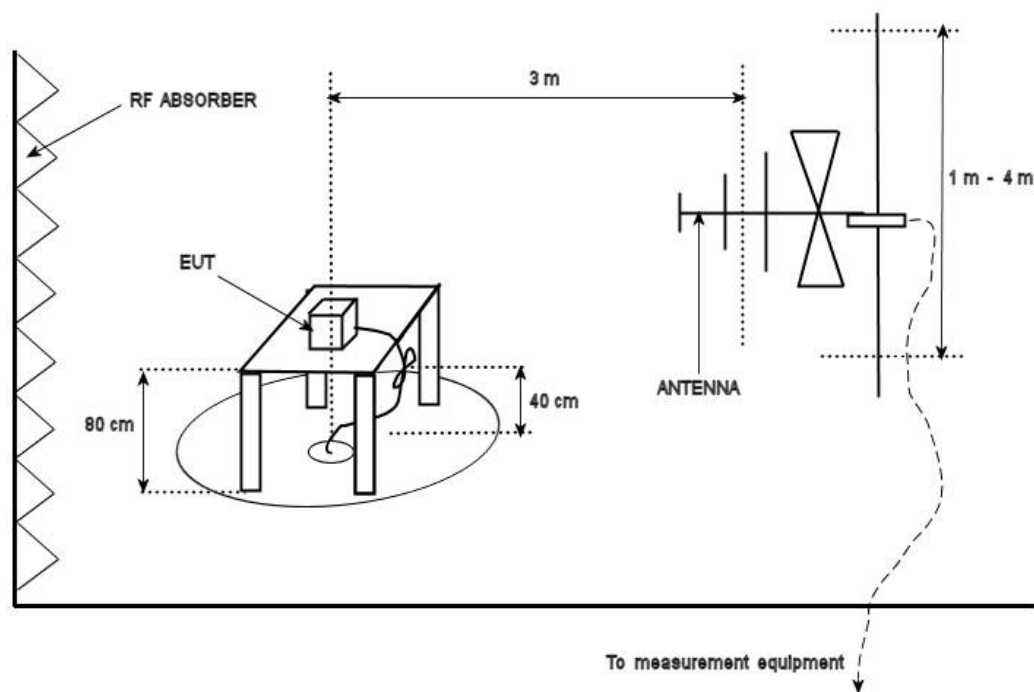
Peak field strengths are limited to be at most 20 dB above the average limits as defined above at the corresponding frequencies.

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.

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

Typical Radiated Emissions Setup



Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

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). Only the noise floor was measured above 18GHz.

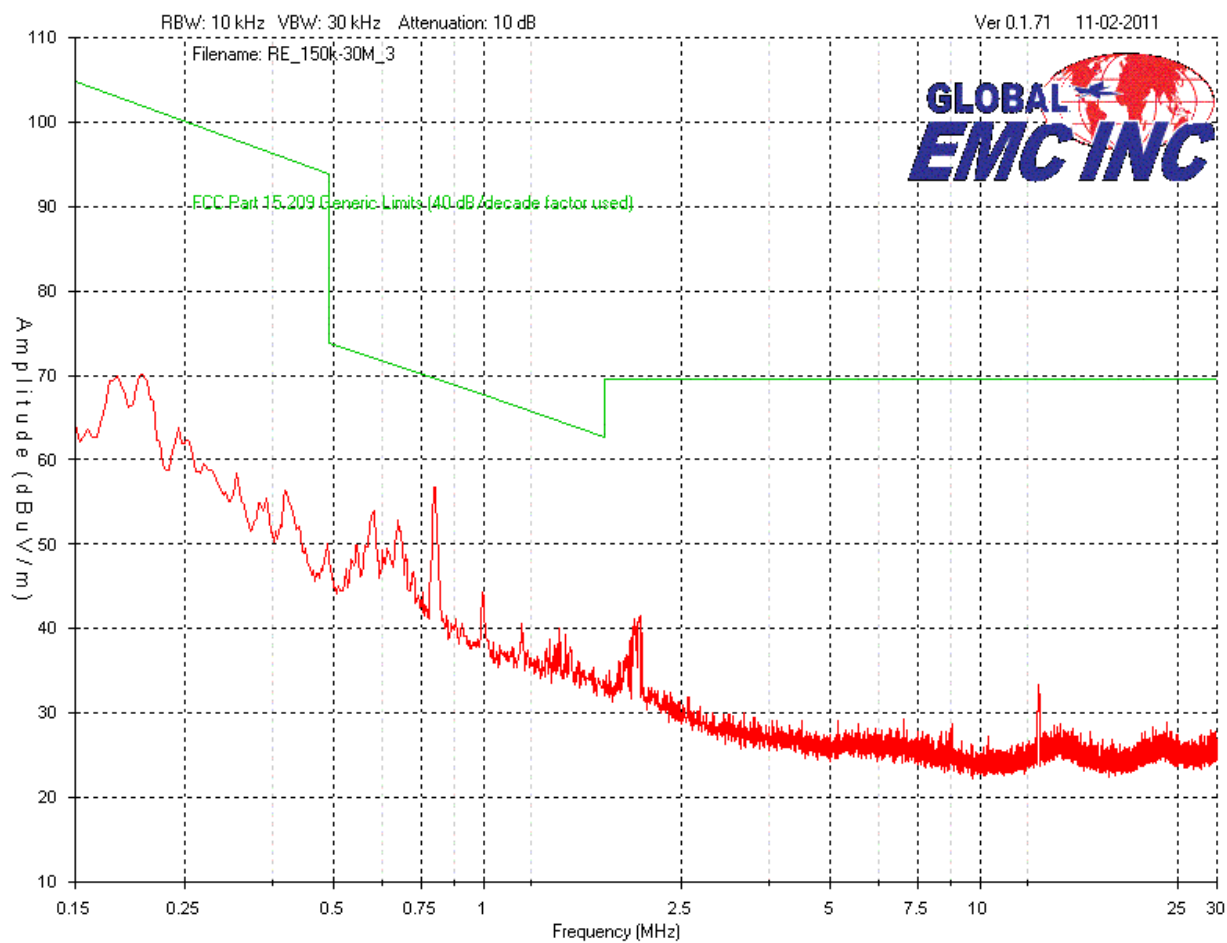
Low, middle, and high modes were investigated. The worst case graphs are presented.


