LS RESEARCH, LLC
WIRELESS PRODUCT DEVELOPMENT
ACCREDITED
Testing Cert. 1255.01
W66 N220 Commerce Court ● Cedarburg, WI 53012 ● USA
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www.lsr.com

TEST REPORT # 311094
LSR Job #: C-1148

Compliance Testing of:
Module with Yagi Antenna

Test Date(s):
March 1, 18, May 11, 2011

Prepared For:
Nelson Irrigation Corp
Attn: Mark Bauman, P.E.
848 Airport Road
Walla Walla, WA 99362

In accordance with:
Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.247
Industry Canada (IC) RSS 210 Annex 8
Digital Modulation Transmitters (DTS) Operating in the
Frequency Band 902 MHz – 928 MHz

This Test Report is issued under the Authority of:
Peter Feilen, EMC Engineer

Signature: Peter Feilen Date: 09.01.11

Test Report Reviewed by:
Shane D Rismeyer, EMC Engineer

Signature: Date: 08.24.11

Tested by:
Peter Feilen, EMC Engineer

Signature: Peter Feilen Date: 08.23.11

Ryan Urness, EMC Lab Manager

Signature: Date: 08.23.11

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EXHIBIT 1. INTRODUCTION

1.1 Scope

References:	FCC Part 15, Subpart C, Section 15.247 and FCC Part 15, Subpart B, Section 15.109
	RSS GEN and RSS 210 Annex 8
Title:	FCC : Telecommunication – Code of Federal Regulations, CFR 47, Part 15
	IC : Low-power License-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment
Purpose of Test:	To gain FCC and IC Certification Authorization for Low-Power License-Exempt Transmitters.
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 – 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.

1.2 Normative References

Publication	Title
47 CFR, Parts 0-15 (FCC)	Code of Federal Regulations - Telecommunications
RSS 210 Annex 8	Low-power License-exempt Radio-communication Devices (All Frequency Bands): Category I Equipment
ANSI C63.4	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
FCC Public Notice DA 00-1407	Part 15 Unlicensed Modular Transmitter Approval
FCC ET Docket No. 99-231	Amendment to FCC Part 15 of the Commission's Rules Regarding Spread Spectrum Devices
FCC Procedures	Measurement of Digital Transmission Systems operating under Section 15.247

1.3 LS Research, LLC Test Facility

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025, 2005 “General Requirements for the Competence of Calibration and Testing Laboratories”.

LS Research, LLC’s scope of accreditation includes all test methods listed herein, unless otherwise noted. Accreditation status can be verified at A2LA’s web site: www.a2la.net.

1.4 Location Of Testing

All testing was performed at LS Research, LLC, W66 N220 Commerce Court, Cedarburg, Wisconsin, 53012 USA, utilizing the facilities listed below, unless otherwise noted.

List of Facilities Located at LS Research, LLC:

- Compact Chamber
- Semi-Anechoic Chamber
- Open Area Test Site (OATS)

1.5 Test Equipment Utilized

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated at a calibration laboratory accredited to ISO17025, and traceable to the SI standard.

Note: Data presented is dated more than 1 year old. Data has been re-reviewed and the testing in the report is valid.

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1 Client Information

Manufacturer Name:	Nelson Irrigation
Address:	848 Airport Road Walla Walla, WA 99362
Contact Name:	Mark Bauman

2.2 Equipment Under Test (EUT) Information

The following information has been supplied by the applicant.

Product Name:	SiFlex Module with Comtelco Yagi
Model Number:	NIC-11543-00
Serial Number:	00:25:CA:08:00:00:00:01

2.3 Associated Antenna Description

806-970 MHz 10.2dB Gain **HEAVY DUTY YAGI ANTENNA**

High Performance: *These antennas provide 10.2dBd, wide band performance.*

Rugged and weatherproof: *The construction of our heavy duty yagis feature 1"aluminum U channel with 3/8" solid elements. All exposed areas are coated with UV polyester. The balun assembly is filled and sealed with elastomeric thermoplastic.*

Lightweight and Durable: *These antennas are easily installed by one person.*

Termination Options:
Type A: *12" Teflon pigtail with N connector.*
Type B: *Direct TNC connection to the balun.*
Type D: *Direct N connection to the balun.*

2.4 EUT'S Technical Specifications

Additional Information:

EUT Frequency Range (in MHz)	906 MHz – 924 MHz
EIRP in Watts	
Minimum:	2.11 Watts
Maximum:	2.37 Watts
Conducted Output Power (in dBm)	21.4 dBm
Occupied Bandwidth (99% BW)	1.625 MHz
Type of Modulation	BPSK
Emission Designator	1M63G1D
Transmitter Spurious (worst case) at 3 meters	55.0 dBµV/m @ 898 MHz
Receiver Spurious (worst case) at 3 meters	36.5 dBµV/m @ 3m @ 3822 MHz
Frequency Tolerance %, Hz, ppm	<100 ppm
Transceiver Model # (if applicable)	AT86RF212
Antenna Information	
Detachable/non-detachable	Detachable
Type	Yagi
Gain (in dBi)	12.35 dBi
EUT will be operated under FCC Rule Part(s)	FCC Part 15.247 and 15.109
EUT will be operated under RSS Rule Part(s)	RSS 210 & RSS GEN
Modular Filing	☒ Yes ☐ No
Portable or Mobile?	Mobile

RF Technical Information:

Type of Evaluation (check one)		SAR Evaluation: Device Used in the Vicinity of the Human Head
		SAR Evaluation: Body-worn Device
	X	RF Evaluation

If RF Evaluation checked above, test engineer to complete the following:

- Evaluated against exposure limits: ☒ General Public Use ☐ Controlled Use
- Duty Cycle used in evaluation: 100 %
- Standard used for evaluation: OET 65
- Measurement Distance: 20 cm
- RF Value: 4.7177 ☐ V/m ☐ A/m ☒ W/m^2
  ☒ Measured ☐ Computed ☐ Calculated

2.5 Product Description

The module is a high performance 900MHz IEEE 802.15.4 radio (AT86RF212 & RF amplifier and low noise amplifier circuit) and microcontroller (ATXMEGA256A3).

Microcontroller
The Atmel XMEGA A3 is a family of low power, high performance and peripheral rich CMOS 8/16-bit microcontrollers based on the AVR® enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the XMEGA A3 achieves throughputs approaching 1 Million Instructions per Second (MIPS), thus allowing the system engineer to optimize power consumption versus processing speed.

Radio
The Atmel AT86RF212 is a low-power, low-voltage 800/900 MHz transceiver specially designed for low-cost IEEE 802.15.4, ZigBee™, and high data rate ISM applications. For the sub-1 GHz bands, it supports a low data rate of 40kbps of the IEEE 802.15.4-2003 standard [2] and provides an optional data rate 250kbps using O-QPSK, according to IEEE 802.15.4-2006. Furthermore hardware accelerators improve overall system power efficiency and timing.
The receiver path is based on a low-IF architecture. After channel filtering and down conversion the low-IF signal is sampled and applied to the digital signal processing part. Communication between transmitter and receiver is based on direct sequence spread spectrum with different modulation schemes and spreading codes. The AT86RF212 supports the IEEE 802.15.4-2006 standard mandatory BPSK modulation and optional O-QPSK modulation in the 800 and 900 MHz band. For applications not necessarily targeting IEEE compliant networks the radio transceiver supports proprietary High Data Rate Modes based on O-QPSK.
The AT86RF212 features hardware supported 128 bit security operation. The standalone AES encryption/decryption engine can be accessed in parallel to all PHY operational modes. Configuration of the AT86RF212, reading, and writing of data memory as well as the AES hardware engine are controlled by the SPI interface and additional control signals.

RF Front End Module
The module contains a high performance RF Front End Module for 900MHz wireless applications. It is capable of +28 dBm output power, providing miles of range in outdoor applications.
It also has a built in low noise amplifier for the receiver to increase sensitivity and all antenna switching.

Antenna/Cable
Antenna is a Heavy Duty Yagi manufactured by Comtelco, part number Y3387. It has a gain of 10.2dBd and frequency range of 806 MHz to 970 MHz. The cable is an L-com N-Male to N-Male 400 series low loss coax cable.

EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 Climate Test Conditions

Temperature:	20-25 ˚C
Humidity:	35-65 % R.H.
Pressure:	645.05 – 795.07

3.2 Applicability & Summary of EMC Emission Test Results

FCC and IC Paragraph	Test Requirements	Compliance (yes/no)
FCC : 15.207 IC : RSS GEN sect. 7.2.2	Power Line Conducted Emissions Measurements	Yes
FCC : 15.107 IC : ICES-003	Power Line Conducted Emissions Measurements	Yes
FCC : 15.247(a)(2) IC : RSS 210 A8.2(a)	6 dB Bandwidth of a Digital Modulation System	Yes
IC : RSS GEN section 4.6.1	20 dB Bandwidth	Yes
FCC : 15.247(b) & 1.1310 IC : RSS 210 A8.4	Maximum Output Power	Yes
FCC : 15.247(i), 1.1307, 1.1310, 2.1091 & 2.1093 IC : RSS 102	RF Exposure Limit	Yes
FCC :15.247(c) IC : RSS 210 A8.5	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
FCC : 15.247(d) IC : RSS 210 A8.2(b)	Transmitted Power Spectral Density of a Digital Modulation System	Yes
FCC : 15.247(c), 15.209 & 15.205 IC : RSS 210 A8.2(b), section 2.2, 2.6 and 2.7	Intentional Radiated Emissions	Yes
FCC : 15.109 IC : ICES-003	Unintentional Radiated Emissions	Yes

3.3 Modifications Incorporated In The EUT For Compliance Purposes

☐ **None** ☒ **Yes (explain below)**

The output power setting was reduced to power setting “9” (21.4 dBm) for conducted output power compliance when antenna gain exceeds 6dBi.

3.4 Deviations & Exclusions From Test Specifications

☒ **None** ☐ **Yes (explain below)**

EXHIBIT 4. DECLARATION OF CONFORMITY

The EUT was found to MEET the requirements as described within the specification of FCC Title 47, CFR Part 15.247, and Industry Canada RSS-210, Issue 8 (2010), Annex 8 (section A8.2) for a Digital Spread Spectrum (DTS) Transmitter.

If some emissions are seen to be within 3 dB of their respective limits:
As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

EXHIBIT 5. RADIATED EMISSIONS TEST

5.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15, RSS GEN and ANSI C63.4. The EUT was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber. The EUT was operated in with pseudorandom data with a 40k BPSK modulation. The unit has the capability to operate on 10 channels, controllable via PC.

The applicable limits apply at a 3 meter distance. Measurements above 4 GHz were performed at a 1.0 meter separation distance. The calculations to determine these limits are detailed in the following pages. Please refer to Appendix A for a complete list of test equipment. The test sample was operated on one of three (3) standard channels: low (906 MHz), middle (914 MHz) and high (924MHz) to comply with FCC Part 15.31(m). The channels and operating modes were changed using a PC.

5.2 Test Procedure

Radiated RF measurements were performed on the EUT in a 3 meter Semi-Anechoic, FCC listed Chamber. The frequency range from 30 MHz to 10000 MHz was scanned and investigated. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on a non-conductive pedestal in the 3 meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the EUT. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. A Double-Ridged Waveguide Horn Antenna was used from 1 GHz to 10 GHz. The maximum radiated RF emissions were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities. The EUT was rotated along three orthogonal axes during the investigations to find the highest emission levels.

5.3 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations were performed by a calibration laboratory accredited to the requirements of ISO 17025, and traceable to the SI standard. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and an Agilent E4445A/N9039A EMI System. The resulting correction factors and the cable loss factors from these calibrations were entered into the EMI Receiver database. As a result, the data taken from the EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The EMI Receiver was operated with a resolution bandwidth of 120 kHz for measurements below 1 GHz (video bandwidth of 300 kHz), and a bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz From 4 GHz to 10 GHz, an Agilent E4446A Spectrum Analyzer and an EMCO Horn Antenna were used.

5.4 Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.247 and Canada RSS-210, Issue 8 (2010), Annex 8 for a DTS transmitter; and Title 47 CFR, FCC Part 15.109 and Canada ICES-003. The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.

5.5 Calculation Of Radiated Emissions Limits

The maximum peak output power of an intentional radiator in the 902-928 MHz band, as specified in Title 47 CFR 15.247 (b)(3) and RSS 210 A8.4 is 1 Watt. The harmonic and spurious RF emissions, as measured in any 100 kHz bandwidth, as specified in 15.247 (d) and RSS 210 A8.2 (b), shall be at least 20 dB below the measured power of the desired signal, and must also meet the requirements described in 15.205(c) for FCC and section 2.2, 2.6, and 2.7 of RSS 210 for IC.

The following table depicts the general radiated emission limits above 30 MHz. These limits are obtained from Title 47 CFR, Part 15.209, for radiated emissions measurements. These limits were applied to any signals found in the 15.205 restricted bands. The mentioned limits correspond to those limits listed in RSS 210 section 2.7.

Frequency (MHz)	3 m Limit μV/m	3 m Limit (dBμV/m)	1 m Limit (dBμV/m)
30-88	100	40.0	-
88-216	150	43.5	-
216-960	200	46.0	-
> 960	500	54.0	63.5

Sample conversion from field strength μV/m to dBμV/m:
$dB\mu V/m = 20 \log_{10}(100)$
= 40 dBμV/m (from 30-88 MHz)

For measurements made at 1.0 meter, a 9.5 dB correction has been invoked.

> 960 MHz
500μV/m or 54.0 dB/μV/m at 3 meters
54.0 + 9.5 = 63.5 dB/μV/m at 1 meter

5.6 RADIATED EMISSIONS TEST DATA CHART

3 Meter Measurements of Electromagnetic Radiated Emissions
Frequency Range Inspected: 30 MHz to 10000 MHz

Manufacturer:	Nelson Irrigation					
Date(s) of Test:	April 8, 2011					
Test Engineer(s):	Ryan Urness					
Voltage:	3.3VDC					
Operation Mode:	Continuous transmit, modulated					
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %					
EUT Power:		Single Phase ___VAC		3 Phase ___VAC		
		Battery	**X**	Other: 3.3VDC		
EUT Placement:	**X**	80cm non-conductive table		10cm Spacers		
EUT Test Location:	**X**	3 Meter Semi-Anechoic FCC Listed Chamber		3/10m OATS		
Measurements:		Pre-Compliance		Preliminary	**X**	Final
Detectors Used:	**X**	Peak	**X**	Quasi-Peak	**X**	Average

The following table depicts the level of unintentional radiated emissions found:

Frequency (MHz)	Height (m)	Azimuth (degree)	EFI Reading (dBµV/m)	EFI Limit (dBµV/m)	Margin (dB)	Antenna Polarity	EUT orientation
35.3	1.00	0	13.8	40.0	26.2	V	TT
92.7	1.00	0	10.3	43.5	33.2	V	TT
299.6	1.00	0	24.7	46.0	21.3	H	TT
698.0	2.12	264	42.3	46.0	3.8	V	TT
746.1	1.36	337	41.6	46.0	4.4	V	TT
898.3	1.00	0	55.0	105.7	50.7	H	TT
976.3	1.00	0	46.6	54.0	7.5	V	TT
990.3	1.00	0	45.6	54.0	8.4	H	TT
2411.3	2.41	0	33.1	54.0	20.9	H	TT
2409.5	1.00	0	32.9	54.0	21.1	V	TT

RADIATED EMISSIONS DATA CHART *(continued)*

The following table depicts the level of significant radiated RF harmonic emissions seen on Channel 1:

Frequency (MHz)	Height (m)	Azimuth (degree)	Peak Reading (dBµV/m)	Avg Reading (dBµV/m)	Avg Limit (dBµV/m)	Margin (dB)	Antenna Polarity	EUT orientation
1812	1.18	0	47.2	43.2	106.5	63.3	Horizontal	Side
2718	1.00	0	50.4	44.0	54.0	10.0	Horizontal	Side
3624	1.61	193	48.4	44.3	54.0	9.7	Horizontal	Side
4530	1.10	71	51.2	43.0	63.5	20.5	Vertical	Side
5436	1.36	295	49.7	40.7	63.5	22.8	Horizontal	Side
6342	1.33	311	48.8	40.7	106.5	65.8	Horizontal	Side
7248	1.13	300	62.0	54.4	106.5	52.1	Horizontal	Side
8154	1.16	319	64.5	55.0	63.5	8.5	Horizontal	Side
9060	1.12	318	66.7	54.9	63.5	8.6	Horizontal	Side

The following table depicts the level of significant radiated RF harmonic emissions seen on Channel 5:

Frequency (MHz)	Height (m)	Azimuth (degree)	Peak Reading (dBµV/m)	Avg Reading (dBµV/m)	Avg Limit (dBµV/m)	Margin (dB)	Antenna Polarity	EUT orientation
1828	1.13	15	46.2	41.0	107.1	66.1	Horizontal	Side
2742	1.00	333	51.1	45.9	54.0	8.1	Horizontal	Side
3656	1.13	0	47.5	41.8	54.0	12.2	Horizontal	Side
4570	1.15	67	50.2	41.3	63.5	22.2	Vertical	Side
5484	1.31	183.6	53.6	45.0	107.1	62.2	Vertical	Side
6398	1.06	353	51.8	39.9	107.1	67.2	Vertical	Side
7312	1.09	350	54.5	44.6	63.5	18.9	Vertical	Side
8226	1.18	13	57.4	49.1	63.5	14.4	Horizontal	Side
9140	1.10	33	63.8	55.2	63.5	8.3	Horizontal	Side

The following table depicts the level of significant radiated RF harmonic emissions seen on Channel 10:

Frequency (MHz)	Height (m)	Azimuth (degree)	Peak Reading (dBµV/m)	Avg Reading (dBµV/m)	Avg Limit (dBµV/m)	Margin (dB)	Antenna Polarity	EUT orientation
1848	1.57	228	44.3	38.4	107.9	69.5	Horizontal	Side
2772	1.14	54	49.6	43.9	54.0	10.1	Vertical	Side
3696	1.45	0	45.9	41.9	54.0	12.1	Horizontal	Side
4620	1.03	298	52.5	43.5	63.5	20.0	Horizontal	Side
5544	1.25	190	54.8	46.1	107.9	61.8	Vertical	Side
6468	1.13	238	55.5	43.4	107.9	64.5	Vertical	Side
7392	1.22	22	53.0	44.4	63.5	19.1	Horizontal	Side
8316	1.10	325	55.1	45.8	63.5	17.7	Horizontal	Side
9240	1.12	92	67.2	59.0	107.9	48.9	Horizontal	Side

Notes:

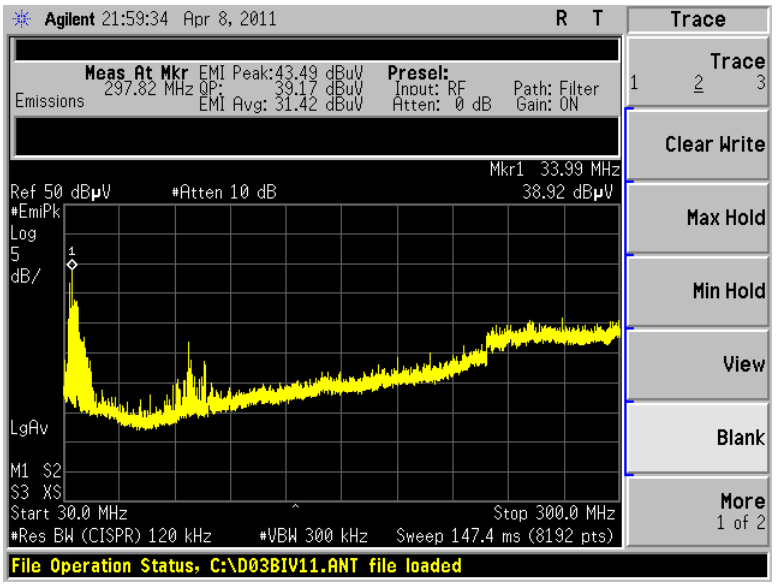
1) A Quasi-Peak Detector was used in measurements below 1 GHz, and a Peak as well as an Average Detector was used in measurements above 1 GHz. The peak detector was used to ensure the peak emissions did not exceed 20 dB above the limits.
2) Measurements above 4 GHz were made at 1 meters of separation from the EUT

5.7 Screen Captures - Radiated Emissions Test

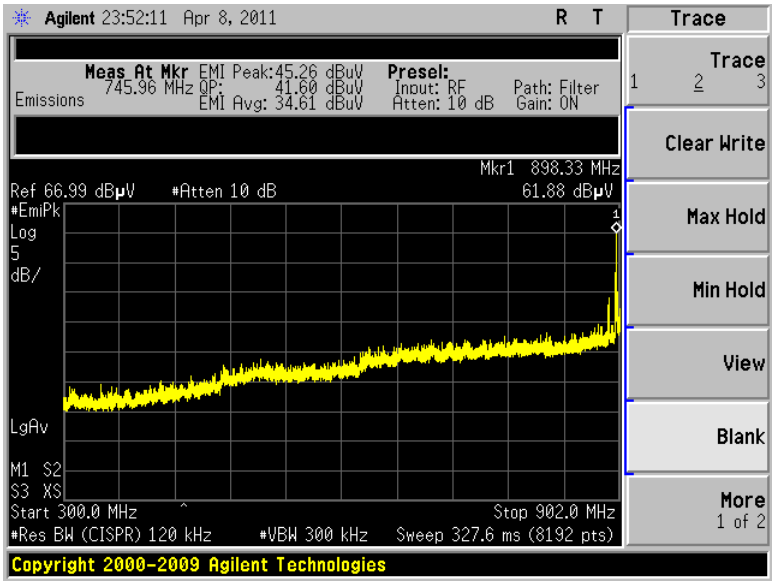
These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, as measured on channels 1, 5, or 10, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

Channel 5, Antenna Vertically Polarized, 30-300 MHz, at 3m

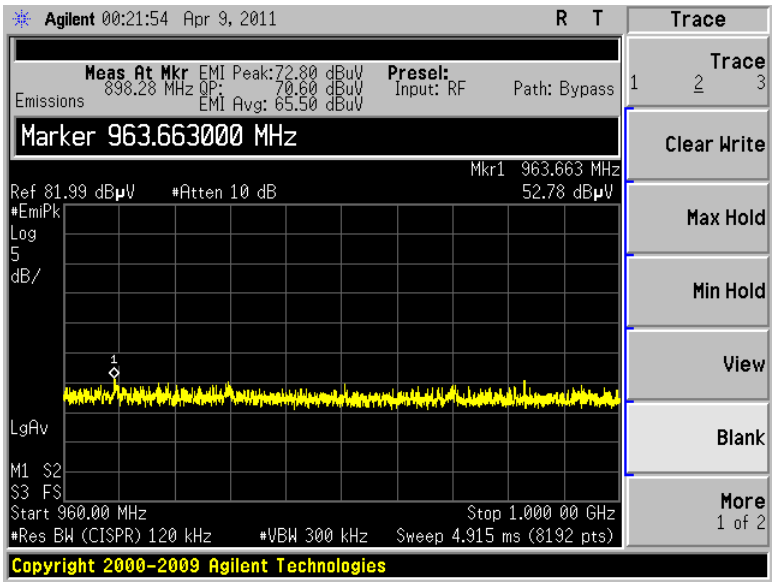


Channel 5, Antenna Horizontally Polarized, 300-802 MHz, at 3m

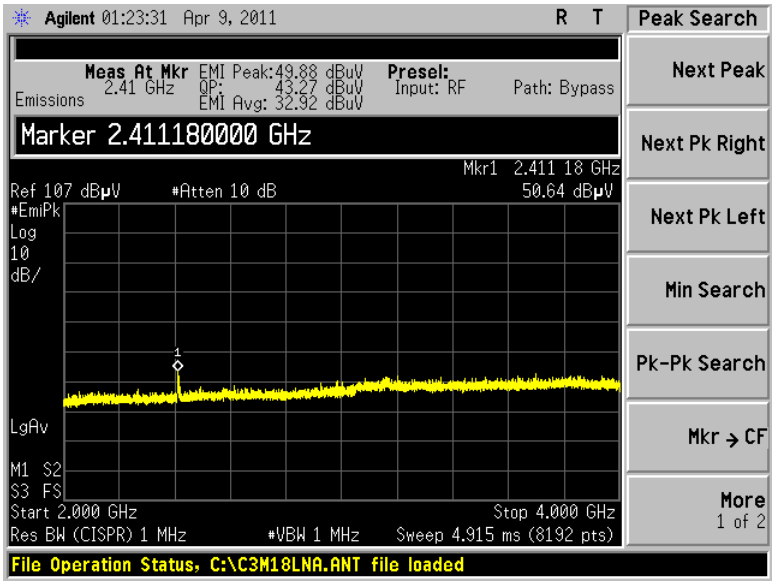


Screen Captures - Radiated Emissions Testing *(continued)*

Channel 5, Antenna Vertically Polarized, 960-1000 MHz, at 3m

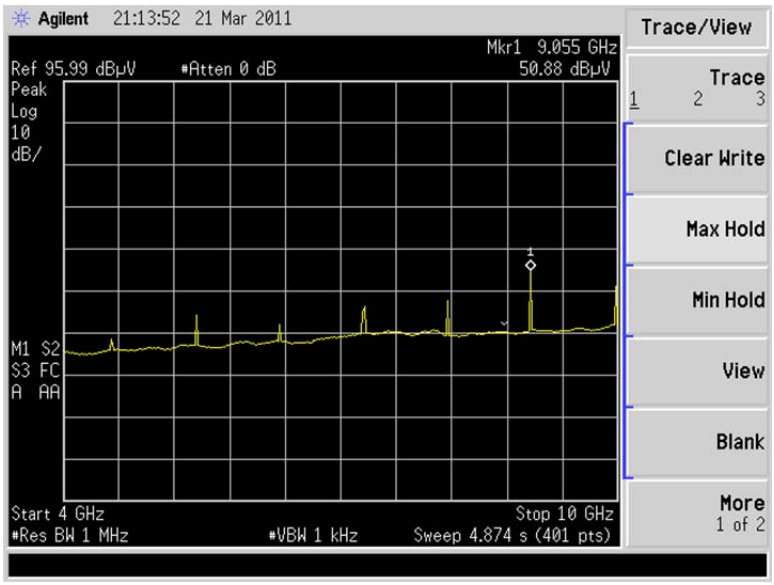


Channel 5, Antenna Vertically Polarized, 2000-4000 MHz, at 3m



Screen Captures - Radiated Emissions Testing (continued)

Channel 5, Antenna Vertically Polarized, 4000-10000 MHz, at 1m



5.8 Receive Mode Testing

Per the requirements of RSS-210, the EUT was placed in continuous receive mode and the radiated spurious emissions were measured and compared to the limits stated in RSS-Gen Section 4.10.

The test setup, procedure, and equipment utilized were identical to that described in sections 5.1, 5.2, and 5.3 of this document.

Measurement data and screen captures from the receive tests are presented below:

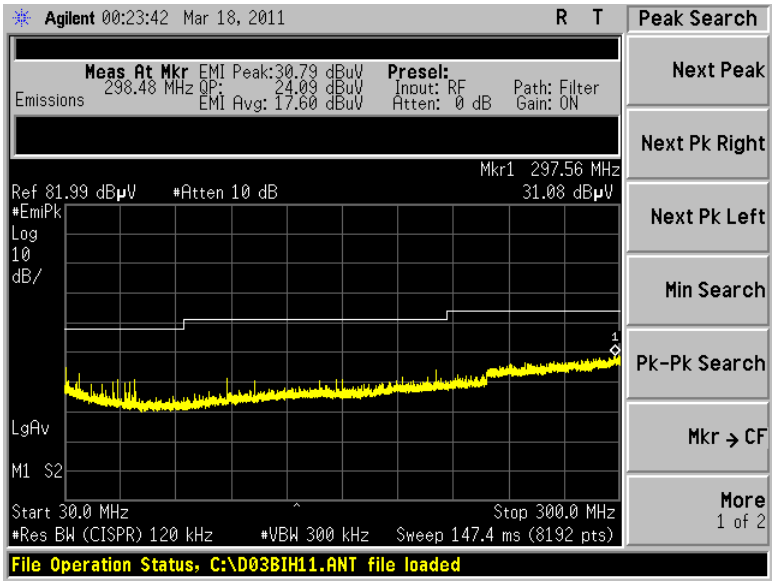
Frequency (MHz)	Height (m)	Azimuth (degree)	Quasi Peak Reading (dBµV/m)	Quasi Peak Limit (dBµV/m)	Margin (dB)	Antenna Polarity	EUT orientation
298.5	1.00	0	24.09	46.0	21.9	V	V EUT Ant, H EUT Board
297.7	1.00	0	24.51	46.0	21.5	H	V EUT Ant, H EUT Board
43.6	1.00	0	11.67	40.0	28.3	H	V EUT Ant, H EUT Board
966.3	1.00	0	29.87	54.0	24.1	H	V EUT Ant, H EUT Board
975.2	1.00	0	30.18	54.0	23.8	V	V EUT Ant, H EUT Board
3822.4	1.00	0	36.51	54.0	17.5	V	V EUT Ant, H EUT Board
3855.3	1.00	0	36.36	54.0	17.6	H	V EUT Ant, H EUT Board

Screen Captures - Radiated Emissions Testing – Receive Mode

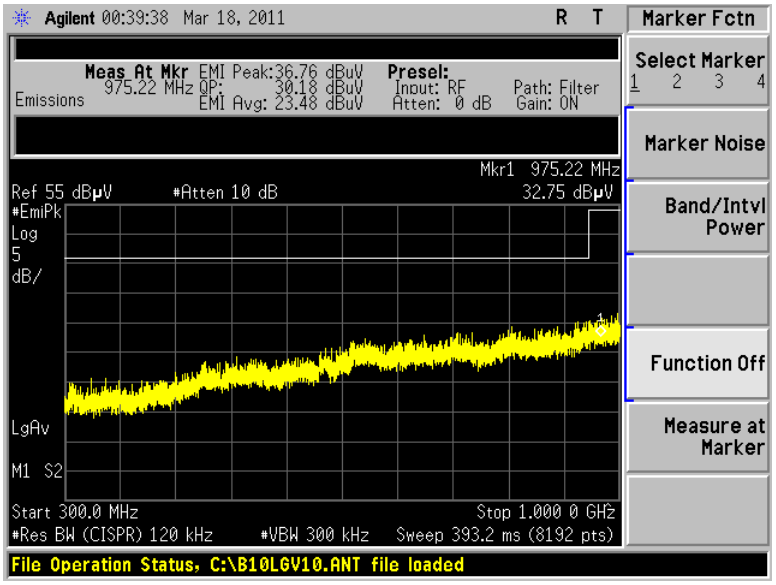
These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak detector function is utilized when measuring frequencies below 1 GHz, and an Average detector function is utilized when measuring frequencies above 1 GHz.

The signature scans shown here are from worst-case emissions, as measured on channels 1, 5 and 10, with the sense antenna both in vertical and horizontal polarity for worst case presentations.

Channel 5, Antenna Horizontally Polarized



Channel 5, Antenna Vertically Polarized



Screen Captures - Radiated Emissions Testing – Receive Mode **(continued)**

Channel 5, Antenna Horizontally Polarized

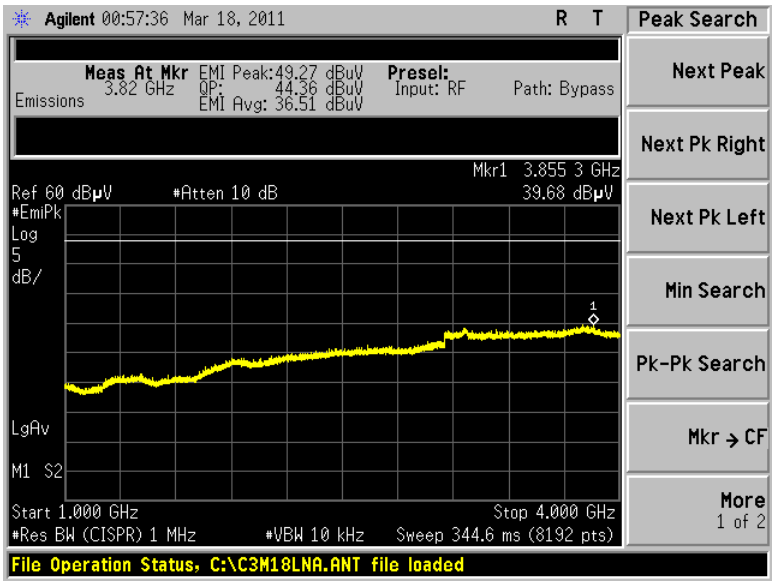


EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE:

6.1 Test Setup

The test area and setup are in accordance with ANSI C63.4 and with Title 47 CFR, FCC Part 15, Industry Canada RSS-210 and RSS GEN. The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power cable was plugged into a 50Ω (ohm), 50/250 μH Line Impedance Stabilization Network (LISN). The AC power supply of 120V was provided via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the Agilent E4445A/N9039A EMI System. The EMCO LISN used has the ability to terminate the unused port with a 50Ω (ohm) load when switched to either L1 (line) or L2 (neutral).

6.2 Test Procedure

The EUT was investigated in continuous modulated transmit mode for this portion of the testing. The appropriate frequency range and bandwidths were selected on the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1, Section 1, Table 1, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30 MHz. Final readings were then taken and recorded.

6.3 Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is provided in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter are traceable to N.I.S.T. All cables are calibrated and checked periodically for conformance. The emissions are measured on the Agilent E4445A/N9039A EMI System, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

6.4 Test Results

The EUT was found to **MEET** the Conducted Emission requirements of FCC Part 15.207 Conducted Emissions for an Intentional Radiator. See the Data Charts and Graphs for more details of the test results.

6.5 FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBµV)		Measuring Bandwidth
	Quasi-Peak	Average	
0.150 -0.50 *	66-56	56-46	RBW = 9 kHz VBW ≥ 9 kHz for QP VBW = 1 Hz for Average
0.5 – 5.0	56	46	
5.0 – 30	60	50	
* The limit decreases linearly with the logarithm of the frequency in this range.			

6.6 CONDUCTED EMISSIONS TEST DATA CHART

Frequency Range inspected: 150 KHz to 30 MHz
Test Standard: FCC 15.207 Class B
IC RSS GEN 7.2.2

Manufacturer:	LS Research					
Date(s) of Test:	May 11, 2011					
Test Engineer:	Peter Feilen					
Voltage:	3.3VDC					
Operation Mode:	PRBS					
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %					
Test Location:						Chamber
EUT Placed On:	X	40cm from Vertical Ground Plane				10cm Spacers
	X	80cm above Ground Plane				Other:
Measurements:		Pre-Compliance		Preliminary	X	Final
Detectors Used:	X	Peak	X	Quasi-Peak	X	Average

		Quasi-Peak			Average		
Frequency (MHz)	Line	Reading (dBµV)	Limit (dBµV)	Margin (dB)	Reading (dBµV)	Limit (dBµV)	Margin (dB)
0.223	L1	34.400	62.707	28.307	24.000	52.707	28.707
4.001	L1	34.800	56.000	21.200	31.300	46.000	14.700
0.171	L2	33.800	64.912	31.112	20.300	54.912	34.612
10.150	L2	28.100	60.000	31.900	17.600	50.000	32.400

Notes:

1) All other emissions were better than 20 dB below the limits.

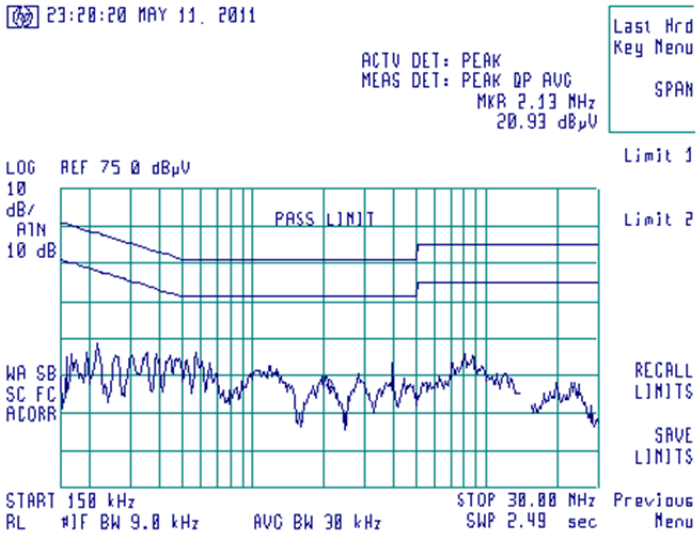
2) The EUT exhibited similar emissions in transmit and receive modes, and across the Low, Middle and High channels tested.

6.7 Screen Captures – Conducted Emissions Test

These screen captures represent Peak Emissions. For conducted emission measurements, both a Quasi-Peak detector function and an Average detector function are utilized. The emissions must meet both the Quasi-peak limit and the Average limit as described in 47 CFR 15.207 and RSS GEN 7.2.2 (Table 2).

The signature scans shown here are from channel 5, chosen as being a good representative of channels.

TX Mode
Line 1



TX Mode
Line 2

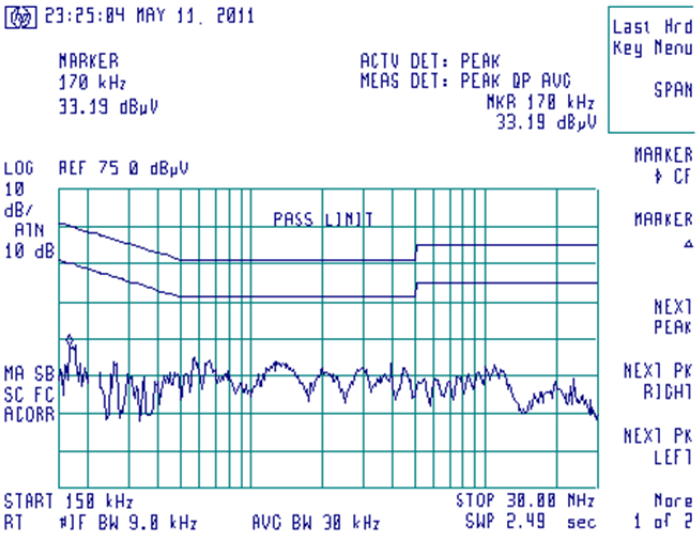


EXHIBIT 7. OCCUPIED BANDWIDTH

7.1 Limits

For a Digital Modulation System, the 6 dB bandwidth shall be at least 500 kHz.

7.2 Method of Measurements

Refer to ANSI C63.4 and FCC Procedures (2007) for Digital Transmission Systems operating under 15.247.

The transmitter output was connected to the Spectrum Analyzer. The bandwidth of the fundamental frequency was measured with the Spectrum Analyzer using 100 kHz RBW and VBW=300 kHz.

The bandwidth requirement found in FCC Part 15.247(a)(2) and RSS 210 A8.2(a) requires a minimum -6dBc occupied bandwidth of 500 kHz. In addition, Industry Canada (IC RSS GEN 4.6.1) requires the measurement of the -20dBc occupied bandwidth. For this portion of the tests, a direct measurement of the transmitted signal was performed at the antenna port of the EUT, via a cable connection to the Agilent E4446A spectrum analyzer. An attenuator was placed in series with the cable to protect the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings, thereby allowing direct measurements, without the need for any further corrections. An Agilent model E4446A spectrum analyzer was used with the resolution bandwidth set to 100 kHz for this portion of the tests. The EUT was configured to run in a continuous transmit mode, while being supplied with typical data as a modulation source. The spectrum analyzer was used in peak-hold mode while measurements were made, as presented in the chart below.

From this data, the closest measurement (6 dB bandwidth) when compared to the specified limit, is 600 kHz, which is above the minimum of 500 kHz.

7.3 Test Equipment List

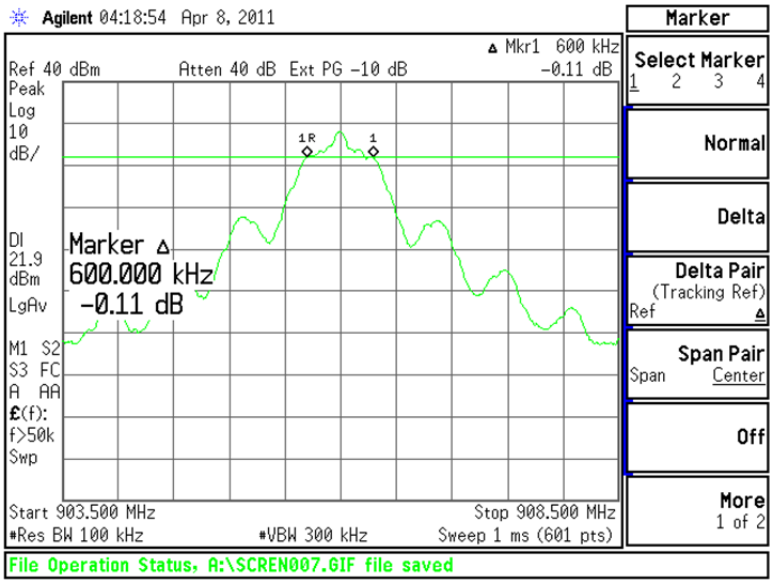
Please see Appendix A for a complete list of test equipment used.

7.4 Test Data

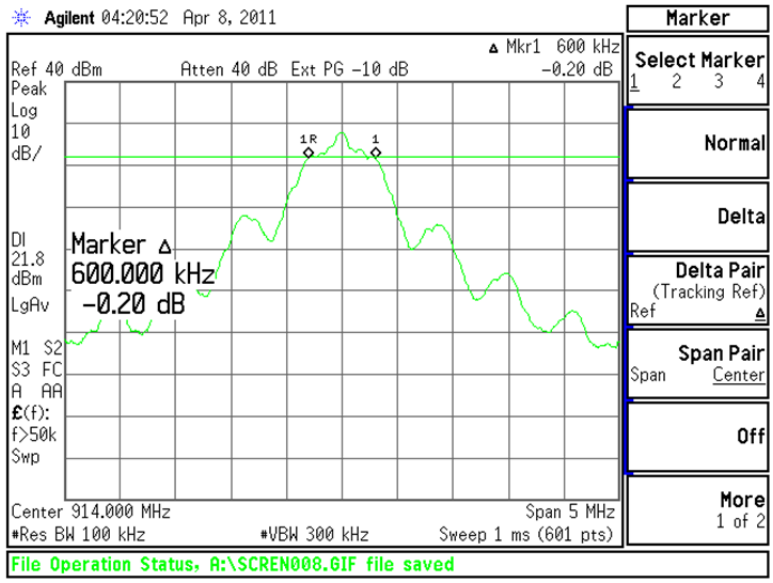
Channel	Center Frequency (MHz)	Measured -6 dBc OBW (kHz)	Minimum -6 dBc Limit (kHz)	Measured -20 dBc OBw (MHz)
1	906	600	500	1.395
5	914	600	500	1.531
10	924	600	500	1.625

7.5 Screen Captures - Occupied Bandwidth

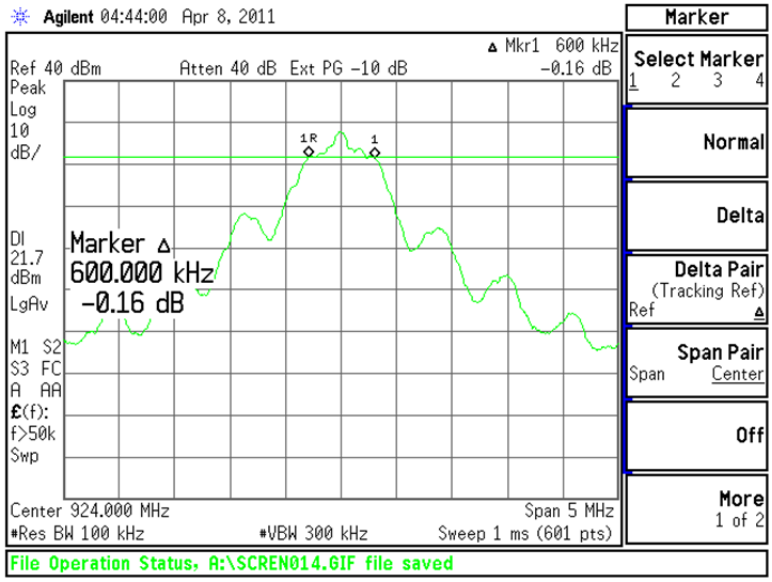
Channel 1, 906 MHz, -6 dBc Occupied Bandwidth



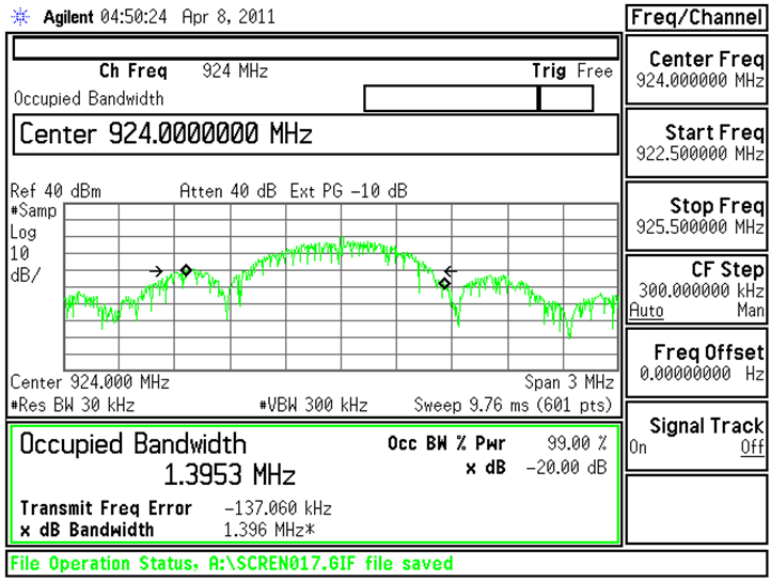
Channel 5, 914 MHz, -6 dBc Occupied Bandwidth



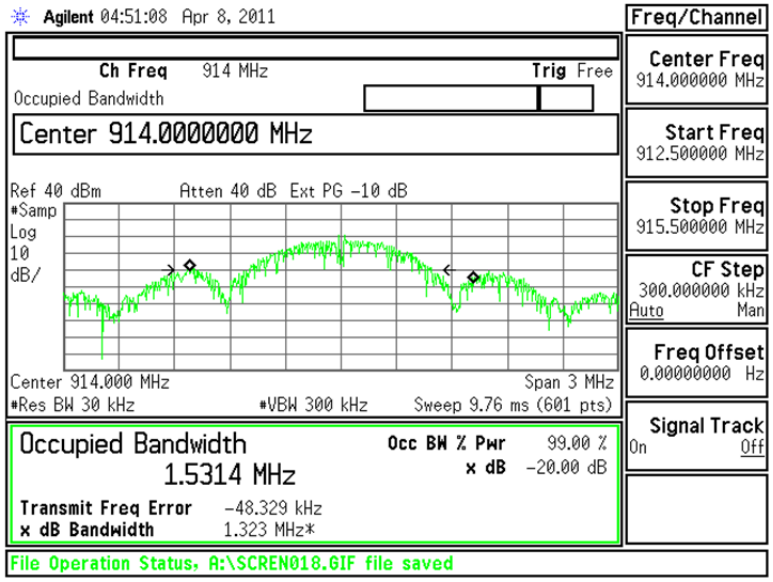
Channel 10, 924 MHz, -6 dBc Occupied Bandwidth



Channel 1, 906 MHz, -20 dBc Occupied Bandwidth



Channel 5, 914 MHz, -20 dBc Occupied Bandwidth



Channel 10, 924 MHz, -20 dBc Occupied Bandwidth

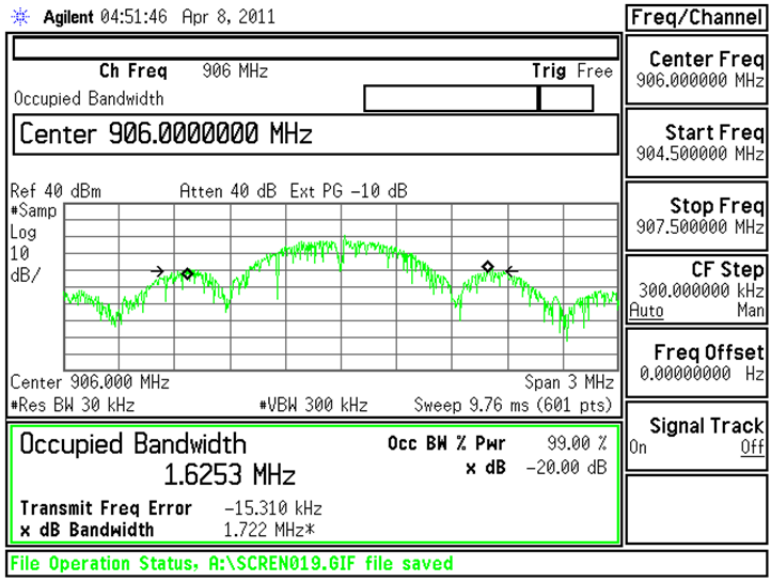


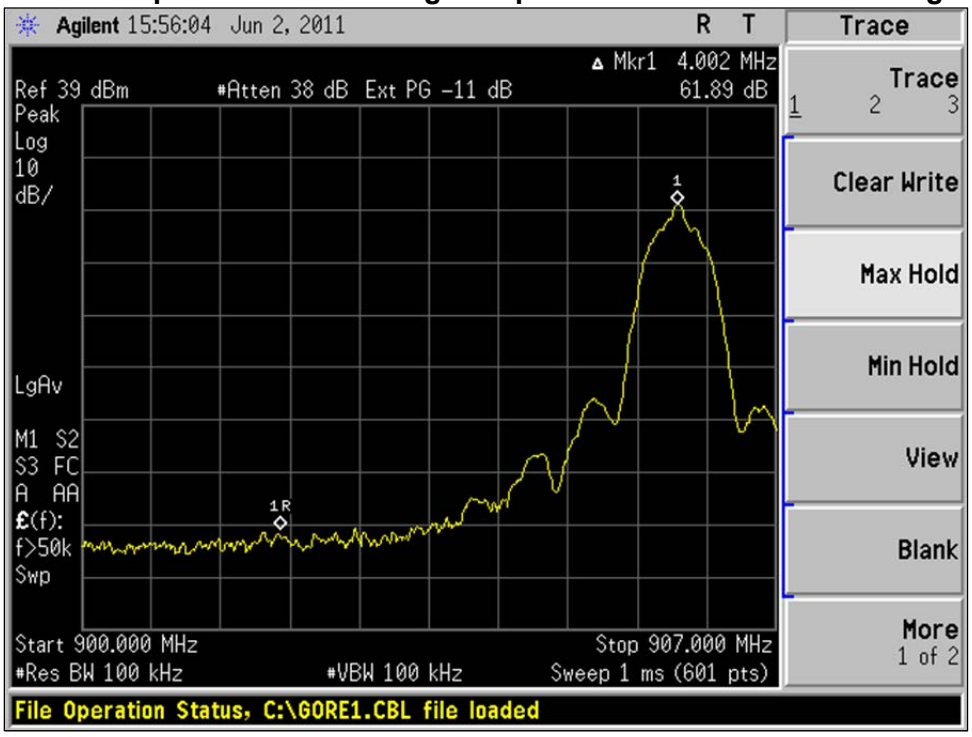
EXHIBIT 8. BAND-EDGE MEASUREMENTS

8.1 Method of Measurements

FCC 15.209(b) and 15.247(d) require a measurement of spurious emission levels to be at least 20 dB lower than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. Also, RSS 210 Section 2.2 requires that unwanted emissions meet limits listed in tables 2 and 3 of the same standard and also to the limits in the applicable annex. The following screen captures demonstrate compliance of the intentional radiator at the 2400-2483.5 MHz Band-Edges. The EUT was operated in continuous transmit mode with continuous modulation, with internally generated data as the modulating source. The EUT was operated at the lowest channel for the investigation of the lower Band-Edge, and at the highest channel for the investigation of the higher Band-Edge.

The Lower and Upper Band-Edge limit, in this case, would be -20 dBc with respect to the fundamental level.

Screen Capture Demonstrating Compliance at the Lower Band-Edge



Screen Capture Demonstrating Compliance at the Higher Band-Edge

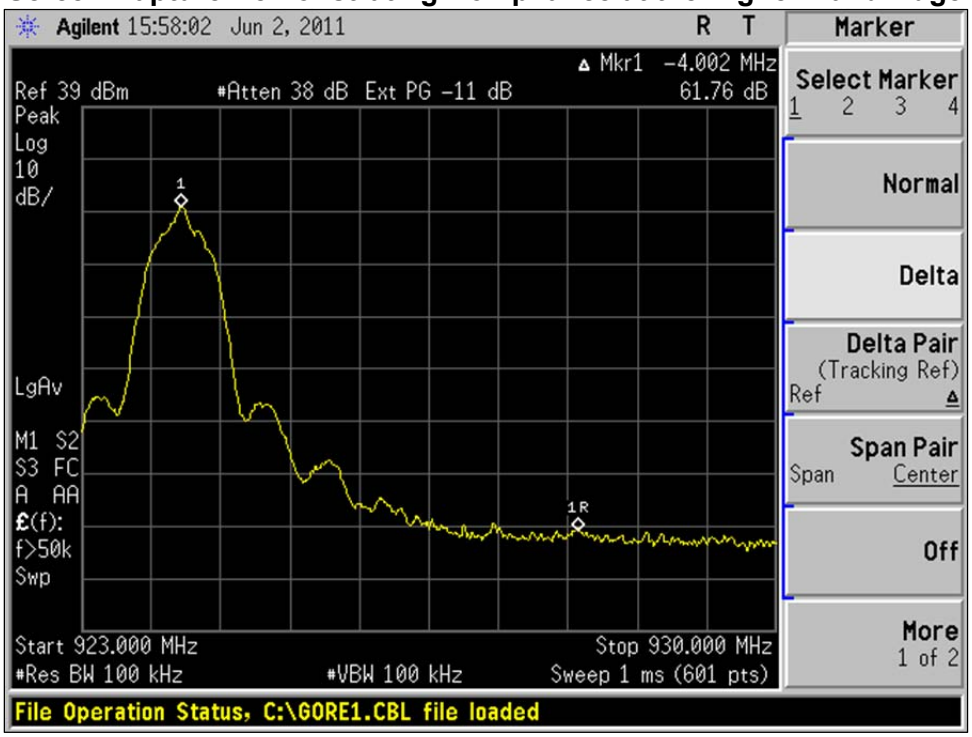


EXHIBIT 9. POWER OUTPUT (CONDUCTED)

9.1 Method of Measurements

The conducted RF output power of the EUT was measured at the antenna port using a short RF cable along with an attenuator as protection for the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings, thereby allowing direct measurements without the need for any further corrections. The unit was configured to run in a continuous transmit mode as a modulation source. The spectrum analyzer was used with resolution and video bandwidths set to 1 MHz, and a span of 5 MHz, with measurements from a peak detector presented in the chart below.

9.2 Test Equipment List

Please see Appendix A for a complete list of test equipment used.

9.3 Test Data

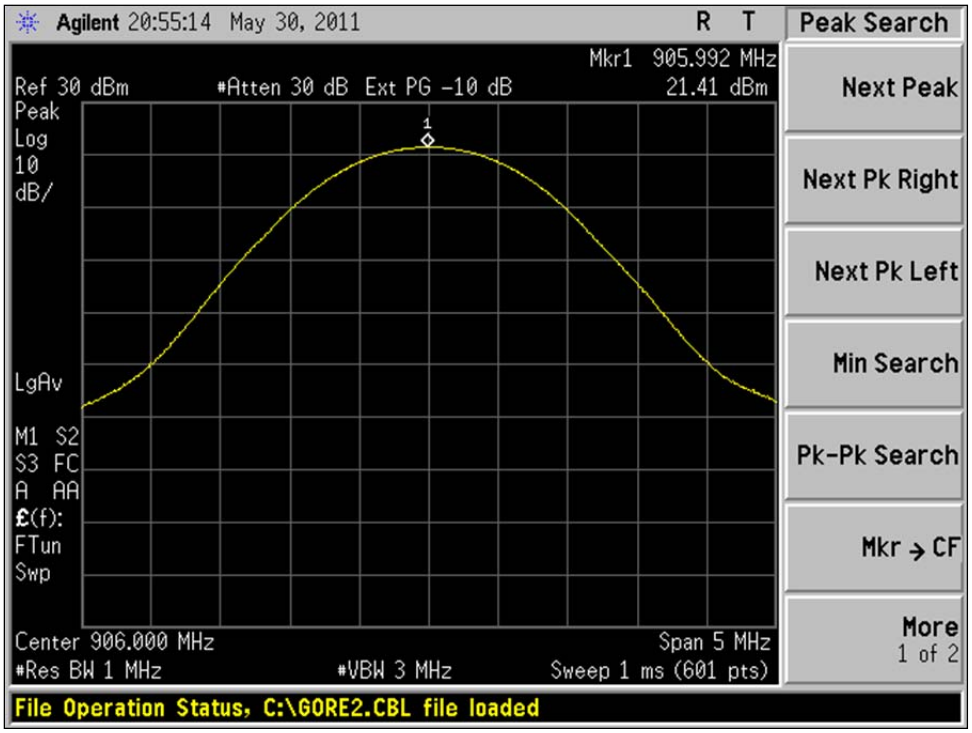
Channel	Center Freq (MHz)	Limit (dBm)	Measured Power (dBm)	Margin (dB)
1	906	23.65	21.4	2.2
5	914	23.65	21.2	2.4
10	924	23.65	20.9	2.8

Transmitter Channel	Freq. (MHz)	Peak Power at Antenna Terminal (dBm)	[(1)]Calculated EIRP (dBm)	Conducted Power Limit (dBm)	EIRP Limit (dBm)
1	906	21.4	33.75	30.0	36.0
5	914	21.2	33.55	30.0	36.0
10	924	20.9	33.25	30.0	36.0

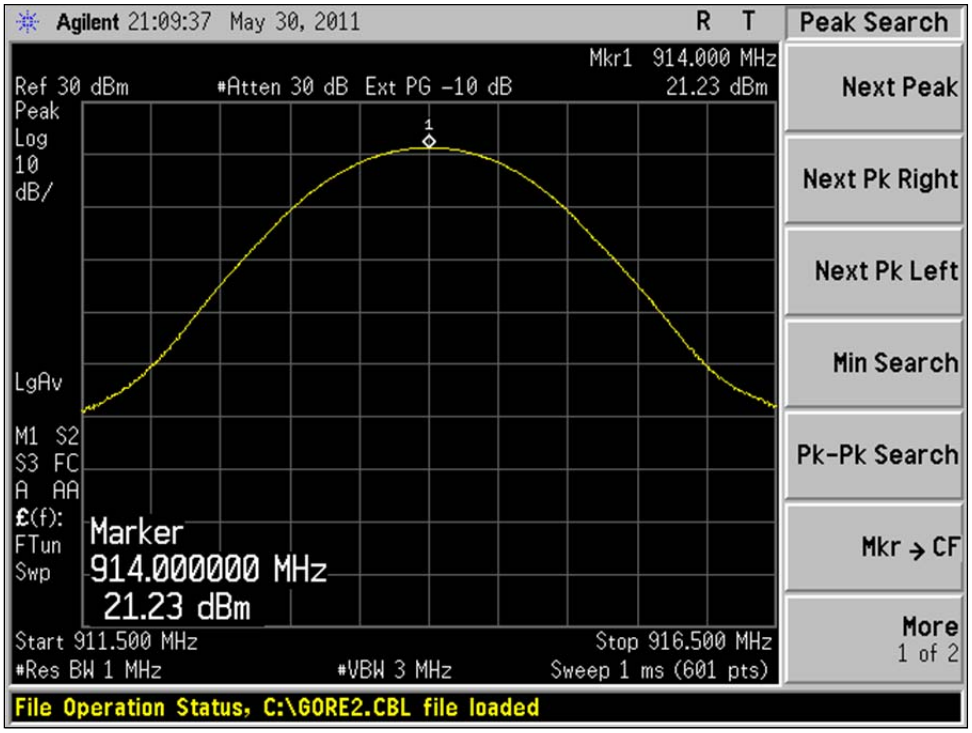
(1) EIRP Calculation:
EIRP = (Peak power at antenna terminal in dBm) + (EUT Antenna gain in dBi)

9.4 Screen Captures – Power Output (Conducted)

Channel 1



Channel 5



Channel 10

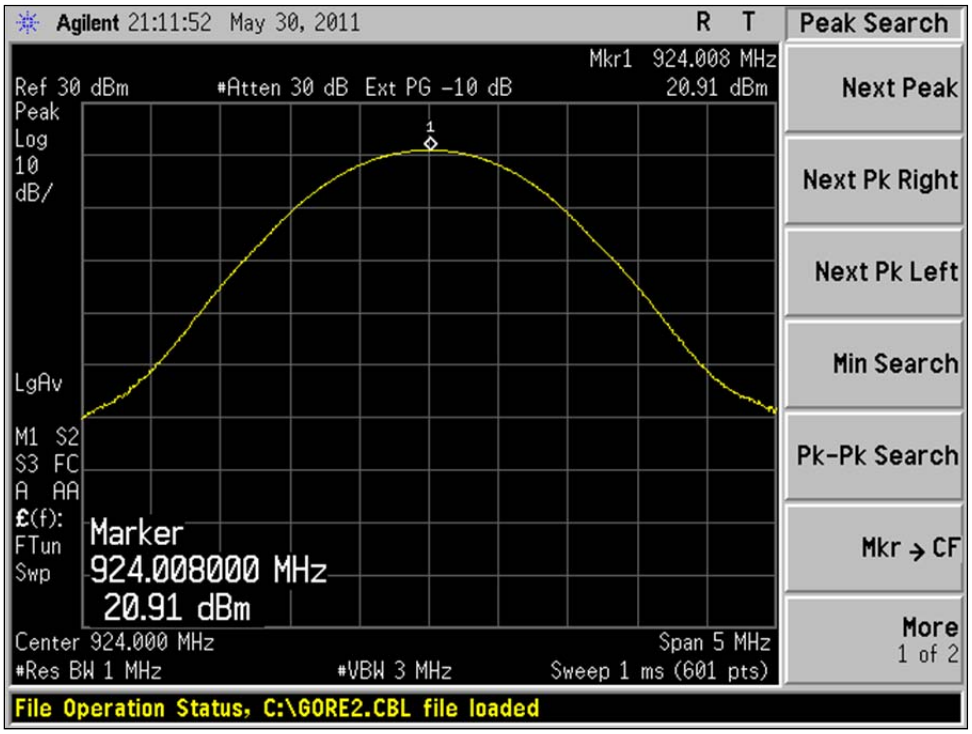

Agilent 21:11:52 May 30, 2011
R T
Peak Search
Mkr1 924.008 MHz
Ref 30 dBm
#Atten 30 dB Ext PG -10 dB
20.91 dBm
Next Peak
Peak
Log
10
dB/
Next Pk Right
Next Pk Left
Min Search
LgAv
M1 S2
S3 FC
A AA
£(f):
FTun
Swp
Pk-Pk Search
Marker
924.008000 MHz
20.91 dBm
Mkr → CF
More
1 of 2
Center 924.000 MHz
Span 5 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 1 ms (601 pts)
File Operation Status, C:\GORE2.CBL file loaded

EXHIBIT 10. POWER SPECTRAL DENSITY

10.1 Limits

For digitally modulate systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

In accordance with FCC Part 15.247(e) and RSS 210 A8.2 (b), the peak power spectral density should not exceed +8 dBm in any 3 kHz band. This measurement was performed along with the conducted power output readings performed as described in previous sections. The peak output frequency for each representative frequency was scanned, with a narrow bandwidth, and reduced sweep, and a power density measurement was performed using the utility built into the HP Analyzer. The resultant density was then corrected to a 3 kHz bandwidth. The highest density was found to be no greater than 1.27 dBm, which is under the allowable limit by 6.73 dB.

10.2 Test Equipment List

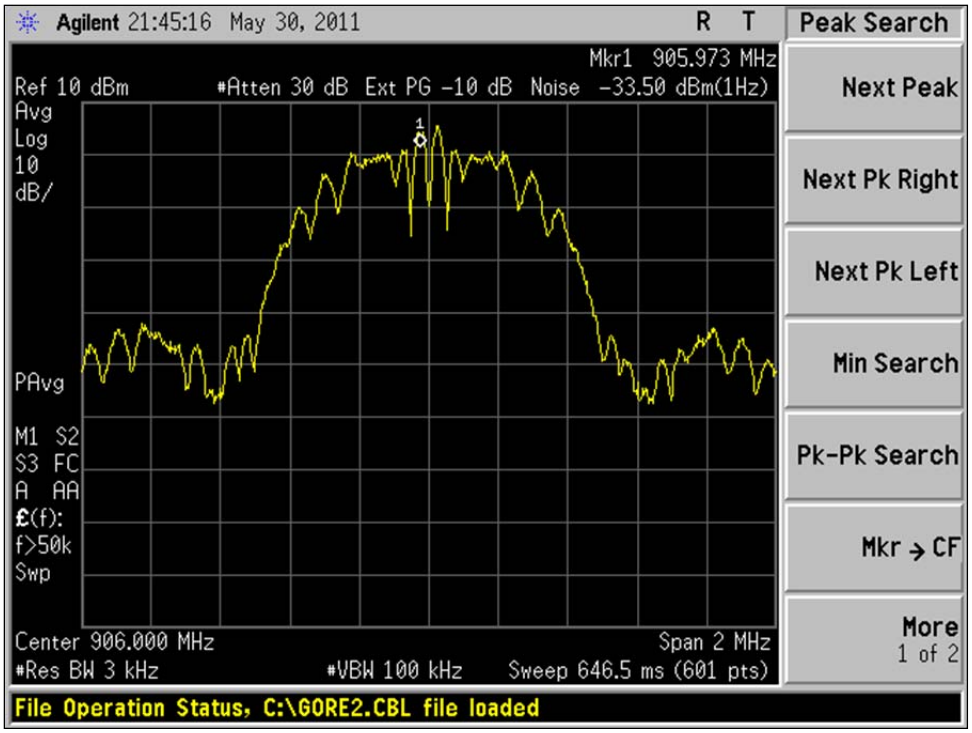
Please see Appendix A for a complete list of test equipment used.

10.3 Test Data

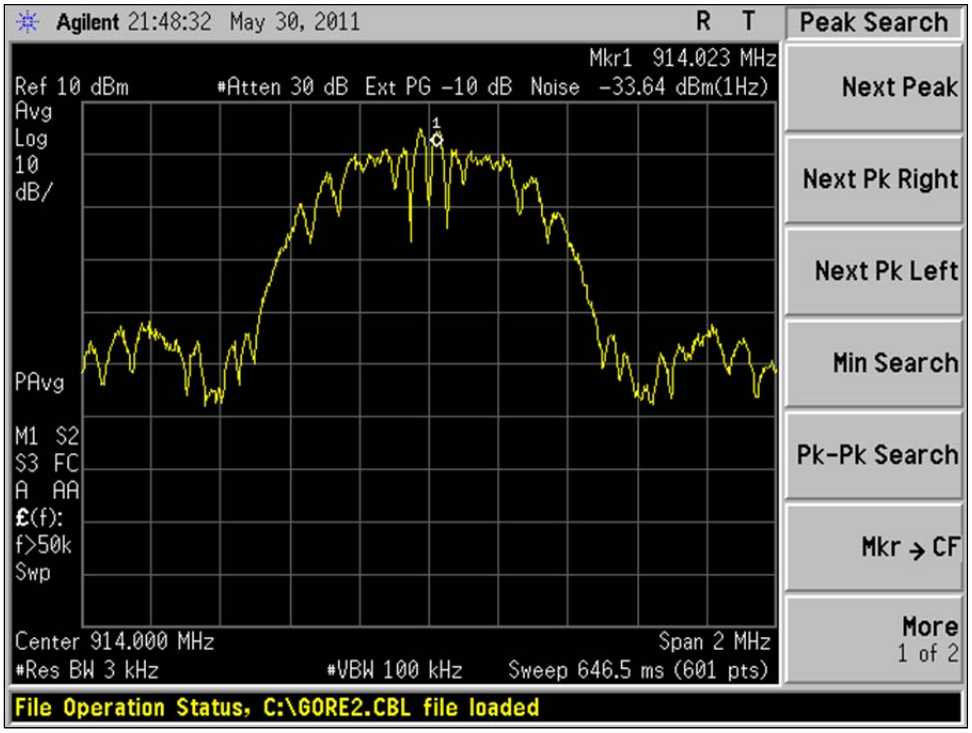
Channel	Center Frequency (MHz)	Measured Channel Power (dBm/1Hz)	3 kHz Correction (dB)	Corrected Power Measurement (dBm/3kHz)	Limit (dBm)	Margin (dB)
1	906	-33.50	34.77	1.27	8.0	6.73
5	914	-33.64	34.77	1.13	8.0	6.87
10	924	-33.55	34.77	1.22	8.0	6.78

10.4 Screen Captures – Power Spectral Density

Channel 1



Channel 5



Channel 10

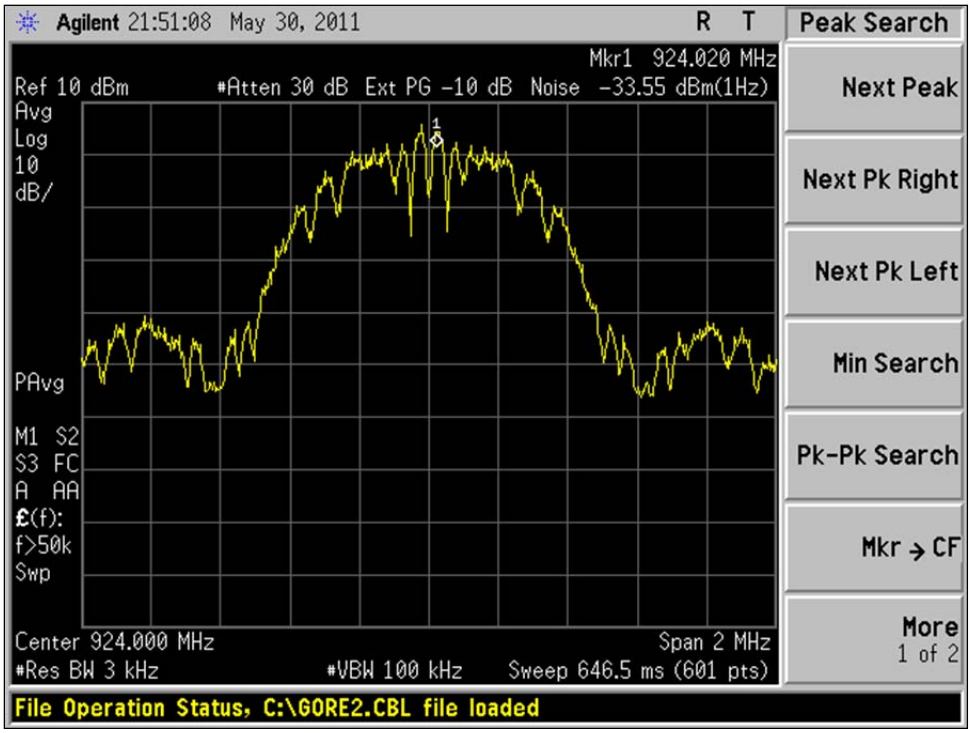

Agilent 21:51:08 May 30, 2011
R T
Peak Search
Mkr1 924.020 MHz
Ref 10 dBm
#Atten 30 dB Ext PG -10 dB Noise -33.55 dBm(1Hz)
Next Peak
Avg
Log
10
dB/
Next Pk Right
Next Pk Left
Min Search
PAvg
M1 S2
S3 FC
A AA
£(f):
f>50k
Swp
Pk-Pk Search
Mkr → CF
Center 924.000 MHz
Span 2 MHz
More
1 of 2
#Res BW 3 kHz
#VBW 100 kHz
Sweep 646.5 ms (601 pts)
File Operation Status, C:\GORE2.CBL file loaded

EXHIBIT 11. SPURIOUS CONDUCTED EMISSIONS

11.1 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 db below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

FCC Part 15.247(d) and IC RSS 210 A8.5 require a measurement of conducted harmonic and spurious RF emission levels, as reference to the carrier level when measured in a 100 kHz bandwidth. For this test, the spurious and harmonic RF emissions from the EUT were measured at the EUT antenna port using a short RF cable along with an attenuator as protection for the spectrum analyzer. The loss from the cable and the attenuator were added on the analyzer as gain offset settings, thereby allowing direct readings of the measurements made without the need for any further corrections. An Agilent spectrum analyzer was used with the resolution bandwidth set to 100 kHz for this portion of the tests. The unit was configured to run in a continuous transmit mode, while being supplied with pseudorandom data as a modulation source. The spectrum analyzer was used with measurements from a peak detector presented in the chart below. Screen captures were acquired and any noticeable spurious and harmonic signals were identified and measured.

No significant emissions could be noted within -50 dBc of the fundamental level for this product.

11.2 Test Data

	Channel 1	Channel 5	Channel 10
Fundamental	+ 21.3 (dBm)	+ 20.8 (dBm)	+ 21.0 (dBm)
2nd Harmonic	Note (1)	Note (1)	Note (1)
3rd Harmonic	Note (1)	Note (1)	Note (1)
4th Harmonic	Note (1)	Note (1)	Note (1)
5th Harmonic	Note (1)	Note (1)	Note (1)
6th Harmonic	Note (1)	Note (1)	Note (1)
7th Harmonic	Note (1)	Note (1)	Note (1)
8th Harmonic	Note (1)	Note (1)	Note (1)
9th Harmonic	Note (1)	Note (1)	Note (1)
10th Harmonic	Note (1)	Note (1)	Note (1)

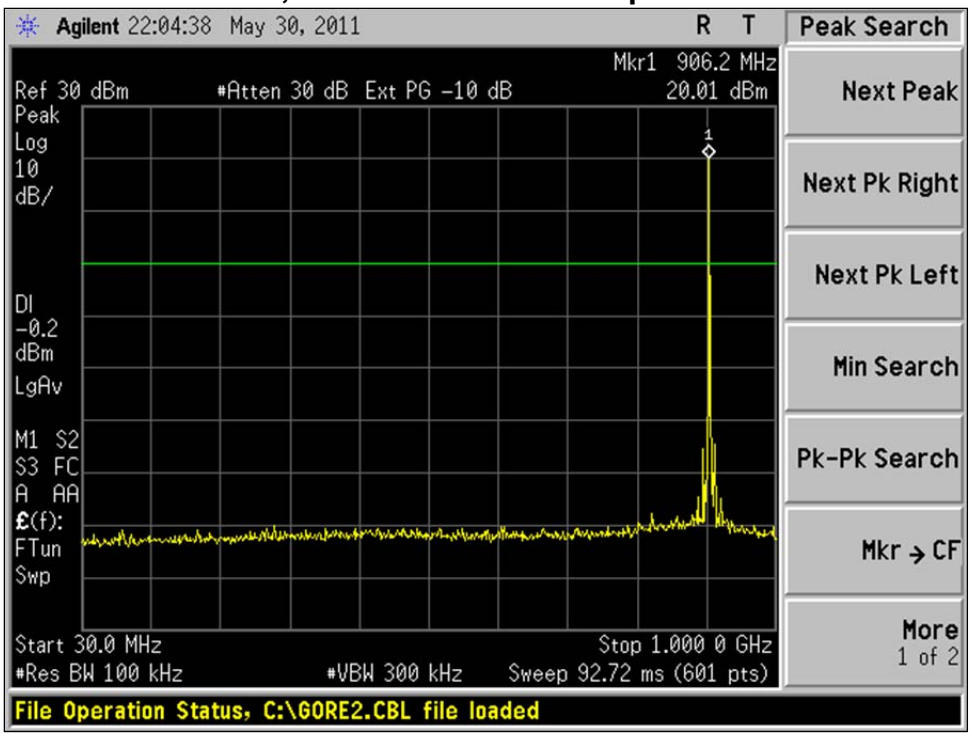
Notes:
(1) Measurement at system noise floor.

11.3 Test Equipment List

Please see Appendix A for a complete list of test equipment used.

11.4 Screen Captures – Spurious Radiated Emissions

Channel 1, shown from 30 MHz up to 1000 MHz



Channel 1, shown from 1000 MHz up to 10000 MHz

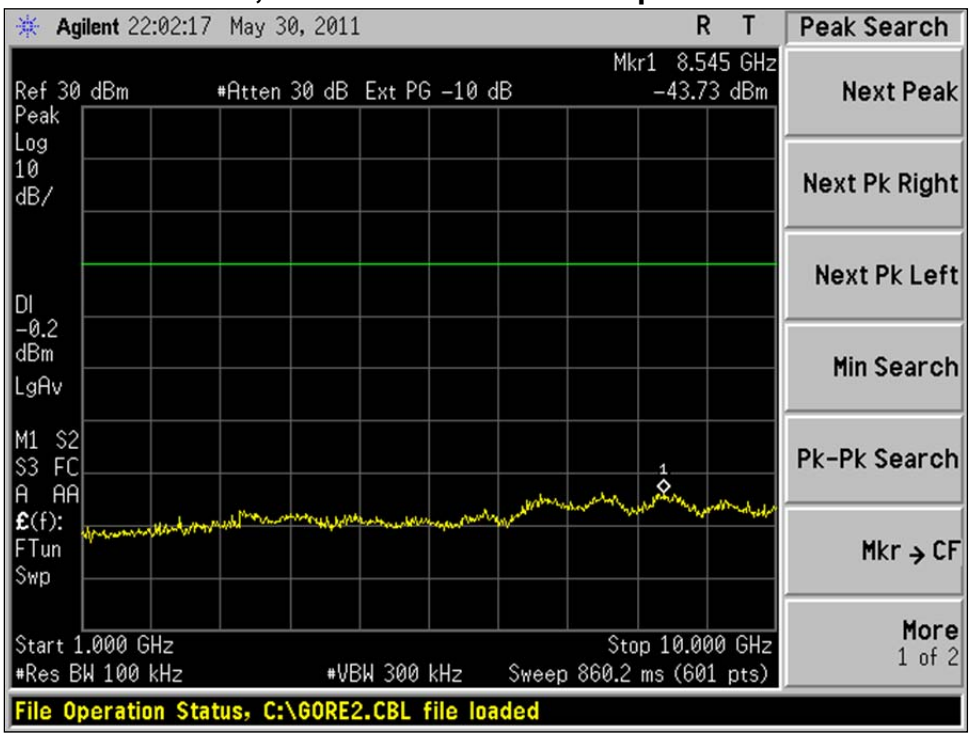


EXHIBIT 12. FREQUENCY & POWER STABILITY OVER VOLTAGE VARIATIONS

The stability of the device was examined as a function of the input voltage available to the EUT. A Spectrum Analyzer was used to measure the frequency at the appropriate frequency markers. Power was supplied by an external bench-type variable power supply, and the frequency of operation was monitored using the spectrum analyzer

A spectrum analyzer was used to measure the frequency at the appropriate frequency markers. For this test, the EUT was placed in continuous transmit CW mode. Power to the EUT was supplied by an external bench-type variable power supply. The frequency of operation was monitored using the spectrum analyzer with RBW=VBW=1 kHz settings while the voltage was varied.

The RF Power Output of the EUT was also monitored in a separate test, also using a Spectrum Analyzer with RBW=VBW=3 MHz setting while the voltage was varied.

The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characterizes were well behaved, and the system returned to the same state of operation as before the power cycle.

No anomalies were noted; in the measured transmit power, varying less than 1 dB, during the voltage variation tests.

Channel	2.8VDC		3.3VDC		3.8VDC	
	Power (dBm)	Frequency (MHz)	Power (dBm)	Frequency (MHz)	Power (dBm)	Frequency (MHz)
1	25.30	906.0250	27.4	906.0097	28.41	906.0125
5	24.96	914.0125	27.3	914.0125	28.17	914.0250
10	24.70	924.0125	27.2	923.9625	27.82	924.0125

APPENDIX A

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 11-May-2011 Type Test : Conducted AC Emissions Job # : C-1148

Prepared By: Peter Customer : LSR Quote #: 311094

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960008	LISN	EMCO	3816/2NM	9701-1057	1/4/2011	1/4/2012	Active Calibration
2	EE 960013	EMI Receiver	HP	8546A System	3617A00320;3448A	10/29/2010	10/29/2011	Active Calibration
3	EE 960014	EMI Receiver-filter section	HP	85460A	3448A00296	10/29/2010	10/29/2011	Active Calibration
4	AA 960031	Transient Limiter	HP	11947A	3107A01708	9/28/2010	9/28/2011	Active Calibration

Project Engineer: Peter Fiduccia Quality Assurance:

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 25-Mar-2011 Type Test : Spurious Emissions Job # : C-1148

Prepared By: Customer : LSR Quote #: 311094

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960144	Phaseflex	Gore	EKD01D010720	5800373	6/4/2010	6/4/2011	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: Peter Fiduccia Quality Assurance:

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 25-Mar-2011 Type Test : Power Spectral Density Job # : C-1148

Prepared By: Peter Customer : LSR Quote #: 311094

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960144	Phaseflex	Gore	EKD01D010720	5800373	6/4/2010	6/4/2011	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: Peter Fiduccia Quality Assurance:

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 25-Mar-2011 Type Test : Conducted Power Output Job # : C-1148

Prepared By: Customer : LSR Quote #: 311094

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960144	Phaseflex	Gore	EKD01D010720	5800373	6/4/2010	6/4/2011	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: Peter Fiduccia Quality Assurance:

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 25-Mar-2011 Type Test : Occupied Bandwidth (6dB & 20dB) Job # : C-1148

Prepared By: Customer : LSR Quote #: 311094

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960144	Phaseflex	Gore	EKD01D010720	5800373	6/4/2010	6/4/2011	Active Calibration
2	EE 960073	Spectrum Analyzer	Agilent	E4446A	US45300564	9/22/2010	9/22/2011	Active Calibration

Project Engineer: Peter Finlon Quality Assurance:

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 25-Mar-2011 Type Test : Band-Edge Job # : C-1148

Prepared By: Peter Customer : LSR Quote #: 311094

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/19/2010	10/19/2011	Active Calibration
2	EE 960156	100kHz-1GHz Analog Signal Generator	Agilent	N5181A	MY49060062	6/7/2010	6/7/2011	Active Calibration
3	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	6/7/2010	6/7/2011	Active Calibration
4	EE 960158	RF Preselecter	Agilent	N9039A	MY46520110	6/7/2010	6/7/2011	Active Calibration

Project Engineer: Peter Finlon Quality Assurance:

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 25-Mar-2011 Type Test : Radiated Emissions Job # : C-1148

Prepared By: Peter Customer : LSR Quote #: 311094

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	EE 960156	100kHz-1GHz Analog Signal Generator	Agilent	N5181A	MY49060062	6/7/2010	6/7/2011	Active Calibration
2	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	6/7/2010	6/7/2011	Active Calibration
3	EE 960158	RF Preselecter	Agilent	N9039A	MY46520110	6/7/2010	6/7/2011	Active Calibration
4	AA 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/19/2010	10/19/2011	Active Calibration
5	AA 960150	Bicon Antenna	ETS	3110B	0003-3346	10/19/2010	10/19/2011	Active Calibration
6	AA 960081	Double Ridge Horn Antenna	EMCO	3115	6907	1/4/2011	1/4/2012	Active Calibration
7	EE 960159	0.8 - 21GHz LNA	Mini-Circuits	ZVA-213X-S+	740411007	8/19/2010	8/19/2011	Active Calibration
8	AA 960158	Double Ridge Horn Antenna	EMCO	3117	109300	8/19/2010	8/19/2011	Active Calibration

Project Engineer: Peter Finlon Quality Assurance:

APPENDIX B

Test Standards – Current Publication Date

STANDARD #	DATE	Am. 1	Am. 2
ANSI C63.4	2003		
ANSI C63.10	2009		
CISPR 11	2009-05	2009-12 P	
CISPR 12	2007-05		
CISPR 14-1	2005-11	2008-11	
CISPR 14-2	2001-11	2001-11	2008-05
CISPR 16-1-1 Note 1	2010-01		
CISPR 16-1-2 Note 1	2003	2004-04	2006-07
CISPR 22	2008-09		
CISPR 24	1997-09	2001-07	2002-10
EN 55011	2007-05		
EN 55014-1	2006		
EN 55014-2	1997		
EN 55022	2006	2007	
EN 60601-1-2	2007-03		
EN 61000-3-2	2006-05		
EN 61000-3-3	2008-12		
EN 61000-4-2	2009-05		
EN 61000-4-3	2006-07	2008-05	
EN 61000-4-4	2004		
EN 61000-4-5	2006-12		
EN 61000-4-6	2009-05		
EN 61000-4-8	1994	2001	
EN 61000-4-11	2004-10		
EN 61000-6-1	2007-02		
EN 61000-6-2	2005-12		
EN 61000-6-3	2007-02		
EN 61000-6-4	2007-02		
FCC 47 CFR, Parts 0-15, 18, 90, 95	2008		
FCC Public Notice DA 00-1407	2000		

STANDARD #	DATE	Am. 1	Am. 2
FCC ET Docket # 99-231	2002		
FCC Procedures	2007		
ICES 001	2006-06		
ICES 002	2009-08		
ICES 003	2004-02		
IEC 60601-1-2 Note 1	2007-03		
IEC 61000-3-2	2005-11	2008-03	2009-02
IEC 61000-3-3	2008-06		
IEC 61000-4-2	2008-12		
IEC 61000-4-3	2008-04	incl in 2008-04	2009-12 FD
IEC 61000-4-4	2004-07	2010-10	
IEC 61000-4-5	2005-11		
IEC 61000-4-6	2008-10		
IEC 61000-4-8	2009-09		
IEC 61000-4-11	2004-03		
IEC 61000-6-1	2005-03		
IEC 61326-1	2006-06		
ISO 14982	1998-07		
MIL Std. 461E	1999-08		
RSS GEN	2007-06		
RSS 119	2007-06		
RSS 123	1999-11		
RSS 125	2000-03		
RSS 131	2003-07		
RSS 136	2002-10		
RSS 137	2009-02		
RSS 210	2007-06		
RSS 213	2005-12		
RSS 243	2005-11		
RSS 310	2007-06		

Note 1: Test not on LSR Scope of Accreditation.

Updated on 02-03-10

APPENDIX C

Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k=2.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	*Particular Configuration*	*Uncertainty Values*
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.82 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.88 dB
Radiated Emissions	3-Meter Chamber, Horn Antenna	4.85 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.32 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.63 dB
Absolute Conducted Emissions	Agilent PSA/ESA Series	1.38 dB
AC Line Conducted Emissions	Shielded Room/EMCO LISN	3.20 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	2.05 Volts/Meter
Conducted Immunity	3 Volts level	2.33 V
EFT Burst, Surge, VDI	230 VAC	54.4 V
ESD Immunity	Discharge at 15kV	3200 V
Temperature/Humidity	Thermo-hygrometer	0.64° / 2.88 %RH

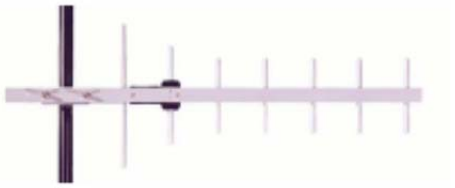
Appendix D

Antenna Specification(s)

COMTELCO

Technical Specification **Y3387**

806-970 MHz 10.2dB Gain **HEAVY DUTY YAGI ANTENNA**



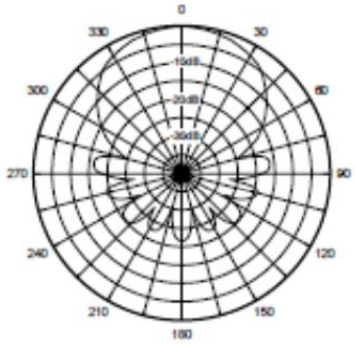
High Performance: *These antennas provide 10.2dBd, wide band performance.*

Rugged and weatherproof: *The construction of our heavy duty yagis feature 1"aluminum U channel with 3/8" solid elements. All exposed areas are coated with UV polyester. The balun assembly is filled and sealed with elastomeric thermoplastic.*

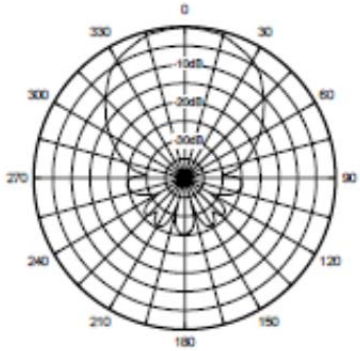
Lightweight and Durable: *These antennas are easily installed by one person.*

Termination Options:
Type A: *12" Teflon pigtail with N connector.*
Type B: *Direct TNC connection to the balun.*
Type D: *Direct N connection to the balun.*

Horizontal Pattern



Vertical Pattern



ELECTRICAL SPECIFICATIONS:

GAIN:	*10.2dBd F/B 20dB*
FREQUENCY:	*-06 806-896MHz <2:1 VSWR*
	-66 866-960MHz <2:1 VSWR
	-96 896-970MHz <2:1 VSWR
	-915 900-930MHz <2:1 VSWR
VERT BEAMWIDTH:	*50°*
HORIZ BEAM WIDTH:	*55°*
RATING :	*300 watts, 50 ohms impedance*

MECHANICAL SPECIFICATIONS:

MATERIAL:	*1" aluminum U channel boom*
	3/8" solid elements
FINISH:	*UV inhibited polyester coat*
LENGTH:	*26"*
WEIGHT:	*<4 lbs.*
MOUNT:	*2 3/8" mast, stainless hardware*
FLAT PLATE AREA:	*.265 ft*
WIND RATING:	*125 MPH*
WIND LOAD:	*15.9 lbs.*

Appendix E

Firmware and Setup Information

EUT was setup utilizing the ModFlex Test Tool, version 2.3.0.0. Programming was achieved by connecting the module to the development board, which was powered by a USB connection to a PC, and the module received power via a wall mount power supply set to 3.3vDC.

In the LSR ModFlex Test Tool, use “RF Eval tab”, set the Channels to 1, 5, or 10; power level set to “9”; PRBS mode; BPSK-40kBps rate.