Excellence in Compliance Testing

Certification Test Report

FCC ID: TEB-HUNTGS10122
IC: 5931A-HUNTGS10122

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

ACS Report Number: 11-0031.W06.44.A

Manufacturer: Hunt Technologies, Inc.
Model: 10122

Test Begin Date: October 17, 2011
Test End Date: October 17, 2011

Report Issue Date: October 17, 2011

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

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

Reviewed by: _____

Kirby Munroe
Director, Wireless Certifications
ACS, Inc.

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 single modular approval.

1.2 Product description

This device is a daughter board module, manufactured by Hunt Technologies, Inc. that plugs into a GE KV2C metrology circuit board. The daughter board contains two separate radios: a 900 MHz ISM band frequency-hopping spread spectrum (FHSS) transceiver and a 2.4 MHz ISM band transceiver employing 802.15.4/ZigBee.

The 10122 module collects metering data from the meter module and transmits it to electric utility companies. It can also receive and repeat data from other similar modules or a central collector module. The 10122 module will be assembled into a GE KV2C meter before delivery to the customer.

The 10122 module is a composite device by definition. The 900 MHz LAN radio and the 2.4 GHz Zigbee radio operate under CFR 47 Part 15.247 and IC RSS-210. This report addresses RF conducted measurements on the 2.4 GHz Zigbee radio only. Separate reports will be issued to address the radiated emissions as well as the 900 MHz LAN radio.

Technical Details:

Band of operation: 2405 – 2475 MHz
Number of hopping channels: 15
Channel spacing 5 MHz
Modulation format: O-QPSK
Antenna Type / Gain: PCB inverted-F / 5.15dBi
Operating Voltage: 28VDC

Manufacturer Information:
Hunt Technologies, Inc.
6436 County Rd 11
Pequot Lakes, MN 56472

Test Sample Serial Number(s): ACS#3

Test Sample Condition: The test samples were provided in good working order with no visible defects.

1.3 Test Methodology and Considerations

For the purpose of RF conducted measurements, the EUT was modified with a temporary 50 ohm antenna port.

Multiple data rates were evaluated with worst case provided where applicable.

2 TEST FACILITIES

2.1 Location

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

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

ACS is accredited to ISO/IEC 17025 by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program (NVLAP), Lab Code 200612-0. Unless otherwise specified, all tests methods described within this report are covered under the ISO/IEC 17025 scope of accreditation.

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment.

FCC Registration Number: 511277
Industry Canada Lab Code: IC 4175A-1
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

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, 2011
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2011
- FCC KDB Publication No. 558074 - Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247), March 2005
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 8, Dec 2010
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue 3, Dec 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

