

Global EMC Inc. Labs

EMC & RF Test Report

As per

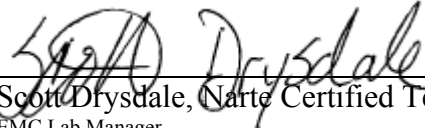
RSS 220 Issue 1:2009

&

FCC Part 15:2010 Subpart F
Ultra Wide Band Transmitters
Ground Penetrating Radar

on the

Noggin Gold (NG250)


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Testing produced for



Sensors & Software Inc.
Ground Penetrating Radar (GPR) Technology

See Appendix A for full customer & EUT details.



**Industry
Canada**

LAB REGISTRATION #6844A-1



FCC REGISTRATION #612361

Client	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

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Report Scope

This report addresses the EMC verification testing and test results of the Noggin Gold (NG250), herein referred to as EUT (Equipment Under Test) performed at Global EMC Labs.

The EUT was tested for compliance against the following standards:

RSS 220 Issue 1:2009 / FCC Part 15 Subpart F 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 government agency, 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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Summary

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

EUT FCC Certification #, FCC ID:	QJQ-NG250
EUT Industry Canada Certification #, IC:	8393A-NG250
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Scott Drysdale

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Test Results Summary

Standard/Method	Description	Class/Limit	Result
FCC 15.203	Antenna Requirement	Unique	Pass See Justification
FCC 15.207	Power line conducted emissions	QuasiPeak Average	Not applicable See justification
FCC 15.503(d)	Fractional BW	> 0.20 or > 500 MHz	Pass
FCC 15.509(a)	UWB Bandwidth	< 10.6 GHz	Pass
FCC 15.509(b)(1)	Operating Parties	Eligible for licensing	Pass See Justification
FCC 15.509(b)(2)	Coordination	Required	Pass See Justification
FCC 15.509(c)	Handheld / Wall	Tx < 10 Seconds	Not applicable See Justification
FCC 15.509(d)	Radiated emissions	Under limit	Pass
FCC 15.509(e)	Narrowband Radiated emissions	Under limit	Pass
FCC 15.509(f)	Peak power EIRP	< 0 dBm	Not Applicable See Justification
FCC 15.521(a)	Operation requirements	Not toys, aircraft, ship or satellite	Pass See justification
Overall Result			PASS

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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. 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 220), the device has an internal antenna which is not accessible.

For the 'power line conducted emissions' requirements as specified in FCC 15.207 (RSS 220) , the EUT is DC powered (battery operated), and this test does not apply.

For the 'eligible parties' requirement as per FCC 15.509 (b)(1), (RSS-220) refer to the user's manual which includes the applicable guidance.

For the 'coordination' requirement as per FCC 15.509(b)(2), (RSS-220) refer to the user's manual which includes the applicable guidance.

For the 'handheld' requirement as per FCC 15.509(c) (RSS-220) of 10 seconds of maximum Tx after release, this does not apply as this device is not hand held or wall imaging.

For the 'peak power' requirement as per FCC 15.509(f), (RSS-220) this does not apply as the frequency at which the highest radiated emission occurs is below 960 MHz.

For the 'operation' requirements as per FCC 15.521(a), (RSS-220) this device is not marketed as a toy or for general use. Operation is not intended, or designed for, use on an aircraft, ship or satellite.

As per guidance in ANSI C63.10 section 7.3.10, for frequencies above 960 MHz, the device was tested with absorber placed above the reference ground plane as depicted in the test setup photo's to ensure a free space propagation path measurement was performed.

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As per guidance in ANSI C63.10 section 7.10.2.2, the device was above a raised 50 cm bed of dry sand, placed above the ground plane. Due to the use of a semi-anechoic chamber, the 50 cm of dry sand could not feasibly be placed below the ground plane. Sand placed over top of the ground plane will likely result in discontinuities within the medium, reflections from which may adversely impact the compliance measurement. However, since the EUT met the requirements this was deemed a worst case measurement for the purposes of compliance.

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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 210:2007	- Issue 7: Spectrum Management and Telecommunications Policy. Radio Standards Specification Low Power Licence-Exempt Radiocommunication Devices
RSS 220:2009	- Issue 1: Spectrum Management and Telecommunications Policy. Radio Standards Specification Devices Using Ultra-Wideband (UWB) Technology

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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 – Released 9/14/2011

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Definitions and Acronyms

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

AE – Auxillary Equipment.

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

EMC – Electro-Magnetic Compatibility

EMI – Electro-Magnetic Immunity

EUT – Equipment Under Test

GPR – Ground Penetrating Radar

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

RBW – Resolution Bandwidth

RF – Radio Frequency

UWB – Ultra Wide Band

VBW – Video Bandwidth

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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) #612361 and Industry Canada (IC) 6844A-2. 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. Global EMC maintains an ISO 17025 accreditation with A2LA (certificate #2555.01), however the tests listed in this report are not covered under the scope of accreditation.

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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)
April 19-20, 2011	RE	SD	20-25°C	30-45%	100 -103kPa

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Detailed Test Results Section

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Bandwidth of Ultra Wide Band Transmitters

Purpose

The purpose of this test is to ensure that the device is capable of being classified as an Ultra Wide Band (UWB) transmitter.

Limits

The Limit is as specified in FCC Part 15 and RSS 220.

In accordance with 15.503(a), “the UWB bandwidth is the frequency band bounded by the points that are 10 dB below the highest radiated emission, as based on the complete transmission system including the antenna. The upper boundary is designated f_H and the lower boundary is designated f_L . The frequency at which the highest radiated emission occurs is designated f_M .

In accordance with 15.503(c), Fractional bandwidth. The fractional bandwidth equals $2(f_H - f_L) / (f_H + f_L)$.

For the product to be defined as a UWB is that, at any point in time, has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

In accordance with FCC 15.509(a), the UWB Bandwidth must be below 10.6 GHz.

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Results

The EUT passed.

f_L was 193.5 MHz and f_H was 563.5 MHz. The 10 dB BW was measured to be 370 MHz.

The fractional bandwidth is
 $2 \times (563.5 - 193.5) / (563.5 + 193.5)$
 $= 2 \times 370 / 757$
 $= 2 \times 0.49$
 $= 0.98$

The fractional bandwidth meets the fractional bandwidth requirement.

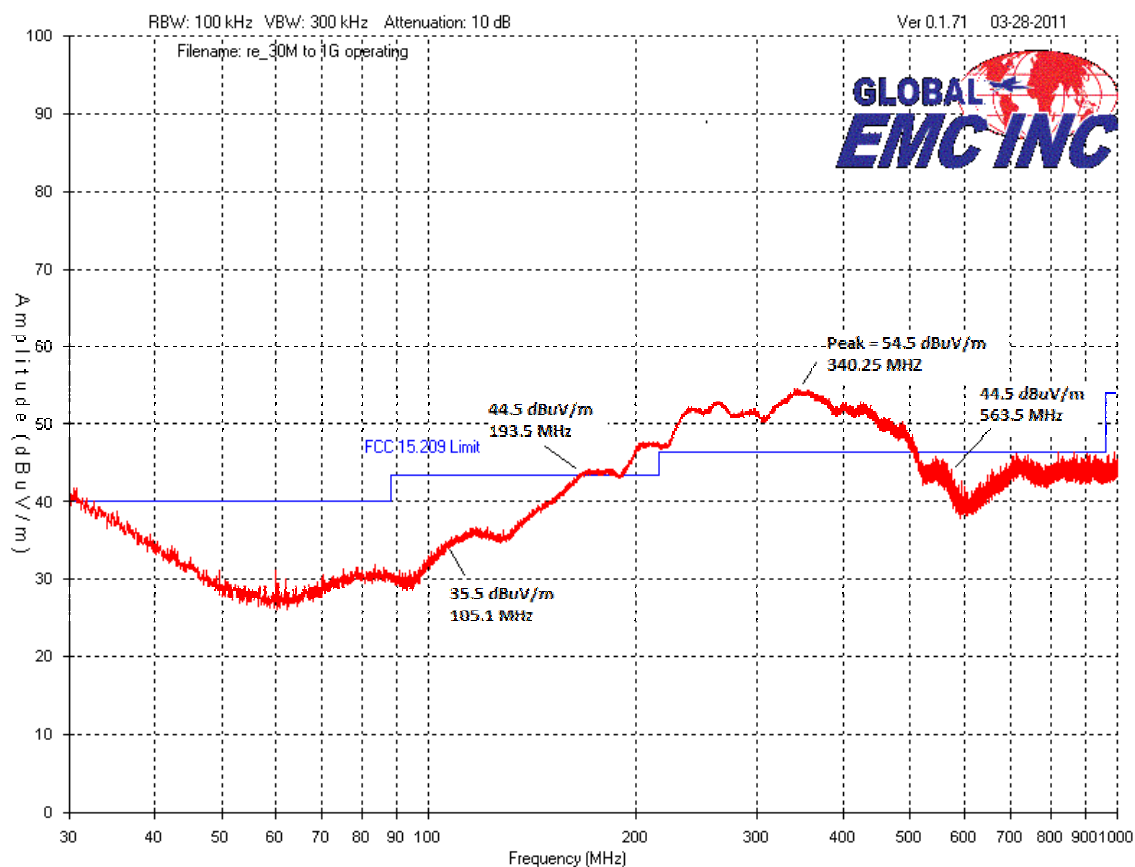
Center Frequency (f_C) = $563.5 + 193.5 / 2 = 378.5$ MHz

Peak Frequency (f_M) = 340 MHz.

