Global EMC Inc. Labs

EMC & RF Test Report

As per

RSS 210 Issue 8:2010

&

FCC Part 15 Subpart C:2010

Unlicensed Intentional Radiators

on the

Savant Bridge (RFG-2000)

Scott Drysdale, Narte Certified Technician
EMC Lab Manager
Global EMC Inc.
180 Brodie Dr, Unit 2
Richmond Hill, ON L4B 3K8
Canada
Ph: (905) 883-3919

Testing produced for

savant
NOW YOU CAN

See Appendix A for full customer & EUT details.

Industry Canada
LAB REGISTRATION #6844A-2

CE

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 Savant Bridge, 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	**Savant Technologies**
Product	**Savant Bridge (RFG-2000)**
Standard(s)	RSS 210 Issue 8:2010 / FCC Part 15 Subpart C 15:2010

Summary

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

EUT FCC Certification #, FCC ID:	ASU- RFG2000
EUT Industry Canada Certification #, IC:	10052A- RFG2000
EUT Passed all tests performed.	Yes (see test results summary)
Tests conducted by	Scott Drysdale

Client	**Savant Technologies**
Product	**Savant Bridge (RFG-2000)**
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 incorporates a reverse polarity SMA 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.

For maximum permissible exposure, this device operates in Digitally modulated mode at 1.3 dBm (1.4 mW) at 2.4 GHz, in both portable and mobile conditions, less than the 20 mW level and is therefore exempt from SAR evaluation.

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 - January 26, 2012

Revision 2 - Feb 17, 2012
Re-measurement performed due to errors as noted by TCB on page 31.
Correction to limits applied on page 31.

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	Initials	Temperature (ºC)	Humidity (%)	Pressure (kPa)
Dec 12-21, 2011	RE	SD	20-25ºC	30-45%	100 -103 kPa
Feb 16, 2012	RE	SD	22.5	43%	101.5 kPa
Dec 12-21, 2011	PLCE	SD	20-25ºC	30-45%	100 -103 kPa
Dec 12, 2011 – Jan 10, 2012	Antenna conducted	SD	20-25ºC	30-45%	100 -103 kPa

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

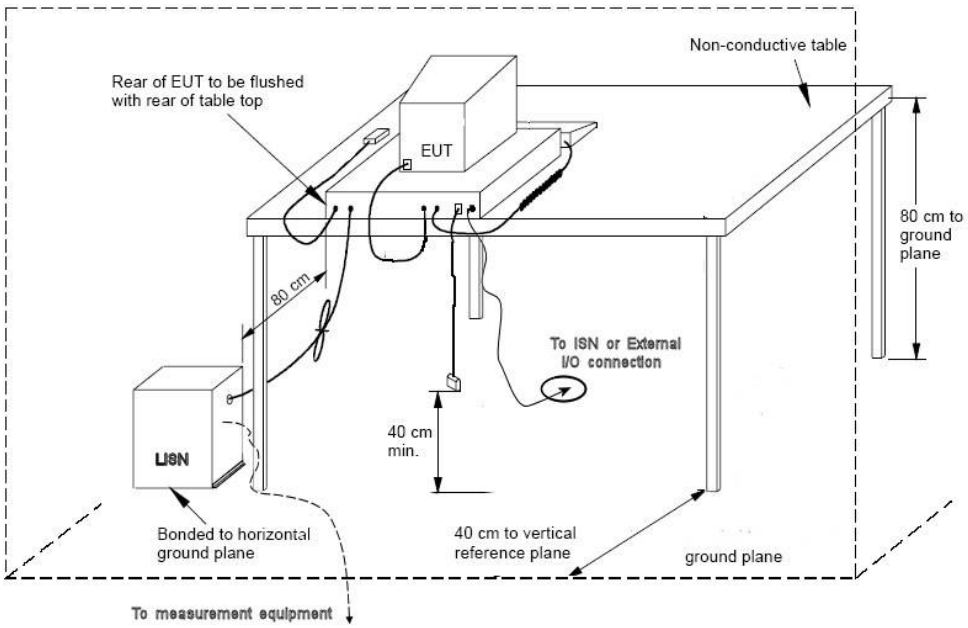
Average Limits		QuasiPeak Limits	
150 kHz – 500 kHz	56 to 46 dBuV	150 kHz – 500 kHz	66 to 56 dBuV
500 kHz – 5 MHz	46 dBuV	500 kHz – 5 MHz	56 dBuV
5 MHz – 30 MHz	50 dBuV	500 kHz – 30 MHz	60 dBuV

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



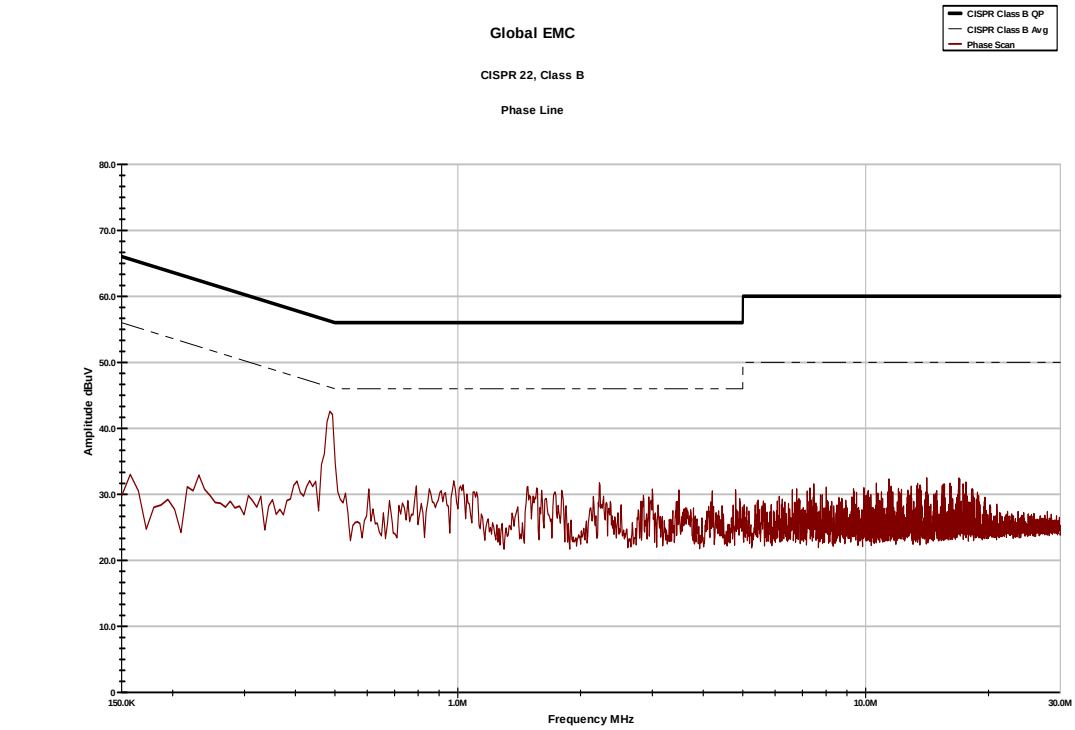
Measurement Uncertainty

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)

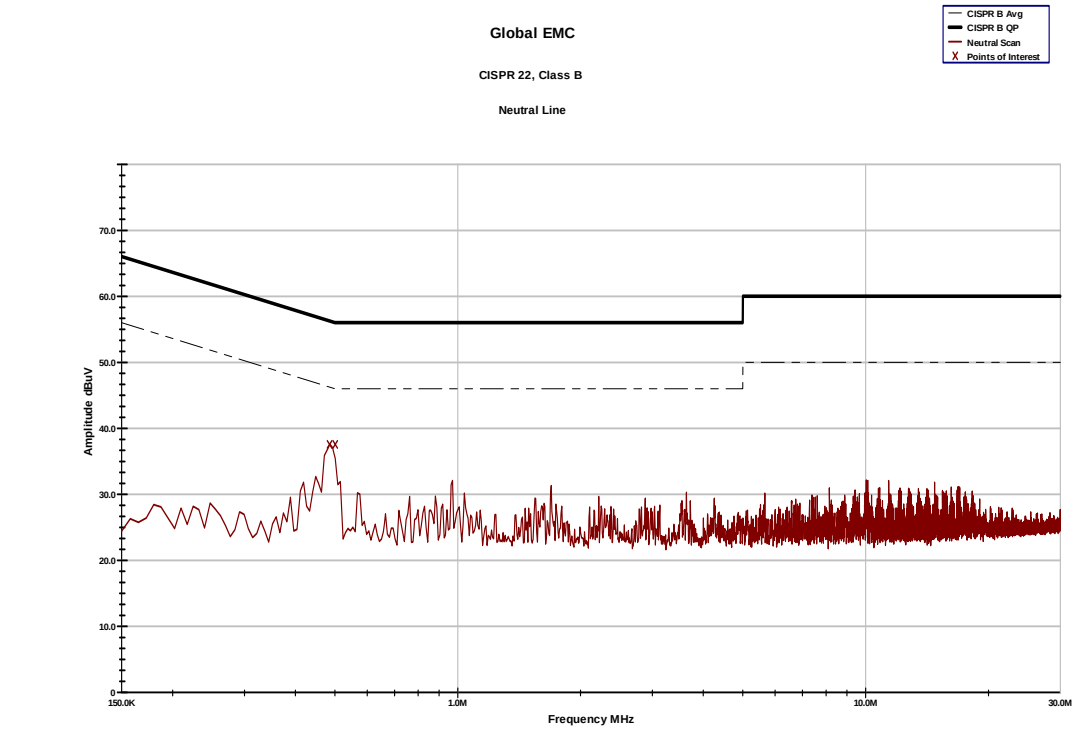


Operator: me

C:\TILE5\profiles\Savant - Bridge.TIL

02:40:50 PM, Tuesday, January 03, 2012 Project #:

Neutral (White/Blue) – Power Supply



Operator: me

C:\TILE5\profiles\Savant - Bridge.TIL

03:06:33 PM, Tuesday, January 03, 2012 **Project #:**

Final Measurements

Top 6 - Quasi Peak – Line 1

Frequency	Raw QP dBuV	LISN dB	Cable dB	Atten dB	QP dBuV	QP Limit dBuV	Margin dB
4.9865 MHz	12.5	0.2	0.4	10	23.1	56	-32.9
492.71 KHz	27.5	0.2	0.1	10	37.8	56.2	-18.4
484.4 KHz	27.8	0.2	0.1	10	38.1	56.4	-18.3

Top 6 – Average – Line 1

Frequency	Raw AVG dBuV	LISN dBuV	Cable dB	Atten dB	AVG dBuV	Limit dBuV	Margin dB
4.9865 MHz	2.3	0.2	0.4	10	12.9	46	-33.1
492.71 KHz	14.1	0.2	0.1	10	24.4	46.2	-21.8
484.4 KHz	14.2	0.2	0.1	10	24.5	46.4	-22

Top 6 - Quasi Peak – Line 2

Frequency	Raw QP dBuV	LISN dB	Cable dB	Atten dB	QP dBuV	QP Limit dBuV	Margin dB
486.45 KHz	26.1	0.2	0.1	10	36.4	56.4	-20
488.66 KHz	26.1	0.2	0.1	10	36.4	56.3	-19.9

Top 6 – Average – Line 2

Frequency	Raw AVG dBuV	LISN dBuV	Cable dB	Atten dB	AVG dBuV	Limit dBuV	Margin dB
488.66 KHz	12.6	0.1	10	0.2	22.9	46.324	-23.4
486.45 KHz	12.4	0.1	10	0.2	22.7	46.387	-23.7

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

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.

