



## ENGINEERING TEST REPORT # 313038 A

### LSR Job #: C-1756

Compliance Testing of:

SWF Network Module

Test Date(s):

July 18, 19, 27 and August 6, 2013

Prepared For:

Springs Window Fashions  
Attn: Tom Merker  
7549 Graber Rd.  
Middleton, WI 53562

**This Test Report is issued under the Authority of:** Adam Alger, EMC Engineer

Signature: Date: 10-17-13

**Test Report Reviewed by:**  
Khairul Aidi Zainal, Sr. EMC Engineer

Signature: Date: 10/17/13

**Report by:**  
Adam Alger, EMC Engineer

Signature: Date: 8-6-13

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Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## **Table of Contents**

i.	Title Page .....	1
ii.	Table of Contents .....	2
iii.	LS Research, LLC .....	3
1.0	Summary of Test Report .....	4
2.0	Test Facilities .....	4
3.0	Client Information .....	5
3.1	Equipment Under Test (EUT) Information .....	5
3.2	Product Description .....	5
3.3	Modifications Incorporated In the EUT for Compliance Purposes .....	5
3.4	Deviations & Exclusions from Test Specifications .....	5
3.5	Additional Information .....	5
4.0	Conditions of Test .....	6
5.0	Test Equipment .....	6
6.0	Conformance Summary .....	6
Appendix A – Test Equipment .....		7
Appendix B – Test Data .....		8
B.1 –	RF Conducted Emissions .....	8
B.2 –	Radiated Emissions .....	18
B.3 –	Radiated Emissions Receive Mode .....	26
B.4 –	AC Mains Conducted Emissions .....	29
Appendix C - Uncertainty Summary .....		32
Appendix D - References .....		33

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## LS Research, LLC in Review

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

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TESTING CERT #1255.01

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025: 2005 with Electrical (EMC) Scope of Accreditation  
A2LA Certificate Number: 1255.01

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Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948  
FCC Registration Number: 90756

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Industrie Canada

Industry 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

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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

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## 1.0 Summary of Test Report

In July and August 2013 the EUT SWF Network Module supplied by Springs Window Fashions was tested and MEETS the following requirements:

FCC and IC Paragraph	Test Requirements	Compliance (Yes/No)
FCC:15.247 (a)(2) IC: RSS 210 A8.2 (a)	6 dB Bandwidth of a Digital Modulation System	Yes
FCC : 15.247(b) & 1.1310 IC : RSS 210 A8.4	Maximum Output Power	Yes
FCC:15.247 (d) IC: RSS 210 A8.2 (b)	Power Spectral Density of a Digital Modulation System	Yes
FCC :15.247(d) IC : RSS 210 A8.5	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	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
FCC : 2.1055 (d)	Frequency Stability	Yes
FCC : 15.207 /15.107 IC : RSS GEN sect. 7.2.2	Power Line Conducted Emissions Measurements	Yes
FCC : 15.109 IC : RSS-GEN	Receive Mode Radiated Emissions	Yes

## 2.0 Test Facilities

All testing was performed at:

LS Research, LLC  
W66 N220 Commerce Court  
Cedarburg, Wisconsin, 53012 USA

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to the requirements of ISO/IEC 17025, 2005 “General Requirements for the Competence of Calibration and Testing Laboratories”.

LS Research, LLC's scope of accreditation includes all test methods listed herein, unless otherwise noted.

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

### 3.0 Client Information

<b>Manufacturer Name:</b>	Springs Window Fashions
<b>Address:</b>	7549 Graber Rd Middleton, WI 53562
<b>Contact Person:</b>	Tom Merker

#### 3.1 Equipment Under Test (EUT) Information

*The following information has been supplied by the applicant.*

<b>Product Name:</b>	SWF Network Module
<b>Model Number:</b>	SRF-01
<b>Serial Number:</b>	N/A (engineering sample)
<b>FCC ID</b>	2AAVX-SRF01
<b>IC Number</b>	11392A-SRF01

#### 3.2 Product Description

A Modular 2.4 GHz RF Transceiver with PCB antenna

#### 3.3 Modifications Incorporated In the EUT for Compliance Purposes

None noted at time of test

#### 3.4 Deviations & Exclusions from Test Specifications

None noted at time of test

#### 3.5 Additional Information

EUT was pre-programmed to transmit on low (2403 MHz), middle (2440 MHz), and high channel (2467 MHz). A button was depressed to cycle between channels.

EUT fitted with a temporary RF port (U.FL) for measurement purpose only.

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
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## 4.0 Conditions of Test

### Environmental:

Temperature: 20-25° C  
Relative Humidity: 30-60%  
Atmospheric Pressure: 86-106 kPa

Mains Voltage: 120VAC 60Hz  
DC Supply to module: 3.3 VDC (nominal)

## 5.0 Test Equipment

All test equipment is calibrated by a calibration laboratory accredited by A2LA to the requirements of ISO 17025. For a complete list of test equipment and calibration dates, see Appendix A. Unless otherwise noted, resolution bandwidth of measuring instrument used during testing for given frequency range, see below.

Frequency Range	Resolution Bandwidth
9 kHz – 150 kHz	200 Hz
150 kHz – 30 MHz	9 kHz
30 MHz – 1000 MHz	120 kHz
Above 1000 MHz	1 MHz

## 6.0 Conformance Summary

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.247, 15.207, 15.107, 15.109, and Industry Canada RSS-210, Issue 8 (2010), Annex 8, RSS-GEN Issue 3 (2010).

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.

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## Appendix A – Test Equipment



Date : 18-Jul-2013

Type Test: Radiated and Conducted

Job #: C-1756

Prepared By: Adam A

Customer: Spring Window Fashions

Quote #: 313038

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960156	100KHz-1GHz Analog Signal Generator	Agilent	N5181A	MY493060062	6/30/2012	7/30/2013	Active Calibration
2	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4456A	MY492052255	6/29/2012	7/30/2013	Active Calibration
3	EE 960158	RF Preselector	Agilent	N9039A	MY485201010	6/29/2012	7/30/2013	Active Calibration
4	AA 960004	Log Periodic Antenna	EMCO	93146	9512-4276	9/17/2012	9/17/2013	Active Calibration
5	AA 960005	Biconical Antenna	EMCO	9310B	9601-2280	6/26/2013	6/26/2014	Active Calibration
6	EE 960147	Pre-Amp	Adv. Micro	VLA612	123101	2/19/2013	2/19/2014	Active Calibration
7	AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	1/29/2013	1/29/2014	Active Calibration
8	EE 960073	Spectrum Analyzer	Agilent	E4466A	US45300564	5/28/2013	5/28/2014	Active Calibration
9	AA 960153	2.4GHz High Pass Filter	KW/M	HPF-L-14186	7272-04	4/19/2013	4/19/2014	Active Calibration
10	EE 960146	Std. Gain Horn Ant. w/preamp	Adv. Micro / EMC	VLA622-4 / 3160-09	123001	9/26/2012	9/26/2013	Active Calibration
11	CC 000221C	Spectrum Analyzer	HP	E4407B	US39160256	6/17/2013	6/17/2014	Active Calibration
12	EE 960084	LISN - 15A	COM-POWER	LI-215A	191920	2/6/2013	2/6/2014	Active Calibration
13	AA 960072	Transient Limiter	HP	11947A	3107A02515	2/15/2013	2/15/2014	Active Calibration

Project Engineer: Adam O'Byrne

Quality Assurance: 

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## Appendix B – Test Data

### B.1 – RF Conducted Emissions

Manufacturer	Springs Window Fashions
Test Location	LS Research, LLC
Rule Part	FCC Part 15.247 / RSS-210 Annex 8
General Measurement Procedure	FCC KDB 558074 D01 DTS Meas Guidance v03r01 ANSI C63.10-2009 Section 6.7
General Description of Measurement	A direct measurement of the transmitted signal was performed at the antenna port of the EUT via a cable connection to a spectrum analyzer. An attenuator was placed in series with the cable to protect the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings thereby allowing direct measurements, without the need for any further corrections. The EUT was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source.

Prepared For: Springs Window Fashions

Name: SWF Network Module

Report: TR 313038 A FCCICTX

Model: SRF-01

LSR: C-1756

Serial: N/A (engineering sample)

### B.1.1 – RF Conducted – Fundamental Bandwidth

Manufacturer	Springs Window Fashions
Date	7-19-13 and 8-6-13
Operator	Aidi / Adam
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	FCC Part 15.247 / RSS-210 A8
Specific Measurement Procedure	FCC KDB 558074 Section 8.0 DTS bandwidth ANSI C63.10-2009 Section 6.9 RSS-GEN Section 4.6
Additional Description of Measurement	Peak detector used
Additional Notes	Continuous transmit modulated used for this test.