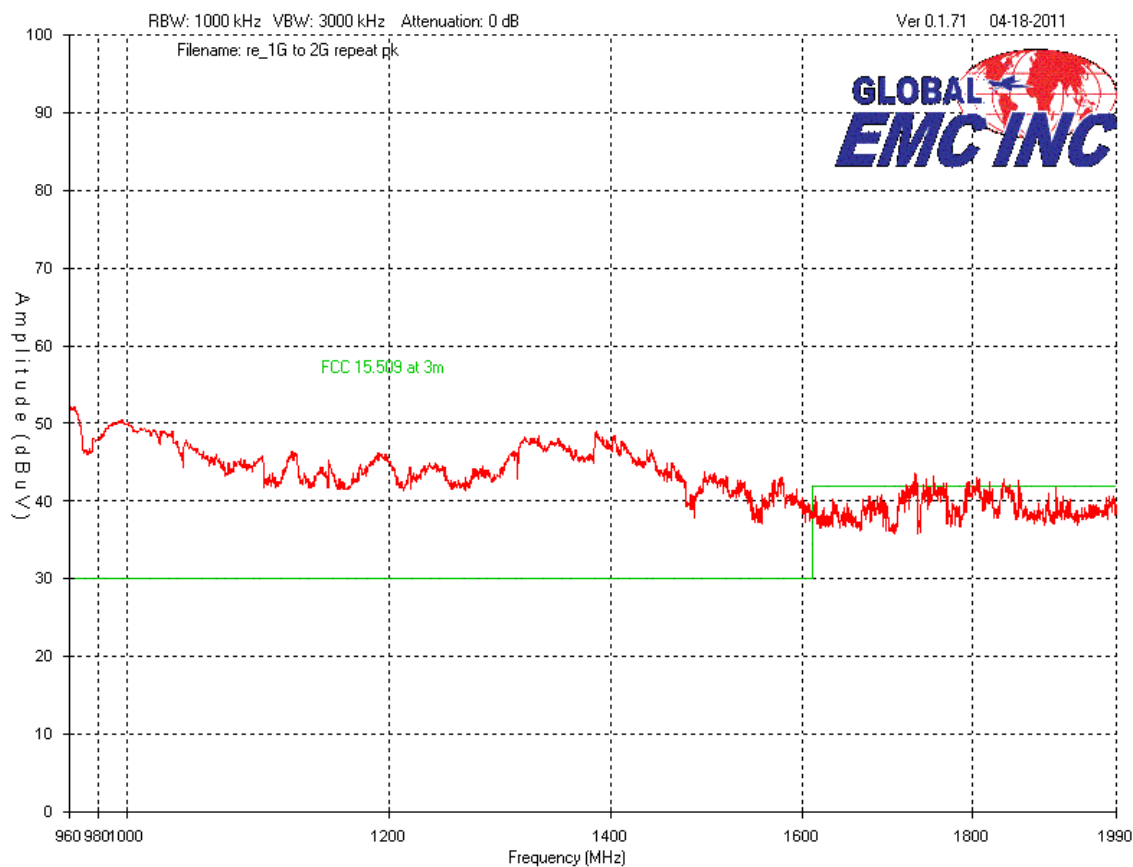
For information purposes, the 20 dB BW was from 105.1 MHz to 2.2 GHz, which is a 20 dB Bandwidth of 2.095 GHz.

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Graph(s)



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Note: The field strength drops below the 20 dB point from the peak (to 35.5 dBuV/m) at 2.2 GHz. The 20 dB point was measured using a 100 kHz resolution bandwidth.

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

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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
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 – 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, GPS, and so on, from unwanted interference.

Limit(s) and Method

The method is as defined in ANSI C63.4 and ANSI C63.10

The limits are as defined in FCC Part 15, Section 15.509(d)

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

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

Above 960 MHz ²

Frequency (MHz)	EIRP (dBm)	dBuV/m @ 3m
960-1610	-65.3	29.9
1610-1990	-53.3	41.9
1990-3100	-51.3	43.9
3100-10600	-41.3	53.9
Above 10600	-51.3	43.9

²Limit is specified with 1 MHz measurement bandwidth and using an **RMS** detector

Above 960 MHz ³

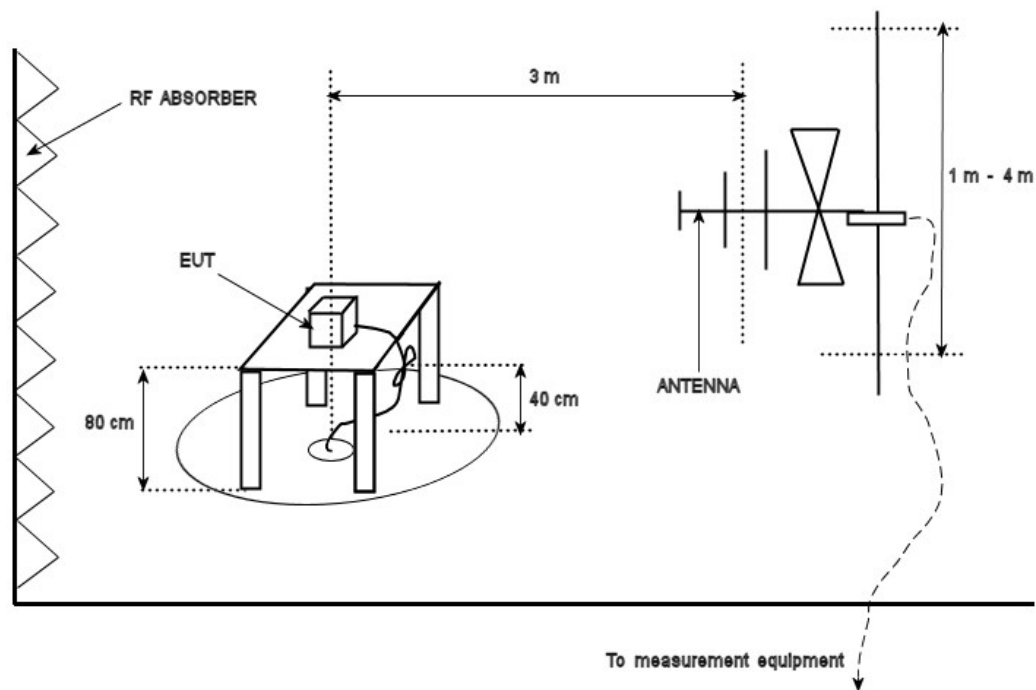
Frequency (MHz)	EIRP (dBm)	dBuV/m @ 3m
1164-1240	-75.3	19.9
1559-1610	-75.3	19.9

³Limit is specified with 1 kHz measurement bandwidth and using an **RMS** detector

In accordance with FCC Part 15, Subpart A, Section 15.33, the device was scanned to 10 GHz, which exceeds the 10th harmonic of f_C (3.5 GHz).

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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

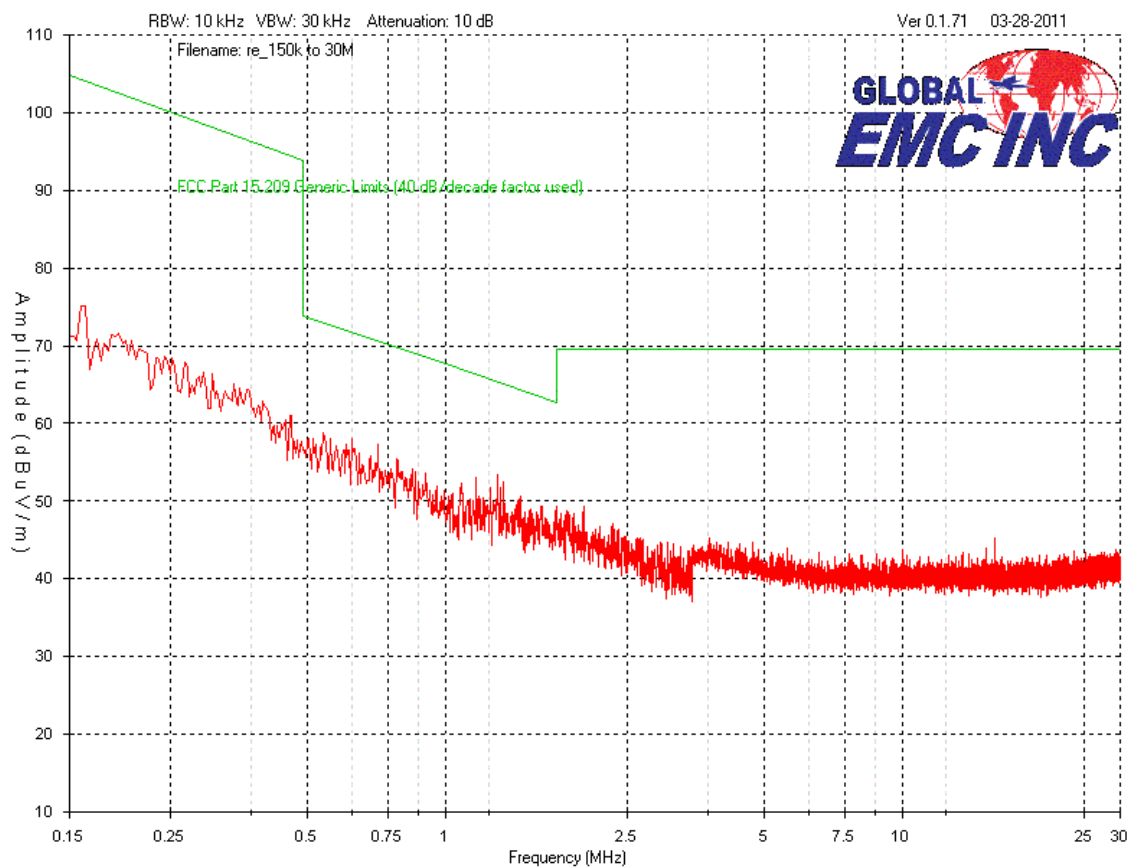
Note the graphs shown below are for graphical illustration only. For final measurements with the appropriate detector, please refer to the final measurement table where applicable. The graphs shown below are a maximized peak measurement graph, measured with a resolution bandwidth approximately the same as 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 minimum of the 10th harmonic.

