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

Smiths Detection RadSeeker™ CS/CL

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Testing produced for

smiths detection
bringing technology to life

See Appendix A for customer & EUT details.

Industry Canada

LAB REGISTRATION #6844A-2

FCC REGISTRATION #612361

ACCREDITED

Testing Laboratory Certificate #2555.01

Table of Contents

Report Scope

This report addresses the EMC verification testing and test results of the Smiths Detection RadSeeker™ CS/CL, 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	**Smiths Detection**
Product	RadSeeker™ CS/CL
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:	Z2X4822X00CSL
EUT Industry Canada Certification #, IC:	8705C-4822X
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Scott Drysdale

Client	**Smiths Detection**
Product	RadSeeker™ CS/CL
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	SAR	Pass See separate SAR report
Overall Result			**PASS**

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.

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 an internal dipole antenna, which is not field replaceable or accessible. This antenna is connected internally by a U.Fl connector.

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.

This device may use one of three separate power supplies. Each power supply was investigated at each mode of operation at each of low, medium, and high band of operation. Where applicable, the representative results of worst case power supply are presented in this test report.

For maximum permissible exposure, this device operates in Digitally modulated mode at 60.3 mW at 2.4 GHz, in both portable and mobile conditions. This device was calculated for maximum permissible exposure based on a 5 cm distance, as required/stated in the end user documentation.

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

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 24, 2011

Revision 2 - Jan 3, 2012
Fixed typographical error on FCC ID.

Definitions and Acronyms

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

AE – Auxiallary 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

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.

Testing Environmental Conditions and Dates

Following were the environmental conditions in the facility during time of testing –

Date	Test	Init.	Temperature (ºC)	Humidity (%)	Pressure (kPa)
Nov 1 – 14, 2011	RE	SD	20-25ºC	30-45%	100 -103kPa
Nov 1 – 14, 2011	PLCE	SD	20-25ºC	30-45%	100 -103kPa

Detailed Test Results Section

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

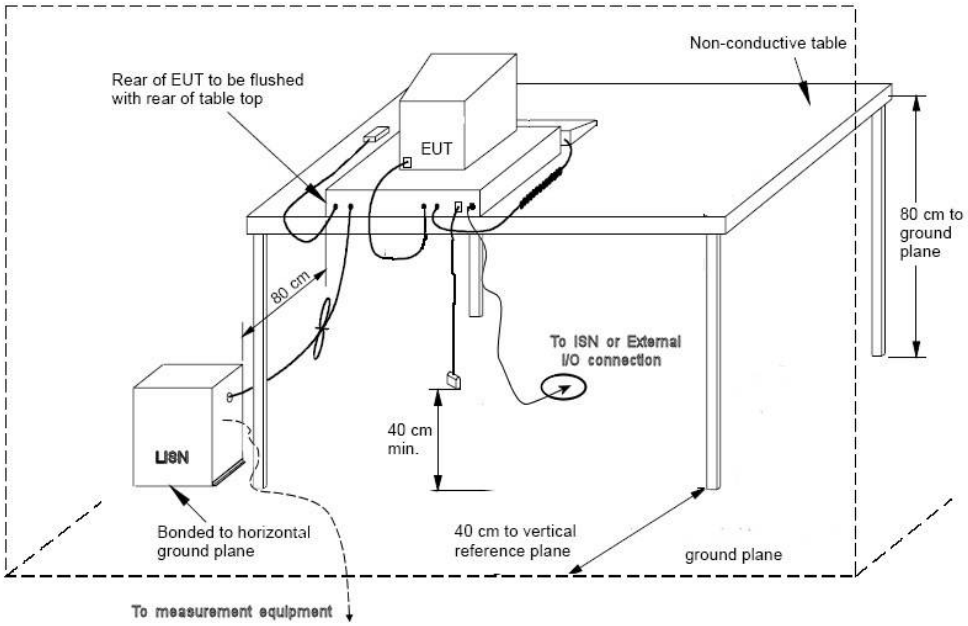
Average Limits		QuasiPeak Limits	
150 kHz – 500 kHz	56 to 46 dBuV	150 kHz – 500 kHz	66 to 56 dBuV
500 kHz – 5 MHz	46 dBuV	500 kHz – 5 MHz	56 dBuV
5 MHz – 30 MHz	50 dBuV	500 kHz – 30 MHz	60 dBuV

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 .

Typical Setup Diagram



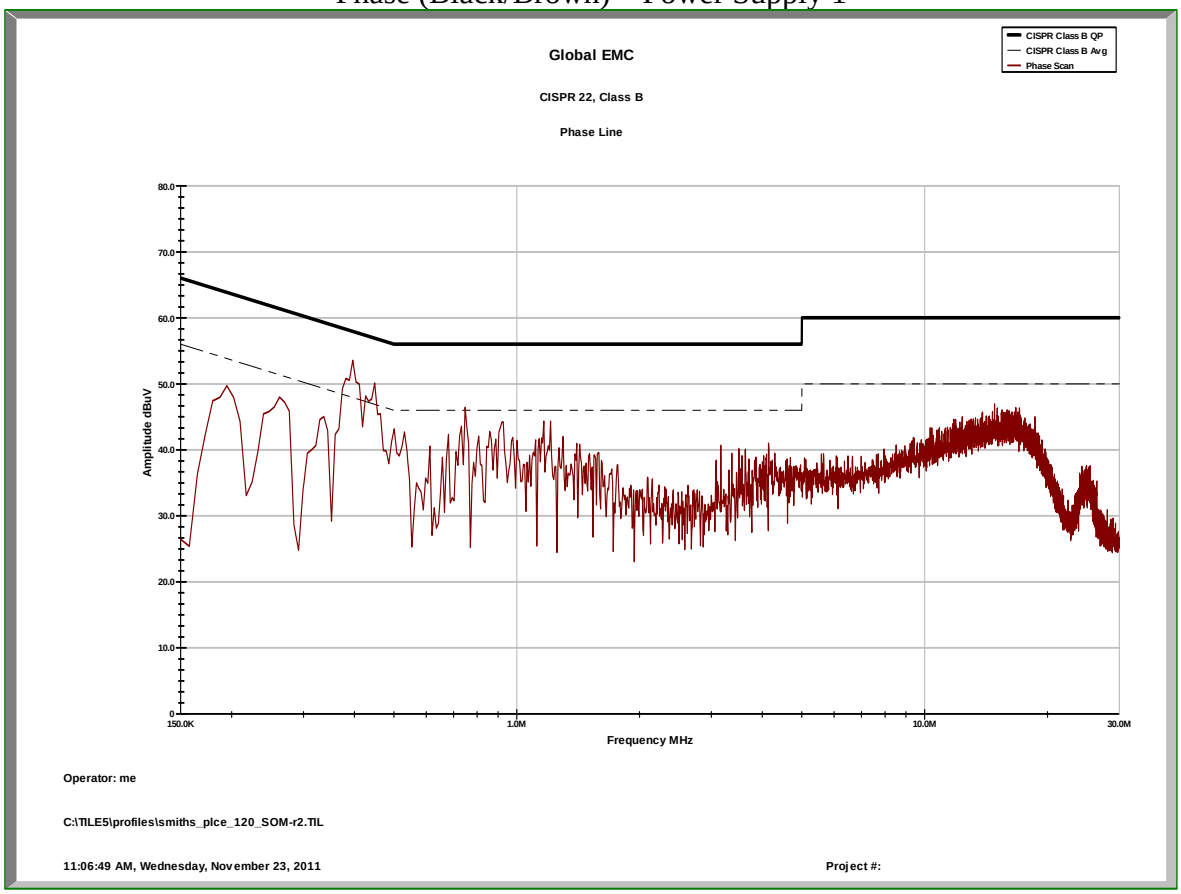
Measurement Uncertainty

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.

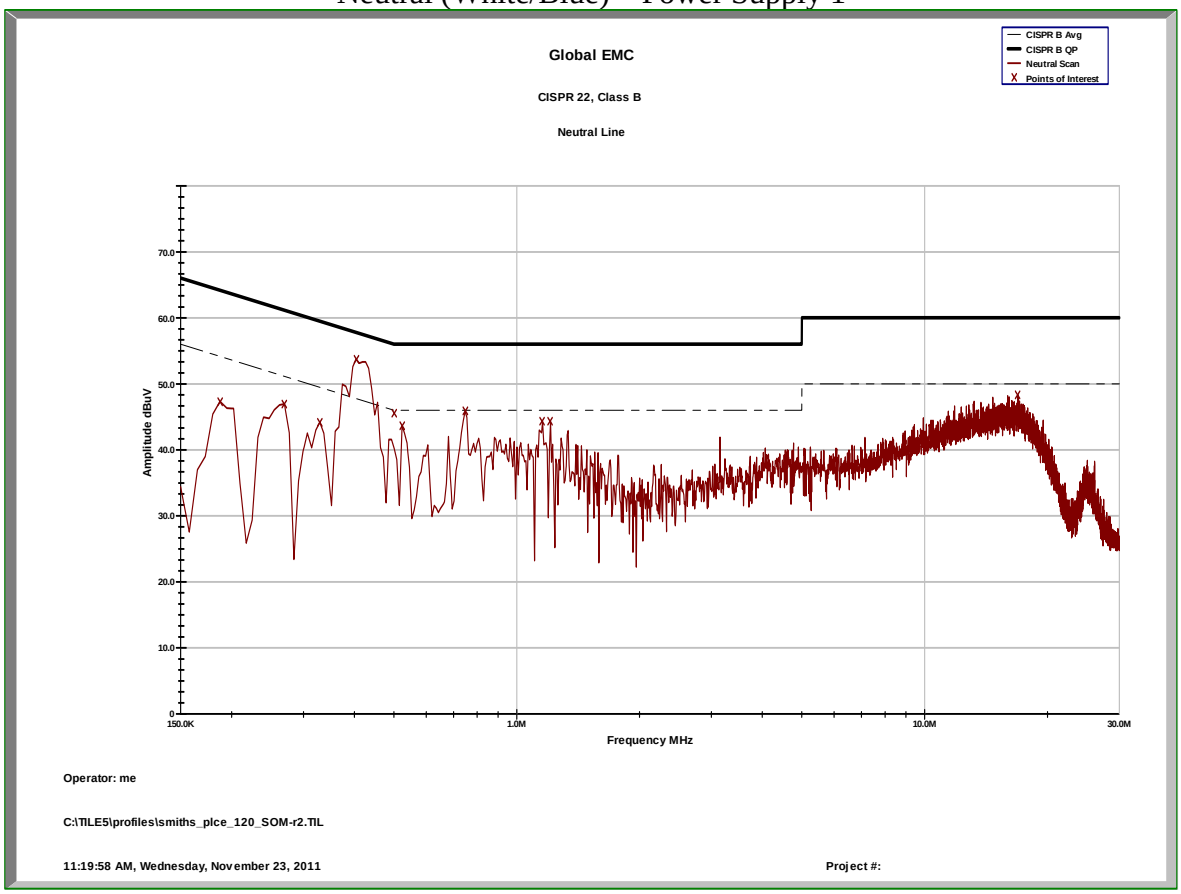
Preliminary Graphs

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 then 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.

Phase (Black/Brown) – Power Supply 1



Neutral (White/Blue) – Power Supply 1



Final Measurements

Top 6 - Quasi Peak – Power Supply 1 – Line 1

Frequency	Raw QP dBuV	LISN dB	Cable dB	Atten dB	QP dBuV	QP Limit dBuV	Margin dB
408.51 KHz	40.6	0.2	0.1	10	50.9	58.6	-7.7
746.0 KHz	32.6	0.2	0.1	10	43	56	-13
512.0 KHz	30.4	0.2	0.1	10	40.7	56	-15.3
1.1949 MHz	29.4	0.2	0.2	10	39.8	56	-16.2
919.45 KHz	28.6	0.2	0.2	10	39	56	-17
265.59 KHz	34.7	0.7	0.1	10	45.5	62.7	-17.2

Top 6 – Average – Power Supply 1 – Line 1

Frequency	Raw AVG dBuV	LISN dBuV	Cable dB	Atten dB	AVG dBuV	Limit dBuV	Margin dB
408.51 KHz	22	0.2	0.1	10	32.3	48.6	-16.3
265.59 KHz	25.4	0.7	0.1	10	36.2	52.7	-16.5
14.858 MHz	20	0.3	1.1	10	31.4	50	-18.6
746.0 KHz	15.9	0.2	0.1	10	26.2	46	-19.8
1.1949 MHz	12.5	0.2	0.2	10	22.9	46	-23.1
919.45 KHz	12.1	0.2	0.2	10	22.5	46	-23.5

Top 6 - Quasi Peak – Power Supply 1 – Line 2

Frequency	Raw QP dBuV	LISN dB	Cable dB	Atten dB	QP dBuV	QP Limit dBuV	Margin dB
405.53 KHz	41.2	0.2	0.1	10	51.5	58.7	-7.2
746.5 KHz	33.1	0.2	0.1	10	43.4	56	-12.6
1.1532 MHz	31.9	0.2	0.2	10	42.3	56	-13.7
508.23 KHz	31.1	0.2	0.1	10	41.4	56	-14.6
1.2114 MHz	30.3	0.2	0.2	10	40.7	56	-15.3
269.5 KHz	34.2	0.7	0.1	10	45	62.6	-17.6

Top 6 – Average – Power Supply 1 – Line 2

Frequency	Raw AVG dBuV	LISN dBuV	Cable dB	Atten dB	AVG dBuV	Limit dBuV	Margin dB
405.53 KHz	26.3	0.1	10	0.2	36.7	48.7	-12
16.93 MHz	22.5	1.2	10	0.4	34.1	50.0	-15.9
269.5 KHz	24	0.1	10	0.7	34.8	52.6	-17.8
746.5 KHz	17.4	0.1	10	0.2	27.8	46.0	-18.2
1.1532 MHz	16.7	0.2	10	0.2	27	46.0	-19
337.35 KHz	19.5	0.1	10	0.4	30	50.6	-20.7

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
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"

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.

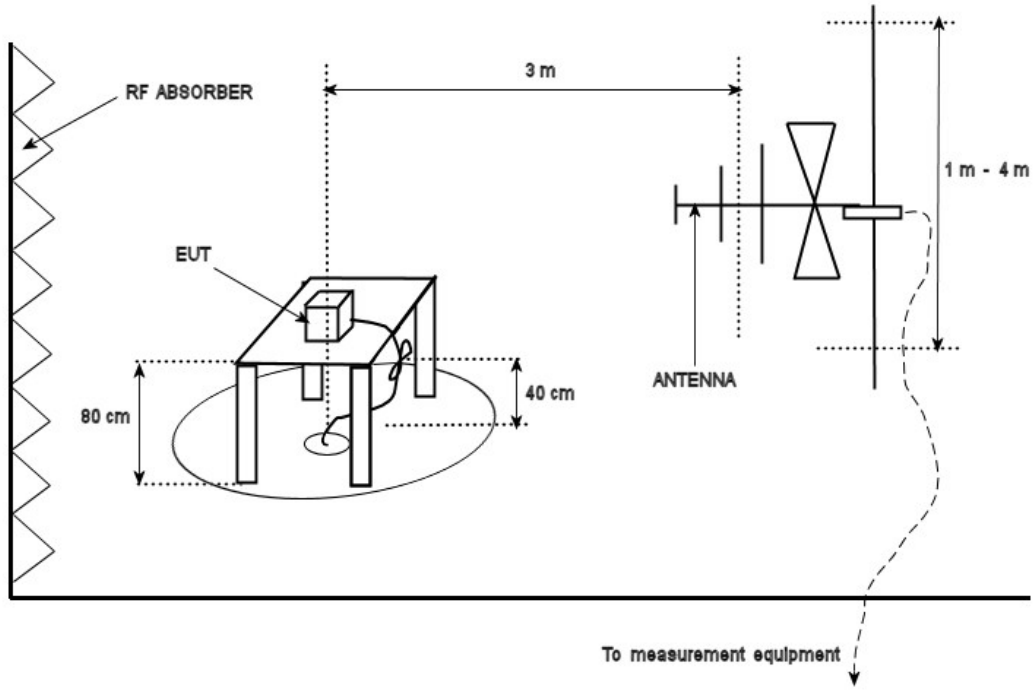
Limit(s) and Method

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[1]) at 3 m
88 MHz – 216 MHz, 150 uV/m (43.5 dBuV/m[1]) at 3 m
216 MHz – 960 MHz, 200 uV/m (46.4 dBuV/m[1]) at 3 m
Above 960 MHz, 500 uV/m (54.0 dBuV/m[1]) at 3 m
Above 1000 MHz, 500 uV/m (54 dBuV/m[2]) at 3m

[1]Limit is with 120 kHz measurement bandwidth and a using a Quasi Peak detector.
[2]Limit is with 1 MHz measurement bandwidth and using an Average detector

Typical Radiated Emissions Setup



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.

