

**EMC QUALIFICATION  
TEST REPORT**

**ELECTRONIC SOLUTIONS, INC.  
A HUNTER DOUGLAS COMPANY**

**PUCK,  
RF SWITCH INTRFC**

**FCC ID# P7RRFSWTINTRFC**

TESTED TO CONFORM WITH:

☒ **EMISSIONS STANDARDS**

FOR

**INDUSTRIAL, SCIENTIFIC AND MEDICAL (ISM)**

Test Report Number: 110720-1717FCC

Date of Test Completion: July 20, 2012

Manufacturer's Address: 1355 Horizon Ave  
Lafayette, CO 80026

Phone: (303) 469-9322

Approved by:



Laboratory Director

**DOCUMENT REVISION HISTORY**

REVISION #	REPORT NUMBER	DESCRIPTION OF REVISION	DATE OF REVISION
0	110720-1717FCC	ORIGINAL REPORT	2012-07-13
1	110720-1717FCC	ADDED ADDITIONAL TEST DATA	2012-07-25
2	110720-1717FCC	ADDED TEST PROCEDURE AND CORRECTED TEST DATA	2012-09-12

**CONFIDENTIAL AND PROPRIETARY**

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Total liability is limited to the amount invoiced for the testing of this EUT and the contents of this report are not warranted.

Compliance with the appropriate governmental standards is the responsibility of the manufacturer.

Any questions regarding this report should be directed to:

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# EMC QUALIFICATION TEST REPORT

## PUCK, RF SWITCH INTRFC

### 1.0 EXECUTIVE SUMMARY

#### 1.1 PURPOSE

The purpose of this report is to present EMC test data and demonstrate conformity to the requirements of the prescribed standards for Emissions and/or Immunity.

#### 1.2 CONFORMITY

The test article was tested to the standards listed in Table I with the indicated conformity status. All test methods were performed in accordance to with the standards listed.

TABLE I. EMISSIONS CONFORMITY SUMMARY

TEST TYPE	COMPLIANCE STANDARD	TESTING TECHNIQUE	TEST DESCRIPTION	PRODUCT CLASSIFICATION	CONFORMITY STATUS
EMISSIONS	<u>FCC Part 15</u>	<input checked="" type="checkbox"/> <u>Publication 558074</u>	Unintentional Radiated Emissions	Class B	<b>PASSED</b>
		<input checked="" type="checkbox"/> <u>FCC Part 15.109</u> <input checked="" type="checkbox"/> <u>FCC Part 15.205</u> <input checked="" type="checkbox"/> <u>FCC Part 15.209</u> <input checked="" type="checkbox"/> <u>FCC Part 15.247</u>	Intentional Radiated Emissions		<b>PASSED</b>

#### 1.3 EQUIPMENT UNDER TEST (EUT)

EUT NAME(S): **Puck**

MODEL NUMBER(S): **RF SWITCH INTRFC**

POWER SOURCE(S): **BATTERY POWERED DEVICE**

## 2.0 EMISSIONS TEST STANDARDS

FCC Part 15

Class B

### 2.1 ☒ RECEIVER SPURIOUS & UNINTENTIONAL RADIATED EMISSIONS – 30 MHZ TO 1000 MHZ

Measurements for *Radiated Emissions* were performed with the transceiver in receive mode over the frequency range of 30 MHz to 1000 MHz in the horizontal and vertical antenna polarities to the requirements of:

#### FCC Part 15.109

##### Testing Conditions

Date of Test: June 21, 2012  
Temperature: 22° C  
Relative Humidity: 40%  
Test Voltage: Battery  
Test Operator: SP

##### Test Location

**Criterion Technology Open Area Test Site**

##### Test Distance

Antenna Distance: **3 meter(s)**      **Final Measurement(s)**

##### Test Equipment

- ☒ Rohde and Schwarz Receiver, ESVS-30      ☒ Hewlett-Packard Quasi-Peak Detector, HP 85650A
- ☒ Mini Circuits Pre-Amp #2
- ☒ Chase BiLog Antenna, Model 1121

Test Accessories: See Appendix C for support equipment details

##### Test Results of Radiated Emissions

Test Status: **PASSED**

Frequency Range: **30 MHz to 1000 MHz**

Minimum Margin to Limit **-11.07** dB at **79.9963** MHz

Uncertainty Horizontal under 200 MHz: **4.64** dB  
Uncertainty Horizontal over 200 MHz: **4.04** dB  
Uncertainty Vertical under 200 MHz: **4.85** dB  
Uncertainty Vertical over 200 MHz: **4.64** dB

Detector: **Peak**

Resolution Bandwidth: **100 kHz**

Measured iaw FCC publication KDB 558074 para. 5.4.1 and 5.4.2

##### Remarks

See: **APPENDIX A** for EUT Photographs  
**APPENDIX B** for Data Sheets  
**APPENDIX D** for Test Equipment Calibration Status

**2.2** ☒ **RECEIVER SPURIOUS & UNINTENTIONAL RADIATED EMISSIONS**

Measurements for *Radiated Emissions* were performed with transceiver in receive mode over the frequency range of 1 GHz to 12.5 GHz with horizontal and vertical antenna polarities to the requirements of:

**FCC Part 15.109**Testing Conditions

Date of Test: July 20, 2012  
Temperature: 21° C  
Relative Humidity: 41 %  
Test Voltage: Battery  
Test Operator: SP

Test Location**Criterion Technology Open Area Test Site**Test Distance

Antenna Distance: **3 meter(s)**      **Final Measurement(s)**

Test Equipment

<input checked="" type="checkbox"/> HP8566B Spectrum Analyzer	<input checked="" type="checkbox"/> Hewlett-Packard Quasi-Peak Adapter, HP 85650A
<input checked="" type="checkbox"/> Mini Circuits Pre-Amp #2	<input checked="" type="checkbox"/> Veratech Pre-Amp #3
<input checked="" type="checkbox"/> Chase BiLog Antenna, Model 1121	<input checked="" type="checkbox"/> Antenna Research, Horn Antenna, Model DRG118/A

Test Results of Radiated Emissions

Test Status: **PASSED**      Frequency Range: **1 GHz to 12.5 GHz**

Minimum Margin to Limit **-10.15** dB at **2404.9680** MHz

Detector: **Peak**

Resolution Bandwidth: **100 kHz**

Measured iaw FCC publication KDB 558074 para. 5.4.1 and 5.4.2

Remarks

See: **APPENDIX A** for EUT Photographs  
**APPENDIX B** for Data Sheets  
**APPENDIX D** for Test Equipment Calibration Status

**2.3 ☒ TRANSMITTER SPURIOUS & UNINTENTIONAL RADIATED EMISSIONS**

Measurements for *Radiated Emissions* were performed with transceiver in transmit mode over the frequency range of 30 MHz to 12.5 GHz with horizontal and vertical antenna polarities to the requirements of:

**FCC Part 15.247**Testing Conditions

Date of Test: July 20, 2012  
Temperature: 21° C  
Relative Humidity: 41 %  
Test Voltage: Battery  
Test Operator: SP

Test Location**Criterion Technology Open Area Test Site**Test Distance

Antenna Distance: **3 meter(s)**      **Final Measurement(s)**

Test Equipment

<input checked="" type="checkbox"/> HP8566B Spectrum Analyzer	<input checked="" type="checkbox"/> Hewlett-Packard Quasi-Peak Adapter, HP 85650A
<input checked="" type="checkbox"/> Mini Circuits Pre-Amp #2	<input checked="" type="checkbox"/> Veratech Pre-Amp #3
<input checked="" type="checkbox"/> Chase BiLog Antenna, Model 1121	<input checked="" type="checkbox"/> Antenna Research, Horn Antenna, Model DRG118/A

Test Results of Radiated Emissions

Test Status: **PASSED**      Frequency Range: **30 MHz to 12.5 GHz**

No Spurs found within 20dB of the FCC 47 CFR Part 15.247(d) limit from 30 MHz to 12.5 GHz (5<sup>th</sup> harmonic)

Detector: **Peak**

Resolution Bandwidth: **100 kHz**

Measured iaw FCC publication KDB 558074 para. 5.4.1 and 5.4.2

Remarks

See: **APPENDIX A** for EUT Photographs  
**APPENDIX B** for Data Sheets  
**APPENDIX D** for Test Equipment Calibration Status

## 2.4 BANDEDGE

Measurements for *Bandedge* were performed with transceiver in transmit mode over the frequency range of 2310 MHz to 2500 MHz with horizontal and vertical antenna polarities to the requirements of:

### FCC Part 15.247

#### Testing Conditions

Date of Test: July 20, 2012  
Temperature: 21° C  
Relative Humidity: 41 %  
Test Voltage: Battery  
Test Operator: SP

#### Test Location

#### Criterion Technology Open Area Test Site

#### Test Distance

Antenna Distance: **3 meter(s)**      **Final Measurement(s)**

#### Test Equipment

<input checked="" type="checkbox"/> HP8566B Spectrum Analyzer	<input checked="" type="checkbox"/> Hewlett-Packard Quasi-Peak Adapter, HP 85650A
<input checked="" type="checkbox"/> Mini Circuits Pre-Amp #2	<input checked="" type="checkbox"/> Veratech Pre-Amp #3
<input checked="" type="checkbox"/> Chase BiLog Antenna, Model 1121	<input checked="" type="checkbox"/> Antenna Research, Horn Antenna, Model DRG118/A

#### Test Results of Radiated Emissions

Test Status: **PASSED**      Frequency Range: **2310 MHz to 2500 MHz**

Low Channel:

Detector: **Peak** Max Level (dBuV): **35.53** Margin to Limit: **-18.47**

High Channel:

Detector: **Average** Max Level (dBuV): **37.719** Margin to Limit: **-16.281**

Measured iaw FCC publication KDB 558074 para 5.4.2.2.4

#### Remarks

See: **APPENDIX A** for EUT Photographs  
**APPENDIX B** for Data Sheets  
**APPENDIX D** for Test Equipment Calibration Status



**2.5** ☒ **INTENTIONAL RADIATOR – RADIATED EMISSIONS**

Measurements for *Radiated Emissions* were performed over the frequency range of 1 GHz to 24 GHz with horizontal and vertical antenna polarities to the requirements of:

**FCC Part 15.205**

**FCC Part 15.209**

**FCC Part 15.247**

Testing Conditions

Date of Test: July 20, 2012

Temperature: 21° C

Relative Humidity: 41 %

Test Voltage: Battery

Test Operator: SP

Test Location**Criterion Technology Open Area Test Site**Test Distance

Antenna Distance: **3 meter(s)**      **Final Measurement(s)**

Test Equipment

- ☒ Hewlett-Packard Spectrum Analyzer, HP 8566B
- ☒ Hewlett-Packard Quasi-Peak Adapter, HP 85650A
- ☒ Veratech Pre-Amp #3
- ☒ Antenna Research, Horn Antenna, Model DRG118/A

Test Results of Radiated Emissions

Test Status: **PASSED**      Frequency Range: **1 GHz to 24 GHz**

Fundamental Minimum Margin to Limit:      **-30.69** dB at      **2404.4740** GHz

Detector: **Average**

Resolution Bandwidth: **1 MHz**

Video Bandwidth: **3 MHz**

Measured iaw FCC publication KDB 558074 para 5.2.1.2. procedure PK2.

