

Certification Test Report

**FCC ID: RS2SXI1
IC: 5697A-SXI1**

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

ACS Report Number: 12-2062.W06.2A

**Manufacturer: SIRIUS XM Radio Inc.
Model: SXi1**

**Test Begin Date: May 11, 2012
Test End Date: May 11, 2012**

Report Issue Date: May 18, 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 ACLASS, 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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**Kirby Munroe
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This report contains 12 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 the specific requirements detailed in this document.

1.2 Product description

The SXi1 is a Sirius XM Satellite Radio receiver. The SXi1 includes a Bluetooth 2.0+EDR as well as a WLAN 802.11 b,g,n radio. The SXi1 also features universal docking capability for home, office or vehicle use.

Technical Details

Mode of Operation:	WLAN 802.11b,g,n
Operating Range:	2412 MHz – 2462MHz
Number of Channels:	11
Channel Separation:	5 MHz
Modulation(s):	802.11b: DSSS (BPSK / QPSK / CCK); 802.11g: OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate(s):	802.11b: 11, 5.5, 2, 1 Mbps; 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps; 802.11n: 65, 58.5, 52, 39, 26, 19.5, 13, 6.5 Mbps;
Input Voltage:	3.7V Li-Ion Battery

Manufacturer Information:
SIRIUS XM Radio Inc.
1500 Eckington PL NE
Washington, DC 20002

Test Sample Serial Number(s): J78P04HU

Test Sample Condition: Test samples were provided in working order with no visible defects

1.3 Test Methodology and Considerations

The following modes/data rates were used for final radiated emissions measurements:

802.11b: 5.5 Mbps (Low Channel), 11Mbps (High Channel)

802.11g: 6 Mbps (Low Channel), 9Mbps (High Channel),

802.11n: MCS0 (Low and High Channels)

For the band-edge radiated emissions evaluation, multiple orientations were investigated.

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

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:

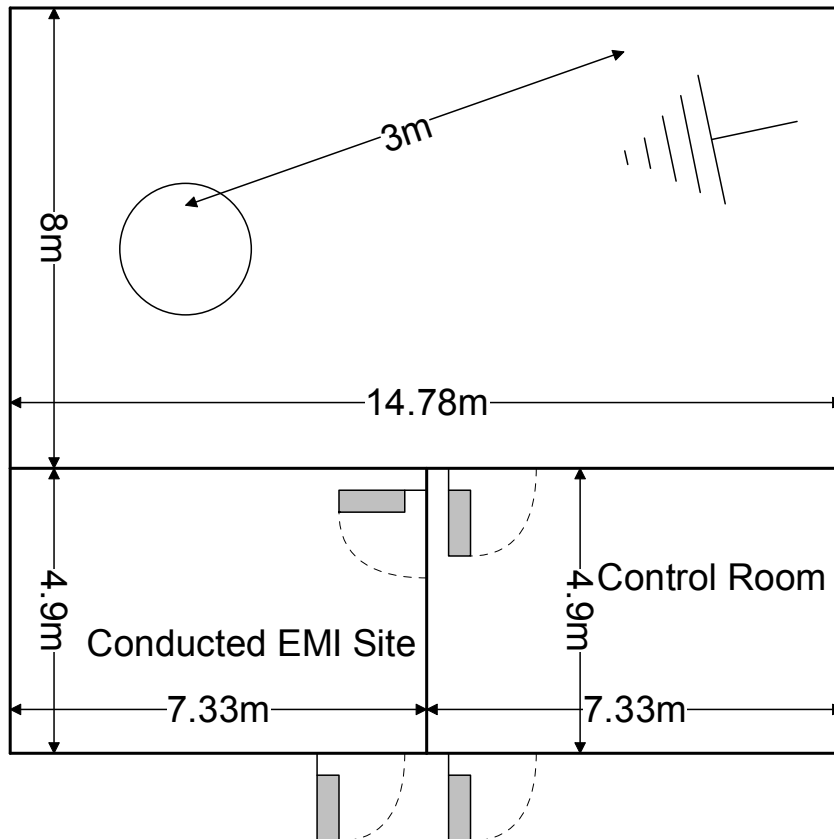


Figure 2.3.1-1: Semi-Anechoic Chamber Test Site

2.3.2 Conducted Emissions Test Site Description

The dimensions of the shielded conducted room are 7.3 x 4.9 x 3 m³. 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:

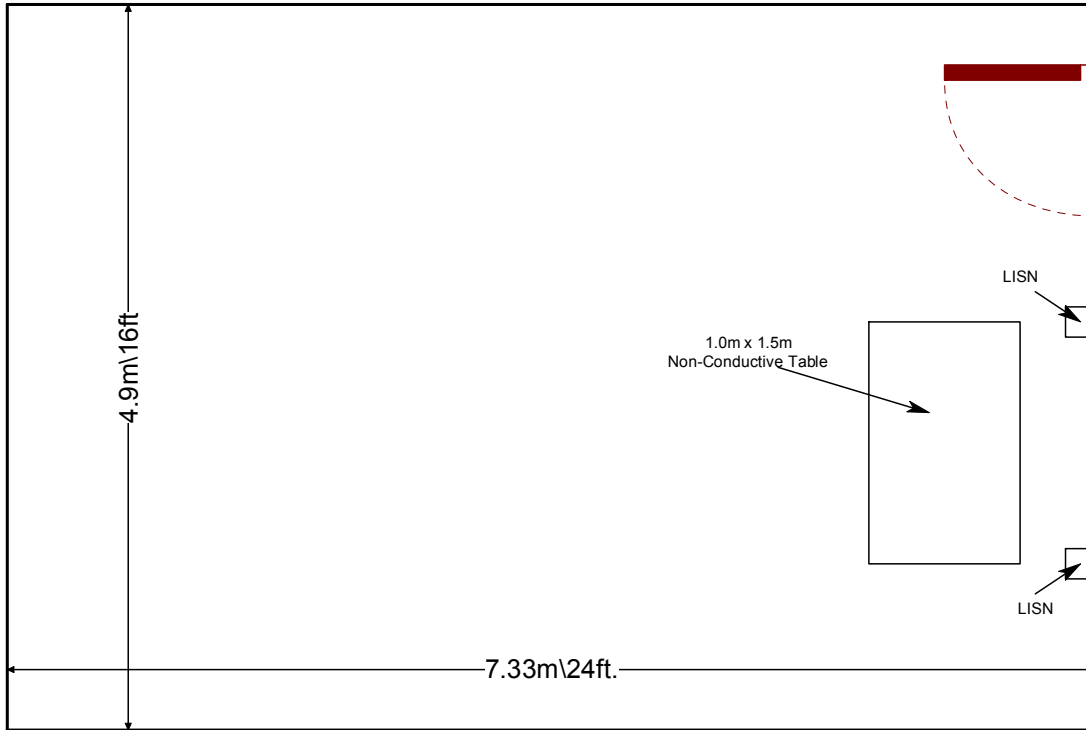


Figure 2.3.2-1: AC Mains Conducted EMI Site

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
- ❖ 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, Issue3, 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
2006	EMCO	3115	Antennas	2573	3/2/2011	3/2/2013
2044	QMI	N/A	Cables	2044	1/2/2012	1/2/2013
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
RE586	Agilent Technologies, Inc.	83017A	Amplifiers	3123A00168	9/23/2011	9/23/2012

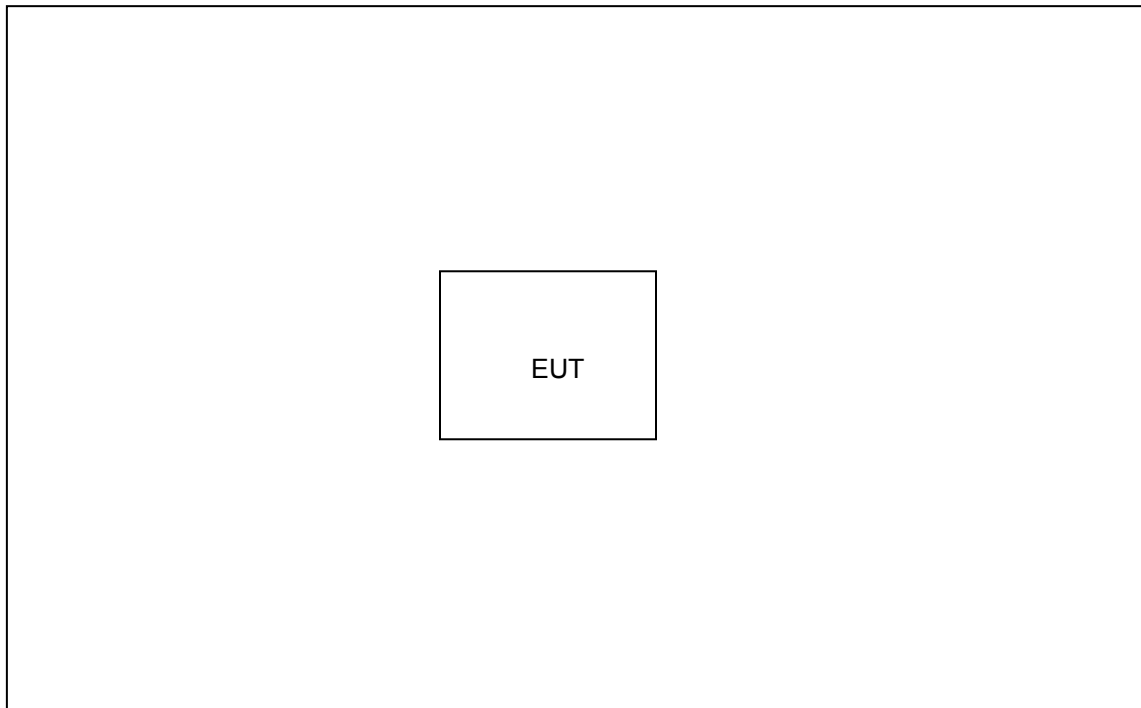
NCR=No Calibration Required

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
The EUT was tested in the stand-alone configuration. Therefore, no support equipment was utilized.				

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 Band-Edge Compliance of Radiated Emissions - FCC 15.247(d) IC: RSS-210 2.2

7.1.1 Measurement Procedure

The EUT was investigated at the low and high channels of operation to determine band-edge compliance. Compliance for the lower and upper band-edge was determined based on absolute radiated field strength measurements at the restricted band-edges.

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. Peak measurements were made with RBW and VBW of 1 MHz and 3 MHz respectively. The average measurements were performed using a video bandwidth of 10 Hz in the linear amplitude scale.

The highest emission found to be in the restricted band at the band-edge as defined by section 15.205 was compared to the radiated emission limits defined in section 15.209.

7.1.2 Measurement Results

Band-Edge data is displayed below:

Table 7.1.2-1: Band-Edge Radiated 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
X-Orientation										
2390	61.30	47.10	H	-10.31	50.99	36.79	74.0	54.0	23.0	17.2
2390	60.64	46.80	V	-10.31	50.33	36.49	74.0	54.0	23.7	17.5
2483.5	61.69	47.67	H	-9.91	51.78	37.76	74.0	54.0	22.2	16.2
2483.5	60.82	48.15	V	-9.91	50.91	38.24	74.0	54.0	23.1	15.8
Y-Orientation										
2390	59.60	46.15	H	-10.31	49.29	35.84	74.0	54.0	24.7	18.2
2390	61.33	48.06	V	-10.31	51.02	37.75	74.0	54.0	23.0	16.3
2483.5	61.58	48.45	H	-9.91	51.67	38.54	74.0	54.0	22.3	15.5
2483.5	61.25	48.73	V	-9.91	51.34	38.82	74.0	54.0	22.7	15.2
Z-Orientation										
2390	61.07	47.34	H	-10.31	50.76	37.03	74.0	54.0	23.2	17.0
2390	60.64	47.88	V	-10.31	50.33	37.57	74.0	54.0	23.7	16.4
2483.5	61.95	48.84	H	-9.91	52.04	38.93	74.0	54.0	22.0	15.1
2483.5	62.35	49.85	V	-9.91	52.44	39.94	74.0	54.0	21.6	14.1

* Note: The emissions at the lower band edge (2390 MHz) correspond to the noise floor of the measurement equipment.

Table 7.1.2-2: Band-Edge Radiated 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
X-Orientation										
2390	62.00	48.66	H	-10.31	51.69	38.35	74.0	54.0	22.3	15.7
2390	61.60	47.94	V	-10.31	51.29	37.63	74.0	54.0	22.7	16.4
2483.5	66.82	50.92	H	-9.91	56.91	41.01	74.0	54.0	17.1	13.0
2483.5	67.45	51.69	V	-9.91	57.54	41.78	74.0	54.0	16.5	12.2
Y-Orientation										
2390	59.99	46.75	H	-10.31	49.68	36.44	74.0	54.0	24.3	17.6
2390	65.73	50.00	V	-10.31	55.42	39.69	74.0	54.0	18.6	14.3
2483.5	67.69	52.31	H	-9.91	57.78	42.40	74.0	54.0	16.2	11.6
2483.5	69.47	52.94	V	-9.91	59.56	43.03	74.0	54.0	14.4	11.0
Z-Orientation										
2390	65.03	49.83	H	-10.31	54.72	39.52	74.0	54.0	19.3	14.5
2390	67.08	50.45	V	-10.31	56.77	40.14	74.0	54.0	17.2	13.9
2483.5	69.57	52.45	H	-9.91	59.66	42.54	74.0	54.0	14.3	11.5
2483.5	72.15	55.10	V	-9.91	62.24	45.19	74.0	54.0	11.8	8.8

Table 7.1.2-3: Band-Edge Radiated Emissions Tabulated Data - WLAN 802.11n

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
X-Orientation										
2390	65.45	49.07	H	-10.31	55.14	38.76	74.0	54.0	18.9	15.2
2390	63.46	48.01	V	-10.31	53.15	37.70	74.0	54.0	20.9	16.3
2483.5	67.50	51.18	H	-9.91	57.59	41.27	74.0	54.0	16.4	12.7
2483.5	69.29	51.77	V	-9.91	59.38	41.86	74.0	54.0	14.6	12.1
Y-Orientation										
2390	64.38	48.83	H	-10.31	54.07	38.52	74.0	54.0	19.9	15.5
2390	66.39	51.00	V	-10.31	56.08	40.69	74.0	54.0	17.9	13.3
2483.5	68.67	52.10	H	-9.91	58.76	42.19	74.0	54.0	15.2	11.8
2483.5	70.33	53.22	V	-9.91	60.42	43.31	74.0	54.0	13.6	10.7
Z-Orientation										
2390	66.51	50.03	H	-10.31	56.20	39.72	74.0	54.0	17.8	14.3
2390	70.65	51.85	V	-10.31	60.34	41.54	74.0	54.0	13.7	12.5
2483.5	70.69	53.86	H	-9.91	60.78	43.95	74.0	54.0	13.2	10.0
2483.5	72.93	55.40	V	-9.91	63.02	45.49	74.0	54.0	11.0	8.5

7.1.2.1 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: $61.3 + -10.31 = 50.99\text{dBuV/m}$

Margin: $74\text{dBuV/m} - 50.99\text{dBuV/m} = 23.0\text{dB}$

Example Calculation: Average

Corrected Level: $47.1 + -10.31 - 0 = 36.79\text{dBuV}$

Margin: $54\text{dBuV} - 36.79\text{dBuV} = 17.2\text{dB}$

8 CONCLUSION

In the opinion of ACS, Inc. the SXi1, manufactured by Sirius XM Radio Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210 as applicable to the test results provided in this document.

END REPORT