



## FCC PART 15.249

### TEST REPORT

For

### SPX Service Solutions

655 Eisenhower Drive, Owatonna, MN 55060, USA

**FCC ID: Z2NJ-50079-16**

<b>Report Type:</b> Original Report	<b>Product Type:</b> Wireless Inspection Camera
<b>Test Engineer:</b> <u>Jimmy Xiao</u> <i>Jimmy Xiao</i>	
<b>Report Number:</b> <u>RSZ110909001-00</u>	
<b>Report Date:</b> <u>2011-10-14</u>	
<b>Reviewed By:</b> <u>EMC Engineer</u>	Merry Zhao <i>merry.zhao</i>
<b>Test Laboratory:</b> Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>	

**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Shenzhen). This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP\*, or any agency of the Federal Government.

\* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk “★” (Rev.2)

## **TABLE OF CONTENTS**

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
OBJECTIVE .....	3
RELATED SUBMITTAL(s)/GRANT(s).....	3
TEST METHODOLOGY .....	3
TEST FACILITY .....	3
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>5</b>
JUSTIFICATION .....	5
EQUIPMENT MODIFICATIONS .....	5
BLOCK DIAGRAM OF TEST SETUP .....	5
<b>SUMMARY OF TEST RESULTS .....</b>	<b>6</b>
<b>FCC§15.203 - ANTENNA REQUIREMENT.....</b>	<b>7</b>
APPLICABLE STANDARD .....	7
ANTENNA CONNECTOR CONSTRUCTION .....	7
<b>FCC§15.205, §15.209&amp; §15.249- RADIATED EMISSIONS .....</b>	<b>8</b>
APPLICABLE STANDARD .....	8
MEASUREMENT UNCERTAINTY .....	8
TEST EQUIPMENT SETUP .....	8
EUT SETUP .....	9
TEST PROCEDURE .....	9
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	9
TEST EQUIPMENT LIST AND DETAILS.....	10
TEST RESULTS SUMMARY .....	10
TEST DATA .....	10
<b>FCC§15.215(C) – 20 DB EMISSION BANDWIDTH.....</b>	<b>15</b>
APPLICABLE STANDARD .....	15
TEST EQUIPMENT LIST AND DETAILS.....	15
TEST PROCEDURE .....	15
TEST DATA .....	15
<b>PRODUCT SIMILARITY DECLARATION LETTER .....</b>	<b>18</b>

## GENERAL INFORMATION

---

### Product Description for Equipment under Test (EUT)

The *SPX Service Solutions*'s product, model: J-50079-15, J-50079-16, FCC ID: Z2NJ-50079-16, or the "EUT" in this report is a *Wireless Inspection Camera and RECEIVER*, which was measured approximately: 116.7 cm (W) x 14.5 cm (D) x 4.1 cm (H)(Exclude Flexible Tube) for J-50079-15, 126.7 cm (W) x 14.5cm (D) x 4.1 cm (H) (Exclude Flexible Tube) for J-50079-16, rated input voltage: DC 6V battery.

*Note: the series product, model J-50079-15 and J-50079-16 are electrically identical, only different in model name, which was explained in the attached declaration.*

*\* All measurement and test data in this report was gathered from production sample serial number: 1109016 (Assigned by BACL, Shenzhen). The EUT was received on 2011-09-09.*

### Objective

This test report is prepared on behalf of *SPX Service Solutions* in accordance with Part 2, Subpart J, and Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine the compliance of the EUT with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.249 rules.

### Related Submittal(s)/Grant(s)

No Related Submittal(s)

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, 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.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

### Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

## SYSTEM TEST CONFIGURATION

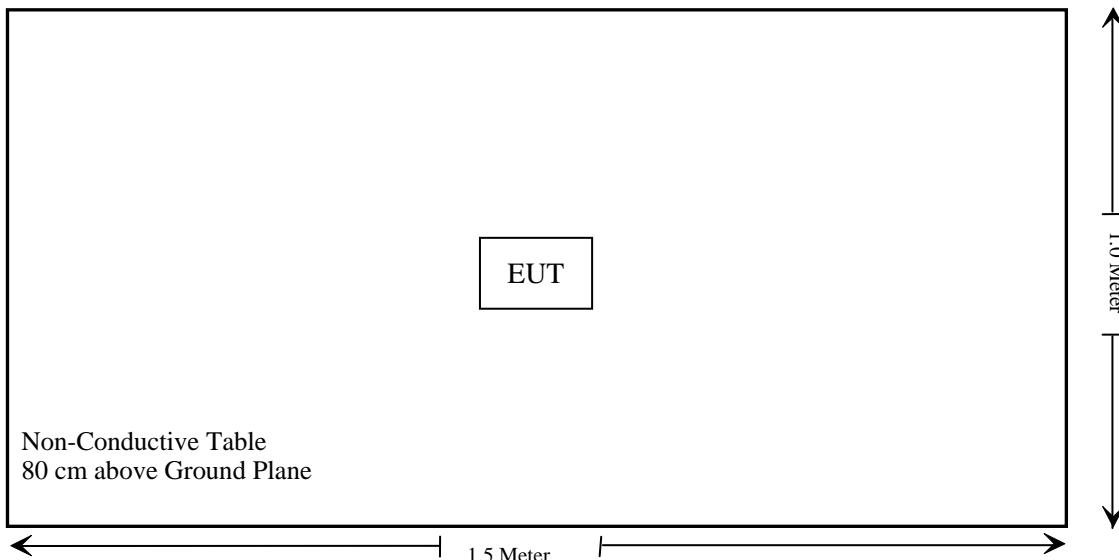
### Justification

The system was configured for testing in an engineering mode which was provided by the manufacturer.

### Equipment Modifications

No modification was made to the EUT tested.

### Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	N/A*
§15.205, §15.209 & §15.249	Radiated Emissions	Compliance
§15.215(c)	20 dB Emission Bandwidth	Compliance
§15.205(a), §15.249(d)	Out of Band Emissions	Compliance

Note: N/A\* - EUT is battery operation.

## **FCC§15.203 - ANTENNA REQUIREMENT**

---

### **Applicable Standard**

For intentional device, according to FCC §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

### **Antenna Connector Construction**

The EUT has an internal monopole antenna, the maximum gain is 0 dBi, which in accordance to section 15.203, is considered sufficient to comply with the provisions of this section.

**Result:** Compliance.

Please refer to the EUT photos.

## FCC§15.205, §15.209& §15.249- RADIATED EMISSIONS

### Applicable Standard

As per FCC §15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

### Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is  $\pm 4.0$  dB.

### Test Equipment Setup

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

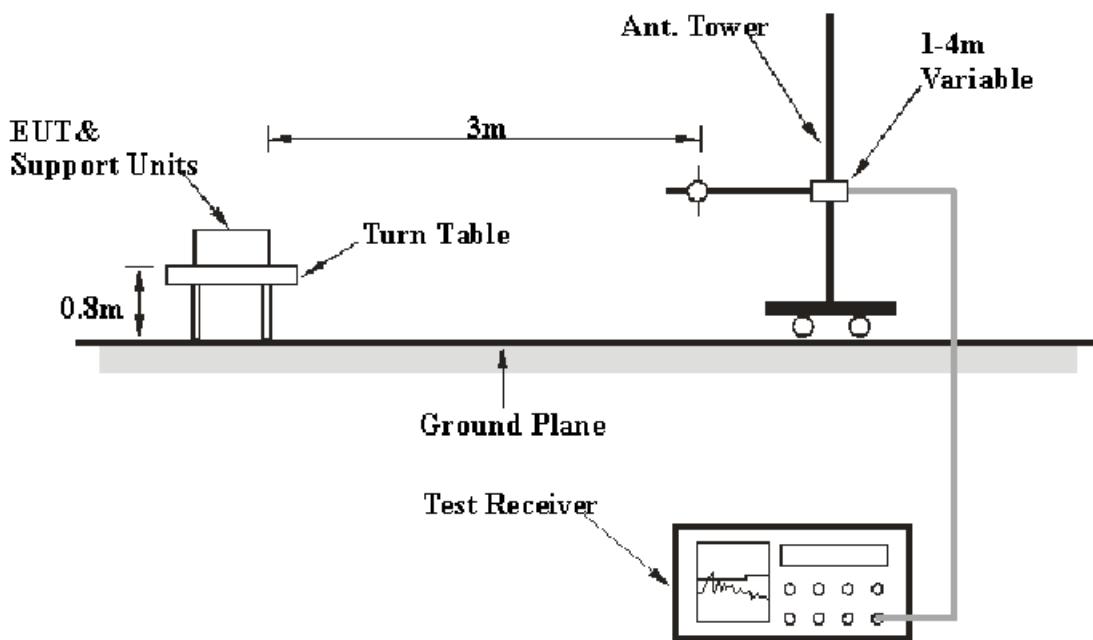
$$\text{RBW} = 100 \text{ kHz} / \text{VBW} = 300 \text{ kHz} / \text{Sweep} = \text{Auto}$$