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

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

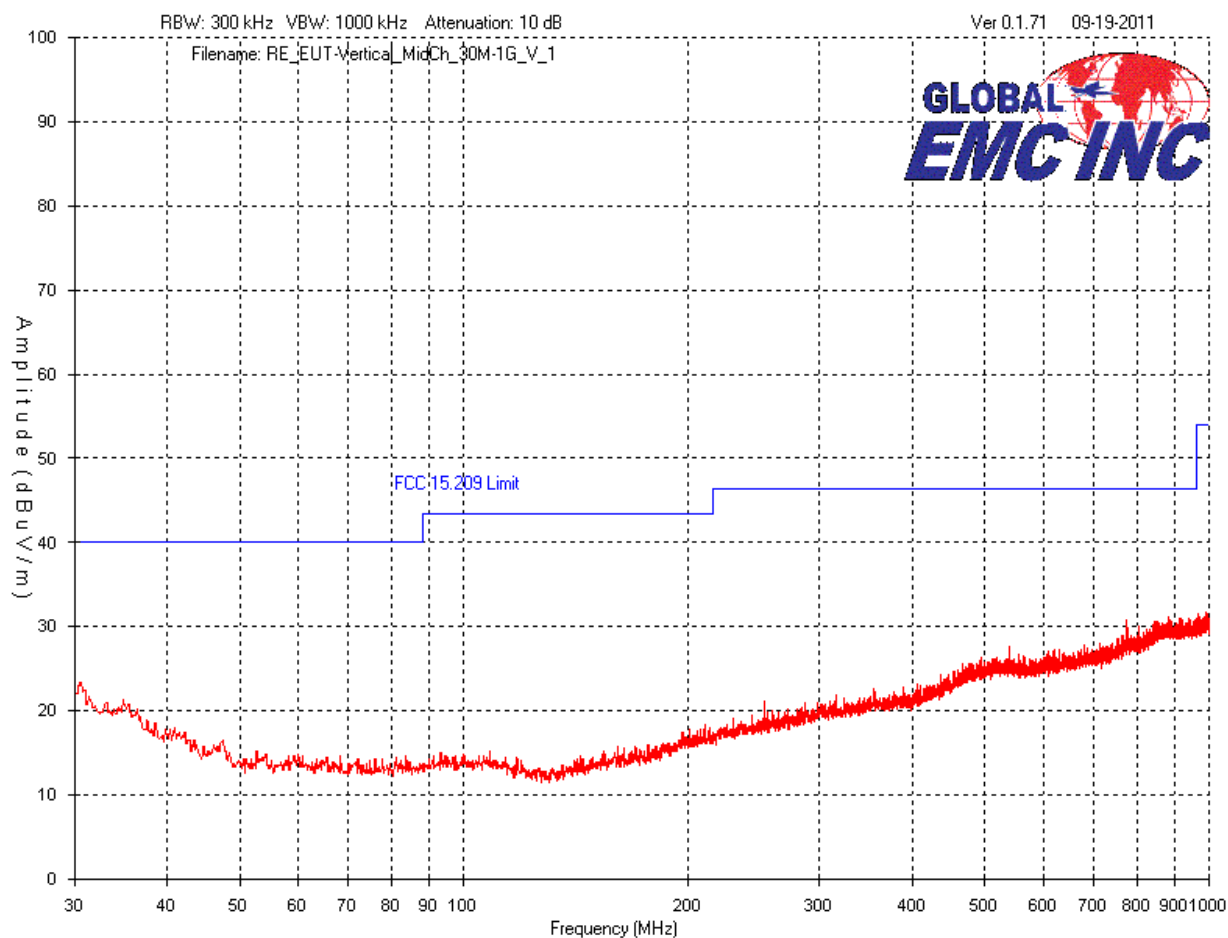
Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	


Peak Emissions Graph – Mid Channel, 150 kHz – 30 MHz



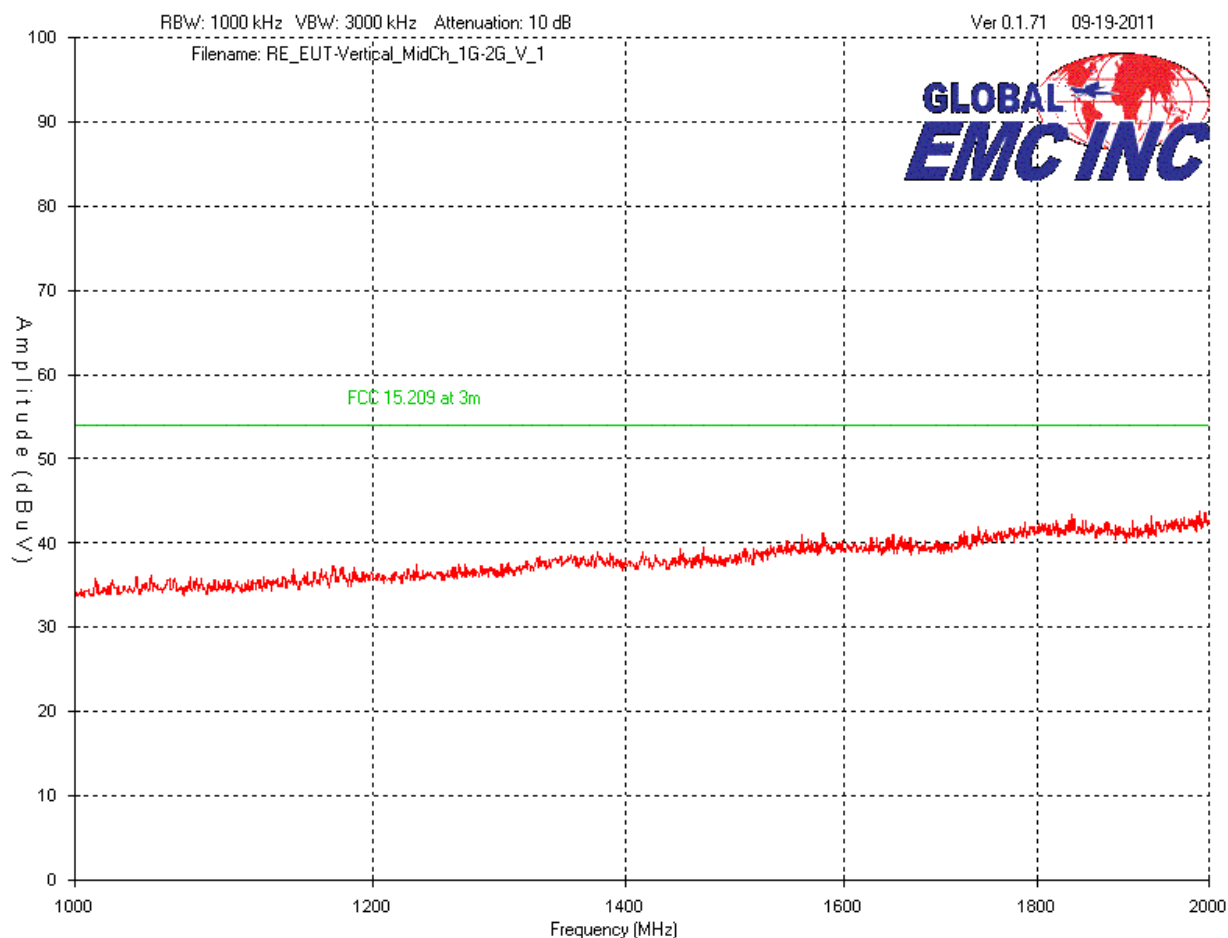
Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	