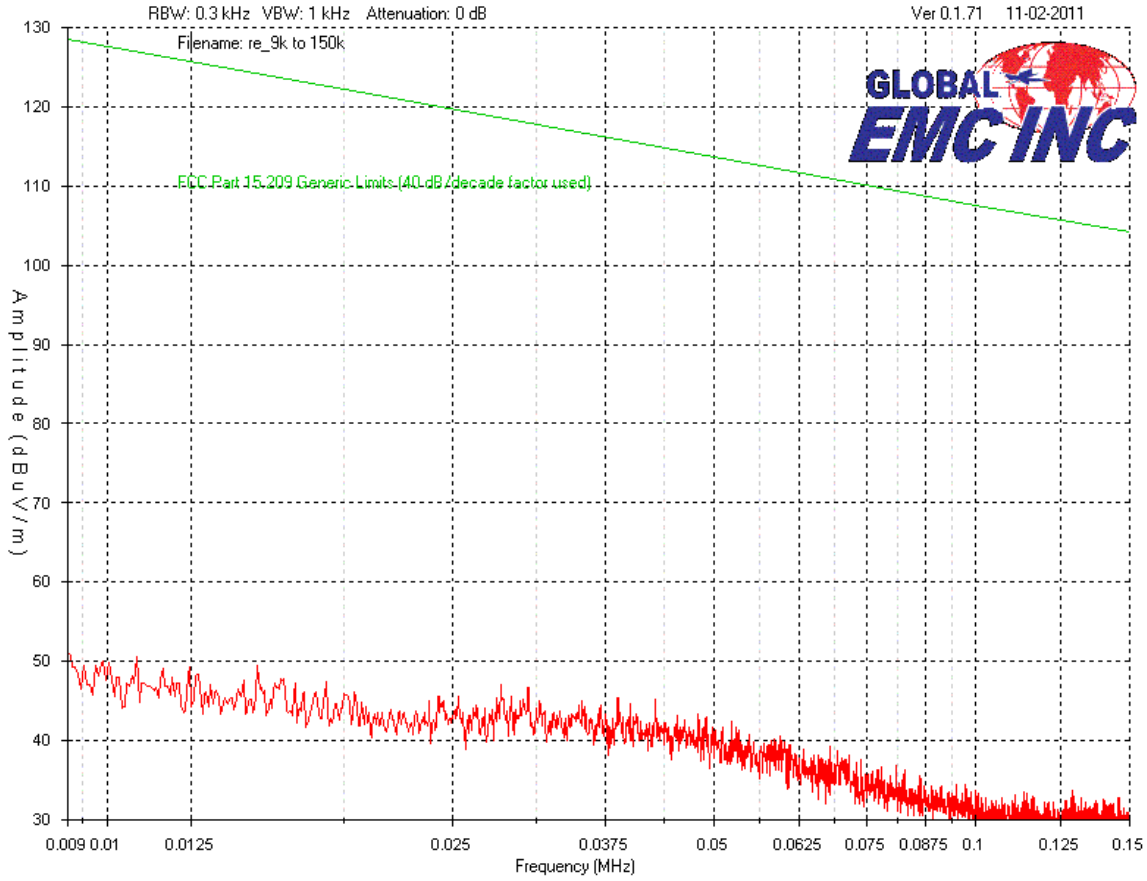
Preliminary Graphs

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. Unless otherwise specified, the graph shown below is a maximized peak measurement graph, measured with a resolution bandwidth greater then 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^{th} harmonic (a minimum of a 25 GHz).

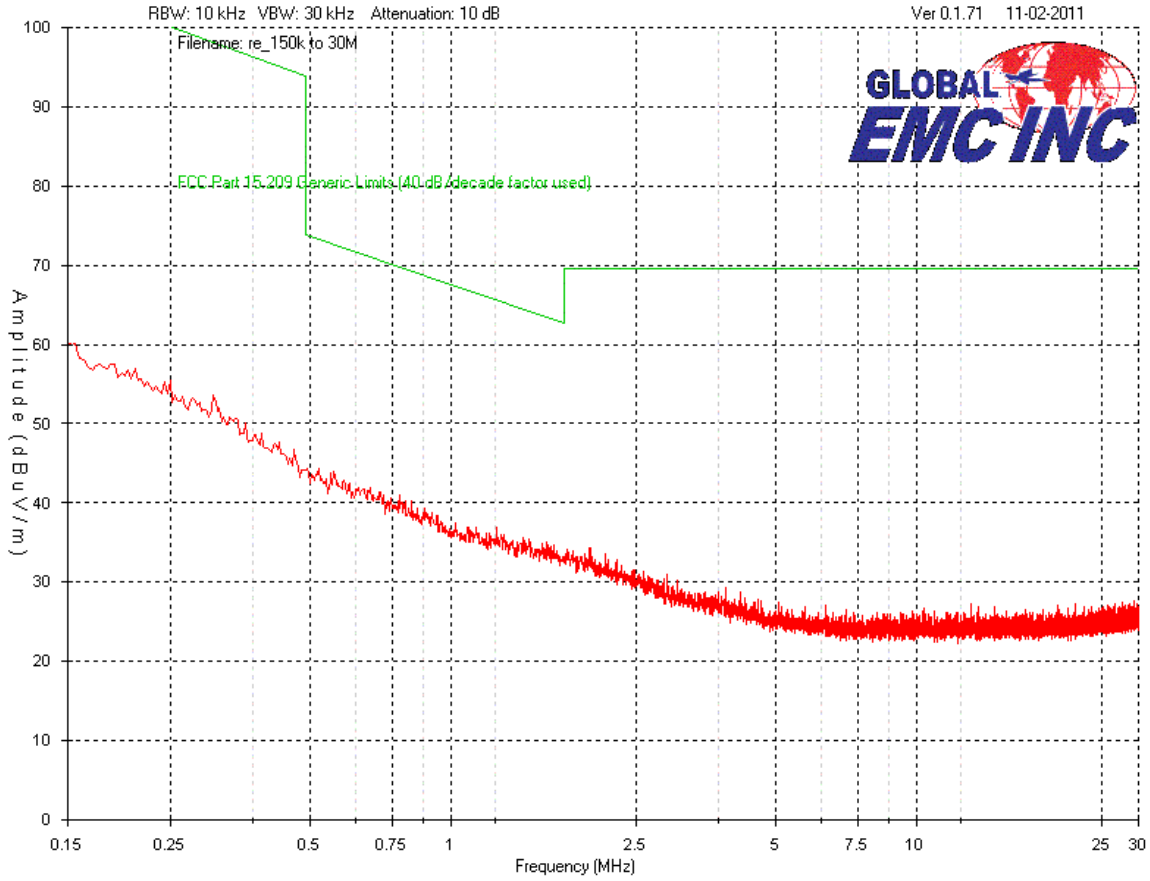
Devices scanned above 10 GHz were scanned at 1 meter test distance, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used.

9 kHz to 150 kHz



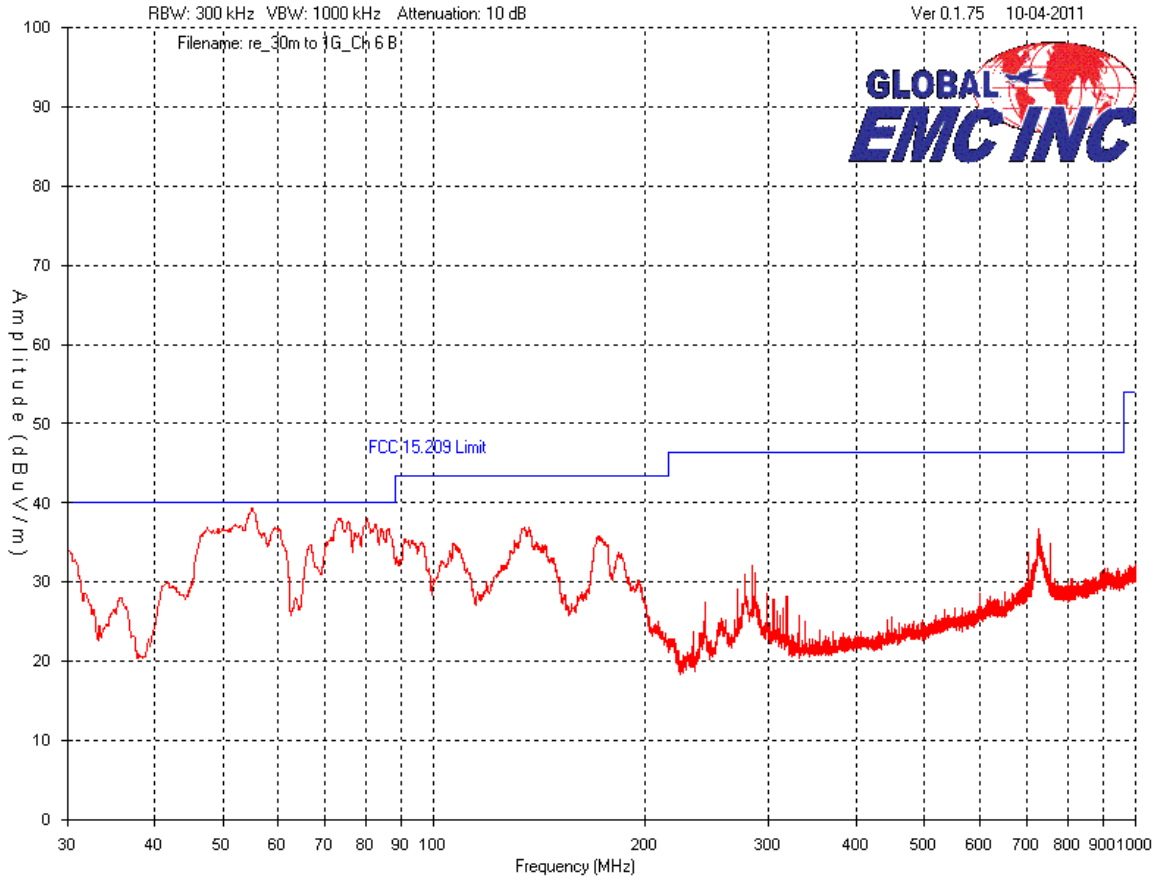
Worst-case/representative channel

150 kHz to 30 MHz

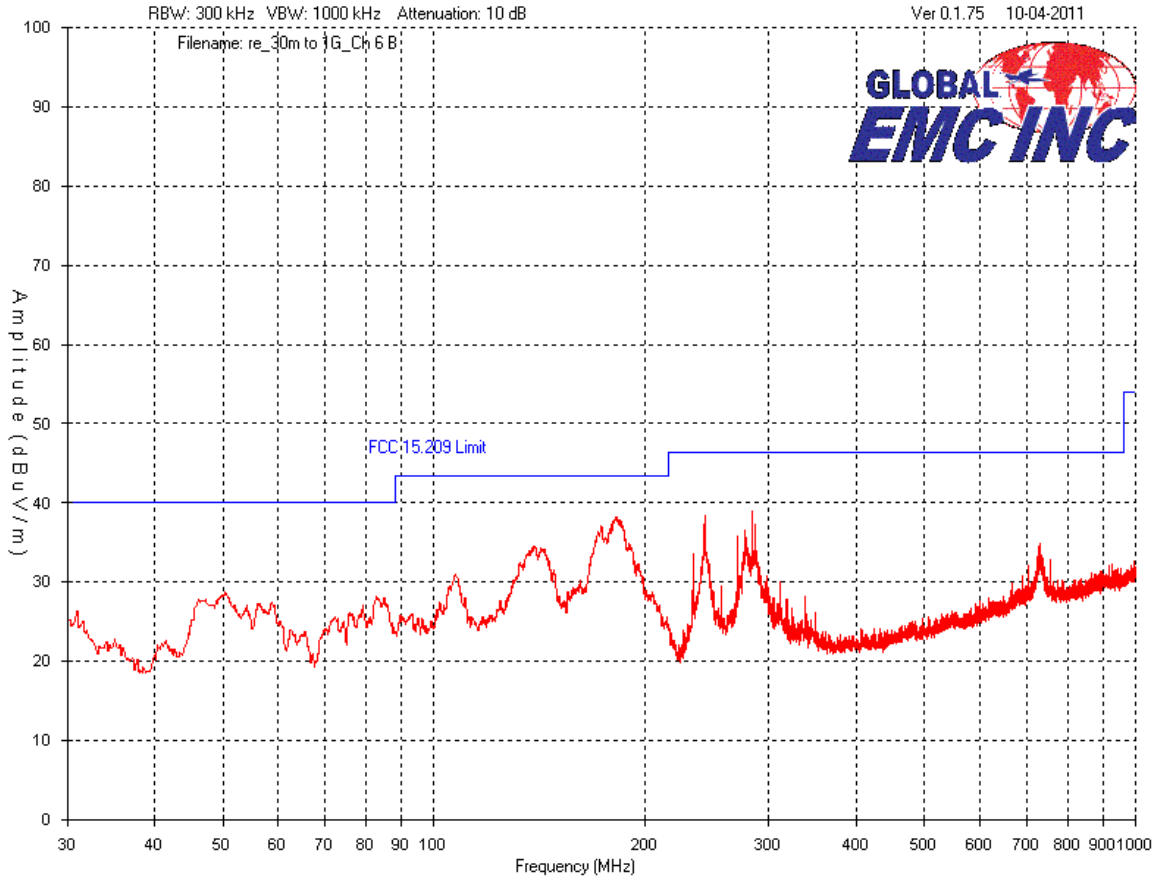


Worst-case/representative channel

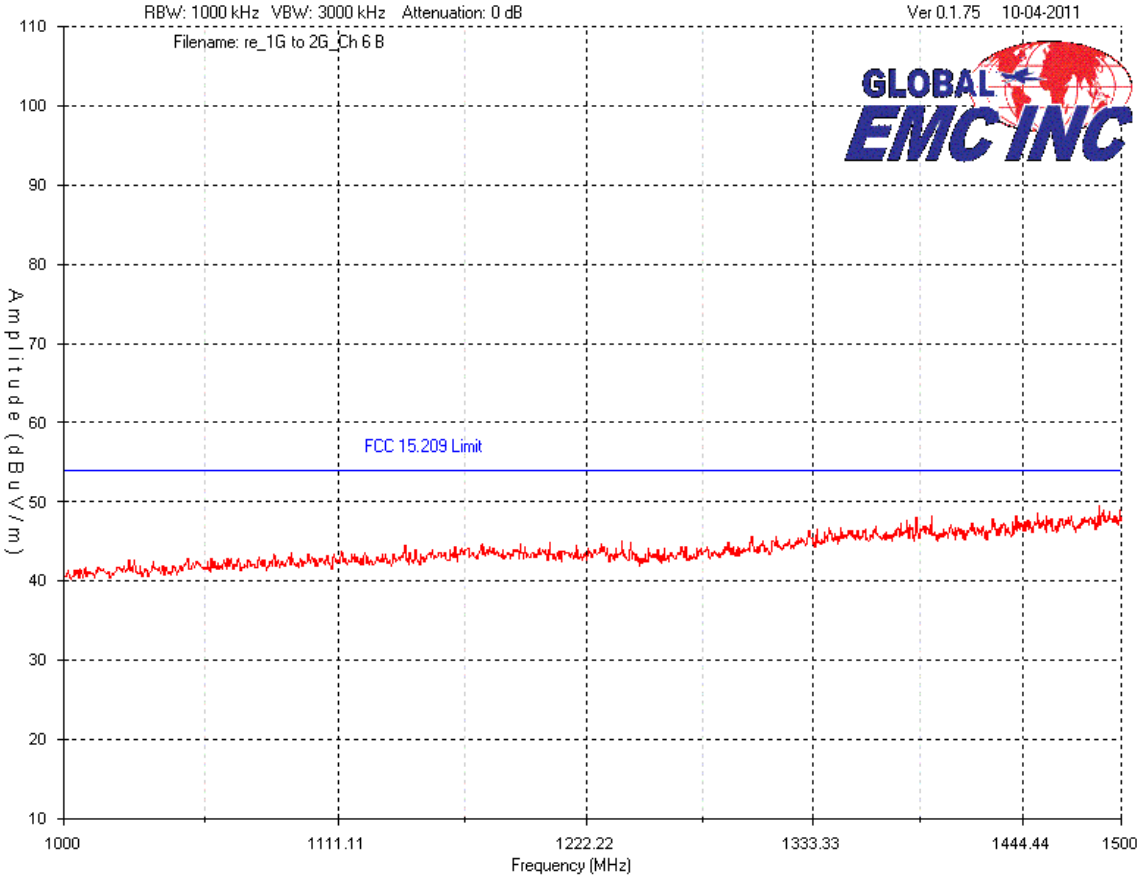
Vertical – Peak Emissions Graph 30 MHz – 1 GHz (worst case channel)



Horizontal – Peak Emissions Graph 30MHz to 1 GHz (worst case channel)