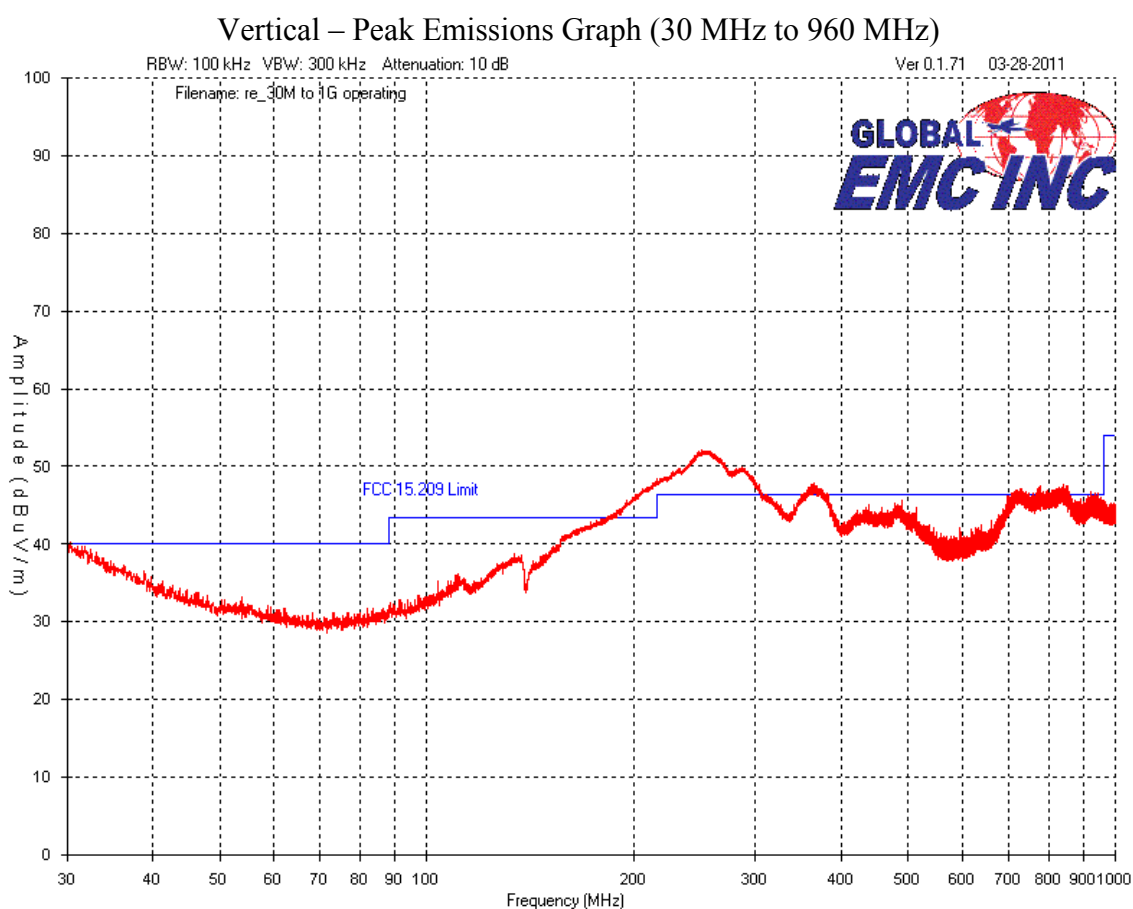
Devices scanned above 10 GHz may be scanned at 1 meter test distance, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used.

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Emissions below 30 MHz



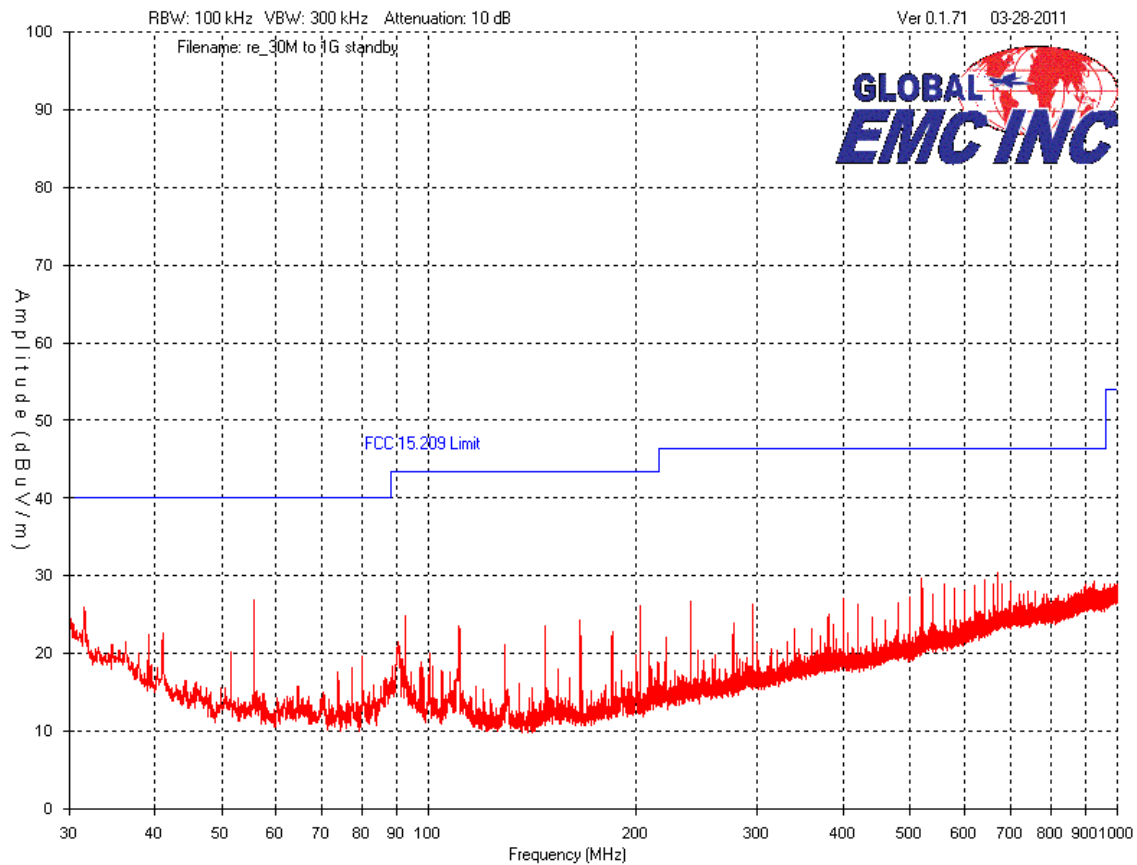
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Operating

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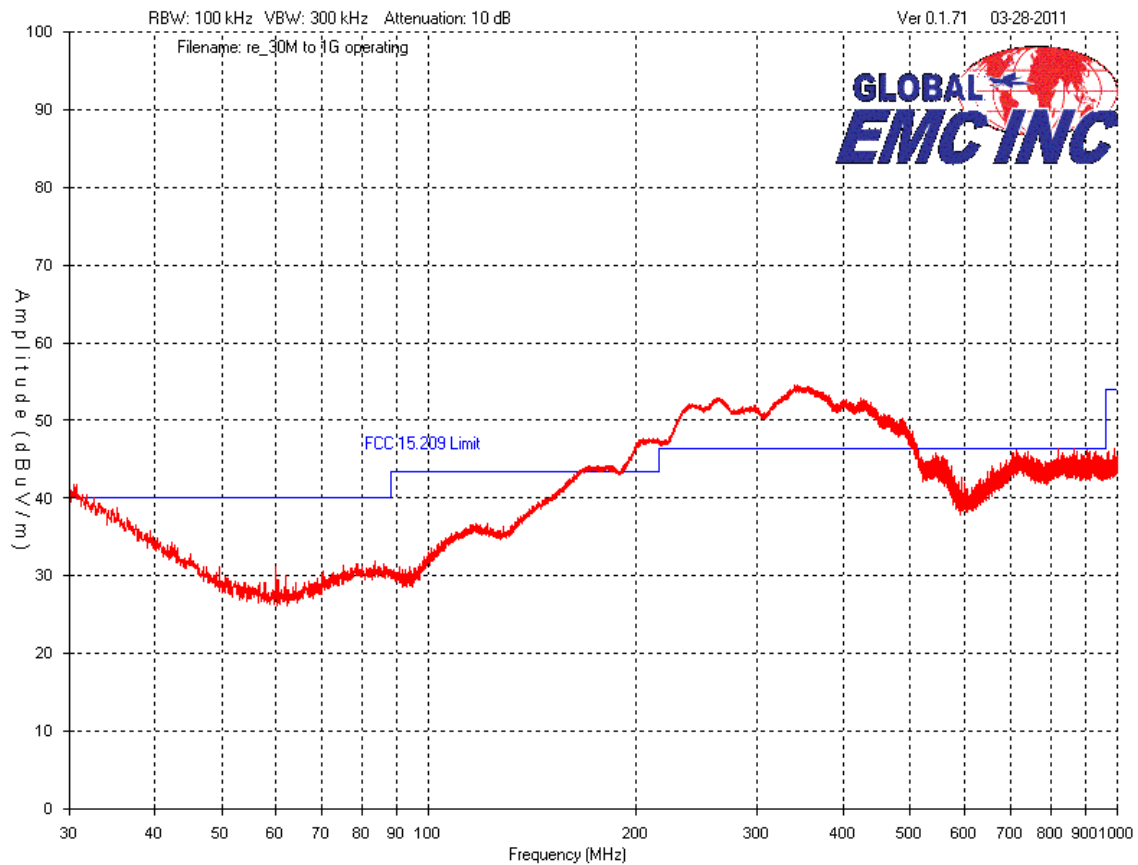
Vertical – Peak Emissions Graph (30 MHz to 960 MHz)