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



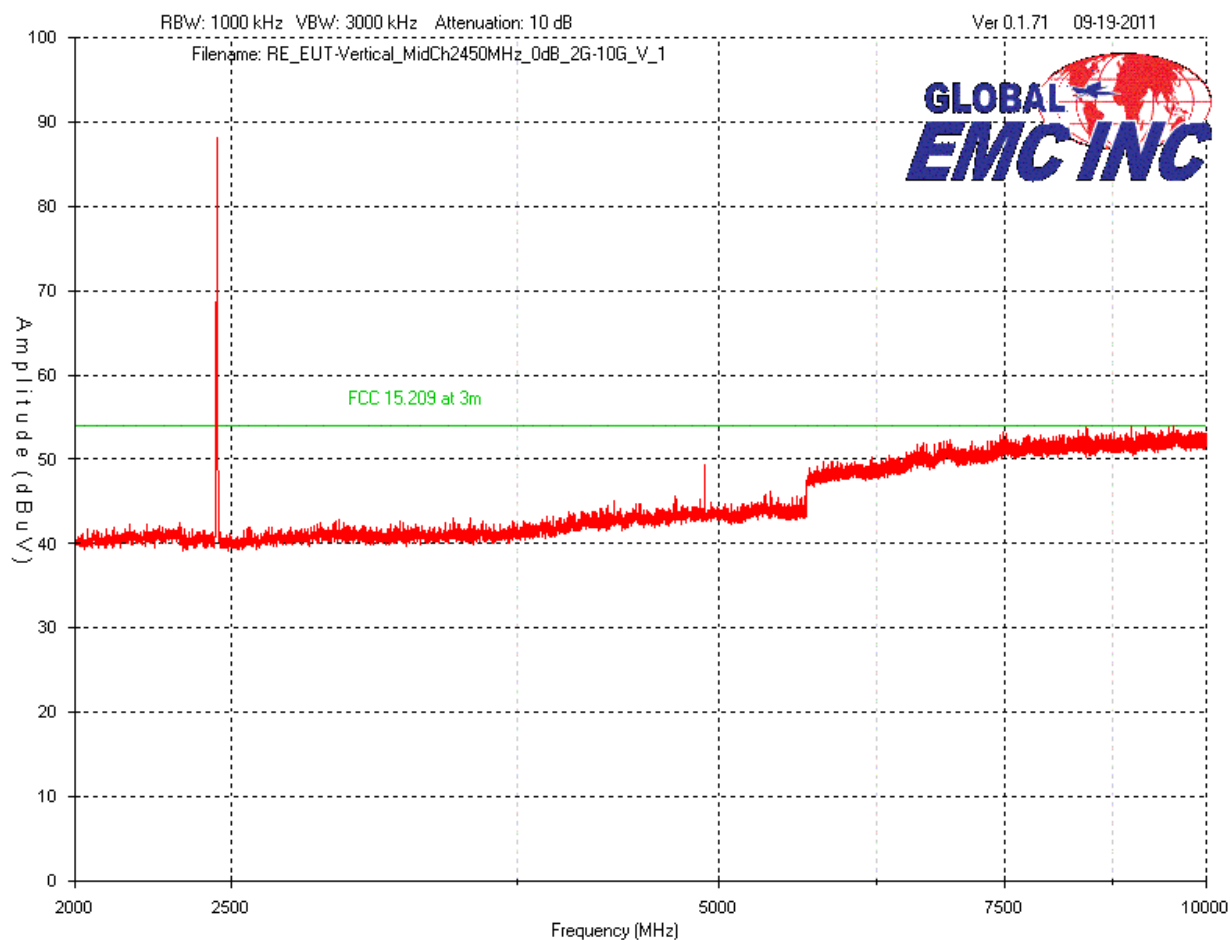
Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

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




Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

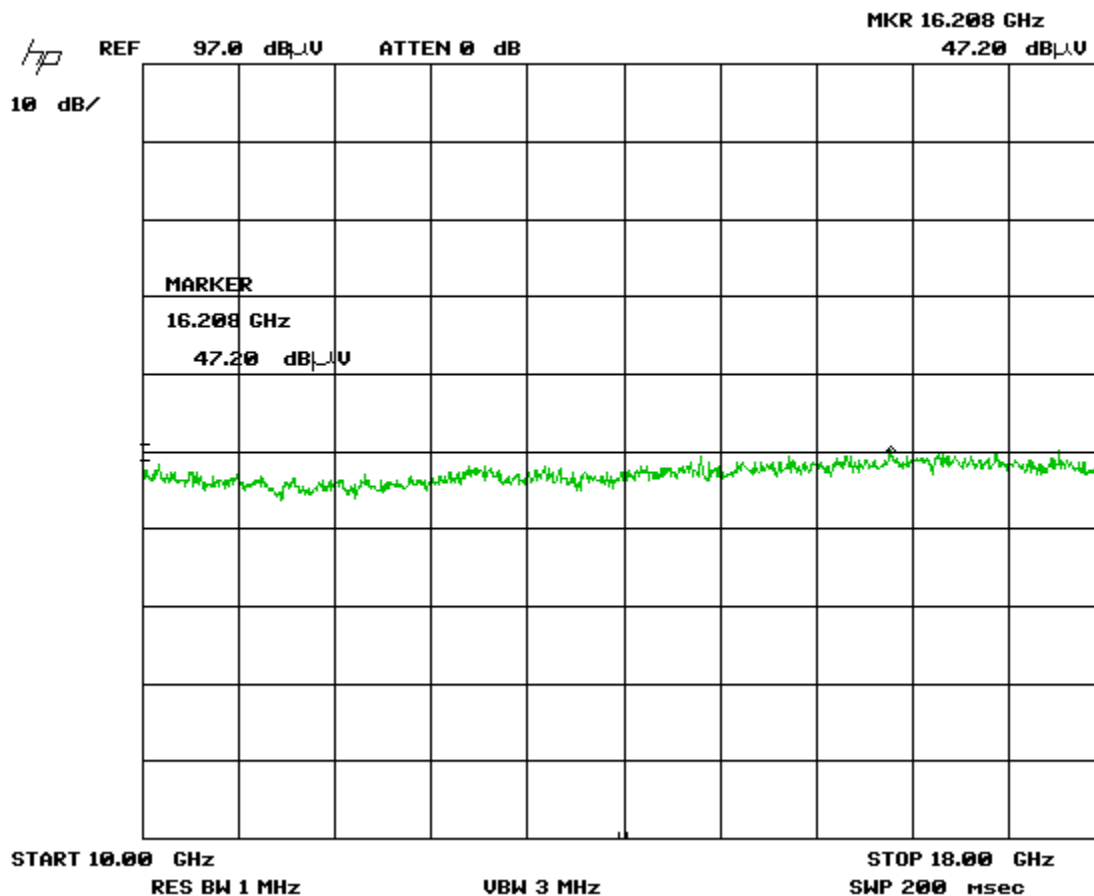
Vertical – Peak Emissions Graph – Mid Channel, 2 GHz – 10 GHz