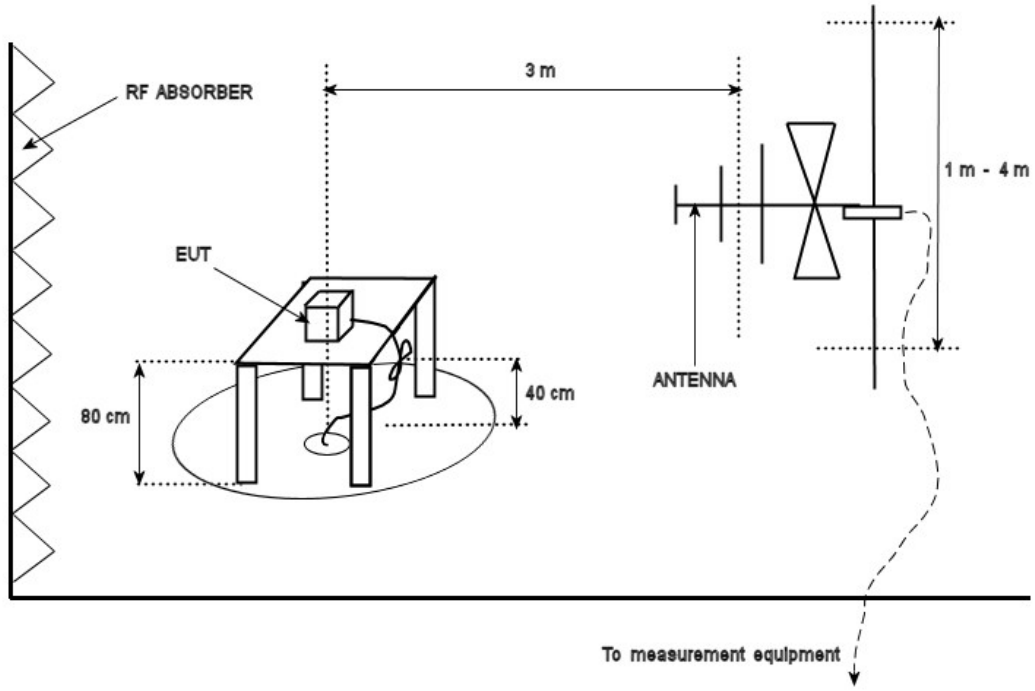
Limit(s) and Method

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 (46.0 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.

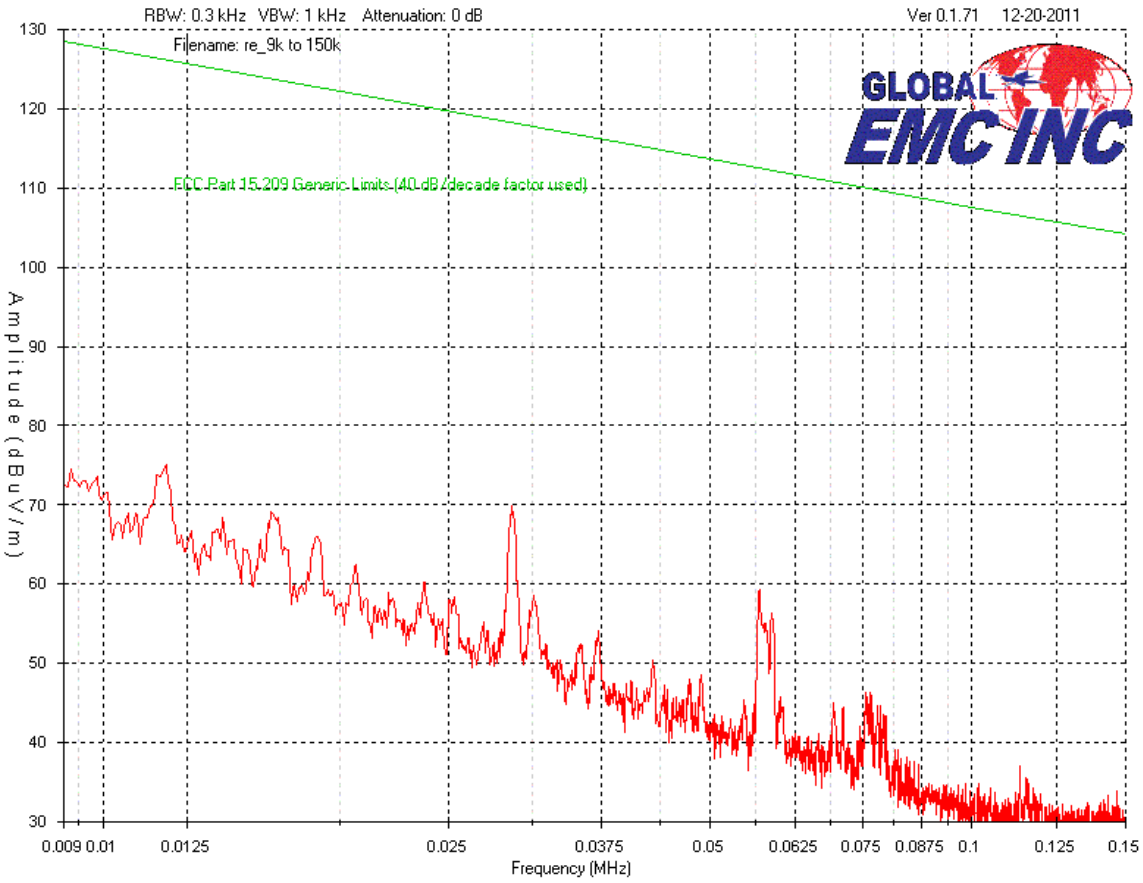
Preliminary Graphs

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. 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).

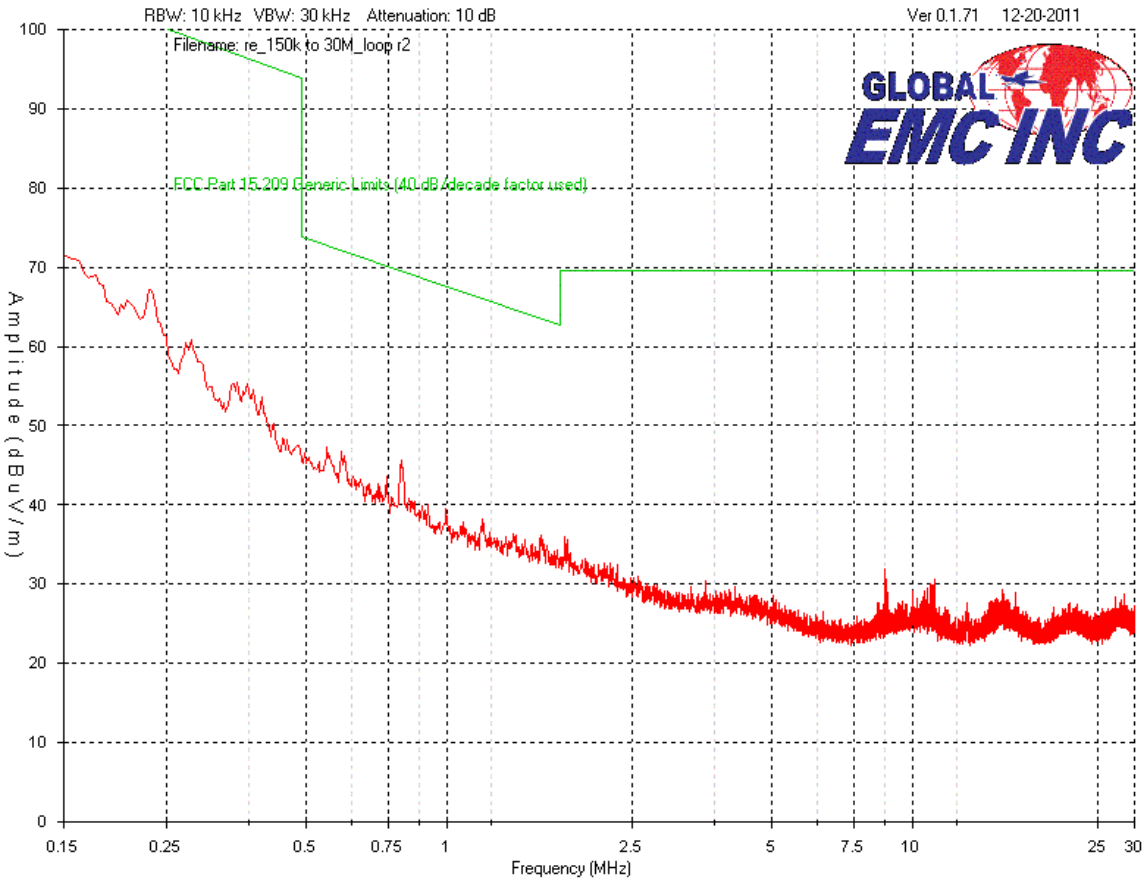
Devices scanned above 10 GHz were scanned at 1 meter test distance, and in accordance with FCC Part 15, Subpart A, Section 15.31, an extrapolation factor of 20 dB/decade was used.

9 kHz to 150 kHz



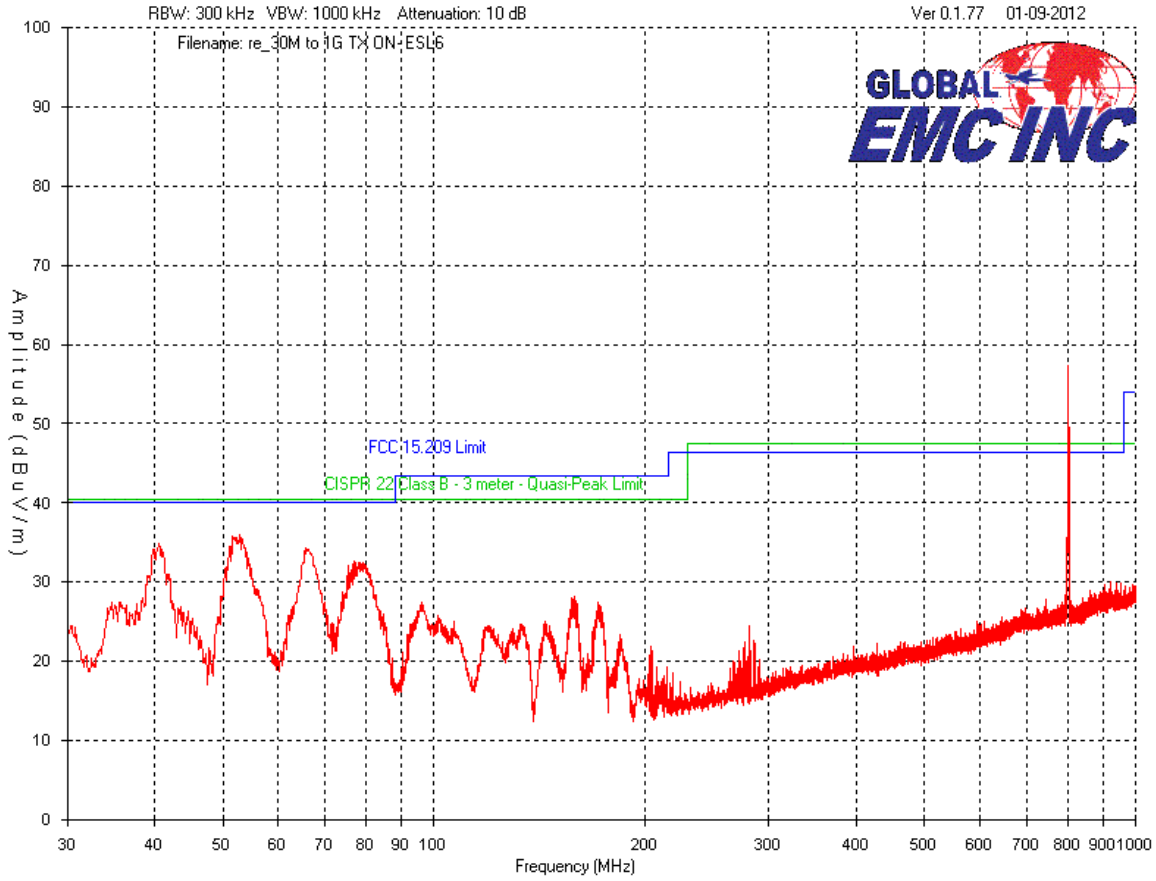
Worst-case/representative channel

150 kHz to 30 MHz

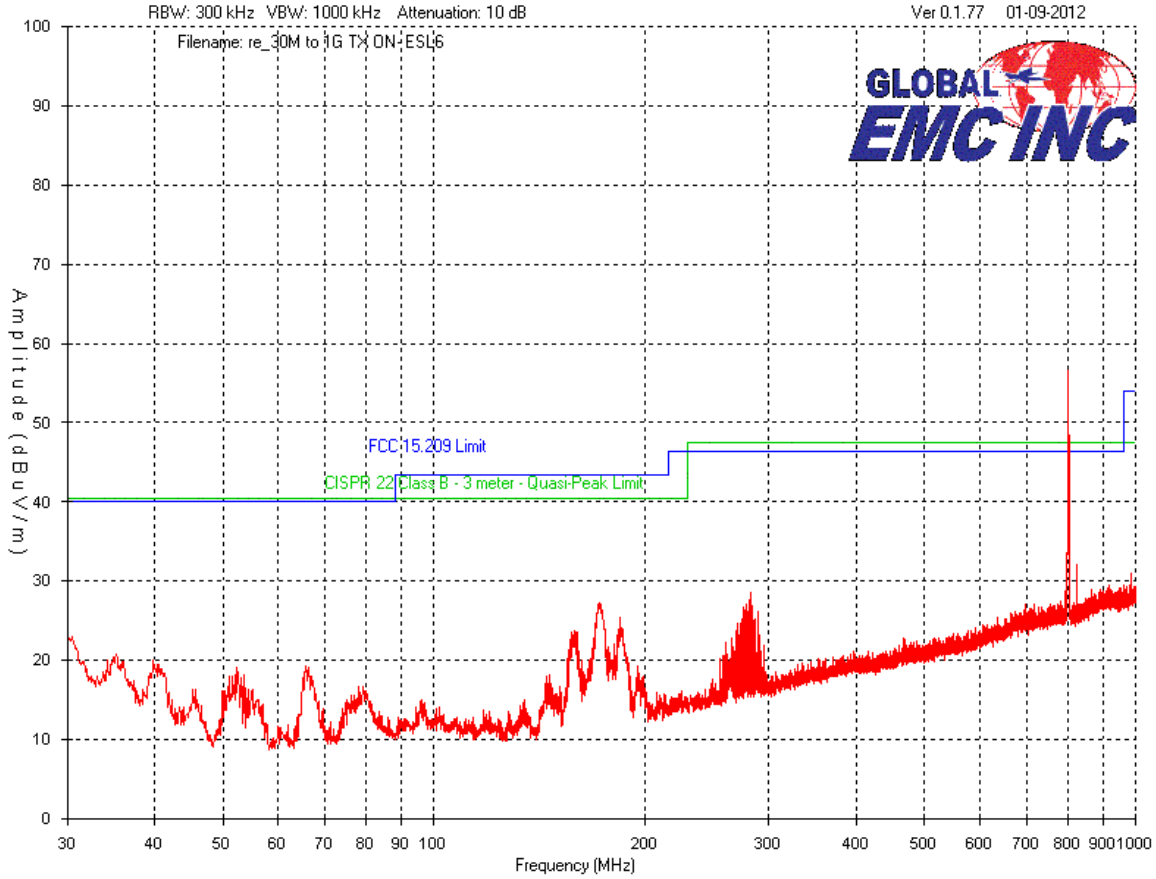


Worst-case/representative channel

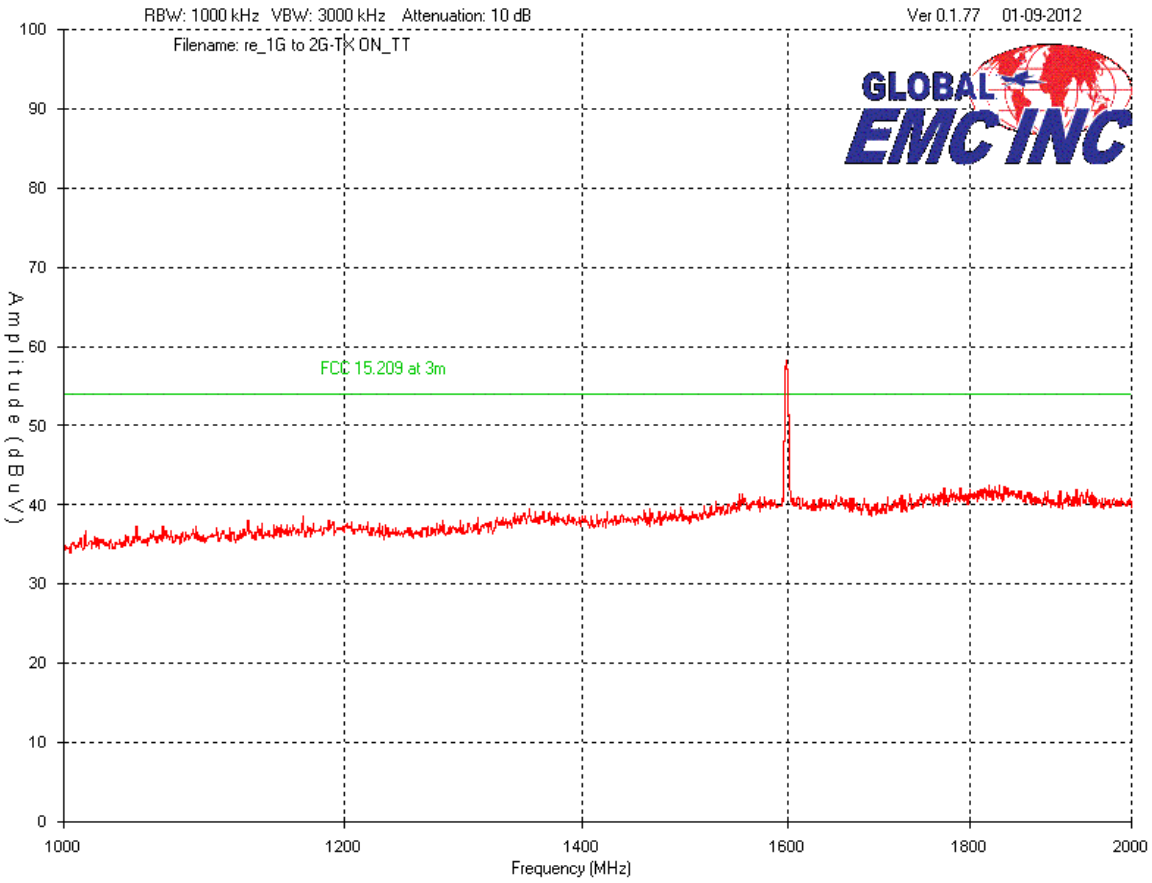
Vertical – Peak Emissions Graph 30 MHz – 1 GHz (worst case/representative channel)



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

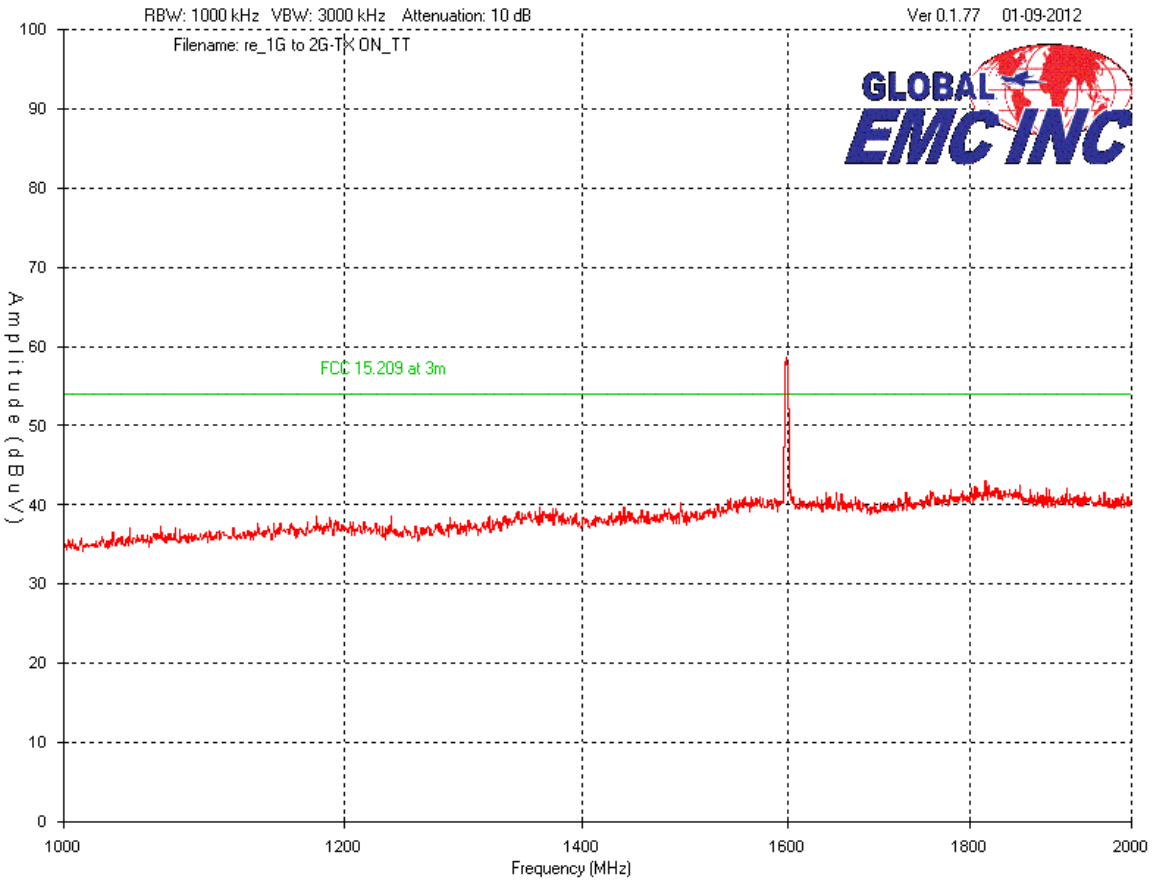


Vertical – 1GHz to 2 GHz



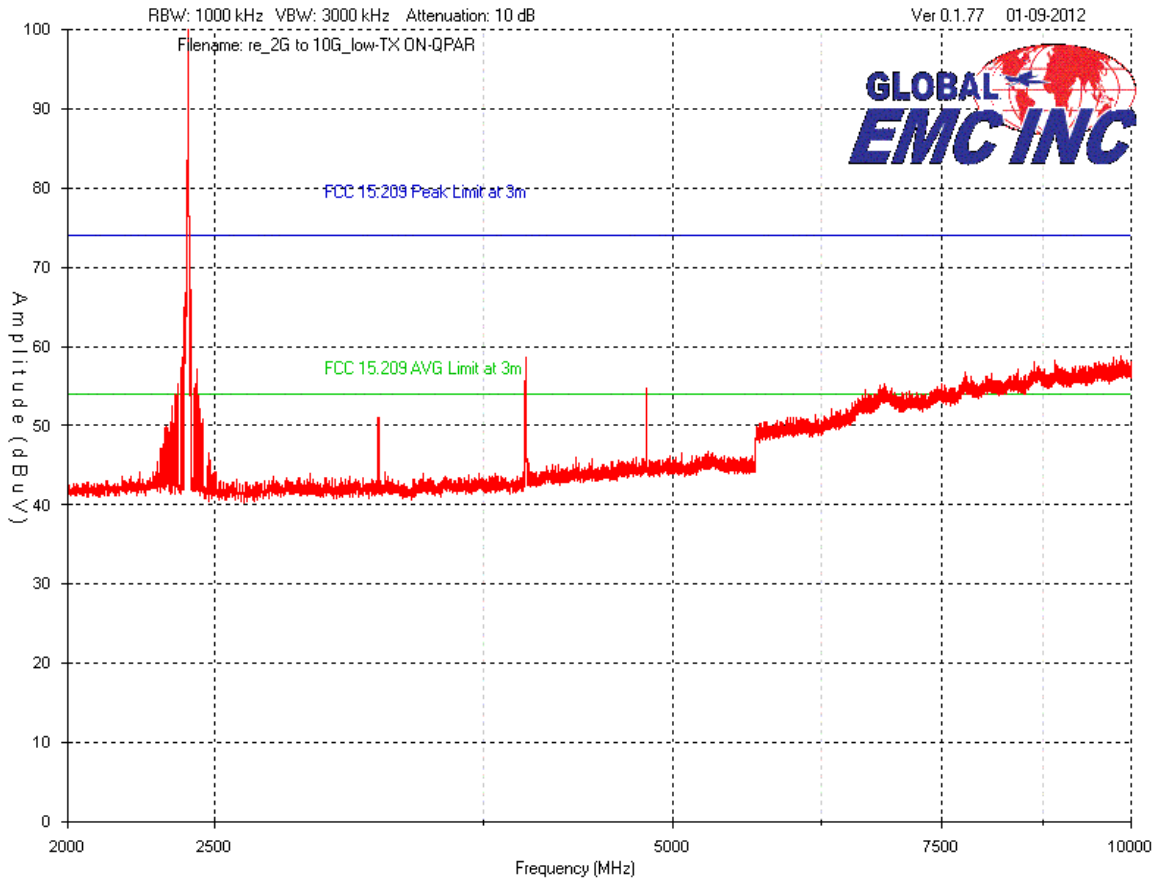
Worst-case/representative channel

Horizontal – 1 GHz to 2 GHz



Worst-case/representative channel

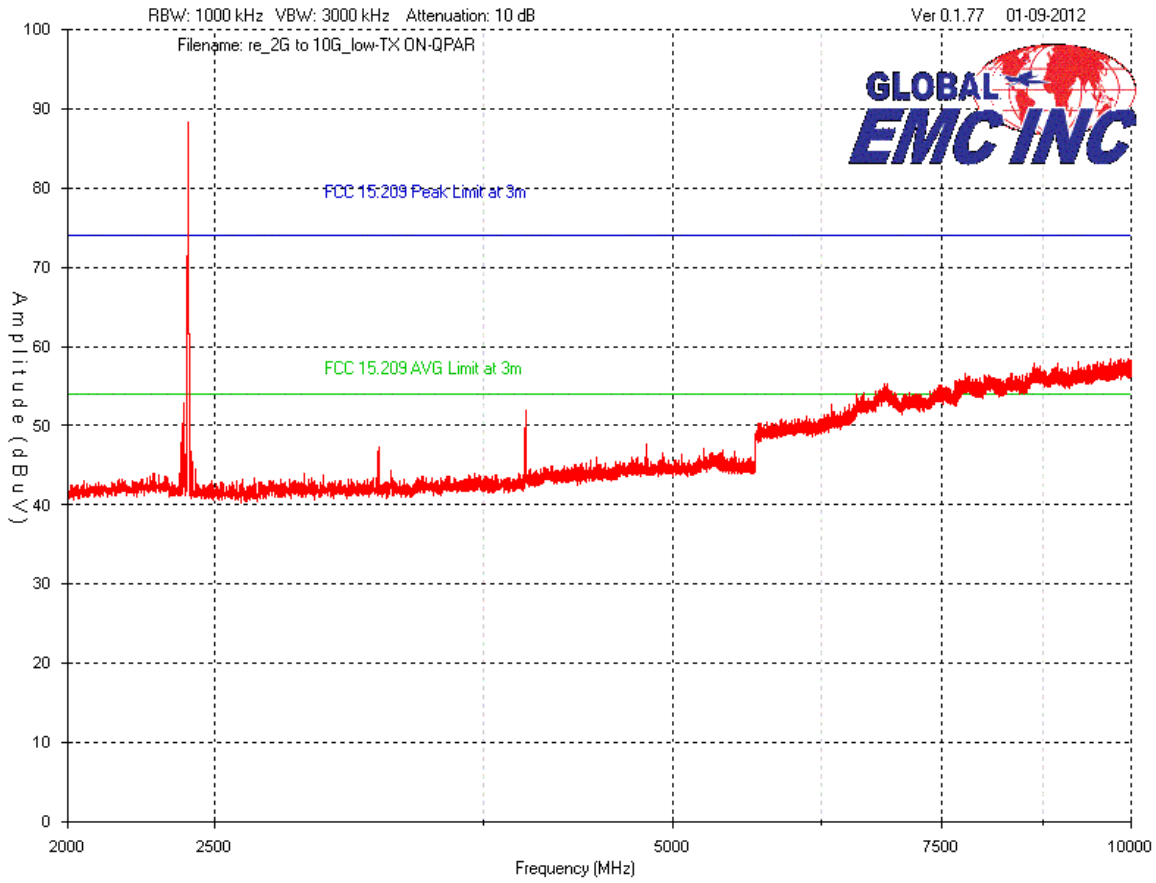
Vertical – 2 GHz to 10 GHz



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

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

Horizontal – 2 GHz to 10 GHz



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

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

Final Measurements

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

Frequency (MHz)	Detector	Raw (dBuV)	Ant. (dB/m)	Cable (dB)	Amp (dB)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/Fail
800	QP	52.9	21.7	1.2	-30.1	45.7	46.0	0.3	Pass*
51.922	PK	57.4	8.4	0.4	-30.1	36.1	40	3.9	Pass
65.696	PK	57.2	7.1	0.4	-30.1	34.6	40	5.4	Pass
40.476	PK	50.6	13	0.3	-30.1	33.8	40	6.2	Pass
77.239	PK	55.4	7.5	0.4	-30.2	33.1	40	6.9	Pass
157.361	PK	49.2	9.3	0.5	-30.3	28.7	43.5	14.8	Pass

Low, medium and high channel were investigated, Worst case results presented above (low channel)

(*) - This frequency and polarity was re-measured on Feb 16, 2012.

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

Frequency (MHz)	Detector	Raw (dBuV)	Ant. (dB/m)	Cable (dB)	Amp (dB)	Level (dBuV/m)	Limit (dBuv/m)	Margin (dB)	Pass/Fail
799.196	QP	50.7	21.7	1.2	-30.1	43.5	46.0	2.5	Pass
30.486	PK	34.1	18.7	0.3	-30.1	23	40	17	Pass
282.997	PK	45.6	13	0.6	-30.4	28.8	46.0	17.2	Pass
184.345	PK	45.4	9.9	0.5	-30.3	25.5	43.5	18	Pass
282.122	PK	45	12.9	0.6	-30.4	28.1	46.0	17.9	Pass
281.053	PK	44.6	12.9	0.6	-30.4	27.7	46.0	18.3	Pass

Low, medium and high channel were investigated, Worst case results presented above (low channel)

Top Average emissions 1 GHz to 2 GHz – Vertical

Frequency (MHz)	Detector	Raw (dBuV)	Ant. (dB/m)	Cable (dB)	Amp (dB)	Level (dBuV/m)	Limit (dBuv/m)	Margin (dB)	Pass/Fail
1599	AVG	54.4	29	1.8	-36.6	48.6	54	5.4	Pass

Low, medium and high channel were investigated, Worst case results presented above (low channel)

Top Average emissions 1 GHz to 2 GHz – Horizontal

Frequency (MHz)	Power Supply	Raw (dBuV)	Ant. (dB/m)	Cable (dB)	Amp (dB)	Level (dBuV/m)	Limit (dBuv/m)	Margin (dB)	Pass/Fail
1599	AVG	54.1	29	1.8	-36.6	48.3	54	5.7	Pass

Low, medium and high channel were investigated, Worst case results presented above (low channel)

Average / Peak above 1 GHz

Note 1: 2390 MHz was worst-case emission between 2300 MHz and 2390 MHz.

Test Frequency (MHz)	Detection mode	Antenna polarity (Horz/Vert)	Raw signal dB(µV)	Antenna factor dB	Cable loss dB + Preselector	Attenuator dB	Pre-Amp Gain dB	Received signal dB(µV/m)	Emission limit dB(µV/m)	Margin dB(µV)	Result
Low Channel (1 – 2402)											
2402	Peak	Horz	91.9	30.6	2.2	0.0	36.2	88.5			PASS
2402	Avg	Horz	85.5	30.6	2.2	0.0	36.2	82.1			PASS
2402	Peak	Vert	102.7	30.6	2.2	0.0	36.2	99.3			PASS
2402	Avg	Vert	96.2	30.6	2.2	0.0	36.2	92.8			PASS
2390	Peak	Horz	59.5	30.6	2.2	0.0	36.2	56.1	74.0	17.9	PASS
2390	Avg	Horz	35.5	30.6	2.2	0.0	36.2	32.1	54.0	21.9	PASS
2390	Peak	Vert	64.6	30.6	2.2	0.0	36.2	61.2	74.0	12.8	PASS
2390	Avg	Vert	35.6	30.6	2.2	0.0	36.2	32.2	54.0	21.8	PASS
4000	Peak	Horz	59.6	33.7	2.9	0.0	35.7	60.5	74.0	13.5	PASS
4000	Avg	Horz	48.7	33.7	2.9	0.0	35.7	49.6	54.0	4.4	PASS
4000	Peak	Vert	52.6	33.7	2.9	0.0	35.7	53.5	74.0	20.5	PASS
4000	Avg	Vert	42.3	33.7	2.9	0.0	35.7	43.2	54.0	10.8	PASS
4804	Peak	Horz	45.6	33.7	2.9	0.0	35.7	46.5	74.0	27.5	PASS
4804	Avg	Horz	35.0	33.7	2.9	0.0	35.7	35.9	54.0	18.1	PASS
4804	Peak	Vert	55.6	33.7	2.9	0.0	35.7	56.5	74.0	17.5	PASS
4804	Avg	Vert	45.3	33.7	2.9	0.0	35.7	46.2	54.0	7.8	PASS
Mid Channel (39 – 2440)											
2440	Peak	Horz	92.2	30.6	2.2	0.0	36.2	88.8			PASS
2440	Avg	Horz	85.2	30.6	2.2	0.0	36.2	81.8			PASS
2440	Peak	Vert	102.4	30.6	2.2	0.0	36.2	99.0			PASS
2440	Avg	Vert	95.7	30.6	2.2	0.0	36.2	92.3			PASS
4067	Peak	Horz	59.1	33.7	2.9	0.0	35.7	60.0	74.0	14.0	PASS
4067	Avg	Horz	49.1	33.7	2.9	0.0	35.7	50.0	54.0	4.0	PASS
4067	Peak	Vert	52.3	33.7	2.9	0.0	35.7	53.2	74.0	20.8	PASS
4067	Avg	Vert	41.9	33.7	2.9	0.0	35.7	42.8	54.0	11.2	PASS
4880	Peak	Horz	45.4	33.7	2.9	0.0	35.7	46.3	74.0	27.7	PASS
4880	Avg	Horz	34.7	33.7	2.9	0.0	35.7	35.6	54.0	18.4	PASS
4880	Peak	Vert	55.2	33.7	2.9	0.0	35.7	56.1	74.0	17.9	PASS
4880	Avg	Vert	44.6	33.7	2.9	0.0	35.7	45.5	54.0	8.5	PASS
High Channel (79 – 2480)											
2480	Peak	Horz	92.0	30.6	2.2	0.0	36.2	88.6			PASS
2480	Avg	Horz	84.7	30.6	2.2	0.0	36.2	81.3			PASS
2480	Peak	Vert	102.0	30.6	2.2	0.0	36.2	98.6			PASS

2480	Avg	Vert	95.6	30.6	2.2	0.0	36.2	92.2			PASS
2483.5	Peak	Horz	62.0	30.6	2.2	0.0	36.2	58.6	74.0	15.4	PASS
2483.5	Avg	Horz	46.4	30.6	2.2	0.0	36.2	43.0	54.0	11.0	PASS
2483.5	Peak	Vert	72.0	30.6	2.2	0.0	36.2	68.6	74.0	5.4	PASS
2483.5	Avg	Vert	56.4	30.6	2.2	0.0	36.2	53.0	54.0	1.0	PASS
4133.3	Peak	Horz	58.7	33.7	2.9	0.0	35.7	59.6	74.0	14.4	PASS
4133.3	Avg	Horz	48.6	33.7	2.9	0.0	35.7	49.5	54.0	4.5	PASS
4133.3	Peak	Vert	52.0	33.7	2.9	0.0	35.7	52.9	74.0	21.1	PASS
4133.3	Avg	Vert	41.9	33.7	2.9	0.0	35.7	42.8	54.0	11.2	PASS
4960	Peak	Horz	45.2	33.7	2.9	0.0	35.7	46.1	74.0	27.9	PASS
4960	Avg	Horz	34.5	33.7	2.9	0.0	35.7	35.4	54.0	18.6	PASS
4960	Peak	Vert	54.9	33.7	2.9	0.0	35.7	55.8	74.0	18.2	PASS
4960	Avg	Vert	44.5	33.7	2.9	0.0	35.7	45.4	54.0	8.6	PASS

Note 2: Frequency was scanned to 25 GHz.

Test Equipment List

Equipment	Model No.	Manufacturer	Last calibration date	Next calibration due date	Asset #
Loop Antenna	EM 6871	Electro-Metrics	2011-01-31	2013-01-31	70
Loop Antenna	EM 6872	Electro-Metrics	2011-01-31	2013-01-31	71
Spectrum Analyzer	ESL6	Rohde & Schwarz	26-Oct-11	26-Oct-13	160
Quasi Peak Adapter	85650A	HP	2011-12-21	2013-12-21	7
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	141
BiLog Antenna	3142-C	ETS	17-Jan-11	17-Jan-13	GEMC 137
Attenuator 3 dB	FP-50-3	Trilithic	NCR	NCR	GEMC 40
Chase Preamp 9kHz - 2 GHz	CPA9231A	Chase	8/25/2010	8/25/2012	GEMC 6403
Q-Par 1.5-18 GHz Horn	6878/24	Q-par	8/25/2010	8/25/2012	GEMC 65
1-26G pre-amp	HP 8449B	HP	8/25/2010	8/25/2012	GEMC 68
RF Cable 7m	LMR-400-7M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 28
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
RF Cable 0.5M	LMR-400-0.5M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 31

This report module is based on GEMC template "FCC - 15.209 - Radiated Emissions_Rev1.doc"

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.

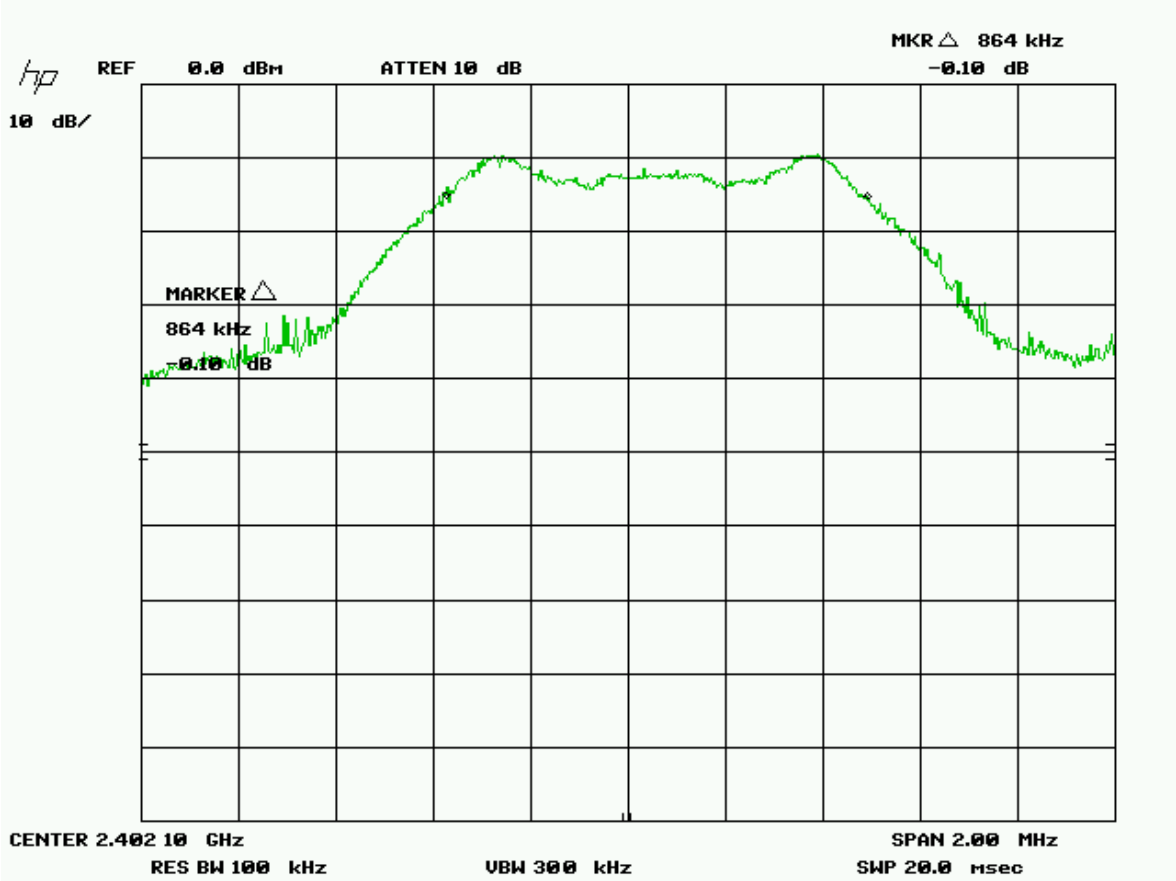
Results

The EUT passed. The minimum 6 dB BW measured was 864 kHz

Graph(s)

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

Test Graph



6 dB BW = 864 kHz
20 dB BW = 1.25 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
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	141
RF Cable 1m	LMR-400-1M-50OHM-MN-MN	LexTec	NCR	NCR	GEMC 29
Power Attenuator 20 dB	25-A-FFN-20	Bird / Hutton	NCR	NCR	GEMC 49

This report module is based on GEMC template "FCC – Power Line Conducted Emissions Class B_Rev1"

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 1.3 dBm (1.4 mW)

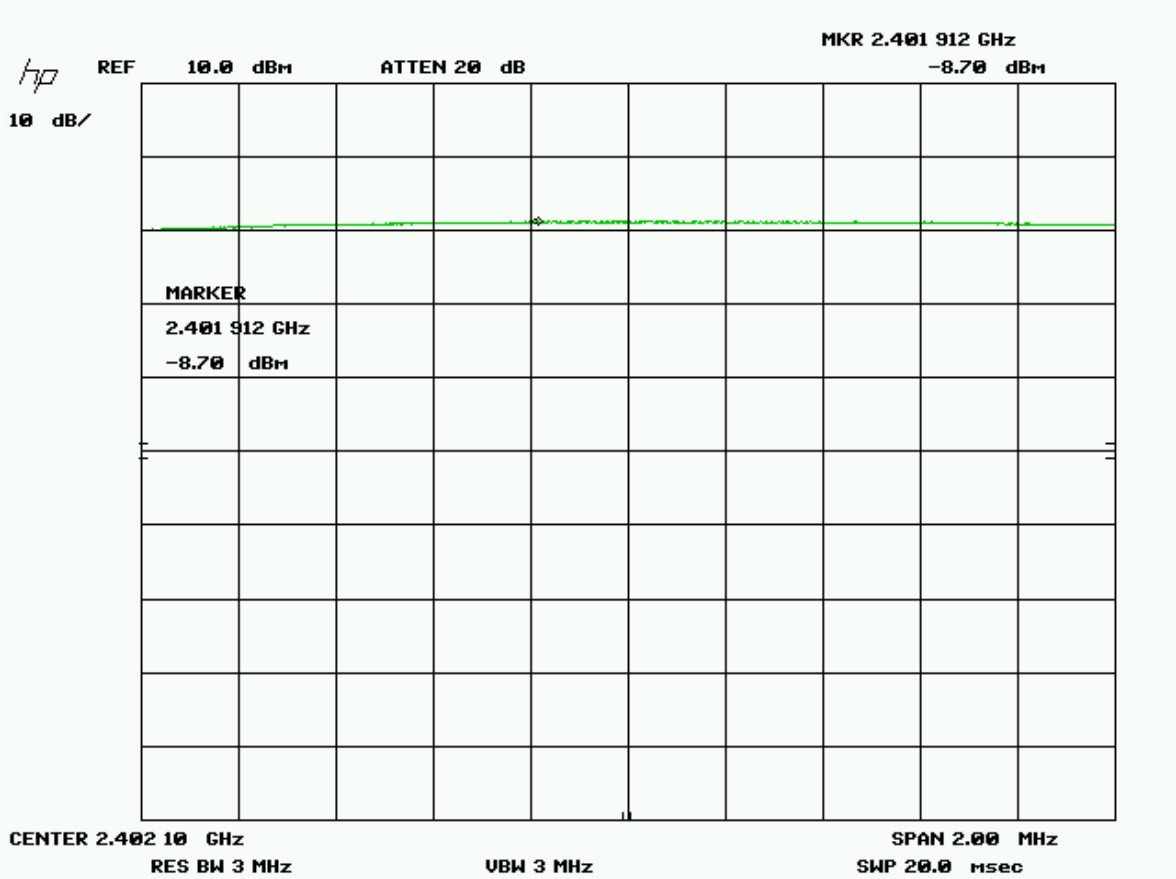
Table(s)

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

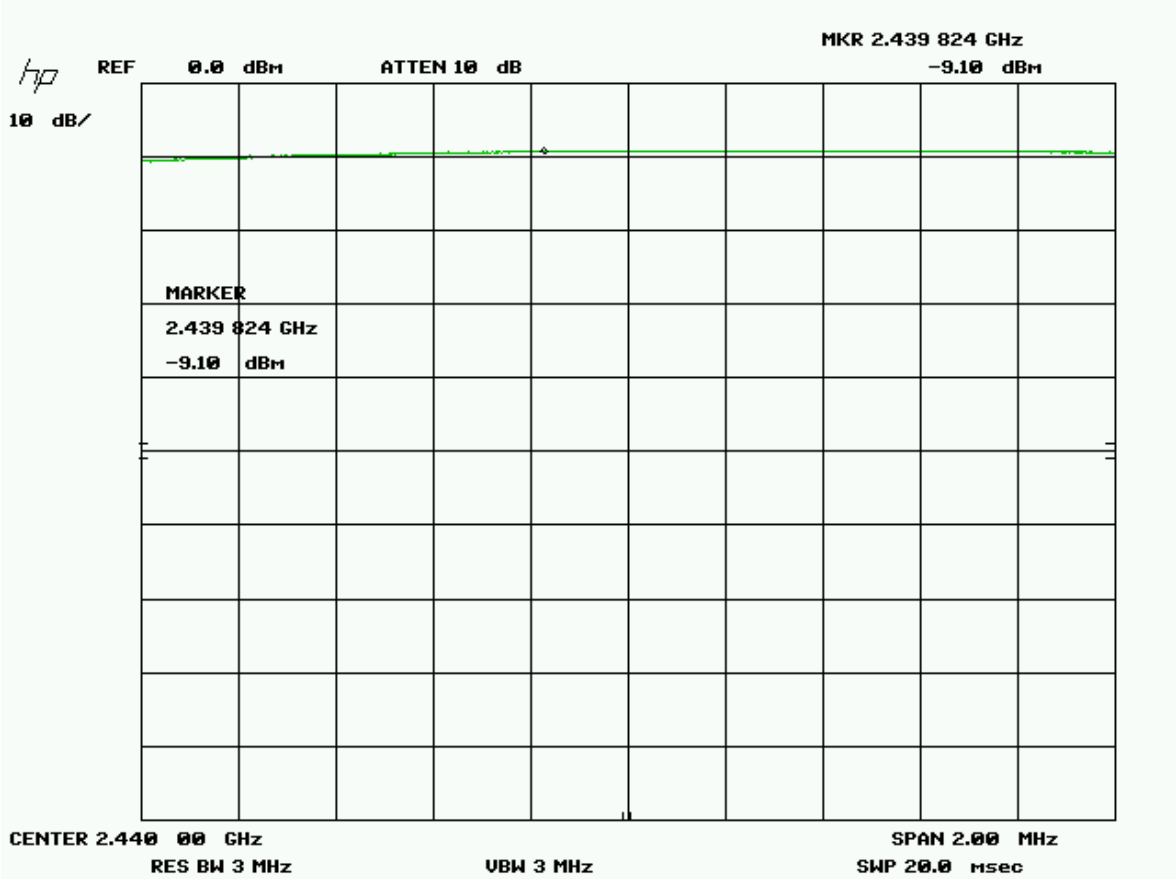
Band	Channel	Frequency (GHz)	Reading (dBm)
Low	1	2.402	1.3
Medium	40	2.440	0.9
High	79	2.480	0.4

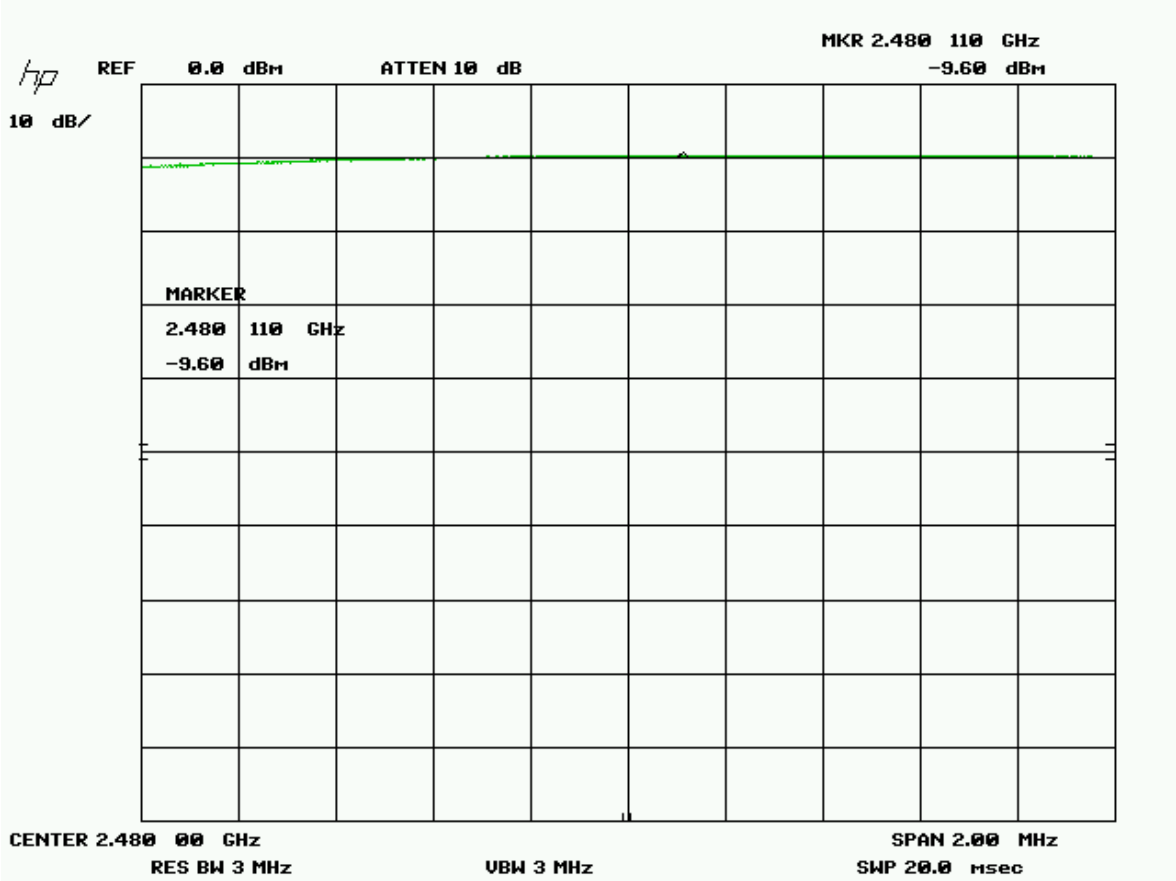
Note: See 'Appendix B – EUT & Test Setup Photographs' for photos showing the test set-up.

Low



Middle





Test Equipment List

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

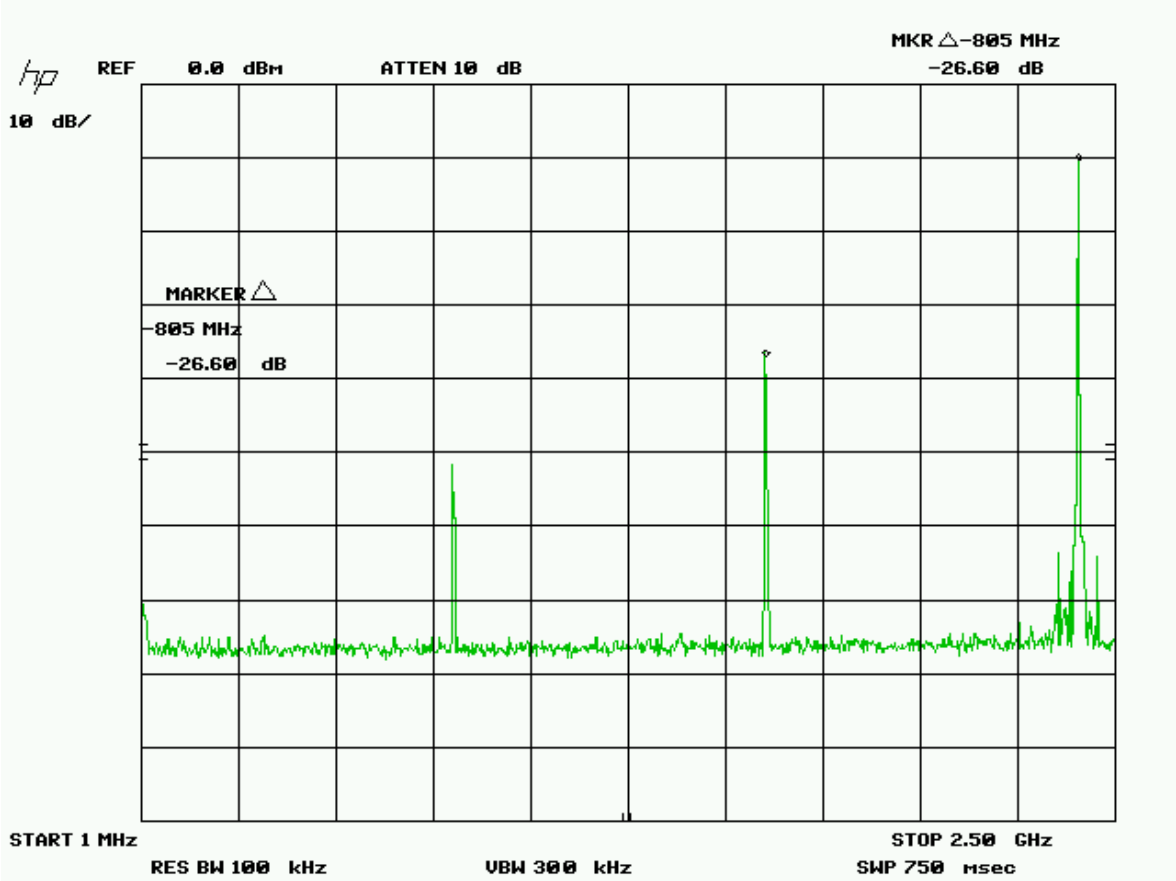
Results

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

Graph(s)

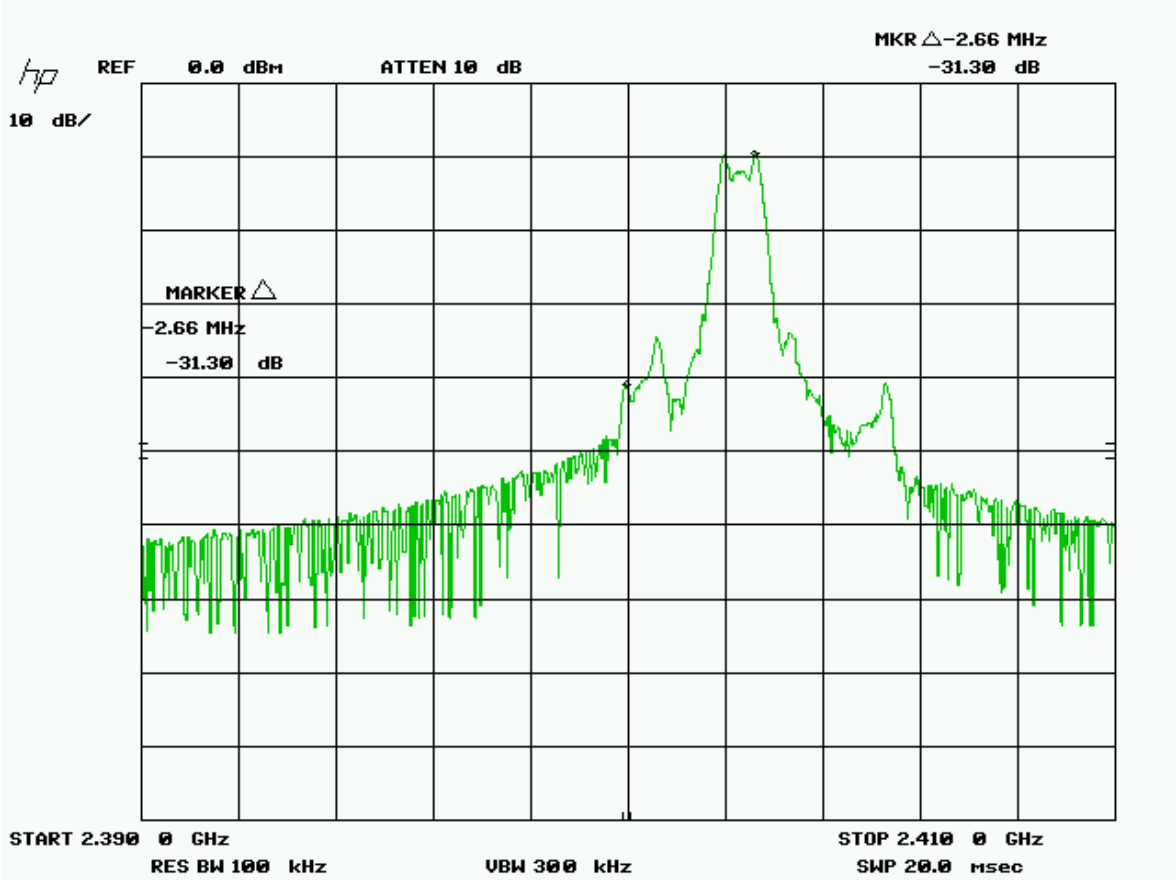
The graphs shown below shows the peak power output of the device during the antenna conducted measurement during transmit operation of the EUT. Note there was 20 dB of external attenuation taken during this measurement.

Frequencies below fundamental

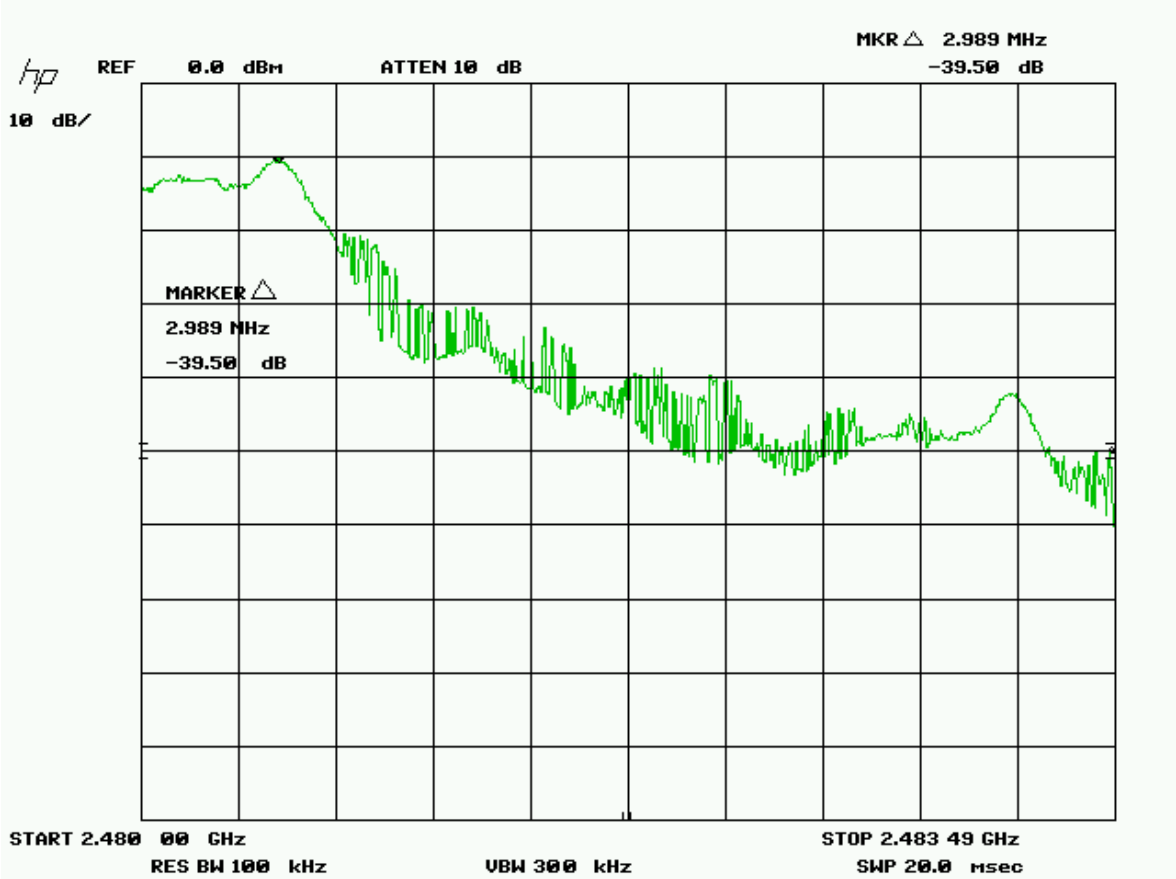


Frequencies below fundamental

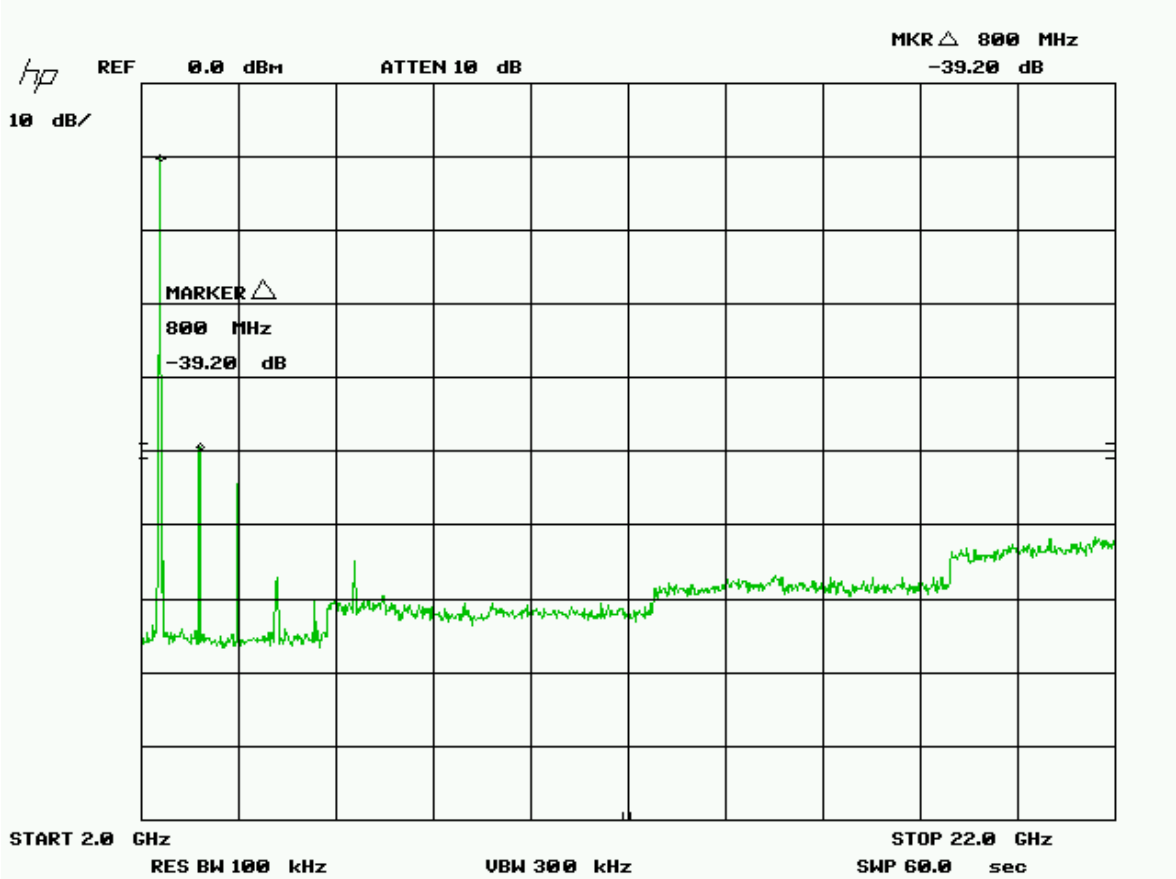
lower band edge



upper band edge



Frequencies above fundamental



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
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	141
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.

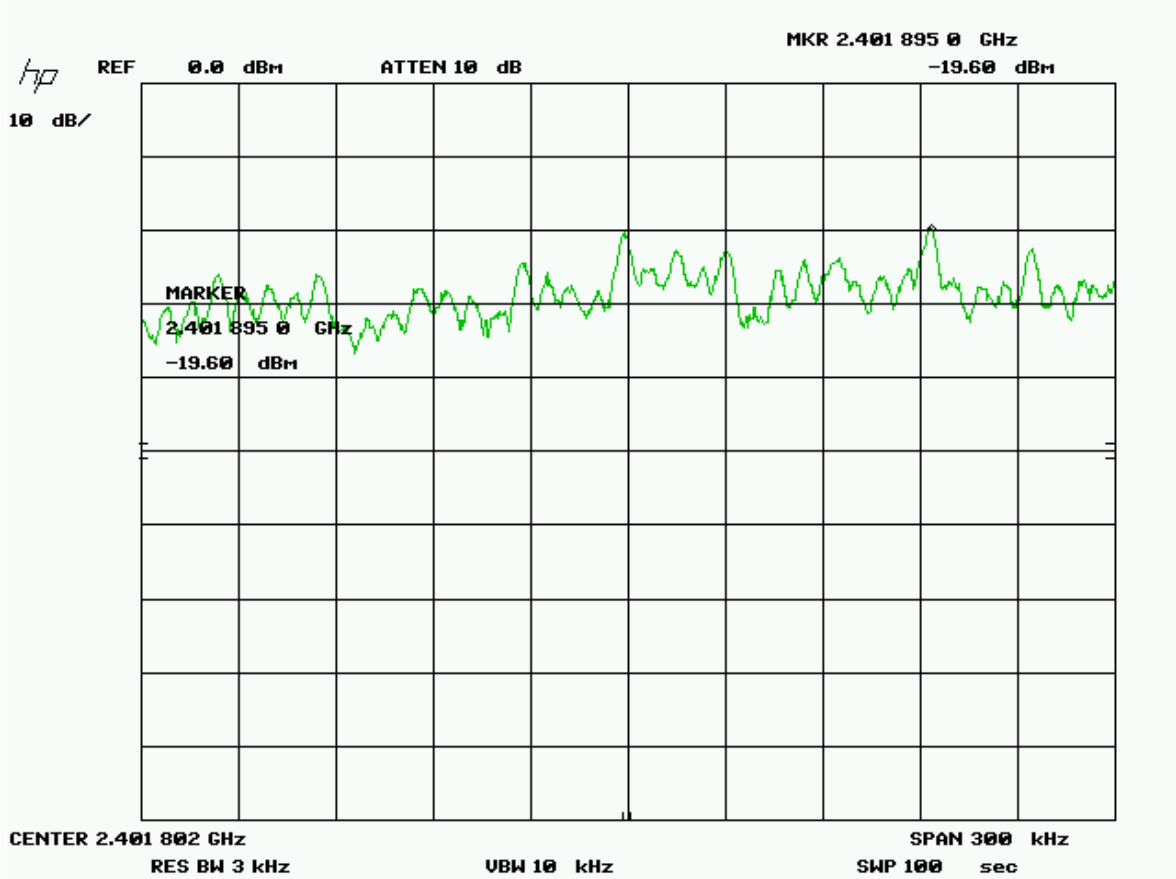
Results

The EUT passed. Each mode was tested at low, medium, and high band. The worst case value is -9.6 dBm as measured with a 3 kHz resolution bandwidth (peak power).

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.

Low (worst case)



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 #
Spectrum Analyzer	8566B	HP	21-Dec-11	21-Dec-13	141
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	Savant Technologies
EUT Name	Bridge
FCCID	ASU- RFG2000
IC #	10052A- RFG2000
Approximate Size (LxWxH)	5cm x 5cm 2 cm
Equipment Category (Commercial / Residential / Medical)	Residential
Input Voltage and Frequency	5Vdc, 1A
Intentional RF (If yes describe)	Yes – Proprietary Digital modulation
Table Top / Wall mount / Floor standing (choose table top if unsure)	Portable
I/O Connectors available on EUT	
Peripherals required for test	n/a
Minimum Separation distance from operator	n/a
Types and lengths of all I/O cables	

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'.

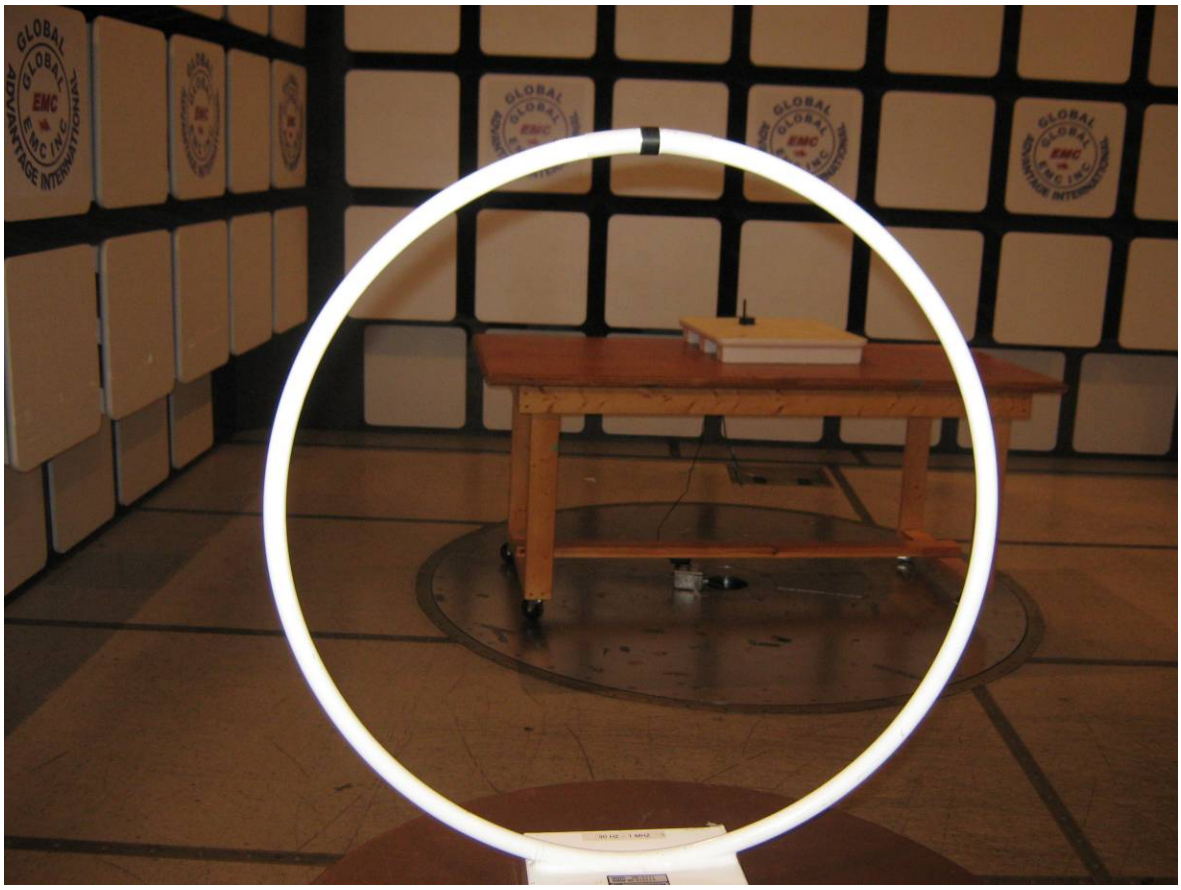
Appendix B – EUT and Test Setup Photographs

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

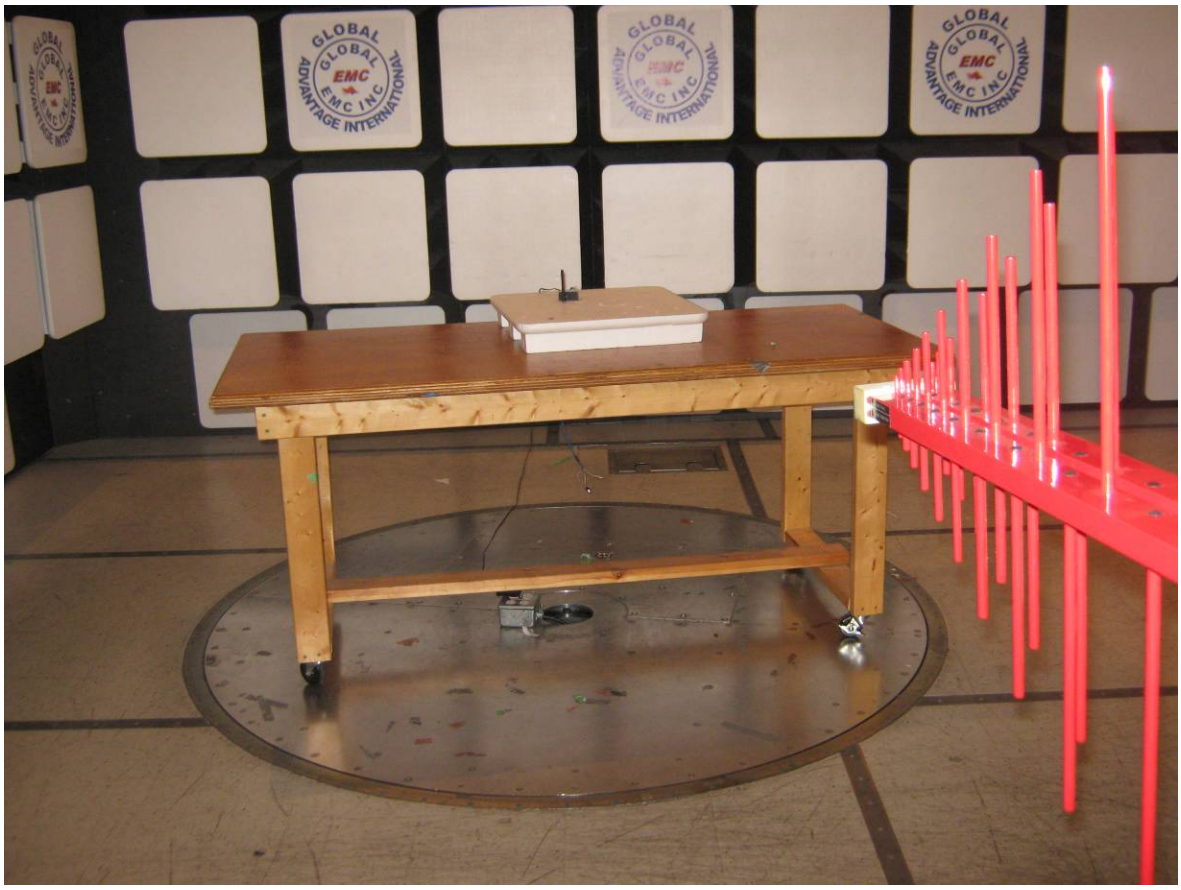
Power Line Conducted Emissions - 1

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.