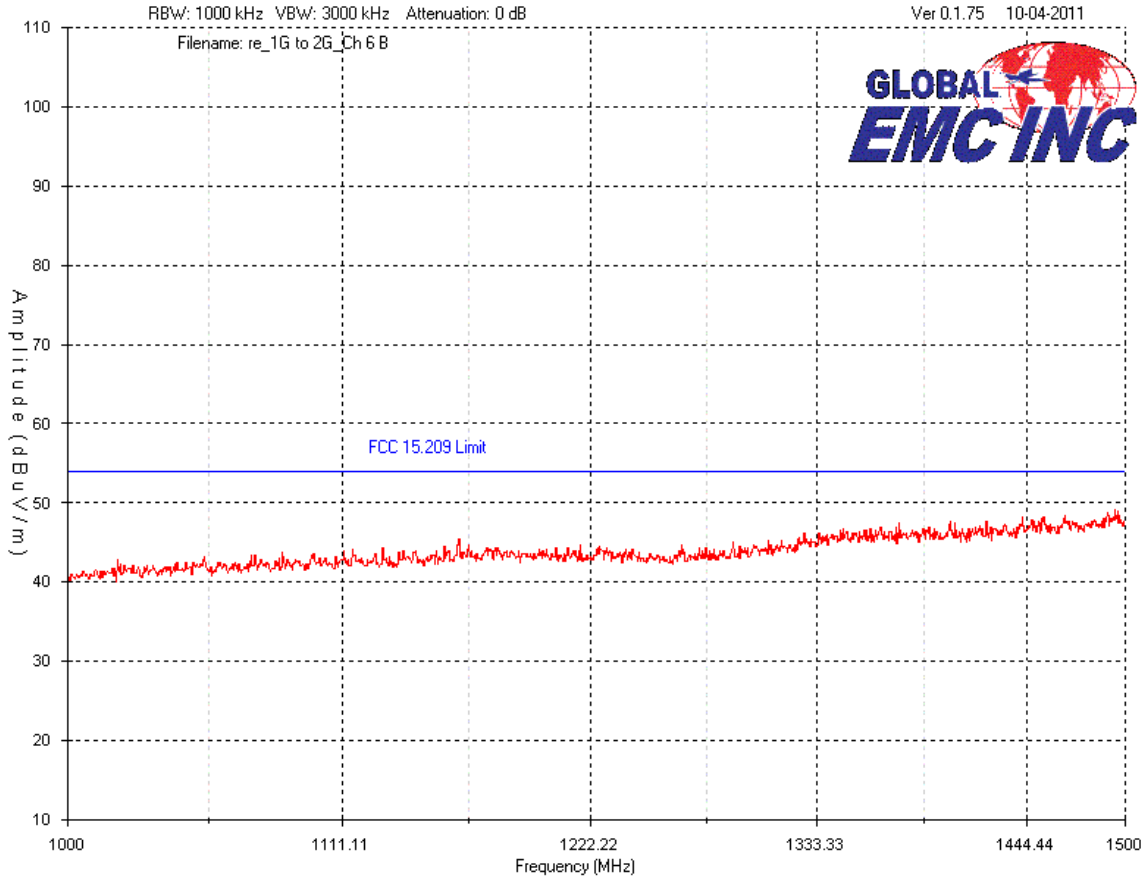


Vertical – 1GHz to 2 GHz



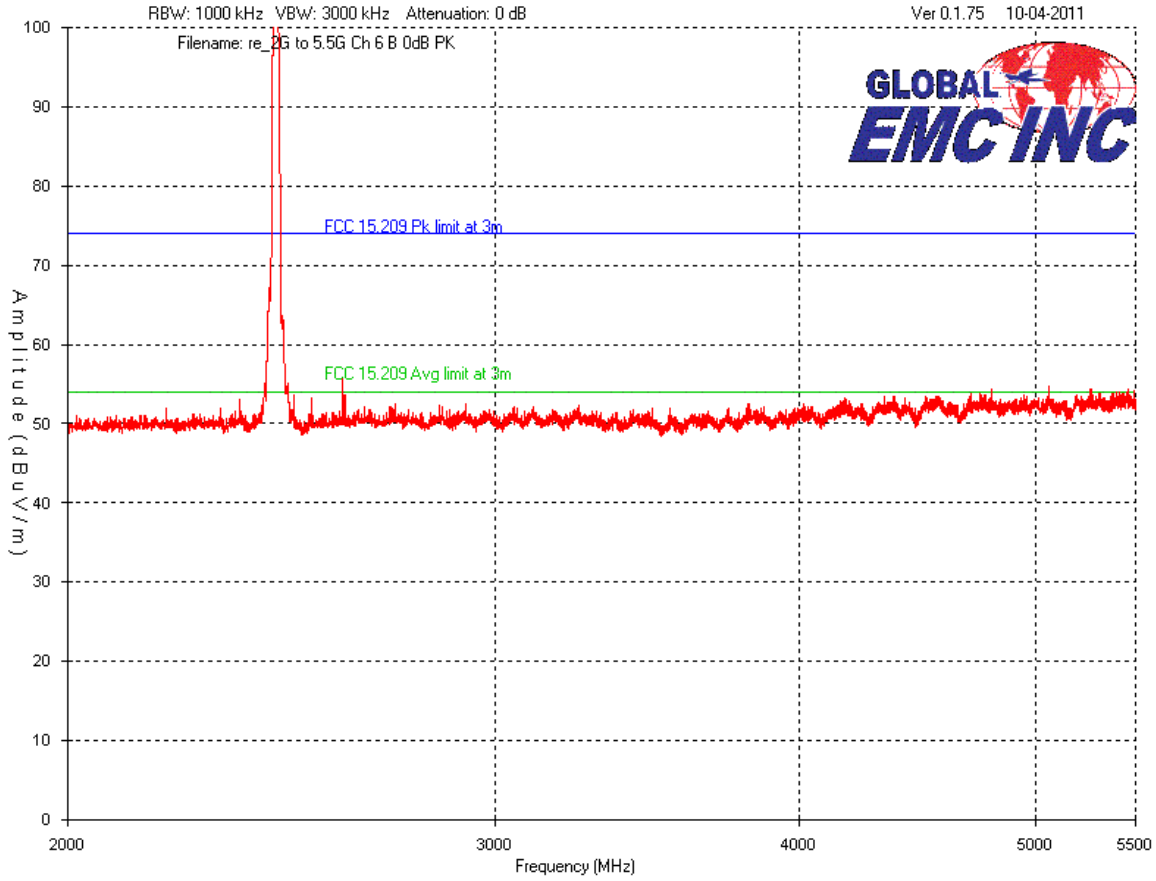
Worst-case/representative channel

Horizontal – 1 GHz to 2 GHz



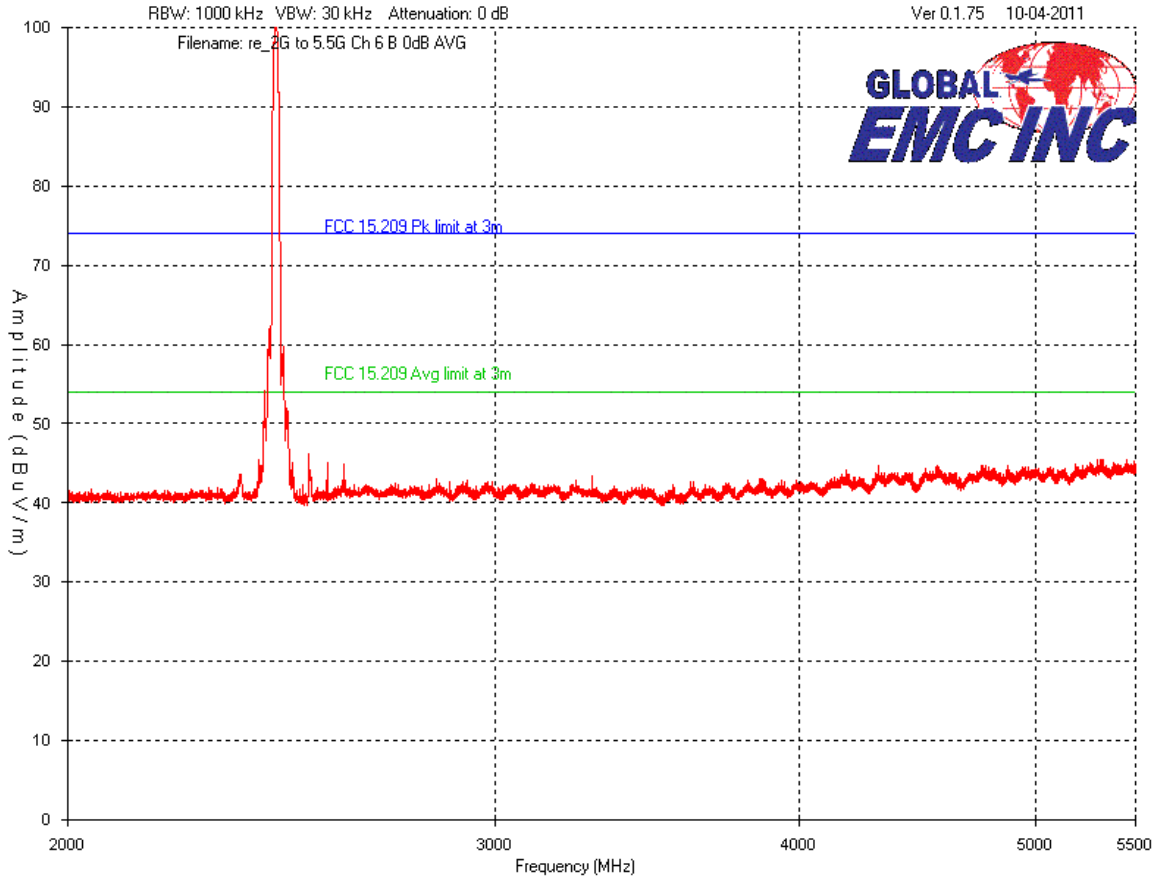
Worst case/representative channel

Vertical – 2 GHz to 5 GHz – Peak (802.11b mode)



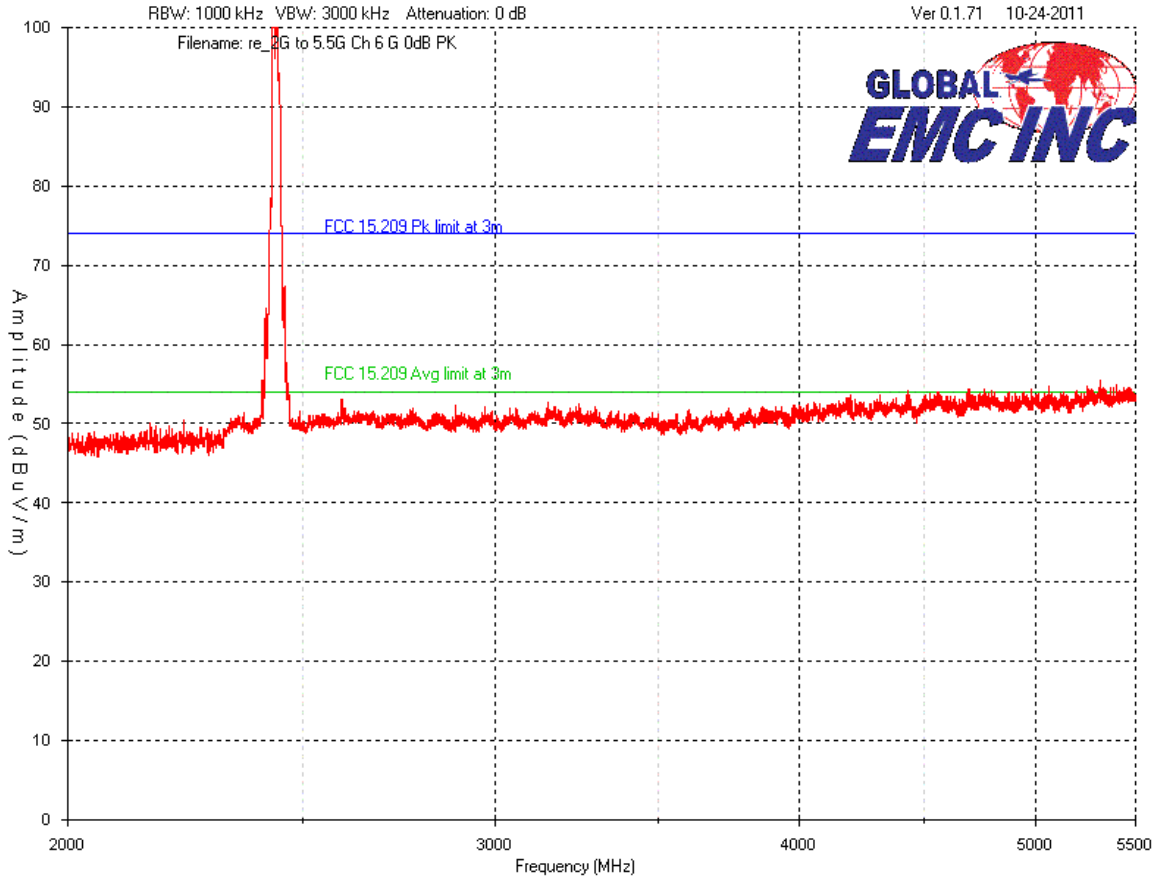
The above graph represents mid channel (channel 6) in 802.11b mode as representative of peak digital modulated emissions for 802.11b. See table for final maximized peak/average measurements.

Vertical – 2 GHz to 5 GHz – Average (802.11b mode)



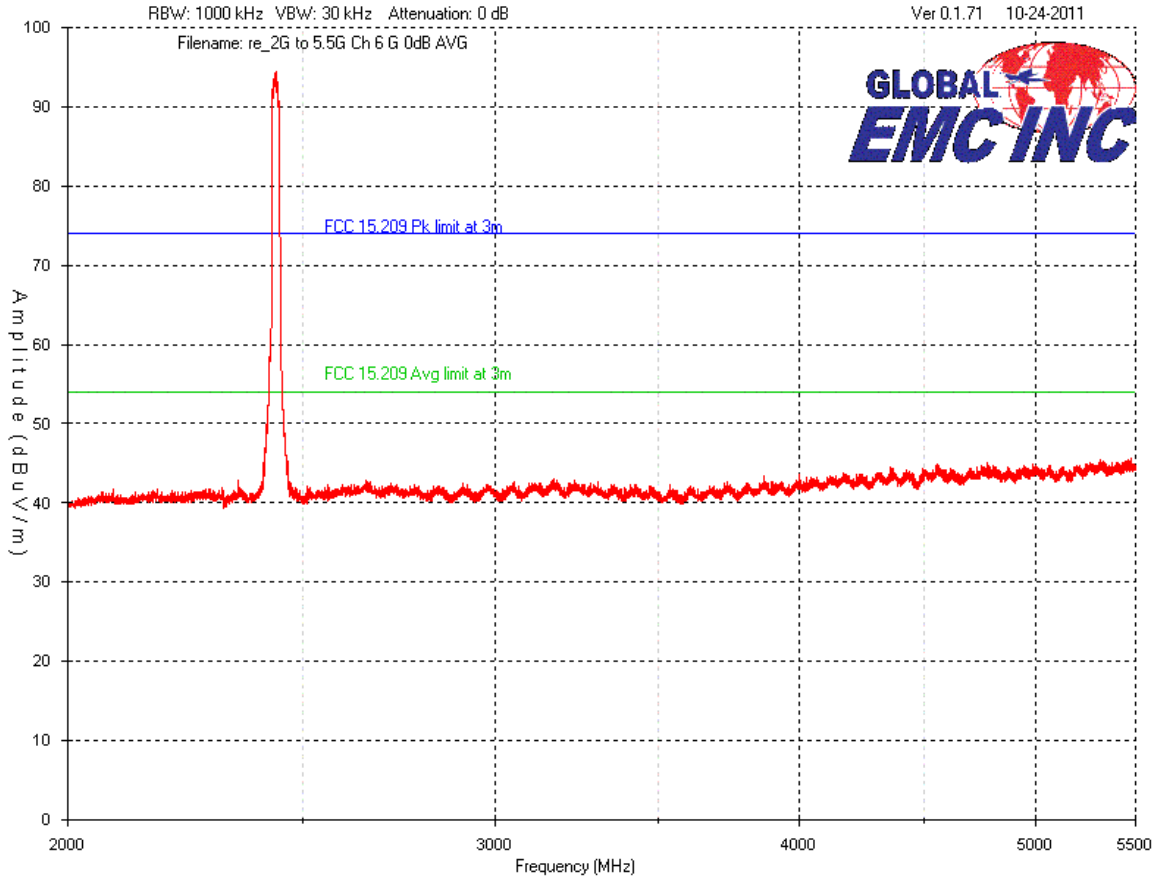
The above graph represents mid channel (channel 6) in 802.11b mode as representative of average digital modulated emissions for 802.11b. See table for final maximized peak/average measurements.

Vertical – 2 GHz to 5 GHz – Peak (802.11g mode)



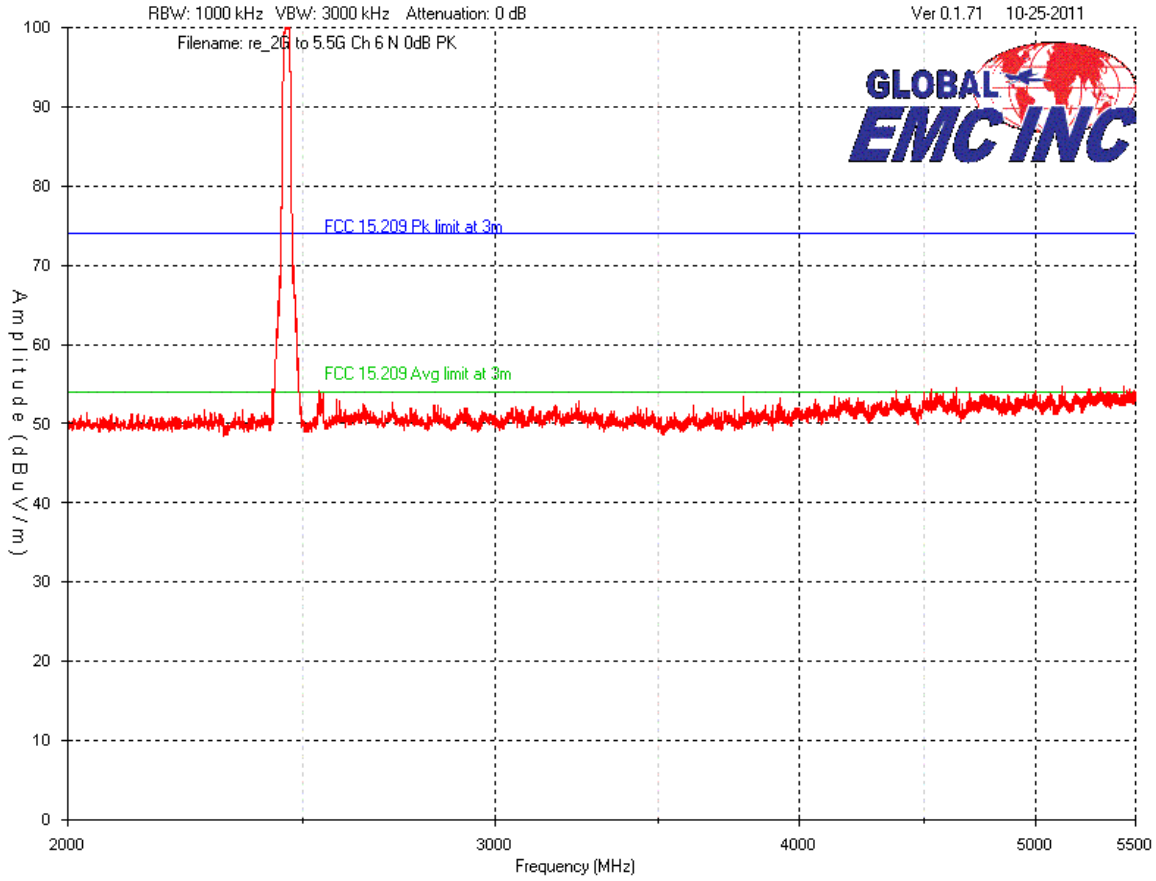
The above graph represents mid channel (channel 6) in 802.11g mode as representative of peak digital modulated emissions for 802.11g. See table for final maximized peak/average measurements.