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

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

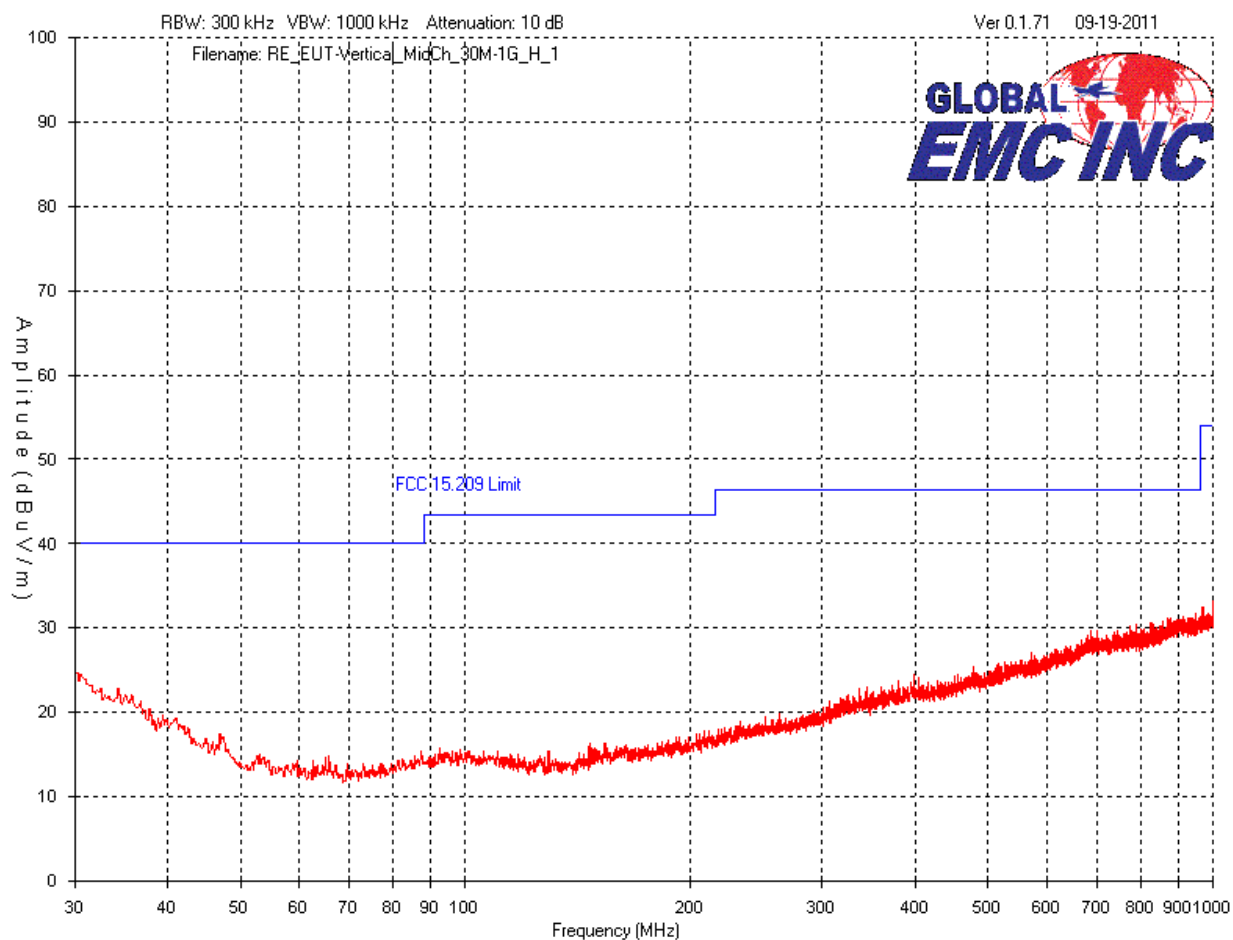
Vertical – Peak Emissions Graph – Mid Channel, 10 GHz – 18 GHz




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

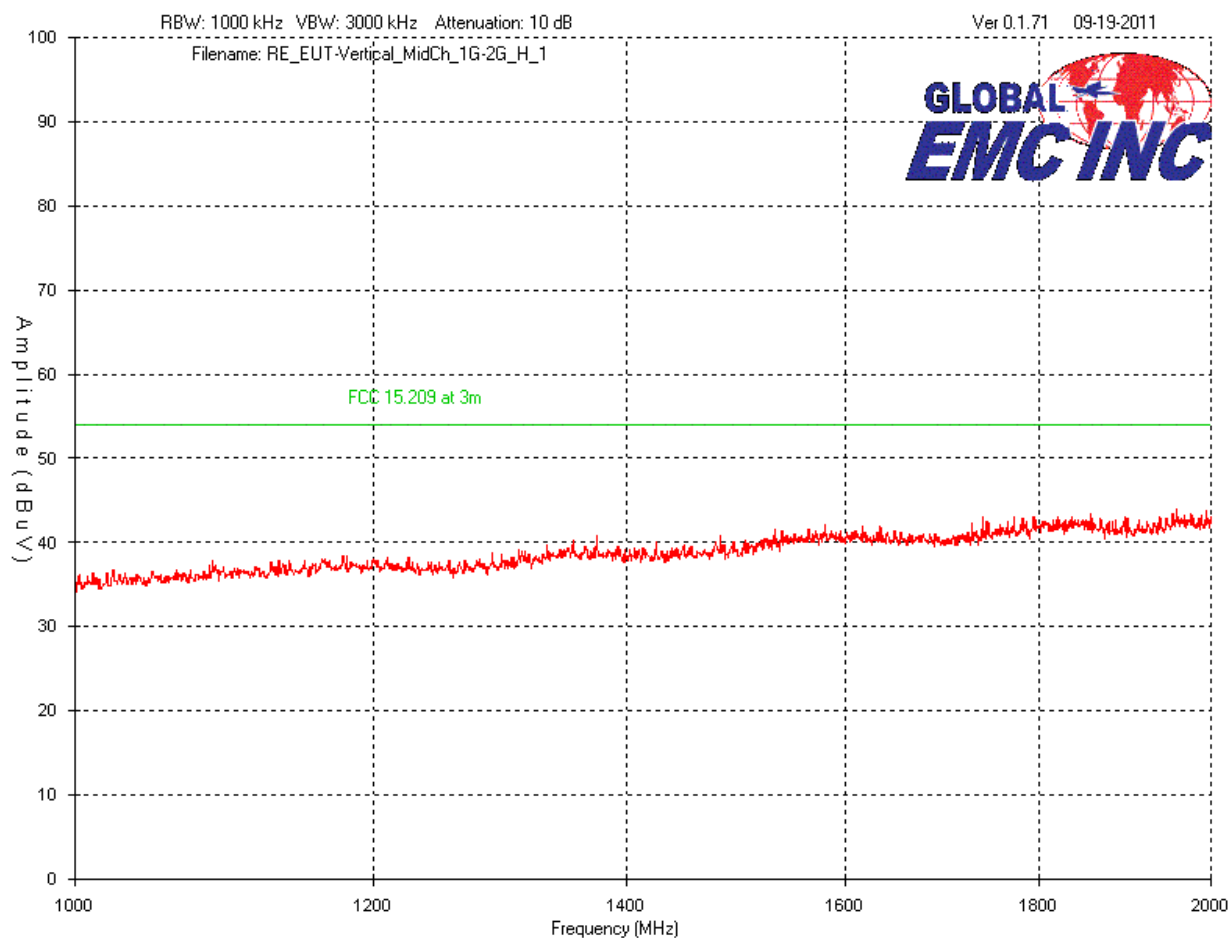
Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	