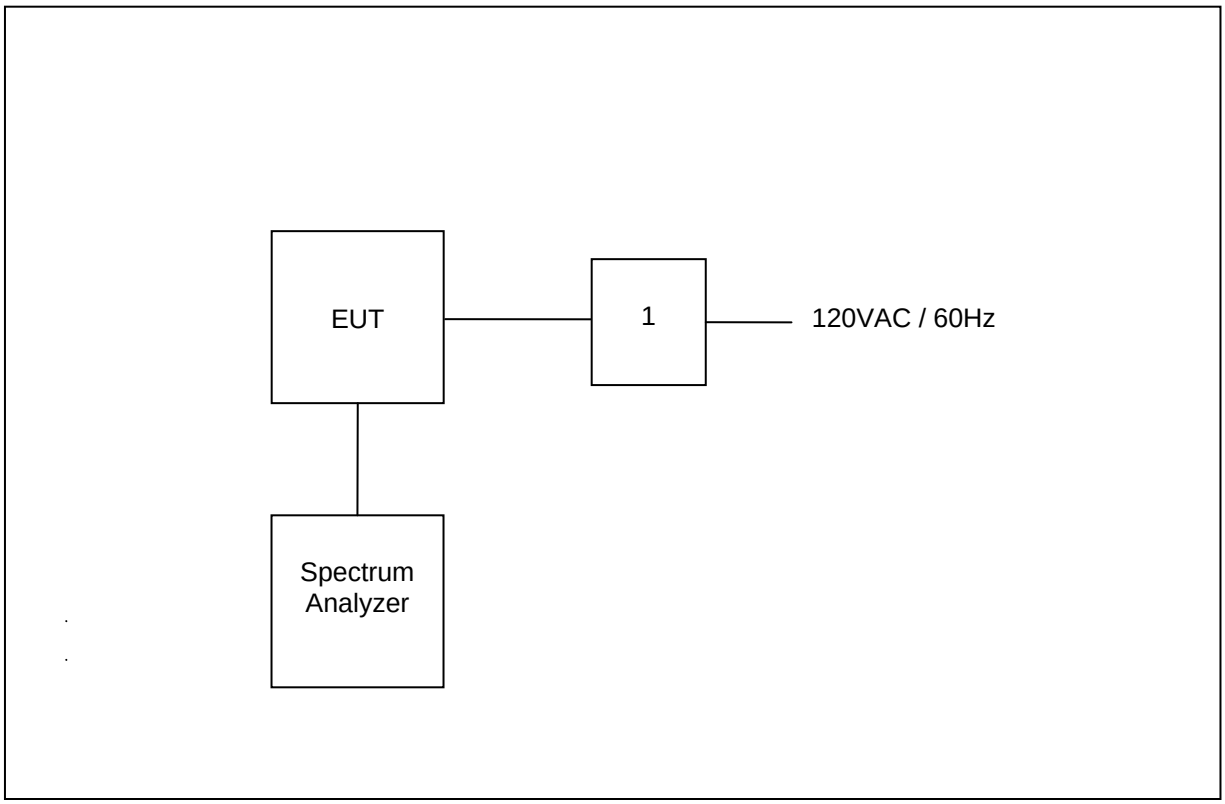
AssetID	Manufacturer	Model #	Equipment Type	Serial #	Last Calibration Date	Calibration Due Date
283	Rohde & Schwarz	FSP40	Spectrum Analyzers	1000033	8/26/2011	8/26/2012
340	Aeroflex/Weinschel	AS-20	Attenuators	7136	8/29/2011	8/29/2012

5 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number
1	DC Supply	Trygon Electronics	DL40-1	489512

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 transmitter antennas are PCB inverted-F antennas integral to the circuit board, and therefore comply with the requirement that no other antenna shall be used with the device.

7.2 6dB / 99% Bandwidth – FCC: Section 15.247(a)(2) IC: RSS-210 A8.2(a)

7.2.1 Measurement Procedure

The 6dB bandwidth was measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)". The RBW of the spectrum analyzer was set to 100 kHz and VBW 300 kHz. Span was set large enough to capture the entire emissions and >> RBW.

The occupied bandwidth measurement function of the analyzer was used for the 99% bandwidth.

7.2.2 Measurement Results

Results are shown below in Table 7.2.2-1 and Figures 7.2.2-1 to 7.2.2-6:

Table 7.2.2-1: 6dB / 99% Bandwidth

Frequency [MHz]	6dB Bandwidth [MHz]	99% Bandwidth [MHz]
2405	1.62	2.46
2440	1.57	2.36
2475	1.6	2.41