Standby (digital emissions)

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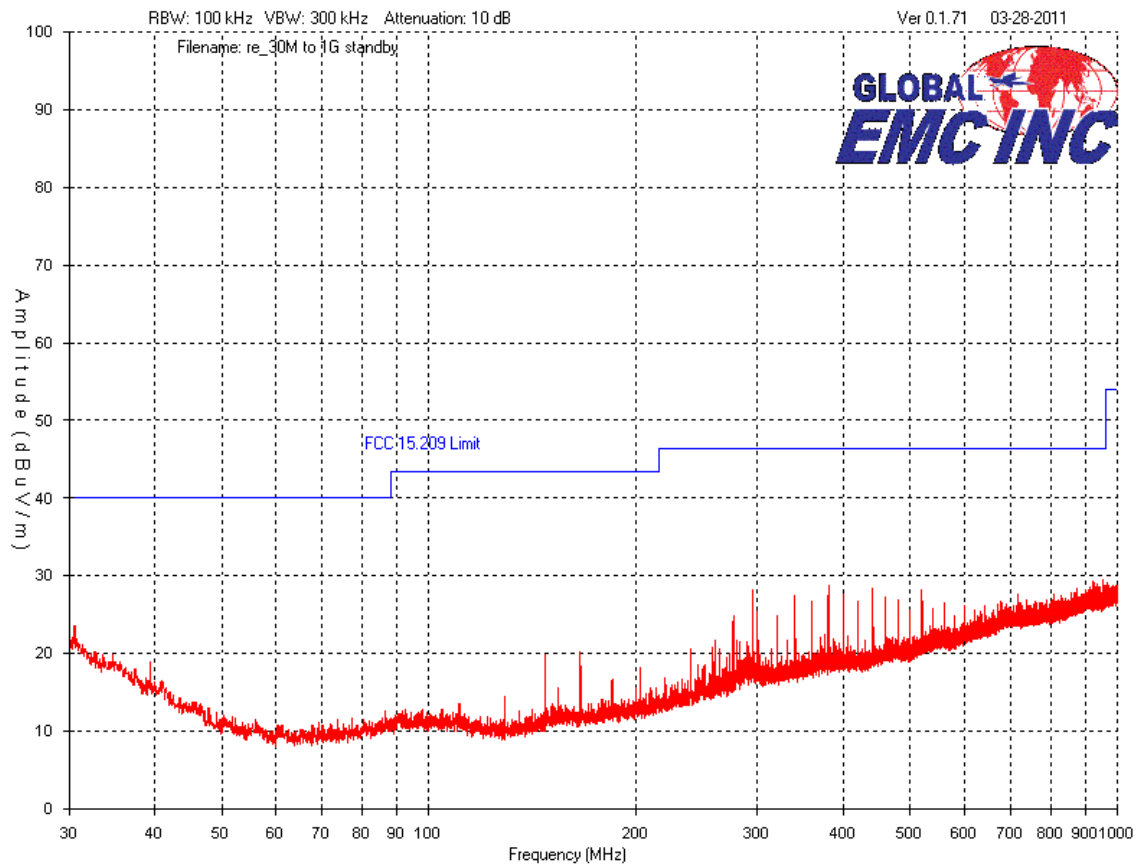
Horizontal – Peak Emissions Graph (30 MHz to 960 MHz)



Operating

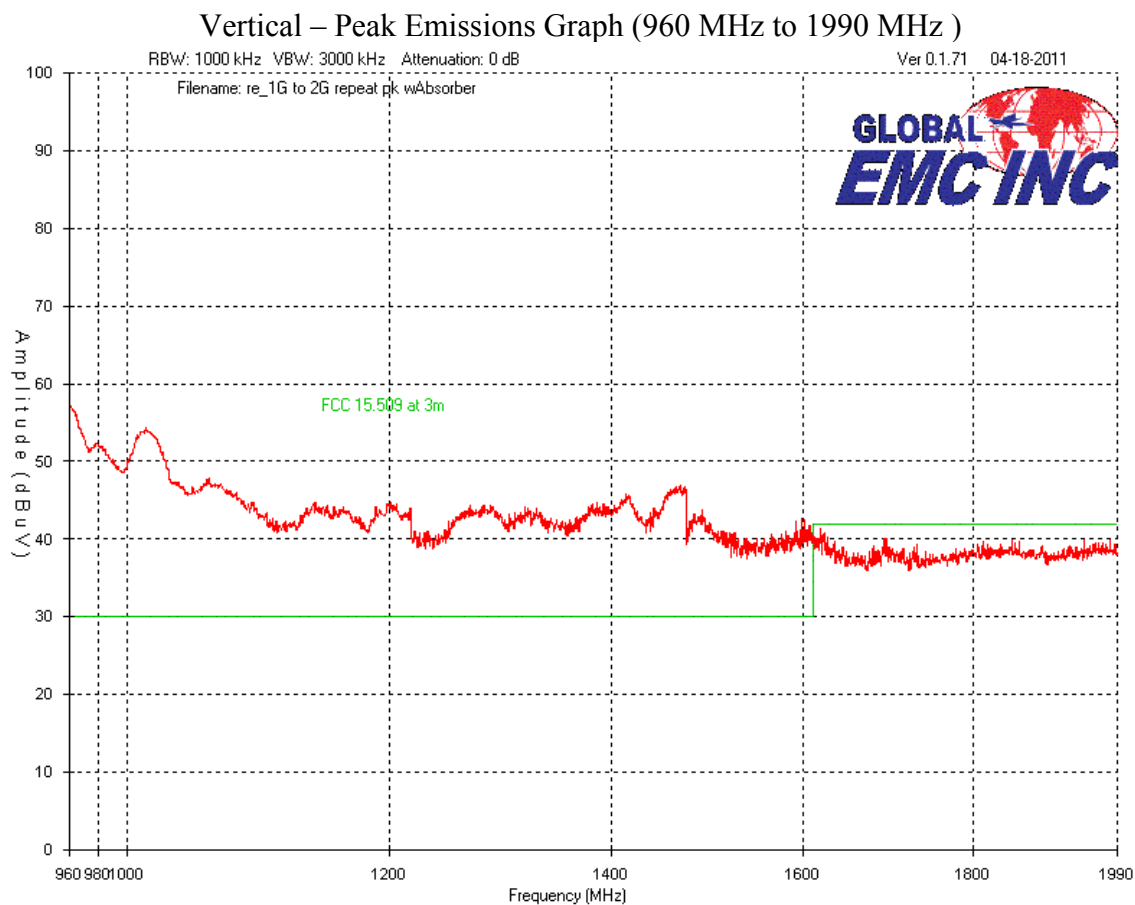
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Horizontal – Peak Emissions Graph (30 MHz to 960 MHz)



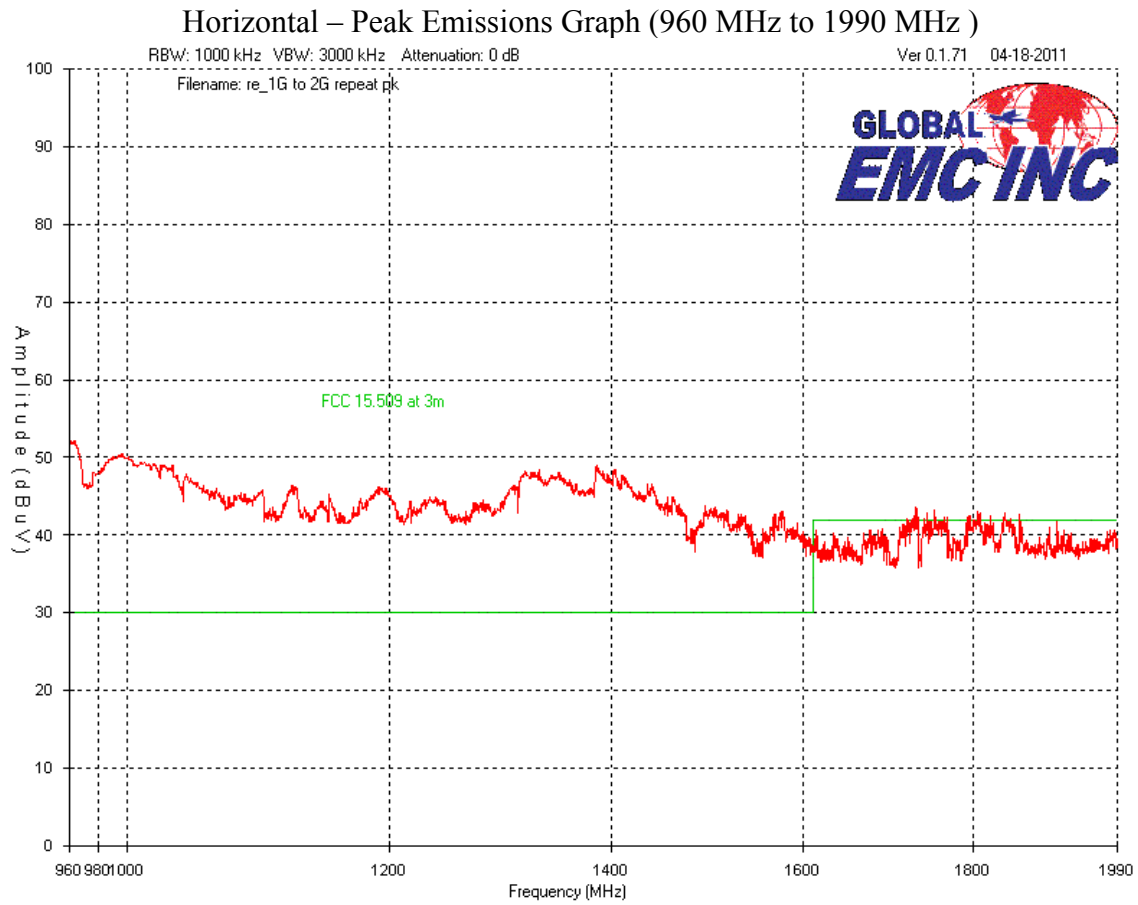
Standby (digital emissions)

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Note: The above graph represents a peak graph. For RMS measurements, refer to table.