Vertical – 2 GHz to 5 GHz – Average (802.11g mode)



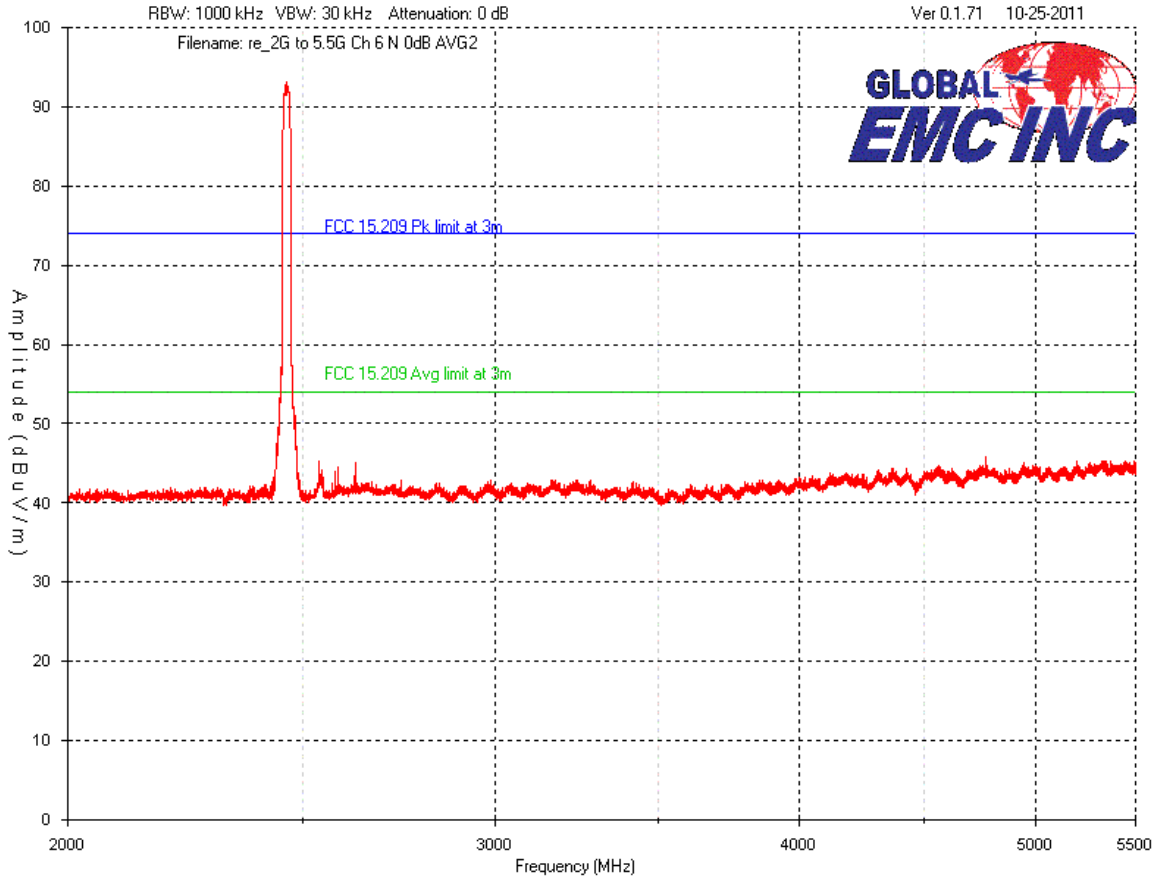
The above graph represents mid channel (channel 6) in 802.11g mode as representative of average digital modulated emissions for 802.11g. See table for final maximized peak/average measurements.

Vertical – 2 GHz to 5 GHz – Peak (802.11n mode)



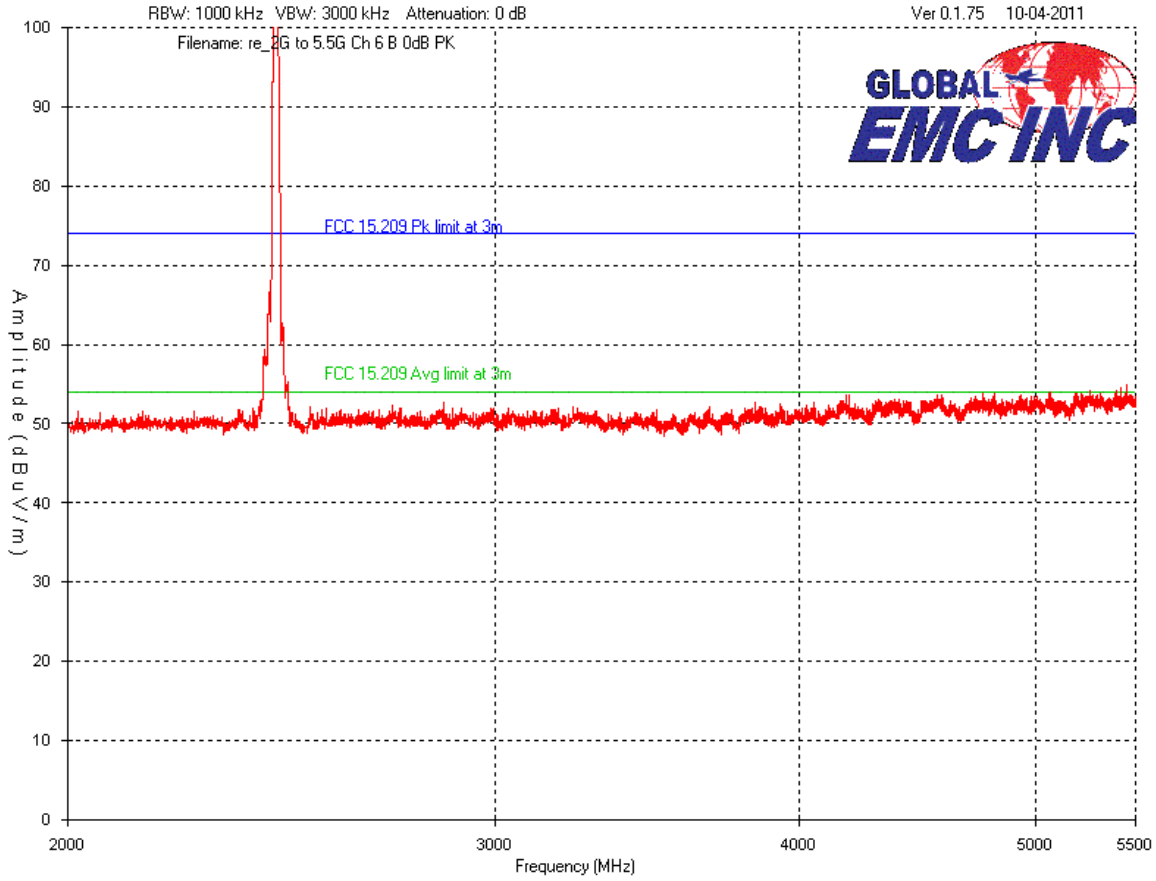
The above graph represents mid channel (channel 6) in 802.11n mode as representative of peak digital modulated emissions for 802.11n. See table for final maximized peak/average measurements.

Vertical – 2 GHz to 5 GHz – Average (802.11n mode)



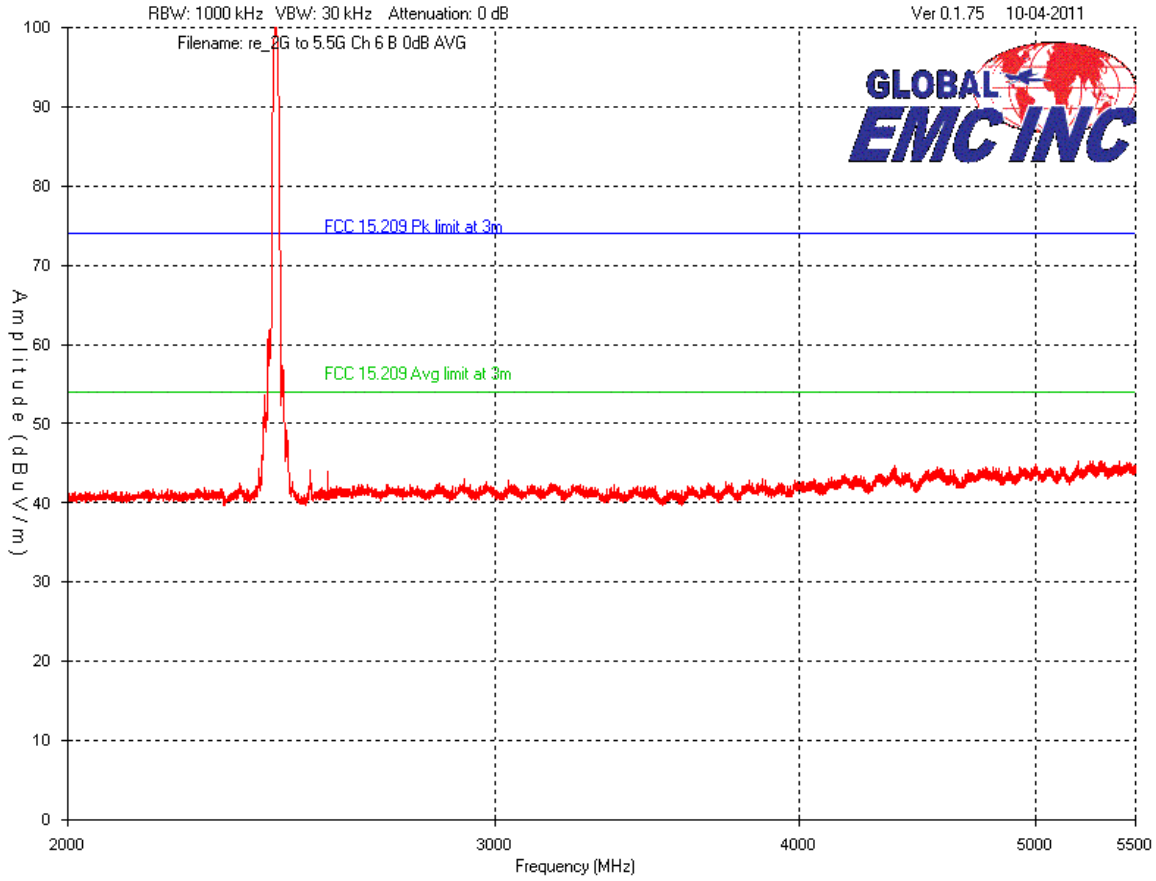
The above graph represents mid channel (channel 6) in 802.11n mode as representative of average digital modulated emissions for 802.11n. See table for final maximized peak/average measurements.

Horizontal – 2 GHz to 5 GHz – Peak (802.11b mode)



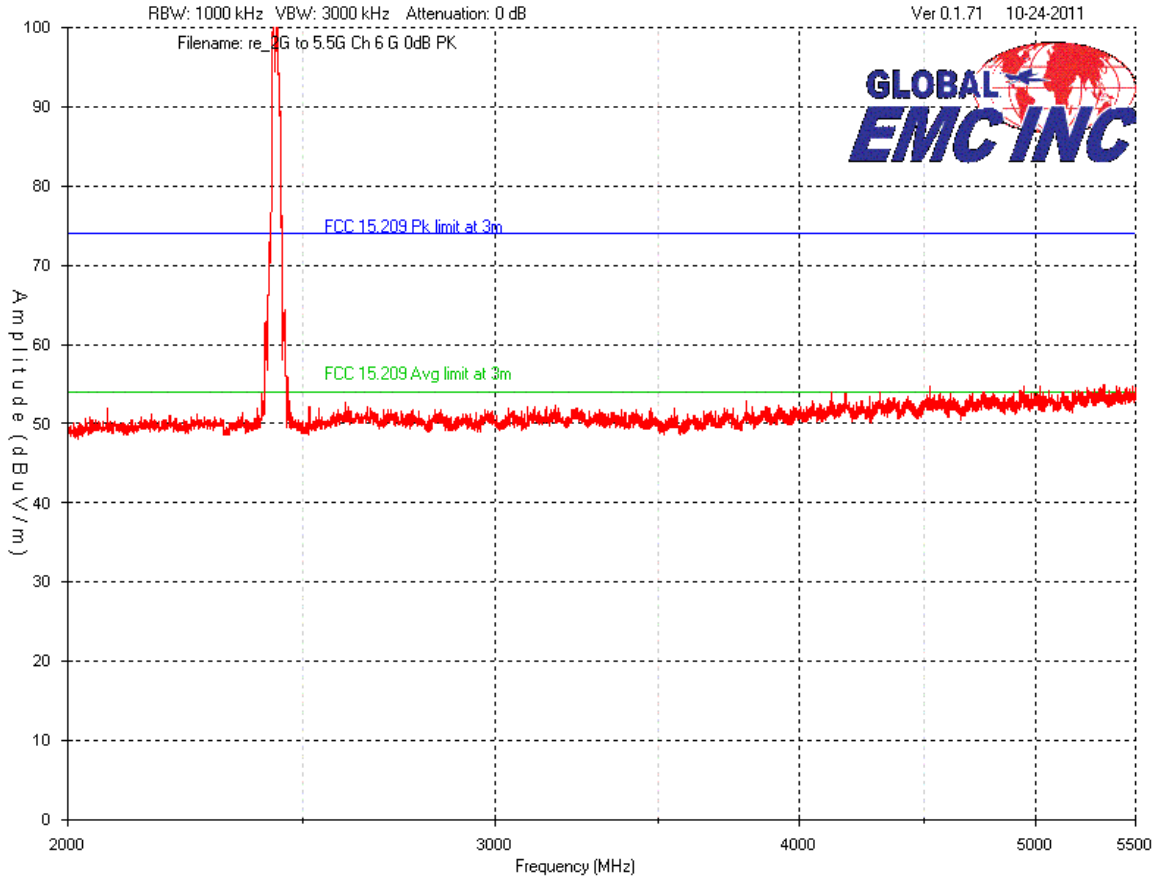
The above graph represents mid channel (channel 6) in 802.11b mode as representative of peak digital modulated emissions for 802.11b. See table for final maximized peak/average measurements.

Horizontal – 2 GHz to 5 GHz – Average (802.11b mode)



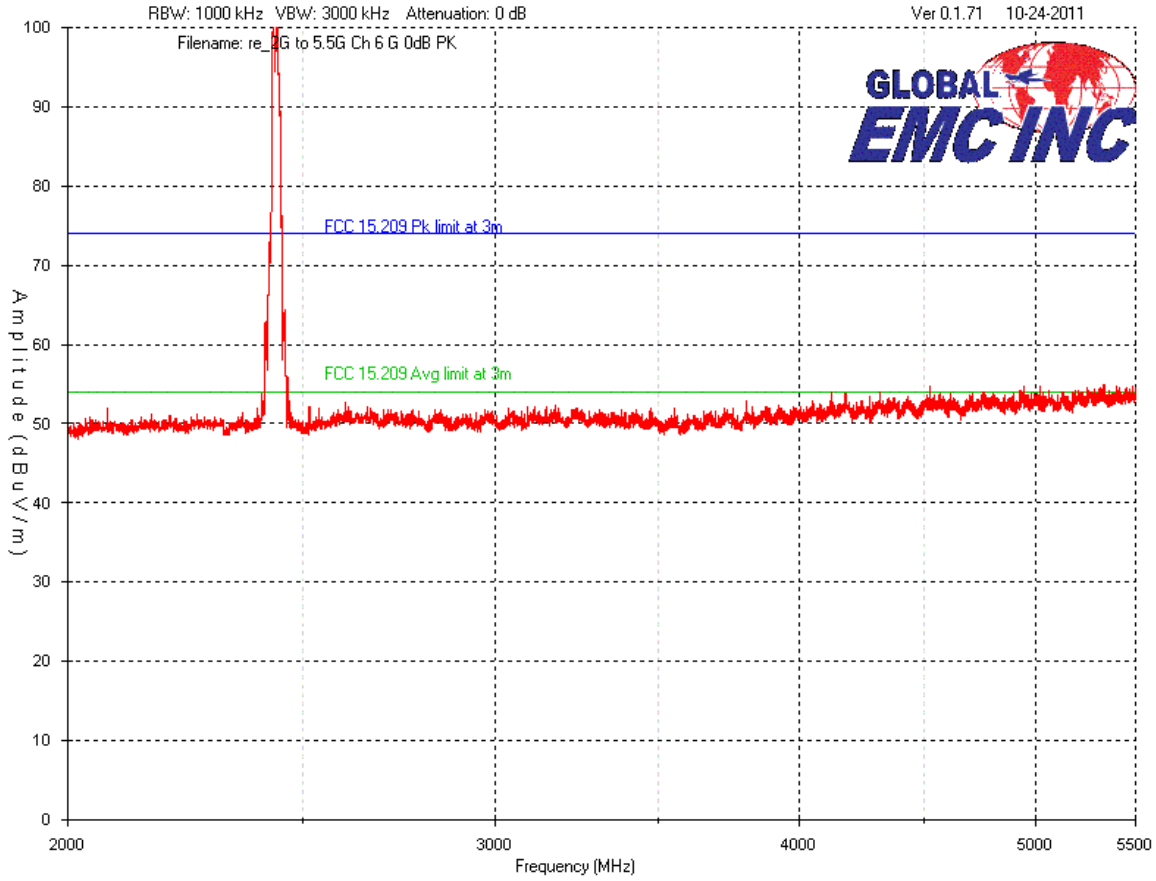
The above graph represents mid channel (channel 6) in 802.11b mode as representative of average digital modulated emissions for 802.11b. See table for final maximized peak/average measurements.

Horizontal – 2 GHz to 5 GHz – Peak (802.11g mode)



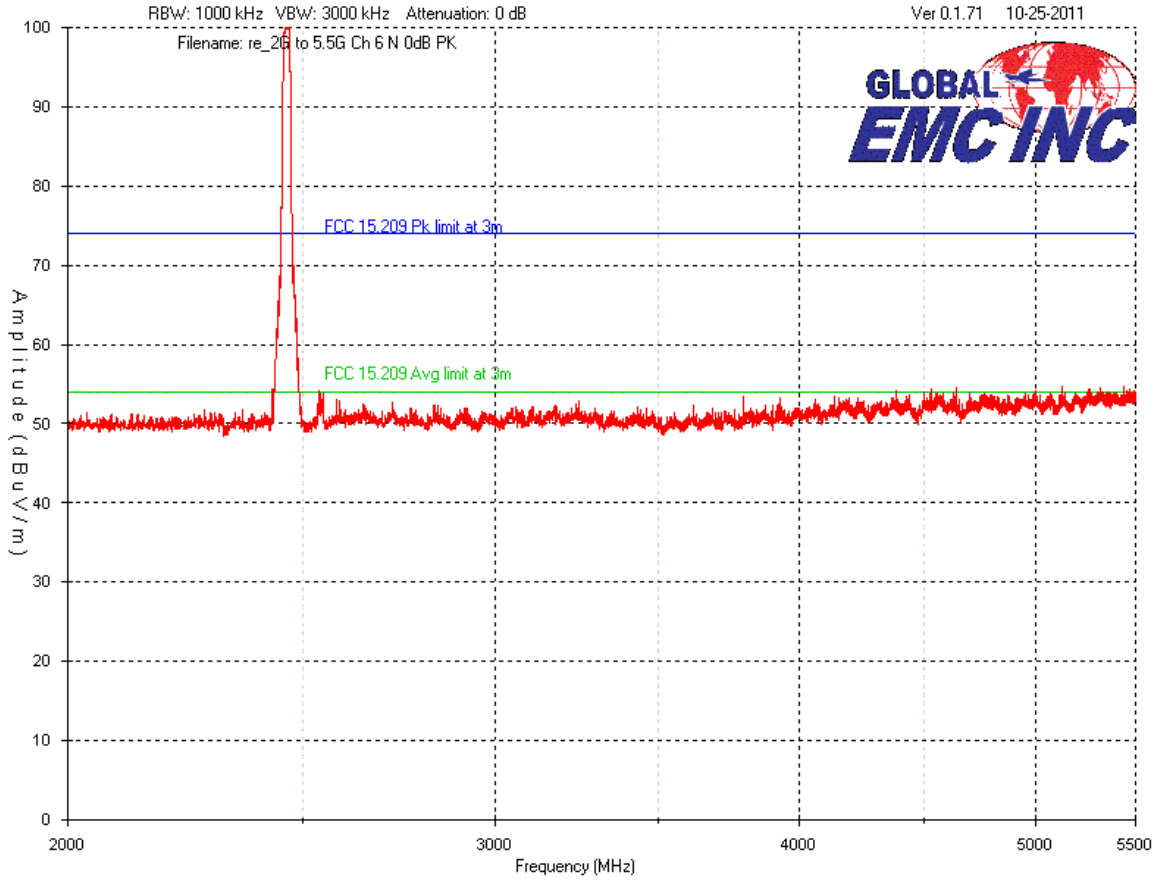
The above graph represents mid channel (channel 6) in 802.11g mode as representative of peak digital modulated emissions for 802.11g. See table for final maximized peak/average measurements.