Horizontal – Peak Emissions Graph – Mid Channel, 30 MHz – 1 GHz



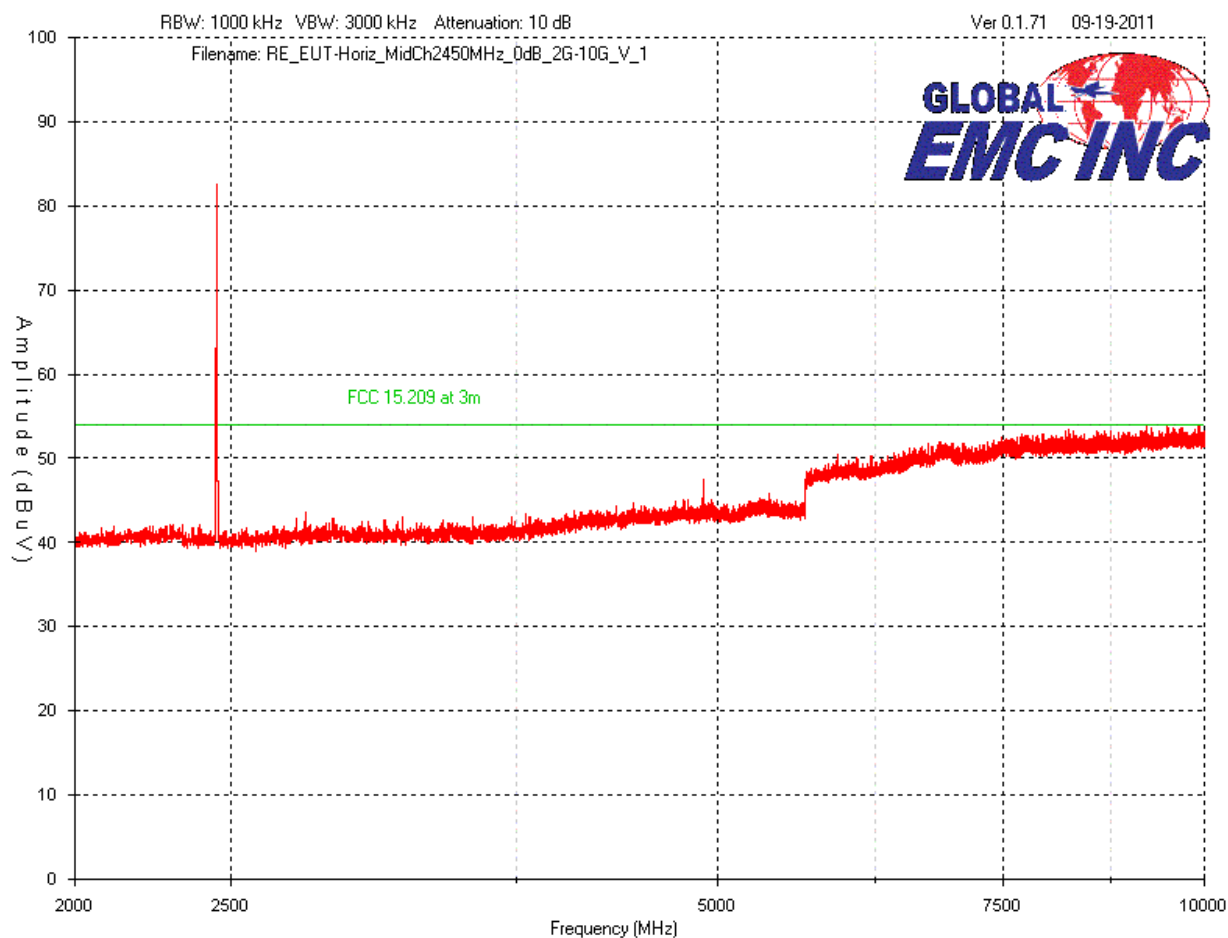
Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

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




Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

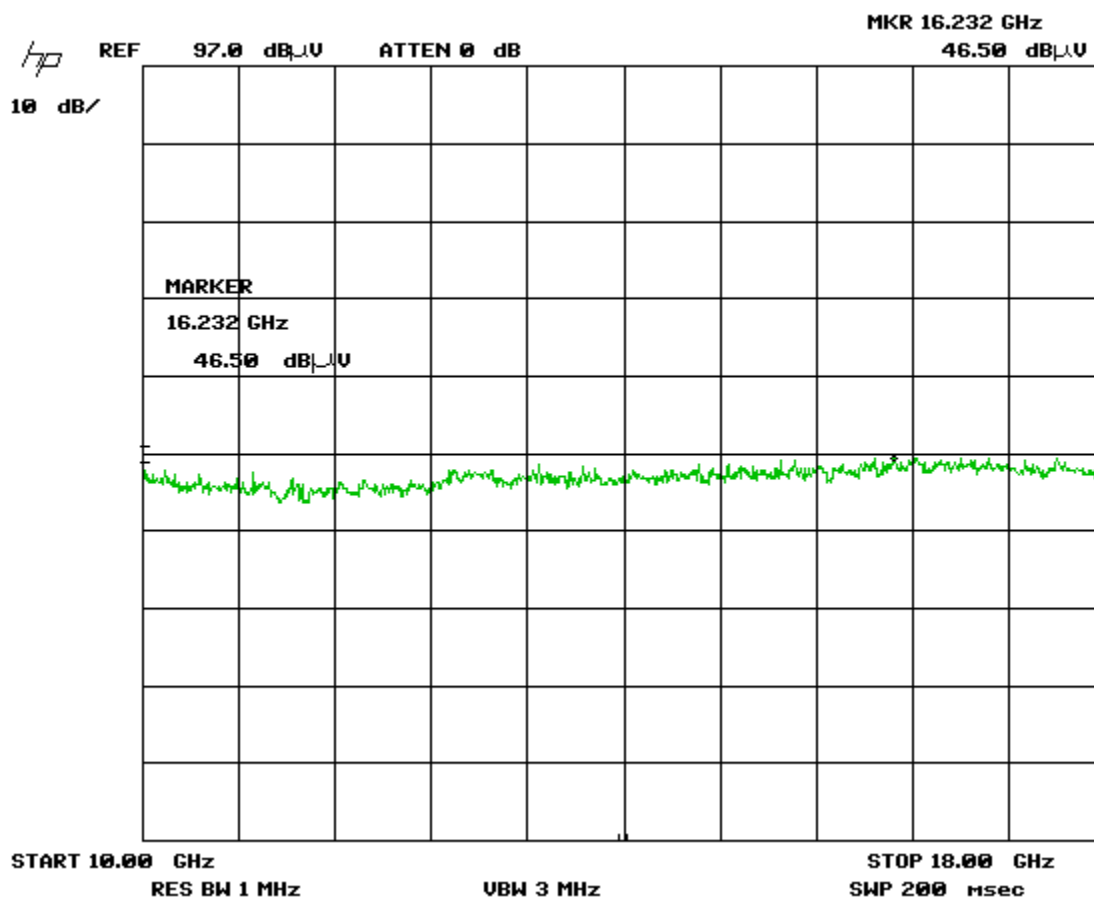
Horizontal – Peak Emissions Graph – Mid Channel, 2 GHz – 10 GHz