Above 1000 MHz:

$$\text{Peak: RBW} = 1\text{MHz} / \text{VBW} = 1\text{MHz} / \text{Sweep} = \text{Auto}$$

$$\text{Peak: RBW} = 1\text{MHz} / \text{VBW} = 10 \text{ Hz} / \text{Sweep} = \text{Auto}$$

## EUT Setup



The radiated emission and out of band emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.4-2009. The specification used was the FCC 15.209 and FCC 15.249 limits.

## Test Procedure

For the radiated emissions test, maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

## Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01046	2011-08-02	2012-08-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100224	2010-11-11	2011-11-10
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2010-03-11	2012-03-10
Mini-Circuits	Amplifier	ZVA-213+	T-E27H	2011-03-08	2012-03-07
Sunol Sciences	Horn Antenna	DRH-118	A052604	2011-05-05	2012-05-04
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

## Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209 & 15.249, with the worst margin reading of:

**1.97 dB at 2468 MHz** in the **Horizontal** polarization for model J-50079-15  
**0.91 dB at 2468 MHz** in the **Vertical** polarization for model J-50079-16

## Test Data

### Environmental Conditions

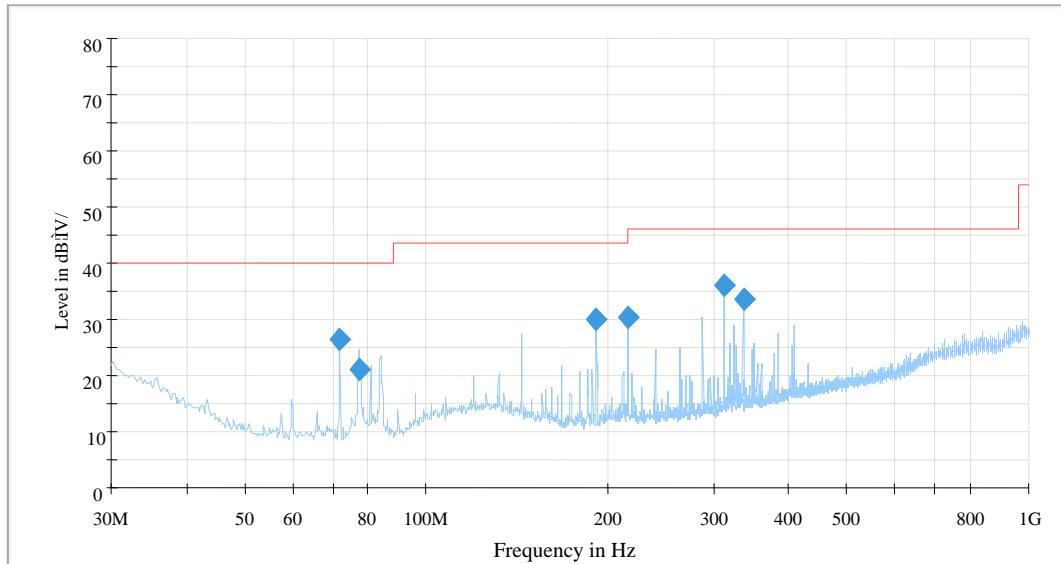
<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.2 kPa

*The testing was performed by Jimmy Xiao on 2011-09-11.*

*Test Mode: Transmitting*

**Model: J-50079-15**

## 1) Below 1 GHz:



Frequency (MHz)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dB $\mu$ V/m)	Margin (dB)
312.000250	36.1	104.0	H	262.0	-12.1	46.0	9.9
336.006250	33.6	104.0	H	257.0	-11.4	46.0	12.4
215.999250	30.4	104.0	H	133.0	-14.1	43.5	13.1
72.009750	26.5	400.0	H	330.0	-18.2	40.0	13.5
191.992500	30.0	104.0	H	322.0	-14.7	43.5	13.5
77.419250	21.2	400.0	H	313.0	-18.2	40.0	18.8