Horizontal – 2 GHz to 5 GHz – Average (802.11g mode)



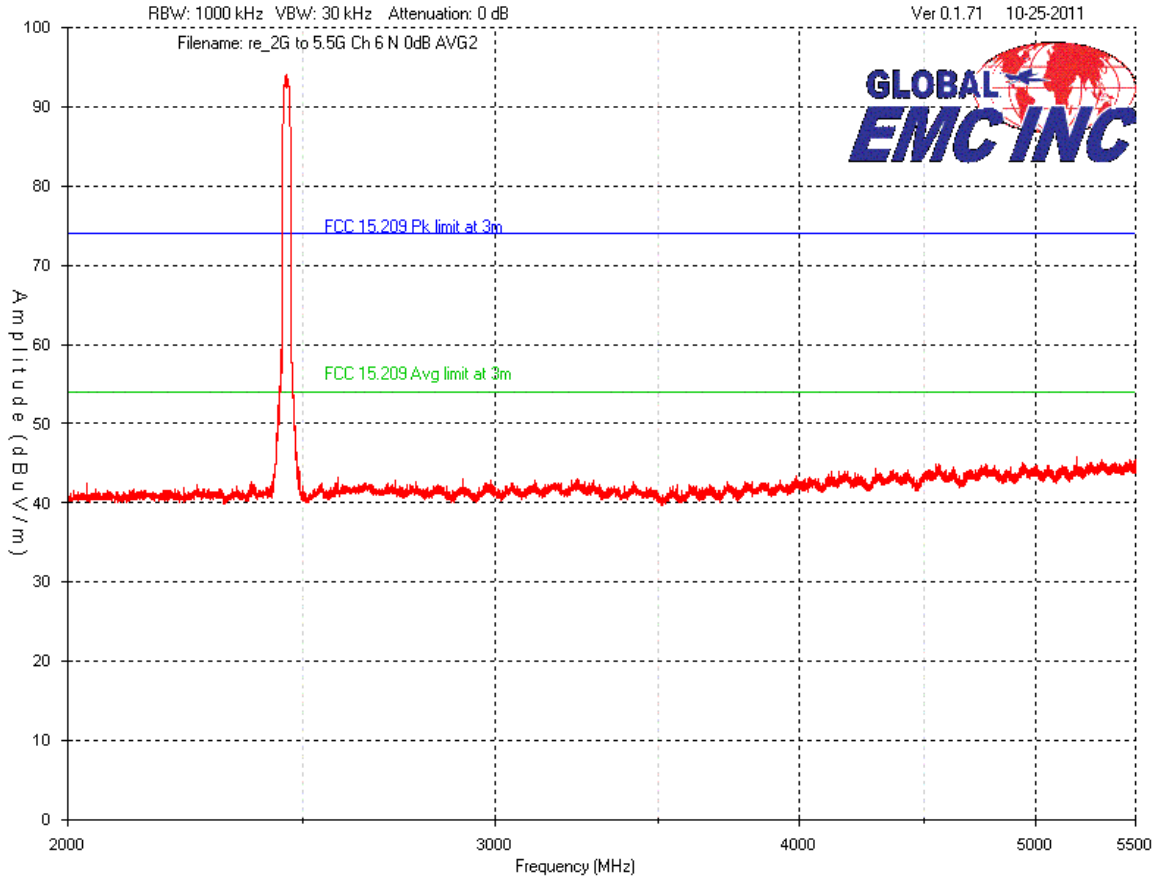
The above graph represents mid channel (channel 6) in 802.11g mode as representative of average digital modulated emissions for 802.11g. See table for final maximized peak/average measurements.

Horizontal – 2 GHz to 5 GHz – Peak (802.11n mode)



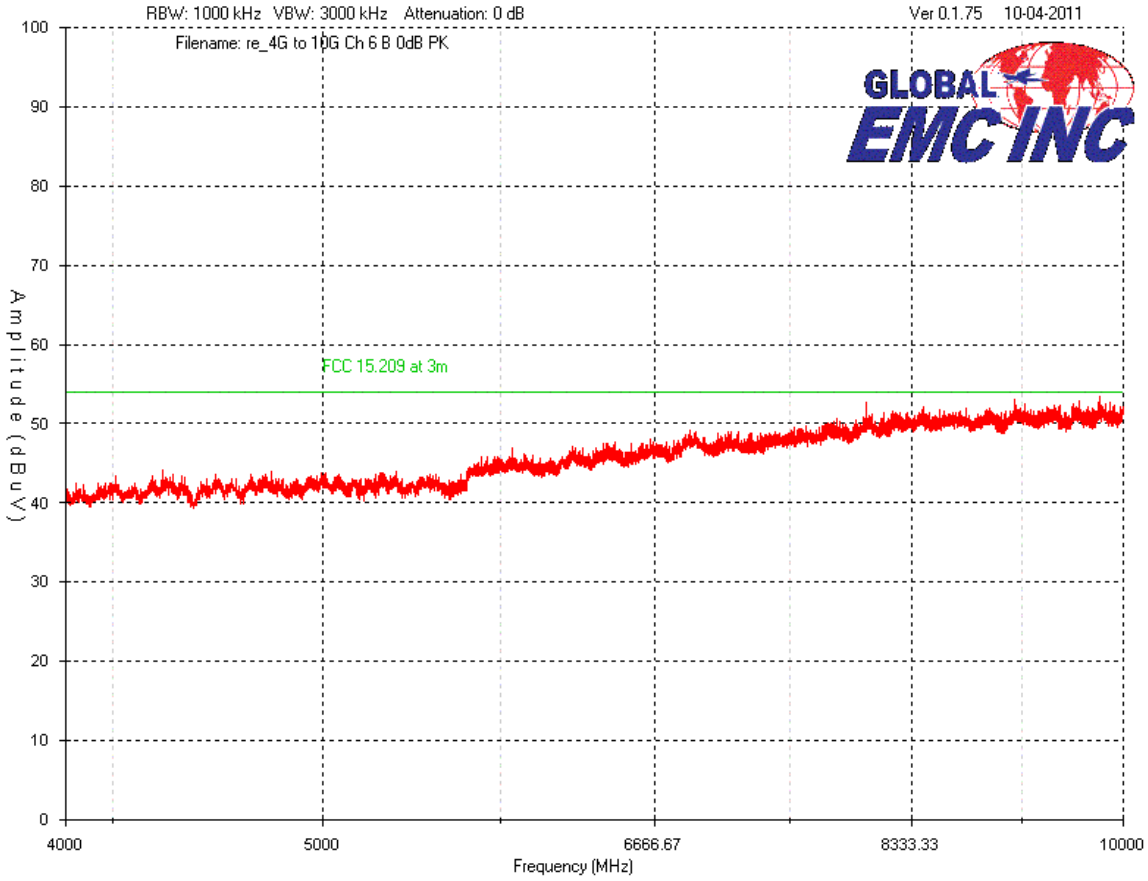
The above graph represents mid channel (channel 6) in 802.11n mode as representative of peak digital modulated emissions for 802.11n. See table for final maximized peak/average measurements.

Horizontal – 2 GHz to 5 GHz – Average (802.11n mode)



The above graph represents mid channel (channel 6) in 802.11n mode as representative of average digital modulated emissions for 802.11n. See table for final maximized peak/average measurements.

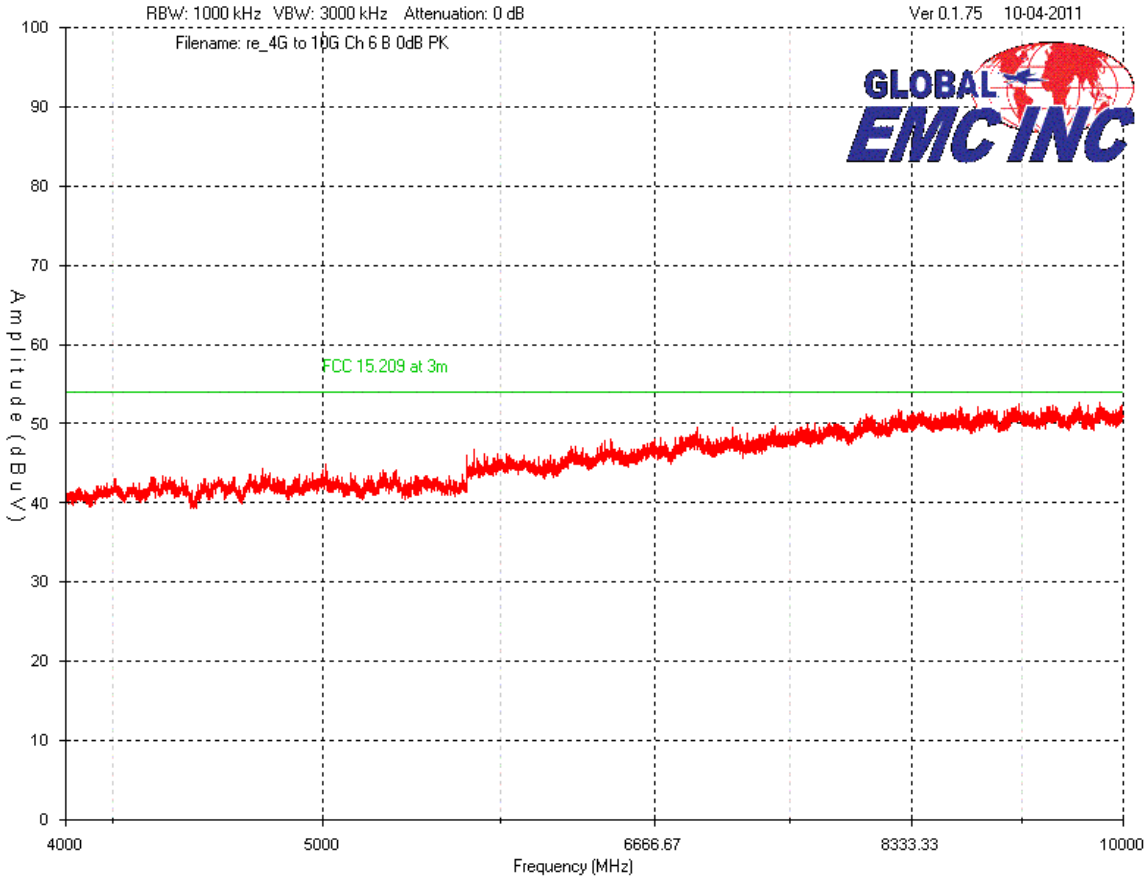
Vertical – 5 GHz to 10 GHz – Peak



The above graph represents high channel (channel 11) in 802.11b mode as representative of peak digital modulated emissions for all modes. See table for final maximized peak/average measurements.

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

Horizontal – 5 GHz to 10 GHz – Peak



The above graph represents high channel (channel 11) in 802.11b mode as representative of peak digital modulated emissions for all modes. See table for final maximized peak/average measurements.

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

Final Measurements

Top Quasi-Peak Emissions 30MHz to 1 GHz - Table - Vertical

Frequency (MHz)	Raw (dBuV)	Ant. (dB/m)	Cable (dB)	Amp (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
55.026	61.1	7.9	0.4	-30.1	39.3	40	0.7	Pass
73.553	60.6	7.2	0.4	-30.2	38	40	2	Pass
30.194	44.8	18.9	0.3	-30.1	33.9	40	6.1	Pass
134.469	58.7	7.9	0.5	-30.2	36.9	43.5	6.6	Pass
172.105	56.2	9.4	0.5	-30.3	35.8	43.5	7.7	Pass
106.436	55.9	8.7	0.5	-30.2	34.9	43.5	8.6	Pass

Low, medium and high channel were investigated, with no differences observed. Representative results presented above.

Top Quasi-Peak Emissions 30 MHz to 1 GHz Table - Horizontal

Frequency (MHz)	Raw (dBuV)	Ant. (dB/m)	Cable (dB)	Amp (dB)	Level (dBuV/m)	Limit (dBuv/m)	Margin (dB)	Pass/Fail
181.999	58.1	9.8	0.5	-30.3	38.1	43.5	5.4	Pass
284.043	55.8	13	0.6	-30.4	39	46.4	7.4	Pass
243.303	56.2	12	0.6	-30.4	38.4	46.4	8	Pass
139.125	56.2	8.1	0.5	-30.3	34.5	43.5	9	Pass
270.269	53	12.6	0.6	-30.4	35.8	46.4	10.6	Pass
50.37	49.9	8.6	0.4	-30.1	28.8	40	11.2	Pass

Low, medium and high channel were investigated, with no differences observed. Representative results presented above.

802.11B mode

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											
2412	Peak	Horz	101.3	30.6	2.2	10.0	36.2	107.9			PASS
2412	Avg	Horz	85.9	30.6	2.2	10.0	36.2	92.5			PASS
2412	Peak	Vert	100.5	30.6	2.2	10.0	36.2	107.1			PASS
2412	Avg	Vert	85.4	30.6	2.2	10.0	36.2	92.0			PASS
2390[1]	Peak	Horz	49.1	30.6	2.2	10.0	36.2	55.7	74.0	18.3	PASS
2390[1]	Avg	Horz	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
2390[1]	Peak	Vert	48.7	30.6	2.2	10.0	36.2	55.3	74.0	18.7	PASS
2390[1]	Avg	Vert	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
2400	Peak	Horz	58.1	30.6	2.2	10.0	36.2	64.7	74.0	9.3	PASS
2400	Avg	Horz	42.3	30.6	2.2	10.0	36.2	48.9	54.0	5.1	PASS
2400	Peak	Vert	57.6	30.6	2.2	10.0	36.2	64.2	74.0	9.8	PASS
2400	Avg	Vert	41.5	30.6	2.2	10.0	36.2	48.1	54.0	5.9	PASS
4824	Peak	Horz	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4824	Peak	Vert	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
7236	Peak	Vert	43.5	37.9	4.3	0.0	35.9	49.8	74.0	24.2	PASS
7236	Peak	Horz	43.5	37.9	4.3	0.0	35.9	49.8	74.0	24.2	PASS
Mid channel 6											
2437	Peak	Horz	102.2	30.6	2.2	10.0	36.2	108.8			PASS
2437	Avg	Horz	86.8	30.6	2.2	10.0	36.2	93.4			PASS
2437	Peak	Vert	101.1	30.6	2.2	10.0	36.2	107.7			PASS
2437	Avg	Vert	86.9	30.6	2.2	10.0	36.2	93.5			PASS
4874	Peak	Horz	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4874	Avg	Horz		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
4874	Peak	Vert	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4874	Avg	Vert		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
High channel11											
2462	Peak	Horz	102.5	30.6	2.2	10.0	36.2	109.1			PASS
2462	Avg	Horz	87.1	30.6	2.2	10.0	36.2	93.7			PASS
2462	Peak	Vert	101.7	30.6	2.2	10.0	36.2	108.3			PASS
2462	Avg	Vert	87.0	30.6	2.2	10.0	36.2	93.6			PASS
2483.5	Peak	Horz	48.3	30.6	2.2	10.0	36.2	54.9	74.0	19.1	PASS
2483.5	Avg	Horz	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
2483.5	Peak	Vert	48.1	30.6	2.2	10.0	36.2	54.7	74.0	19.3	PASS

2483.5	Avg	Vert	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
4924	Peak	Horz	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4924	Avg	Horz		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
4924	Peak	Vert	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4924	Avg	Vert		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS

Note 1: Worst case between 2300 MHz and 2390 MHz occurred at 2390 MHz.

802.11G mode

Test Frequency (MHz)	Detection mode (Q-Peak)	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											
2412	Peak	Horz	98.9	30.6	2.2	10.0	36.2	105.5			PASS
2412	Avg	Horz	69.8	30.6	2.2	10.0	36.2	76.4			PASS
2412	Peak	Vert	98.2	30.6	2.2	10.0	36.2	104.8			PASS
2412	Avg	Vert	69.2	30.6	2.2	10.0	36.2	75.8			PASS
2390[1]	Peak	Horz	49.1	30.6	2.2	10.0	36.2	55.7	74.0	18.3	PASS
2390[1]	Avg	Horz	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
2390[1]	Peak	Vert	48.7	30.6	2.2	10.0	36.2	55.3	74.0	18.7	PASS
2390[1]	Avg	Vert	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
2400[2]	Peak	Horz	67.1	30.6	2.2	10.0	36.2	73.7	74.0	0.3	PASS
2400[2]	Avg	Horz	45.8	30.6	2.2	10.0	36.2	52.4	54.0	1.6	PASS
2400[2]	Peak	Vert	66.4	30.6	2.2	10.0	36.2	73.0	74.0	1.0	PASS
2400[2]	Avg	Vert	45.2	30.6	2.2	10.0	36.2	51.8	54.0	2.2	PASS
2398	Peak	Horz	65.1	30.6	2.2	10.0	36.2	71.7	74.0	2.3	PASS
2398	Avg	Horz	43.2	30.6	2.2	10.0	36.2	49.8	54.0	4.2	PASS
2398	Peak	Vert	54.2	30.6	2.2	10.0	36.2	60.8	74.0	13.2	PASS
2398	Avg	Vert	43.0	30.6	2.2	10.0	36.2	49.6	54.0	4.4	PASS
4824	Peak	Horz	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4824	Avg	Horz		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
4824	Peak	Vert	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4824	Avg	Vert		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
7236	Peak	Vert	43.5	37.9	4.3	0.0	35.9	49.8	74.0	24.2	PASS
7236	Avg	Vert		37.9	4.3	0.0	35.9	6.3	54.0	47.7	PASS
7236	Peak	Horz	43.5	37.9	4.3	0.0	35.9	49.8	74.0	24.2	PASS
7236	Avg	Horz		37.9	4.3	0.0	35.9	6.3	54.0	47.7	PASS
Mid channel 6											
2437	Peak	Horz	99.7	30.6	2.2	10.0	36.2	106.3			PASS
2437	Avg	Horz	70.8	30.6	2.2	10.0	36.2	77.4			PASS
2437	Peak	Vert	98.9	30.6	2.2	10.0	36.2	105.5			PASS
2437	Avg	Vert	70.5	30.6	2.2	10.0	36.2	77.1			PASS
4874	Peak	Horz	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4874	Avg	Horz		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
4874	Peak	Vert	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4874	Avg	Vert		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
High channel11											

2462	Peak	Horz	100.3	30.6	2.2	10.0	36.2	106.9			PASS
2462	Avg	Horz	70.8	30.6	2.2	10.0	36.2	77.4			PASS
2462	Peak	Vert	99.9	30.6	2.2	10.0	36.2	106.5			PASS
2462	Avg	Vert	71.0	30.6	2.2	10.0	36.2	77.6			PASS
2483.5	Peak	Horz	48.3	30.6	2.2	10.0	36.2	54.9	74.0	19.1	PASS
2483.5	Avg	Horz	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
2483.5	Peak	Vert	48.1	30.6	2.2	10.0	36.2	54.7	74.0	19.3	PASS
2483.5	Avg	Vert	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
4924	Peak	Horz	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4924	Avg	Horz		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
4924	Peak	Vert	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4924	Avg	Vert		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS

Note 1: Worst case between 2300 MHz and 2390 MHz occurred at 2390 MHz.