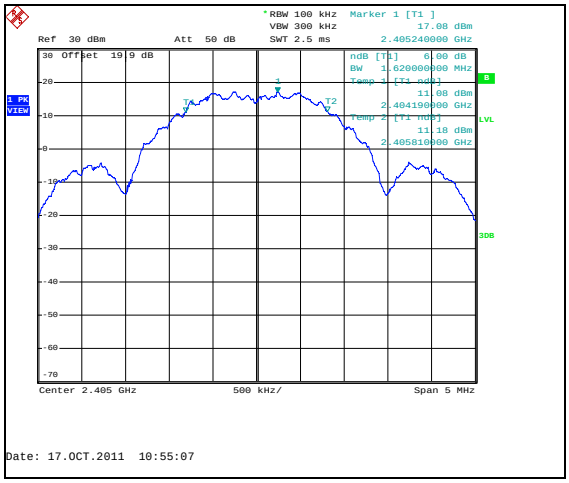


Figure 7.2.2-1: 6dB Bandwidth Plot – 2405MHz

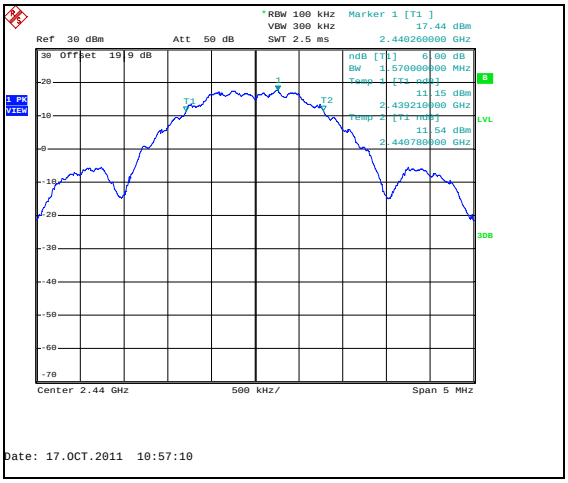


Figure 7.2.2-2: 6dB Bandwidth Plot – 2440MHz

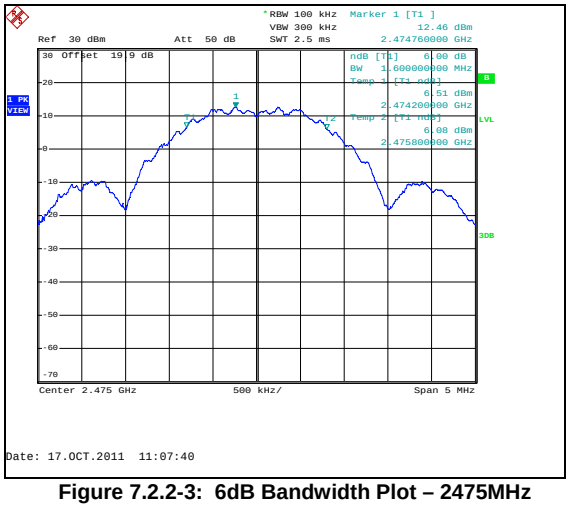


Figure 7.2.2-3: 6dB Bandwidth Plot – 2475MHz

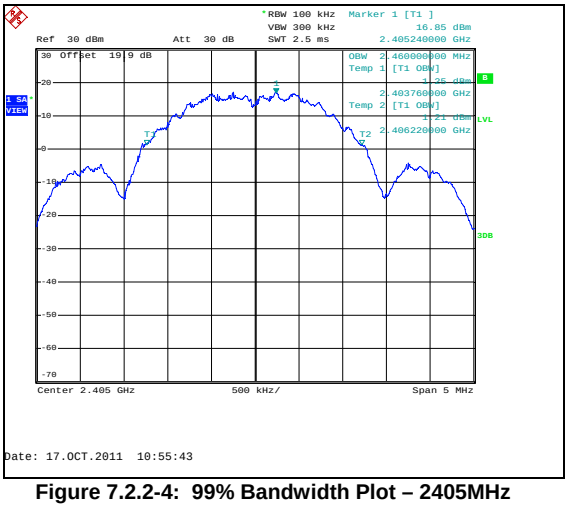


Figure 7.2.2-4: 99% Bandwidth Plot – 2405MHz

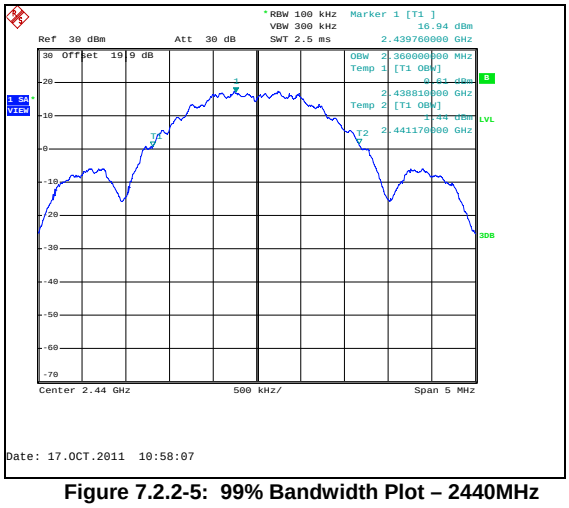


Figure 7.2.2-5: 99% Bandwidth Plot – 2440MHz

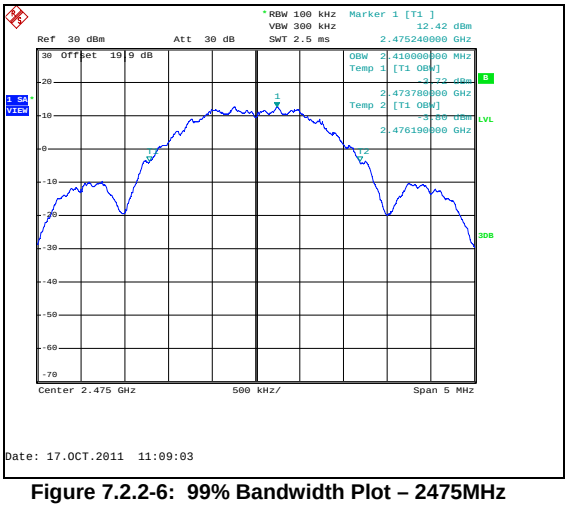


Figure 7.2.2-6: 99% Bandwidth Plot – 2475MHz

7.3 Peak Output Power Requirement - FCC Section 15.247(b)(3) IC: RSS-210 A8.4(4)

7.3.1 Measurement Procedure

The Peak Output Power was measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)" Power Option 1. The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer. Data was collected with the EUT operating at maximum power per channelization.

7.3.2 Measurement Results

Results are shown below in Table 7.3.2-1 and Figures 7.3.2-1 to 7.3.2-3.