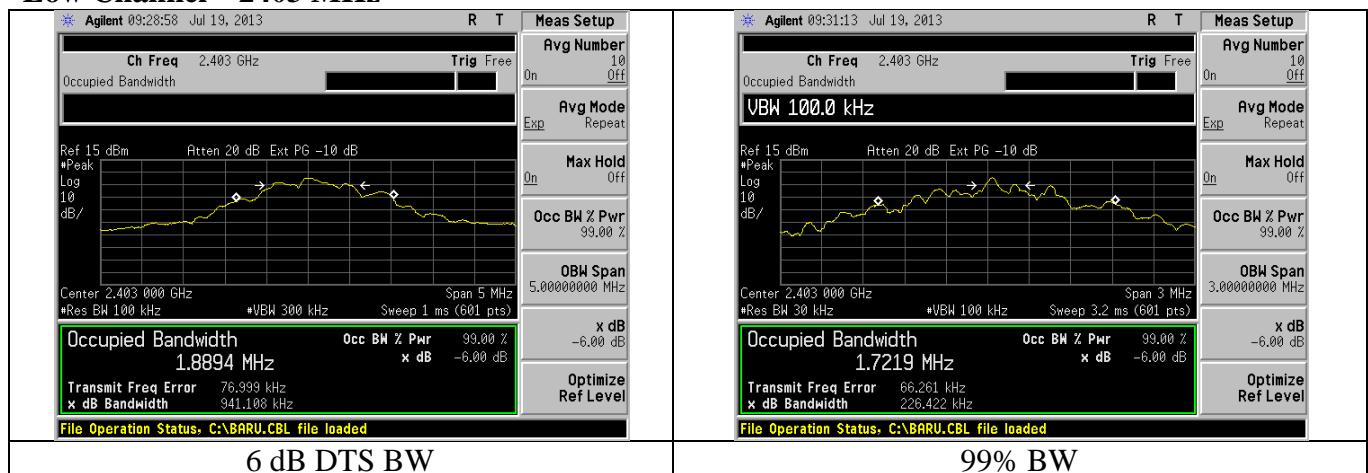
**Table**

Frequency (MHz)	6 dB DTS BW (kHz)	99 % BW (MHz)
2403	941.108	1.7219
2440	955.631	1.7316
2467	909.648	1.6552

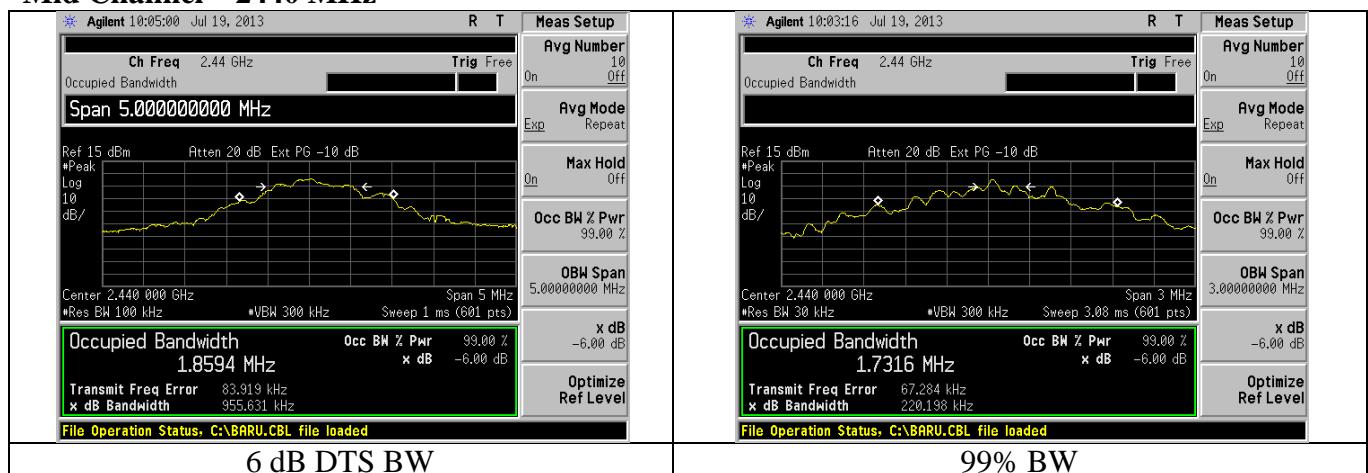
Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## Plots

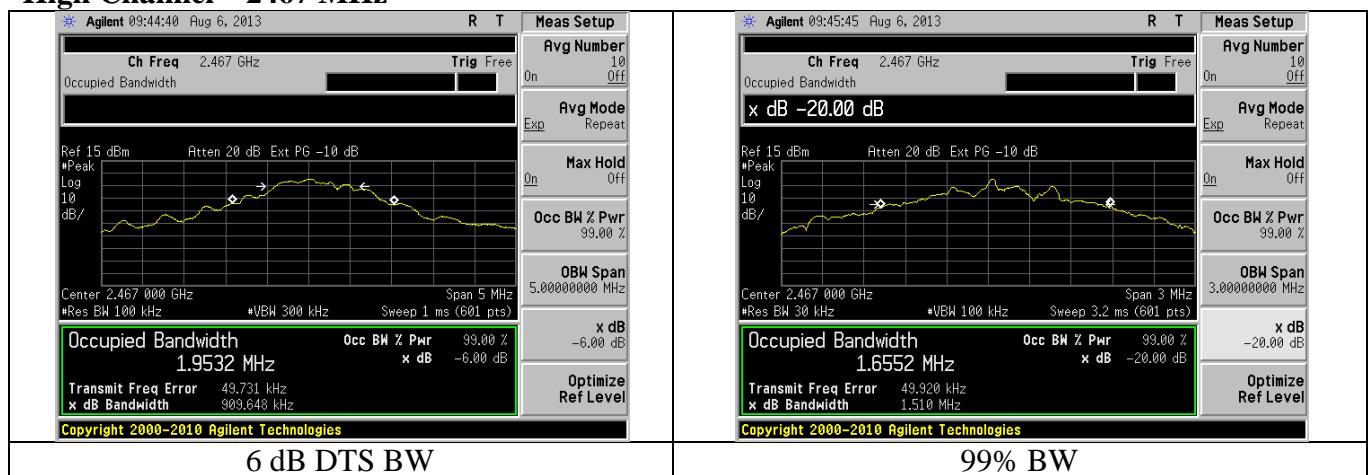
### Low Channel – 2403 MHz



### Mid Channel – 2440 MHz



### High Channel – 2467 MHz



Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

### B.1.2 – RF Conducted – Fundamental Power and Spectral Density

Manufacturer	Springs Window Fashions
Date	7-19-13 and 8-6-13
Operator	Aidi / Adam
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	15.247 / RSS-210 A8
Specific Measurement Procedure	FCC KDB 558074 Section 9.1.1 – Maximum peak conducted output power FCC KDB 558074 Section 10.2 – Peak PSD
Additional Description of Measurement	3 kHz resolution bandwidth used for Peak Power Spectral Density measurement
Additional Notes	Sample Calculation: Margin (dB) = Limit – Measured level  Continuous transmit modulated used for this test.

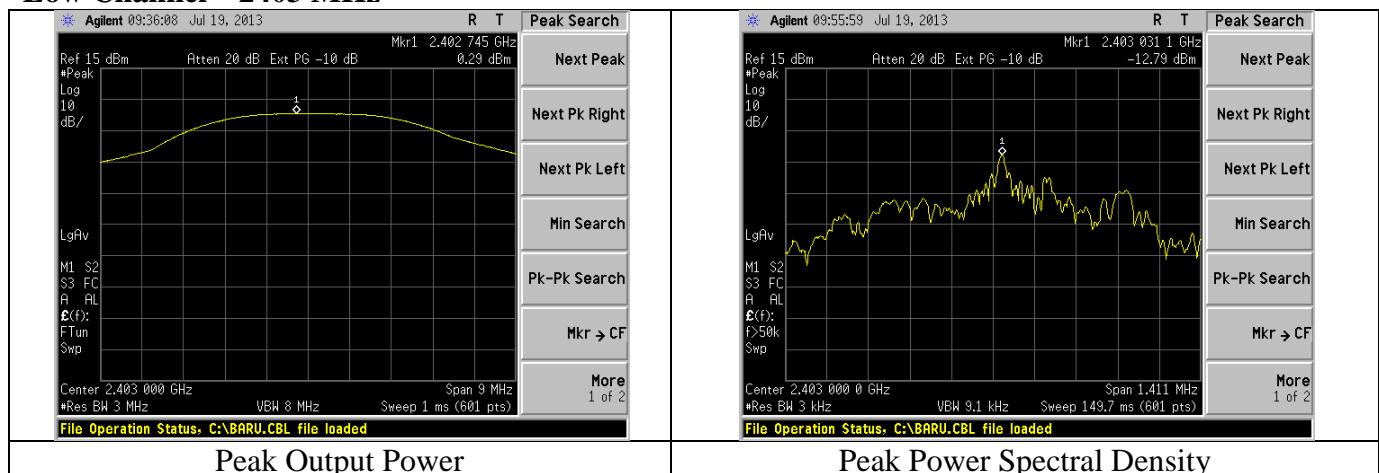
**Table**

Frequency (MHz)	Power (dBm)	PKPSD (dBm)	Limit (dBm)	Margin (dB)
2403	0.29	-12.79	8	20.79
2440	0.40	-14.18	8	22.18
2467	0.26	-12.31	8	20.31

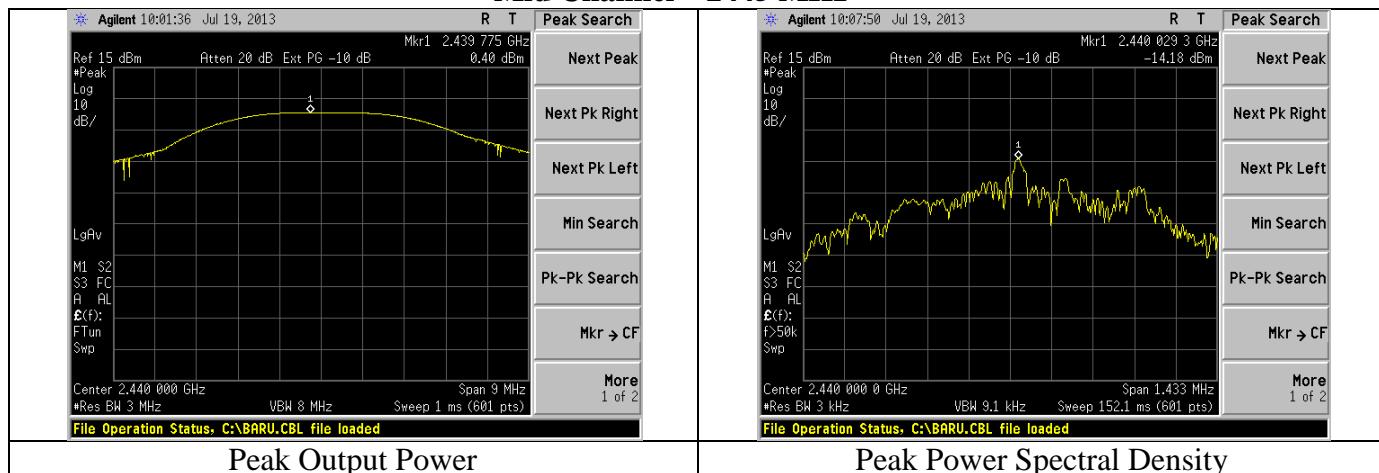
Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## Plots