Note 2: Marker Delta method employed.

802.11N mode

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											
2412	Peak	Horz	98.3	30.6	2.2	10.0	36.2	104.9			PASS
2412	Avg	Horz	82.3	30.6	2.2	10.0	36.2	88.9			PASS
2412	Peak	Vert	97.3	30.6	2.2	10.0	36.2	103.9			PASS
2412	Avg	Vert	81.3	30.6	2.2	10.0	36.2	87.9			PASS
2390[1]	Peak	Horz	49.1	30.6	2.2	10.0	36.2	55.7	74.0	18.3	PASS
2390[1]	Avg	Horz	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
2390[1]	Peak	Vert	48.7	30.6	2.2	10.0	36.2	55.3	74.0	18.7	PASS
2390[1]	Avg	Vert	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
2400[2]	Peak	Horz	65.8	30.6	2.2	10.0	36.2	72.4	74.0	1.6	PASS
2400[2]	Avg	Horz	43.0	30.6	2.2	10.0	36.2	49.6	54.0	4.4	PASS
2400[2]	Peak	Vert	64.8	30.6	2.2	10.0	36.2	71.4	74.0	2.6	PASS
2400[2]	Avg	Vert	43.0	30.6	2.2	10.0	36.2	49.6	54.0	4.4	PASS
2398	Peak	Horz	65.1	30.6	2.2	10.0	36.2	71.7	74.0	2.3	PASS
2398	Avg	Horz	43.2	30.6	2.2	10.0	36.2	49.8	54.0	4.2	PASS
2398	Peak	Vert	54.2	30.6	2.2	10.0	36.2	60.8	74.0	13.2	PASS
2398	Avg	Vert	43.0	30.6	2.2	10.0	36.2	49.6	54.0	4.4	PASS
4824	Peak	Horz	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4824	Avg	Horz		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
4824	Peak	Vert	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4824	Avg	Vert		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
7236	Peak	Vert	43.5	37.9	4.3	0.0	35.9	49.8	74.0	24.2	PASS
7236	Avg	Vert		37.9	4.3	0.0	35.9	6.3	54.0	47.7	PASS
7236	Peak	Horz	43.5	37.9	4.3	0.0	35.9	49.8	74.0	24.2	PASS
7236	Avg	Horz		37.9	4.3	0.0	35.9	6.3	54.0	47.7	PASS
Mid channel 6											
2437	Peak	Horz	99.2	30.6	2.2	10.0	36.2	105.8			PASS
2437	Avg	Horz	82.9	30.6	2.2	10.0	36.2	89.5			PASS
2437	Peak	Vert	98.7	30.6	2.2	10.0	36.2	105.3			PASS
2437	Avg	Vert	82.8	30.6	2.2	10.0	36.2	89.4			PASS
4874	Peak	Horz	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4874	Avg	Horz		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
4874	Peak	Vert	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4874	Avg	Vert		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
7311	Peak	Vert		37.9	4.3	0.0	35.9	6.3	74.0	67.7	PASS

7311	Avg	Vert		37.9	4.3	0.0	35.9	6.3	54.0	47.7	PASS
7311	Peak	Horz		37.9	4.3	0.0	35.9	6.3	74.0	67.7	PASS
7311	Avg	Horz		37.9	4.3	0.0	35.9	6.3	54.0	47.7	PASS
High channel11											
2462	Peak	Horz	100.1	30.6	2.2	10.0	36.2	106.7			PASS
2462	Avg	Horz	83.6	30.6	2.2	10.0	36.2	90.2			PASS
2462	Peak	Vert	98.9	30.6	2.2	10.0	36.2	105.5			PASS
2462	Avg	Vert	82.6	30.6	2.2	10.0	36.2	89.2			PASS
2483.5	Peak	Horz	48.3	30.6	2.2	10.0	36.2	54.9	74.0	19.1	PASS
2483.5	Avg	Horz	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
2483.5	Peak	Vert	48.1	30.6	2.2	10.0	36.2	54.7	74.0	19.3	PASS
2483.5	Avg	Vert	36.1	30.6	2.2	10.0	36.2	42.7	54.0	11.3	PASS
4924	Peak	Horz	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4924	Avg	Horz		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
4924	Peak	Vert	43.5	33.7	2.9	0.0	35.7	44.4	74.0	29.6	PASS
4924	Avg	Vert		33.7	2.9	0.0	35.7	0.9	54.0	53.1	PASS
7386	Peak	Vert		37.9	4.3	0.0	35.9	6.3	74.0	67.7	PASS
7386	Avg	Vert		37.9	4.3	0.0	35.9	6.3	54.0	47.7	PASS
7386	Peak	Horz		37.9	4.3	0.0	35.9	6.3	74.0	67.7	PASS
7386	Avg	Horz		37.9	4.3	0.0	35.9	6.3	54.0	47.7	PASS

Note 1: Worst case between 2300 MHz and 2390 MHz occurred at 2390 MHz.

Note 2: Marker Delta method employed.

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
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 - 15.209 - Radiated Emissions_Rev1.doc"

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.

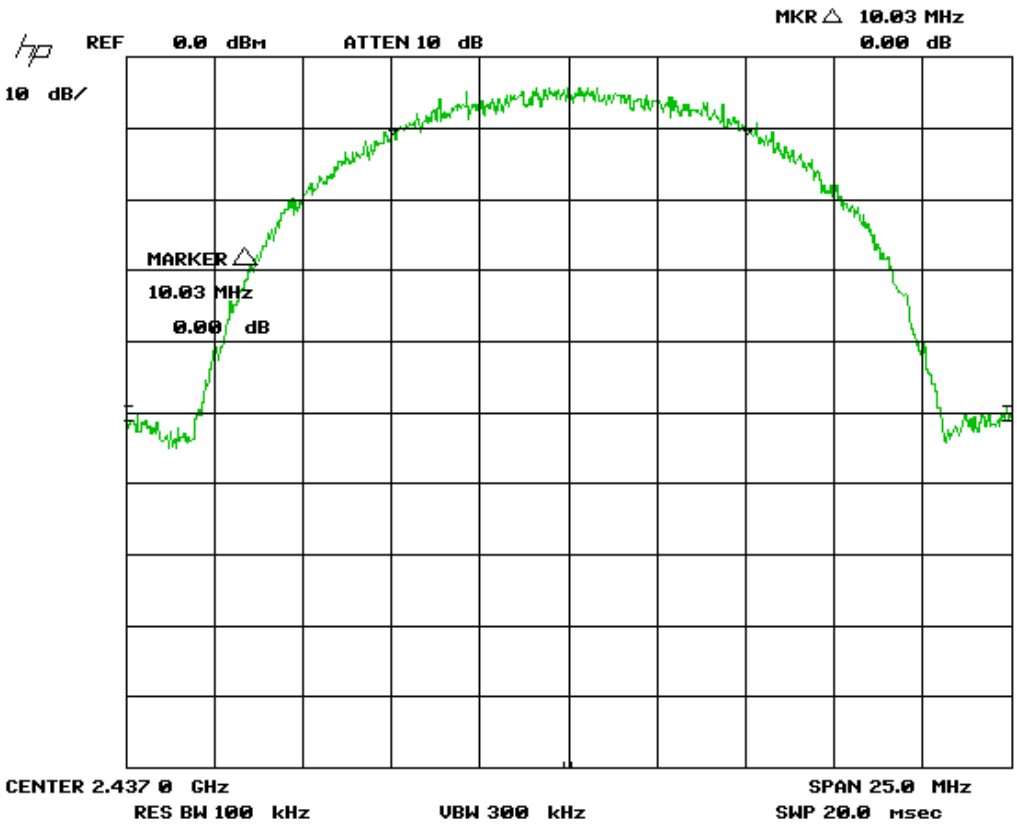
Results

The EUT passed. The minimum 6 dB BW measured was 8.32 MHz

Graph(s)

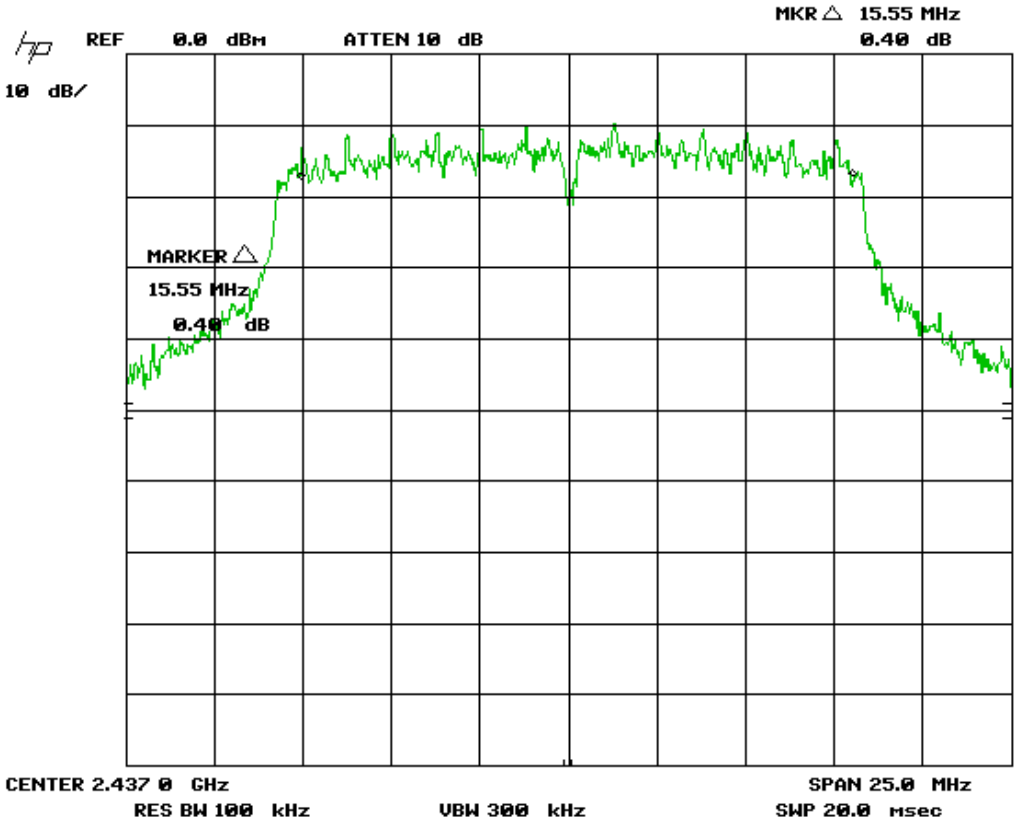
The graphs shown below shows the channel spacing during the operation of the device. This is measured by a max hold on the spectrum analyzer and the highest resolution bandwidth that is sufficiently low to exhibit the 6 dB bandwidth of a channel during operation of the EUT. This measurement is a peak measurement. Max hold is performed for a duration of not less then 1 minute.

802.11 b mode



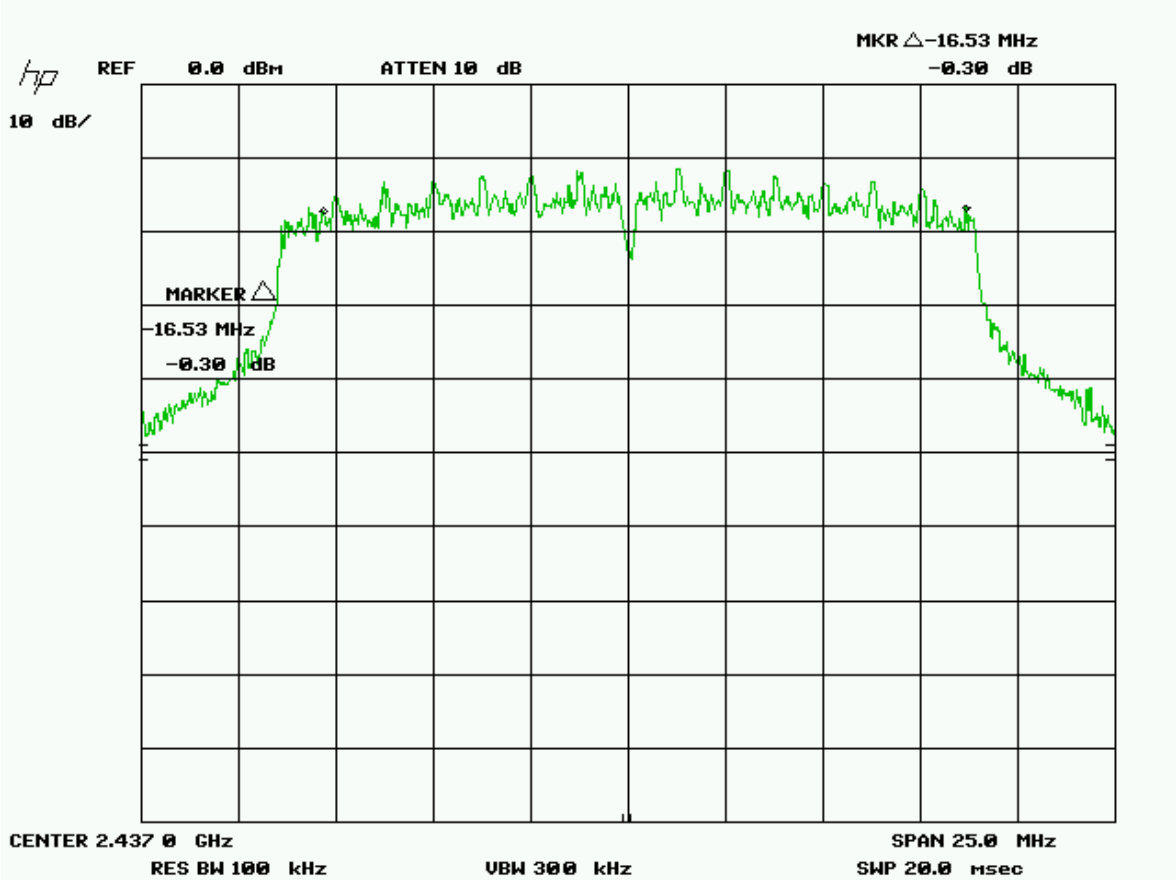
6 dB BW = 10.03 MHz
20 dB BW = 16.13 MHz

802.11g mode



6 dB BW = 15.55 MHz
20 dB BW = 17.25 MHz

802.11n mode



6 dB BW = 16.53 MHz
20 dB BW = 18.28 MHz

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

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"

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 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 17.8 dBm (60.3 mW), in 802.11b mode

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.

802.11b mode

Band	Channel	Frequency (GHz)	Reading (dBm)
Low	1	2.412	16.1
Medium	6	2.437	17.1
High	11	2.462	17.8

802.11g mode

Band	Channel	Frequency (GHz)	Reading (dBm)
Low	1	2.412	14.3
Medium	6	2.437	15.3
High	11	2.462	16.1

802.11n mode

Band	Channel	Frequency (GHz)	Reading (dBm)
Low	1	2.412	13.3
Medium	6	2.437	14.2
High	11	2.462	15.1

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

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
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
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"

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^{th} harmonic. This -20 dBc requirement also applies at the 'band edge' or 2.4 GHz and 2.4835 GHz.

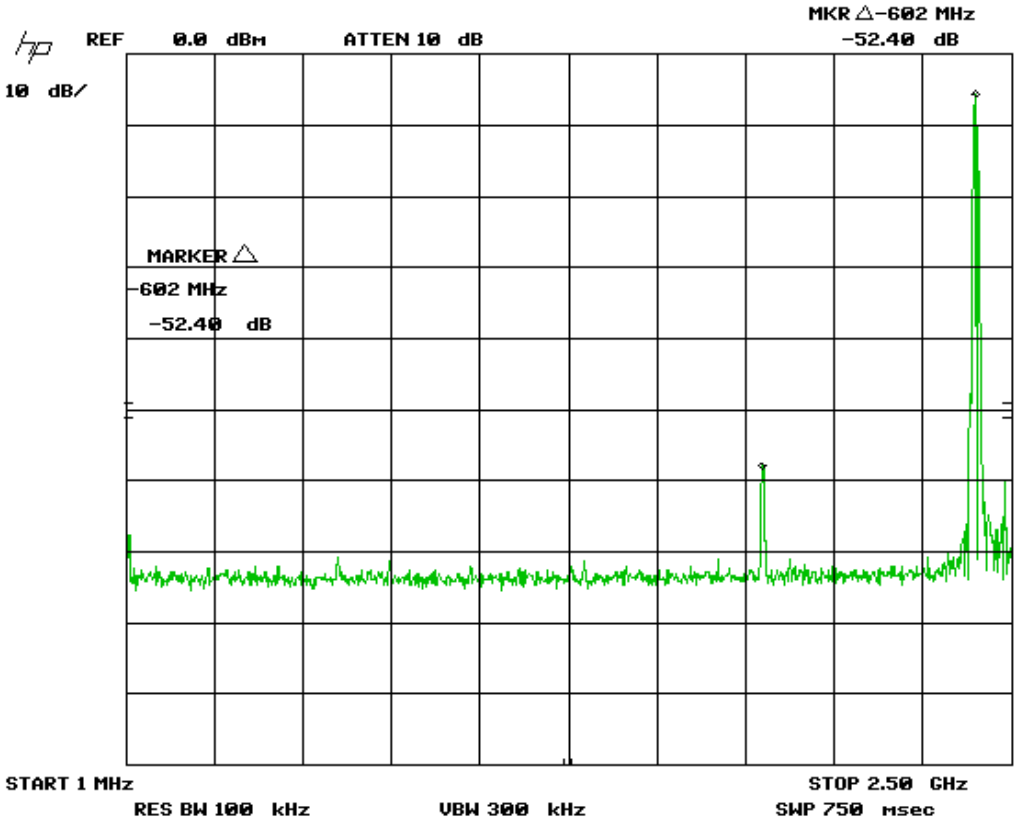
Results

The EUT pass. Low, middle and high band was measured for each 802.11b, 802.11g, 802.11n mode. 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 in the low band for all modes. The -20 dBc requirement is also shown for the higher band edge at 2.4835 GHz in the high band for all modes.

Graph(s)

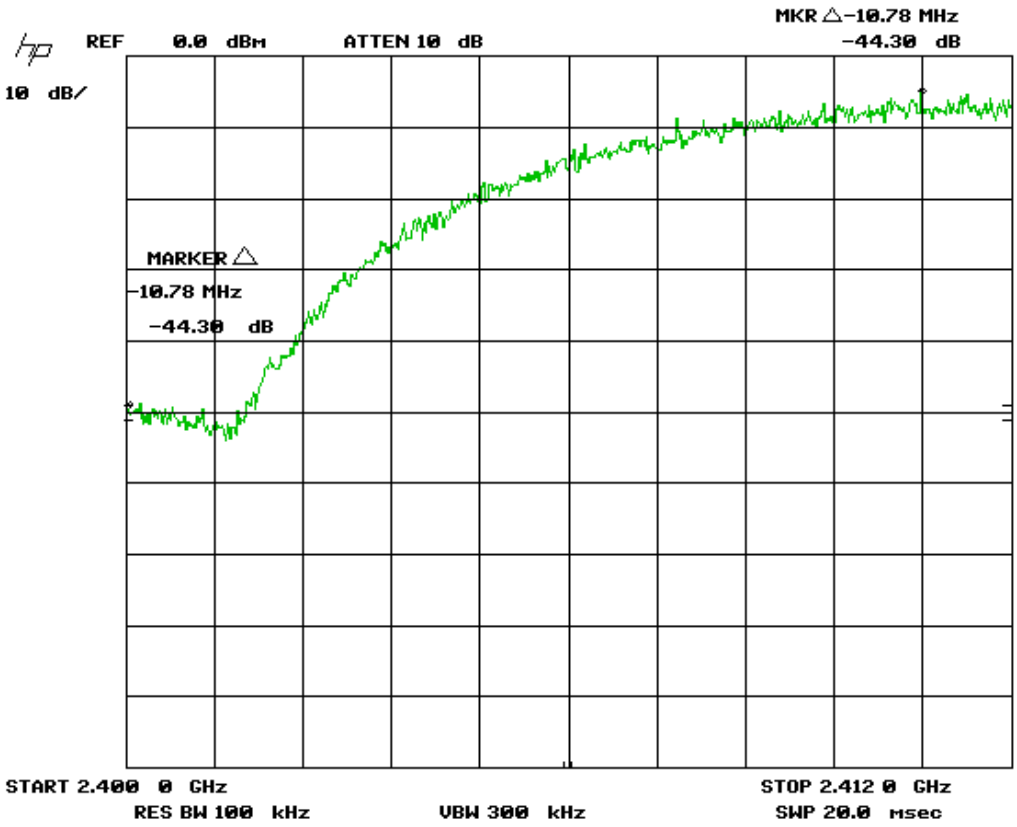
The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. Note there was 10 dB of external attenuation taken during this measurement.

Frequencies below fundamental

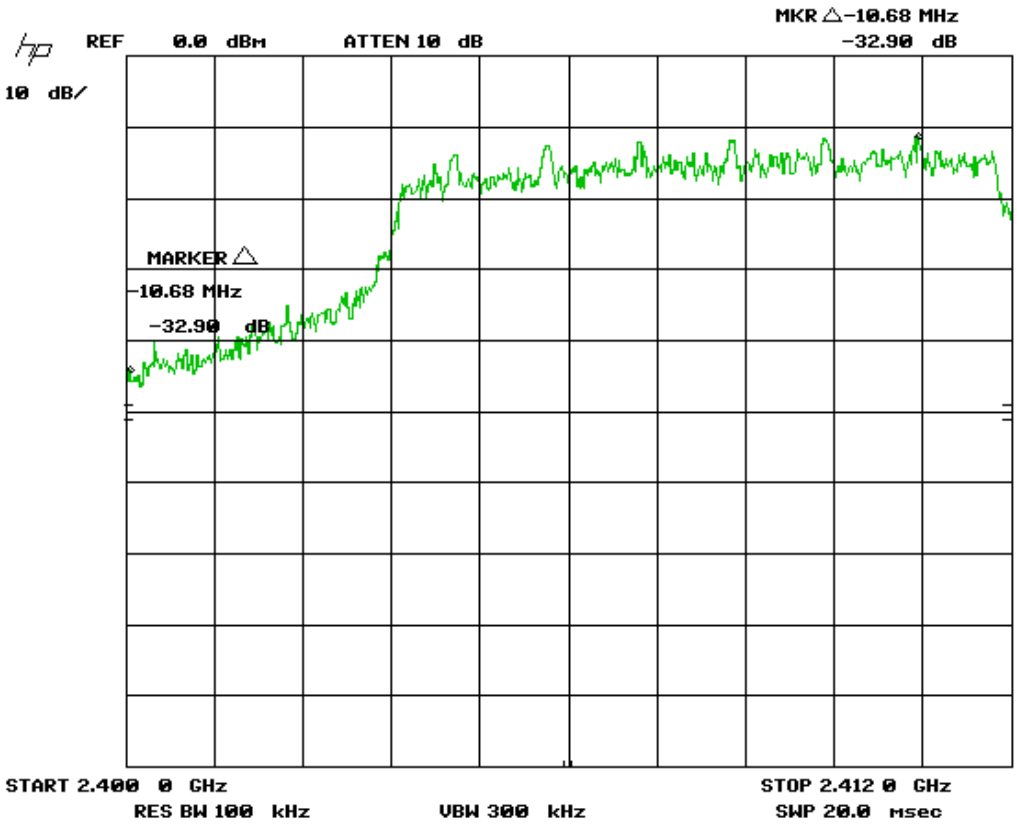


802.11b mode (worst case shown)

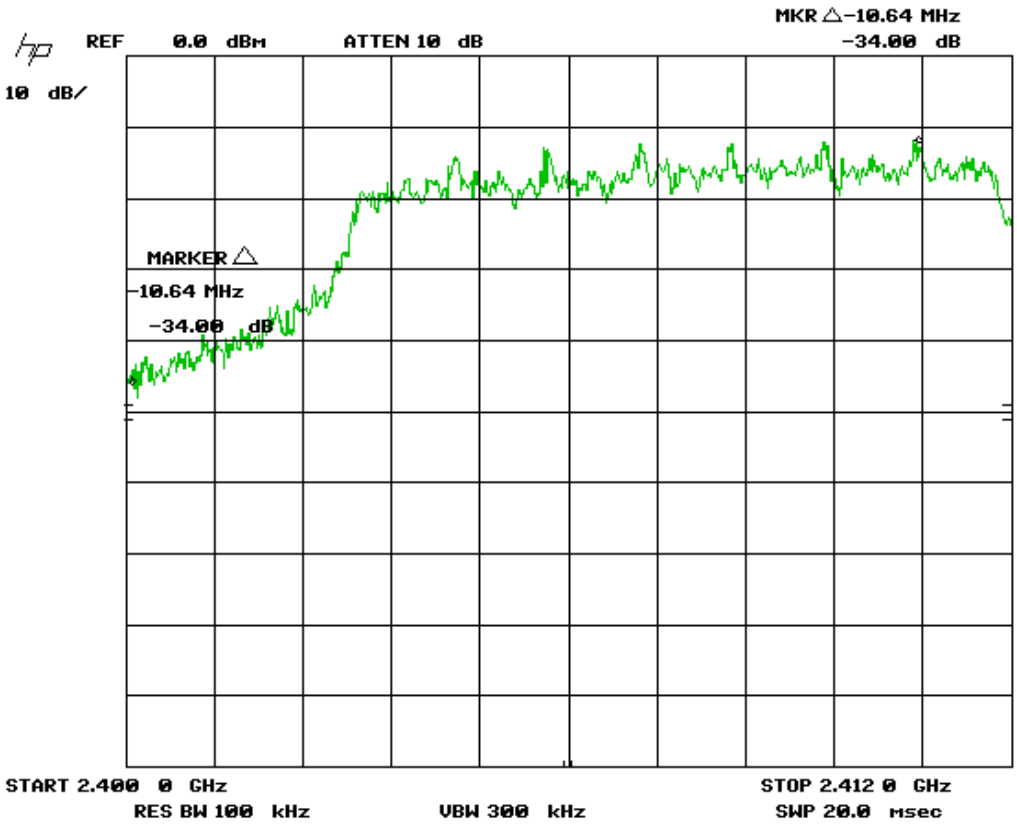
Frequencies below fundamental



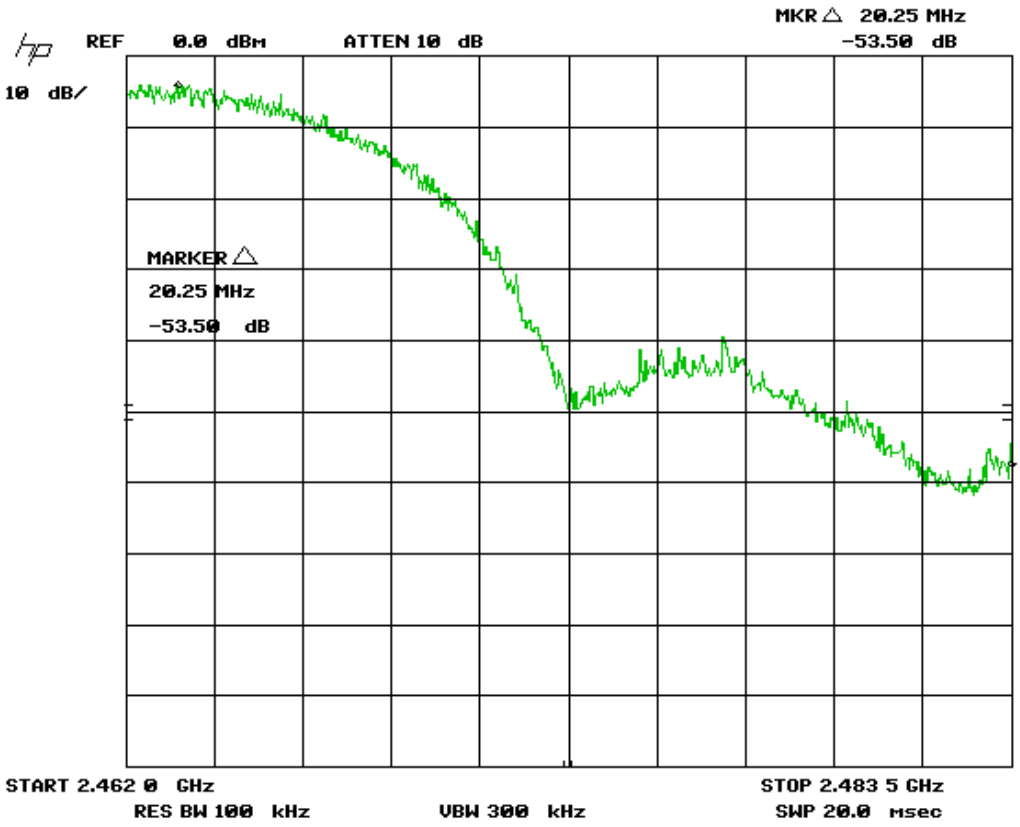
B mode – lower band edge



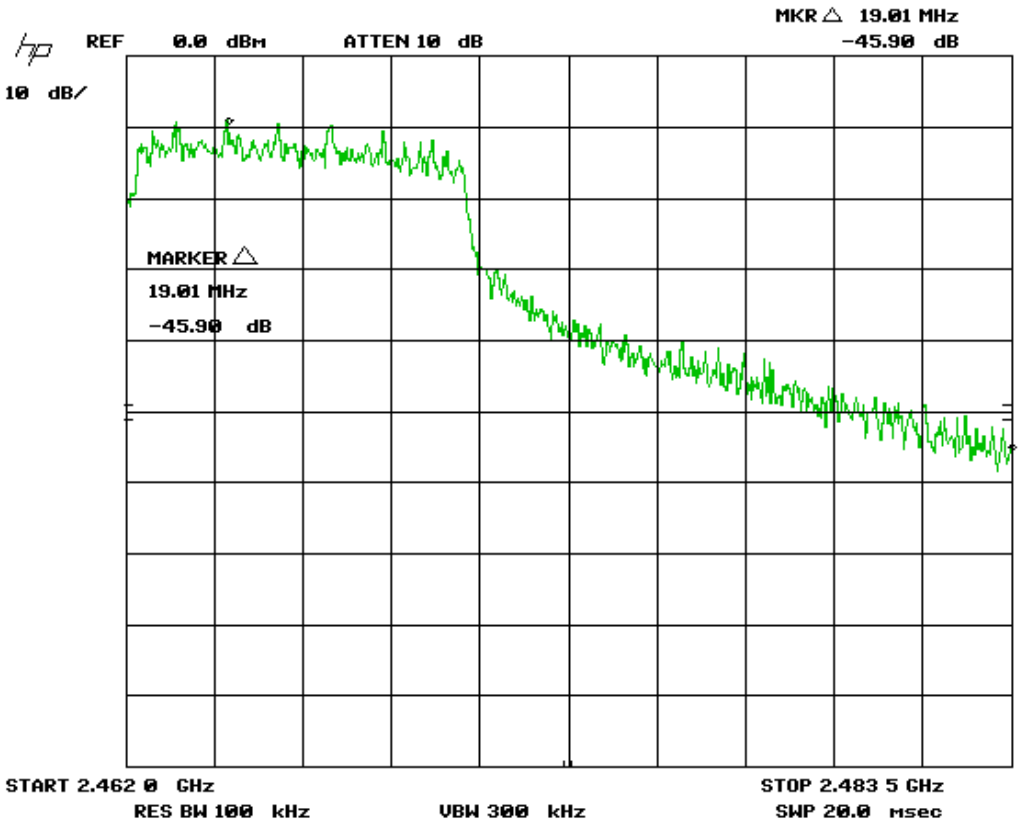
G mode – lower band edge



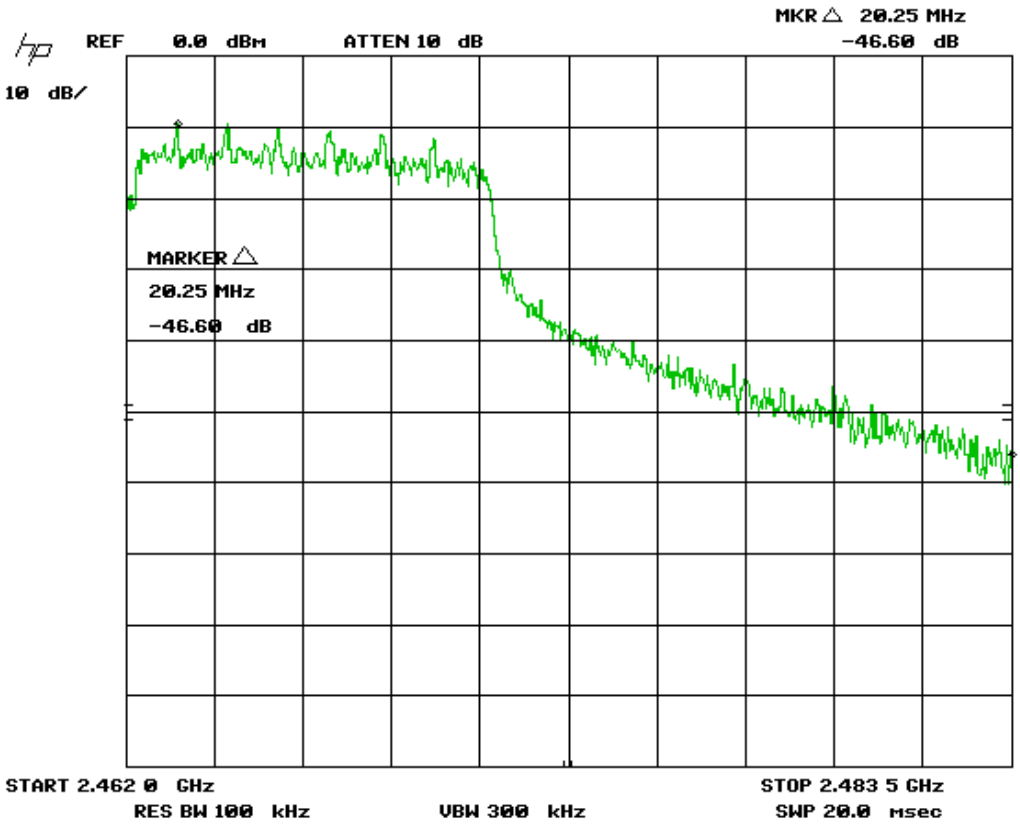
N mode – lower band edge



B mode – upper band edge

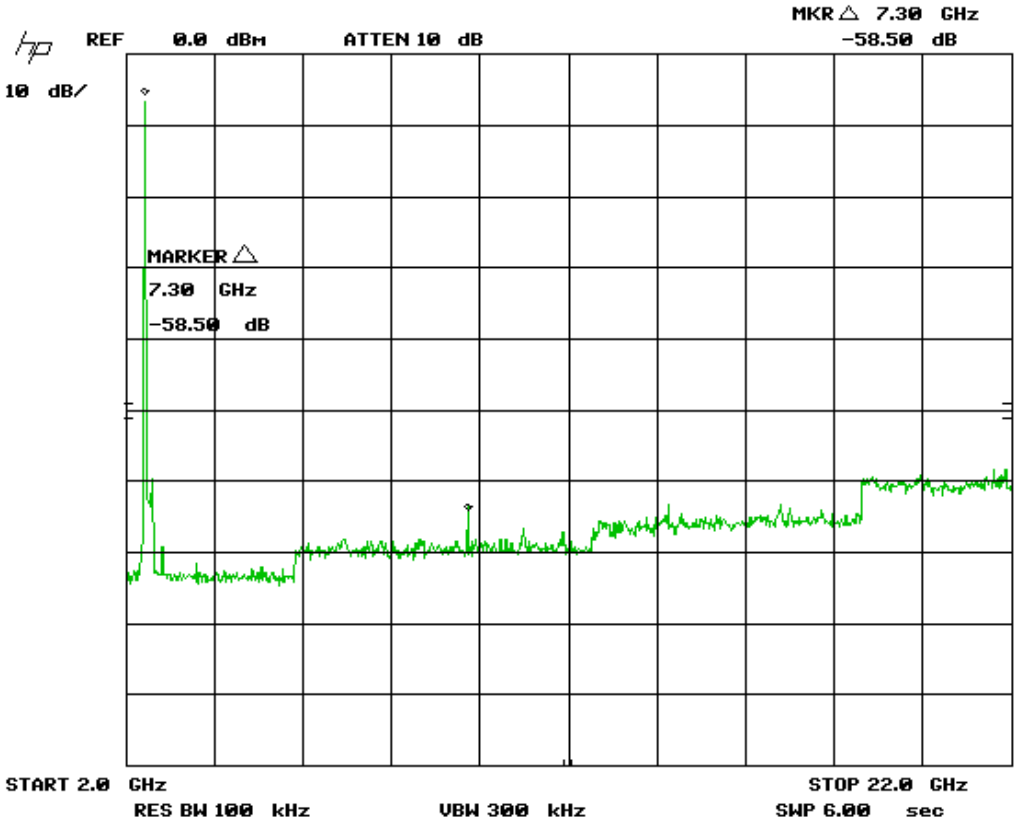


G mode – upper band edge



N mode – upper band edge

High Channel, Upper Band Edge



802.11b mode (worst case shown)

