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www.lsr.com

TEST REPORT #: 310103
LSR Job #: C-873

Compliance Testing of:

ProFLEX02

Test Date(s):

December 1st – 9th, 2010

Prepared For:

LS Research, LLC

In accordance with:
Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247
Industry Canada (IC) RSS 210 Annex 8
Digital Modulation Transmitters (DTS) Operating in the
Frequency Band 2400 MHz – 2483.5 MHz

This Test Report is issued under the Authority of:

Thomas T. Smith, Manager EMC Test Services

Signature: 

Date: 12/9/2010

Quality Assurance by:
Khairul A. Zainal, Senior EMC Engineer

Signature:  Date: 12/9/2010

Project Engineer:
Shane D. Rismeyer, EMC Engineer

Signature:  Date: 12/9/10

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EXHIBIT 1. INTRODUCTION

1.1 - Scope

References:	FCC Part 15, Subpart C, Section 15.247 and 15.209 FCC Part 2, Section 2.1043 paragraph (b)1. RSS GEN and RSS 210 Annex 8
Title:	FCC : Telecommunication – Code of Federal Regulations, CFR 47, Part 15. IC : Low-power License-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment
Purpose of Test:	To gain FCC and IC Certification Authorization for Low- Power License-Exempt Transmitters.
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
Environmental Classification:	Commercial, Industrial or Business Residential

1.2 – Normative References

Publication	Year	Title
47 CFR, Parts 0-15 (FCC)	2009	Code of Federal Regulations - Telecommunications
RSS 210 Annex 8	2007 June	Low-power License-exempt Radio- communication Devices (All Frequency Bands): Category I Equipment
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 16-1-1	2006-03 A1: 2006-09 A2: 2007-07	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-2-1	2003 A1: 2004-04 A2: 2007-07	Specification for radio disturbance and immunity measuring apparatus and methods. Part 201: Conducted disturbance measurement.
FCC Public Notice DA 00-1407	2000	Part 15 Unlicensed Modular Transmitter Approval
FCC ET Docket No. 99-231	2002	Amendment to FCC Part 15 of the Commission's Rules Regarding Spread Spectrum Devices.
FCC Procedures	2007	Measurement of Digital Transmission Systems operating under Section 15.247.

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1.3 - LS Research, LLC in Review

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:



A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope of Accreditation

A2LA Certificate Number: 1255.01



Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948

FCC Registration Number: 90756



Canada

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1

File Number: IC 3088-A

On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1

File Number: IC 3088



U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Competent Body operating under the U. S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility – Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2).

Date of Validation: January 16, 2001

Validated by the European Commission as a U.S. Notified Body operating under the U.S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.

Date of Validation: November 20, 2002

Notified Body Identification Number: 1243

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EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1 - Client Information

Manufacturer Name:	LS Research, LLC
Address:	W66 N220 Commerce Ct., Cedarburg, WI 53012
Contact Name:	

2.2 - Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

Product Name:	ProFLEX02
Model Number:	ProFLEX02
Serial Number:	N/A

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2.4 - EUT'S Technical Specifications

EUT Frequency Range (in MHz)	2405 MHz to 2475 MHz
RF Power in Watts	
Minimum:	0.337
Maximum:	0.119
Conducted Output Power (in dBm)	25.27
Field Strength at 3 meters (dBuV/m)	123.3
Occupied Bandwidth (99% BW)	2.22 MHz
Type of Modulation	O-QPSK
Emission Designator	2M22G1D
EIRP (in mW)	545
Transmitter Spurious (worst case) at 1 meters	62.8 at 4809MHz
Receiver Spurious (worst case) at 3 meters	47.49 at 2405MHz
Stepped (Y/N)	Yes
Step Value:	Nonlinear
Frequency Tolerance %, Hz, ppm	+/- 40 ppm
Microprocessor Model # (if applicable)	AT91SAM3U4
Antenna Information	
Detachable/non-detachable	Detachable
Type	Dipole
Gain (in dBi)	2.1
EUT will be operated under FCC Rule Part(s)	15.247
EUT will be operated under RSS Rule Part(s)	210
Modular Filing	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Portable or Mobile?	Mobile

RF Technical Information:

Type of Evaluation (check one)	<input type="checkbox"/>	SAR Evaluation: Device Used in the Vicinity of the Human Head
	<input type="checkbox"/>	SAR Evaluation: Body-worn Device
	<input checked="" type="checkbox"/>	RF Evaluation

If RF Evaluation checked above, test engineer to complete the following:

Evaluated against exposure limits: General Public Use Controlled Use

Duty Cycle used in evaluation: 30 %

Standard used for evaluation: OET 65

Measurement Distance: 0.20 m

RF Value: 0.127565 V/m A/m W/m²
 Measured Computed Calculated

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2.5 - Product Description

2.4 GHz ZIGBEE Module

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EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 - Climate Test Conditions

Temperature:	70°F
Humidity:	40%
Pressure:	750mmHg

3.2 - Applicability & Summary Of EMC Emission Test Results

FCC and IC Paragraph	Test Requirements	Compliance (Yes/No)
FCC : 15.207 IC : RSS GEN sect. 7.2.2	Power Line Conducted Emissions Measurements	Yes
FCC : 15.247(a)(2) IC : RSS 210 A8.2(a)	6 dB Bandwidth of a Digital Modulation System	Yes
IC : RSS GEN section 4.6.1	20 dB Bandwidth	Yes
FCC : 15.247(b) & 1.1310 IC : RSS 210 A8.4	Maximum Output Power	Yes
FCC : 15.247(i), 1.1307, 1.1310, 2.1091 & 2.1093 IC : RSS 102	RF Exposure Limit	Yes
FCC : 15.247(c) IC : RSS 210 A8.5	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
FCC : 15.247(d) IC : RSS 210 A8.2(b)	Transmitted Power Spectral Density of a Digital Modulation System	Yes
FCC : 15.247(c), 15.209 & 15.205 IC : RSS 210 A8.2(b), section 2.2, 2.6 and 2.7	Transmitter Radiated Emissions	Yes

The digital circuit portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B Digital Devices (RSS GEN and RSS 210 of IC) and the associated Radio Receiver has also been tested and found to comply with Part 15, Subpart B – Radio Receivers (RSS GEN and RSS 210 of IC). The Receiver Test Report is available upon request.

3.3 - Modifications Incorporated In the EUT for Compliance Purposes

None Yes (explain below)

The power level on Channel 25 must be set to 5 in order for the EUT to pass Band Edge measurements.

3.4 - Deviations & Exclusions from Test Specifications

None Yes (explain below)

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EXHIBIT 4. DECLARATION OF CONFORMITY

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.247, and Industry Canada RSS-210, Issue 7 (2007), Section Annex 8 (section 8.2) for a Digital Spread Spectrum (DTS) Transmitter.

Note: If some emissions are seen to be within 3 dB of their respective limits; as these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

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EXHIBIT 5. RADIATED EMISSIONS TEST

5.1 - Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15, RSS GEN and ANSI C63.4-2003. The EUT was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber. The EUT was operated in continuous transmit mode with modulation, using power as provided by a DC lab supply. The unit has the capability to operate on 15 channels, controllable via laptop PC and programming board.

The applicable limits apply at a 3 meter distance. Measurements above 4 GHz were performed at a 1.0 meter separation distance. The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a complete list of test equipment. The test sample was operated on one of three (3) standard channels: low (2405 MHz), middle (2440 MHz) and high (2475 MHz) to comply with FCC Part 15.35.

5.2 - Test Procedure

Radiated RF measurements were performed on the EUT in 3 meter Semi-Anechoic and Compact Semi-Anechoic FCC listed Chambers. The frequency range from 30 MHz to 25000 MHz was scanned and investigated. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. For the lower frequency ranges the EUT was placed on a non-conductive pedestal in the 3 meter Semi-Anechoic Chamber with the antenna mast placed so that the separation distance between the antenna and EUT was 3 meters. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz, a Double-Ridged Waveguide Horn Antenna was used from 1 GHz to 4 GHz in the 3 meter Semi-Anechoic Chamber. The remaining measurements were taken in the Compact Semi-Anechoic Chamber at a separation distance of 1 meter. The Double-Ridged Waveguide Horn Antenna used from 4 GHz to 18 GHz and a Standard Gain Horn Antenna was used from 18 GHz to 25 GHz. The maximum radiated RF emissions were found by raising and lowering the antenna between 1 and 4 meters in height (1 and 1.8 meters in the Compact Chamber), using both horizontal and vertical antenna polarities.

5.3 - Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. The Agilent E4445A EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz). From 4 GHz to 25 GHz, an Agilent E4446A Spectrum Analyzer was used.

5.4 - Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.247 and Canada RSS-210, Issue 7 (2007), Annex 8 for a DTS transmitter. The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

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5.5 - Calculation of Radiated Emissions Limits

The maximum peak output power of an intentional radiator in the 2400-2483.5 MHz band, as specified in Title 47 CFR 15.247 (b)(3) and RSS 210 A8.4 is 1 Watt. The harmonic and spurious RF emissions, as measured in any 100 kHz bandwidth, as specified in 15.247 (d) and RSS 210 A8.2 (b), shall be at least 20 dB below the measured power of the desired signal, and must also meet the requirements described in 15.205(c) for FCC and section 2.2, 2.6 and 2.7 of RSS 210 for IC.

The following table depicts the general radiated emission limits above 30 MHz. These limits are obtained from Title 47 CFR, Part 15.209, for radiated emissions measurements. These limits were applied to any signals found in the 15.205 restricted bands. The mentioned limits correspond to those limits listed in RSS 210 section 2.7.

Frequency (MHz)	3 m Limit $\mu\text{V/m}$	3 m Limit (dB $\mu\text{V/m}$)	1 m Limit (dB $\mu\text{V/m}$)
30-88	100	40.0	-
88-216	150	43.5	-
216-960	200	46.0	-
960-24,000	500	54.0	63.5

Sample conversion of field strength ($\mu\text{V/m}$ to dB $\mu\text{V/m}$):

$$\text{dB}\mu\text{V/m} = 20 \log_{10} (100) = 40 \text{ dB}\mu\text{V/m} \text{ (from 30-88 MHz)}$$

For measurements made at 1.0 meter, a 9.5 dB correction has been invoked.

$$\begin{aligned} &960 \text{ MHz to } 10,000 \text{ MHz} \\ &500\mu\text{V/m or } 54.0 \text{ dB}\mu\text{V/m at 3 meters} \\ &54.0 + 9.5 = 63.5 \text{ dB}\mu\text{V/m at 1 meter} \end{aligned}$$

Reported data is the raw data corrected for all applicable factors such as antenna factors, cable loss, etc.

Sample reported data:

Raw Data + Antenna Factor + Cable Factor = Reported Data

$$18.7 \text{ dB}\mu\text{V/m} + 23.0 \text{ dB} + 1.5 \text{ dB} = 43.2 \text{ dB}\mu\text{V/m}$$

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5.6 - Radiated Emissions Test Data Chart

3 Meter Measurements of Electromagnetic Radiated Emissions

Test Standard: 47CFR, Part 15.205 and 15.247(DTS)

RSS 210 A8, sections 2.2, 2.6 and 2.7

Frequency Range Inspected: 30 MHz to 25000 MHz

Manufacturer:	LS Research, LLC				
Date(s) of Test:	12/1/10-12/4/10				
Test Engineer(s):	Shane Rismeyer				
Voltage:	3.3 VDC				
Operation Mode:	Modulated				
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %				
EUT Power:	X	3.3VDC		3 Phase VAC	
		Battery		Other:	
EUT Placement:	X	80cm non-conductive table		10cm Spacers	
EUT Test Location:	X	3 Meter Semi-Anechoic FCC Listed Chamber		3/10m OATS	
Measurements:		Pre-Compliance		Preliminary	X Final
Detectors Used:	X	Peak	X	Quasi-Peak	X Average

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 11:

Freq (MHz)	EUT/Ant. Polarity	Height (cm)	Azimuth (deg)	Peak EFI (dBμV/m)	Video Averaged (dBμV/m)	Duty Cycle Corrected (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)
2405	Side/H	118	0	123.5	123.1	-	125.2	2.1
4809.0	Flat/H	112.9	19	82.0	72.8	62.8	63.5	0.7
7213.4	Flat/V	103.0	240	77.5	65.9	55.9	102.6	46.7
9622.0	Side/H	106.4	88	78.2	66.6	56.6	102.6	46.0
12027.4	Side/H	102.9	156	62.9	52.4	42.4	63.5	21.1
14426.8	Vertical/H	107.1	351	68.3	58.0	48.0	102.6	54.6
16831.6	Vertical/H	102.0	303	57.4	46.7	36.7	102.6	65.9
2405	Vertical/H	150	129	123.1	122.5	-	125.2	2.7
4808.9	Vertical/H	130.2	305	79.4	71.9	61.9	63.5	1.6
7216.5	Flat/H	113.3	47	71.7	60.3	50.3	102.0	51.7
9621.9	Flat/H	106.4	106	76.9	65.1	55.1	102.0	46.9
12022.5	Vertical/H	101.9	267	58.6	48.4	38.4	63.5	25.1
14426.7	Vertical/H	102.7	8	64.9	54.0	44.0	102.0	58.0
16831.1	Vertical/V	102.4	86	66.1	55.6	45.6	102.0	56.4

Notes: The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.

Data above the dotted line indicates the antenna was in the straight position and below denotes bent position.

Per the FCC's DTS measurement guideline, the correction factor was applied to the video averaged measurement of the harmoni

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The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 18:

Freq (MHz)	EUT/Ant. Polarity	Height (cm)	Azimuth (deg)	Peak EFI (dB μ V/m)	Video Averaged (dB μ V/m)	Duty Cycle Corrected (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)
2440	Flat/H	108	94	123.3	122.8	-	125.2	2.4
4880.9	Vertical/H	105.8	123	74.9	66.1	56.1	63.5	7.4
7321.5	Side/H	100.0	314	76.0	64.5	54.5	63.5	9.0
9762.0	Side/H	102.8	94	84.2	72.4	62.4	102.3	39.9
12197.6	Side/H	106.7	89	57.6	47.2	37.2	63.5	26.3
14636.9	Vertical/H	102.0	288	72.0	61.2	51.2	102.3	51.1
17083.4	Flat/V	111.3	308	61.0	51.0	41.0	102.3	61.3
2440	Side/H	100	76	123.9	123.3	-	125.2	1.9
4878.9	Side/V	102.2	13	78.3	70.1	60.1	63.5	3.4
7321.5	Side/V	101.9	151	73.9	62.4	52.4	63.5	11.1
9762.0	Vertical/V	108.1	22	83.1	71.2	61.2	102.8	41.6
12202.3	Vertical/H	106.8	167	64.2	54.0	44.0	63.5	19.5
14643.0	Flat/H	100.2	119	70.2	60.0	50.0	102.8	52.8
17083.4	Vertical/V	101.8	117	63.0	52.3	42.3	102.8	60.5

The following table depicts the level of significant radiated RF fundamental and harmonic emissions seen on Channel 25:

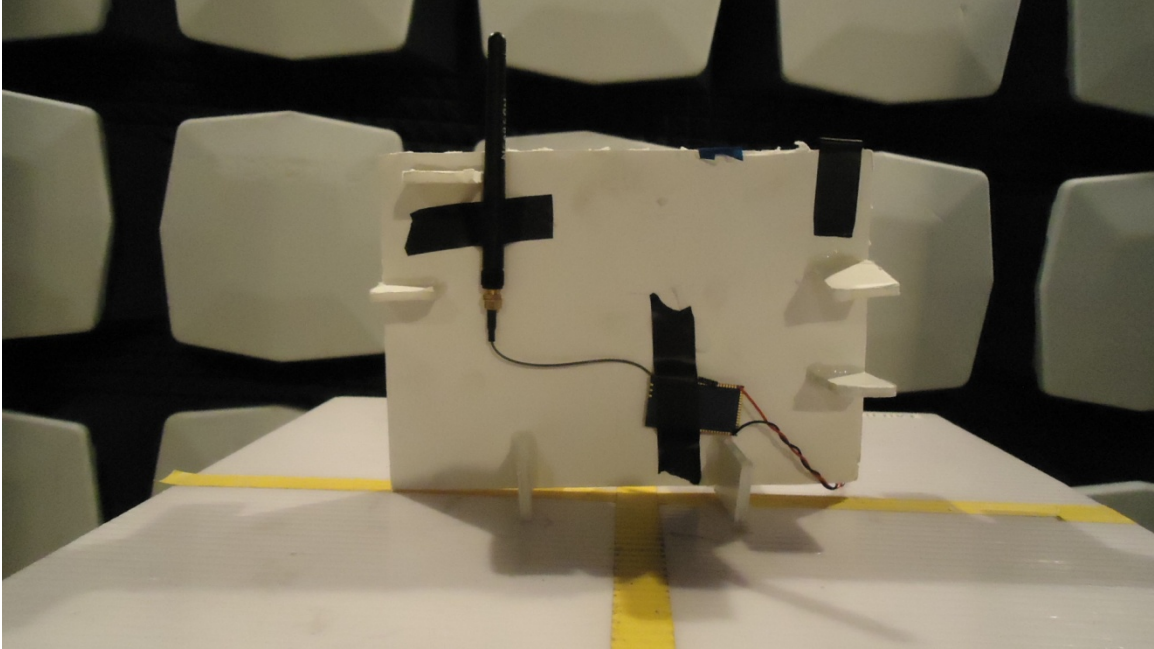
Freq (MHz)	EUT/Ant. Polarity	Height (cm)	Azimuth (deg)	Peak EFI (dB μ V/m)	Video Averaged (dB μ V/m)	Duty Cycle Corrected (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)
2475	Flat/H	100	243	119.5	118.7	-	125.2	6.5
4949.0	Flat/H	110.7	26	71.7	63.6	53.6	63.5	9.9
7423.5	Flat/V	106.7	108	75.1	63.6	53.6	63.5	9.9
9902.0	Flat/V	104.3	170	84.3	72.0	62.0	98.2	36.2
12372.8	Side/V	166.2	323	53.4	41.5	31.5	63.5	32.0
14847.2	Vertical/H	124.7	274	66.7	55.7	45.7	98.2	52.5
17321.5	Side/H	107.9	34	59.2	48.5	38.5	98.2	59.7
2475	Side/H	115	276	119.4	118.6	-	125.2	6.6
4949.0	Side/V	103.2	345	70.8	61.5	51.5	63.5	12.0
7423.5	Side/H	120.8	326	66.2	55.4	45.4	63.5	18.1
9901.9	Flat/H	104.3	106	80.9	69.2	59.2	98.0	38.8
12372.5	Vertical/H	100.0	261	58.4	48.5	38.5	63.5	25.0
14846.7	Side/H	103.1	89	65.3	55.2	45.2	98.0	52.8
17328.2	Vertical/V	102.3	126	63.4	52.1	42.1	98.0	55.9

Notes: The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.
 Data above the dotted line indicates the antenna was in the straight position and below denotes bent position.
 Per the FCC's DTS measurement guideline, the correction factor was applied to the video averaged measurement of the harmonics

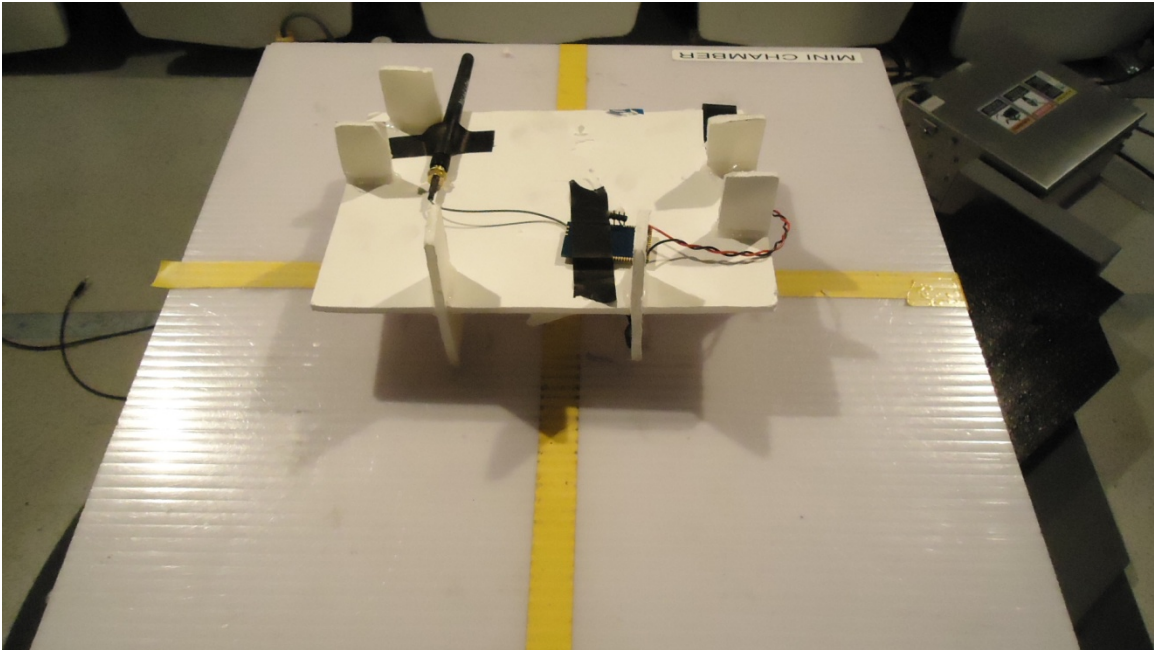
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5.7 - Test Setup Photo(s) - Radiated Emissions Test

Vertical Orientation

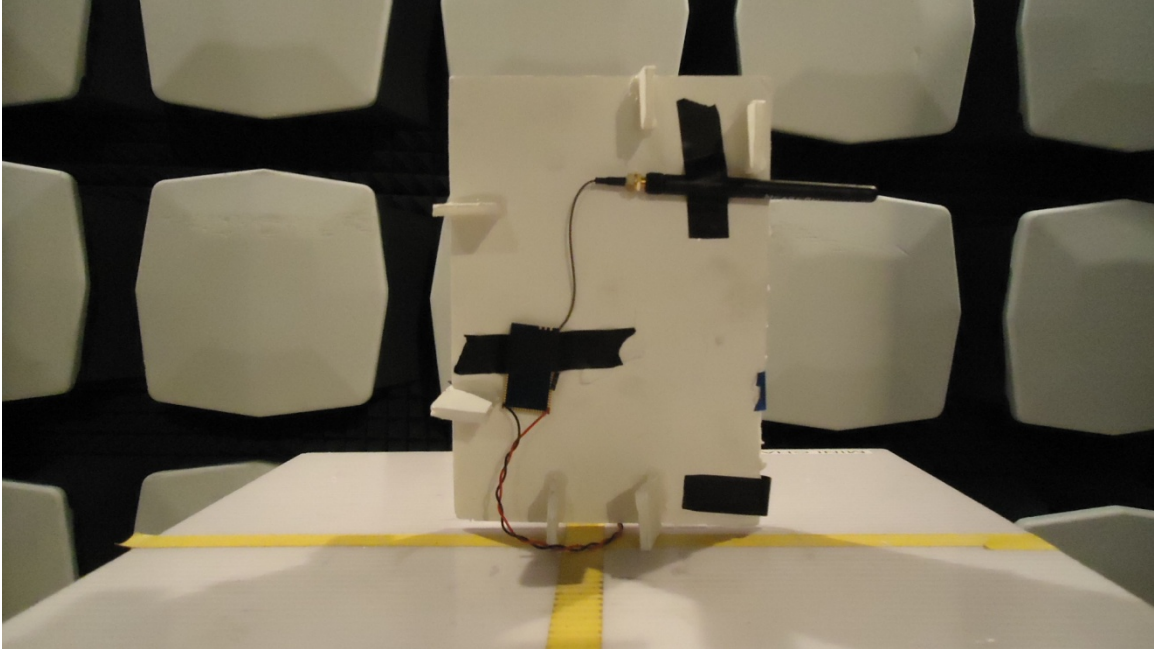


Horizontal Orientation

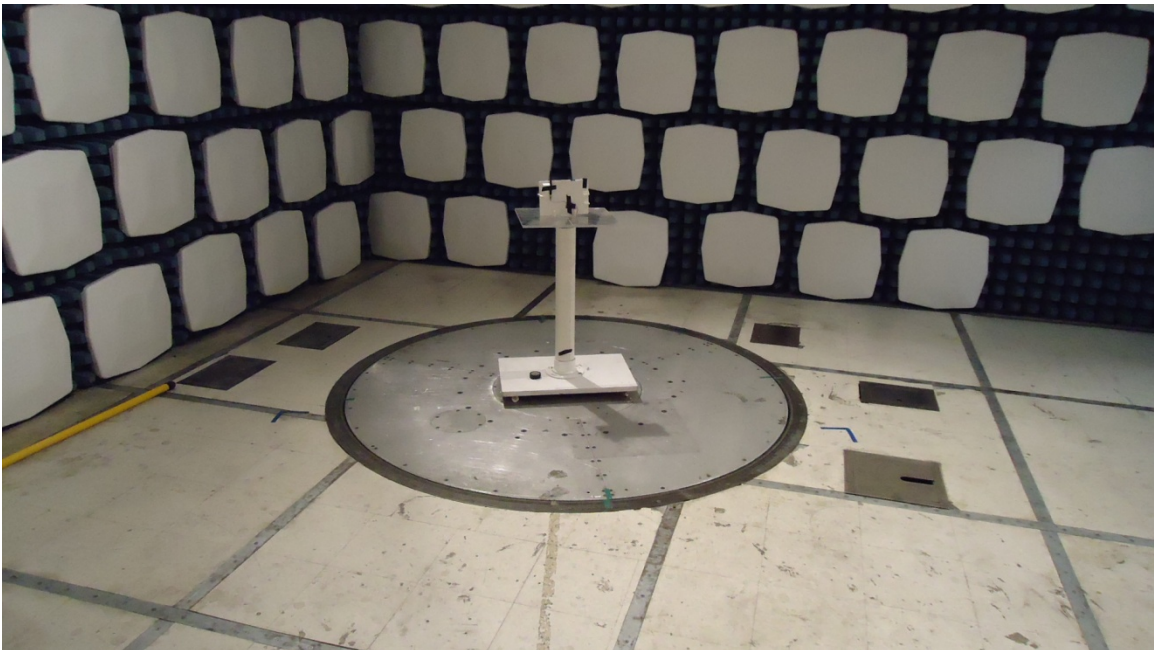


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Side Orientation



EUT on Test Pedestal

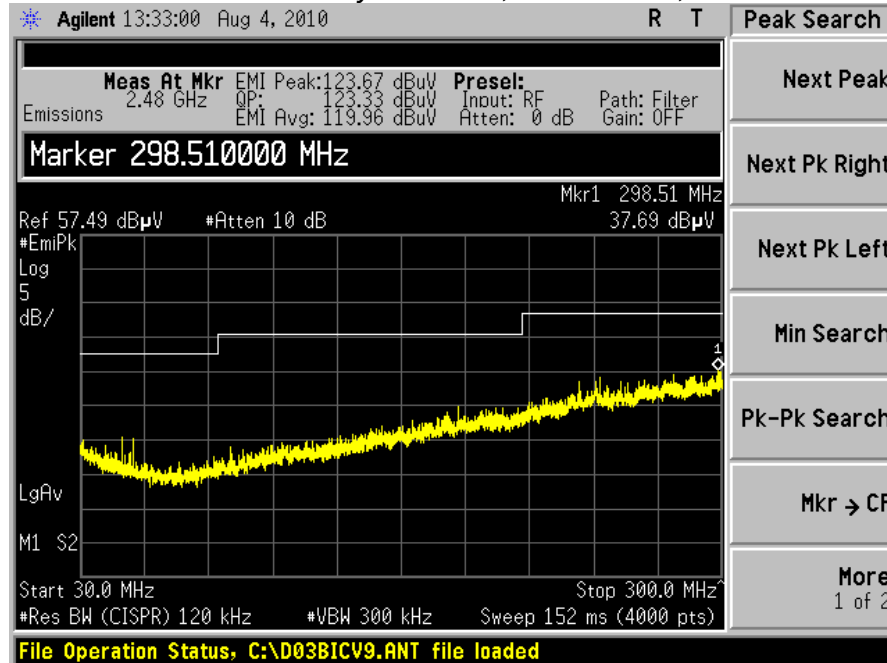


Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

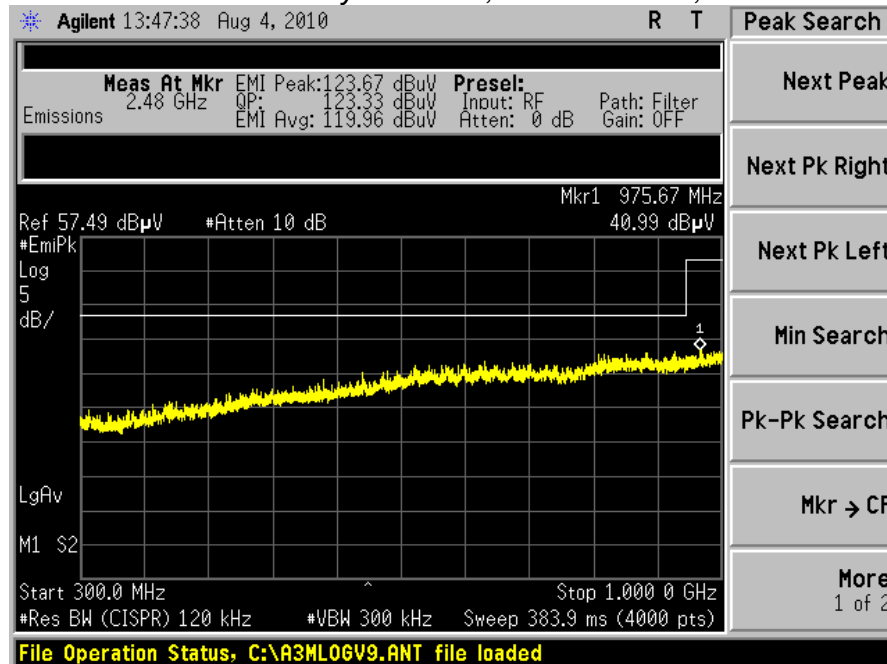
5.8 - Screen Captures - Radiated Emissions Test

These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

Antenna Vertically Polarized, 30-300 MHz, at 3m

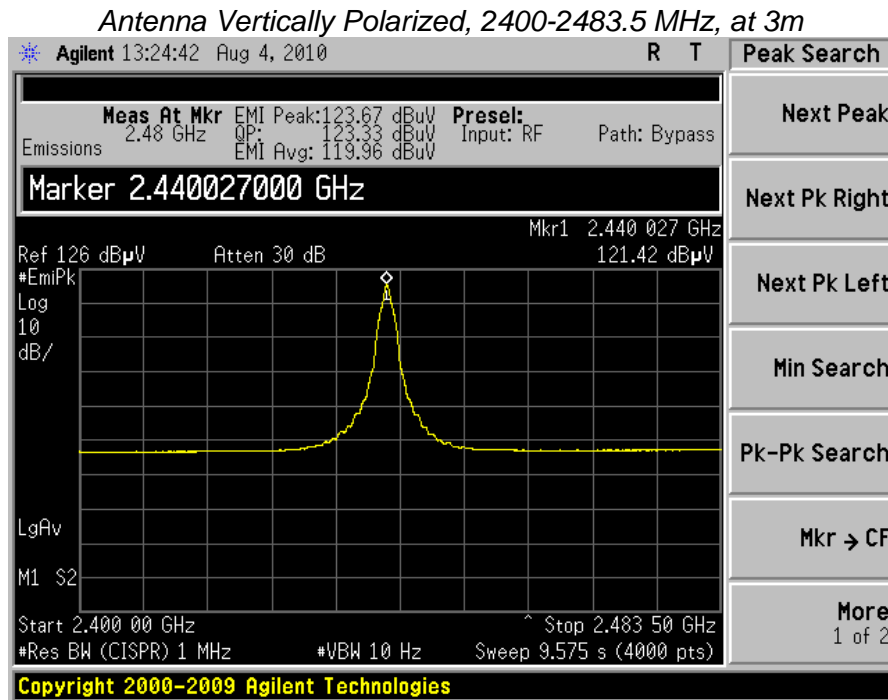
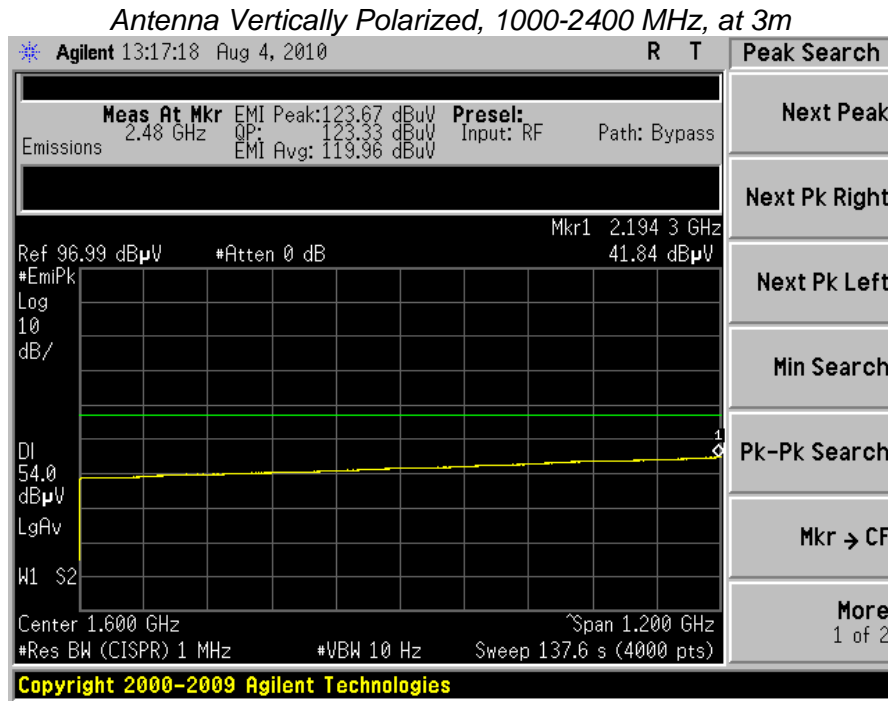


Antenna Vertically Polarized, 300-1000 MHz, at 3m



Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

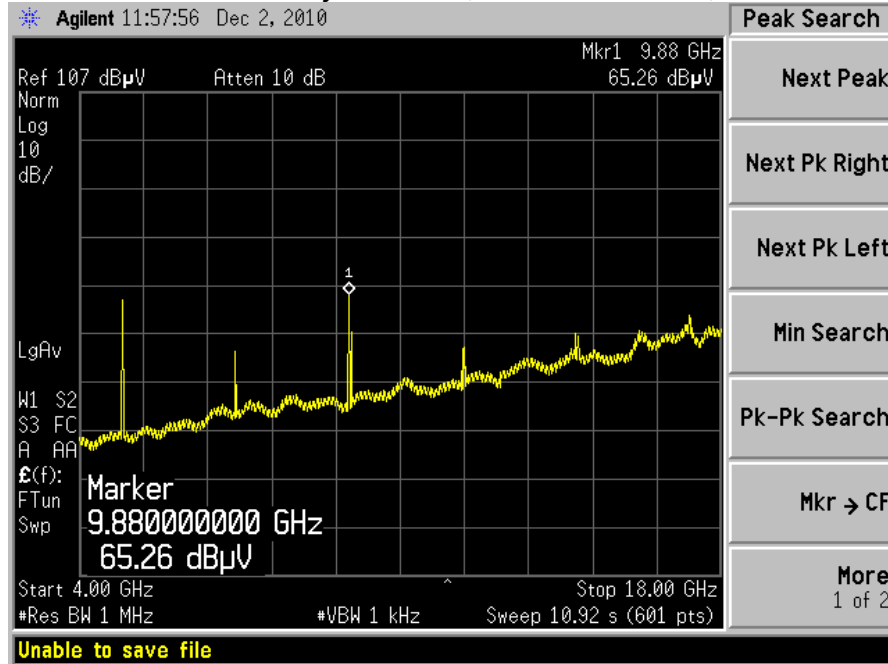
Screen Captures - Radiated Emissions Testing (continued)



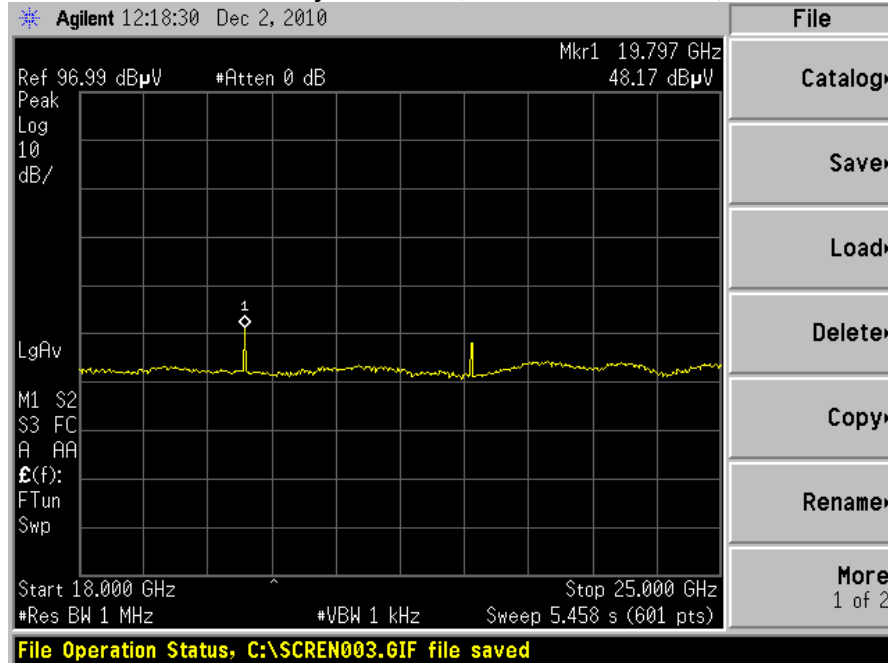
Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Screen Captures - Radiated Emissions Testing (continued)

Antenna Vertically Polarized, 4000-18000 MHz, at 1m



Antenna Vertically Polarized, 18000-25000 MHz, at 1m



Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

5.9 - Receive Mode Testing

Per the requirements of RSS-210, the EUT was placed in continuous receive mode and the radiated spurious emissions were measured and compared to the limits stated in RSS-Gen Section 4.10.

The test setup, procedure, and equipment utilized were identical to that described in sections 5.1, 5.2, and 5.3 of this document.

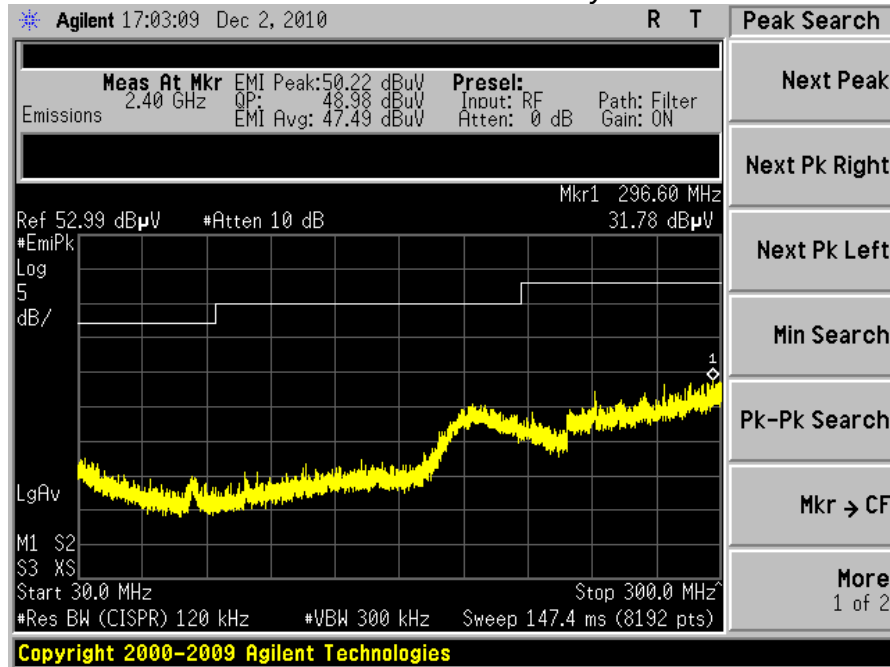
Measurement data and screen captures from the receive tests are presented below:

Frequency (MHz)	Height (m)	Azimuth (degree)	Average Reading (dB μ V/m)	Average Limit (dB μ V/m)	Margin (dB)	Antenna Polarity	EUT orientation
2405	1	90	47.49	54.0	6.51	H	V
2405	1	0	42.15	54.0	11.85	V	V

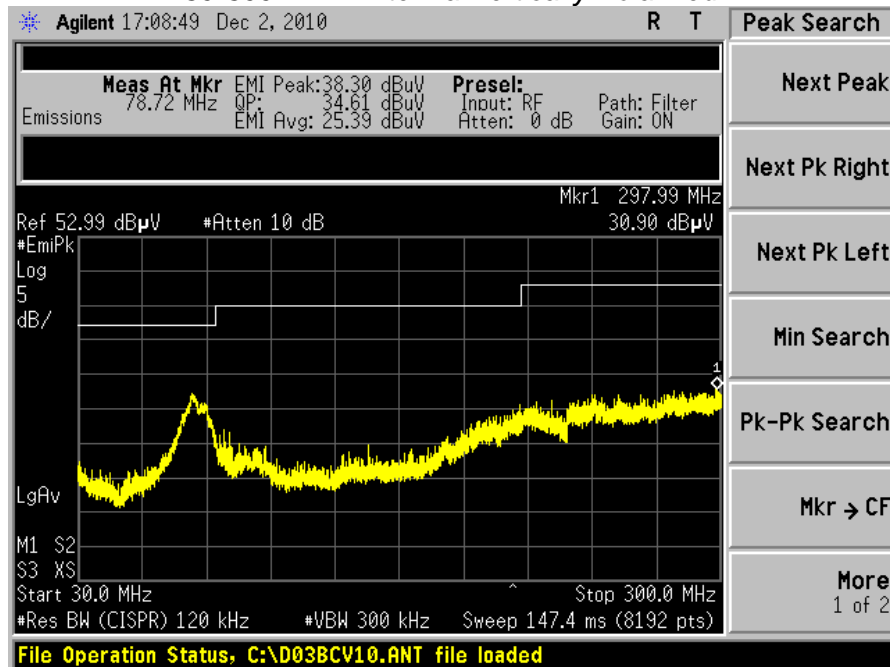
Prepared For: LS Research	Model Number: ProFLEX02	Report #: C-873
EUT: ProFLEX02	Serial Number: N/A	LSR Job #: 310103

5.10 - Screen Captures - Radiated Emissions Testing - Receive Mode

30-300 MHz Antenna Horizontally Polarized



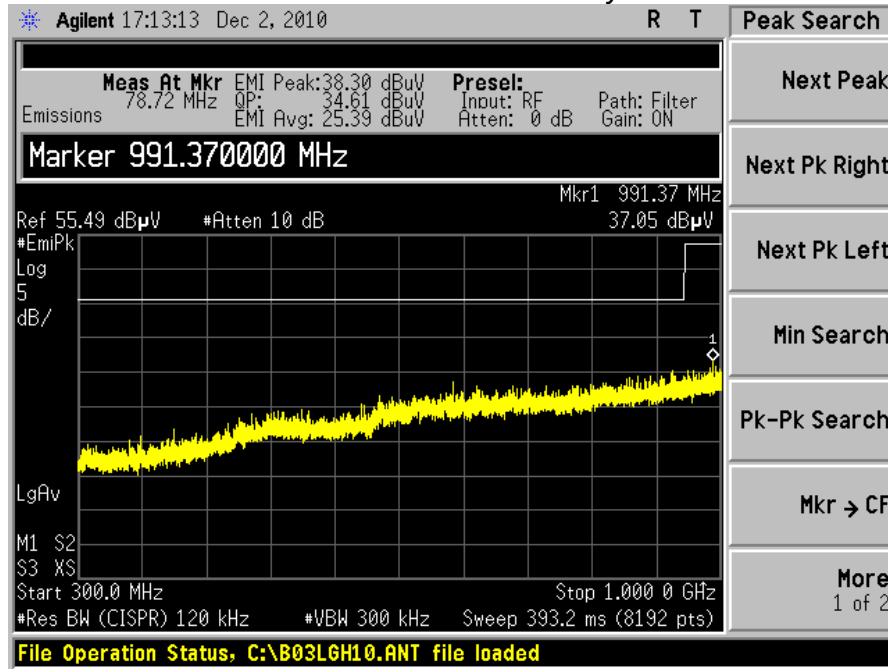
30-300 MHz Antenna Vertically Polarized



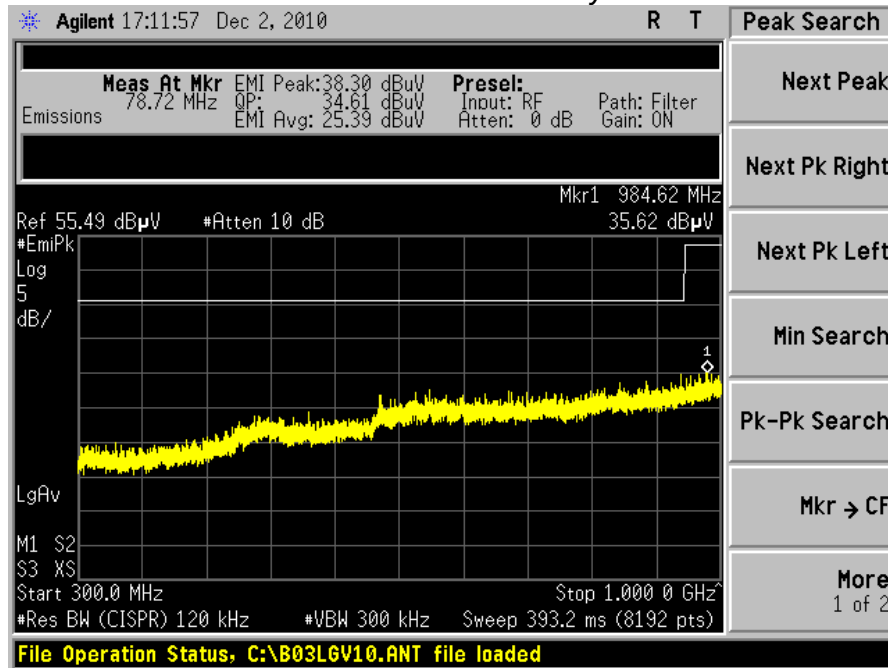
Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Screen Captures - Radiated Emissions Testing – Receive Mode (continued)