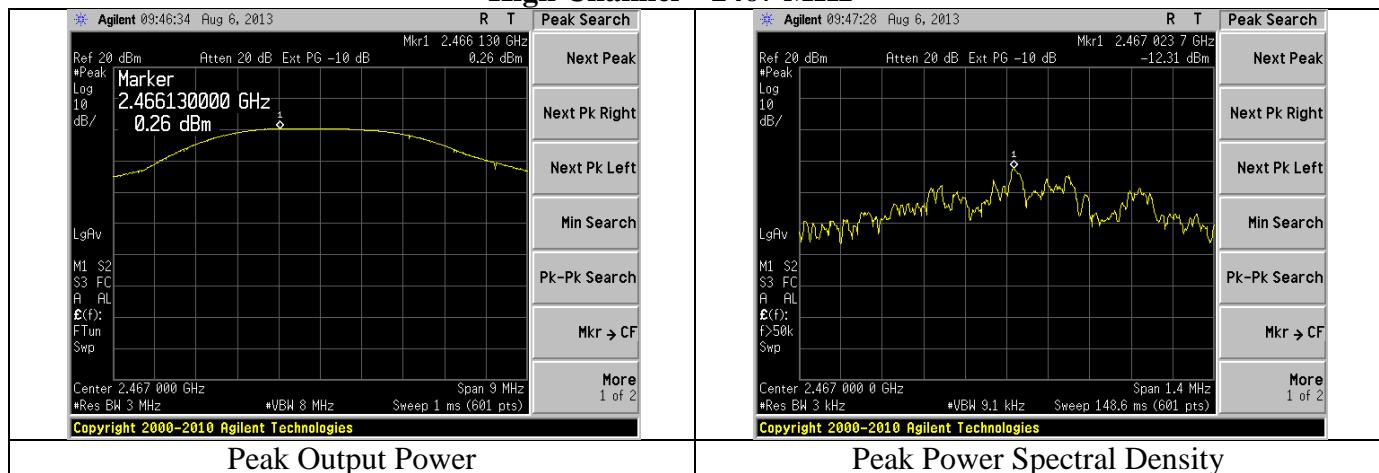
### Low Channel – 2403 MHz



### Mid Channel – 2445 MHz



### High Channel – 2467 MHz



Prepared For: Springs Window Fashions

Name: SWF Network Module

Report: TR 313038 A FCCICTX

Model: SRF-01

LSR: C-1756

Serial: N/A (engineering sample)

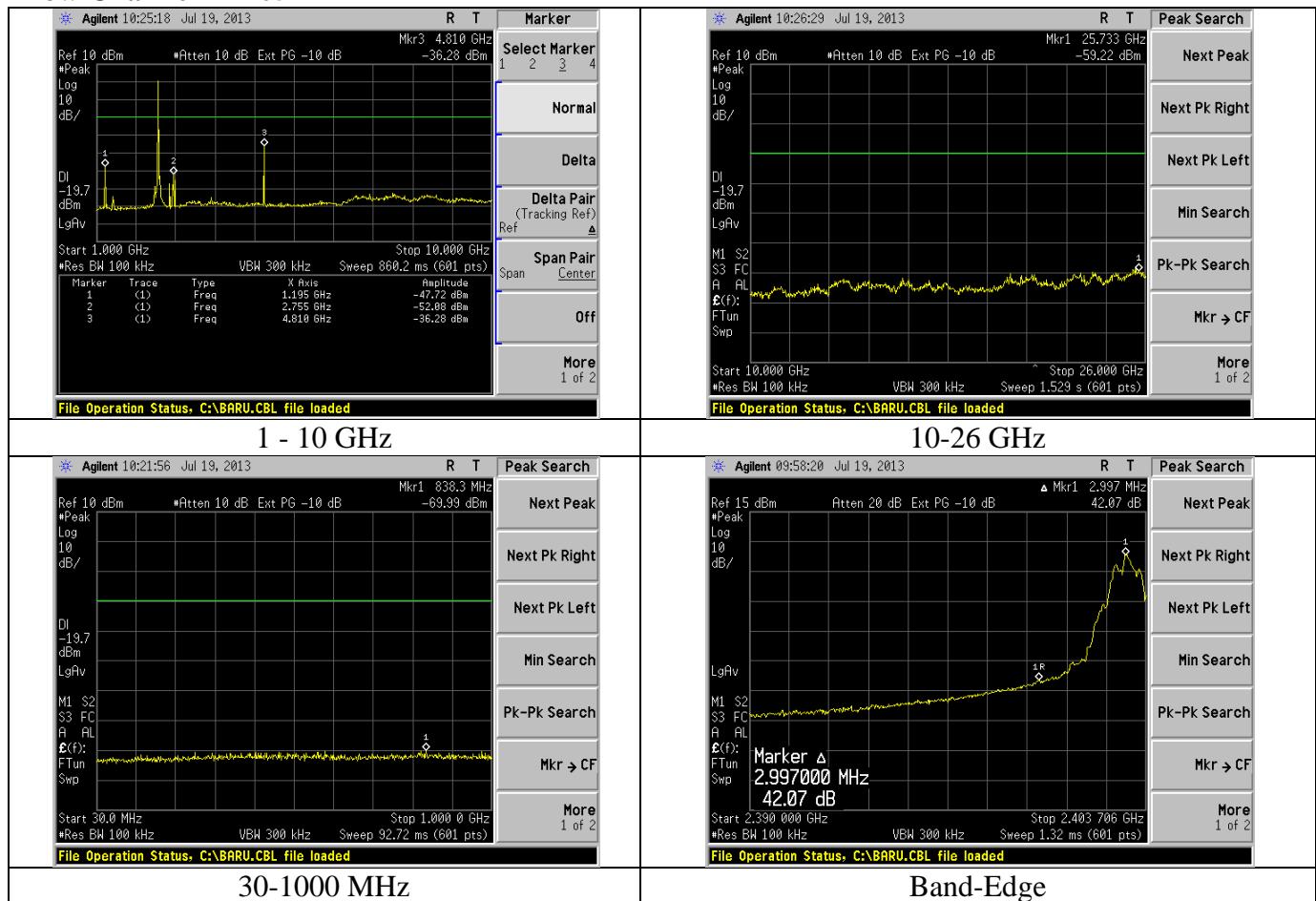
### B.1.3 – RF Conducted – Fundamental Spurious

Manufacturer	Springs Window Fashions
Date	7-19-13 and 8-6-13
Operator	Aidi / Adam
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	15.247 / RSS-210 A8
Specific Measurement Procedure	FCC KDB 558074 Section 11.0 – Emissions in non-restricted frequency bands
Additional Description of Measurement	RF Conducted Measurement
Additional Notes	No Emissions found to be within 15 dB of limit Continuous transmit modulated used for this test.