The EUT is battery powered using a 3 Vdc battery.

Spurious & Harmonics Minimum Margin to Limit:      **-7.49** dB at      **12022.37** GHz

Detector: **Peak**

Resolution Bandwidth: **1 MHz**

Video Bandwidth: **3 MHz**

Measured iaw KDB 558074 para 5.4.1.1 and 5.4.1.2

Remarks

See: **APPENDIX A** for EUT Photographs

**APPENDIX B** for Data Sheets

**APPENDIX D** for Test Equipment Calibration Status

## 2.6 FREQUENCY LIMITS

Measurements for bandwidth, band edges, number of channels were performed in accordance with the Operations to the Requirements of:

**FCC Part 15.205**

**FCC Part 15.209**

**FCC Part 15.247**

### Testing Conditions

Date of Test: June 21, 2012

Temperature: 22° C

Relative Humidity: 40 %

Test Voltage: Battery

Test Operator: SP

### Test Location

**Criterion Technology Open Area Test Site**

### Test Equipment

☒ Hewlett-Packard Spectrum Analyzer, HP 8566B

☒ Hewlett-Packard Quasi-Peak Adapter, HP 85650A

### Test Results of Occupied Bandwidth and 20 dB / 6 dB Bandedges

Test Status: **PASSED**

Low Channel:

**6 dB lower Bandedge: 2404.156 MHz**

**6 dB upper Bandedge: 2405.7110 MHz**

**6 dB Occupied Channel Bandwidth: 1.528 MHz**

Low Channel:

**20 dB lower Bandedge: 2403.626 MHz**

**20 dB upper Bandedge: 2406.229 MHz**

**20 dB Occupied Channel Bandwidth: 2.603 MHz**

Mid Channel:

**6 dB lower Bandedge: 2439.10 MHz**

**6 dB upper Bandedge: 2440.705 MHz**

**6 dB Occupied Channel Bandwidth: 1.596 MHz**

Mid Channel:

**20 dB lower Bandedge: 2438.591 MHz**

**20 dB upper Bandedge: 2441.21 MHz**

**20 dB Occupied Channel Bandwidth: 2.62 MHz**

High Channel:

**6 dB lower Bandedge: 2479.0020 MHz**

**6 dB upper Bandedge: 2480.6680 MHz**

**6 dB Occupied Channel Bandwidth: 1.666 MHz**

High Channel:

**20 dB lower Bandedge: 2478.5780 MHz**

**20 dB upper Bandedge: 2481.180MHz**

**20 dB Occupied Channel Bandwidth: 2.602 MHz**

Detector: **Average**

Resolution Bandwidth: **100 kHz**

Video Bandwidth: **3 kHz**

Measured iaw FCC publication KDB 558074 para 5.1

All fundamental 99% (-20 dB) bandwidth emissions are contained within the 2400 to 2783.5 MHz band

### Remarks

See: **APPENDIX A** for EUT Photographs

**APPENDIX B** for Data Sheets

**APPENDIX D** for Test Equipment Calibration Status

## 2.7 POWER SPECTRAL DENSITY

Measurements for Power Spectrum Density were performed with the transceiver in the transmit modulated mode in accordance with the Operations to the Requirements of:

### FCC Part 15.247

#### Testing Conditions

Date of Test: June 20, 2012  
Temperature: 22° C  
Relative Humidity: 40 %  
Test Voltage: Battery  
Test Operator: SP

#### Test Location

#### Criterion Technology Open Area Test Site

#### Test Equipment

☒ Hewlett-Packard Spectrum Analyzer, HP 8566B      ☒ Hewlett-Packard Quasi-Peak Adapter, HP 85650A

#### Test Results of 3 kHz Power Spectrum Density

Test Status: **PASSED**

Low Channel:

Minimum Margin to Limit: **-44.3** dB at **2405.1280** MHz

Mid Channel:

Minimum Margin to Limit: **-45.15** dB at **2439.9400** MHz

High Channel: :

Minimum Margin to Limit: **-44.28** dB at **2479.4530** MHz

Detector: **Average**

Resolution Bandwidth: **100 kHz**

Video Bandwidth: **300 kHz**

Measured iaw KDB 558074 para 5.3.2

#### Remarks

See: **APPENDIX A** for EUT Photographs  
**APPENDIX B** for Data Sheets  
**APPENDIX D** for Test Equipment Calibration Status

### 3.0 APPENDIX A: EUT PHOTOGRAPHS

#### 3.1 UNINTENTIONAL RADIATED EMISSIONS



## 4.0 APPENDIX B: DATA SHEETS

### 4.1 UNINTENTIONAL RADIATED EMISSIONS PLOT – 30 MHZ TO 1 GHZ

Criterion Technology

Date: June 21, 2012

EUT: Puck, RF SWITCH INTRFC

Manufacturer: Electronic Solutions, Inc. A Hunter Douglas Company

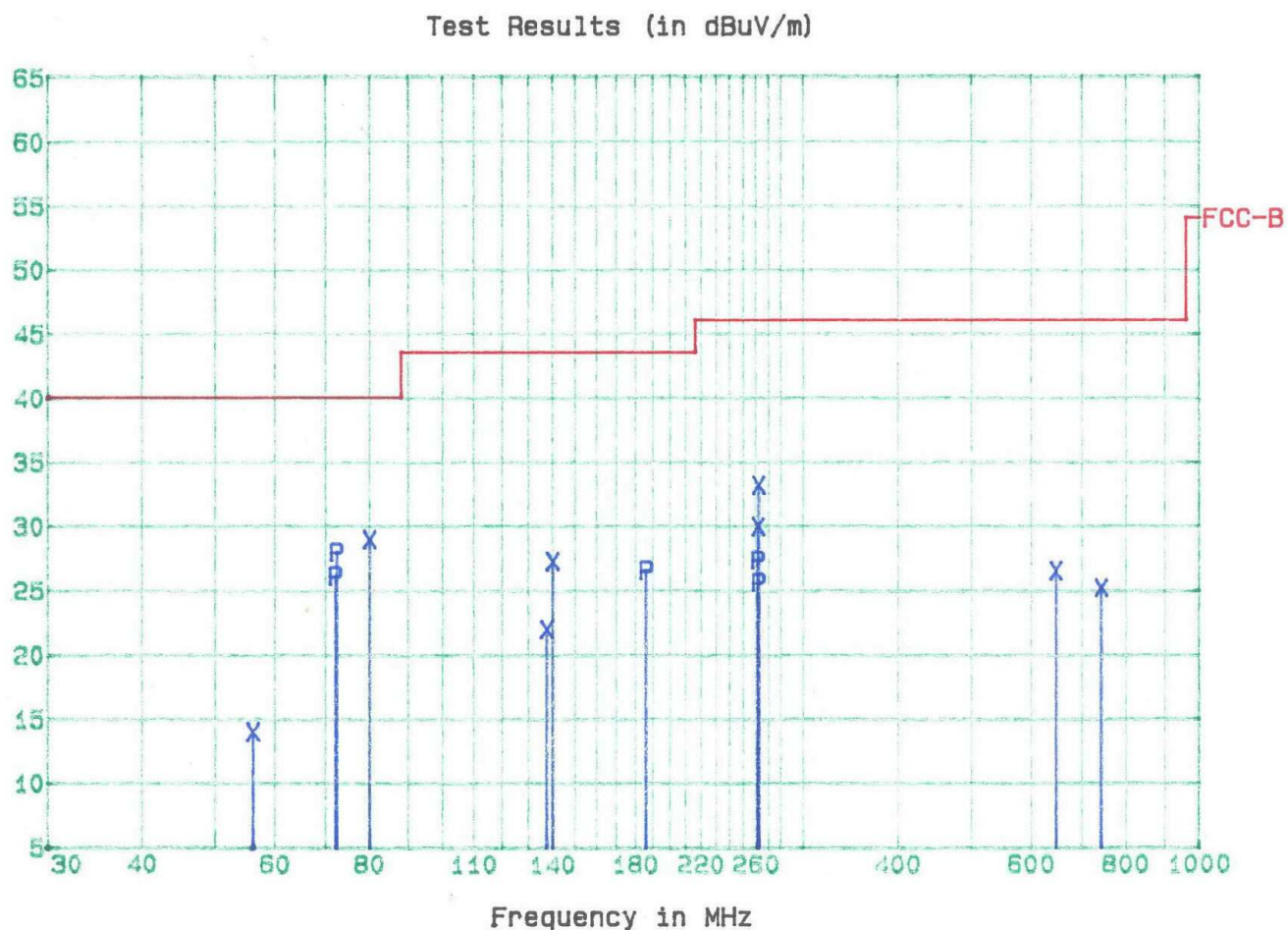
Tester: SP

SpiD: 110702-1717FCC

Test Information: 3 meters, Battery, FCC Part 15 Class B

Test Cond: Temp: 22°C

Humidity: 40 %



**4.2 UNINTENTIONAL RADIATED EMISSIONS TABLE – 30 MHZ TO 1 GHZ****Notes:**

Fval = Ival + AF + Cable + Pads – Amp

Where:

Fval is the final electric field in dbuv/m

Ival is the initial reading from the EMC receiver or spec an in dbuv.

AF is the antenna factor, a + value is loss

Cable is the cable attenuation in db, a + value is loss

Pads is the total attenuator loss in db, a + value is loss

Amp is the preamplifier gain in db, a + value is amplifier gain

A Sample calculation with Ival, AF, Cable, Pads, & Amp values of  
50 dbuv, 18, 4, 3, 32 respectively is:

Fval = 50 + 18 + 4 + 3 – 32 = 43 dbuv/m

Minimum Margin to Limit: **-11.07** dB at **79.9963** MHz

Criterion Technology Thu Jun 21 15:37:26 2012

EUT: Puck, RF SWITCH INTRFC

Manufacturer: Electronic Solutions, Inc. A Hunter Douglas Company

Tester: SP

Special ID: 110720-1717FCC

EUT Level: Table top Unit, normal ops

EUT Information: Production Unit

Test information: FCC Part 15 Class B, 3 meters, Battery

**Table 1: Scan List, sorted by margin to limit FCC-B, -40.0dB filter**

<u>Freq. MHz</u>	<u>Value</u> <u>dBuV/m</u>	<u>Sts</u>	<u>Margin to FCC-B</u> <u>limits (dB)</u>	<u>TT</u>	<u>Hght</u>	<u>Az</u>	<u>Comment</u>
79.9963	28.93	m	-11.07	180	200	H	.
262.2688	33.14	m	-12.88	270	350	H	.
261.8222	29.93	m	-16.09	90	350	H	.
140.0000	27.21	m	-16.31	0	350	H	noise to fill list
647.2888	26.49	m	-19.53	270	100	H	.
743.0000	25.15	m	-20.87	90	150	V	noise to fill list
137.5811	21.96	m	-21.56	1	100	H	.
55.9999	13.98	m	-26.02	-3	103	H	.
72.3589	27.96	p	-12.04	180	350	H	.
72.1044	26.11	p	-13.89	180	200	H	.
186.3093	26.54	p	-16.98	180	400	V	.
261.5756	27.33	p	-18.69	180	400	V	.
262.1188	25.64	p	-20.38	90	350	H	.

Table 2: Scan List for FCC-B, sorted by Frequency, -40.0dB filter

<u>Freq. MHz</u>	<u>Value</u> <u>dBuV/m</u>	<u>Sts</u>	<u>Margin to FCC-B</u> <u>limits (dB)</u>	<u>TT</u>	<u>Hght</u>	<u>Az</u>	<u>Comment</u>
55.9999	13.98	m	-26.02	-3	103	H	.
72.1044	26.11	p	-13.89	180	200	H	.
72.3589	27.96	p	-12.04	180	350	H	.
79.9963	28.93	m	-11.07	180	200	H	.
137.5811	21.96	m	-21.56	1	100	H	.
140.0000	27.21	m	-16.31	0	350	H	noise to fill list
186.3093	26.54	p	-16.98	180	400	V	.
261.5756	27.33	p	-18.69	180	400	V	.
261.8222	29.93	m	-16.09	90	350	H	.
262.1188	25.64	p	-20.38	90	350	H	.
262.2688	33.14	m	-12.88	270	350	H	.
647.2888	26.49	m	-19.53	270	100	H	.
743.0000	25.15	m	-20.87	90	150	V	noise to fill list

Table 3: Complete Scan List Sorted by Frequency

<u>Freq. MHz</u>	<u>I-val before xducr</u> <u>factors dBuV</u>	<u>Final Value</u> <u>dBuV/m</u>	<u>Sts</u>	<u>TT</u>	<u>Hght</u>	<u>Az</u>	<u>Time</u>	<u>Comment</u>
55.9999	29.86	13.98	m	-3	103	H	Thu Jun 21 14:22:23 2012	.
72.1044	41.73	26.11	p	180	200	H	Thu Jun 21 14:07:22 2012	.
72.3589	43.55	27.96	p	180	350	H	Thu Jun 21 14:08:22 2012	.
79.9963	43.58	28.93	m	180	200	H	Thu Jun 21 14:07:24 2012	.
137.5811	31.65	21.96	m	1	100	H	Thu Jun 21 14:39:07 2012	.
140.0000	36.93	27.21	m	0	350	H	Thu Jun 21 13:59:21 2012	noise to fill list
186.3093	38.75	26.54	p	180	400	V	Thu Jun 21 14:09:04 2012	.
261.5756	35.64	27.33	p	180	400	V	Thu Jun 21 14:09:05 2012	.
261.8222	38.24	29.93	m	90	350	H	Thu Jun 21 14:01:25 2012	.
262.1188	33.96	25.64	p	90	350	H	Thu Jun 21 14:01:26 2012	.
262.2688	41.46	33.14	m	270	350	H	Thu Jun 21 14:10:51 2012	.
647.2888	25.91	26.49	m	270	100	H	Thu Jun 21 14:13:54 2012	.
743.0000	23.61	25.15	m	90	150	V	Thu Jun 21 14:03:42 2012	noise to fill list

Emissions were maximized per Criterion procedure CT0457 Sec. 5.6.4 which details turntable rotation 0-360° raising the antenna 1-4 meters horizontal and vertical polarity, and cable movement to maximize readings.



**4.3 RECEIVER SPURIOUS & UNINTENTIONAL RADIATED EMISSIONS PLOT – ABOVE 1 GHZ**

Criterion Technology

Date: June 22, 2012

EUT: Puck, RF SWITCH INTRFC

Manufacturer: Electronic Solutions, Inc. A Hunter Douglas Company

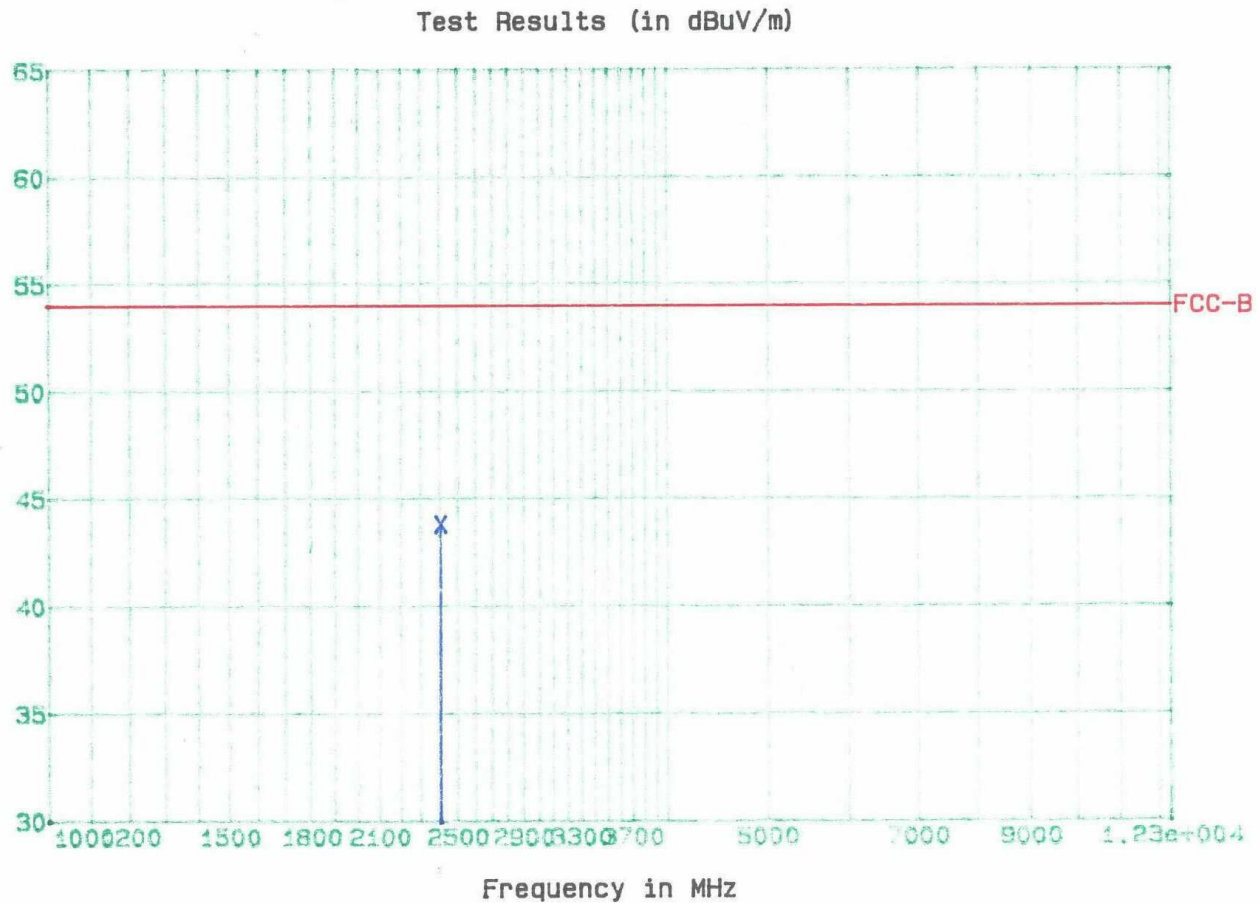
Tester: SP

SpiD: 110720-1717FCC

Test Information: 3 meters, Battery, FCC Part 15 Class B

Test Cond: Temp: 22°C

Humidity: 40 %





**4.4 RECEIVER SPURIOUS & UNINTENTIONAL RADIATED EMISSIONS TABLE – ABOVE 1 GHZ****Notes:**

$$F_{val} = I_{val} + AF + Cable + Pads - Amp$$

Where:

Fval is the final electric field in dbuv/m

Ival is the initial reading from the EMC receiver or spec an in dbuv.

AF is the antenna factor, a + value is loss

Cable is the cable attenuation in db, a + value is loss

Pads is the total attenuator loss in db, a + value is loss

Amp is the preamplifier gain in db, a + value is amplifier gain

A Sample calculation with Ival, AF, Cable, Pads, &amp; Amp values of

50 dbuv, 18, 4, 3, 32 respectively is:

$$F_{val} = 50 + 18 + 4 + 3 - 32 = 43 \text{ dbuv/m}$$
Minimum Margin to Limit: **-10.15** dB at **2402.9680** MHz

Criterion Technology Fri Jun 22 15:16:58 2012

EUT: Puck, RF SWITCH INTRFC

Manufacturer: Electronic Solutions, Inc. A Hunter Douglas Company

Tester: SP

Special ID: 110720-1717FCC

EUT Level: Table top Unit, normal ops

EUT Information: Production Unit

Test information: FCC Part 15 Class B, 3 meters, Battery

**Table 1: Scan List, sorted by margin to limit FCC-B, -50.0dB filter**

<u>Freq. MHz</u>	<u>Value dBuV/M</u>	<u>Sts</u>	<u>Margin to FCC-B</u> <u>limits (dB)</u>	<u>TT</u>	<u>Hght</u>	<u>Az</u>	<u>Comment</u>
2402.9680	43.83	m	-10.15	67	100	H	.

**Table 2: Scan List for FCC-B, sorted by Frequency, -50.0dB filter**

<u>Freq. MHz</u>	<u>Final Value</u> <u>dBuV/M</u>	<u>Sts</u>	<u>Margin to FCC-B</u> <u>limits (dB)</u>	<u>TT</u>	<u>Hght</u>	<u>Az</u>	<u>Comment</u>
2402.9680	43.83	m	-10.15	67	100	H	.

**Table 3: Complete Scan List Sorted by Frequency**

<u>Freq. MHz</u>	<u>I-val before xducr</u> <u>factord dBuV</u>	<u>Final value</u> <u>dBuV/m</u>	<u>Sts</u>	<u>TT</u>	<u>Hght</u>	<u>Az</u>	<u>Time</u>	<u>Comment</u>
2402.9680	47.02	43.83	m	67	100	H	Fri Jun 22 14:41:11 2012	.

