

## **Certification Test Report**

**FCC ID: KBCIX-WS53HN1**  
**IC: 1943A-WS53HN1**

**FCC Rule Part: 15.247**  
**IC Radio Standards Specification: RSS-210**

**ACS Report Number: 12-2029.W04.1B**

**Manufacturer: General Dynamics Itronix Corporation**  
**Model: 46-0503-002R**

**Test Begin Date: March 30, 2012**  
**Test End Date: May 14, 2012**

**Report Issue Date: June 12, 2012**



FOR THE SCOPE OF ACCREDITATION UNDER CERTIFICATE NUMBER AT-1533

This report must not be used by the client to claim product certification, approval, or endorsement by ACCLASS, ANSI, or any agency of the Federal Government.

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A handwritten signature in black ink, appearing to read "Thierry Jean-Charles".

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**EMC Engineer**  
**Advanced Compliance Solutions, Inc.**

**Reviewed by:**

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**Director, Wireless Certifications**  
**Advanced Compliance Solutions, Inc.**

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**This report contains 14 pages**

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**1 GENERAL**

**1.1 Purpose**

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC’s Code of Federal Regulations and Industry Canada’s Radio Standards Specification RSS-210 for a class II permissive change for the specific test requirements described in this document.

**1.2 Product description**

The General Dynamics Itronix Corporation 802.11b/g/n Mini Card, Model No.: 46-0503-002R, is a WLAN IEEE 802.11b/g/n radio module. The transceiver is incorporated inside of the G8200 ruggedized laptop which can be used in the portable and mobile (vehicle-mount) configurations. The vehicle docking station provides an external antenna option. The GD8200 also includes a co-located Bluetooth 2.1+EDR class 1 transceiver.

**Technical Details**

Mode of Operation: WLAN 802.11b/g/n  
 Frequency Range: 802.11b/g/n HT20: 2142 MHz – 2462 MHz  
 802.11n HT40: 2422 MHz – 2452 MHz  
 Number of Channels: 802.11b/g/n HT20: 11  
 802.11n HT40: 7  
 Channel Separation: 5 MHz  
 Transmit Data Rates: 802.11b: 11, 5.5, 2, 1 Mbps  
 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps  
 802.11n HT20: 130, 117, 104, 78, 52, 39, 26, 13 Mbps  
 802.11n HT40: 300, 270, 243, 216, 162, 108, 81, 54, 27 Mbps  
 Modulations: 802.11b: DSSS (CCK, DQPSK, DBPSK)  
 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK)  
 802.11n HT20/40: OFDM (64QAM, 16QAM, QPSK, BPSK)

**Table 1.2- 1: Collocated Radios**

Radio	Company	Model Number	FCC ID	IC
Bluetooth	General Dynamics Itronix	IX-WT11	KBCIX-WT11	1943A-WT11

Manufacturer Information:  
 General Dynamics Itronix  
 1000 Sawgrass Corporate Parkway, Suite 300  
 Sunrise, Florida 33323

Test Sample Serial Number(s): ZZSJC2059ZZ0080

Test Sample Condition: The unit was in good physical condition with no visible damages.

### 1.3 Test Methodology and Considerations

The General Dynamics Itronix Corporation 46-0503-002R was tested for radiated emissions in the mobile configuration when inserted in the host GD8200 laptop with the external antenna. The unit was evaluated up to the 10 harmonic for all available modes of operations using the data rate leading to the highest emissions. The configurations of evaluation are described below.

The 46-0503-002 was also evaluated for radiated emissions for inter-modulation products generated by the co-located WLAN and Bluetooth radios transmitting at the same time. The evaluation was performed for both external and internal antenna configurations, mobile and portable configurations respectively, and all inter-modulations products of the co-located radios were found to be compliant.