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

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

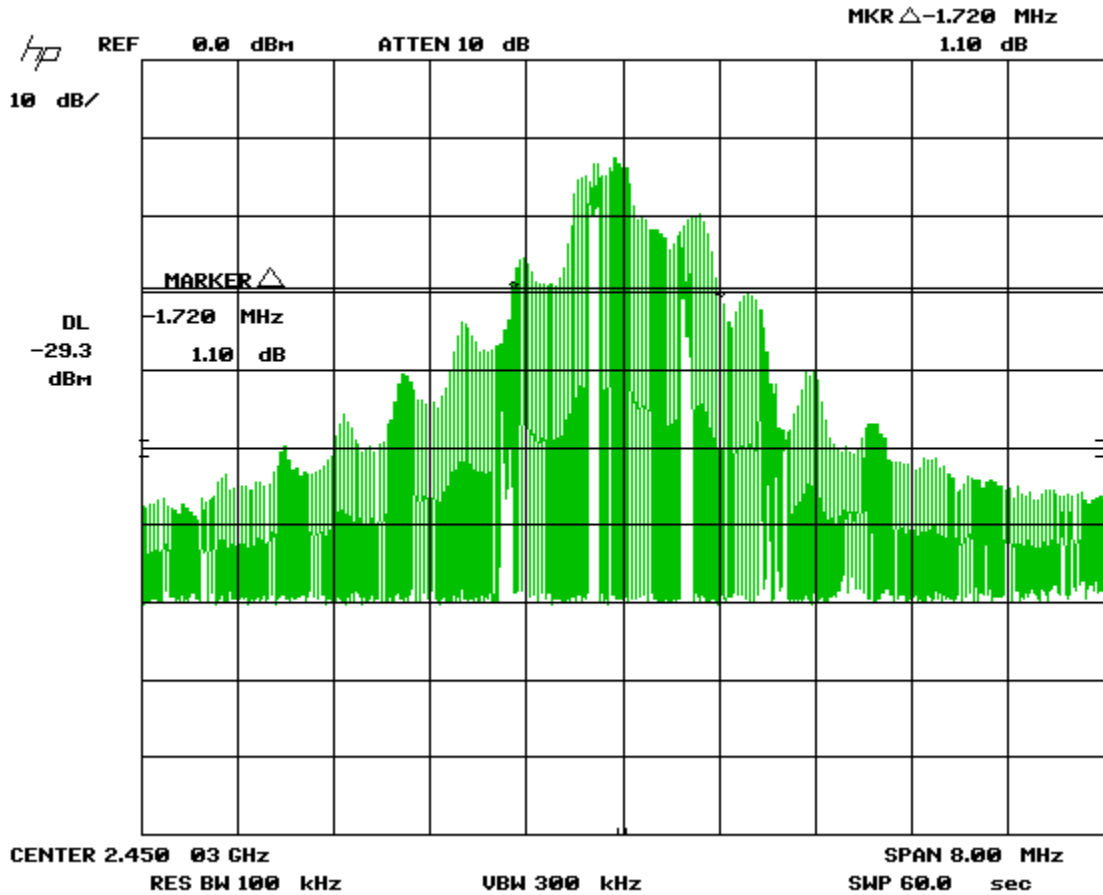
Horizontal – Peak Emissions Graph – Mid Channel, 10 GHz – 18 GHz




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

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

Occupied Bandwidth



Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	


Final Measurements

The fundamental was measured to be 88.3 dBuV/m at 3 meters.

In the chart below, if the peak emission did not exceed the average limit, only the peak reading is shown compared with the average limit as the worst case for the purpose of demonstrating compliance. Where peak emissions are over average limits, both the peak and average readings are compared against their respective limits.

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.

Project Name / Number	4iiii Innovation/20486										
Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(μV)	Antenna factor dB	Cable loss dB + Preselec	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	83.0	30.6	2.2	0.0	36.2	79.6	93.97	14.4	PASS
2403	Peak	Vert	87.4	30.6	2.2	0.0	36.2	84.0	93.97	10.0	PASS
2390	Peak	Horz	48.7	30.6	2.2	0.0	36.2	45.3	53.97	8.7	PASS
2390	Peak	Vert	51.0	30.6	2.2	0.0	36.2	47.6	53.97	6.4	PASS
2400	Peak	Horz	61.9	30.6	2.2	0.0	36.2	58.5	73.97	15.5	PASS
2400	Avg	Horz	45.0	30.6	2.2	0.0	36.2	41.6	53.97	12.4	PASS
2400	Peak	Vert	63.7	30.6	2.2	0.0	36.2	60.3	73.97	13.7	PASS
2400	Avg	Vert	47.6	30.6	2.2	0.0	36.2	44.2	53.97	9.8	PASS
4806	Peak	Horz	50.6	33.7	2.9	0.0	35.7	51.5	53.97	2.5	PASS
4806	Peak	Vert	55.0	33.7	2.9	0.0	35.7	55.9	73.97	18.1	PASS
4806	Avg	Vert	46.7	33.7	2.9	0.0	35.7	47.6	53.97	6.4	PASS
7209	Peak	Vert	47.7	37.9	4.3	0.0	35.9	54.0	73.97	20.0	PASS
7209	Avg	Vert	40.5	37.9	4.3	0.0	35.9	46.8	53.97	7.2	PASS
7209	Peak	Horz	42.2	37.9	4.3	0.0	35.9	48.5	53.97	5.5	PASS
Mid channel											
2450	Peak	Horz	84.4	30.6	2.2	0.0	36.2	81.0	93.97	13.0	PASS
2450	Peak	Vert	91.7	30.6	2.2	0.0	36.2	88.3	93.97	5.7	PASS
4900	Peak	Horz	48.3	33.7	2.9	0.0	35.7	49.2	53.97	4.8	PASS
4900	Peak	Vert	50.1	33.7	2.9	0.0	35.7	51.0	53.97	3.0	PASS
7350	Peak	Vert	48.5	37.9	4.3	0.0	35.9	54.8	73.97	19.2	PASS


Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	

7350	Avg	Vert	40.3	37.9	4.3	0.0	35.9	46.6	53.97	7.4	PASS
7350	Peak	Horz	39.5	37.9	4.3	0.0	35.9	45.8	53.97	8.2	PASS
High channel											
2480	Peak	Horz	79.4	30.6	2.2	0.0	36.2	76.0	93.97	18.0	PASS
2480	Peak	Vert	90.8	30.6	2.2	0.0	36.2	87.4	93.97	6.6	PASS
2483.5	Peak	Horz	54.6	30.6	2.2	0.0	35.9	51.5	53.97	2.5	PASS
2483.5	Peak	Vert	66.3	30.6	2.2	0.0	35.9	63.2	73.97	10.8	PASS
2483.5	Avg	Vert	52.7	30.6	2.2	0.0	35.9	49.6	53.97	4.4	PASS
4960	Peak	Horz	48.3	33.7	2.9	0.0	35.7	49.2	53.97	4.8	PASS
4960	Peak	Vert	47.7	33.7	2.9	0.0	35.7	48.6	53.97	5.4	PASS
7440	Peak	Vert	44.8	37.9	4.3	0.0	35.9	51.1	53.97	2.9	PASS
7440	Peak	Horz	47.8	37.9	4.3	0.0	35.9	54.1	73.97	19.9	PASS
7440	Avg	Horz	40.2	37.9	4.3	0.0	35.9	46.5	53.97	7.5	PASS

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
IFR Spectrum Analyzer	AN940	IFR	12/29/2009	12/29/2011	GEMC 6350
BiLog Antenna	3142-C	ETS	17-Jan-11	17-Jan-13	GEMC 137
Loop Antenna	EM 6872	Electro-Metrics	1/31/2011	1/31/2013	GEMC 71
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	4iiii Innovations Inc.	
Product	SP100	
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

Client Details	
Organization / Address	4iiii Innovations Inc. Suite 888, 105-150 Crowfoot Crescent, NW, Calgary, Alberta, T3G3T2, Canada
Contact	Jake McEvoy, P.Eng.
Phone	403.800.3095
Email	Jake@4iiii.com
EUT (Equipment Under Test) Details	
EUT Name	Sportiiiis
EUT Model / SN	SP100
EUT revision	Rev 3.4
Software version	Rev3.24
EUT is powered using	Internal Battery
Input voltage range(s) (V)	(5VDC via USB, P/S not included)
Frequency range(s) (Hz)	DC
Rated input current (A)	(120mA DC via USB, P/S not included.)
Nominal power consumption (W)	15mW
Transmits RF energy? (describe)	GFSK 2403-2480 MHz, ANT+ protocol 1mW transceiver
Basic EUT functionality description	Receives process and displays processed sensor information on LEDs in the periphery of the eye. Occasionally transmits and receives packets with a smartphone or tablet (system settings changes.)
Modes of operation	Receiving sensor data via RF telemetry, communicating with peripheral system, USB connection - Charging, data download, and firmware upload. Off and shipping mode.
Frequency of all clocks present in EUT	32.768kHz, 16MHz, and 25MHz (DCO)
Available connectors on EUT	micro USB B
Peripherals required to exercise	none

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	


EUT	
Dimensions of product	L ~130mm W ~13mm H ~26mm

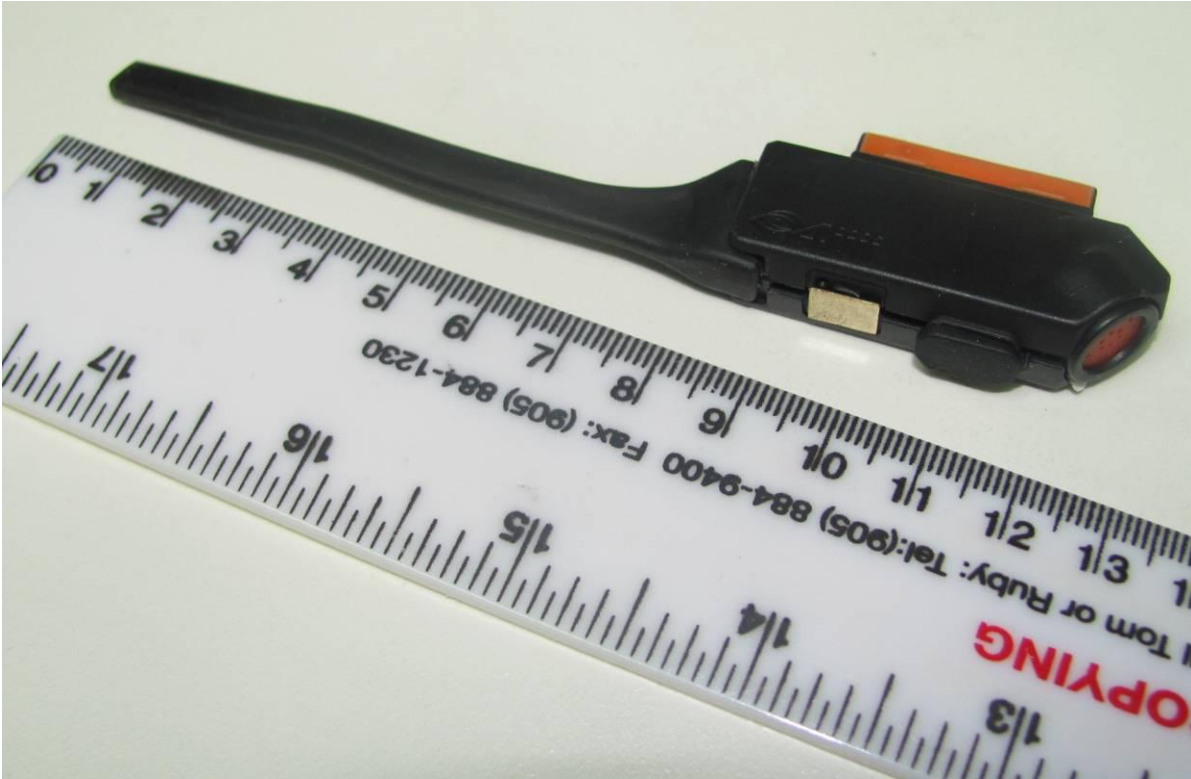
Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see ‘Appendix B – EUT & Test Setup Photographs’.