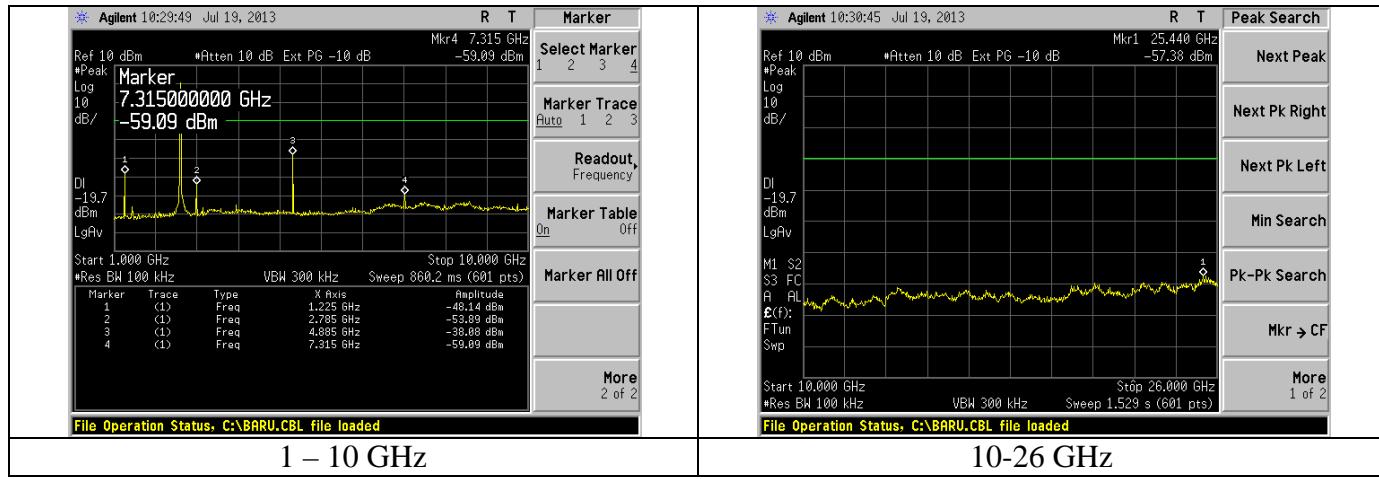
**Plots start next page**

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## Low Channel – 2405 MHz



## Mid Channel – 2440 MHz



Prepared For: Springs Window Fashions

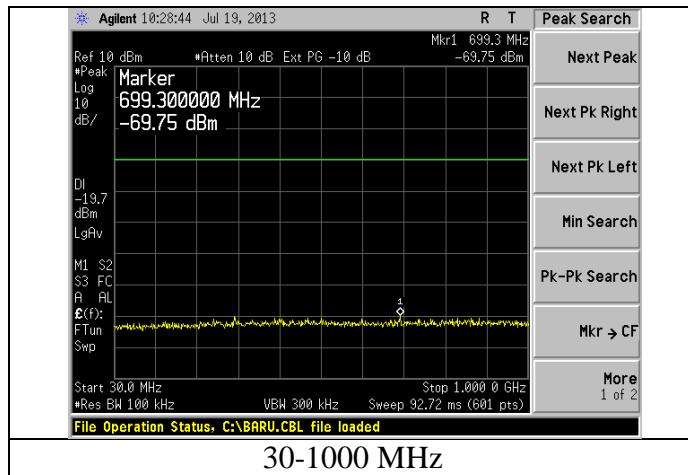
Name: SWF Network Module

Report: TR 313038 A FCCICTX

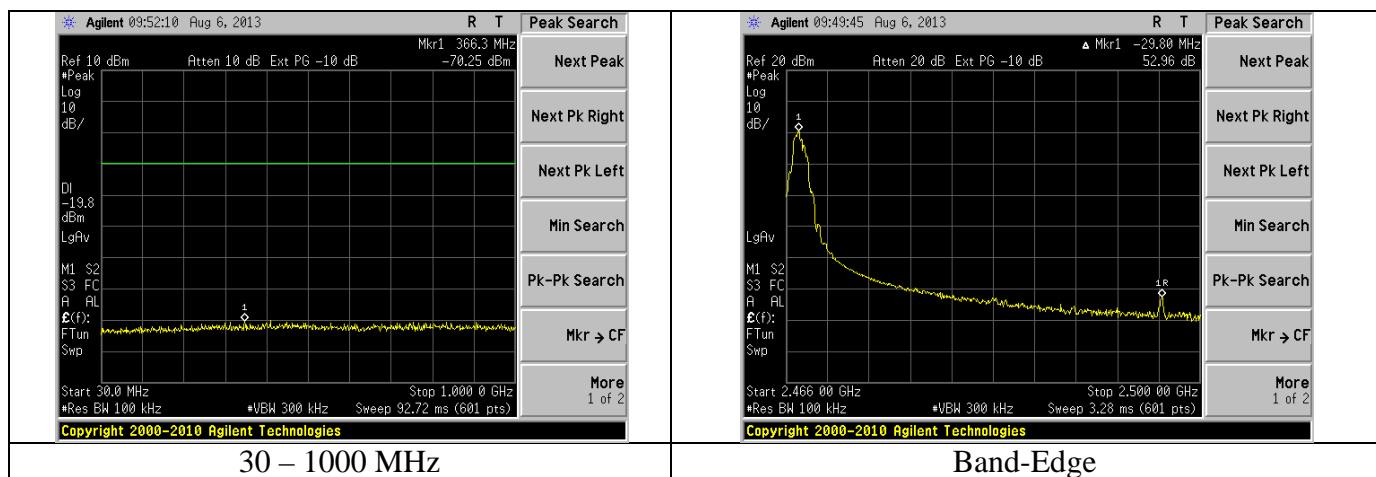
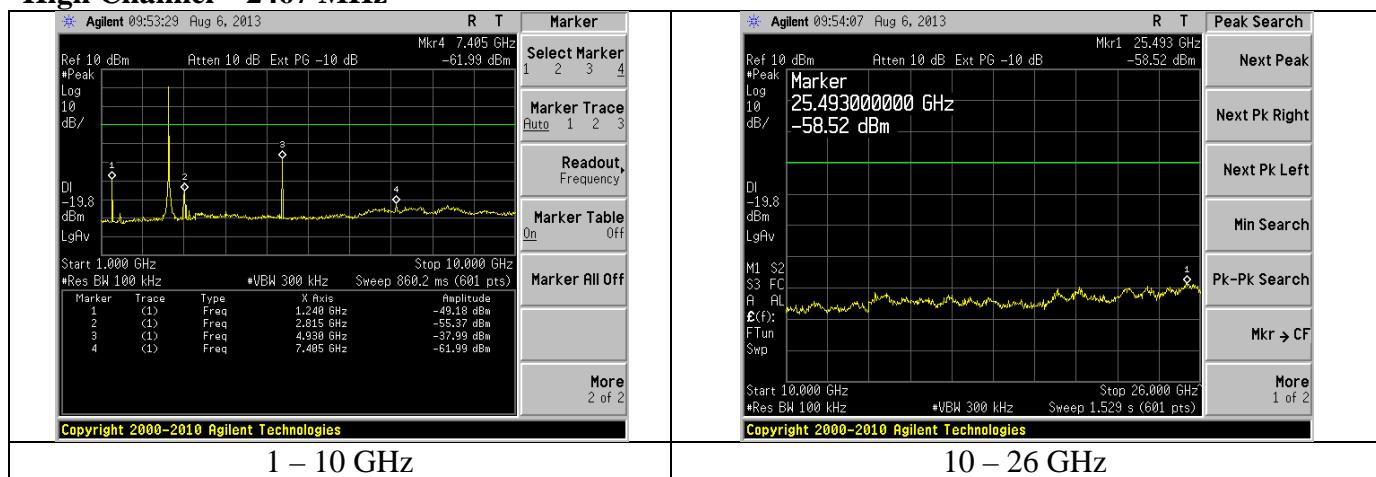
Model: SRF-01

LSR: C-1756

Serial: N/A (engineering sample)



### High Channel – 2467 MHz



Prepared For: Springs Window Fashions

Name: SWF Network Module

Report: TR 313038 A FCCICTX

Model: SRF-01

LSR: C-1756

Serial: N/A (engineering sample)

#### B.1.4 – Duty Cycle

Manufacturer	Springs Window Fashions
Date	7-27-13
Operator	Adam A
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	15.247/ 15.205 / 15.209
Measurement Procedure	ANSI C63.4 - 2003 ANSI C63.10 - 2009 Section 7.5 FCC KDB 558074 Section 6.0
Test Distance	N/A
EUT Placement	RF Conducted Measurement
Detectors	Peak; RBW 1MHz
Additional Notes	1) None

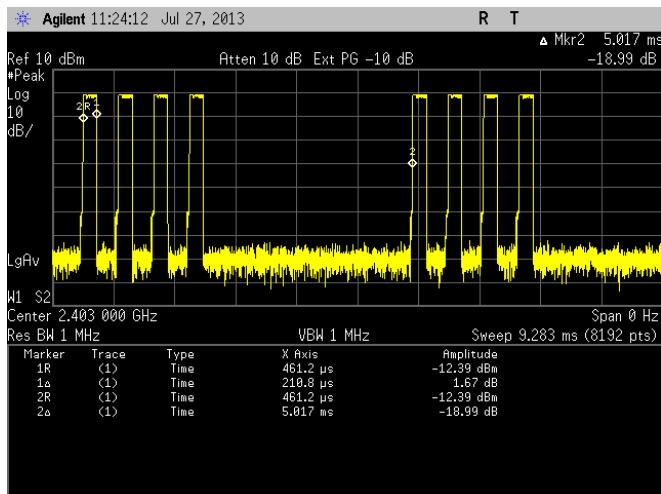
#### Example Calculation:

1 Pulse = 0.2108 ms \* 4 pulses = 0.8432 ms total on time

1 Pulse train = 5.017 ms

Duty Cycle =  $20 * \log(0.8432/5.017) = -15.5 \text{ dB}$

#### Duty Cycle Correction Factor: 15.5 dB



Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## B1.5 – Frequency Stability

Manufacturer	Springs Window Fashions
Operator	Adam A
Additional Notes	<p>The power and frequency 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 RF output power and frequency at the appropriate frequency markers. Power was supplied by an external bench-type DC power supply and was varied from the nominal.</p> <p>The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characteristics were well behaved, and the system returned to the same state of operation as before the power cycle.</p> <p>Below is data showing stability of the fundamental frequency.</p> <p>Continuous transmit modulated used for this test.</p> <p>EUT does not operate below 1.7 VDC</p>

Channel	max	min	freq drift (Hz)
Low	2403033133	2403032766	367
Mid	2440031616	2440031516	100
High	2467032133	2467032616	483

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## B.2 – Radiated Emissions

Rule Part(s)	FCC: 15.247 / 15.205 / 15.209 IC: RSS-210 A8 / RSS-210 Section 2.2					
Measurement Procedure	ANSI C63.4 - 2003 ANSI C63.10 – 2009 FCC KDB 558074 D01 DTS Meas Guidance v03r01					
Test Location	LS Research, LLC - FCC Listed 3 meter Semi-Anechoic Chamber					
Test Distance	See data section					
EUT Placement	80 cm height non-conductive table above reference ground plane					
Frequency Range of Measurement	Biconical: 30-300 MHz	Log Periodic Dipole Array: 300-1000 MHz	Double-Ridged Waveguide Horn: 1-18 GHz	Standard Gain Horn: 18-26GHz		
Measurement Detectors	30-1000MHz RBW: 120 kHz VBW: At least 300 kHz		1 - 40 GHz: RBW : 1MHz VBW: At least 3 (MHz) Peak 10 Hz Average			
Description of Measurement	1) The antenna, cable, pre-amp, and other necessary measurement system correction factors are loaded onto the EMI receiver / spectrum analyzer when the measurements are preformed. The data is gathered and reported as the corrected values.  2) The EUT is placed on a non-conductive pedestal centered on a turn-table in the test location with the antenna at the test distance from the EUT  3) Maximum radiated RF emissions are determined by rotation of azimuth and scanning the sense antenna between 1 and 4 meters in height using both horizontal and vertical antenna polarities. Maximized levels are manually noted at degree values of azimuth and at sense antenna height.					
Example Calculations	Reported Measurement data = Raw receiver measurement + Antenna Correction Factor + Cable factor (dB) - amplification factor (when applicable) + Additional factor (when applicable)					

## FCC Part 15.209 / IC RSS-210 Section 2.7 Limits:

Frequency (MHz)	3 m Limit ( $\mu$ V/m)	3 m Limit ( $\text{dB}\mu\text{V/m}$ )	Type
30-88	100	40.0	Quasi-Peak
88-216	150	43.5	Quasi-Peak
216-960	200	46.0	Quasi-Peak
Above 960	500	54.0	Average (>1 GHz)