300-1000 MHz Antenna Horizontally Polarized



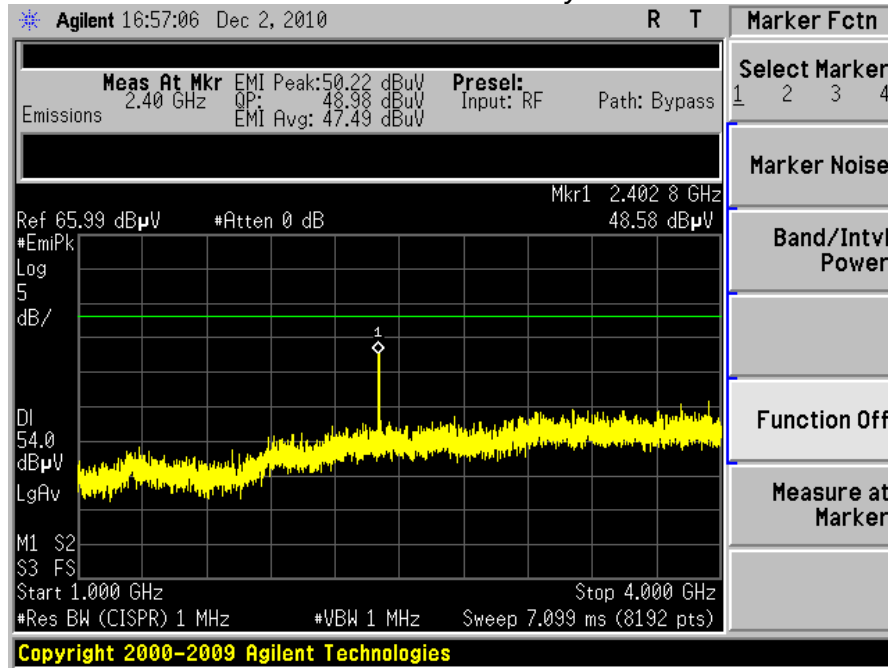
300-1000 MHz Antenna Vertically Polarized



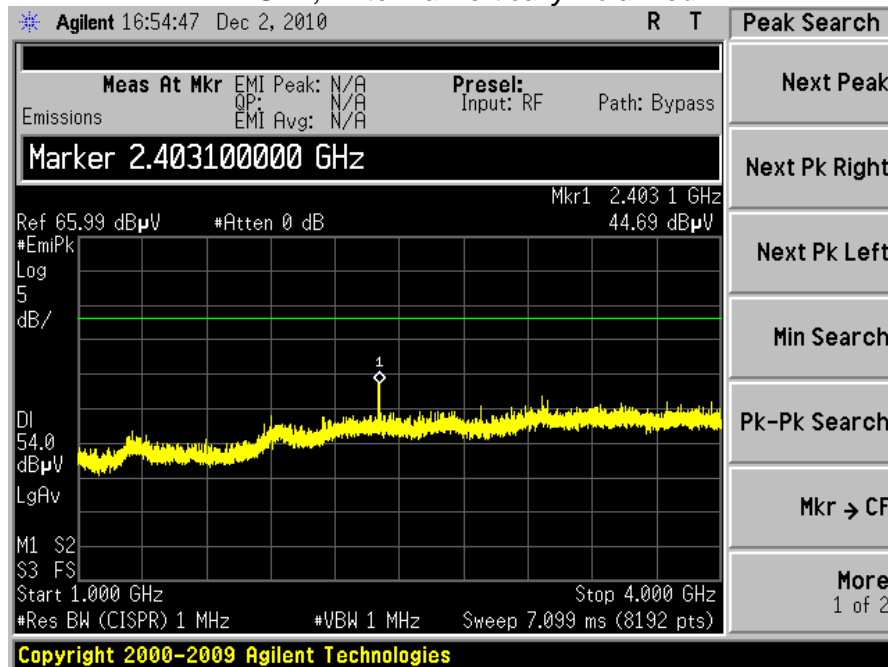
Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Screen Captures - Radiated Emissions Testing – Receive Mode (continued)

1-4 GHz Antenna Horizontally Polarized

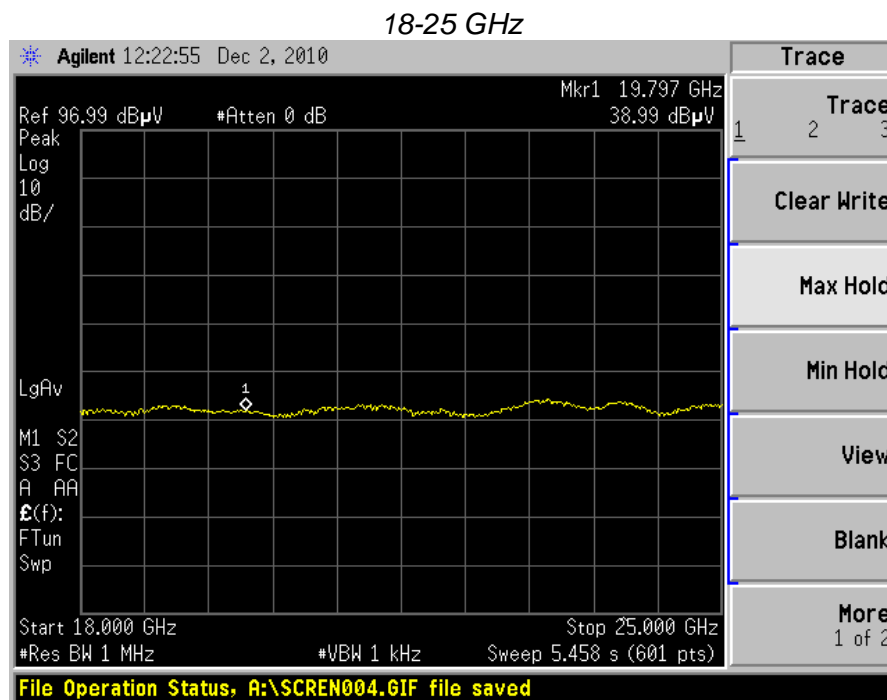
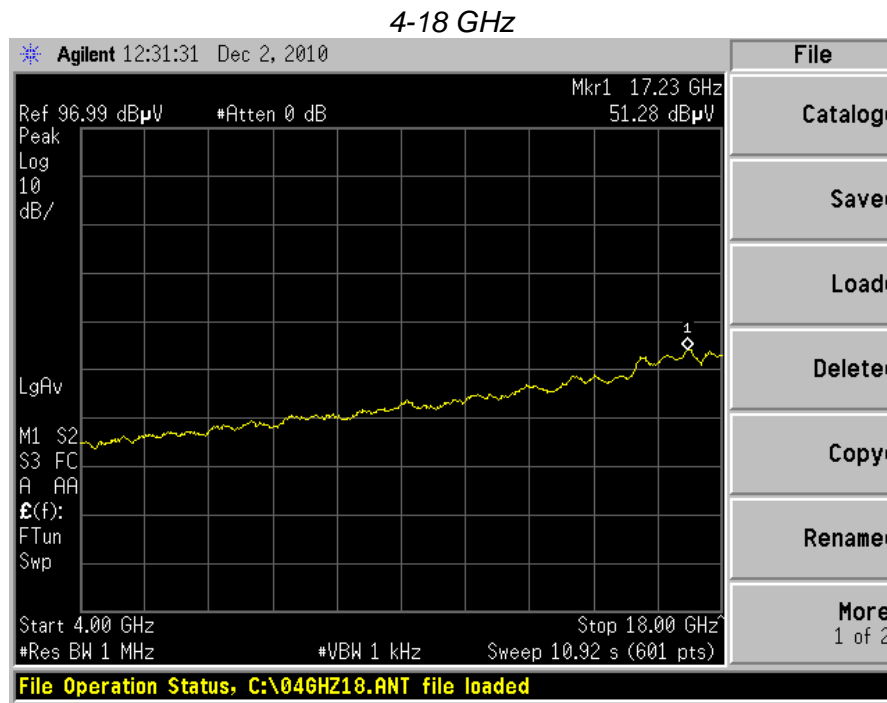


1-4 GHz, Antenna Vertically Polarized



Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Screen Captures - Radiated Emissions Testing – Receive Mode (continued)



Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE

6.1 - Test Setup

The test area and setup are in accordance with ANSI C63.4-2003 and with Title 47 CFR, FCC Part 15, Industry Canada RSS-210 and RSS GEN. The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power was supplied by an AC adapter (3VDC) which was then plugged into a 50Ω (ohm), 50/250 μH Line Impedance Stabilization Network (LISN). Final readings were then taken and recorded. After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the HP 8546A EMI Receiver. The EMCO LISN used has the ability to terminate the unused port with a 50Ω (ohm) load when switched to either L1 (line) or L2 (neutral).

6.2 - Test Procedure

The EUT was investigated in continuous modulated transmit mode for this portion of the testing. The appropriate frequency range and bandwidths were selected on the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1, Section 1, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30 MHz. Final readings were then taken and recorded.

6.3 - Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is provided in Appendix A.

6.4 - Test Results

The EUT was found to **MEET** the Conducted Emission requirements of FCC Part 15.207 Conducted Emissions for an Intentional Radiator. See the Data Charts and Graphs for more details of the test results.

Prepared For: LS Research	Model Number: ProFLEX02	Report #: C-873
EUT: ProFLEX02	Serial Number: N/A	LSR Job #: 310103

6.5 - FCC Limits of Conducted Emissions at the AC Mains Ports

The follow table represents the limits for Conducted Emissions Class B taken from CFR 15.207:

Frequency Range (MHz)	Quasi-Peak Limit (dBµV)	Average Limit (dBµV)
0.150 -0.50 *	66-56	56-46
0.5 – 5.0	56	46
5.0 – 30	60	50
* The limit decreases linearly with the logarithm of the frequency in this range.		

Sample calculation for the limits in the 0.15 to 0.5 MHz:

$$\text{Limit} = -19.12 (\text{Log}_{10} (F [\text{MHz}] / 0.15 [\text{MHz}])) + 66.0 \text{ dB}\mu\text{V}$$

For a frequency of 200 kHz for example:

$$\text{Quasi-Peak Limit (F=200 kHz)} = -19.12 (\text{Log}_{10} (0.2[\text{MHz}] / 0.15 [\text{MHz}])) + 66.0 \text{ dB}\mu\text{V}$$

$$\text{Quasi-Peak Limit (F=200 kHz)} = 63.6 \text{ dB}\mu\text{V}$$

$$\text{Average Limit (F=200 kHz)} = -19.12 (\text{LOG}_{10} (0.2[\text{MHz}]/0.15[\text{MHz}])) + 56.0 \text{ dB}\mu\text{V}$$

$$\text{Average Limit (F = 200 kHz)} = 53.6 \text{ dB}\mu\text{V}$$

Reported data is the raw data corrected for all applicable factors such as antenna factors, cable loss, etc.

Sample reported data:

Raw Data + Antenna Factor (LISN) + Cable Factor + Transient Limiter= Reported Data

$$30.0 \text{ dB}\mu\text{V} + 0.5 \text{ dB} + 1.5 \text{ dB} + 10.0 \text{ dB} = 42.0 \text{ dB}\mu\text{V}$$

Prepared For: LS Research	Model Number: ProFLEX02	Report #: C-873
EUT: ProFLEX02	Serial Number: N/A	LSR Job #: 310103

6.6 – Conducted Emissions Test Data Chart

Frequency Range inspected: 150 KHz to 30 MHz

Test Standard: FCC 15.207 Class B

IC RSS GEN 7.2.2

Manufacturer:	LS Research, LLC				
Date(s) of Test:	December 9 th , 2010				
Test Engineer:	Shane Rismeyer				
Voltage:	3.3VDC				
Operation Mode:	Modulated				
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %				
Test Location:	<input checked="" type="checkbox"/>	Other			Chamber
EUT Placed On:	<input checked="" type="checkbox"/>	40cm from Vertical Ground Plane			10cm Spacers
	<input checked="" type="checkbox"/>	80cm above Ground Plane			Other:
Measurements:		Pre-Compliance		Preliminary	<input checked="" type="checkbox"/> Final
Detector Used:	<input checked="" type="checkbox"/>	Peak	<input checked="" type="checkbox"/>	Quasi-Peak	<input checked="" type="checkbox"/> Average

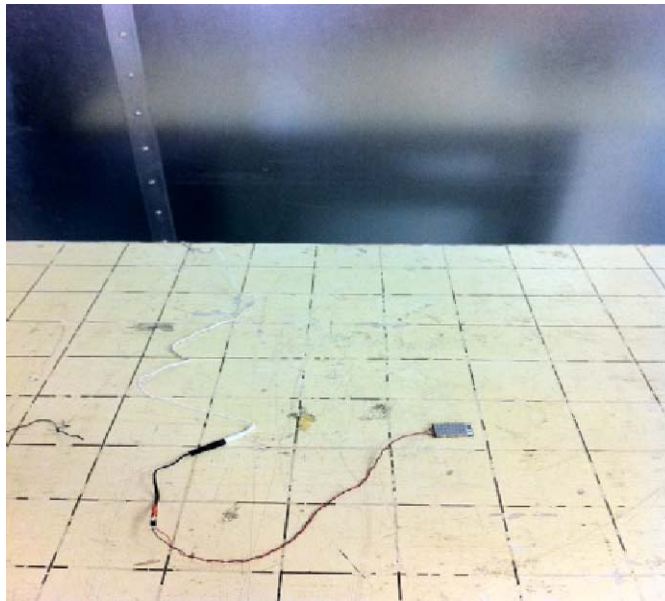
Frequency (MHz)	Line	QUASI-PEAK			AVERAGE		
		Reading (dB μ V)	Limit (dB μ V)	Margin (dB)	Reading (dB μ V)	Limit (dB μ V)	Margin (dB)
28.100	L1	36.700	60.000	23.300	27.000	50.000	23.000
28.090	L2	36.200	60.000	23.800	33.000	50.000	17.000

Notes:

- 1) All other emissions were better than 20 dB below the limits.
- 2) The EUT exhibited similar emissions in transmit and receive modes, and across the Low, Middle and High channels tested.

Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

6.7 - Test Setup Photo(s) - Conducted Emissions Test

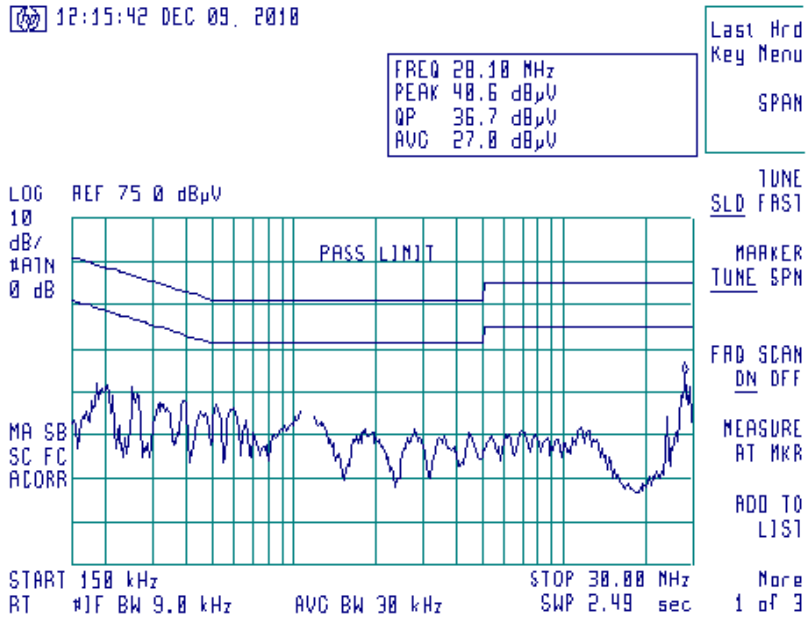


Prepared For: LS Research	Model Number: ProFLEX02	Report #: C-873
EUT: ProFLEX02	Serial Number: N/A	LSR Job #: 310103

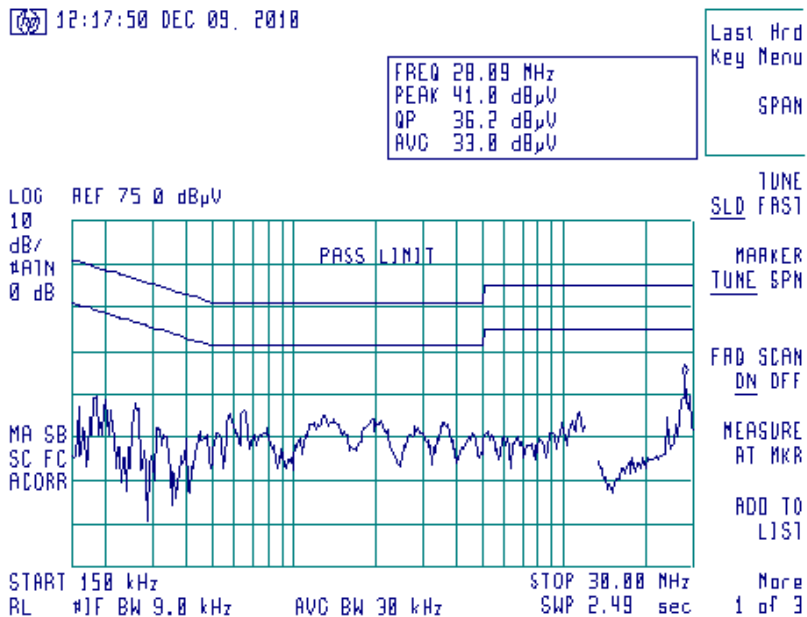
6.8 - Screen Captures - Conducted Emissions Test

Note: These screen captures represent Peak Emissions. For conducted emission measurements, both a Quasi-Peak detector function and an Average detector function are utilized. The emissions must meet both the Quasi-peak limit and the Average limit as described in 47 CFR 15.207 and RSS GEN 7.2.2 (Table 2). The signature scans shown here are from channel 2440, chosen as being a good representative of channels.

Line 1



Line 2



Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

EXHIBIT 7. OCCUPIED BANDWIDTH

7.1 - Limits

For a Digital Modulation System, the 6 dB bandwidth shall be at least 500 kHz.

7.2 - Method of Measurements

Refer to ANSI C63.4 (2003) and FCC Procedures (2007) for Digital Transmission Systems operating under 15.247.

The transmitter output was connected to the Spectrum Analyzer. The bandwidth of the fundamental frequency was measured with the Spectrum Analyzer using 100 kHz RBW and VBW=300 kHz.

The bandwidth requirement found in FCC Part 15.247(a)(2) and RSS 210 A8.2(a) requires a minimum -6dBc occupied bandwidth of 500 kHz. In addition, Industry Canada (IC RSS GEN 4.6.1) requires the measurement of the -20dBc occupied bandwidth. For this portion of the tests, a direct measurement of the transmitted signal was performed at the antenna port of the EUT, via a cable connection to the Agilent E4446A spectrum analyzer. The EUT was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used in peak-hold mode while measurements were made, as presented in the chart below.

From this data, the closest measurement (6 dB bandwidth) when compared to the specified limit, is 1233 kHz, which is above the minimum of 500 kHz.

7.3 - Test Equipment List

A complete list of test equipment that was used for this test can be found in Appendix A.

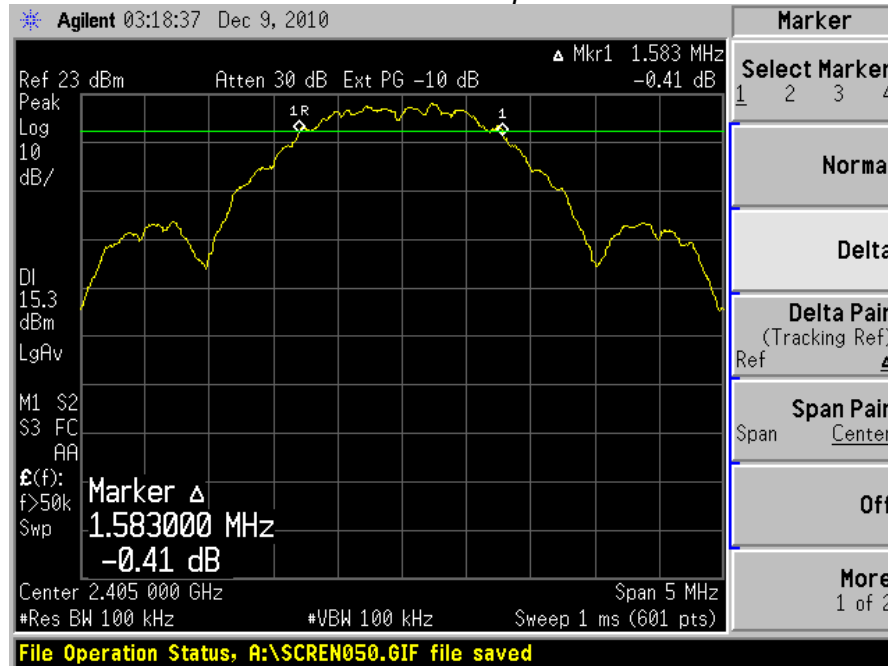
7.4 - Test Data

Channel	Center Frequency (MHz)	Measured -6 dBc OBW (kHz)	Minimum -6 dBc Limit (kHz)	Measured 99% OBW (kHz)
11	2405	1583	500	2196.8
18	2440	1583	500	2199.5
25	2475	1550	500	2213.1

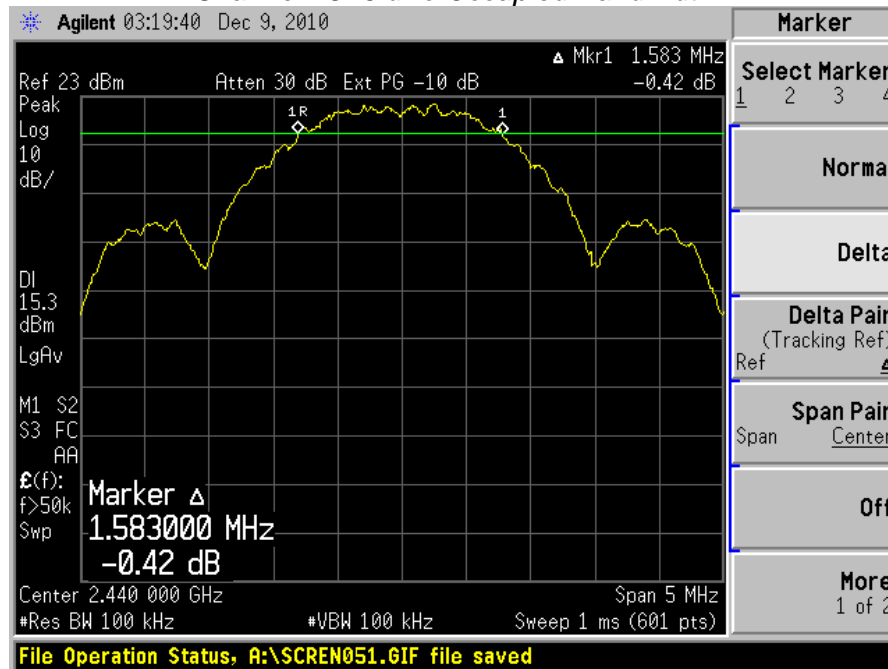
Prepared For: LS Research	Model Number: ProFLEX02	Report #: C-873
EUT: ProFLEX02	Serial Number: N/A	LSR Job #: 310103

7.5 - Screen Captures - Occupied Bandwidth

Channel 11 -6 dBc Occupied Bandwidth

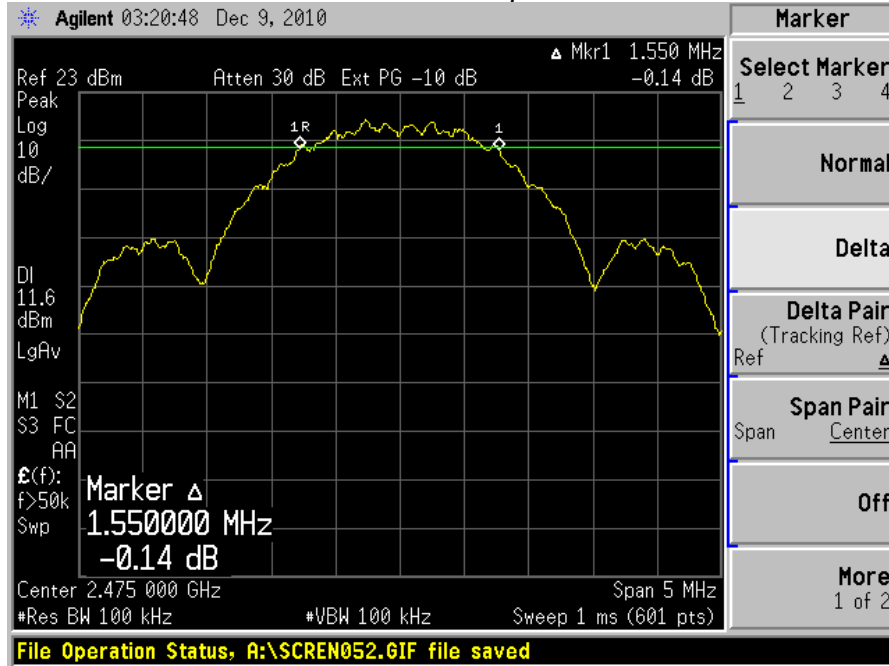


Channel 18 -6 dBc Occupied Bandwidth

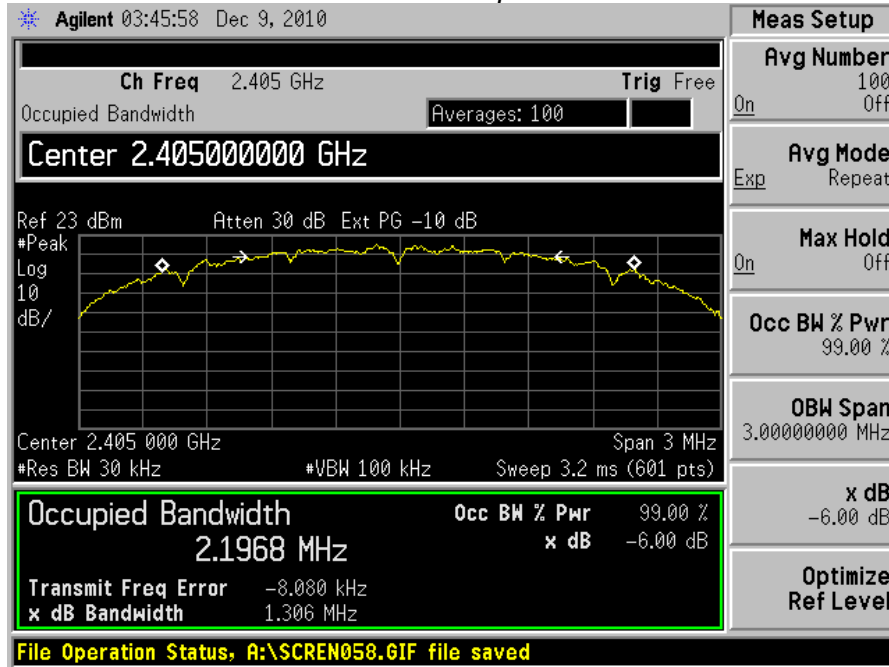


Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Channel 25 -6 dBc Occupied Bandwidth

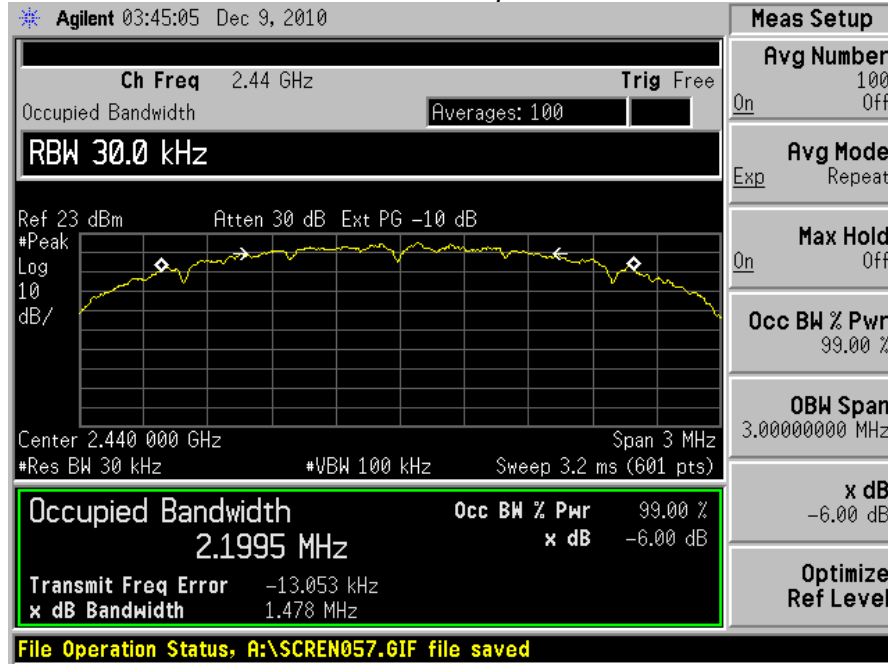


Channel 11 99% Occupied Bandwidth

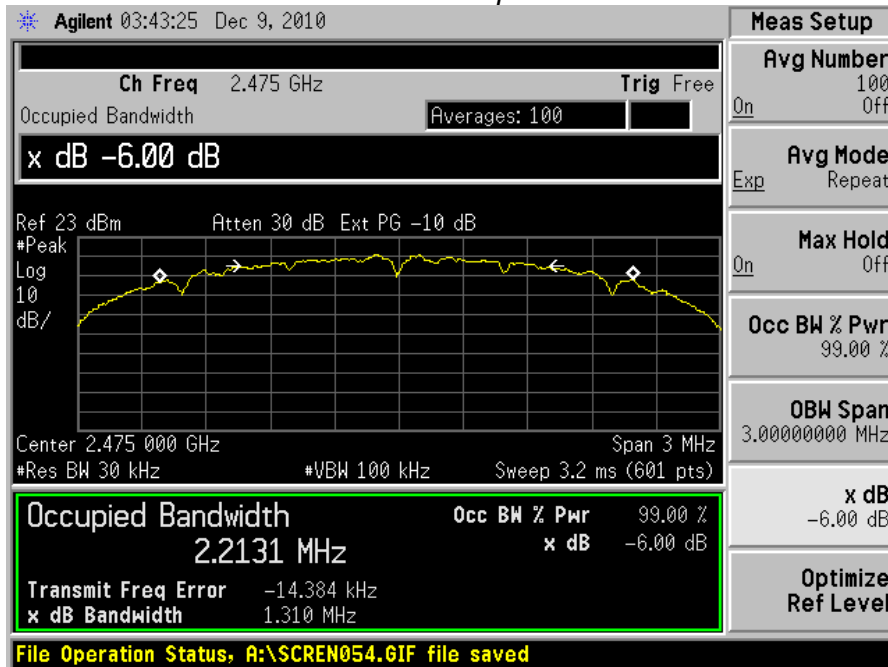


Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Channel 18 99% Occupied Bandwidth



Channel 25 99% Occupied Bandwidth



Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

EXHIBIT 8. BAND EDGE MEASUREMENTS

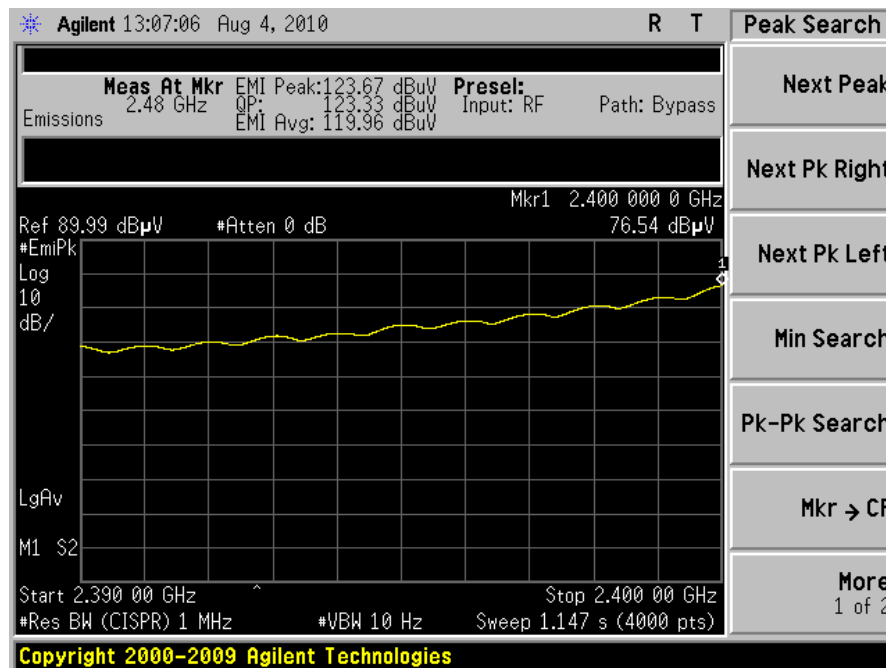
8.1 - Method of Measurements

FCC 15.209(b) and 15.247(d) require a measurement of spurious emission levels to be at least 20 dB lower than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. Also, RSS 210 Section 2.2 requires that unwanted emissions meet limits listed in tables 2 and 3 of the same standard and also to the limits in the applicable annex. The following screen captures demonstrate compliance of the intentional radiator at the 2400-2483.5 MHz Band-Edges. The EUT was operated in continuous transmit mode with continuous modulation, with internally generated data as the modulating source. The EUT was operated at the lowest channel for the investigation of the lower Band-Edge, and at the highest channel for the investigation of the higher Band-Edge.

The Lower Band-Edge limit, in this case, would be -20 dBc with respect to the fundamental level of 123.3 dB μ V/m at 3m.

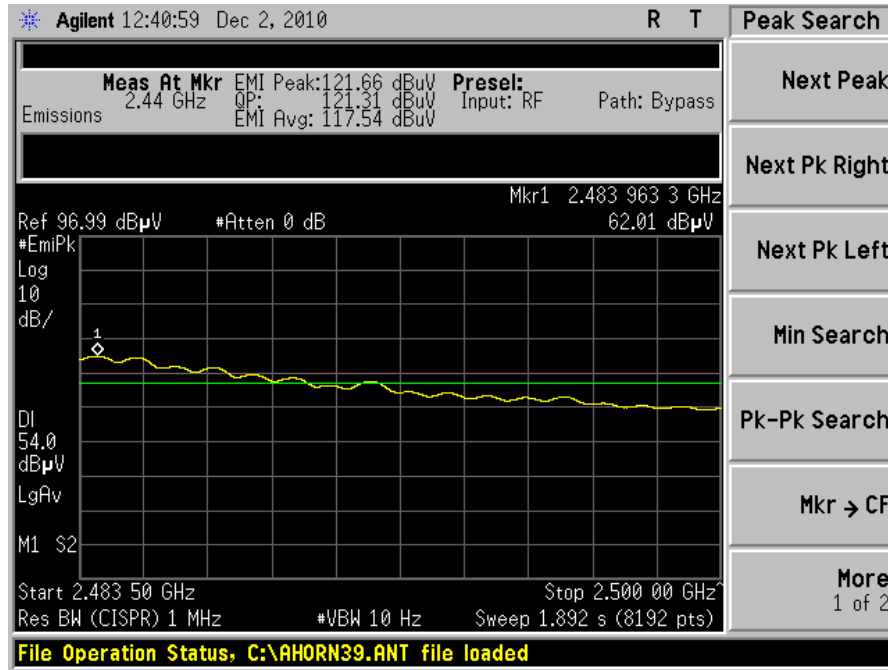
The Upper Band-Edge limit, in this case, would be + 54 dB μ V/m at 3m.

Screen Capture Demonstrating Compliance at the Lower Band-Edge

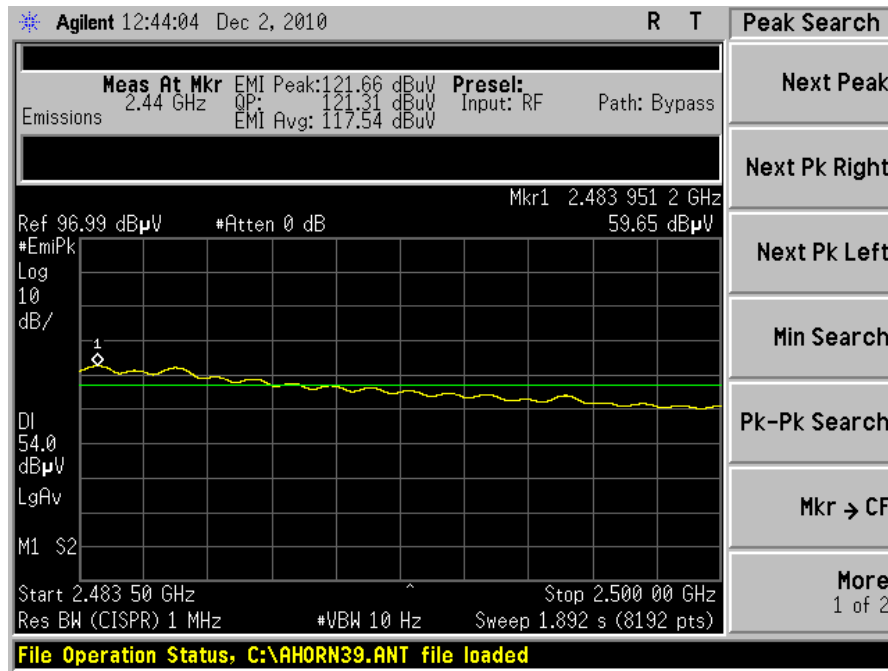


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EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Screen Capture Demonstrating Compliance at the Higher Band-Edge



Channel 25 (power level set to 5)



Channel 24 (Power level set to 15, full power)

Note: Band edge passes with duty cycle correction factor of 10dB.

Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

EXHIBIT 9. POWER OUTPUT (CONDUCTED): 15.247(b)

9.1 - Method of Measurements

The conducted RF output power of the EUT was measured at the antenna port using a short RF cable. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with resolution and video bandwidths set to 3 MHz, and a span of 20 MHz, with measurements from a peak detector presented in the chart below.

9.2 - Test Equipment List

A complete list of test equipment that was used for this test can be found in Appendix A.

9.3 - Test Data

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
11	2405	+30 dBm	25.02	4.98
18	2440	+30 dBm	25.27	4.73
25	2475	+30 dBm	20.74	9.26

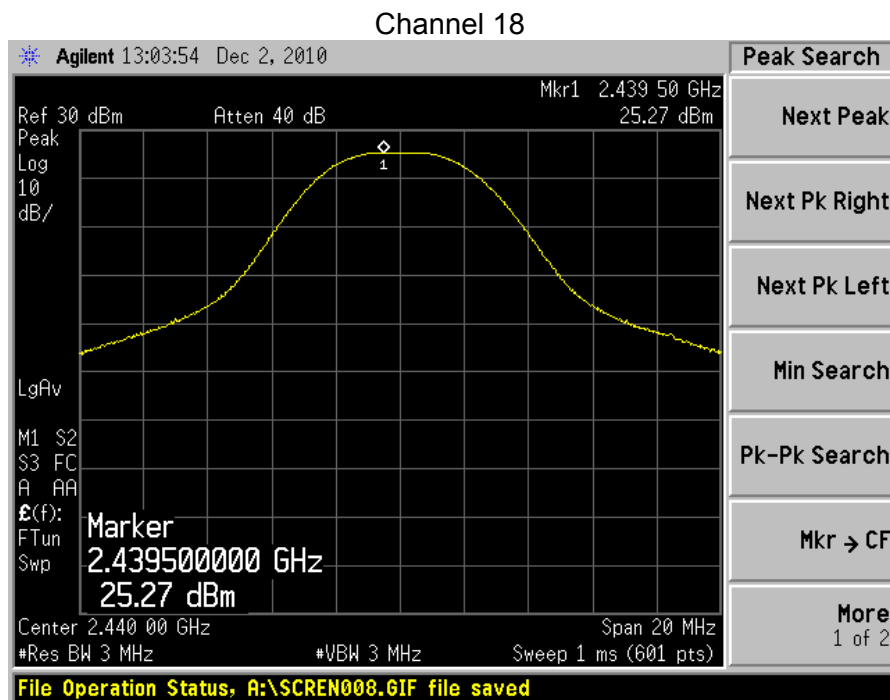
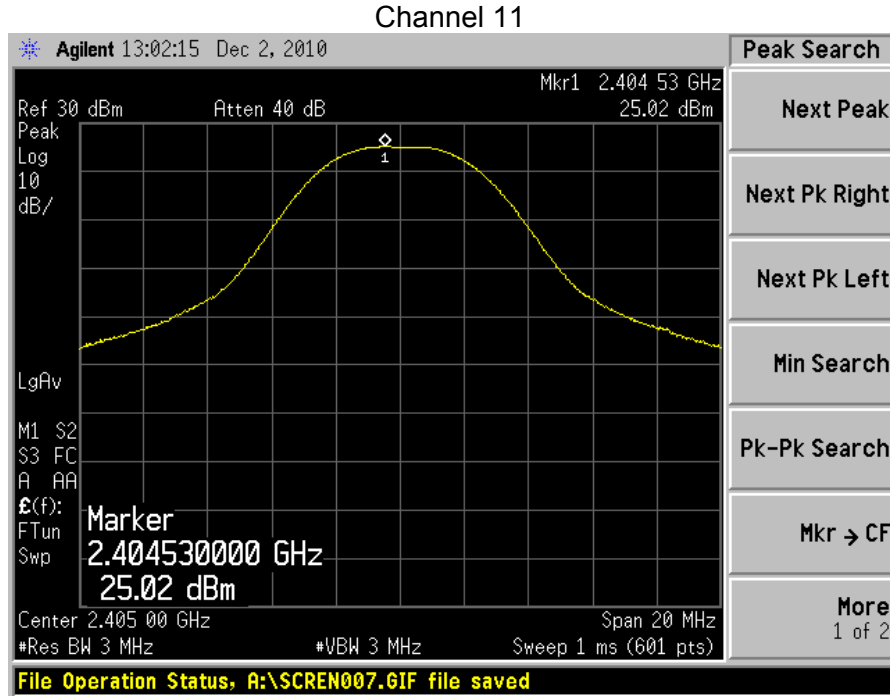
Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	Calculated EIRP (dBm) ⁽¹⁾	Conducted Power Limit (dBm)	EIRP Limit (dBm)
11	2405	25.02	27.12	30.0	36.0
18	2445	25.27	27.37	30.0	36.0
25	2480	20.74	22.84	30.0	36.0

⁽¹⁾ EIRP Calculation:

$$\text{EIRP} = (\text{Peak power at antenna terminal in dBm}) + (\text{EUT Antenna gain in dBi})$$

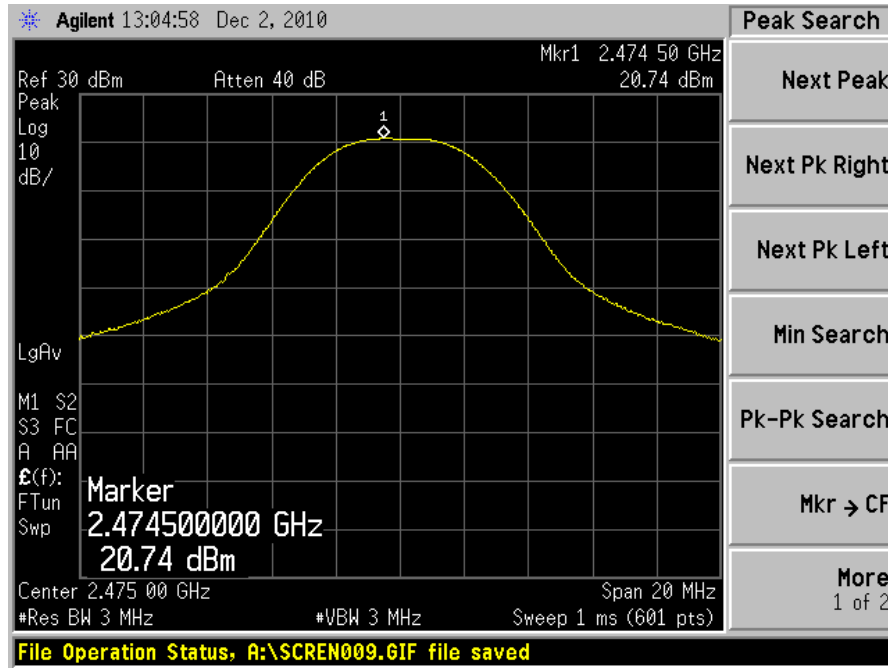
Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

9.4 - Screen Captures - Power Output (Conducted)



Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Channel 25



Prepared For: LS Research	Model Number: ProFLEX02	Report #: C-873
EUT: ProfLEX02	Serial Number: N/A	LSR Job #: 310103

EXHIBIT 10. POWER SPECTRAL DENSITY: 15.247(e)

10.1 - Limits

For digitally modulate 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.

In accordance with FCC Part 15.247(e) and RSS 210 A8.2(b), the peak power spectral density should not exceed +8 dBm in any 3 kHz band. This measurement was performed along with the conducted power output readings performed as described in previous sections. The peak output frequency for each representative frequency was scanned, with a narrow bandwidth, and reduced sweep, and a power density measurement was performed. The resultant density was then corrected to a 3 kHz bandwidth. The highest density was found to be no greater than 6.82 dBm, which is under the allowable limit by 1.18 dB.

10.2 - Test Equipment List

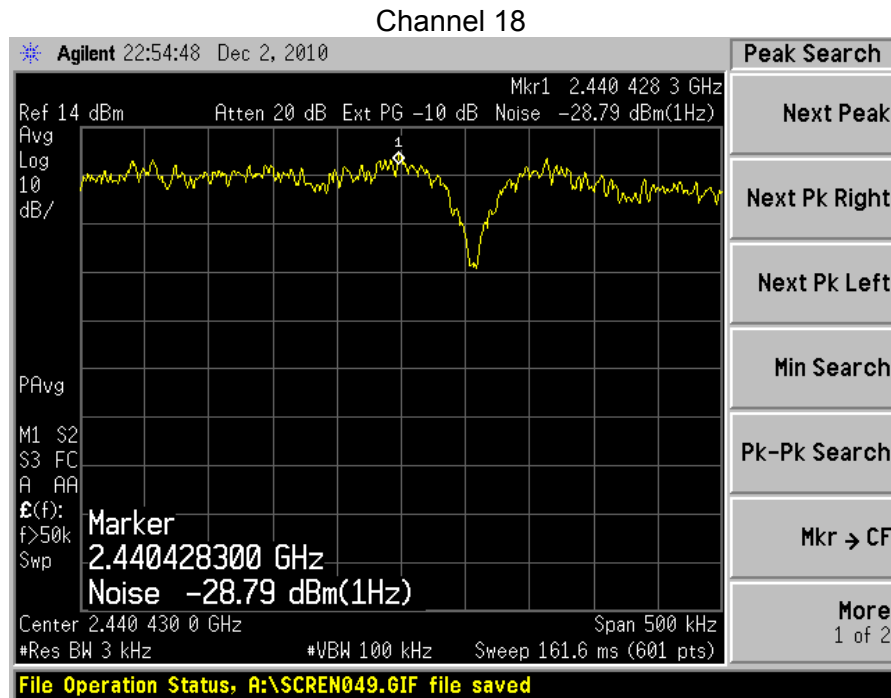
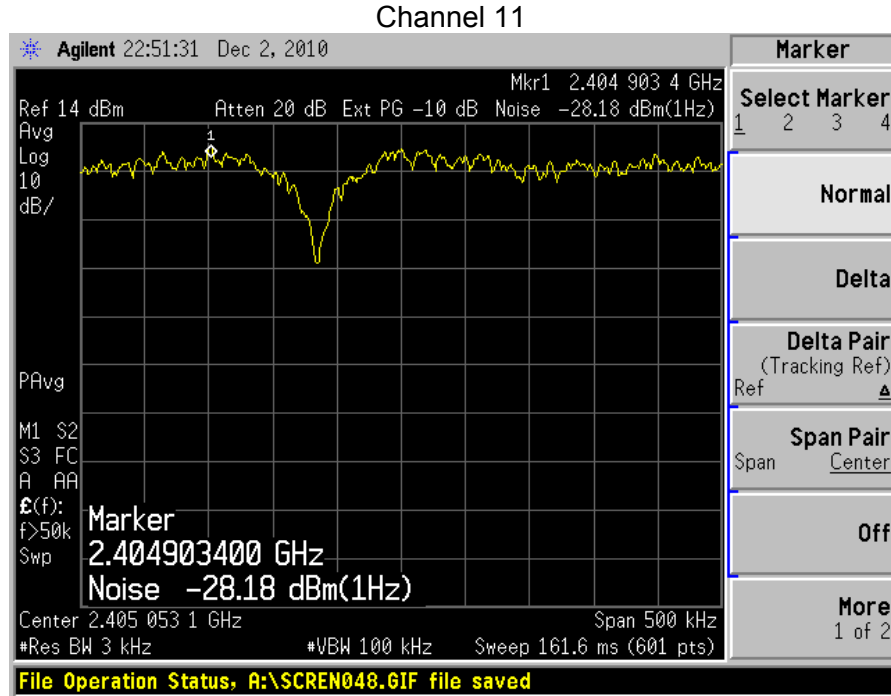
A complete list of test equipment utilized can be found in Appendix A.

10.3 - Test Data

Channel	Center Frequency (MHz)	Measured Channel Power (dBm/Hz)	Corrected Power Measurement (dBm/3kHz)	Limit (dBm)	Margin (dB)
11	2405	-28.18	6.82	+8.0	1.18
18	2440	-28.79	6.21	+8.0	1.79
25	2475	-34.05	0.95	+8.0	7.05

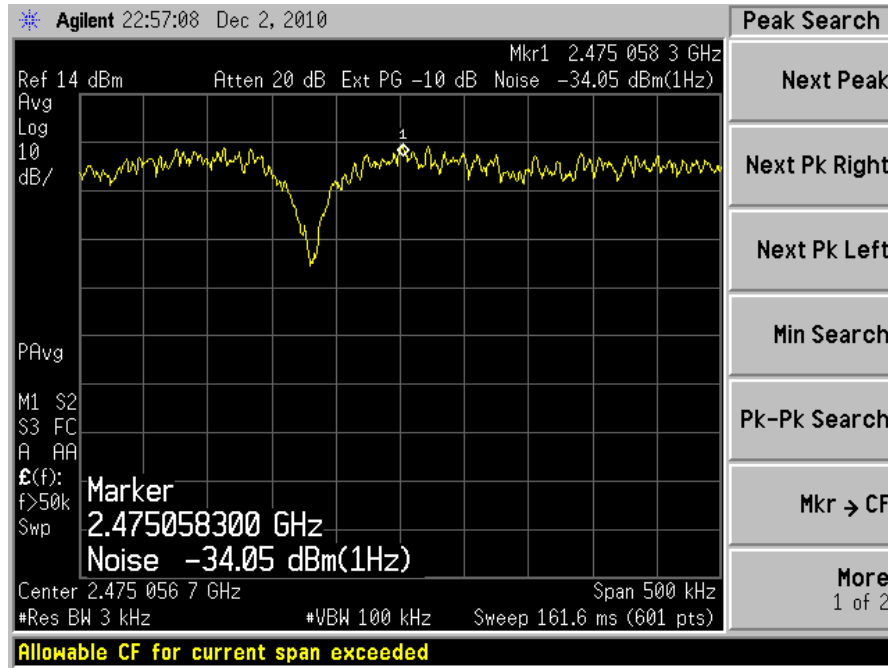
Prepared For: LS Research	Model Number: ProFLEX02	Report #: C-873
EUT: ProFLEX02	Serial Number: N/A	LSR Job #: 310103

10.4 - Screen Captures – Power Spectral Density



Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Channel 25



Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

EXHIBIT 11. SPURIOUS CONDUCTED EMISSIONS: 15.247(d)

11.1 - Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

In addition, radiated emissions, which fall in the restricted band, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(e)

Remarks:

Applies to harmonics/spurious emissions that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209.

The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in Section 15.35 for limiting peak emissions apply.

FCC 47 CFR 15.205(a) – Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 – 0.110	162.0125 – 167.17	2310 – 2390	9.3 – 9.5
0.49 – 0.51	167.72 – 173.2	2483.5 – 2500	10.6 – 12.7
2.1735 – 2.1905	240 – 285	2655 – 2900	13.25 – 13.4
8.362 – 8.366	322 – 335.4	3260 – 3267	14.47 – 14.5
13.36 – 13.41	399.9 – 410	3332 – 3339	14.35 – 16.2
25.5 – 25.67	608 – 614	3345.8 – 3358	17.7 – 21.4
37.5 – 38.25	960 – 1240	3600 – 4400	22.01 – 23.12
73 – 75.4	1300 – 1427	4500 – 5250	23.6 – 24.0
108 – 121.94	1435 – 1626.5	5350 – 5460	31.2 – 31.8
123 – 138	1660 – 1710	7250 – 7750	36.43 – 36.5
149.9 – 150.05	1718.8 – 1722.2	8025 – 8500	Above 38.6
156.7 – 156.9	2200 – 2300	9000 – 9200	

FCC 47 CFR 15.209(a) Field Strength Limits within Restricted Frequency Bands

Frequency (MHz)	Field Strength Limits (microvolts/m)	Distance (Meters)
0.009 – 0.490	2,400 / F (kHz)	300
0.490 – 1.705	24,000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 – 960	200	3
Above 960	500	3

Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Calculation of Radiated Emission Measurements:

Frequency (MHz)	3 m Limit (μV/m)	3 m Limit (dBμV/m)	1 m Limit (dBμV/m)
30-88	100	40.0	-
88-216	150	43.5	-
216-960	200	46.0	-
960-25,000	500	54.0	63.5

Sample conversion of field strength (μV/m to dBμV/m):

$$\text{dB}\mu\text{V/m} = 20 \log_{10} (100) = 40 \text{ dB}\mu\text{V/m} \text{ (from 30-88 MHz)}$$

For measurements made at 1.0 meter, a 9.5 dB correction has been invoked.

$$\begin{aligned} &960 \text{ MHz to } 10,000 \text{ MHz} \\ &500\mu\text{V/m or } 54.0 \text{ dB}\mu\text{V/m at 3 meters} \\ &54.0 + 9.5 = 63.5 \text{ dB}/\mu\text{V/m at 1 meter} \end{aligned}$$

Reported data is the raw data corrected for all applicable factors such as antenna factors, cable loss, etc.

Sample reported data:

Raw Data + Cable Factor = Reported Data

$$33.0 \text{ dBm} + 2 \text{ dB} = 35.0 \text{ dBm}$$

Prepared For: LS Research	Model Number: ProFLEX02	Report #: C-873
EUT: ProFLEX02	Serial Number: N/A	LSR Job #: 310103

11.2 - Conducted Harmonic and Spurious RF Measurements

FCC Part 15.247(d) and IC RSS 210 A8.5 both require a measurement of conducted harmonic and spurious RF emission levels, as reference to the carrier level when measured in a 100 kHz bandwidth. For this test, the spurious and harmonic RF emissions from the EUT were measured at the EUT antenna port using a short RF cable. An Agilent E4446A spectrum analyzer was used with the resolution bandwidth set to 100 kHz for this portion of the tests. The unit was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used with measurements from a peak detector presented in the chart below. Screen captures were acquired and any noticeable spurious and harmonic signals were identified and measured.

No significant emissions could be noted within -45 dBc of the fundamental level for this product.

Frequency	Channel 11	Channel 18	Channel 25
Fundamental	+ 21.76(dBm)	+ 21.50 (dBm)	+ 17.77(dBm)
2 nd Harmonic	- 45.74 (dBm)	- 48.37 (dBm)	- 56.92 (dBm)
3 rd Harmonic	- 47.38 (dBm)	- 46.29(dBm)	- 40.81 (dBm)
4 th Harmonic	- 46.30(dBm)	- 40.25 (dBm)	- 77.32 (dBm)
5 th Harmonic	- 69.43 (dBm)	- 60.04 (dBm)	- 60.26 (dBm)
6 th Harmonic	- 52.77(dBm)	- 44.53 (dBm)	- 72.23 (dBm)
7 th Harmonic	- 63.88 (dBm)	- 63.58 (dBm)	- 65.80 (dBm)
8 th Harmonic	- 64.91 (dBm)	- 65.06(dBm)	Note (1)
9 th Harmonic	- 79.15 (dBm)	- 78.32 (dBm)	Note (1)
10 th Harmonic	- 73.57(dBm)	Note (1)	Note (1)

Note 1): Measurement at system noise floor.

Frequency (MHz)	Channel	Measured Level (dBm)
443	11	-32.24
479	18	-33.68
513	25	-35.65

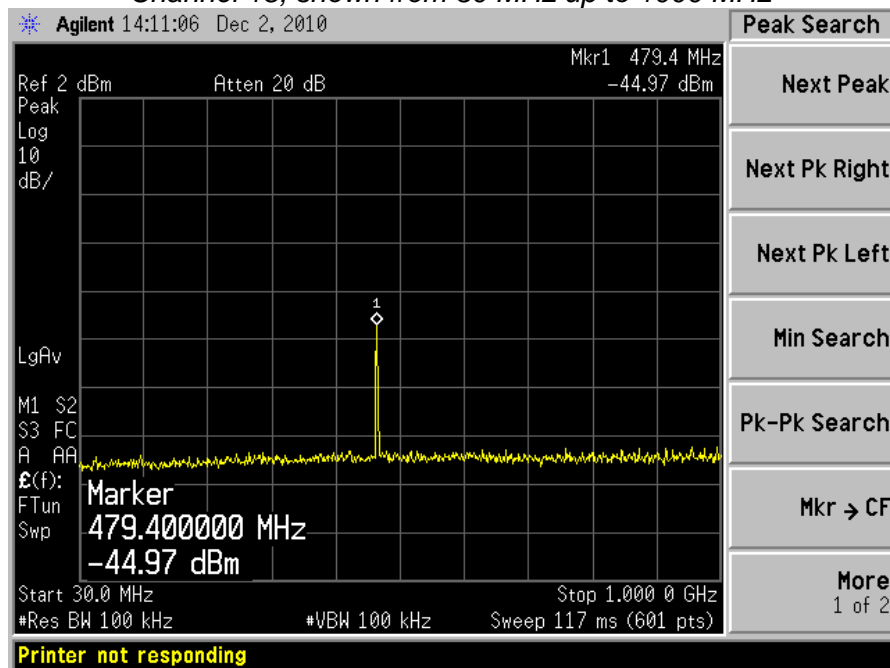
11.3 - Test Equipment List

A complete list of test equipment that was used for this test can be found in Appendix A.

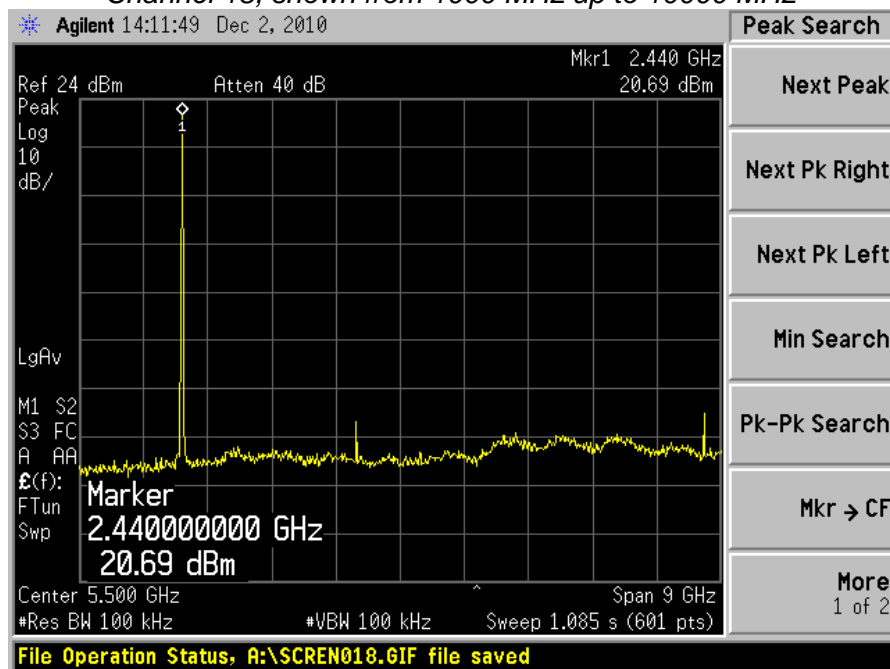
Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

11.4 - Screen Captures – Spurious Radiated Emissions

Channel 18, shown from 30 MHz up to 1000 MHz

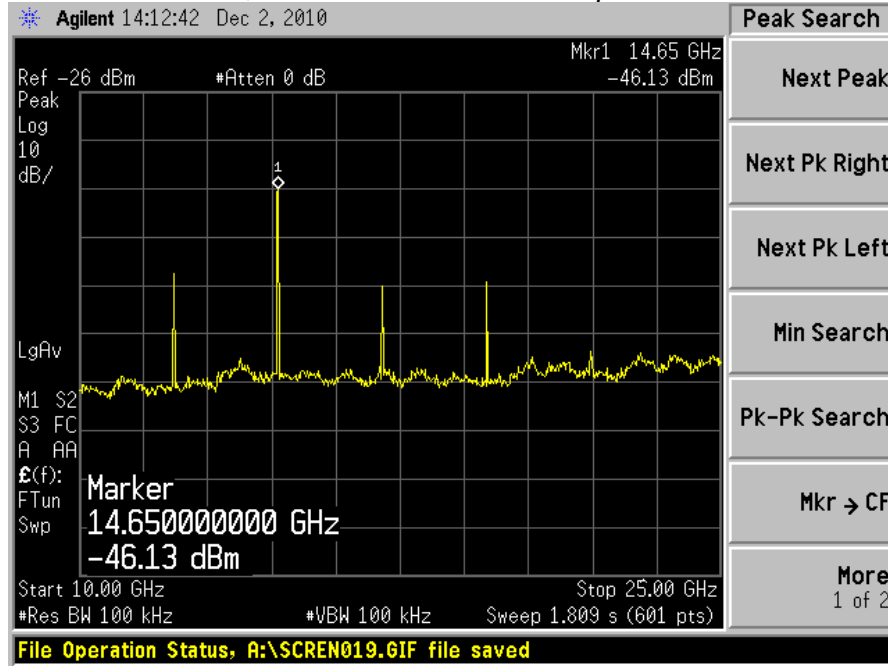


Channel 18, shown from 1000 MHz up to 10000 MHz



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Channel 18, shown from 10000 MHz up to 25000 MHz



Prepared For: LS Research	Model Number: ProFLEX02	Report #: C-873
EUT: ProfLEX02	Serial Number: N/A	LSR Job #: 310103

EXHIBIT 12. FREQUENCY & POWER STABILITY OVER VOLTAGE VARIATIONS

Power to the EUT was supplied by an external bench-type variable power supply. The frequency of operation was monitored using the spectrum analyzer. The stability of the device was examined as a function of the input voltage available to the EUT. A Spectrum Analyzer was used to measure the frequency at the appropriate frequency markers.

For this test, the EUT was placed in continuous transmit mode with typical data for modulation. Power to the EUT was supplied by an external bench-type variable power supply. The frequency of operation was monitored using the spectrum analyzer with RBW=VBW=1 kHz settings while the voltage was varied.

	DC Voltage Source		
	3.0 VDC	3.3 VDC	3.6 VDC
Channel 11	2405.074(MHz)	2405.074(MHz)	2405.075(MHz)
Channel 18	2439.564(MHz)	2439.563(MHz)	2439.563(MHz)
Channel 25	2475.419(MHz)	2475.419(MHz)	2475.419(MHz)

The RF Power Output of the EUT was also monitored in a separate test, also using a Spectrum Analyzer with RBW=VBW=3 MHz setting while the voltage was varied.

	DC Voltage Source		
	3.0 VDC	3.3 VDC	3.6 VDC
Channel 11	23.94(dBm)	24.81(dBm)	25.27(dBm)
Channel 18	24.44(dBm)	25.03(dBm)	25.61(dBm)
Channel 25	19.82(dBm)	20.78(dBm)	21.45(dBm)

Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

EXHIBIT 13. MPE CALCULATIONS

The following MPE calculations are based on a Nearson Dipole antenna, with a measured ERP of 123.3 dB μ V/m, at 3 meters, and conducted RF power of +25.27 dBm as presented to the antenna. The measured gain of this antenna, based on the ERP measurements is 2.8 dB as measured over a conducting ground plane.

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density
P = power input to the antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	25.27 (dBm)
Maximum peak output power at antenna input terminal:	336.512 (mW)
Antenna gain(typical):	2.8 (dBi)
Maximum antenna gain:	1.905 (numeric)
Prediction distance:	20 (cm)
Prediction frequency:	2440 (MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1 (mW/cm ²)
Power density at prediction frequency:	0.127565 (mW/cm ²)
Maximum allowable antenna gain:	11.7 (dBi)
Margin of Compliance at 20 cm =	8.9 dB

Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Appendix A: Test Equipment List



Date: 8-Dec-2010 Type Test: Power Spectral Density Job #: C-873
 Prepared By: Shane Rismeyer Customer: BPLG Quote #: 310103

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960142	Phaseflex	Gore	EMOCJOCJO36.0	4943263	9/23/2010	9/23/2011	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: *Shane Rismeyer* Quality Assurance: *Thomas T. Smith*



Date: 8-Dec-2010 Type Test: Conducted Power Output Job #: C-873
 Prepared By: Shane Rismeyer Customer: BPLG Quote #: 310103

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960142	Phaseflex	Gore	EMOCJOCJO36.0	4943263	9/23/2010	9/23/2011	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: *Shane Rismeyer* Quality Assurance: *Thomas T. Smith*



Date: 8-Dec-2010 Type Test: Radiated Emissions Job #: C-873
 Prepared By: Shane Rismeyer Customer: BPLG Quote #: 310103

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960013	EMI Receiver	HP	8546A System	3617A00320,3448A	10/29/2010	10/29/2011	Active Calibration
2	EE 960014	EMI Receiver-filter section	HP	85460A	3448A00296	10/29/2010	10/29/2011	Active Calibration
3	AA 960072	Transient Limiter	HP	11947A	3107A02515	10/8/2010	10/8/2011	Active Calibration
4	AA 960075	LISN	EMCO	3810/2NM	9612-1710	9/21/2010	9/21/2011	Active Calibration

Project Engineer: *Shane Rismeyer* Quality Assurance: *Thomas T. Smith*



Date: 8-Dec-2010 Type Test: Occupied Bandwidth (6dB & 20dB) Job #: C-873
 Prepared By: Shane Rismeyer Customer: BPLG Quote #: 310103

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960142	Phaseflex	Gore	EMOCJOCJO36.0	4943263	9/23/2010	9/23/2011	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: *Shane Rismeyer* Quality Assurance: *Thomas T. Smith*

Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Date: 9-Dec-2010

Type Test: Radiated Emissions

Job #: C-873

Prepared By: Shane Rismeyer

Customer: BPLG

Quote #: 310103

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960158	RF Preselector	Agilent	N9039A	MY4652010	6/7/2010	6/7/2011	Active Calibration
2	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	6/7/2010	6/7/2011	Active Calibration
3	EE 960130	Multi-Device Controller	ETS	2090	45968	XXX	XXX	Cal Not Required
4	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/19/2010	10/19/2011	Active Calibration
5	AA 960150	Bicon Antenna	ETS	3110B	0003-3346	10/19/2010	10/19/2011	Active Calibration
6	AA 960158	Double Ridge Horn Antenna	EMCO	3117	109300	8/19/2010	8/19/2011	Active Calibration
7	EE 960159	0.8 - 21GHz LNA	Mini-Circuits	ZVA-213V-S-	740411007	8/19/2010	8/19/2011	Active Calibration
8	EE 960156	100kHz-1GHz Analog Signal Generator	Agilent	N5181A	MY49060062	6/7/2010	6/7/2011	Active Calibration
9	EE 960146	Std. Gain Horn Ant. w/preamp	Adv. Micro	\LA622-4	123001	10/13/2010	10/13/2011	Active Calibration

Project Engineer: *Shane Rismeyer*

Quality Assurance: *Thomas T. Smith*

Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Appendix B: Test Standards - CURRENT PUBLICATION DATES RADIO

STANDARD #	DATE	Am. 1	Am. 2	STANDARD #	DATE	Am. 1	Am. 2
ANSI C63.4	2003			IEC 61000-4-5	2005-11		
CISPR 11	2009-05			IEC 61000-4-6	2008-06		
CISPR 12	2007-05			IEC 61000-4-8	2001-03		
CISPR 14-1	2005-11	2008-11		IEC 61000-4-11	2004-03		
CISPR 14-2	2001-11	2001-11	2008-05	IEC 61326-1	2006-06		
CISPR 16-1-1 Note 1	2006-03	2006-09	2007-07	ISO 14082	1998-07		
CISPR 16-1-2 Note 1	2003	2004-04	2006-07	MIL Std. 461E	1999-08		
CISPR 22	2008-09			RSS GEN	2007-06		
CISPR 24	1997-09	2001-07	2002-10	RSS 119	2007-06		
EN 55011	2007-05			RSS 123	1999-11		
EN 55014-1	2006			RSS 125	2000-03		
EN 55014-2	1997			RSS 131	2003-07		
EN 55022	2006	2007		RSS 136	2002-10		
EN 60601-1-2	2007-03			RSS 137	2009-02		
EN 61000-3-2	2006-05			RSS 210	2007-06		
EN 61000-3-3	2008-12			RSS 213	2005-12		
EN 61000-4-2	2001	1998	2001	RSS 243	2005-11		
EN 61000-4-3	2006-07	2008-05		RSS 310	2007-06		
EN 61000-4-4	2004						
EN 61000-4-5	2006-12						
EN 61000-4-6	2007-08						
EN 61000-4-8	1993	1994-01					
EN 61000-4-11	2004-10						
EN 61000-6-1	2007-02						
EN 61000-6-2	2005-12						
EN 61000-6-3	2007-02						
EN 61000-6-4	2007-02						
FCC 47 CFR, Parts 0-15, 18, 90, 95	2009						
FCC Public Notice DA 00-1407	2000						
FCC ET Docket # 99-231	2002						
FCC Procedures	2007						
ICES 001	2006-06						
ICES 002	2007-02						
ICES 003	2004-02						
IEC 60601-1-2 Note 1	2007-03						
IEC 61000-3-2	2005-11	2008-03					
IEC 61000-3-3	2008-06						
IEC 61000-4-2	2008-12						
IEC 61000-4-3	2008-04	incl in 2006					
IEC 61000-4-4	2004-07						
				Note 1: Test not on LSR Scope of Accreditation.			

Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Appendix C: Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level, using a coverage factor of k=2.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V

Prepared For: LS Research	Model Number: ProFLEX02	Report #: C-873
EUT: ProFLEX02	Serial Number: N/A	LSR Job #: 310103

Appendix D: Antenna Specification(s)

Series Part Numbers		
Connector Code -XX-	Description	P / N
AM	SMA Plug	S131AM-2450S
AH	SMA Plug Reverse Polarity	S131AH-2450S
AT	SMA Plug Reverse Thread	S131AT-2450S

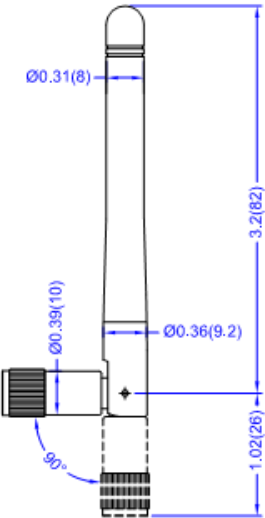
Electrical Properties:

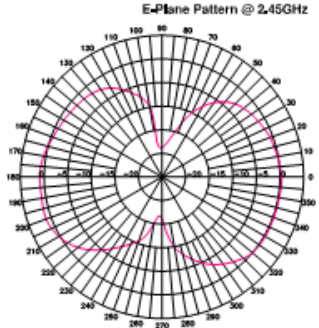
Frequency Range: 2.4~2.5 GHz
 Impedance: 50Ω nominal
 VSWR: <2.0:1
 Gain: 2 dBi
 Radiation: Omni
 Polarization: Vertical
 Wave: Half Wave Dipole

Mechanical Properties:

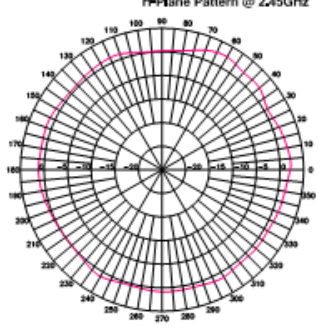
Connector: SMA type
 Material: Polyurethane(Black)
 Whip: Polycarbonate(Black)
 Swivel Mechanism: Brass with black chrome plating
 Connector: Brass with black chrome plating
 Operation Temp.: -20°C to +65°C
 Storage Temp.: -30°C to +75°C

This is a RoHS compliant product.






E-Plane Pattern @ 2.45GHz




H-Plane Pattern @ 2.45GHz


Connector Interface



SMA Plug
(AM)



SMA Plug Reverse Polarity
(AH)



SMA Plug Reverse Thread
(AT)

TITLE	2.4GHz Swivel Antenna -131 Model	Rev. Date	SHEET
		01/04/06	1 of 1
UNIT	DWG. NO. S131XX-2450S		
In.(mm)			
SCALE	NEARSON		
	1:1		

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Prepared For: LS Research	Model Number: ProfFLEX02	Report #: C-873
EUT: ProfFLEX02	Serial Number: N/A	LSR Job #: 310103

Appendix E: Justifications of Average Duty Factor Calculations

Average (Relaxation) Factor

Average Factor = $20 * \text{Log}_{10}$ (Worst Case EUT On-time over 100 ms time window)

The transmit packet occupies 30 ms of time, within any 100 ms window. Therefore, the relaxation factor allowance is calculated as:

Average Factor = $20 * \text{Log}_{10}$ (30 / 100 ms) = 10.45

A relaxation factor of 10.45 dB would be allowable for this product.

Prepared For: LS Research	Model Number: ProFLEX02	Report #: C-873
EUT: ProFLEX02	Serial Number: N/A	LSR Job #: 310103