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

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

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
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"

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

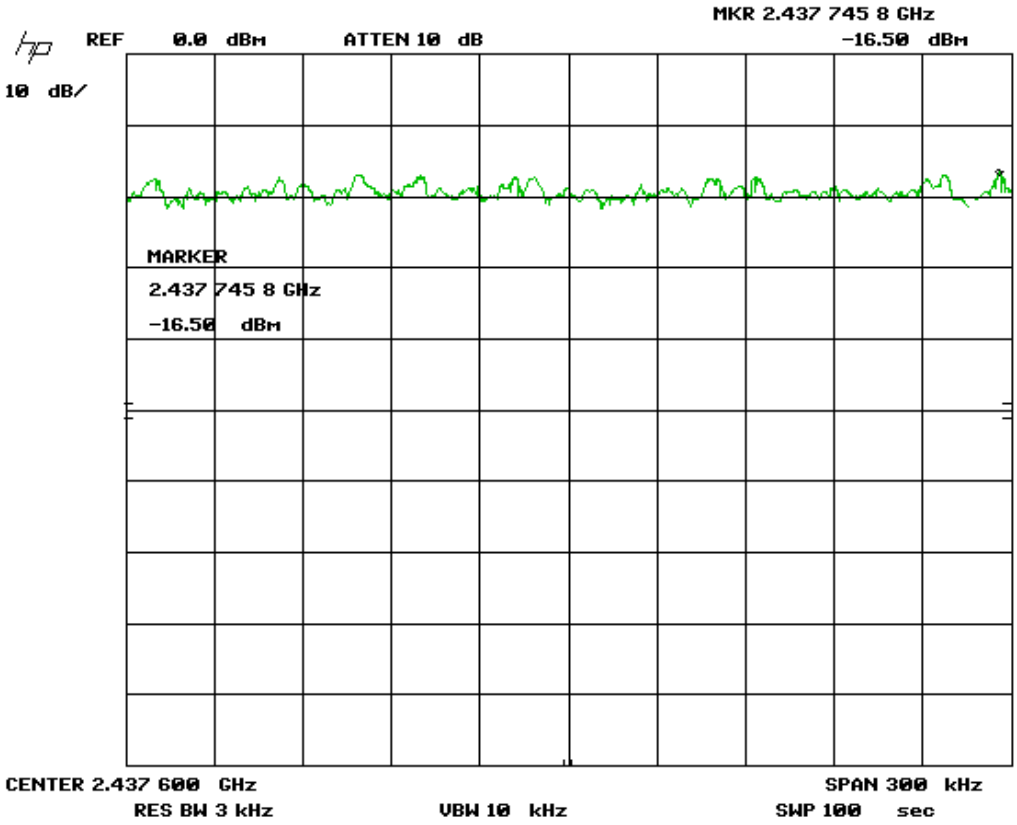
The EUT passed. Each mode was tested at low, medium, and high band. The worst case value is dBm as measured with a 3 kHz resolution bandwidth (peak power).

B mode	G mode	N mode	Pass/Fail
-6.5	-13.7	-15.9	PASS

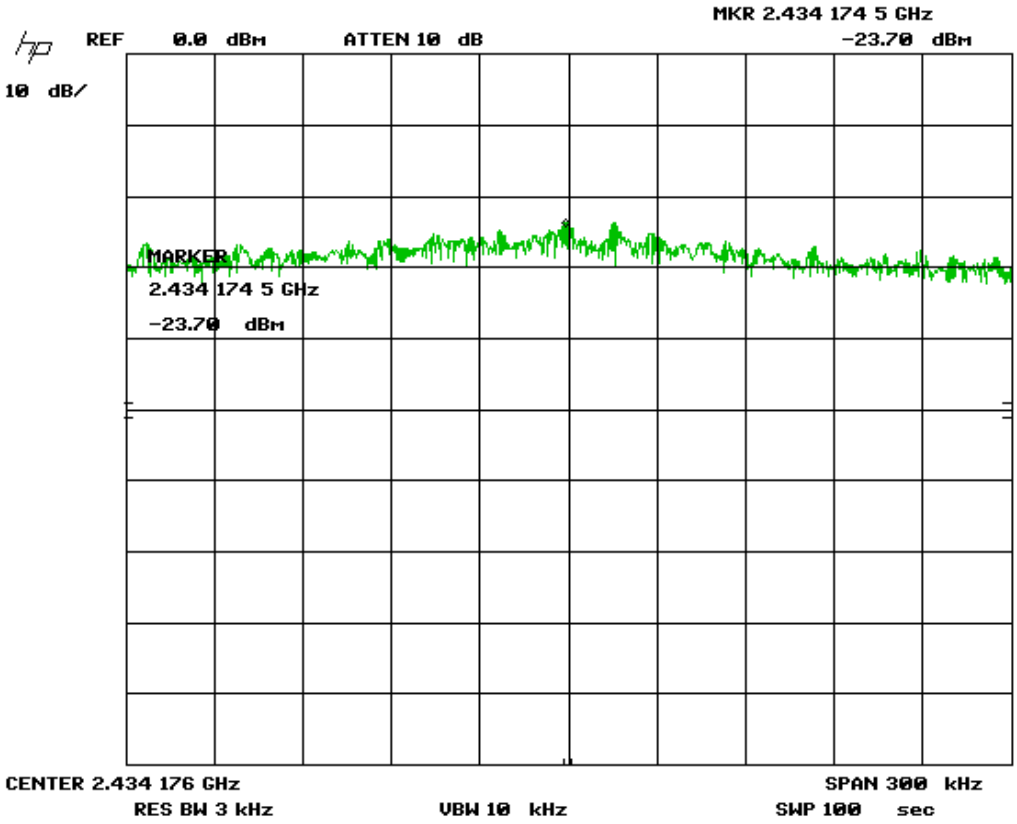
Graph(s)

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.

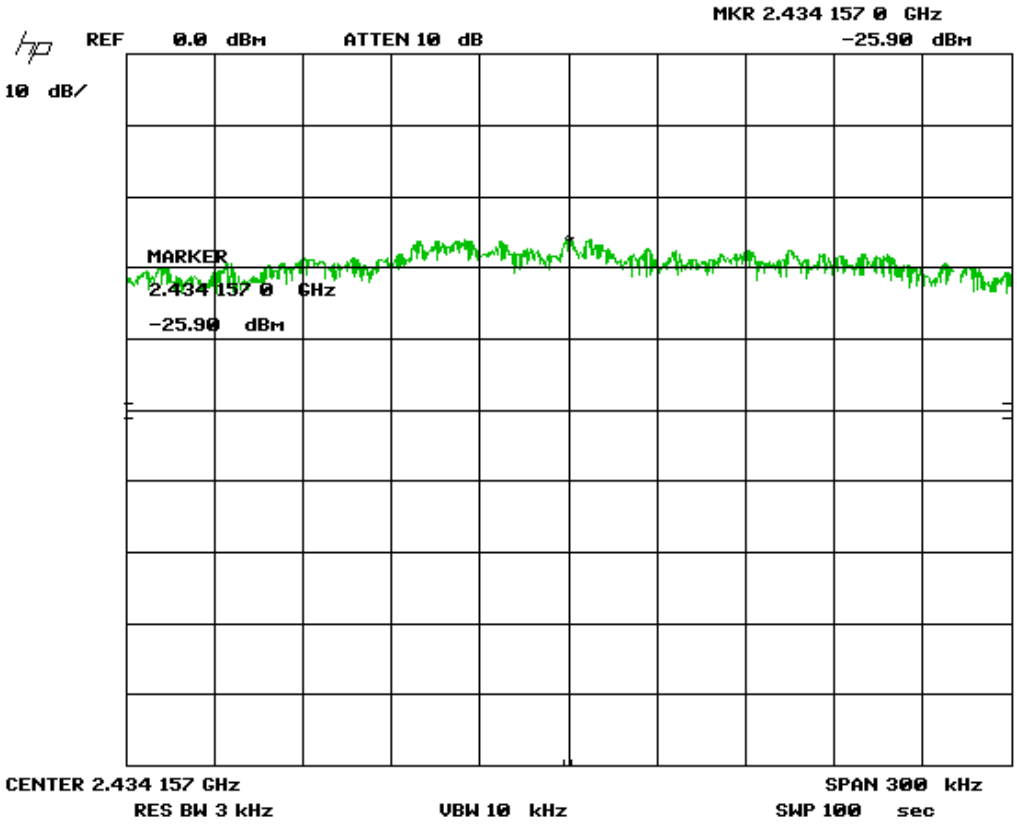
B mode (10 dB ext)



G mode (10 dB ext)



N mode (10 dB ext)



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

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
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"

Appendix A – EUT Summary

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

General EUT Description

Manufacturer	Smiths Detection
	7030 Century Ave Mississauga, ON. L5N 2V8
EUT Name	RadSeeker™ CS/CL
FCCID	Z2X4822X00CSL
IC #	8705C-4822X00CSL
Equipment Category (Commercial / Residential / Medical)	Residential
Input Voltage and Frequency	5Vdc, 1A
Intentional RF (If yes describe)	Yes – WiFi
Table Top / Wall mount / Floor standing (choose table top if unsure)	Portable (5cm antenna to end user)
I/O Connectors available on EUT	None,
Peripherals required for test	n/a
Minimum Separation distance from operator	n/a
Types and lengths of all I/O cables	none.

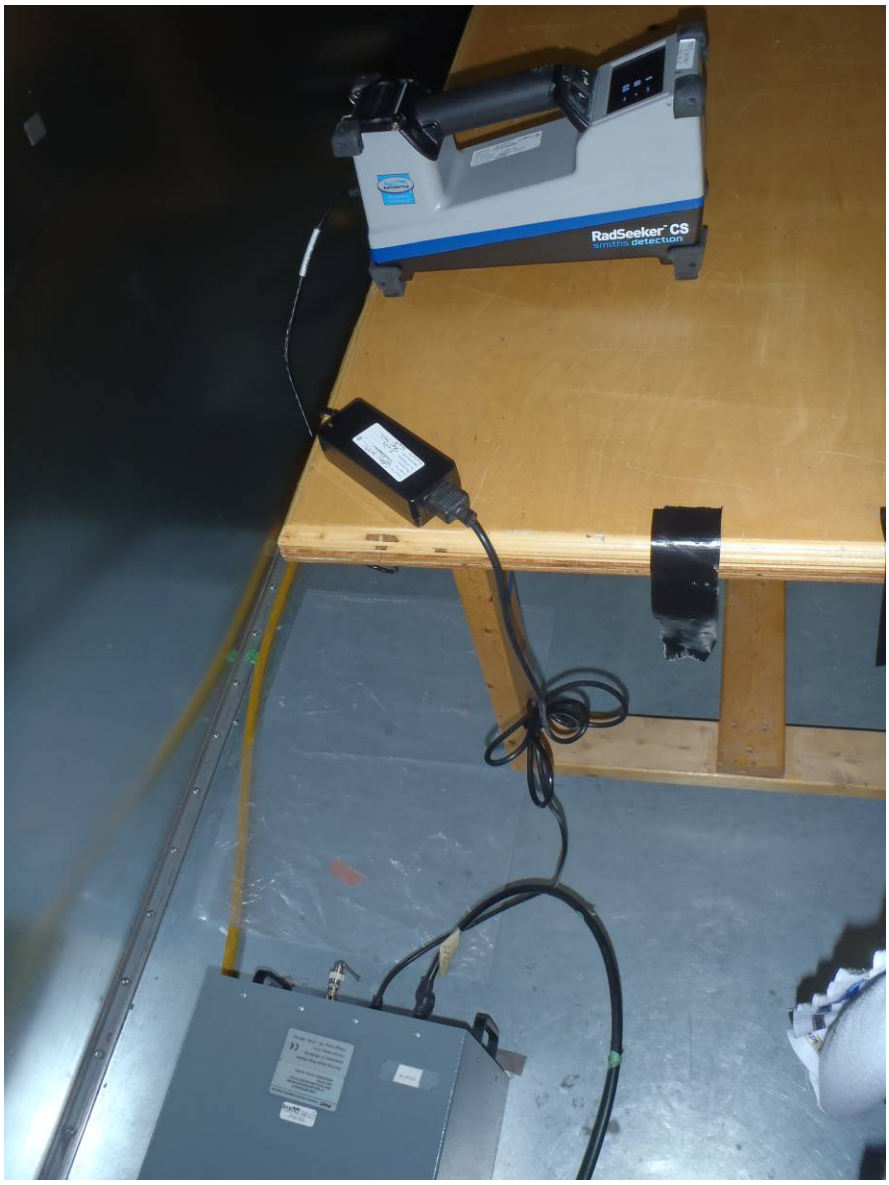
Note the EUT is considered to have been received the date of the commencement of the first test, unless otherwise stated. For a close-up picture of the EUT, see 'Appendix B – EUT & Test Setup Photographs'.

Appendix B – EUT and Test Setup Photographs

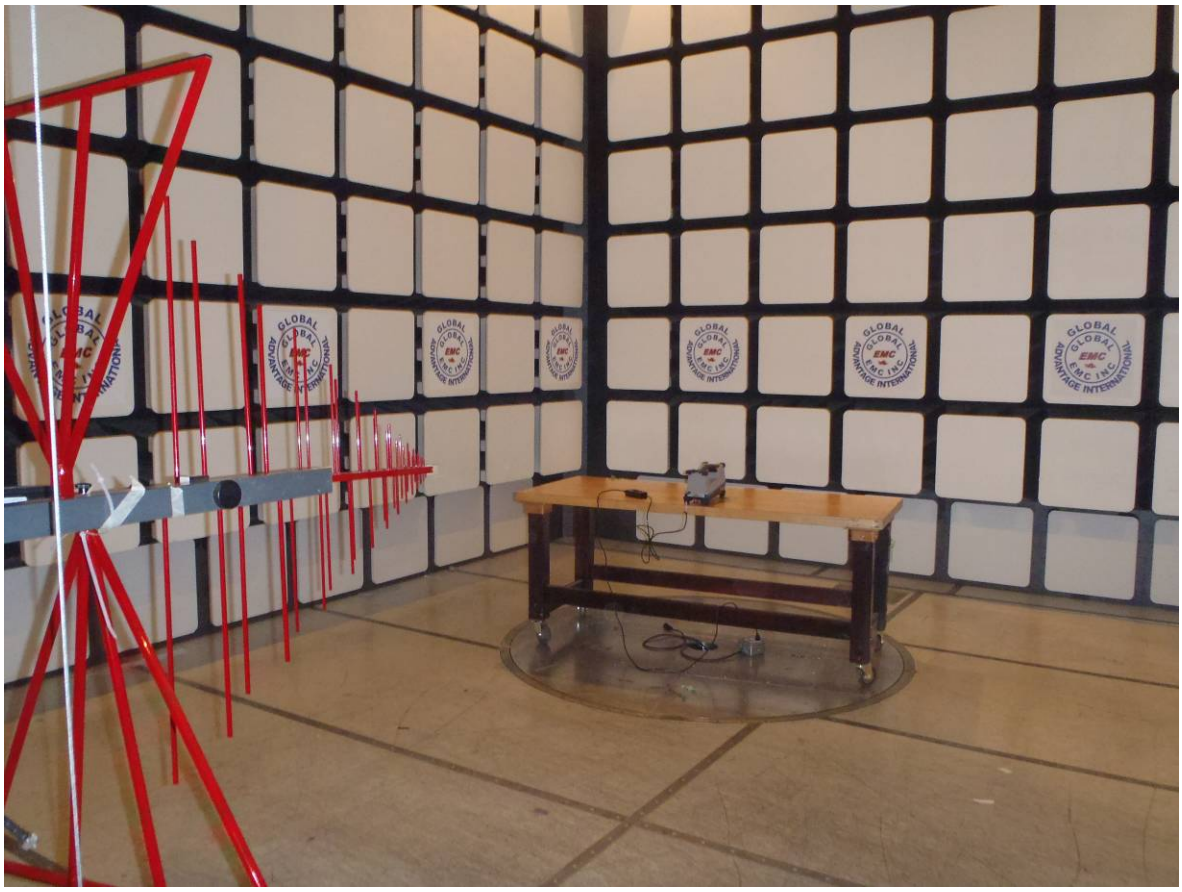
Note: These photos are for information purposes only. Also refer to PDF files that are separate from this test report.

Power Line Conducted Emissions - 1

Power Line Conducted Emissions - 2



Radiated Emissions - 9 kHz to 30 MHz



Radiated Emissions – 30 MHz to 2 GHz

Radiated Emissions – 2GHz to 26 GHz

Antenna Conducted Measurements.