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

### B.2.1 – Radiated Band-Edge Restricted Bands

Manufacturer	Springs Window Fashions
Date	7-18-13 and 7-31-13
Operator	Adam A
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	15.247/ 15.205 / 15.209
Measurement Procedure	ANSI C63.4 - 2003 ANSI C63.10 - 2009 FCC KDB 558074
Test Distance	3 meter (1-4 GHz)
EUT Placement	80 cm height non-conductive table centered on turn-table
Detectors	Peak; RBW 1MHz VBW 3 MHz (10Hz VBW for average measurements)
Additional Notes	<ol style="list-style-type: none"> <li>1) Tested in the worst case of continuous transmit modulated mode with EUT in three orientations at maximum power.</li> <li>2) EUT maximized in azimuth and antenna height with maximum results reported.</li> </ol>

#### Example Calculation:

FCC 15.209 Peak Limit @ 3 meter (dB $\mu$ V/m) – Peak Reading (dB $\mu$ V/m) = Peak Margin

Peak Reading (dB $\mu$ V/m) – Duty Cycle (dB) = Calculated Average (dB $\mu$ V/m)

FCC 15.209 Average Limit @ 3 meter (dB $\mu$ V/m) – Calculated Average (dB $\mu$ V/m) = Average Margin

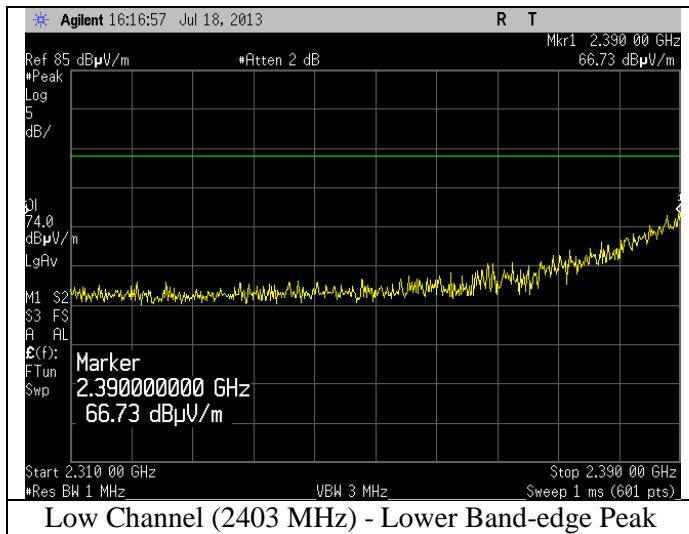
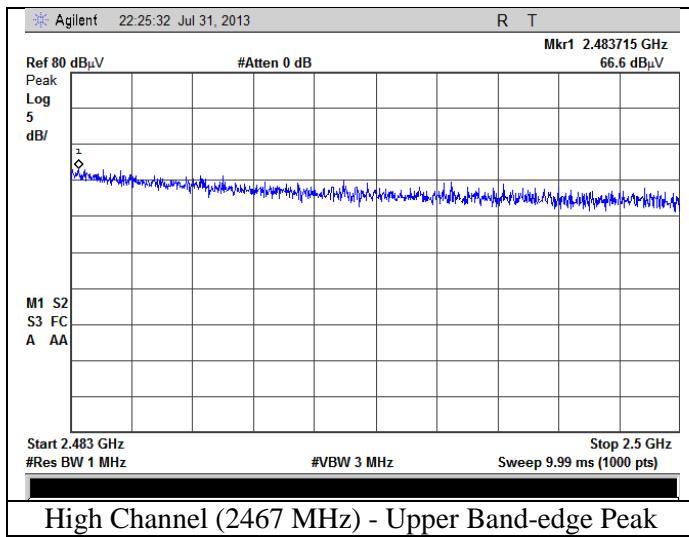
#### Data Table

Channel (MHz)	Peak Emission (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Peak Margin (dB)	Duty Cycle <sup>1</sup> (dB)	Calculated Average (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Average Margin (dB)
2403	66.7	74.0	7.3	15.5	51.2	54.0	2.8
2467	66.6	74.0	7.4	15.5	51.1	54.0	2.9

**Note 1:** See section B1.4 for duty cycle calculation

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## Plots



Prepared For: Springs Window Fashions

Name: SWF Network Module

Report: TR 313038 A FCCICTX

Model: SRF-01

LSR: C-1756

Serial: N/A (engineering sample)

## B.2.2 – Radiated Harmonics in Restricted Bands

Manufacturer	Springs Window Fashions
Date	7-18-13 and 8-6-13
Operator	Mike H / Adam A
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	15.247/ 15.205 / 15.209
Measurement Procedure	ANSI C63.4 - 2003 ANSI C63.10 - 2009
Test Distance	1 meter 4-26 GHz
EUT Placement	80 cm height non-conductive table centered on turn-table
Detectors	Peak; RBW 1 MHz Average VBW (10Hz)
Additional Notes	<ol style="list-style-type: none"> <li>1) Tested in worst case continuous transmit modulated mode with EUT in three orientations at maximum power.</li> <li>2) Maximum results reported.</li> <li>3) Tested at 1 meter test distance so a distance correction factor of 9.5 added to 3 meter limit</li> <li>4) Peak measurements meet average limits</li> </ol>

### Example Calculation:

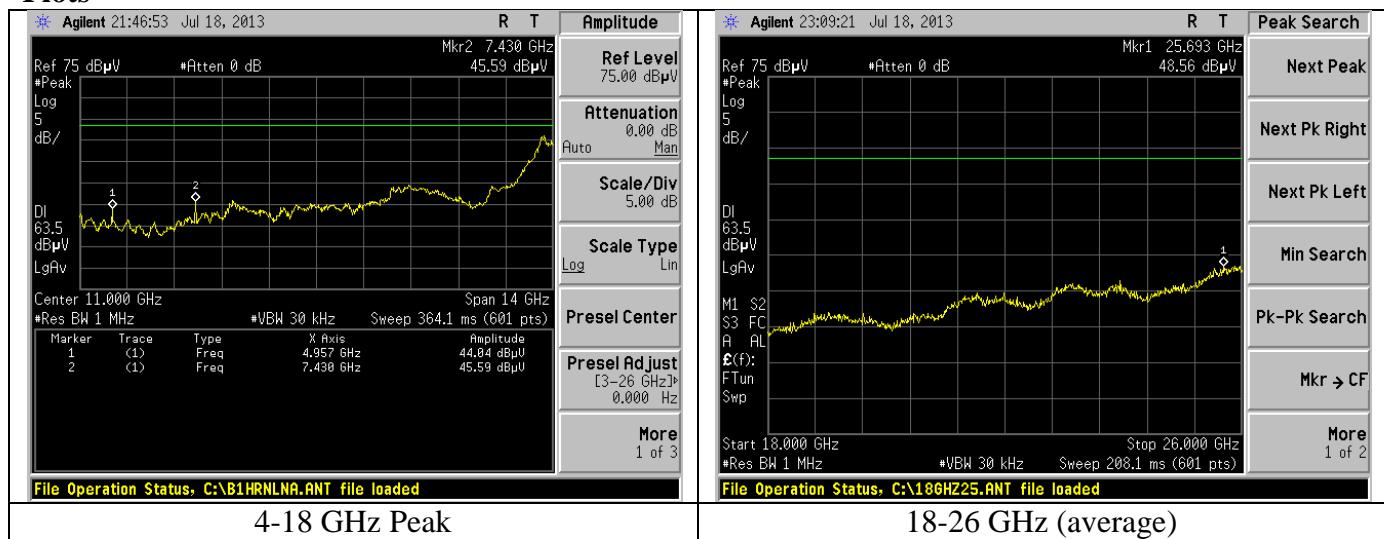
FCC 15.209 Average Limit @ 1 meter (dB $\mu$ V/m) – Peak Reading (dB $\mu$ V/m) = Margin

### Data Table

Channel	Frequency (MHz)	Height (m)	Azimuth (degree)	Peak Reading (dB $\mu$ V/m)	Avg Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Polarity	EUT orientation
Low	4806	1.00	179	50.15	63.50	13.35	Horizontal	Vertical
Mid	4880	1.00	157	52.91	63.50	10.59	Horizontal	Flat
	7320	1.04	92	52.67	63.50	10.83	Vertical	Horizontal
High	4934	1.00	170	52.10	63.50	11.40	Horizontal	Flat
	7401	1.00	75	52.78	63.50	10.72	Vertical	Horizontal

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## Plots



Prepared For: Springs Window Fashions

Name: SWF Network Module

Report: TR 313038 A FCCICTX

Model: SRF-01

LSR: C-1756

Serial: N/A (engineering sample)

### B.2.3 – Radiated Emissions Transmit Mode

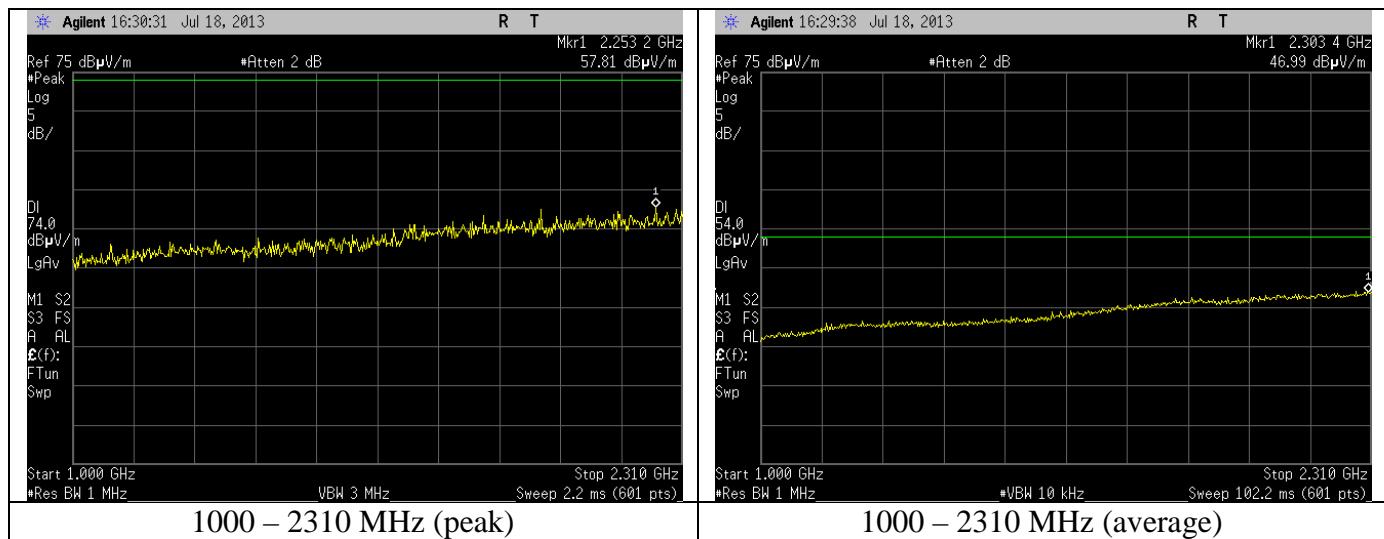
Manufacturer	Springs Window Fashions
Date	7-18-13
Operator	Adam A / Peter F / Mike H
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	15.247/ 15.205 / 15.209
Measurement Procedure	ANSI C63.4 - 2003 ANSI C63.10 - 2009
Test Distance	3 meter 30-4000 MHz
EUT Placement	80 cm height non-conductive table centered on turn-table
Detectors	Peak; RBW 1 MHz
Additional Notes	<ol style="list-style-type: none"><li>1) Tested in continuous transmit modulated mode with EUT in three orientations at maximum power.</li><li>2) Peak detector with max hold in vertical and horizontal antenna polarizations</li><li>3) No emissions found associated with EUT</li></ol>

#### Example Calculation:

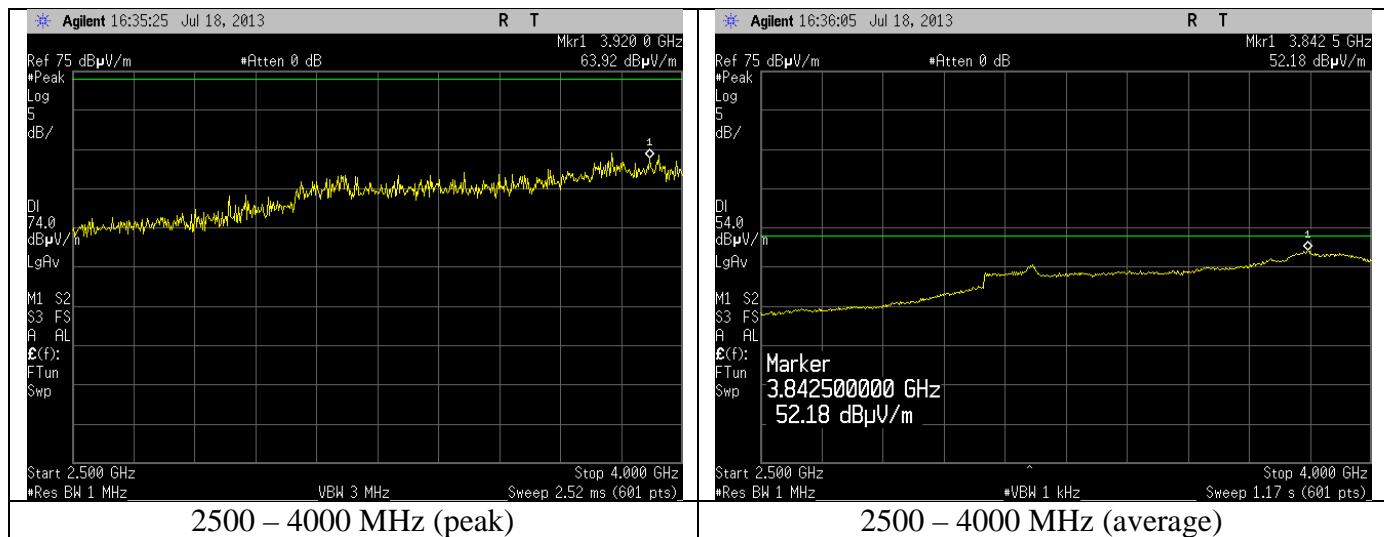
$$\text{Limit (dB}\mu\text{V/m)} - \text{Reading (dB}\mu\text{V/m)} = \text{Margin}$$

Plots start next page

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)



Note: See band-edge section for 2310 – 2400 MHz and 2483.5 - 2500 MHz



Prepared For: Springs Window Fashions

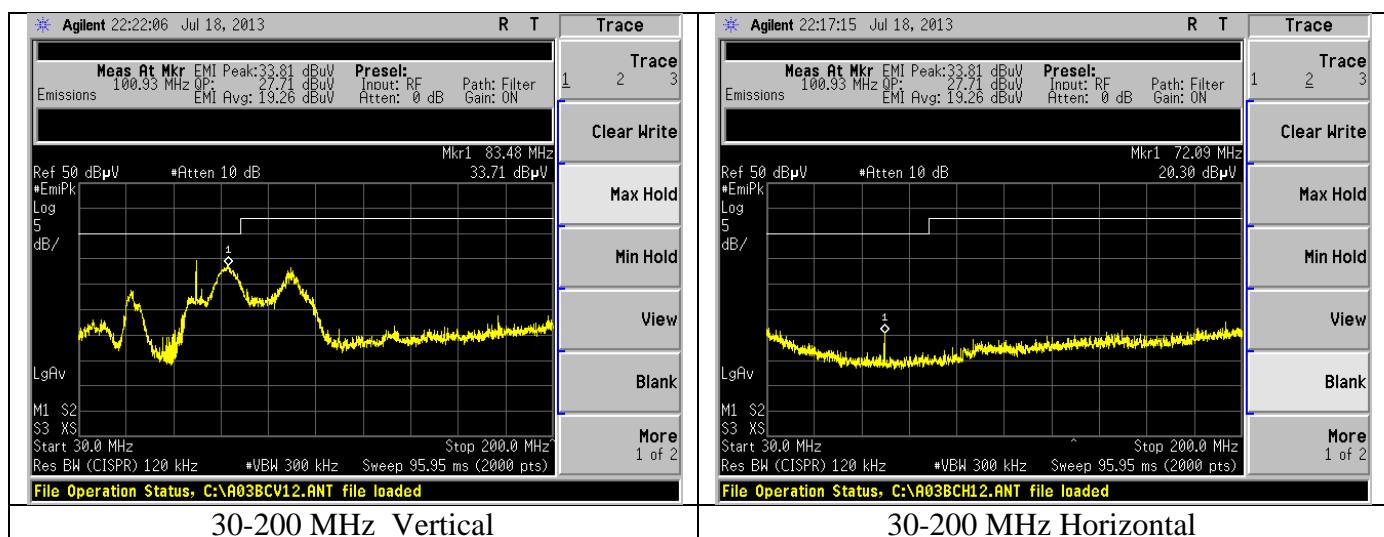
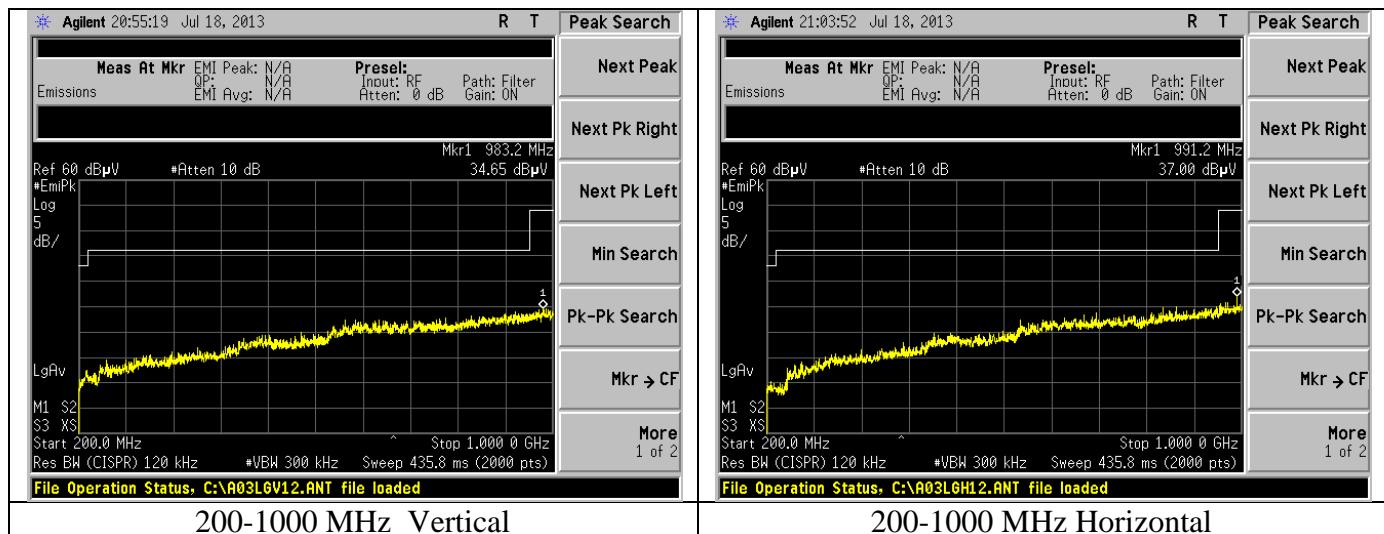
Name: SWF Network Module

Report: TR 313038 A FCCICTX

Model: SRF-01

LSR: C-1756

Serial: N/A (engineering sample)



Note: Emissions determined not associated with radio and a result of DC bench supply.

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

### B.3 – Radiated Emissions Receive Mode

Manufacturer	Springs Window Fashions
Date	7-18-13 and 7-19-13
Operator	Mike H / Adam A
Temp. / R.H.	20 - 25° C / 30-60% R.H.
Rule Part	15.247/ 15.205 / 15.209
Measurement Procedure	ANSI C63.4 - 2003 ANSI C63.10 - 2009
Test Distance	3 meter 30-4000 MHz
EUT Placement	80 cm height non-conductive table centered on turn-table
Detectors	Peak; RBW 1 MHz
Additional Notes	1) Tested in continuous receive mode with EUT in three orientations at maximum power. 2) Maximum results reported

#### Example Calculation:

$$\text{Limit (dB}\mu\text{V/m)} - \text{Reading (dB}\mu\text{V/m)} = \text{Margin}$$

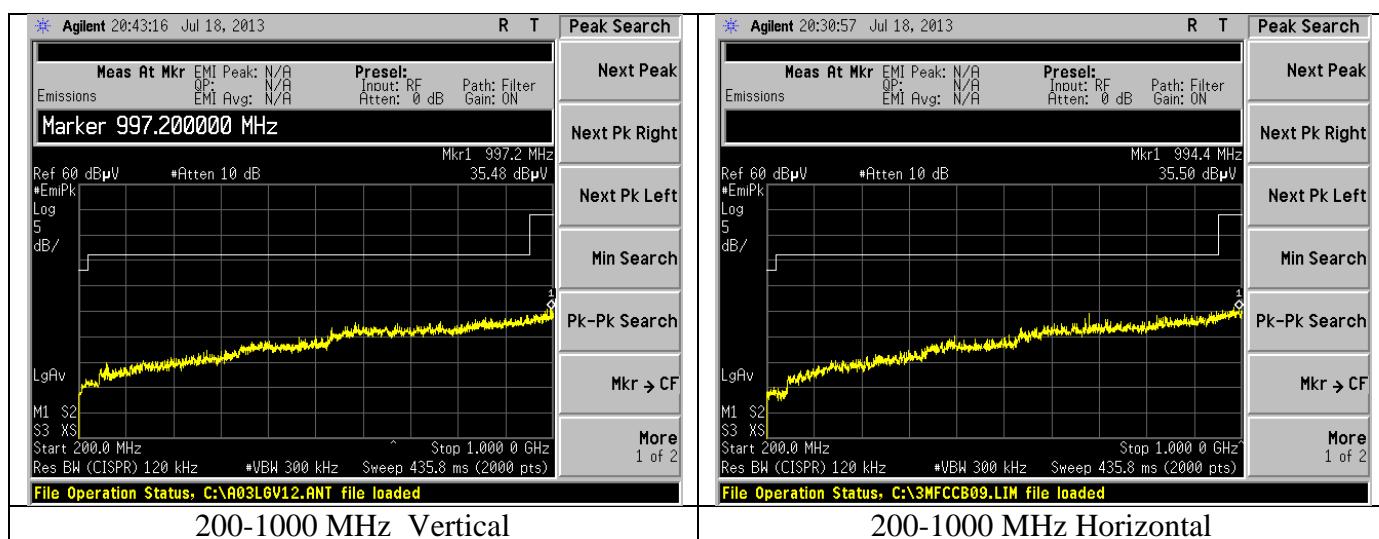
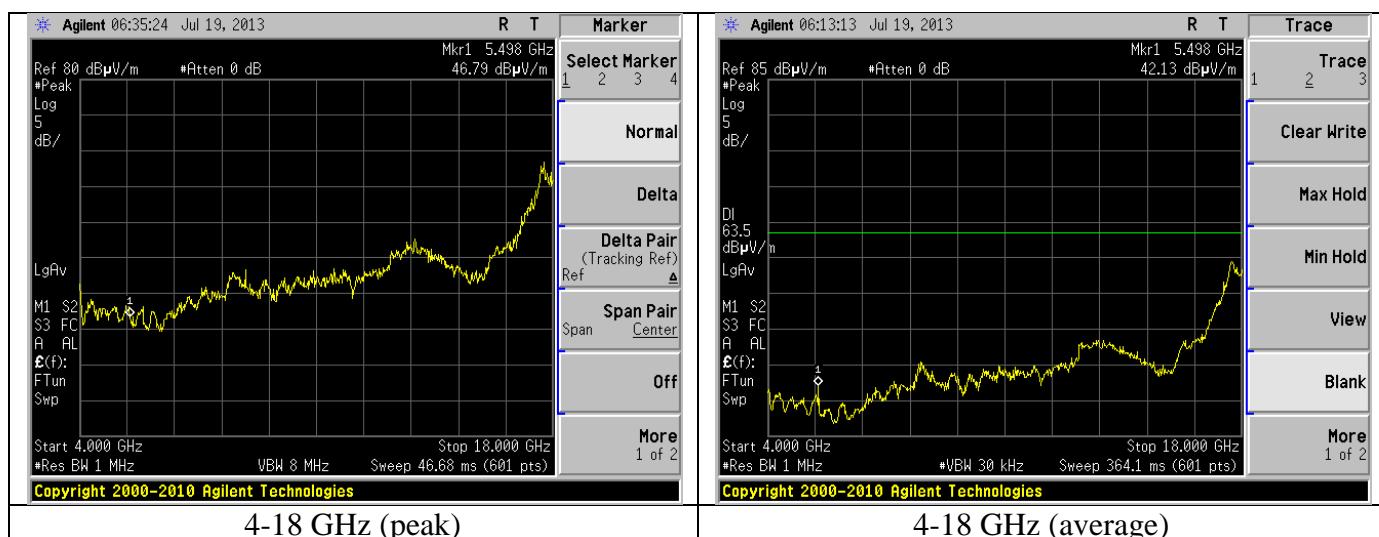
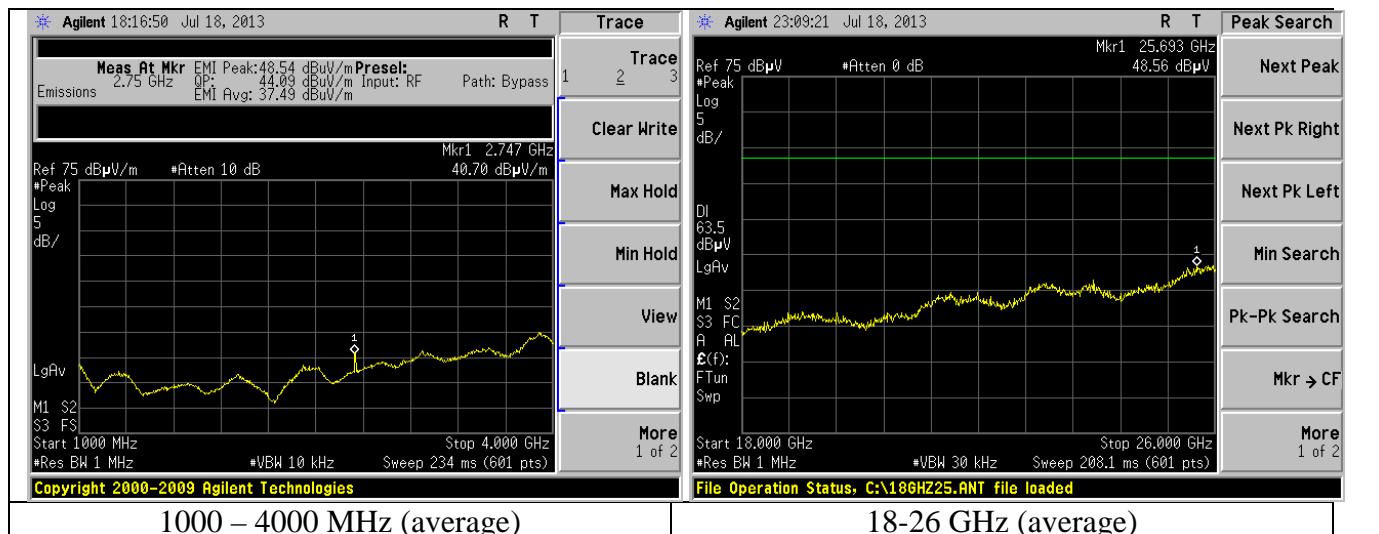
**Table 30-1000 MHz**

Frequency (MHz)	Height (m)	Azimuth (degree)	Quasi Peak Reading (dB $\mu$ V/m)	Quasi Peak Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Polarity	EUT orientation
100.9	1.00	0	27.71	43.5	15.8	V	FLAT

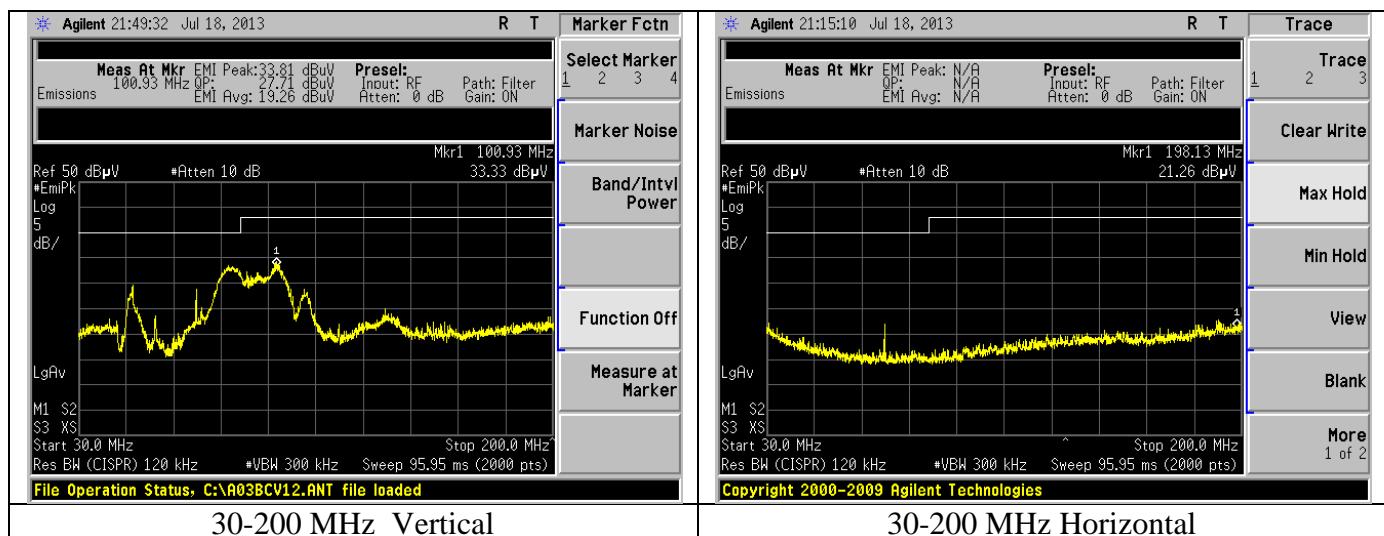
Note: Emission determined not associated with EUT and a result of DC bench supply

Frequency (GHz)	Height (m)	Azimuth (degree)	Peak Reading (dB $\mu$ V/m)	Average Reading (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Polarity	EUT orientation	EUT Channel
2749.0	1.00	135	49.93	40.21	54.0	13.8	H	F	LOW
2749.0	1.00	135	49.84	40.46	54.0	13.5	H	V	LOW
2791.0	1.25	175	50.23	39.67	54.0	14.3	H	V	MID
2791.0	1.00	138	49.47	39.83	54.0	14.2	H	F	MID
2830.0	1.00	139	49.56	38.52	55.0	16.5	H	F	HIGH

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)



Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)



Note: Emissions determined not associated with radio and a result of DC bench supply.