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	


Appendix B – EUT and Test Setup Photographs

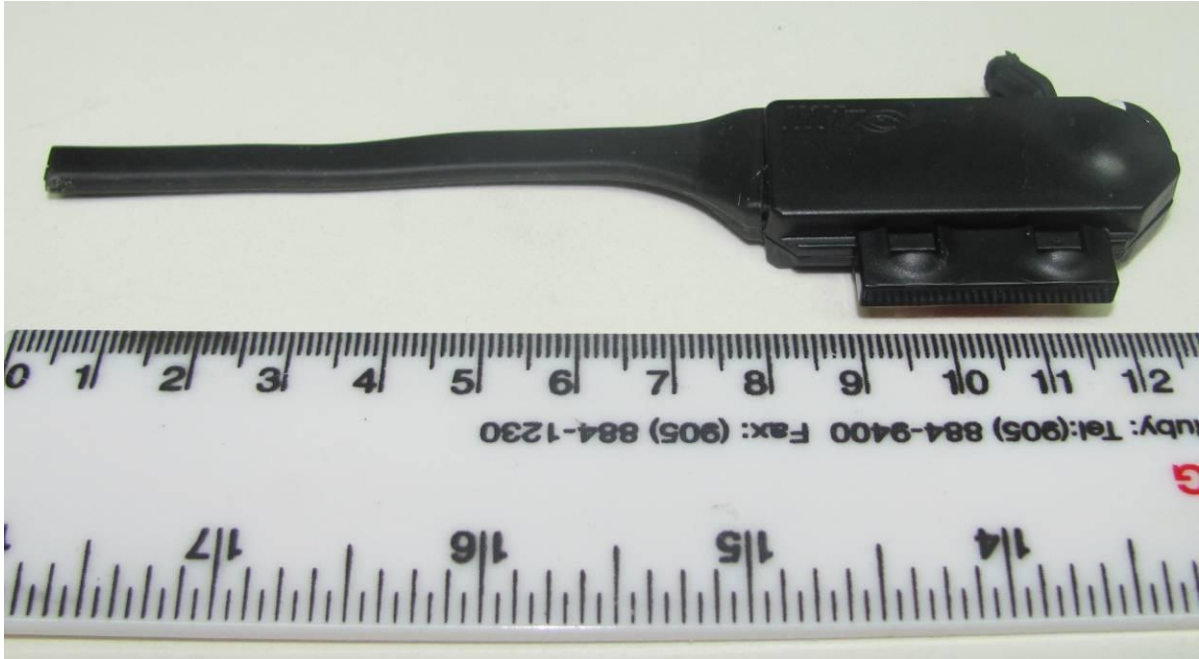
These photos are for information purposes only.
Also refer to PDF files that are separate from this test report.

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	



EUT – View 1

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	




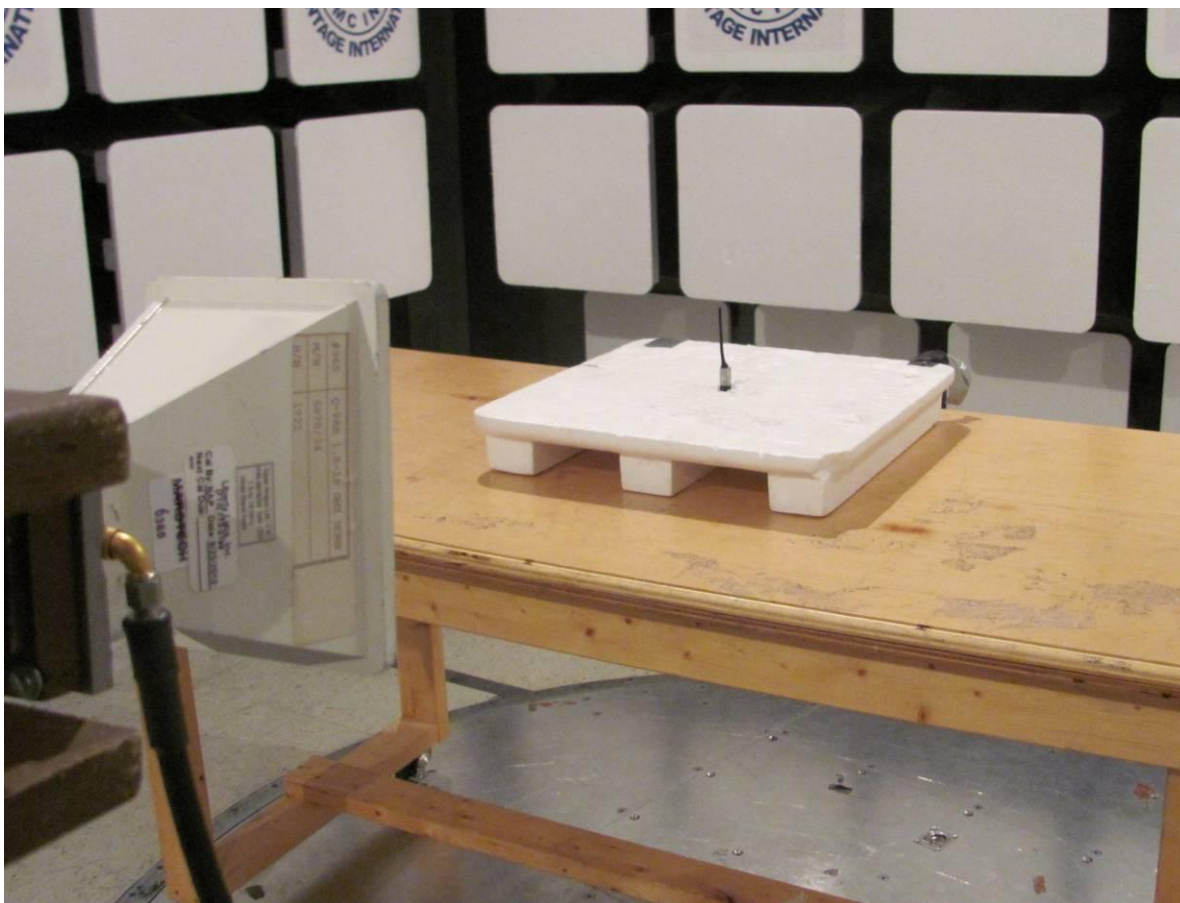
EUT – View 2

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	



Radiated Emissions Photo 1

Client	4iiii Innovations Inc.	
Product	SP100	
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010	



Radiated Emissions Photo 2