Table 7.3.2-1: Peak Output Power

Frequency (MHz)	Output Power (dBm)
2405	21.06
2440	20.88
2475	16.42

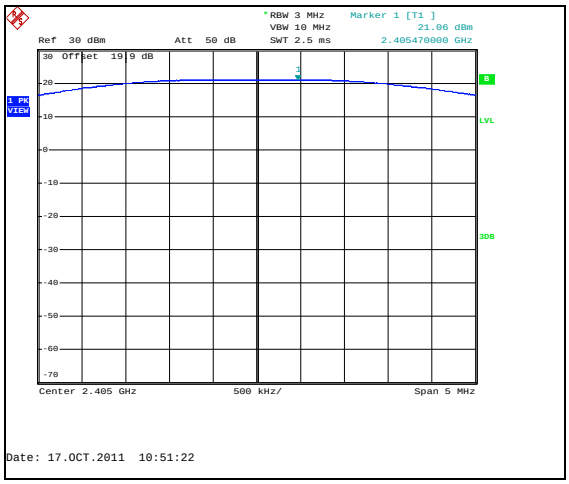


Figure 7.3.2-1: Output power – 2405MHz

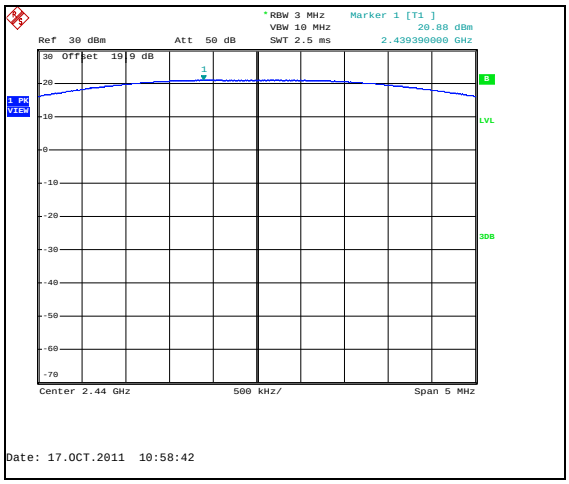


Figure 7.3.2-2: Output power – 2440MHz

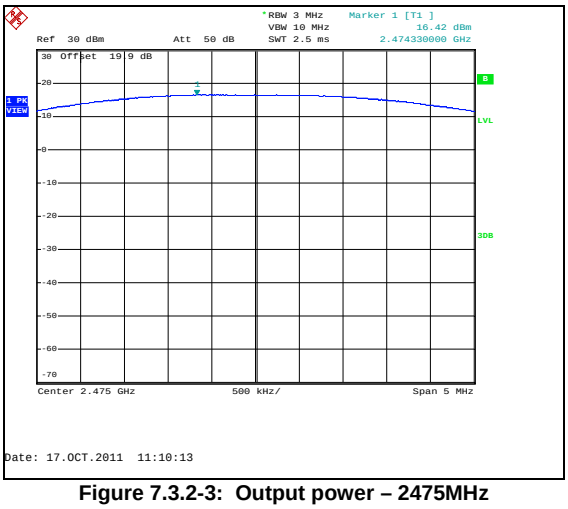


Figure 7.3.2-3: Output power – 2475MHz

7.4 Band-Edge Compliance and Spurious Emissions-FCC 15.247(d) IC:RSS-210 2.2, A8.5

7.4.1 Band-Edge Compliance

7.4.1.1 Measurement Procedure

The EUT was investigated at the low and high channels of operation to determine band-edge compliance. Because the upper band-edge coincides with a restricted band, band-edge compliance for the upper band-edge was determined based on the measurement of the absolute field strength of the highest emission outside the band-edge. The upper band-edge radiated emissions data can be found in report 11-0031.W06.22.A.

The lower band-edge compliance was determined using the conducted marker-delta method in which the radio frequency power that is produced by the EUT is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power.

7.4.1.2 Measurement Results

Band-edge compliance is displayed in Figure 7.4.1.2-1.

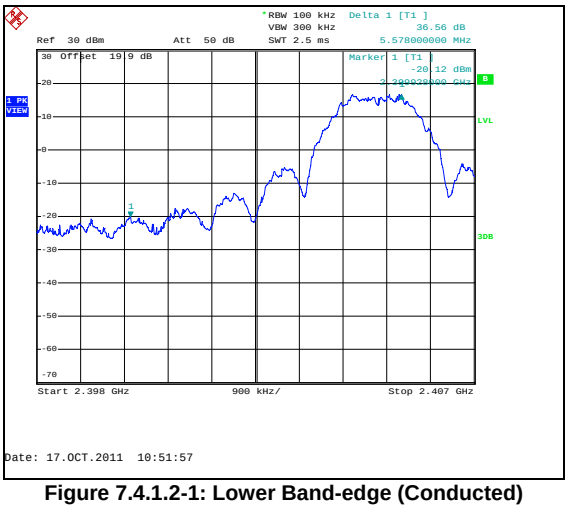


Figure 7.4.1.2-1: Lower Band-edge (Conducted)

7.4.2 RF Conducted Spurious Emissions

7.4.2.1 Measurement Procedure

The RF Conducted Spurious Emissions were measured in accordance with the FCC KDB Publication No. 558074 “Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)”. The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer. The EUT was investigated for conducted spurious emissions from 30MHz to 25GHz, 10 times the highest fundamental frequency. For each measurement, the spectrum analyzer’s RBW was set to 100 kHz and the VBW was set to 300 kHz. The peak detector and Max Hold function of the analyzer were utilized.

7.4.2.2 Measurement Results

RF Conducted Emissions are displayed in Figures 7.4.2.2-1 through 7.4.2.2-9.