**Table 1.3-1: Configurations evaluated**

Mode of Operation	Frequency (MHz)	Channel	Data Rate	Power Settings
802.11b	2412	1	11 Mbps	18.5 dBm
	2437	6	11 Mbps	20.0 dBm
	2462	11	11 Mbps	19.5 dBm
802.11g	2412	1	6 Mbps	16.5 dBm
	2437	6	6 Mbps	16.5 dBm
	2462	11	6 Mbps	14.5 dBm
802.11n HT20	2412	1	13 Mbps	15.0 dBm
	2437	6	13 Mbps	15.0 dBm
	2462	11	13 Mbps	13.0 dBm
802.11n HT40	2422	3	27 Mbps	11.5 dBm
	2437	6	27 Mbps	12.0 dBm
	2452	9	27 Mbps	11.0 dBm

## **2 TEST FACILITIES**

### **2.1 Location**

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions, Inc.  
3998 FAU Blvd, Suite 310  
Boca Raton, Florida 33431  
Phone: (561) 961-5585  
Fax: (561) 961-5587  
[www.acstestlab.com](http://www.acstestlab.com)

FCC Test Firm Registration #: 587595  
Industry Canada Lab Code: 4175C

### **2.2 Laboratory Accreditations/Recognitions/Certifications**

ACS is accredited to ISO/IEC 17025 by ANSI-ASQ National Accreditation Board under their ACLASS program and has been issued certificate number AT-1533 in recognition of this accreditation. Unless otherwise specified, all test methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

**2.3 Radiated & Conducted Emissions Test Site Description**

**2.3.1 Semi-Anechoic Chamber Test Site**

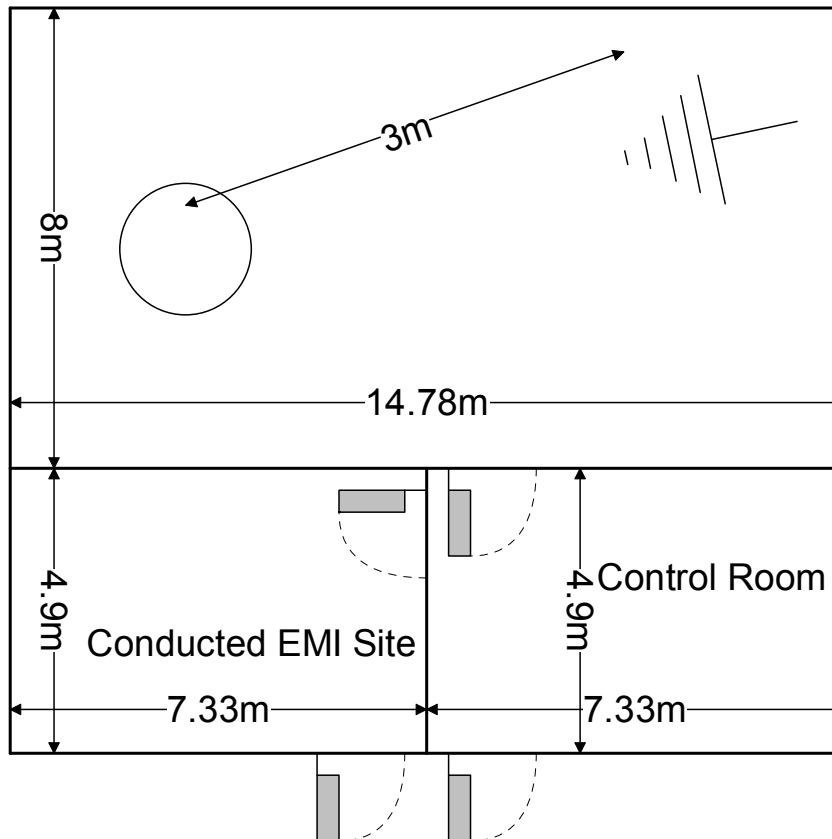
The EMC radiated test facility consists of an RF-shielded enclosure. The interior dimensions of the indoor semi-anechoic chamber are approximately 48 feet (14.6 m) long by 36 feet (10.8 m) wide by 24 feet (7.3 m) high and consist of rigid, 1/8 inch (0.32 cm) steel-clad, wood core modular panels with steel framing. In the shielded enclosure, the faces of the panels are galvanized and the chamber is self-supporting. 8-foot RF absorbing cones are installed on 4 walls and the ceiling. The steel-clad ground plane is covered with vinyl floor.