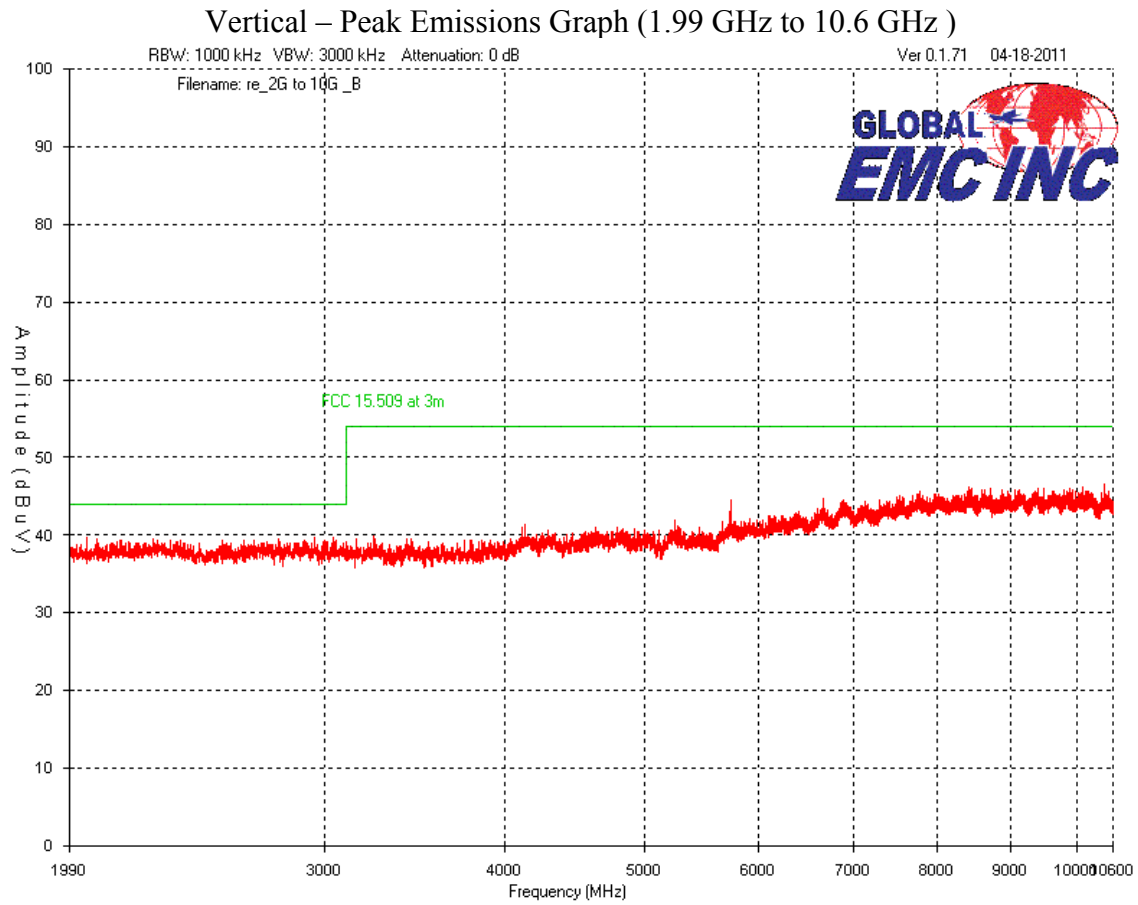
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Operating

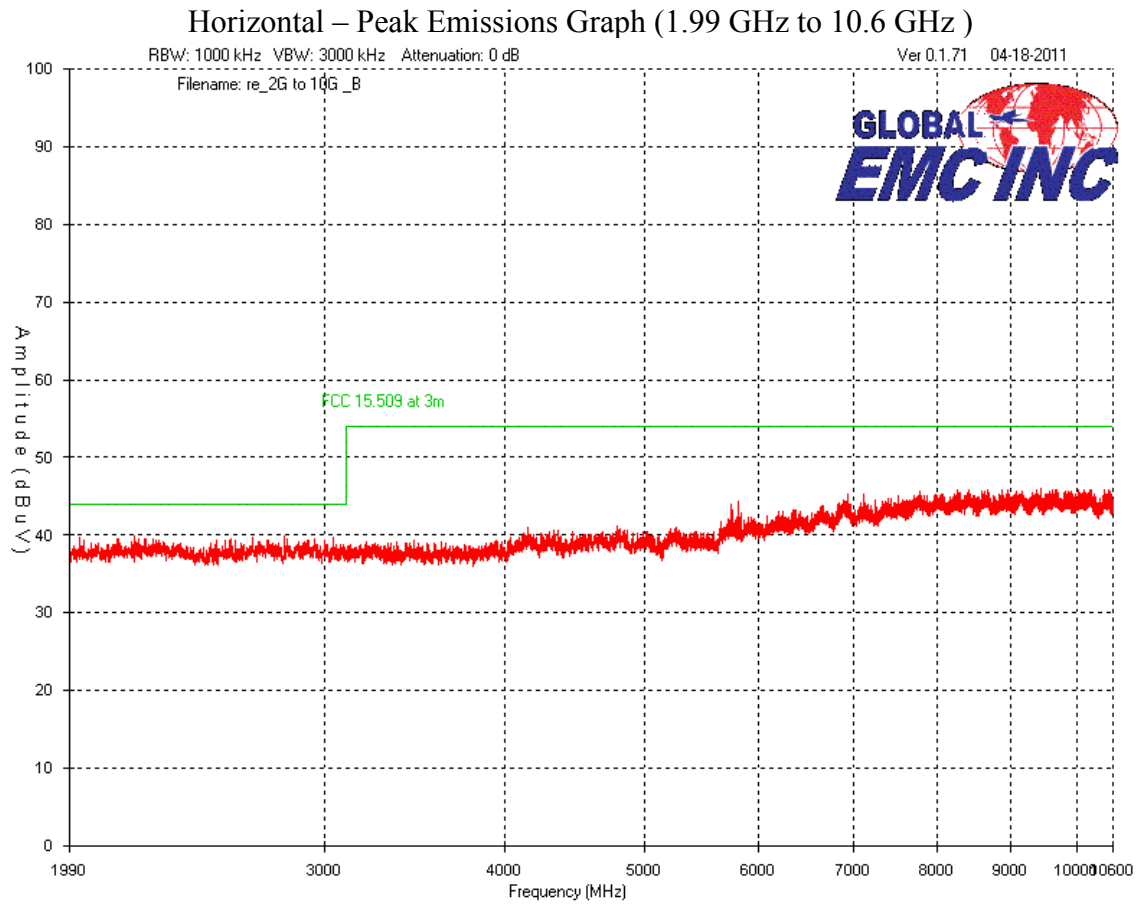
Note: The above graph represents a peak graph. For RMS measurements, refer to table.