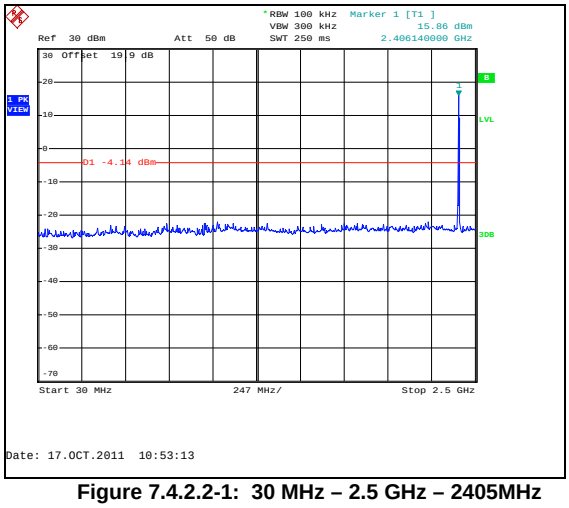


Figure 7.4.2.2-1: 30 MHz – 2.5 GHz – 2405MHz

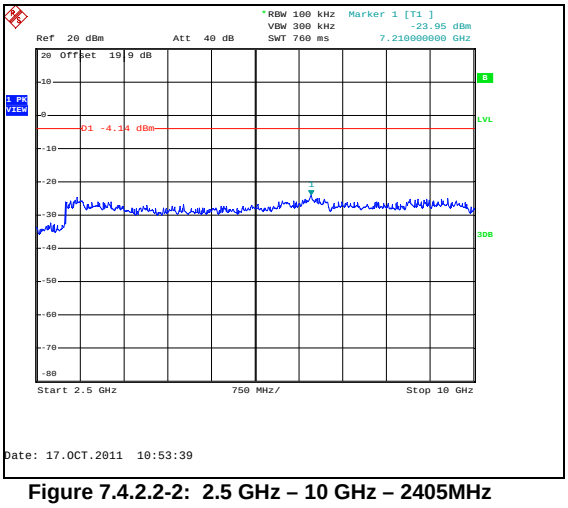


Figure 7.4.2.2-2: 2.5 GHz – 10 GHz – 2405MHz

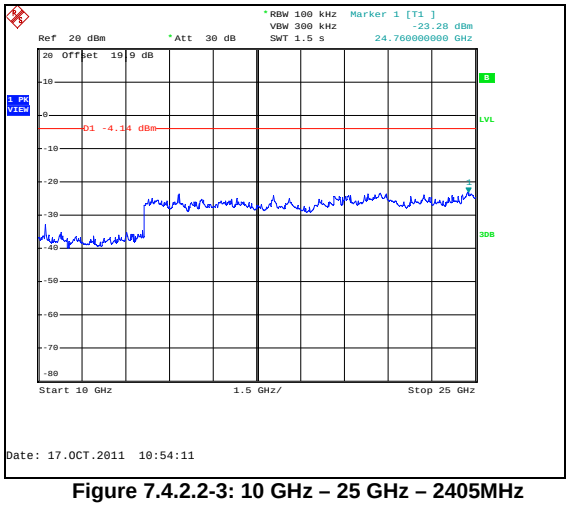


Figure 7.4.2.2-3: 10 GHz – 25 GHz – 2405MHz

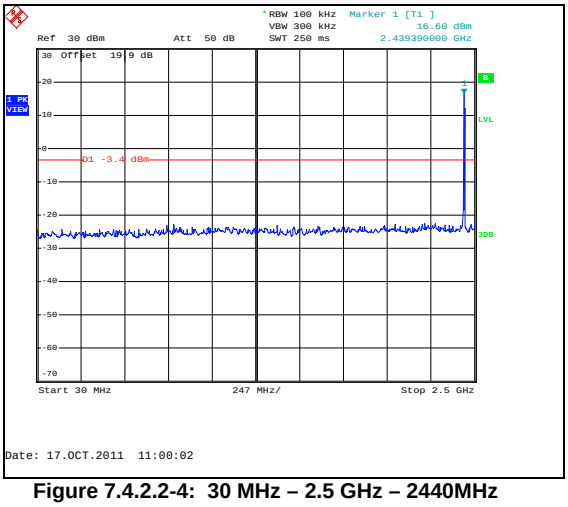


Figure 7.4.2.2-4: 30 MHz – 2.5 GHz – 2440MHz

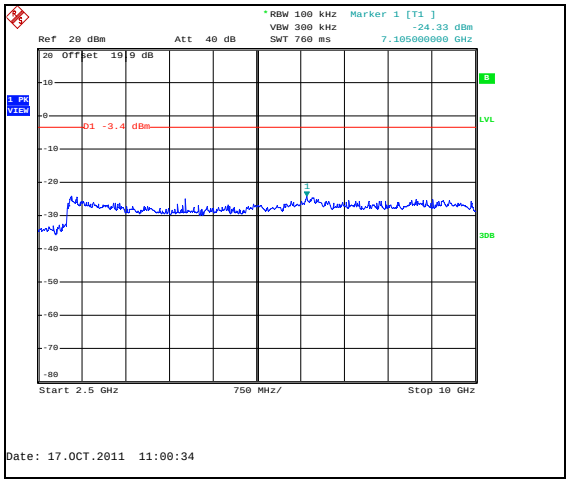


Figure 7.4.2.2-5: 2.5 GHz – 10 GHz – 2440MHz

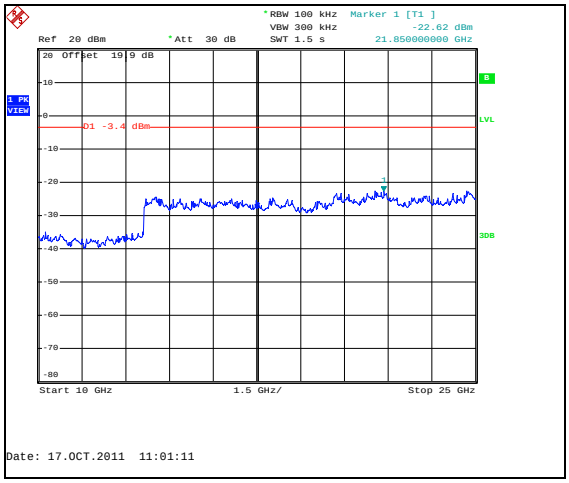


Figure 7.4.2.2-6: 10 GHz – 25 GHz – 2440MHz

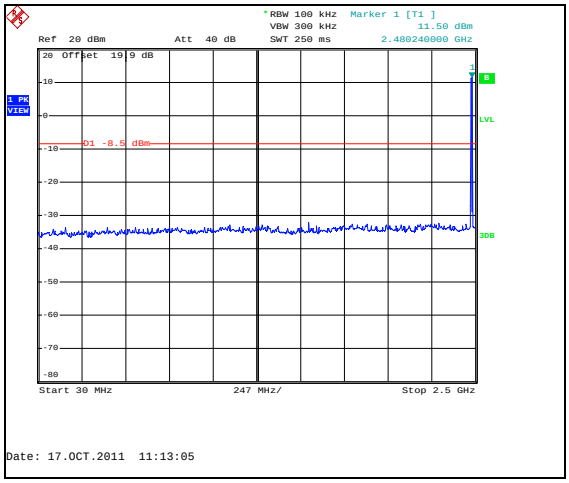


Figure 7.4.2.2-7: 30 MHz – 2.5 GHz – 2475MHz