The turntable is driven by pneumatic motor, which is capable of supporting a 2000 lb. load. The turntable is flushed with the chamber floor which it is connected to, around its circumference, with a continuous metallic loaded spring. An EMCO Model 1050 Multi-device Controller controls the turntable position.

A pneumatic motor is used to control antenna polarizations and height relative to the ground. The height information is displayed on the control unit EMCO Model 1050.

The control room is an RF shielded enclosure attached to the semi-anechoic chamber with two bulkhead panels for connecting RF, and control cables. The dimension of the room is 7.3 m x 4.9 m x 3 m high and the entrance doors of both control and conducted rooms are 3 feet (0.91 m) by 7 feet (2.13 m).

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3.1-1 below:

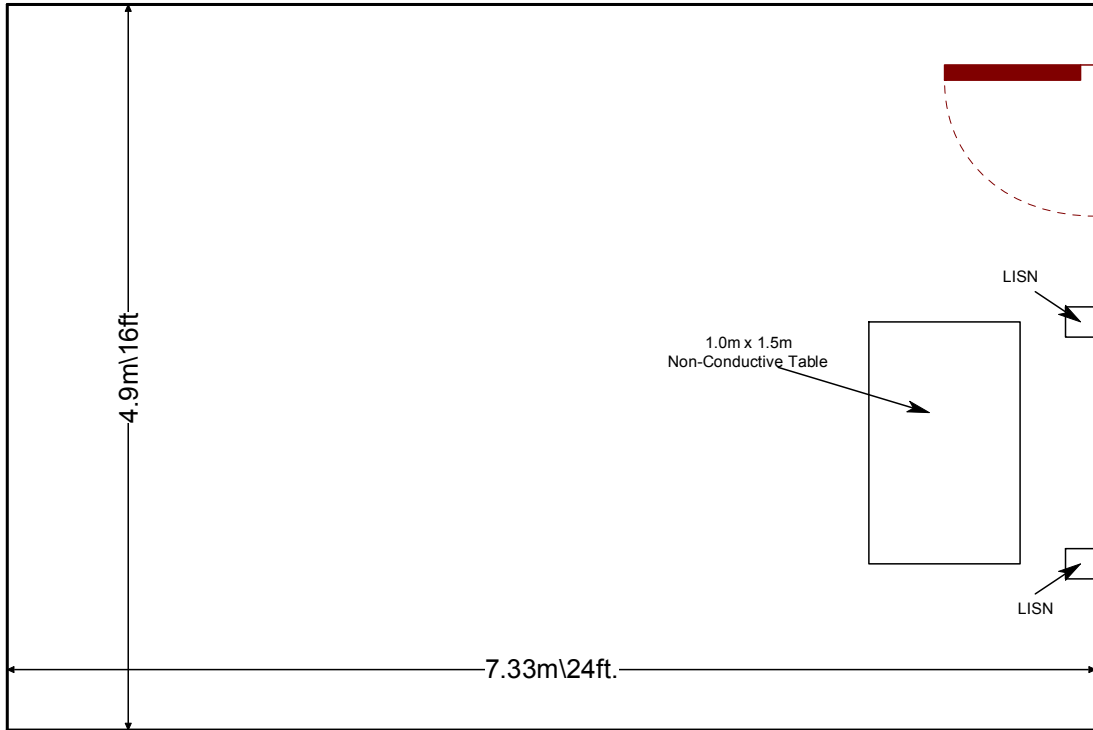


**Figure 2.3.1-1: Semi-Anechoic Chamber Test Site**

**2.3.2 Conducted Emissions Test Site Description**

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m<sup>3</sup>. As per ANSI C63.4 2003 requirements, the data were taken using two LISNs; a Solar Model 8028-50 50 Ω/50 μH and an EMCO Model 3825, which are installed as shown in Photograph 3. For 220 V, 50 Hz, a Polarad LISN (S/N 879341/048) is used in conjunction with a 1 kVA, 50 Hz/220 V EDGAR variable frequency generator, Model 1001B, to filter conducted noise from the generator.