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Operating

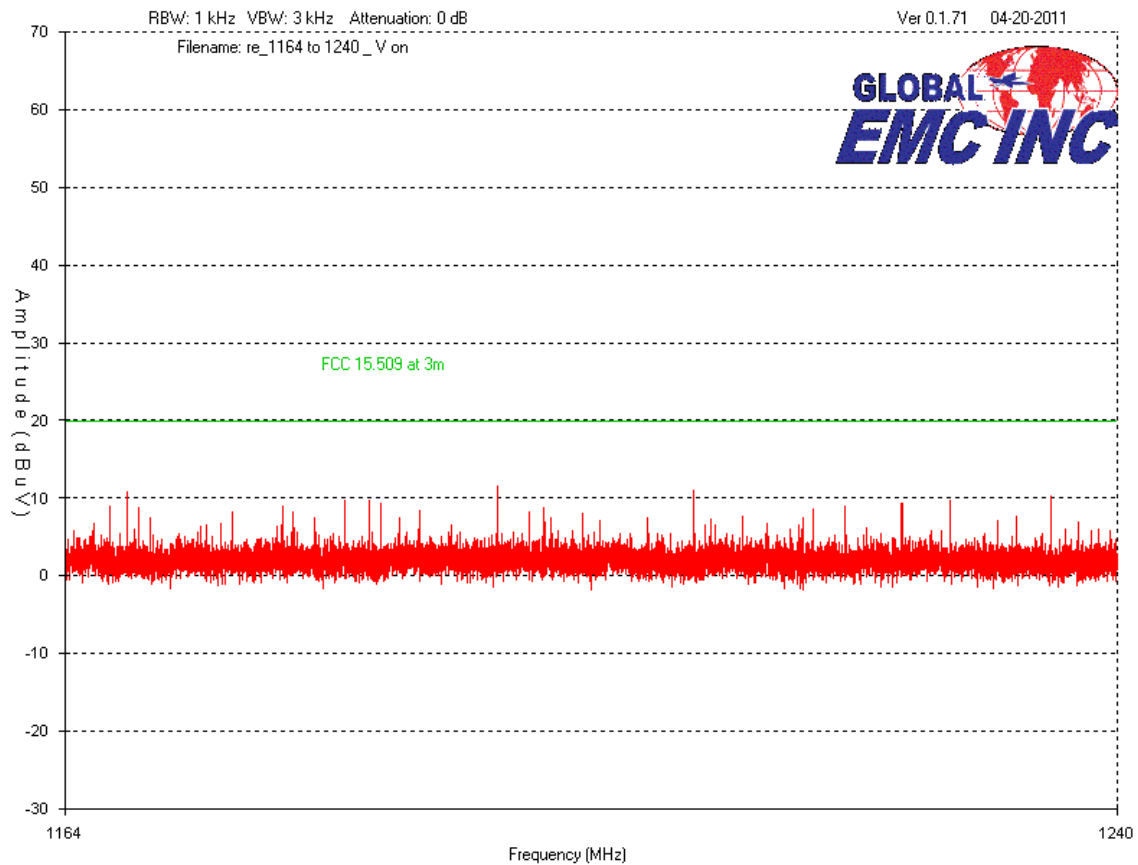
Client	Sensors & Software	
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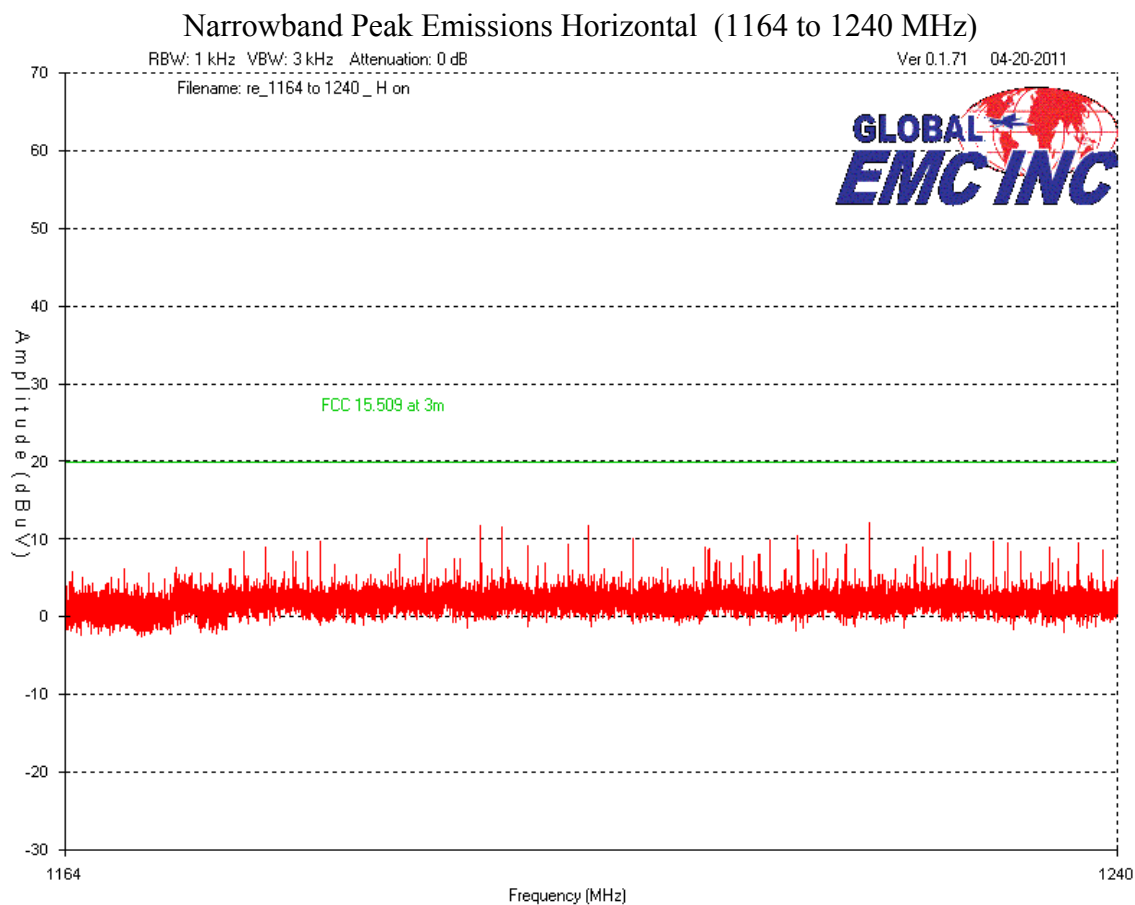
Operating

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Narrowband Peak Emissions Vertical (1164 to 1240 MHz)

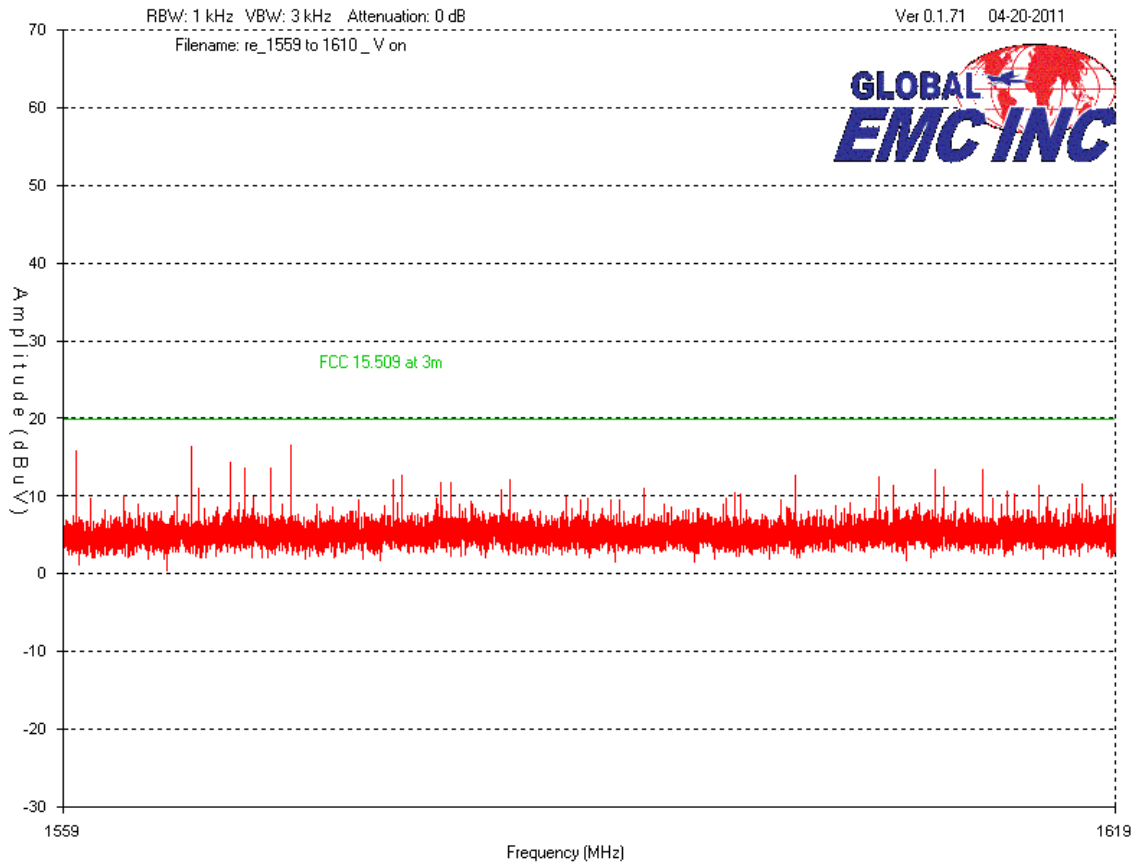


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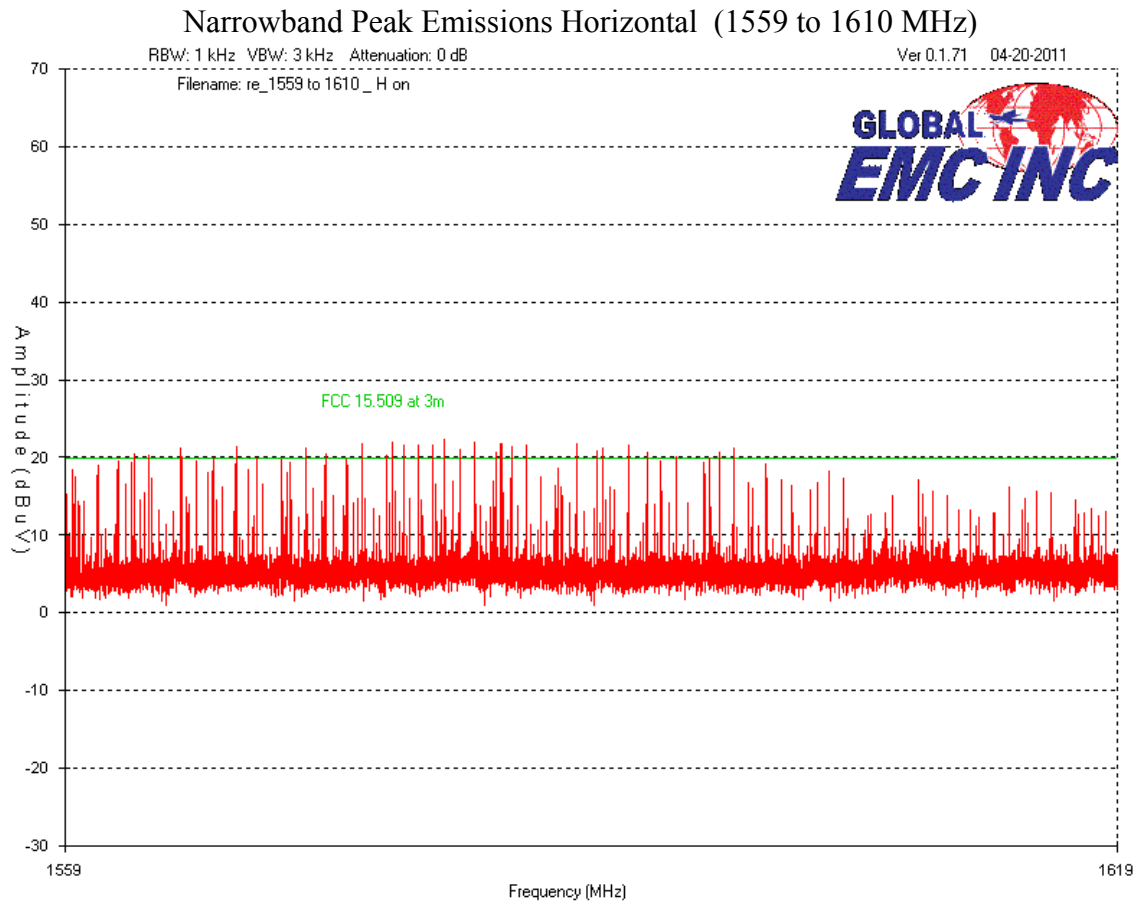


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Narrowband Peak Emissions Vertical (1559 to 1610 MHz)



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For RMS detector readings, refer to table.