**4.5 INTENTIONAL RADIATED EMISSIONS TABLE**

Criterion Technology

Date: July 20, 2012

EUT: Puck, RF SWITCH INTRFC

Manufacturer: Electronic Solutions, Inc. A Hunter Douglas Company

Tester: SP

SpiD: 110720-1717FCC

Test Cond: Temp: 21°C

Humidity: 41 %

**NOTES:**

- 1) Determine ctr. Freq.
- 2) Set span 5% to 30% greater than EBW
- 3) Set RBW = 1MHz
- 4) Set VBW = 3 MHz
- 5) Ensure that number of measurement points  $\geq 2x$  (span/RBW)
- 6) Sum the spectral levels in power units @ 1 MHz. Intervals extending across the entire EBW

Channel Setting	Channel Frequency (MHZ)	1 MHz RBW Power at ctr freq minus 500 kHz (mw)	1 MHz RBW Power at ctr freq plus 500 kHz (mw)	Max conducted Power in EBW (mw)	Max conducted Power in EBW at end of cable (dBm)	Cable loss (dB)	Max Conducted Power in EBW (dBm)	Max Conducted Power in EBW (milliwatts)	FCC P15 .247 (a) (3) 1 watt, 30 dBm or 137 dBuV Limit (dBm)	Margin to Limit (dB)
Low	2404.4740	0.3020	0.4073	0.7093	-1.49	0.8	-0.69	0.853	30	-30.69
Middle	2439.4760	0.3020	0.3715	0.6735	-1.72	0.8	-0.92	0.809	30	-30.92
High	2480.4720	0.3162	0.2630	0.5792	-2.37	0.8	-1.57	0.697	30	-31.57

## EUT with Integral Antenna

Harmonic	Frequency (Bold => restricted band)	Radiated Pk Field Strength (dBuV)	part 15.247(d) limit, 54 restricted band or -20dB from the 100KHz Pk (dBuV)	Margin to Limit (db)	EL	Az	Pol	Orientation	Antenna
2	<b>4808.948</b>	43.48	54	-10.52	104.7	68	V	Y	DRG 118A
2	<b>4878.952</b>	42.12	54	-11.88	101.6	69	V	Y	DRG 118A
2	<b>4960.944</b>	42.67	54	-11.33	103.7	69	V	Y	DRG 118A
3	<b>7213.422</b>	36.28	54	-17.72	*	*	*	Y	DRG 118A
3	<b>7318.428</b>	36.28	54	-17.72	*	*	*	Y	DRG 118A
3	<b>7441.416</b>	36.28	54	-17.72	*	*	*	Y	DRG 118A
4	9617.896	49.20	68.90	-19.70	*	*	*	Y	DRG 118A
4	9757.904	49.20	67.90	-18.70	*	*	*	Y	DRG 118A
4	9921.888	49.20	67.20	-18.00	*	*	*	Y	DRG 118A
5	<b>12022.37</b>	46.51	54	-7.49	*	*	*	Y	DRG 118A
5	<b>12197.38</b>	46.51	54	-7.49	*	*	*	Y	DRG 118A
5	<b>12402.36</b>	46.51	54	-7.49	*	*	*	Y	DRG 118A
6	14426.844	41.47	68.90	-27.43	*	*	*	Y	3160 horn
6	14636.856	41.47	67.90	-26.43	*	*	*	Y	3160 horn
6	14882.832	41.47	67.20	-25.73	*	*	*	Y	3160 horn
7	16831.318	45.99	68.90	-22.91	*	*	*	Y	3160 horn
7	17076.332	45.99	67.90	-21.91	*	*	*	Y	3160 horn
7	17363.304	45.99	67.20	-21.21	*	*	*	Y	3160 horn
8	<b>19235.792</b>	26.50	54	-27.50	*	*	*	Y	SA 12A- 18
8	<b>19515.808</b>	26.50	54	-27.50	*	*	*	Y	SA 12A- 18
8	<b>19843.776</b>	26.50	54	-27.50	*	*	*	Y	SA 12A- 18
9	21640.266	26.60	68.90	-42.30	*	*	*	Y	SA 12A- 18
9	21955.284	26.60	67.90	-41.30	*	*	*	Y	SA 12A- 18
9	22324.248	26.60	67.20	-40.60	*	*	*	Y	SA 12A- 18
10	24044.74	27.00	68.90	-41.90	*	*	*	Y	SA 12A- 18
10	24394.76	27.00	67.90	-40.90	*	*	*	Y	SA 12A- 18
10	24804.72	27.00	67.20	-40.20	*	*	*	Y	SA 12A- 18

## 4.6 BANDEDGE

Criterion Technology

Date: July 20, 2012

EUT: Puck, RF SWITCH INTRFC

Manufacturer: Electronic Solutions, Inc. A Hunter Douglas Company

Tester: SP

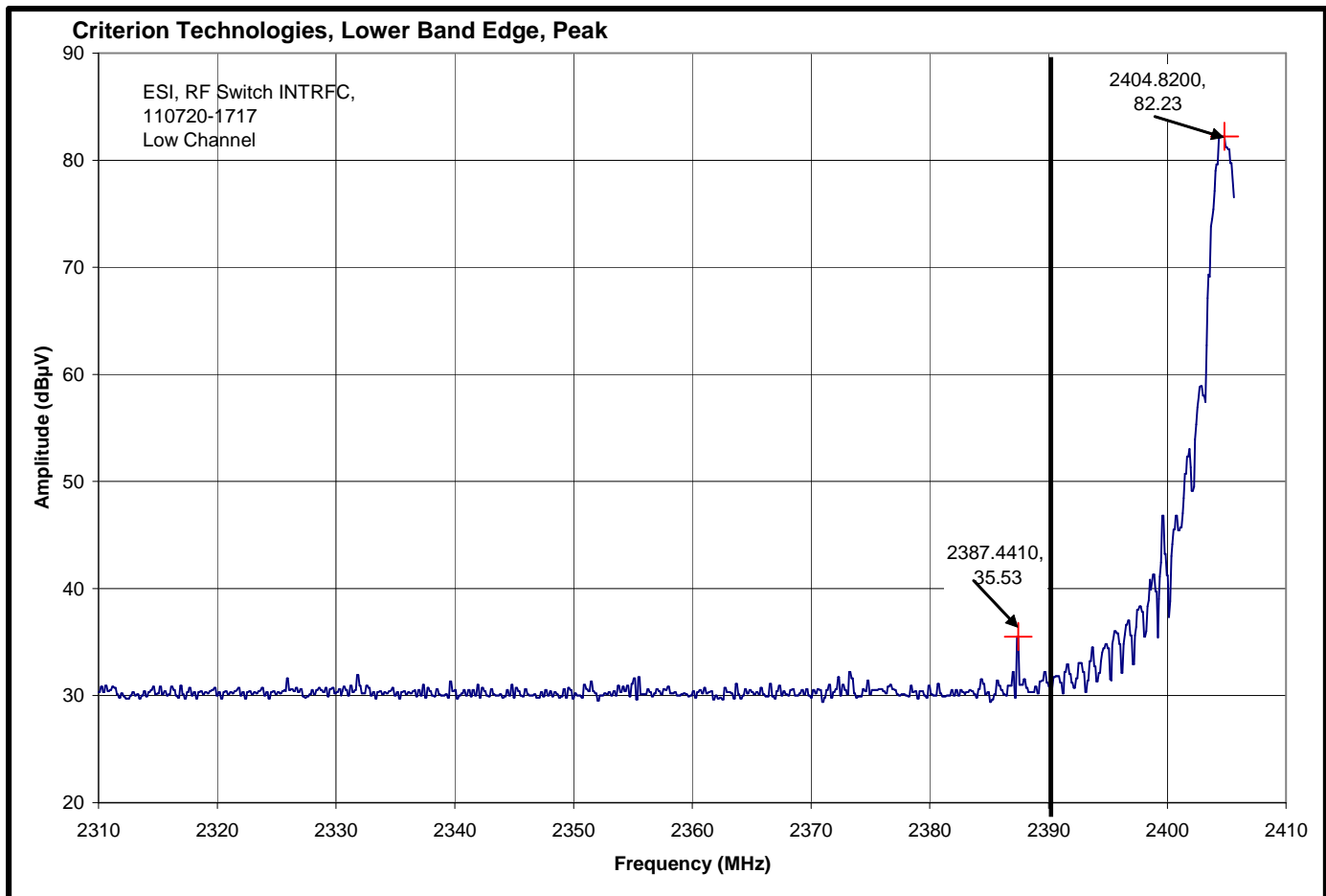
SpiD: 110720-1717FCC

Test Cond: Temp: 21°C

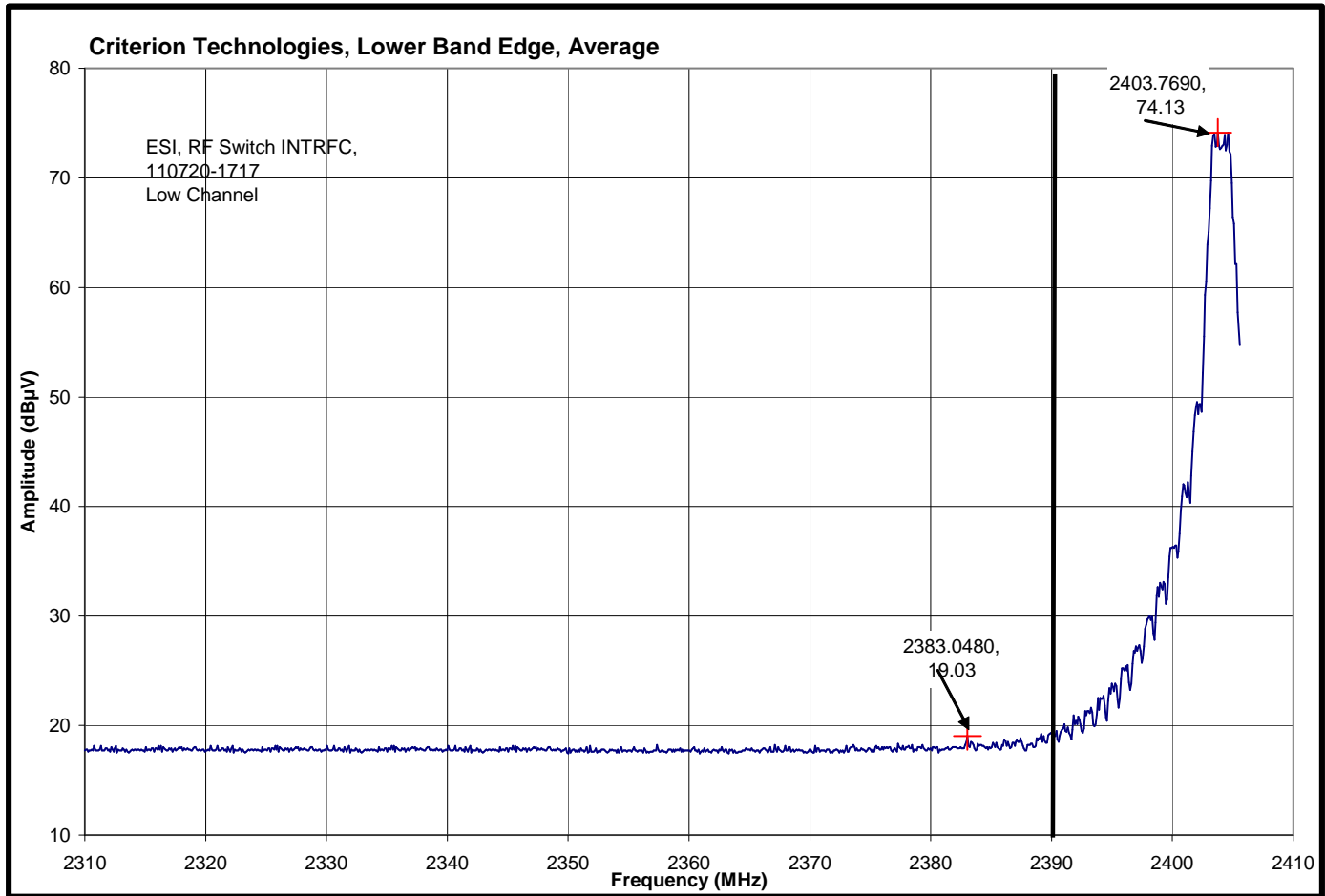
Humidity: 41 %

Band Edge, Restricted Band Emissions					
Channel	Restricted Band (MHz)	Detector	Max Level (dBμV)	Limit (dBμV)	Margin (dB)
Low	2310 to 2390	Pk	35.53	74	-18.47
Low		Av	19.03	54	-34.97
High	2483.5 to 2500	Pk	48.219	74	-25.781
High		Av	37.719	54	-16.281

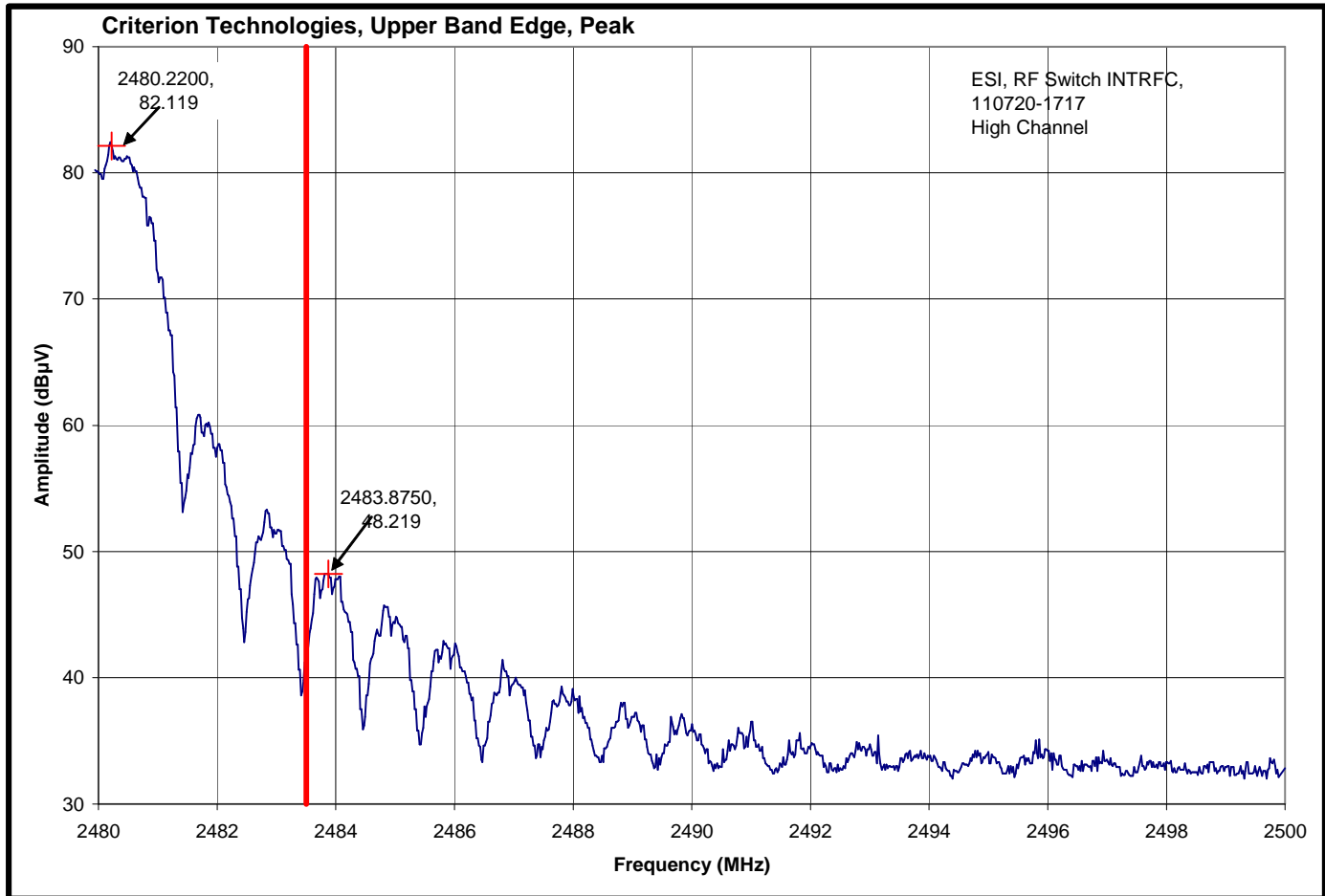
Low Channel

Detector: **Peak**Resolution Bandwidth: **1 MHz**Video Bandwidth: **1 MHz**

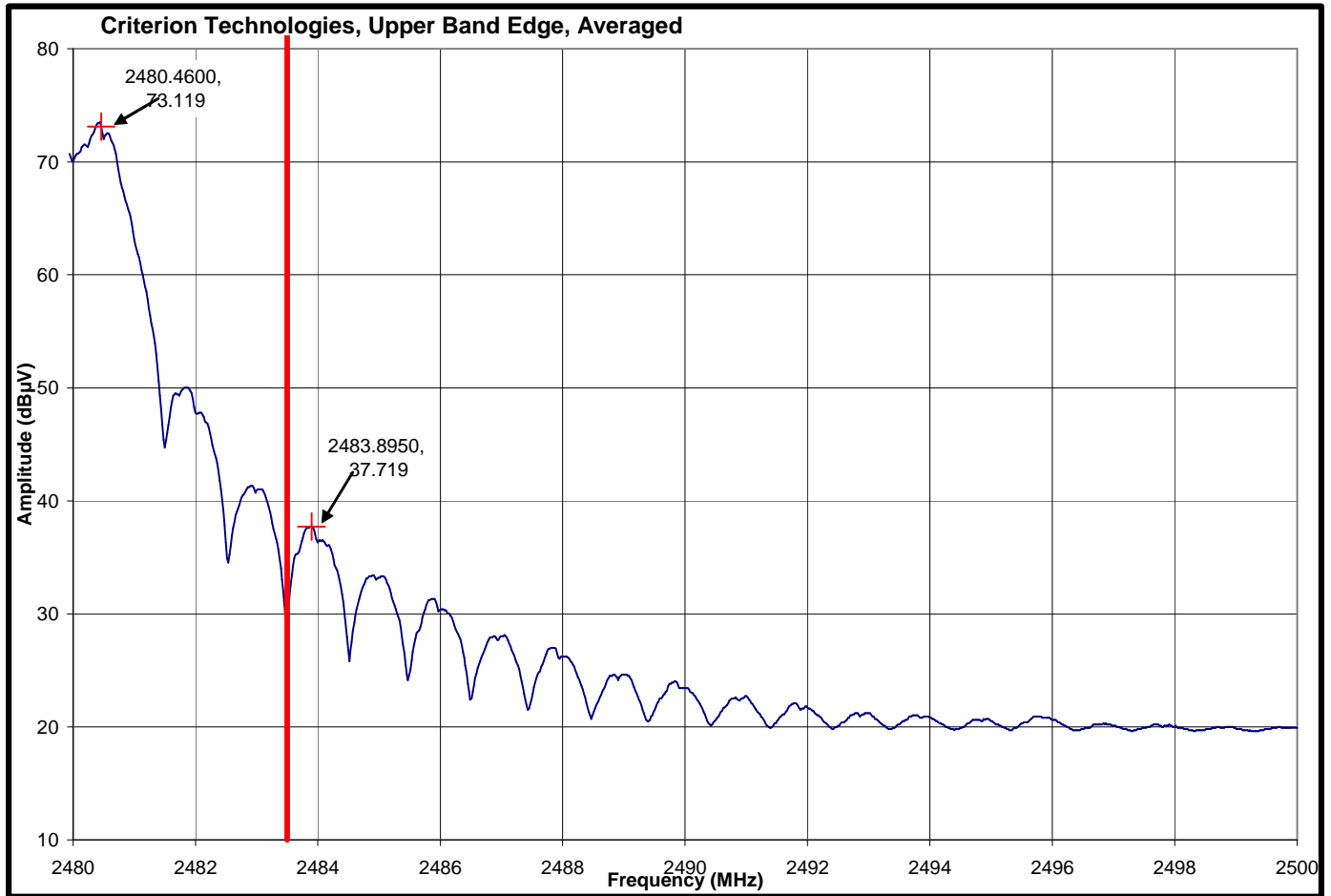
Low Channel

Detector: AverageResolution Bandwidth: 1 MHzVideo Bandwidth: 300 Hz

High Channel

Detector: **Peak**Resolution Bandwidth: **1 MHz**Video Bandwidth: **1 MHz**

High Channel; Average

Detector: AverageResolution Bandwidth: 1 MHzVideo Bandwidth: 10 Hz

## 4.7 FREQUENCY LIMITS

Criterion Technology

June 21, 2012

EUT: Puck, RF SWITCH INTRFC

Manufacturer: Electronic Solutions, Inc. A Hunter Douglas Company

Tester: SP

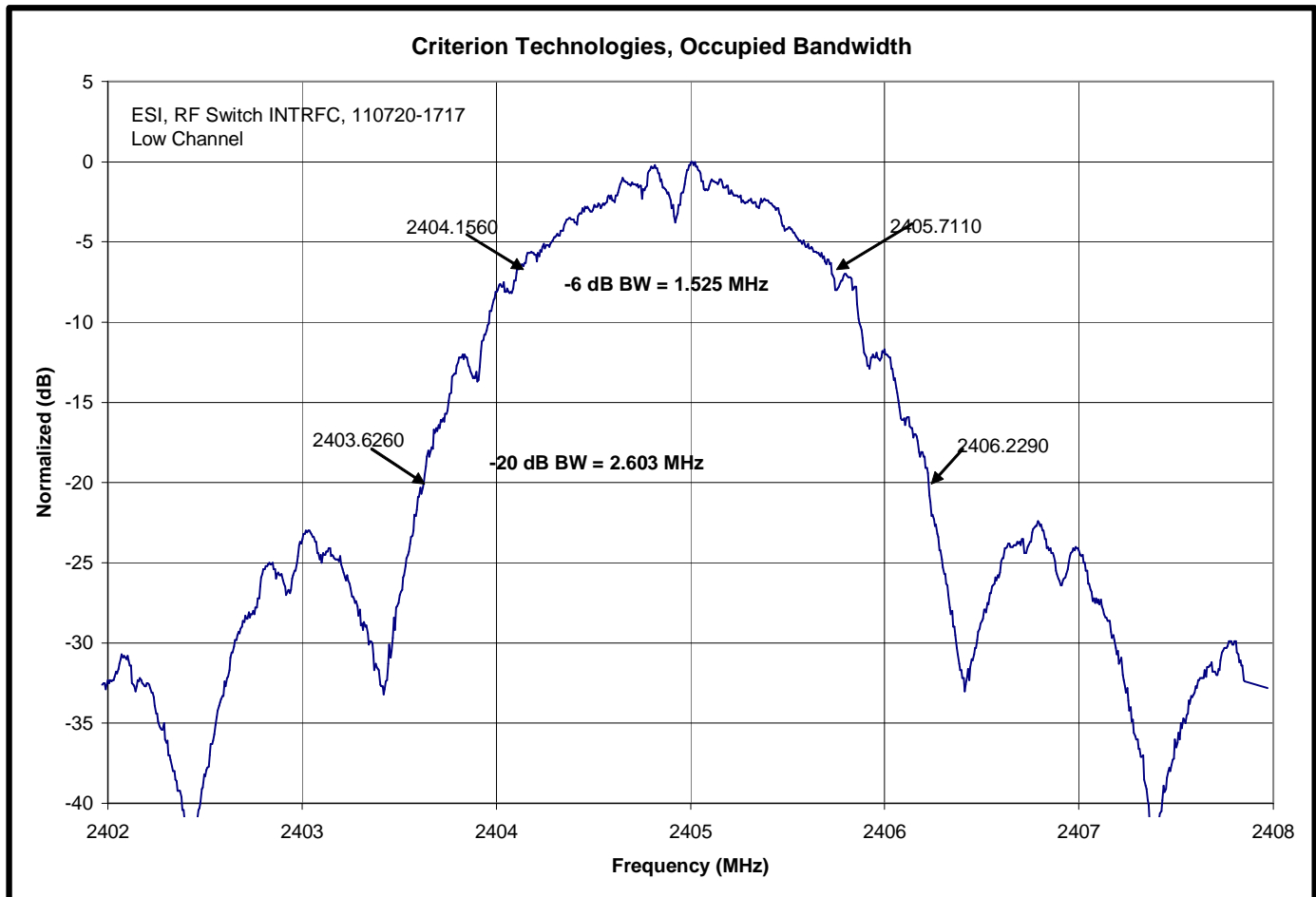
SpiD: 110720-1717FCC

Test Cond: Temp: 22°C

Humidity: 40 %

## Emission Bandwidths &lt;2483.5 MHz Low and High &gt;2400 MHz

Required	Low	High	BW (MHz)	FCC 47 CFR P15.247 (a) (2) Limit	Margin
-6 dB	2404.156	2405.681	1.525	>500 kHz	1.025
-20dB	2403.626	2406.229	2.603		

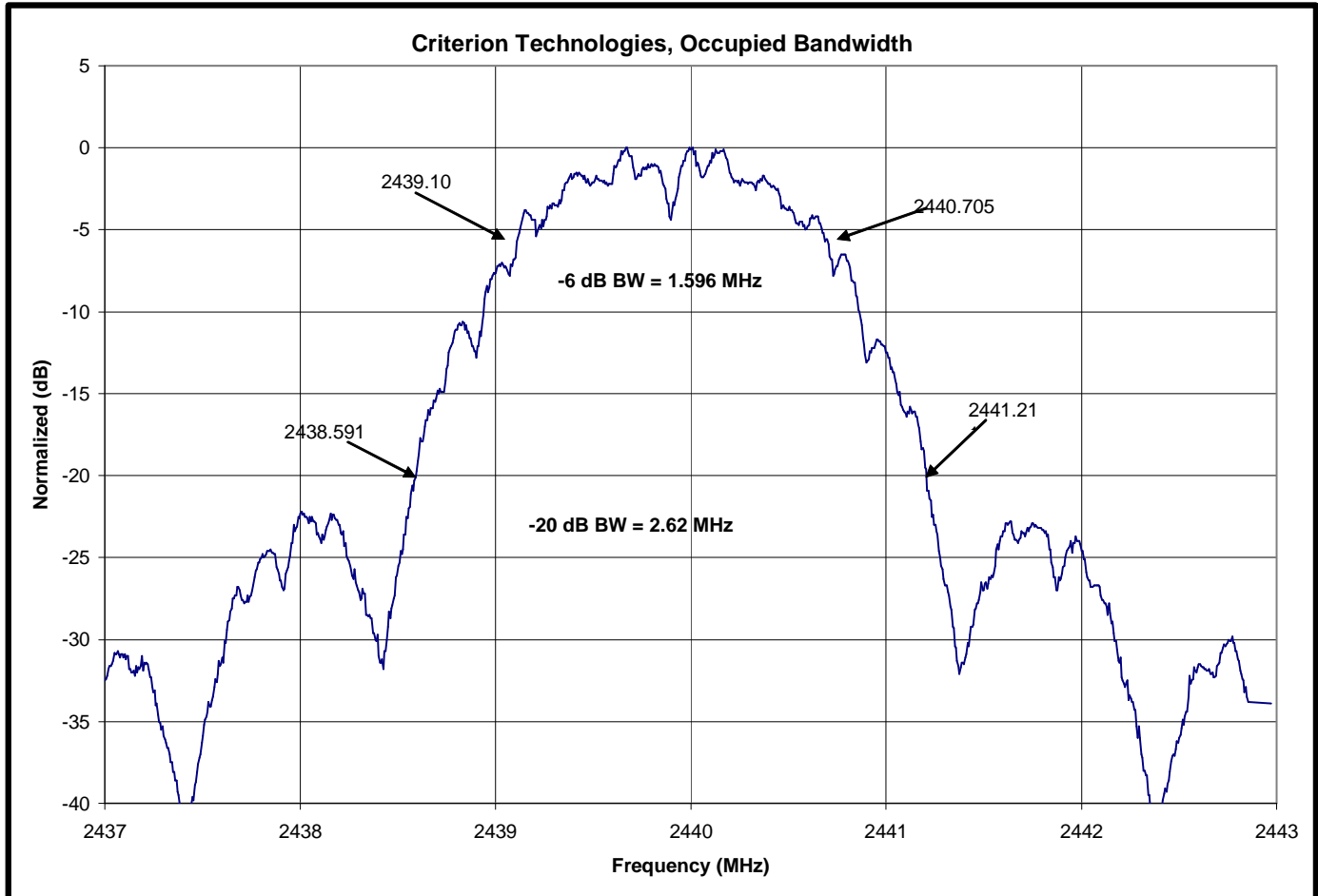


Low Channel

-6db &amp; -20 db occupied bandwidth caculated by data acquisition software



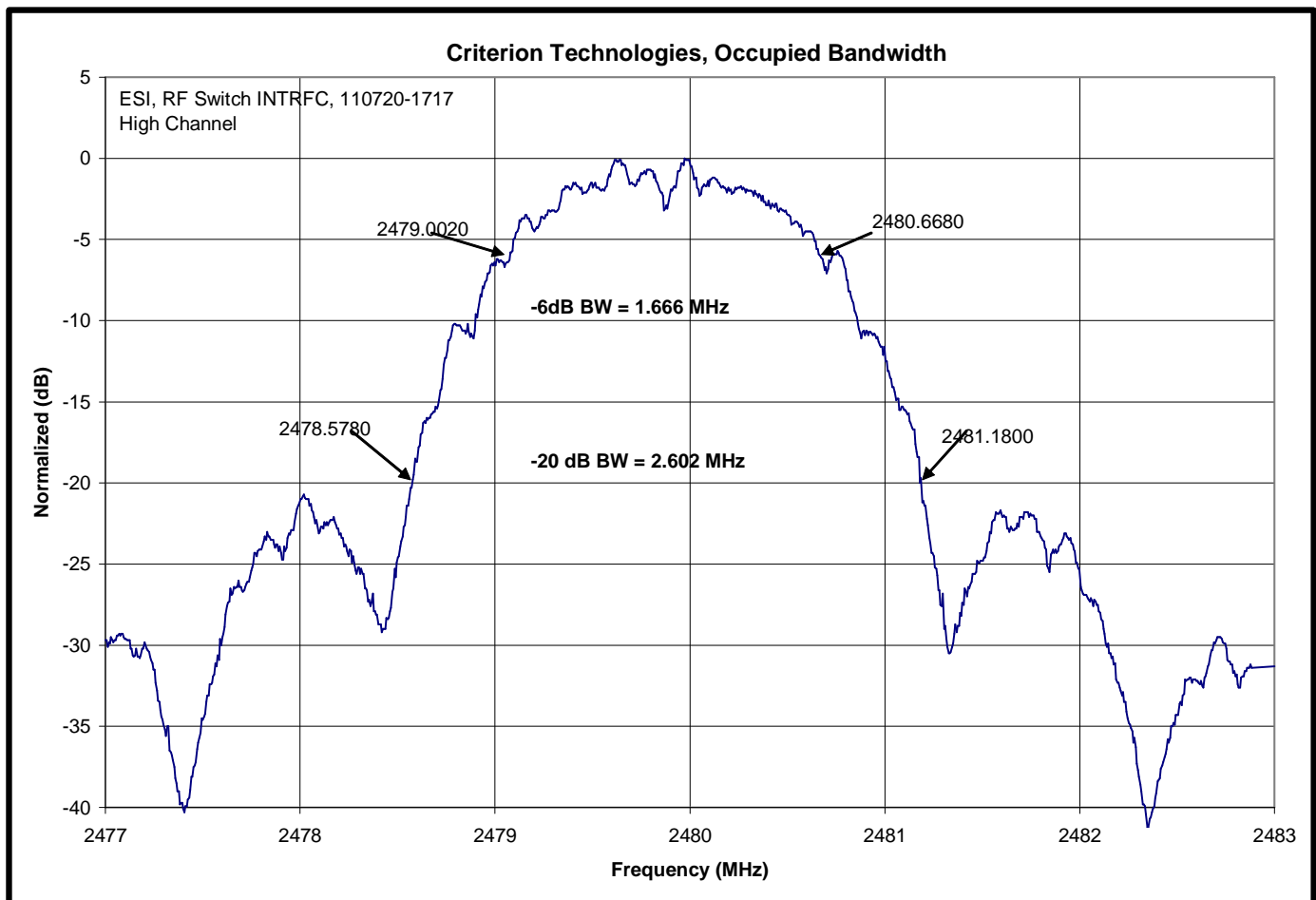
Bandwidth <2483.5 MHz Low and High >2400 MHz					
Required	Low	High	BW (MHz)	FCC 47 CFR P15.247 (a) (2) Limit	Margin
-6 dB	2439.109	2440.705	1.596	>500 kHz	1.096
-20dB	2438.591	2441.211	2.62		



Middle Channel

-6db & -20 db occupied bandwidth caculated by data acquisition software

Bandwidth <2483.5 MHz Low and High >2400 MHz					
Required	Low	High	BW (MHz)	FCC 47 CFR P15.247 (a) (2) Limit	Margin
-6 dB	2479.002	2480.668	1.666	>500 kHz	2.102
-20dB	2478.578	2481.18	2.602		

**High Channel**

-6db & -20 db occupied bandwidth caculated by data acquisition software

**4.8 POWER SPECTRAL DENSITY**

Criterion Technology

June 20, 2012

EUT: PucK, RF SWITCH INTRFC

Manufacturer: Electronic Solutions, Inc. A Hunter Douglas Company

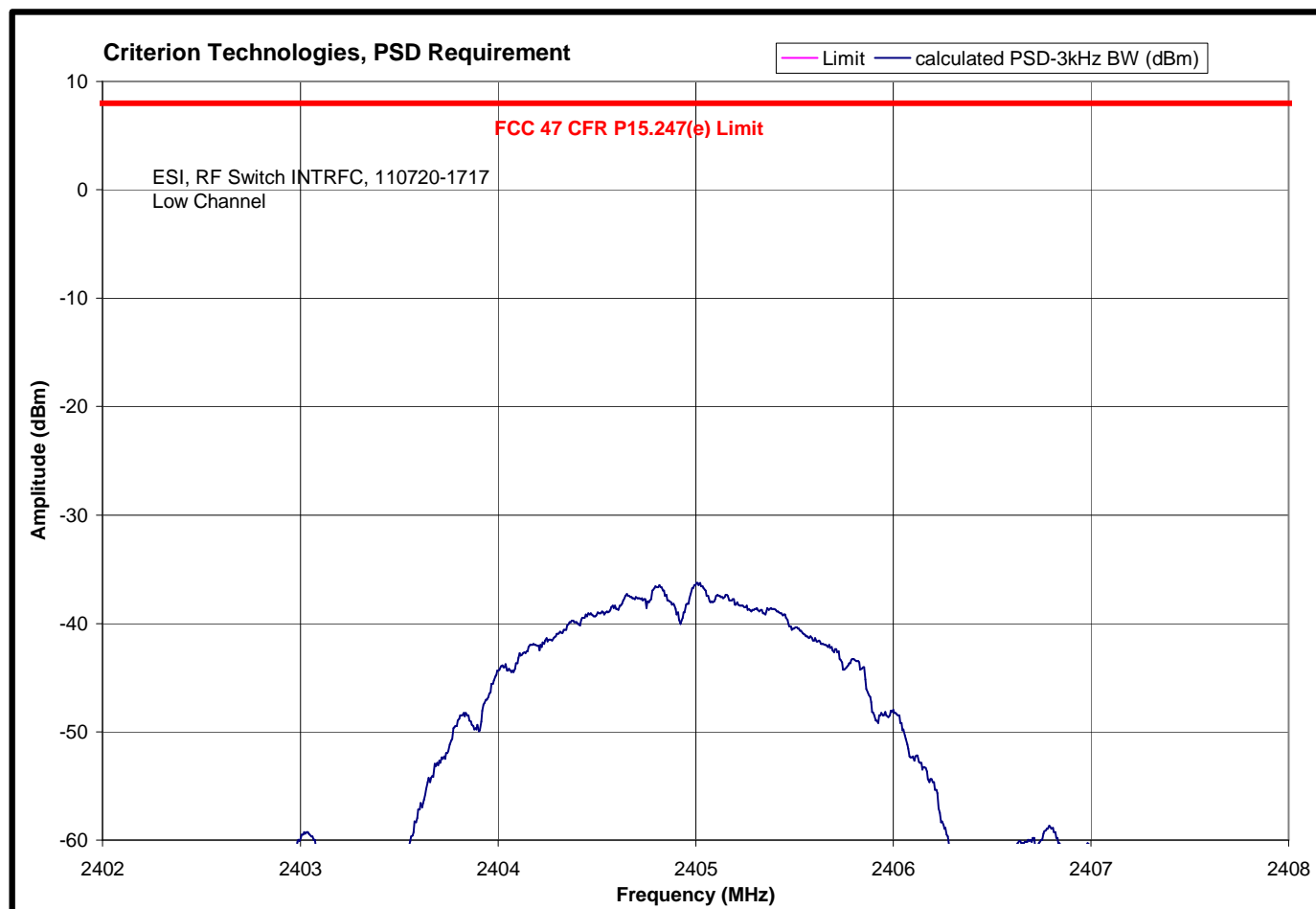
Tester: SP

SpiD: 110720-1717FCC

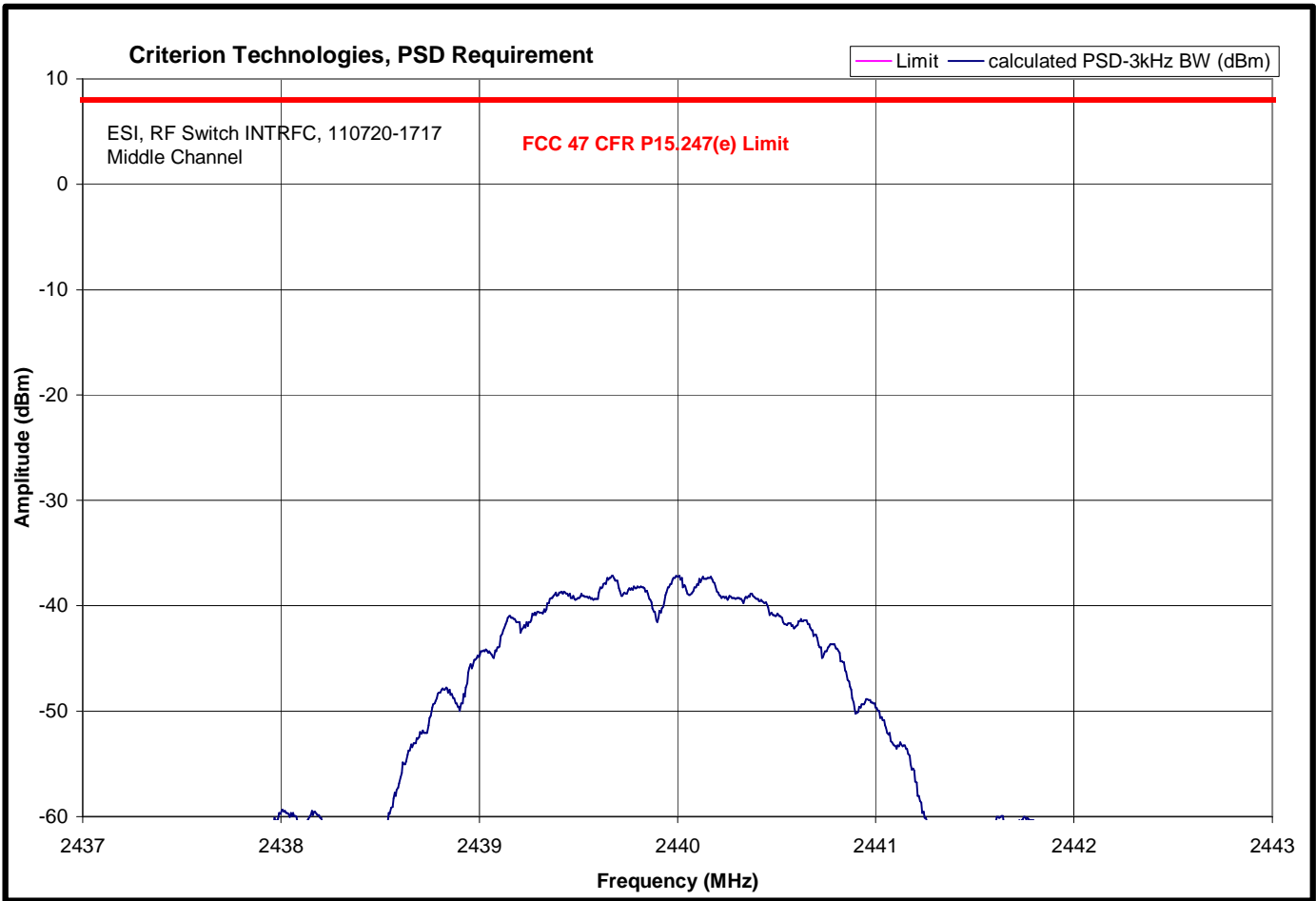
Test Cond: Temp: 22°C

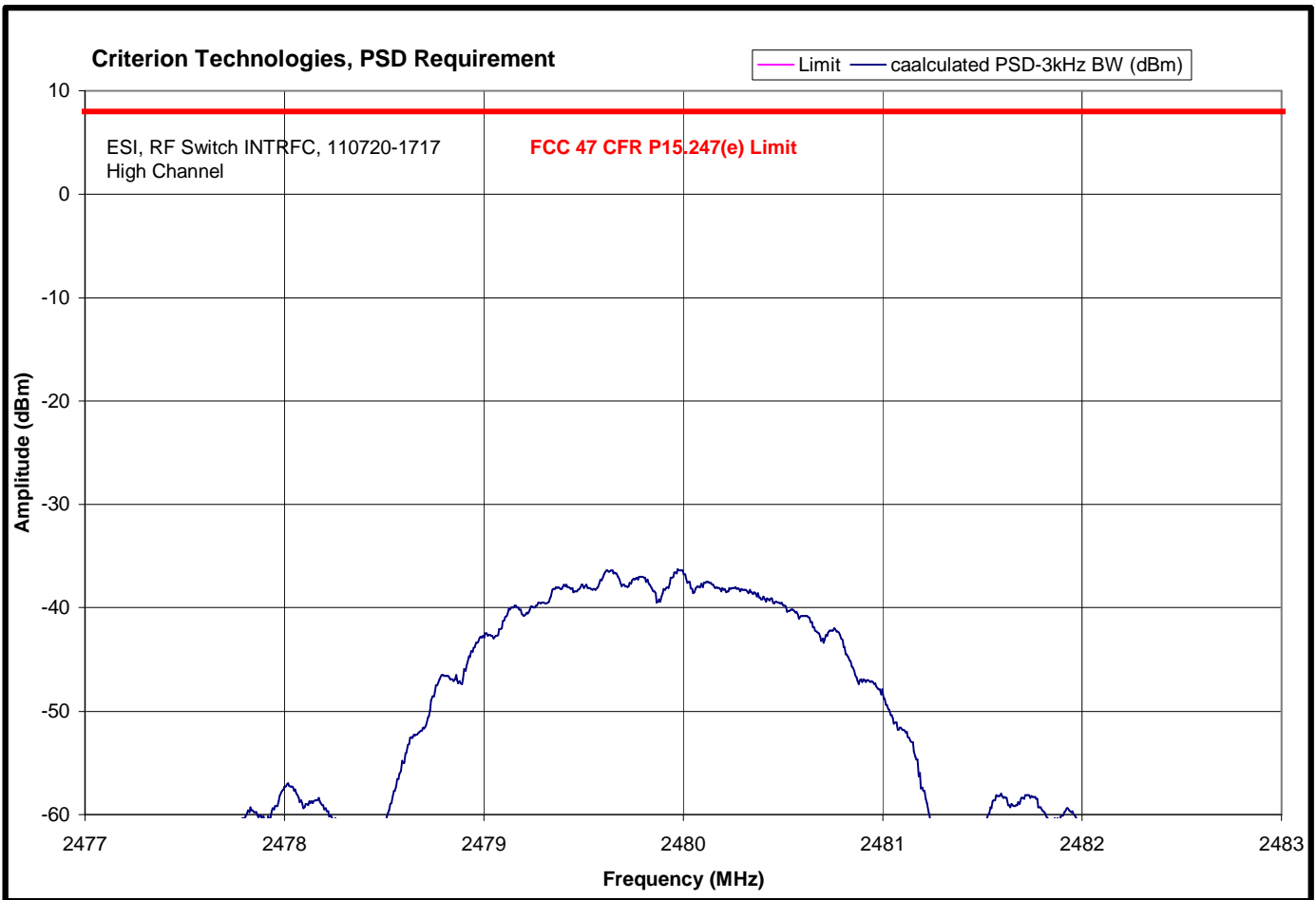
Humidity: 40 %

Frequency of Max Radiation (MHz)	Axis of Orientation	Max 3kHz Segment Power (dBm)	FCC 47 CFR P15.247(e) Limit (dBm)	Margin to Limit (dB)
2405.1280	Y	-36.28	8	-44.3
2439.9400	Y	-37.15	8	-45.15
2479.4530	Y	-36.28	8	-44.28

**Low Channel**

Middle channel



High Channel

**5.0 APPENDIX C: PRODUCT INFORMATION FORM****General Information****Date:** 6/12/12Company Name: Electronic Solutions Inc.  
A Hunter Douglas CompanyCompany Address: 1355 Horizon Ave  
Lafayette, CO 80026

Contacts:

Compliance Engineer: Douglas Barnes Phone: 303 663 3396 Email: doug@compliance-more.com**Market Information (Check all that Apply)**USA ☒ Canada ☐ Euro. Union ☐ Taiwan ☐ Japan ☐ New Zealand ☐ Australia ☐  
Other FCC 15.107, 15.109, 15.205, 15.209, 15.247**Product Information**Model Name: PuckModel Number: RF SWITCH INTRFCProduct Dimensions: 10 mm x 10 mmWeight: 4 oz**Product Power Source:**Battery: Yes

AC Supply:

# of cords under 10 meters: 0Voltage of cords: N/A**Emissions Testing:**Is this equipment to be used in a residence: ☐ No (Class A) ☒ Yes (Class B)Does this have a transmitter or Transceiver: ☐ No ☒ YesHighest oscillator/Clock frequency (including internal clocks only to the microprocessor): 16 Mz 2.4 GHz

To be compliant with C63.4-2003 test methodology, for the emissions testing, the equipment must be exercising all of the functionality within the capability of the Equipment under test. In addition, the equipment must be equipped in the configuration of maximum capability, which will be offered to customers. The test software installed in the Equipment Under Test (EUT) must exercise all of the modules in this maximum capability configuration.

Description of the maximum capability configuration: 1Name and revision # of the test software used for the emissions test: N/A**61000-3-2** Harmonics: ☒ No

Max. Steady State Power Consumed by Product: \_\_\_\_\_ Watts

**61000-3-3** Flicker Meter: ☒ No

**6.0 APPENDIX D: TEST EQUIPMENT AND CALIBRATION STATUS**

Manufacturer	Name/Description	Model Number	Serial Number	Cal. Due Date	Intervals
Haefely Trench	ESD Gun	PESD 1600	H605100	8/23/2012	24 months
FCC	CDN	FCC-801-M3-25	9714	11/22/2012	24 months
Schaffner	ESD Simulator	NSG438	767	11/24/2012	24 months
Veratech	Preamplifier (AMP2)	unknown	N/A	11/26/2012	24 months
Rohde/ Schwarz	LISN	ESH2-Z5	828739-001	11/29/2012	24 months
Gigatronics	Power Sensor	80301A-410	1831996	11/30/2012	24 months
Gigatronics	Power Meter	8541C	1830945	11/30/2012	24 months
Hewlett Packard	Tracking Generator	HP85645A	3210A00124	11/30/2012	24 months
Rohde/ Schwarz	VHF/UHF Receiver	ESVS-30	863342014	11/30/2012	24 months
Rohde/ Schwarz	HF Receiver	ESHS-30	826003/011	11/30/2012	24 months
Solar Electronics	LISN	8610-50-TS-100N	13690	3/15/2013	24 months
Solar Electronics	LISN	8610-50-TS-100N	13691	3/15/2013	24 months
Solar Electronics	LISN	8610-50-TS-100N	13692	3/15/2013	24 months
Solar Electronics	LISN	8610-50-TS-100N	13693	3/15/2013	24 months
California Instruments	AC Power Source Pacs-1	5001iX-CTS-411	55637/ 72242	6/11/2013	24 months
Haefely Trench	Surge Generator	PSURGE 6.1	083-906-07	11/28/2013	24 months
Haefely Trench	EFT Tester	PEFT Junior	583-333-51	11/28/2013	24 months
Haefely Trench	Surge Coupler	FP-Surge 32.1	083-925-05	11/28/2013	24 months
EMCO	Active Loop	6502	2626	11/28/2013	24 months
Amplifier Research	E-Field Probe	FP2000	19682	11/28/2013	24 months
Haefely Trench	Test Mag	Mag 100	80162	11/29/2013	24 months
Amplifier Research	E-Field Probe	FP2080	20236	11/30/2013	24 months
Hewlett Packard	Signal Generator	HP 8648D	3642000145	7/13/2014	24 months
Hewlett Packard	Quasi Peak Adapter	85650A	2430A00441	7/15/2014	24 months
Hewlett Packard	Spectrum Analyzer Display	HP 8566B62A	2403A09179	7/15/2014	24 months
Hewlett Packard	Spectrum Analyzer	HP 8566B	2240A01951	7/15/2014	24 months

## 7.0 APPENDIX E: TEST DIRECTIVES, STANDARDS AND METHODS

### 7.1.1 EUROPEAN DIRECTIVES, STANDARDS AND METHODS

89/336/EEC: Council Directive of 03 May 1989 on the Approximation of the Laws of the Member States Relating to Electromagnetic Compatibility, OJEC No. L 139/19-26, Aug 1993.

BS DD ENV 50204 (CENELEC): Testing and Measurement Techniques; Radiated Electromagnetic Field from Digital Radio Telephones - Immunity Test, 1996.

EN 55011 (CENELEC): ISM Radio-Frequency Equipment Radio Disturbance Characteristics - Limits and Methods of Measurement, 2007.

EN 55014-1 (CENELEC): Part 1. Electromagnetic Compatibility Requirements for Household Appliances, Electric Tools and Similar Apparatus - Part 1. Emission - Product Family Standard, 2007.

EN 55022 (CENELEC): ITE - Radio-Frequency Equipment Radio Disturbance Characteristics - Limits and Methods of Measurement, 2008.

CISPR 22: Information Technology Equipment – Radio Disturbance Characteristics - Limits and Methods of Measurement, 2009.

EN 55024 (CENELEC): ITE - Immunity Characteristics - Limits and Methods of Measurement, 2008.

EN 55103-1: Product Family standard for audio, video, audio - visual and entertainment lighting control apparatus for professional use. Part 1: Emissions, April 1997.

EN 55103-2: Product Family standard for audio, video, audio - visual and entertainment lighting control apparatus for professional use. Part 2: Immunity, April 1997.

EN 60601-1-2 (CENELEC): Medical Electrical Equipment. Part 1. General Requirements for Safety - Section 1.2. Collateral Standard: Electromagnetic Compatibility - Requirements and Tests, Third Edition 2007.

EN 61000-6-1: EMC- Part 6-1. Generic Standard-Immunity for residential, commercial and light-industrial Environments 2007.

EN 61000-6-2: EMC- Part 6-2. Generic Standard-Immunity for Industrial Environments, 2005.

EN 61000-6-3: EMC- Part 6-3. Generic Standard-Emissions for residential, commercial and light-industrial Environments 2007.

EN61000-6-4 (CENELEC): EMC - Generic Emission Standard, Part 6-4: Industrial Environment, 2007.

EN 61000-3-2 (CENELEC): EMC - Part 2. Limits for Harmonic Current Emissions (Equipment Input Current  $\leq 16$  A per phase), with Amendment 14, 2006.

EN 61000-3-3 (CENELEC): EMC - Part 3. Limitation of Voltage Fluctuation and Flicker in Low-Voltage Supply Systems for Equipment with Rated Current  $\leq 16$  A, 2008.

EN 61000-4-2 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 2. Electrostatic Discharge Immunity Test, 2009.

EN 61000-4-3 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 3. Radiated, Radio-Frequency, Electromagnetic Field Immunity, 2008.

EN 61000-4-4 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 4. Electrical Fast Transient/Burst Immunity Test, 2008.

EN 61000-4-5 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 5. Surge Immunity Test, 2006.



EN 61000-4-6 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 6. Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields, 2009.

EN 61000-4-8 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 8. Power Frequency Magnetic Field Immunity Test, 1993 with the incorporation of amendment A1:2001.

EN 61000-4-11 (CENELEC): EMC - Part 4. Testing and Measurement Techniques; Section 11. Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests, 2004

ETSI EN 300 220-1 V2.1.1 – Electromagnetic Compatibility and Radio spectrum Matters (ERM); Short range devices (SRD); radio equipment to be used in the 25MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 1: Technical characteristics and test methods; 2006.

ETSI EN 300 220-2 V2.1.1 – Electromagnetic Compatibility and Radio spectrum Matters (ERM); Short range devices (SRD); radio equipment to be used in the 25MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 2: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive, 2006

ETSI EN 300 220-3 V1.1.1 – Electromagnetic Compatibility and Radio spectrum Matters (ERM); Short range devices (SRD); radio equipment to be used in the 25MHz to 1000 MHz frequency range with power levels ranging up to 500 mW; Part 3: Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

ETSI EN 300 683 –Radio Equipment and Systems (RES); ElectroMagnetic Compatibility (EMC) Standard for Short Range Devices (SRD) Operating on Frequencies between 9 kHz and 25kHz, 1997

EN 300 328 v1.7.1: Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive, 2006.

EN 301 489-1 v1.8.1: Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements, 2008.

EN 301 489-3 v1.4.1: Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Rangr Devices (SRD) operating on frequencies between 9kHz and 40 GHz, 2002.

EN 301 489-17 v2.1.1: Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic compatibility (EMC) standard for radio equipment; Part 17: Specific conditions for Broadband Data Transmission Systems, 2008.

EN 61326 (CENELEC): Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements, 2005.

EN 61326-1 Electrical Equipment for Measurement, Control and Laboratory Use - EMC Requirements,  
- Part 1: General Requirments, 2008

## 7.1.2 47 CFR FCC PART 15 RADIO FREQUENCY DEVICES: OCT 2011

Subpart A General.Subpart B Unintentional Radiators.Subpart C Intentional Radiators.Subpart D Unlicensed Personal Communications Service Devices.

## 7.1.3 47 CFR FCC PART 22 PUBLIC MOBILE SERVICES: OCT 2011

## 7.1.4 47 CFR FCC PART 24 PERSONAL COMMUNICATIONS SERVICES: OCT 2011

## 7.1.5 JAPAN

VCCI V-3

## 7.1.6 CANADA

ICES-001: Interference-Causing Equipment Standard - ISM RF Generators, 2006.ICES-003: Interference-Causing Equipment Standard - Digital Apparatus, 2004.RSS 210: Radio Standards Specification - Low-power License-exempt Radio Communication Devices (ALL Frequency Bands): Category I Equipment, Issue 7, June 2007.RSS GEN: General Requirements and Information for the Certification of Radio Apparatus. Issue 3.

## 7.1.7 AUSTRALIA/NEW ZEALAND

SAA AS/NZ 3548: Limits and Methods of Measurement of Radio Disturbance Characteristics of ITE, 1997.AS/NZS 4268:2008: Radio Equipment and systems-Short range devices-Limits and methods of measurement.AS/NZS CISPR22

## 7.1.8 TAIWAN

CNS13438, 2006.

## 7.1.9 KOREA

KN22, September 29, 2005KN 24, 1998