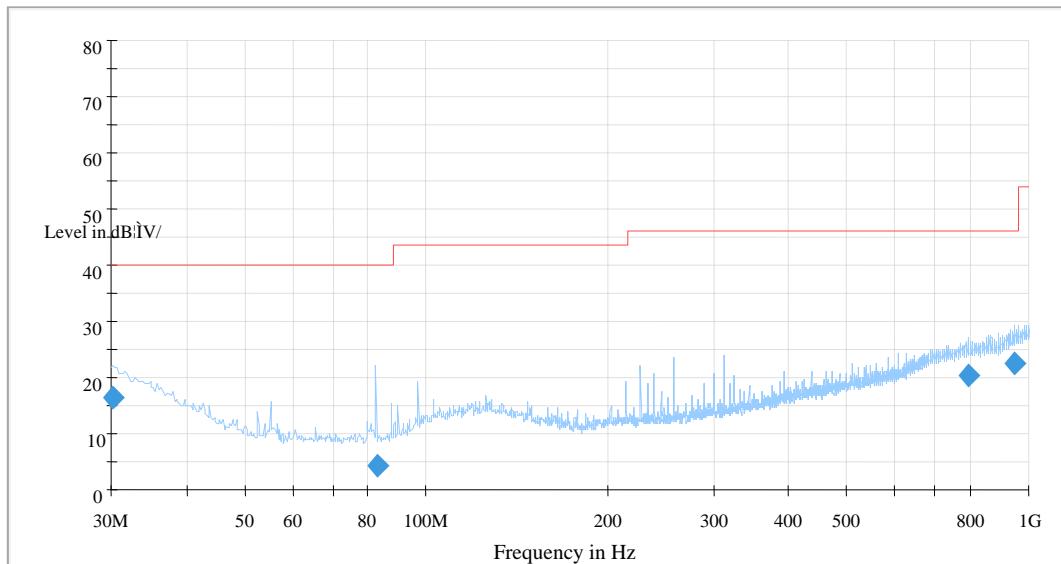
## 2) Above 1 GHz:

Freq. (MHz)	S.A. Reading (dB $\mu$ V)	Detector QP/PK/Ave.	Direction Degree	Test Antenna			Cable Loss (dB)	Amp. Gain (dB)	Cod. Amp. (dB $\mu$ V/m)	Part 15.249/15.209/15.205		
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dB $\mu$ V/m)	Margin (dB)	Comment
2468	85.47	Ave.	230	1.2	H	30.3	3.11	26.85	92.03	94	1.97*	Fund.
2468	84.37	Ave.	180	1.1	V	30.3	3.11	26.85	90.93	94	3.07*	Fund.
4936	32.88	Ave.	320	1.1	H	36.2	4.38	26.74	46.72	54	7.28	Harmonic
4936	32.06	Ave.	260	1.2	V	35.2	4.38	26.74	44.90	54	9.10	Harmonic
7404	28.37	Ave.	330	1.1	V	37.8	5.19	26.58	44.78	54	9.22	Harmonic
2468	96.08	PK	230	1.2	H	30.3	3.11	26.85	102.64	114	11.36	Fund.
2490.6	54.58	PK	160	1.4	H	30.5	3.23	26.85	61.46	74	12.54	Spurious
7404	23.67	Ave.	150	1.3	H	39.1	5.19	26.58	41.38	54	12.62	Harmonic
2468	92.82	PK	180	1.1	V	30.3	3.11	26.85	99.38	114	14.62	Fund.
7404	41.73	PK	330	1.1	V	37.8	5.19	26.58	58.14	74	15.86	Harmonic
2490.6	31.26	Ave.	160	1.4	H	30.5	3.23	26.85	38.14	54	15.86	Spurious
2490.6	51.21	PK	330	1.2	V	30.5	3.23	26.85	58.09	74	15.91	Spurious
4936	43.78	PK	320	1.1	H	36.2	4.38	26.74	57.62	74	16.38	Harmonic
7404	37.56	PK	150	1.3	H	39.1	5.19	26.58	55.27	74	18.73	Harmonic
4936	41.84	PK	260	1.2	V	35.2	4.38	26.74	54.68	74	19.32	Harmonic
2490.6	27.56	Ave.	330	1.2	V	30.5	3.23	26.85	34.44	54	19.56	Spurious
2383.7	21.98	Ave.	240	1.1	H	30.3	3.01	26.84	28.45	54	25.55	Spurious
2383.7	21.26	Ave.	230	1.5	V	30.3	3.01	26.84	27.73	54	26.27	Spurious
2383.7	36.66	PK	240	1.1	H	30.3	3.01	26.84	43.13	74	30.87	Spurious
2383.7	36.30	PK	230	1.5	V	30.3	3.01	26.84	42.77	74	31.23	Spurious

\*Within measurement uncertainty!