A diagram of the room is shown below in figure 2.3.2-1:



**Figure 2.3.2-1: AC Mains Conducted EMI Site**

### 3 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ❖ ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2012
- ❖ US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2012
- ❖ KDB Publication No. 558074 – Guidance for Performing Measurements on Digital Transmission Systems (DTS) Operating under Section 15.247, January 18, 2012
- ❖ Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8, December 2010.
- ❖ Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3, December 2010.

### 4 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

**Table 4-1: Test Equipment**

AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
523	Agilent	E7405	Spectrum Analyzers	MY45103293	1/5/2011	1/5/2013
524	Chase	CBL6111	Antennas	1138	1/7/2011	1/7/2013
2006	EMCO	3115	Antennas	2573	3/2/2011	3/2/2013
2008	COM-Power	AH-826	Antennas	81009	NCR	NCR
2011	Hewlett-Packard	HP 8447D	Amplifiers	2443A03952	1/2/2012	1/2/2013
2037	ACS Boca	Chamber EMI Cable Set	Cable Set	2037	1/2/2012	1/2/2013
2044	QMI	N/A	Cables	2044	1/2/2012	1/2/2013
2070	Mini Circuits	VHF-8400+	Filter	2070	1/19/2012	1/19/2013
2072	Mini Circuits	VHF-3100+	Filter	30737	1/19/2012	1/19/2013
2076	Hewlett Packard	HP5061-5458	Cables	2076	1/2/2012	1/2/2013
2086	Merrimac	FAN-6-10K	Attenuators	23148-83-1	12/30/2011	12/30/2012
2091	Agilent Technologies, Inc.	8573A	Spectrum Analyzers	2407A03233	12/12/2011	12/12/2013
2095	ETS Lindgren	TILE4! - Version 4.2.A	Software	85242	NCR	NCR
RE586	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00168	9/23/2011	9/23/2012

**NCR=No Calibration Required**

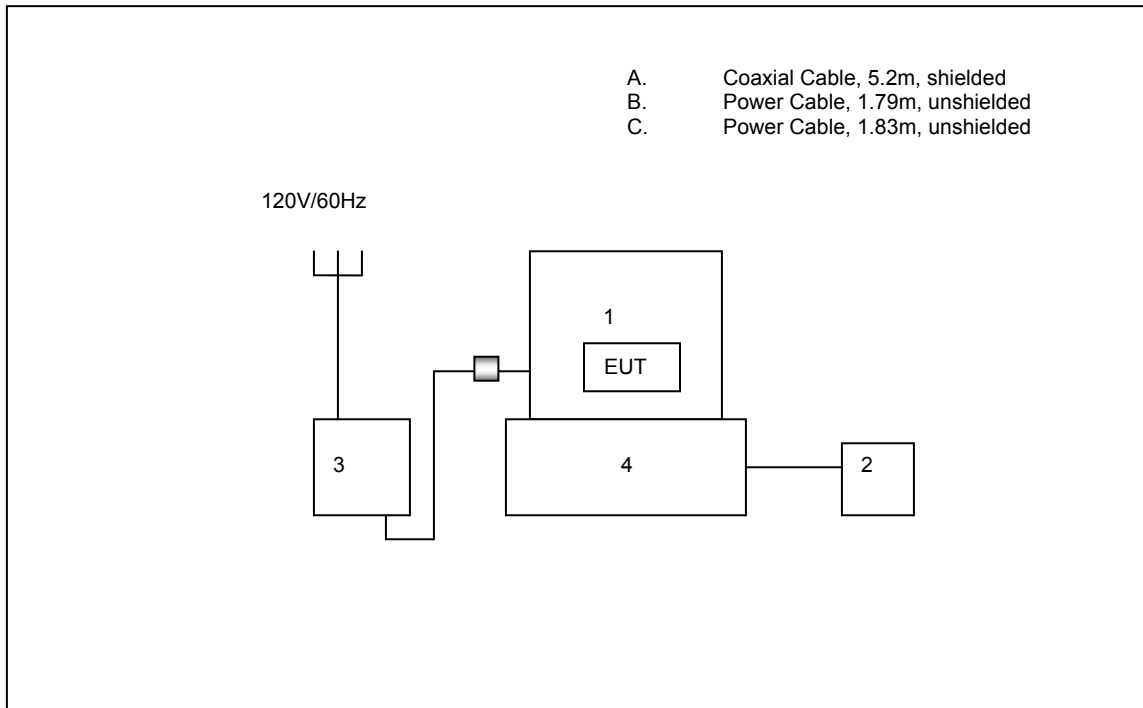


5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	Host Laptop	General Dynamics Itronix	GD8200	ZZSJC2059ZZ0080
2	External Antenna	PCTEL, Inc.	(B)MAXC24505	N/A
3	19V ITE Power Supply	Delta Electronics, Inc.	ADP-90CD BB	83EW18N01TD
4	Vehicle Dock	General Dynamics	50-0207-001R	ZZCWA7039AE004

6 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM



## **7 SUMMARY OF TESTS**

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

### **7.1 Antenna Requirement – FCC: Section 15.203**

The General Dynamics Itronix Model 46-0503-002R in the portable mode features internal planar inverted-F antennas which are not accessible to the end-user. In the mobile configuration, the Model 46-0503-002R provides a standard SMA connector from the vehicle dock. However, the equipment is professionally installed per the applicant, thus meeting the requirements of 15.203.

The evaluation in the mobile configuration was performed using the PTCEL, Inc. (B)MAXC24505 5 dBi whip antenna.

### **7.2 Radiated Spurious Emissions - FCC Section 15.205 IC: RSS-210 2.6**

#### **7.2.1 Measurement Procedure**

Radiated emissions tests were made over the frequency range of 30MHz to 26GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth RBW of 120 kHz and a video bandwidth VBW of 300 kHz. For frequencies above 1000MHz, peak measurements were made with RBW and VBW of 1 MHz and 3MHz respectively. The average measurements were performed in the linear scale with a VBW of 10 Hz.

7.2.2 Measurement Results

Radiated spurious emissions found in the band of 30MHz to 26GHz are reported below.

**Table 7.2.2-1: Radiated Spurious Emissions Tabulated Data – WLAN 802.11b**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel 2412 MHz</b>										
2385.72	74.21	63.97	V	-10.33	63.88	53.64	74.0	54.0	10.10	0.40
2386.425	74.62	62.88	H	-10.33	64.29	52.55	74.0	54.0	9.70	1.40
<b>Middle Channel 2437 MHz</b>										
4874	52.40	39.23	V	-2.57	49.83	36.66	74.0	54.0	24.20	17.30
7311	50.46	38.23	V	1.57	52.03	39.80	74.0	54.0	22.00	14.20
<b>High Channel 2462 MHz</b>										
2483.5	74.03	60.66	H	-9.91	64.12	50.75	74.0	54.0	9.90	3.20
2483.5	71.36	59.43	V	-9.91	61.45	49.52	74.0	54.0	12.50	4.50
2487.6	73.20	62.12	H	-9.89	63.31	52.23	74.0	54.0	10.70	1.80
2486.8	71.47	60.96	V	-9.89	61.58	51.07	74.0	54.0	12.40	2.90
4924	49.63	35.67	H	-2.44	47.19	33.23	74.0	54.0	26.80	20.80
4924	52.43	38.84	V	-2.44	49.99	36.40	74.0	54.0	24.00	17.60

\*Note: All emissions falling in the restricted bands above 7311 MHz were attenuated below the noise floor of the measurement equipment.