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Final Measurements

Quasi Peak Emissions Table - Vertical

Frequency (MHz)	Raw (dBuV)	Ant. (dB/m)	Atten. (dB)	Cable (dB)	Amp (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
30.2	26.5	18.6	16	0.3	-30.1	31.3	40	8.7	Pass
250.934	40.1	12.2	16	0.6	-30.4	38.5	46.4	7.9	Pass
340.238	32.5	15.1	16	0.6	-30.4	33.8	46.4	12.6	Pass
850	27.5	22	16	1.2	-30.1	36.6	46.4	9.8	Pass
960	26.7	23.1	16	1.4	-29.8	37.4	46.4	9	Pass
350	33.7	15.1	16	0.6	-30.4	35	46.4	11.4	Pass

Quasi Peak Emissions Table - Horizontal

Frequency (MHz)	Raw (dBuV)	Ant. (dB/m)	Atten. (dB)	Cable (dB)	Amp (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
30.2	27.5	18.6	16	0.3	-30.1	32.3	40	7.7	Pass
250.934	33.6	12.2	16	0.6	-30.4	32	46.4	14.4	Pass
340.238	32.4	15.1	16	0.6	-30.4	33.7	46.4	12.7	Pass
850	28.5	22	16	1.2	-30.1	37.6	46.4	8.8	Pass
960	28.2	23.1	16	1.4	-29.8	38.9	46.4	7.5	Pass
350	40.6	15.1	16	0.6	-30.4	41.9	46.4	4.5	Pass

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RMS Emissions Table - Vertical

Frequency (MHz)	Raw (dBuV)	Ant. (dB/m)	Amp / Cable (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
961.03	42.6	23.1	-35.8	29.9	30	0.1	Pass
1056.56	41.5	24.6	-37.2	28.9	30	1.1	Pass
1350	36.4	27.2	-36.9	26.7	30	3.3	Pass
1577.74	34.5	28.9	-36.7	26.7	30	3.3	Pass
1250	35.7	25.5	-37	24.2	30	5.8	Pass
1100	37.7	24.9	-37.2	25.4	30	4.6	Pass

The worst case emission appeared at 961 MHz at a vertical antenna height of 1 m and at turn table azimuth of 185 degrees as depicted in Appendix B of this test report.

RMS Emissions Table - Horizontal

Frequency (MHz)	Raw (dBuV)	Ant. (dB/m)	Amp / Cable (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
961.03	42.2	23.1	-35.8	29.5	30	0.5	Pass
1056.56	39.5	24.6	-37.2	26.9	30	3.1	Pass
1350	38.6	27.2	-36.9	28.9	30	1.1	Pass
1577.74	33.4	28.9	-36.7	25.6	30	4.4	Pass
1250	36.6	25.5	-37	25.1	30	4.9	Pass
1100	38.2	24.9	-37.2	25.9	30	4.1	Pass

Narrowband RMS Emissions Table - Horizontal

Frequency (MHz)	Raw (dBuV)	Ant. (dB/m)	Amp / Cable (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
1580.33	26.8	28.9	-36.7	19.0	19.9	0.9	Pass
1582.11	25.1	28.9	-36.7	17.3	19.9	2.6	Pass

Client	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

Method of determining RMS value

A Rhode & Schwarz ESL 6 EMI receiver (SN: ESL6100135) incorporating an RMS detector was utilized to take the initial RMS measurement. This measurement was then additionally verified using the IFR spectrum analyzer using the following settings:

All RMS measurements >960MHz were verified with the following IFR spectrum analyzer settings:

RBW = 1MHz (or 1kHz in GPS band)

VBW = 3MHz

Detector = Sample (peak)

Sweep time = 200 ms

At each frequency measured above 960MHz (where RMS values are specified) the spectrum analyzer was set up with the appropriate measurement bandwidth (1MHz or 1kHz) in 'zero-span' mode. The maximum signal level was captured and the waveform was downloaded to the computer. A total of 400 points were acquired at each frequency. The RMS level at the measurement frequency was calculated as follows:

$mWRMS = \sqrt{(P1^2 + P2^2 + \dots + P_x^2)/x}$ where:

mWRMS = RMS power in a 1msec interval at measurement frequency

x = 1 to (number of analyzer samples)

Px = Power at each time sample

Using this RMS power at the analyzer, EIRP at each frequency was calculated as described above.

Client	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

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
EMI Receiver	ESL6	Rhode & Schwarz	NCR	NCR	GEMC 545
Loop Antenna	EM 6871	Electro-Metrics	2011-01-31	2013-01-31	GEMC70
Loop Antenna	EM 6872	Electro-Metrics	2011-01-31	2013-01-31	GEMC 71
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	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

Duty Cycle

Purpose

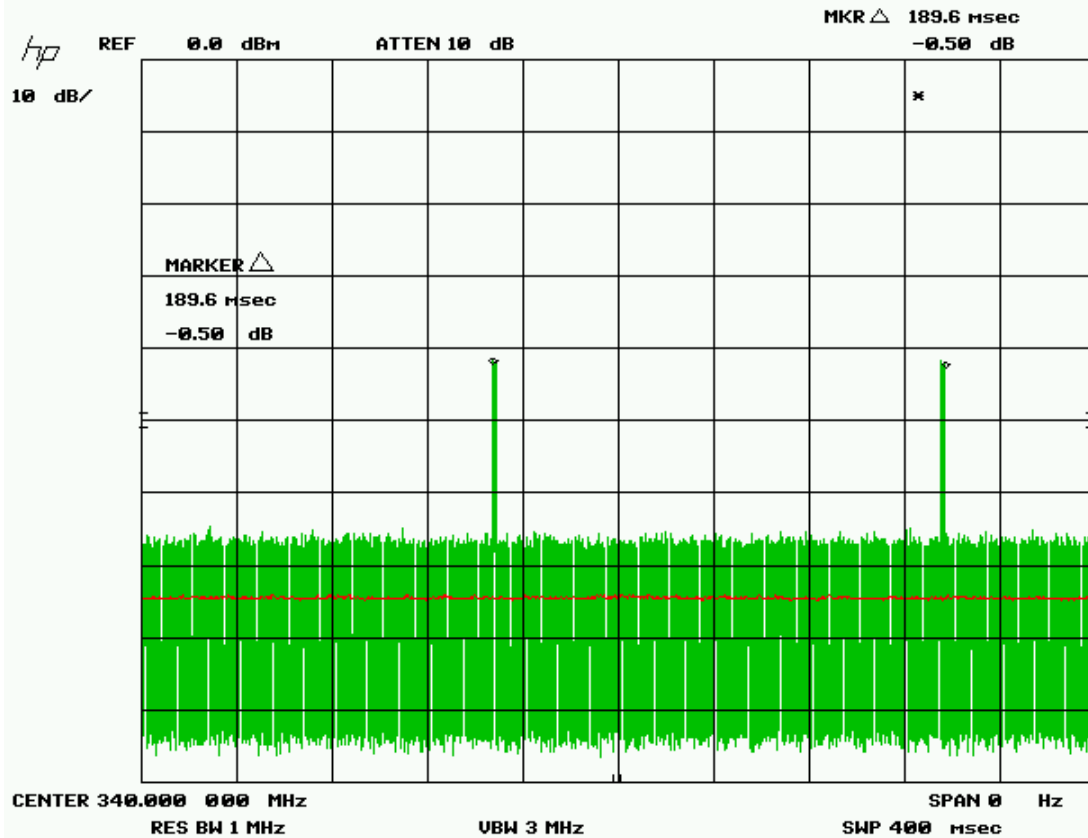
The purpose of this test is to measure the duty cycle of the transmitter.

Limits

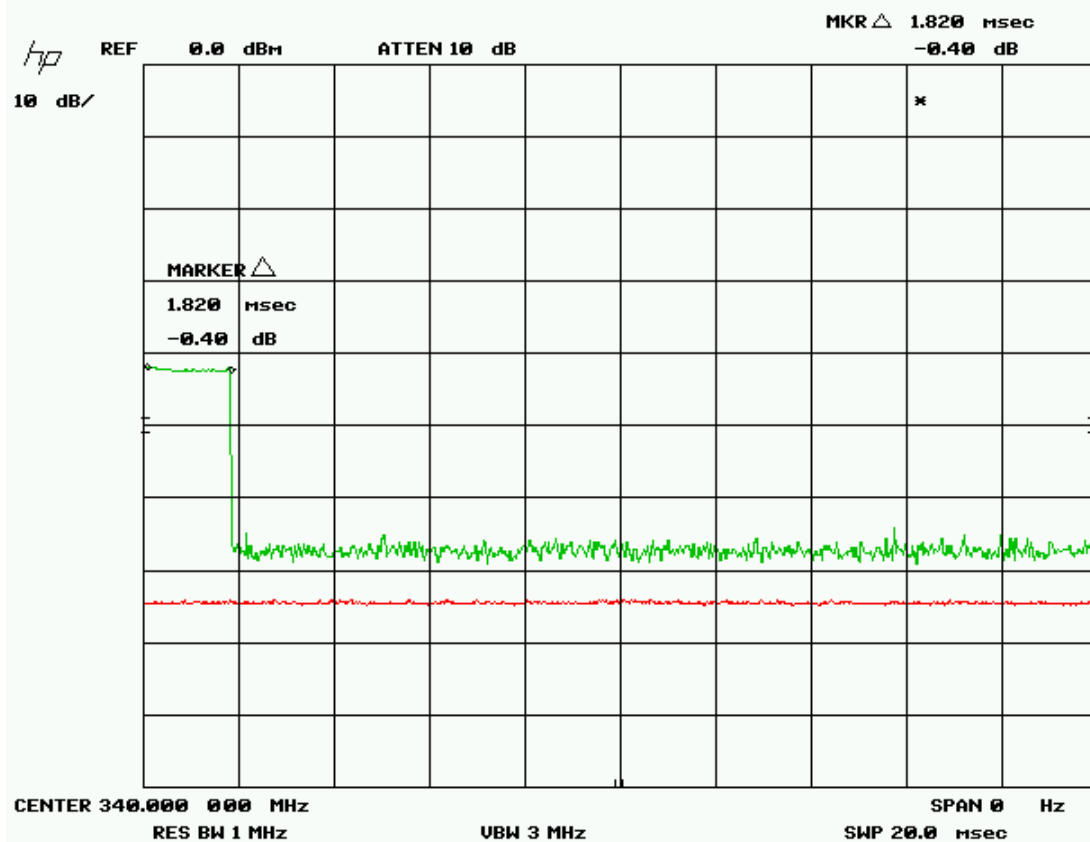
No limit applies, however this is provided for information purposes.

Client	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

Results



Client	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	



Client	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

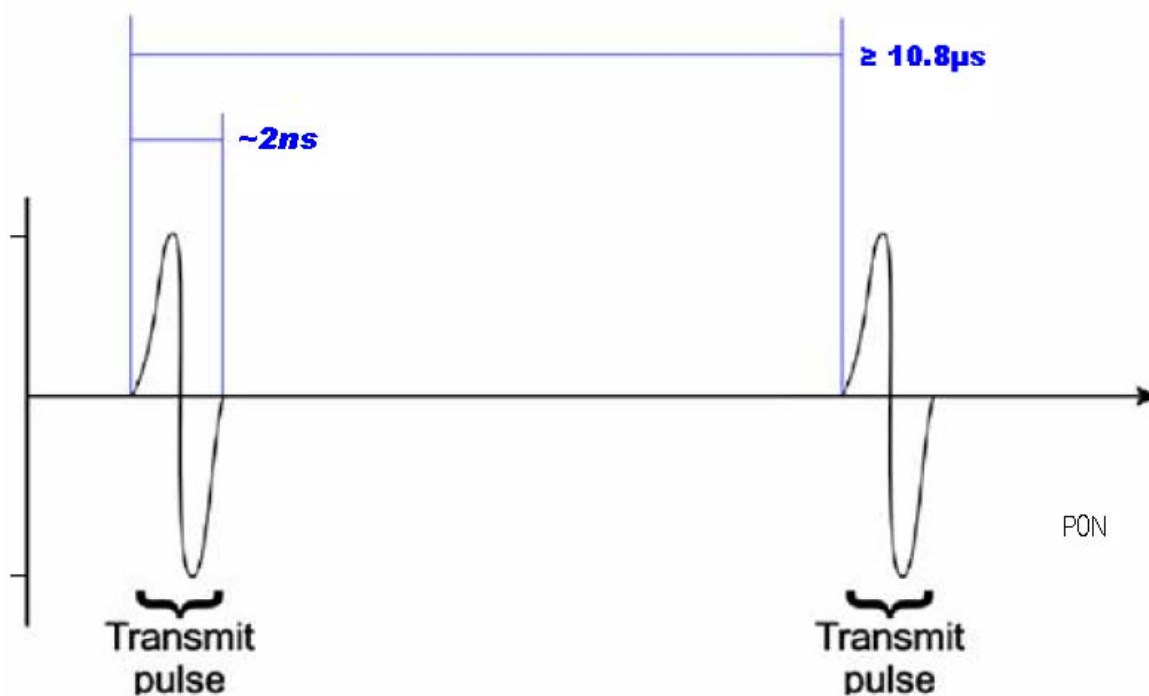
Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Attenuator 20 dB	FP-50-20	Trilithic	NCR	NCR	GEMC 43
IFR Spectrum Analyzer	AN940	IFR	12/29/2009	12/29/2011	GEMC 6350
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	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

Pulse Shape



Client	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

Appendix A – EUT Summary

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

General EUT Description

Manufacturer	Sensors & Software Inc. 1040 Stacey Court, Mississauga ON. L4W 2X8 Toll Free: 1-800-267-6013 T: 905-624-8909
EUT Name	Noggin Gold (NG250)
FCCID	QJQ-NG250
IC #	8393A-NG250
Approximate Size (LxWxH)	40 cm x 60 cm x
Equipment Category (Commercial / Residential / Medical)	Commercial
Input Voltage and Frequency	N/A – Battery operated
Rated Input Current	N/A
Table Top / Wall mount / Floor standing (choose table top if unsure)	Floor standing
Minimum Separation distance from operator	> 20 cm from transmit antenna

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	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

Appendix B – EUT and Test Setup Photographs

Client	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

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

EUT



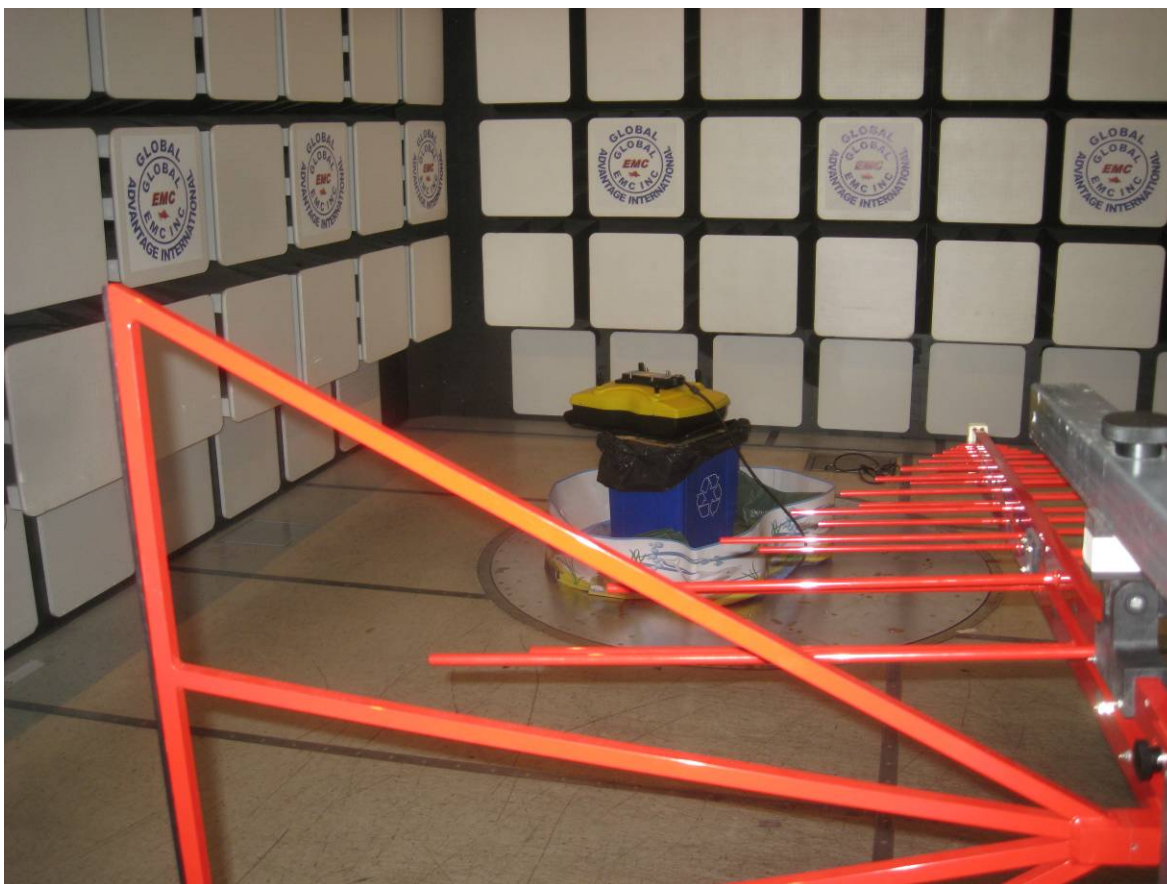
Client	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

Radiated Emissions (Below 30 MHz) – Test Setup



Client	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

Radiated Emissions – 30 MHz to 960 MHz



As per guidance in ANSI C63.10 section 7.10.2.2, the device was above a raised 50 cm bed of dry sand, placed above the ground plane. Due to the use of a semi-anechoic chamber, the 50 cm of dry sand could not feasibly be placed below the ground plane. Sand placed over top of the ground plane will likely result in discontinuities within the medium, reflections from which may adversely impact the compliance measurement. However, since the EUT met the requirements this was deemed a worst case measurement and suitable for the purposes of compliance.

Client	Sensors & Software	
Product	Noggin Gold (NG250)	
Standard(s)	RSS 220 Issue 1:2009 / FCC Part 15:2010 Subpart F	

Radiated Emissions Above 960 MHz



As per guidance in ANSI C63.10 section 7.3.10, for frequencies above 960 MHz, the device was tested with absorber placed above the reference ground plane as depicted in the test setup photo's to ensure a free space propagation path measurement was performed.