**Model: J-50079-16**

## 1) Below 1 GHz:



Frequency (MHz)	Corrected Amplitude (dB $\mu$ V/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dB $\mu$ V/m)	Margin (dB)
30.173002	16.5	306.0	H	115.0	-5.5	40.0	23.5
947.035250	22.4	143.0	H	7.0	0.5	46.0	23.6
795.429250	20.4	322.0	V	263.0	-1.9	46.0	25.6
82.924750	4.2	160.0	H	188.0	-18.0	40.0	35.8

## 2) Above 1 GHz:

Freq. (MHz)	S.A. Reading (dB $\mu$ V)	Detector QP/PK/Ave.	Direction Degree	Test Antenna			Cable Loss (dB)	Amp. Gain (dB)	Cod. Amp. (dB $\mu$ V/m)	Part 15.249/15.209/15.205		
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dB $\mu$ V/m)	Margin (dB)	Comment
2468	86.53	Ave.	210	1.1	V	30.3	3.11	26.85	93.09	94	0.91*	Fund.
2468	85.94	Ave.	250	1.1	H	30.3	3.11	26.85	92.50	94	1.50*	Fund.
4936	34.81	Ave.	170	1.2	H	36.2	4.38	26.74	48.65	54	5.35	Harmonic
2489.5	60.68	PK	210	1.4	H	30.6	3.23	26.85	67.66	74	6.34	Spurious
4936	32.28	Ave.	160	1.4	V	35.2	4.38	26.74	45.12	54	8.88	Harmonic
7404	26.90	Ave.	360	1.2	V	37.8	5.19	26.58	43.31	54	10.69	Harmonic
2468	96.63	PK	250	1.1	H	30.3	3.11	26.85	103.19	114	10.81	Fun.
7404	25.32	Ave.	140	1.3	H	39.1	5.19	26.58	43.03	54	10.97	Harmonic
2489.5	53.14	PK	170	1.1	V	30.6	3.23	26.85	60.12	74	13.88	Spurious
2468	93.05	PK	210	1.1	V	30.3	3.11	26.85	99.61	114	14.39	Fund.
4936	44.11	PK	170	1.2	H	36.2	4.38	26.74	57.95	74	16.05	Harmonic
4936	43.65	PK	160	1.4	V	35.2	4.38	26.74	56.49	74	17.51	Harmonic
7404	38.21	PK	140	1.3	H	39.1	5.19	26.58	55.92	74	18.08	Harmonic
7404	39.50	PK	360	1.2	V	37.8	5.19	26.58	55.91	74	18.09	Harmonic
2489.5	28.16	Ave.	210	1.4	H	30.6	3.23	26.85	35.14	54	18.86	Spurious
2489.5	26.85	Ave.	170	1.1	V	30.6	3.23	26.85	33.83	54	20.17	Spurious
2353.1	21.43	Ave.	360	1.9	V	30.2	3.01	26.83	27.81	54	26.19	Spurious
2353.1	21.27	Ave.	110	1.2	H	30.2	3.01	26.83	27.65	54	26.35	Spurious
2353.1	36.20	PK	110	1.2	H	30.2	3.01	26.83	42.58	74	31.42	Spurious
2353.1	35.58	PK	360	1.9	V	30.2	3.01	26.83	41.96	74	32.04	Spurious

\*Within measurement uncertainty!

## FCC§15.215(c) – 20 dB EMISSION BANDWIDTH

### Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07
Mini-Circuits	Amplifier	ZVA-213+	T-E27H	2011-03-08	2012-03-07
Sunol Sciences	Horn Antenna	DRH-118	A052604	2011-05-05	2012-05-04

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

### Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that indicated 20dB bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.2 kPa

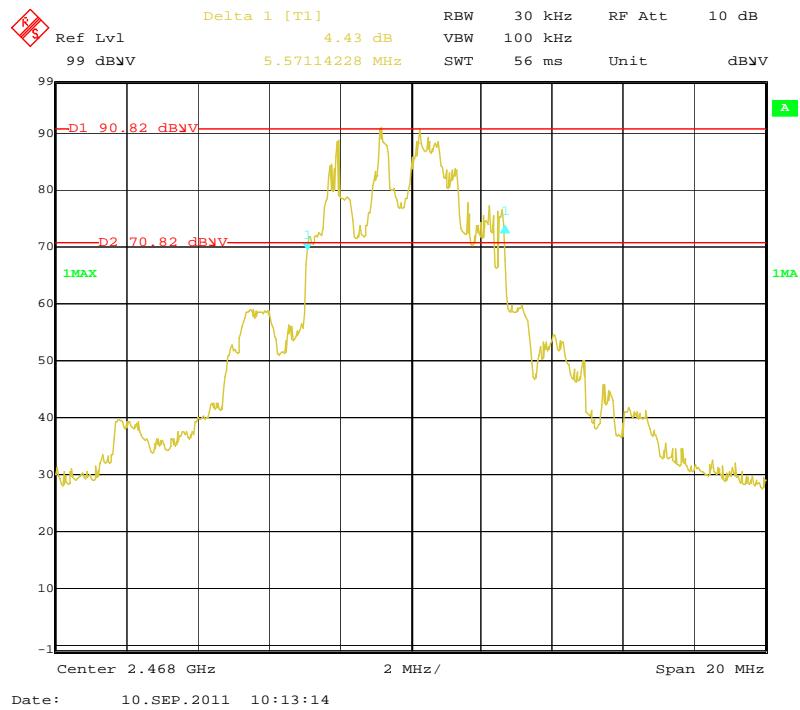
\*The testing was performed by Jimmy Xiao on 2011-09-10.

Test Mode: Transmitting

Pleas refer to the plot and tabular data sheet attached.

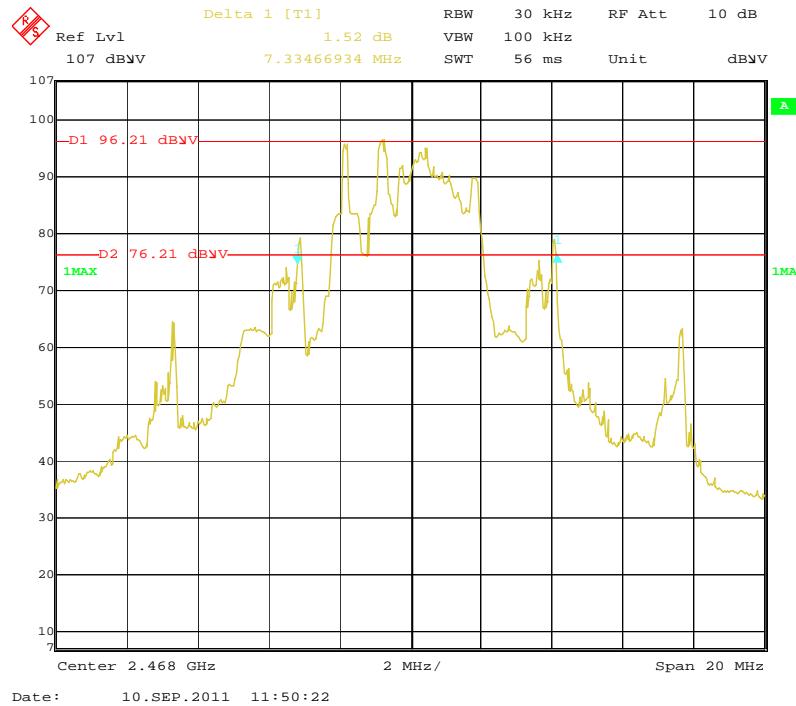
**Model: J-50079-15**

Frequency (MHz)	20 dB Emission Bandwidth (MHz)
2468	5.571



**Model: J-50079-16**

Frequency (MHz)	20 dB Emission Bandwidth (MHz)
2468	7.335



## **PRODUCT SIMILARITY DECLARATION LETTER**

SPX Service Solutions  
655 Eisenhower Drive, Owatonna, MN, 55060, United States  
Tel: +1 586-578-7214 Fax: +1 586-578-7376

Date: 2011.9.21

### **Product Similarity Declaration**

To Whom It May Concern,

We, SPX Service Solutions hereby declare that our Wireless Inspection Camera and RECEIVER Model Number: J-50079-15 are electrically identical with the J-50079-16 that was certified by BACL. They are just different in model names due to the length of tube.

Please contact me if you have any question.

Signature:

Fred Kaleal

Product Manager

\*\*\*\*\* END OF REPORT \*\*\*\*\*