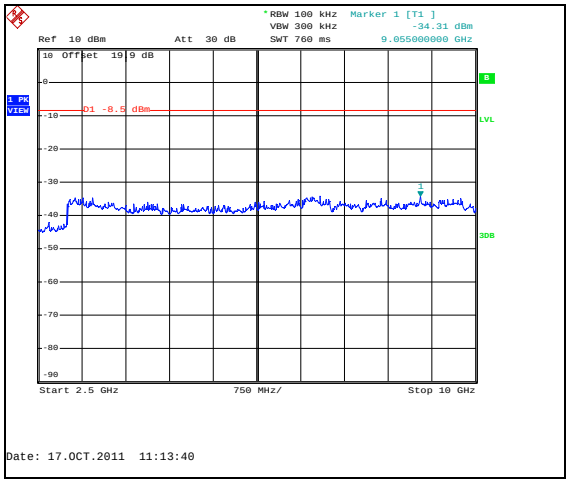


Figure 7.4.2.2-8: 2.5 GHz – 10 GHz – 2475MHz

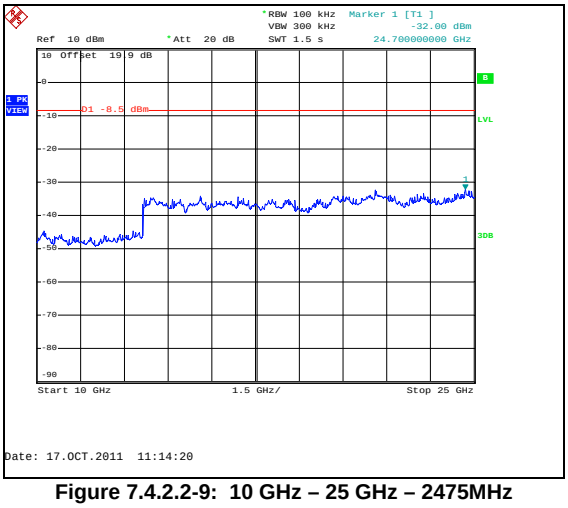


Figure 7.4.2.2-9: 10 GHz – 25 GHz – 2475MHz

7.5 Peak Power Spectral Density- FCC Section 15.247(e) IC: RSS-210 A8.2(b)

7.5.1 Measurement Procedure

The power spectral density was measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)". The emission peaks within the pass band were located and zoomed in on. The spectrum analyzer RBW was set to 3 kHz and VBW 10 kHz. Span was adjusted to 200 kHz and the sweep time was calculated to be 68s ~ (Span/3 kHz).