**Table 7.2.2-2: Radiated Spurious Emissions Tabulated Data – WLAN 802.11g**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel 2412 MHz</b>										
2390	81.46	63.92	H	-10.31	71.15	53.61	74.0	54.0	2.90	0.40
2390	82.76	63.91	V	-10.31	72.45	53.60	74.0	54.0	1.60	0.40
<b>Middle Channel 2437 MHz</b>										
10646.858	45.02	33.27	H	6.74	51.76	40.01	83.5	63.5	31.70	23.50
<b>High Channel 2462 MHz</b>										
2483.5	80.26	60.40	H	-9.91	70.35	50.49	74.0	54.0	3.60	3.50
2483.5	83.27	63.13	V	-9.91	73.36	53.22	74.0	54.0	0.60	0.80

\*Note: All emissions falling in the restricted bands above 10646.86 MHz were attenuated below the noise floor of the measurement equipment.

**Table 7.2.2-3: Radiated Spurious Emissions Tabulated Data – WLAN 802.11n HT20**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel 2412 MHz</b>										
2390	77.92	60.68	H	-10.31	67.61	50.37	74.0	54.0	6.40	3.60
2390	80.54	63.44	V	-10.31	70.23	53.13	74.0	54.0	3.80	0.90
<b>Middle Channel 2437 MHz</b>										
8095	47.19	34.15	H	3.16	50.35	37.31	74.0	54.0	23.60	16.70
<b>High Channel 2462 MHz</b>										
2483.5	80.03	59.19	H	-9.91	70.12	49.28	74.0	54.0	3.90	4.70
2483.5	79.83	61.57	V	-9.91	69.92	51.66	74.0	54.0	4.10	2.30
8425	39.90	27.90	H	3.54	43.44	31.44	74.0	54.0	30.60	22.60

\*Notes:

All emissions falling in the restricted bands above 8425 MHz were attenuated below the noise floor of the measurement equipment.

Both main and auxiliary antenna chains were active during the evaluation.

**Table 7.2.2-4: Radiated Spurious Emissions – WLAN 802.11n HT40**

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
<b>Low Channel 2422 MHz</b>										
2390	80.22	64.22	H	-10.31	69.91	53.91	74.0	54.0	4.10	0.10
2390	80.37	63.86	V	-10.31	70.06	53.55	74.0	54.0	3.90	0.50
<b>Middle Channel 2437 MHz</b>										
<b>Noise Floor</b>										
<b>High Channel 2452 MHz</b>										
2483.5	77.81	61.61	H	-9.91	67.90	51.70	74.0	54.0	6.10	2.30
2483.5	78.23	62.50	V	-9.91	68.32	52.59	74.0	54.0	5.70	1.40

\*Notes:

All emissions falling in the restricted bands above 2483.5 MHz were attenuated below the noise floor of the measurement equipment.

Both main and auxiliary antenna chains were active during the evaluation.

**7.2.3 Sample Calculation:**

$$R_C = R_U + CF_T$$

Where:

 $CF_T$  = Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only) $R_U$  = Uncorrected Reading $R_C$  = Corrected Level

AF = Antenna Factor

CA = Cable Attenuation

AG = Amplifier Gain

DC = Duty Cycle Correction Factor

**Example Calculation: Peak**Corrected Level:  $74.21 + -10.33 = 63.88\text{dBuV/m}$ Margin:  $74\text{dBuV/m} - 63.88\text{dBuV/m} = 10.1\text{dB}$ **Example Calculation: Average**Corrected Level:  $63.97 + -10.33 - 0 = 53.64\text{dBuV}$ Margin:  $54\text{dBuV} - 53.64\text{dBuV} = 0.4\text{dB}$ **8 CONCLUSION**

In the opinion of ACS, Inc. the 46-0503-002R, manufactured by General Dynamics Itronix Corporation meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210 based on the test results documented in this test report.

**END REPORT**