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## B.4 – AC Mains Conducted Emissions

### 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 cable was plugged into a Line Impedance Stabilization Network (LISN). The AC power supply of 120V was provided via an appropriate broadband EMI Filter, and then to the LISN line input. 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 EMI Receiver. The LISN used has the ability to terminate the unused port with a  $50\Omega$  (ohm) load when switched to either L1 (line) or L2 (neutral).

### 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 was as specified for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30 MHz. Final readings were then taken and recorded.

#### Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dB $\mu$ V)		Measuring Bandwidth
	Quasi-Peak	Average	
0.150 -0.50 *	66-56	56-46	RBW = 9 kHz
0.5 – 5.0	56	46	
5.0 – 30	60	50	

\* The limit decreases linearly with the logarithm of the frequency in this range.

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## Test Data

Manufacturer:	Springs Window Fashions				
Date(s) of Test:	7-19-13				
Test Engineer:	Adam A				
Voltage:	120 VAC 60Hz supplying 3.3 VDC to module				
Operation Mode:	Tested in continuous transmit modulated and receive mode – worst case reported (no difference in emissions)				
Environmental Conditions in the Lab:	Temperature: 71°F Relative Humidity: 40%				
Test Location:	X	AC Mains Test area			Chamber
EUT Placed On:	X	40cm from Vertical Ground Plane			10cm Spacers
	X	80cm above Ground Plane			Other:
Measurements:		Pre-Compliance		Preliminary	X Final
Detectors Used:	X	Peak		Quasi-Peak	Average

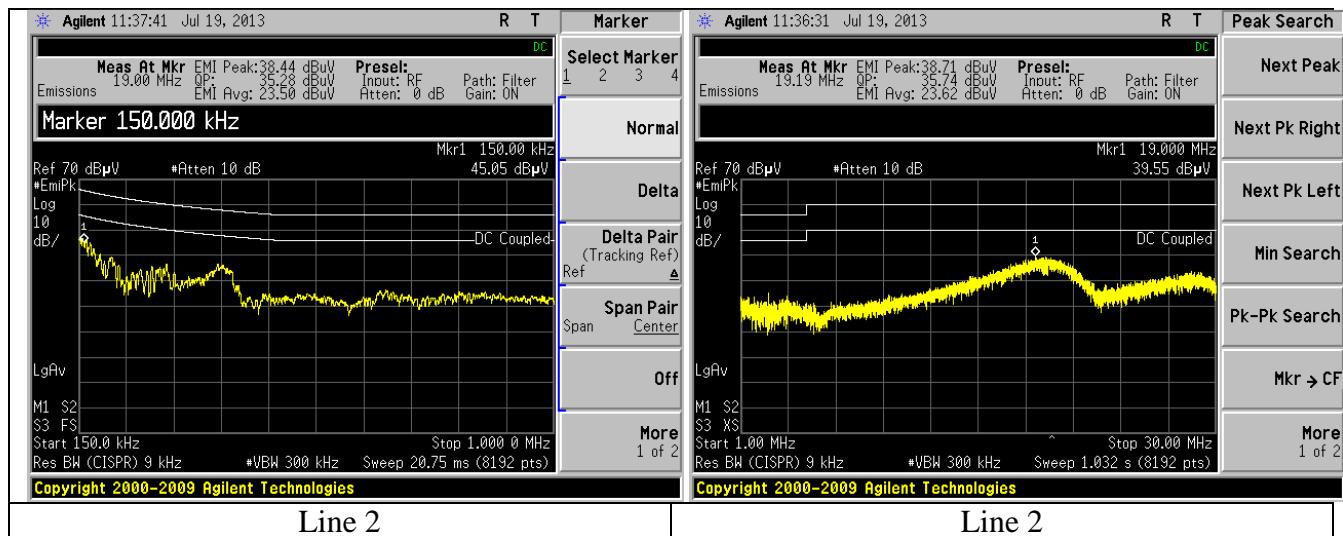
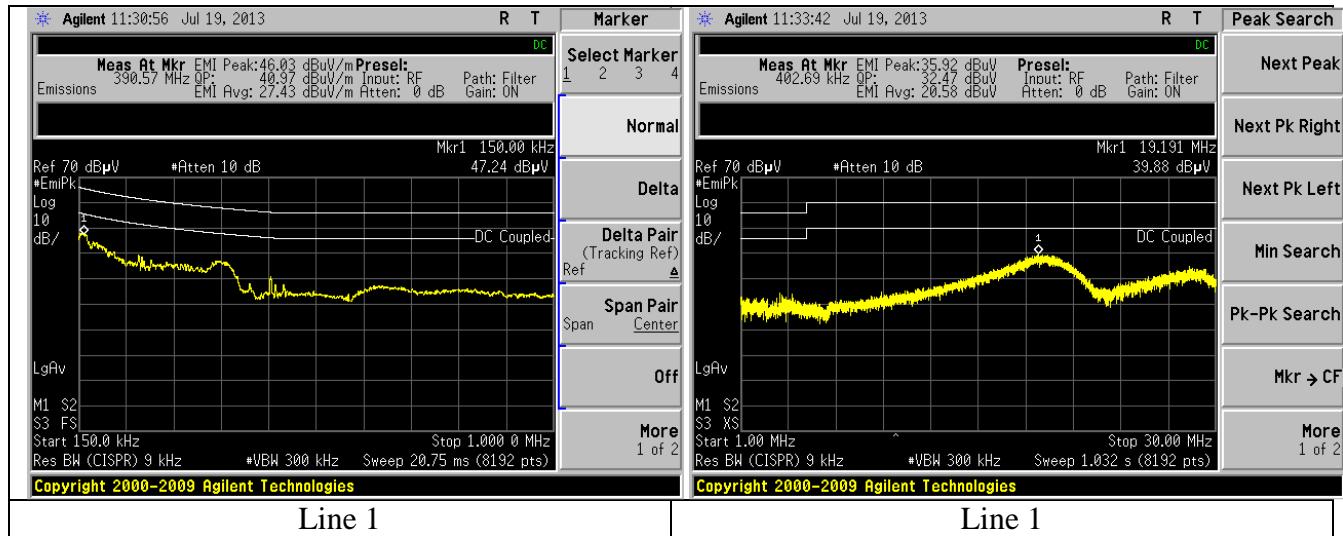
### Sample Calculation:

$$\text{Margin (dB)} = \text{Limit (dB}\mu\text{V)} - \text{Reading (dB}\mu\text{V)}$$

Frequency (MHz)	Line	Q-Peak Reading (dB $\mu$ V)	Q-Peak Limit (dB $\mu$ V)	Quasi-Peak Margin (dB)	Average Reading (dB $\mu$ V)	Average Limit (dB $\mu$ V)	Average Margin (dB)
0.150	L1	45.72	66.00	20.28	22.30	56.00	33.70
0.402	L1	32.47	57.81	25.34	20.58	47.81	27.23
19.190	L1	35.74	60.00	24.26	23.62	50.00	26.38
19.000	L2	32.23	60.00	27.77	23.50	50.00	26.50
0.150	L2	41.79	66.00	24.21	18.77	56.00	37.23
0.402	L2	32.81	57.81	25.00	20.73	47.81	27.08

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

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).



Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## Appendix C - Uncertainty Summary

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	4.82 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.88 dB
Radiated Emissions	3-Meter Chamber, Horn Antenna	4.85 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.32 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.63 dB
Absolute Conducted Emissions	Agilent PSA/ESA Series	1.38 dB
AC Line Conducted Emissions	Shielded Room/EMCO LISN	3.20 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	2.05 Volts/Meter
Conducted Immunity	3 Volts level	2.33 V
EFT Burst, Surge, VDI	230 VAC	54.4 V
ESD Immunity	Discharge at 15kV	3200 V
Temperature/Humidity	Thermo-hygrometer	0.64°/ 2.88 %RH

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## Appendix D - References

Publication	Year	Title
FCC CFR Parts 0-15	2013	Code of Federal Regulations – Telecommunications
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.
RSS-210 Annex 8	2010	Low-power License-exempt Radio communication Devices (All Frequency Bands): Category I Equipment
RSS-GEN Issue 3	2010	General Requirements and Information for the Certification of Radio Apparatus
ANSI C63.10	2009	American National Standard for Testing Unlicensed Wireless Devices
FCC KDB 558074 D01 DTS Meas Guidance v03r01	2013	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)

## END OF REPORT

Date	Version	Comments	Person
8-6-13	V0	Initial Draft Release	Adam A
10-17-13	V1	Final Release	Adam A

Prepared For: Springs Window Fashions	Name: SWF Network Module
Report: TR 313038 A FCCICTX	Model: SRF-01
LSR: C-1756	Serial: N/A (engineering sample)