7.5.2 Measurement Results

Results are shown below in table 7.5.2-1 and figures 7.5.2-1 – 7.5.2-3:

Table 7.5.2-1: Peak Power Spectral Density

Frequency (MHz)	PSD Level (dBm)
2405	6.62
2440	6.02
2475	1.37

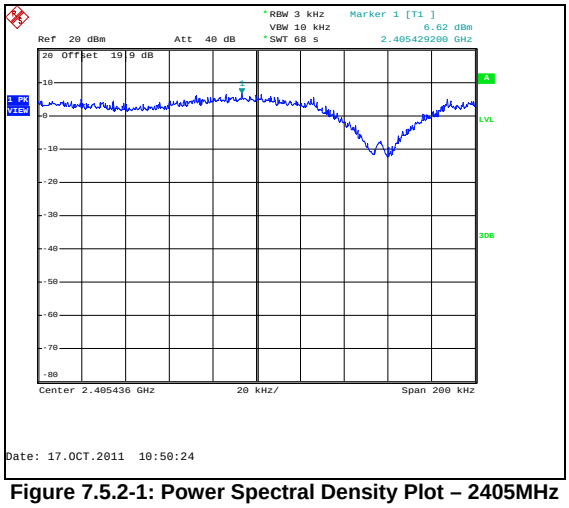


Figure 7.5.2-1: Power Spectral Density Plot – 2405MHz

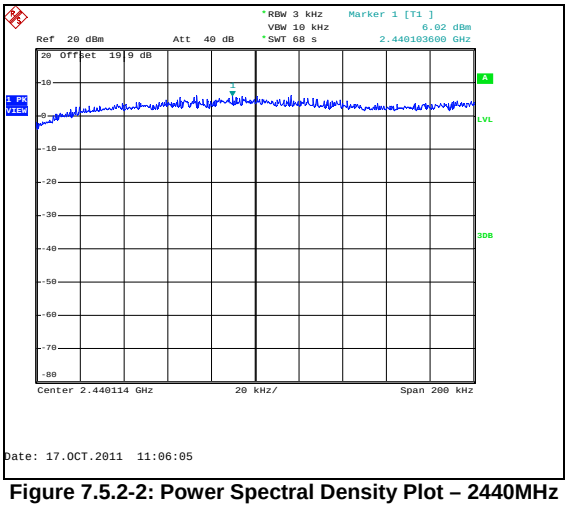


Figure 7.5.2-2: Power Spectral Density Plot – 2440MHz

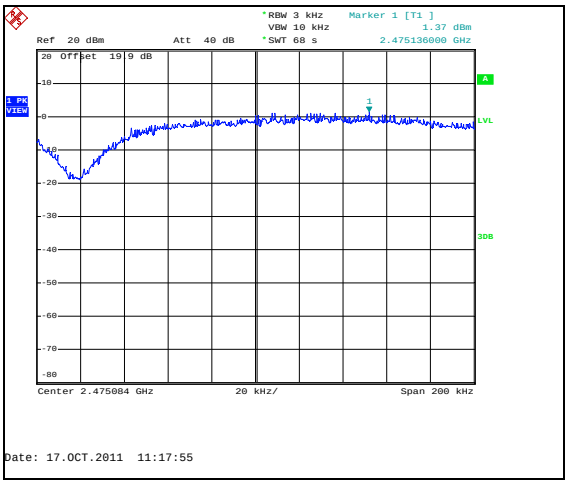


Figure 7.5.2-3: Power Spectral Density Plot – 2475MHz

8 CONCLUSION

In the opinion of ACS, Inc. the 10122, manufactured by Hunt Technologies, Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT