Exegin Technologies Limited

Q52 Zigbee Bridge Device

Report of Measurements

per

FCC CFR47 Part 15/B Class B
FCC CFR47 Part 15/C 15.247
IC ICES-003 Class B
IC RSS-Gen
IC RSS-210 Annex 8

Revision 1.0

June 27, 2007

Approved by		
Checked by	David Johanson, EMC Eng.	27 JUN 07 Date

Protocol Datasystems Inc, EMC Lab, Abbotsford BC, Canada
SCC ISO/17025 (CAN-P-4E) Accredited Laboratory No. 612
FCC O.A.T.S. Registration Number 96437
Industry Canada O.A.T.S. Registration Number IC3384

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Section I: Report of Mesurements Testing Information

Testing Details

TESTED BY: Emissions: David Johanson

TEST CONDITIONS: Temperature and Humidity: 25°C, 68%

TEST VOLTAGE: 120Vac 60Hz

Test Facilities

Protocol Datasystems Inc., EMC Lab
28945 McTavish Rd.
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SCC ISO/17025 (CAN-P-4E) Accredited Laboratory No. 612
FCC O.A.T.S. Registration Number 96437
Industry Canada O.A.T.S. Registration Number IC3384

Test Equipment List

EMISSION:

Manufacturer	Model	Equipment Description	Serial No.	Last Cal	Next Cal
HP	85650A	CDN Quasi-Peak Adapter	2043A00240	12/07/06	12/07/07
HP	85662A	Spectrum Analyzer Display	2318A05184	12/07/06	12/07/07
HP	8566B	Spectrum Analyzer RF Section	2241A02102	12/07/06	12/07/07
HP	85685A	RF-Preselector	3107A01222	12/07/06	12/07/07
EMCO	EM6912	Antenna Biconical 20-300MHz	380	06/03/06	06/03/07
EMCO	3146	Ant. Log Periodic 200-1000MHz	9402-3776	17/02/06	17/02/07
EMCO	3115	Antenna Horn 1-18GHz	9005-3429	07/03/06	07/03/07
SOLAR	8012-50-R-24-BNC	LISN(25A 50ohm 50/250uH 10k-50MHz)	863092	28/09/06	28/09/07
Rhientech	Custom	Antenna Mast	N/A	N/A	N/A
Protocol EMC	Custom	Turntable	N/A	N/A	N/A

Measurement Uncertainty

Parameter	Uncertainty
Radio Frequency	±1 x 10-5
Total RF power, conducted	±1,5 dB
RF power density, conducted	±3 dB
Spurious emissions, conducted	±3 dB
All emissions, radiated	±6 dB
Temperature	±1°C
Humidity	±5 %
DC and low frequency voltages	±3 %

Company Under Test

NAME: Exegin Technologies Limited

ADDRESS: 204-2071 Kingsway Ave.
Port Coquitlam, BC V3C 6N2

CONTACT PERSON: Mr. Fred Fierling

EMAIL: fff@exegin.com

PHONE NUMBER: 604-468-3639

Equipment Under Test

THE TEST SYSTEM:

EUT 1:	Q52
Manufacturer:	Exegin Technologies Ltd.
Part Number:	Q52
Serial Number:	00065
Antenna1:	Antenna 2.4GHz ½Wave
Manufacturer:	Linx Technologies Antenna Factor
Part Number:	ANT-2.4-CW-RCL
EUT Firmware	Q52 Firmware
Manufacturer:	Exegin
Part Number:	Q52-Ver 0.40
Test Software	PC test software
Manufacturer:	Exegin
Part Number:	EMITest.exe
AUX EQUIP 1:	120Vac – 6Vdc 300mA Transformer
Manufacturer:	AQualities
Part Number:	MD350603
AUX EQUIP 2:	240Vac – 5Vdc 1A Transformer
Manufacturer:	Imation
Part Number:	JOD-4801-011R
AUX EQUIP 3:	100-240Vac – 5Vdc 1.2A Switching Power Adapter
Manufacturer:	Condor
Part Number:	3A-061WP05
AUX EQUIP 4:	Laptop
Manufacturer:	Sony Vaio
Part Number:	VGN-CZ220P
AUX EQUIP 5:	Ethernet Switch
Manufacturer:	Netgear
Part Number:	FS-108
Serial Number:	FS18E12132327

Cabling

Ref	Cable	Pins	Connector	Termination	Shielded	Ferrites
1	Power Supply	2	2.4mm Coaxial plug	No	No	No
2	Ethernet CAT-5e	8	RJ-45 plug	No	No	No

TEST SETUP:

The Q52 ZigBee Bridge (Q52) was tested for Unintentional, Intentional, radiated emissions and conducted emissions. The Q52 provides a Communication Bridge between a ZigBee Wireless System module and an Ethernet System. The method of wireless communications is a 2.4GHz Digital Modulation Spread Spectrum signal operating in accordance with the ZigBee Alliance regulations. The type of modulation used is designated O-QPSK.

For un-intentional emissions tests, the Q52 was tested in its normal mode of operation, when not in communications with another ZigBee device. In this mode of operation, the Q52 transmitter is making periodic broadcasts, looking for other ZigBee modules to communicate with. The Q52 was attached to a remotely located laptop using the Ethernet port.

The Q52 was tested using various power supplies. Both radiated and conducted emissions were evaluated to ensure compliance with the various power supplies that could be shipped with the product. These emissions were evaluated while the unit was in Normal mode and Continuous Transmission modes of operation.

For Intentional Conducted emissions testing at the transmitters Antenna RF port of the Q52, the tests were performed while the Spectrum Analyzer was connected directly to the Antenna port. For these tests, The laptop was connected via the Ethernet port and the Q52 was programmed to put the transmitter into its various modes of operation.

For the Spurious Radiated emissions were performed while the Q52 was transmitting at full power while using a 50 Ohm terminator in the Antenna Port.

Refer to Appendix A for photos about Cables and setup. Refer to Appendix B for the Part15/B and ICES-003 Radiated and Conducted Emission data.

MODIFICATIONS: This unit requires no modifications for it to pass.

CONCLUSION: The Exegin Technologies Q52 ZigBee Bridge complies with the requirements of FCC CFR47 Part 15/B Class B; Part 15.247; IC ICES-003 Class B and IC RSS-210 Appendix A.8. These test results are representive of the provided samples given to us for testing as documented above in the EUT section

Section II: Report of Measurements to FCC 47CFR Ch. I

General

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15 – Subpart B – Unintentional Radiators Class B and Subpart C - Part 15.247 Intentional Radiators Operating within the band 2400-2483.5 MHz.

The specific sections used for Part 15.247 compliance is contained in the sections relating to Digital Modulation Systems and references to Digital Sequence Spread Spectrum (DSSS). Testing was performed in accordance with the Guidelines from the FCC Knowledge Database 558074 Measurement of Digital Transmission Systems Operating under Section 15.247.

Requirements for Intentional Radiators

According to 47CFR Ch. I FCC 15.201 Equipment authorization requirement paragraph
(b) *"Except as otherwise exempted in paragraph (c) of this section and in § 15.23 of this part, all intentional radiators operating under the provisions of this part shall be certificated by the Commission pursuant to the procedures in subpart J of part 2 of this chapter prior to marketing."*

Labeling and Markings

You should refer to the clauses of FCC part 2 Section 2.925 and FCC part 15 Section 15.19 for information to be contained on the label as well as information about the label. Any other statements or Labeling requirements may appear on a separate label at the option of the applicant/grantee.

According to FCC Part 2 Section 2.925(a)." Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:

> (1) FCC Identifier consisting of the two elements in the exact order specified in § 2.926. The FCC Identifier shall be preceded by the term FCC ID in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification. Example: FCC ID XXX123. XXX—Grantee Code and 123—Equipment Product Code "

According to FCC Section 15.19(a)(3), the following statement must be included on the identification label:

> "This equipment complies with FCC Rules, Part 15 Digital Device. Operation is subject to the following two conditions: 1) This device may not cause harmful interference, and 2) This device must accept any interference that may cause any undesired operation"

According to FCC Section 15.19(b) the FCC logo is not required for this product since it does not fall under the rules for a Product subject to authorization under a Declaration of Conformity.

User Manual Statements

According to FCC Section 15.105 (b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

> NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.
>
> If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
> - Reorient or relocate the receiving antenna.
> - Increase the separation between the equipment and receiver.
> - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
> - Consult the dealer or an experienced radio/ TV technician for help.

According to FCC Section 15.21, a caution statement is to be included. It can be similar to:

> "Caution: Changes or modifications to this equipment, not expressly approved by the manufacturer could void the user's authority to operate the equipment. "

According to FCC Section 2.1091, a caution statement about the RADIOFREQUENCY RADIATION EXPOSURE limitation of a separation of at least 20 centimeters is required.

> **§ 2.1091** (b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term ''fixed location'' means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20-centimeter separation requirement.

FCC Test Results Summary

Test	Standard	Description	Result
Unintentional Radiated Emissions Idle Mode	FCC PART 15 Subpart B 15.109 Class B Limits; Subpart C 15.209	The radiated emissions are measured in the 30-1000Mhz range	Complies
Unintentional AC Mains Conducted Emissions Idle Mode	FCC PART 15 Subpart B 15.107 Class B Limits; Subpart C 15.207	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0 MHz range.	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 15.247(a)(2)	Bandwidth	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 15.247(b)(3)	RF Power Output	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 15.247(b)(5)	RF Safety	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 15.247(c)	Conducted Spurious Emissions	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 15.247(c)	Radiated Spurious Emissions	Complies
Intentional Radiated Emissions - Transmit Mode	FCC Part 15.247(d)	Power Spectral Density	Complies

Part 1 - Unintentional Radiated Emission Testing

DATE: March 16, 2007

TEST STANDARD: FCC 47CFR, Part 15, Subpart B 15.109 – Class B
FCC 47CFR, Part 15, Subpart C 15.209 – Class B

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The Q52 was tested in its normal mode of operation, when not in communications with a ZigBee device. In this mode of operation, the Q52 transmitter is making periodic broadcasts, looking for a ZigBee device to communicate with. The Q52 was attached to a remotely located laptop personal Computer using the Ethernet Port

MINIMUM STANDARD: Class B Limits:

Frequency	**Field Strength at 3m**	
MHz	µV/m at 3m	dBµV/m at 3m
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 - above	500	54.0

METHOD OF MEASUREMENT: The equipment was set up in a 3-meter open field test site. Tests were performed using the manufacturer's specified normal cabling configuration, with all cables over 1 meter in length bundled at 1 meter and retained from the floor. A typical application was tested.

Emissions in both horizontal and vertical polarization's were measured while rotating the EUT on a turntable to maximize the emissions signal strength.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MEASUREMENT DATA: See Appendix B for corresponding frequencies tables and plots

PERFORMANCE: Complies.

Part 2 - AC Mains Conducted Emission Testing

DATE: June 15, 2007

TEST STANDARD: FCC 47CFR, Part 15, Subpart B 15.107– Class B
FCC 47CFR, Part 15, Subpart C 15.207

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus. The equipment was operated and tested at 120Vac 60Hz. The Q52 was tested with various power supplies to ensure compliance. The Q52 was tested in its normal mode of operation, when not in communications with a ZigBee device. In this mode of operation, the Q52 transmitter is making periodic broadcasts, looking for a ZigBee device to communicate with. The Q52 was also tested in a contiuous Transmission mode. The Q52 was attached to a remotely located laptop personal Computer using the Ethernet Port

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	**Conducted Limit** (dBµV)	
	Quasi-Peak	Average
0.15 - 0.50	66-56	56-46
0.50 - 5	56	46
5 - 30	60	50

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer with 10kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 10kHz bandwidth, CISPR Quasi-Peak detector as well as an average detector meter.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MEASUREMENT DATA: See Appendix B for corresponding frequencies tables and plots

PERFORMANCE: Complies.

Part 3 - Antenna Requirement - 15.203

APPLICABLE REGULATIONS 2.1:

15.203 - An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

RESULT 2.2: This unit meets this requirement. The antenna is a 2.4GHz Full wave whip antenna that uses a “Reverse SMA” connector. It is normally sold with the unit and installed at the site by the end-user. "Replacement Antennas" can only be ordered from the factory. The only antenna that has been tested for this product is the Linx Technologies, Antenna Factor “ANT-2.4-CW-RCL”

Gain = 2.9dBiB92-072
Impedance = 50Ohm
Bandwidth = 120MHz

Part 4 - Bandwidth

DATE: March 23, 2007

TEST STANDARD: FCC CFR47, Part 15, Subpart C 15.247(a)(2)
Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The Bandwidth was a Conducted measurement taken from the antenna port using a 1meter cable connected directly to the Spectrum Analyzers RF input.

In order to perform the tests, the Q52 was programmed for Continuous Transmission on the required Frequency Channel.

The Q52 was tested for using channels 11 (2405MHz), 19 (2445MHz) and 26(2480MHz).

MINIMUM STANDARD: using a RBW = 100kHz, the 6dB bandwidth must be greater than 500kHz.

METHOD OF MEASUREMENT: The equipment was set up in on the labs test bench with a horizontal Ground Plane. The Programming PC was connected to the Q52 using an Ethernet connection. The Antenna port was connected directly to the Spectrum Analyzer using a 1Meter low-loss RF cable. Due to the low power levels, no attenuator was used on the Spectrum Analyzer input.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above in Part 1.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MEASUREMENT DATA: See attached Plots after the Peak Power section and the table:

Frequency	6dB Bandwidth
(MHz)	(MHz)
2405	1.583
2445	1.570
2480	1.538

PERFORMANCE: Complies.

Part 5 - Power Output

DATE: March 23, 2007

TEST STANDARD: FCC CFR47, Part 15, Subpart C 15.247(b)(3)
(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:
(3) For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The Peak Power level was a Conducted measurement taken from the antenna port using a 1meter cable connected directly to the Spectrum Analyzers RF input.

In order to perform the tests, the Q52 was programmed for Continuous Transmission on the required Frequency Channel.

The Q52 was tested for using channels 11 (2405MHz), 19 (2445MHz) and 26(2480MHz).

MINIMUM STANDARD: When using a Spectrum Analyzer the RBW > (6dB Bandwidth 1.5MHz), the maximum peak conducted power of 1Watt.

METHOD OF MEASUREMENT: The equipment was set up in on the labs test bench with a horizontal Ground Plane. The Programming PC was connected to the Q52 using an Ethernet connection. The Antenna port was connected directly to the Spectrum Analyzer using a 1Meter low-loss RF cable. Due to the low power levels, no attenuator was used on the Spectrum Analyzer input.

Peak Measurements were taken using the Spectrum Analyzer set to a RBW=1MHz. The Transmitter was measured at 3 frequencies.

Since the requirement is for a Modulated signal measurement at a RBW greater then the 6dB bandwidth, the preferred selected RBW=2MHz. The measurement was taken with RBW=1MHz. This measurement is corrected for cable loss and from dBμV to dBm and then is corrected to RBW=2 and then converted to Watts.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above in Part 1.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

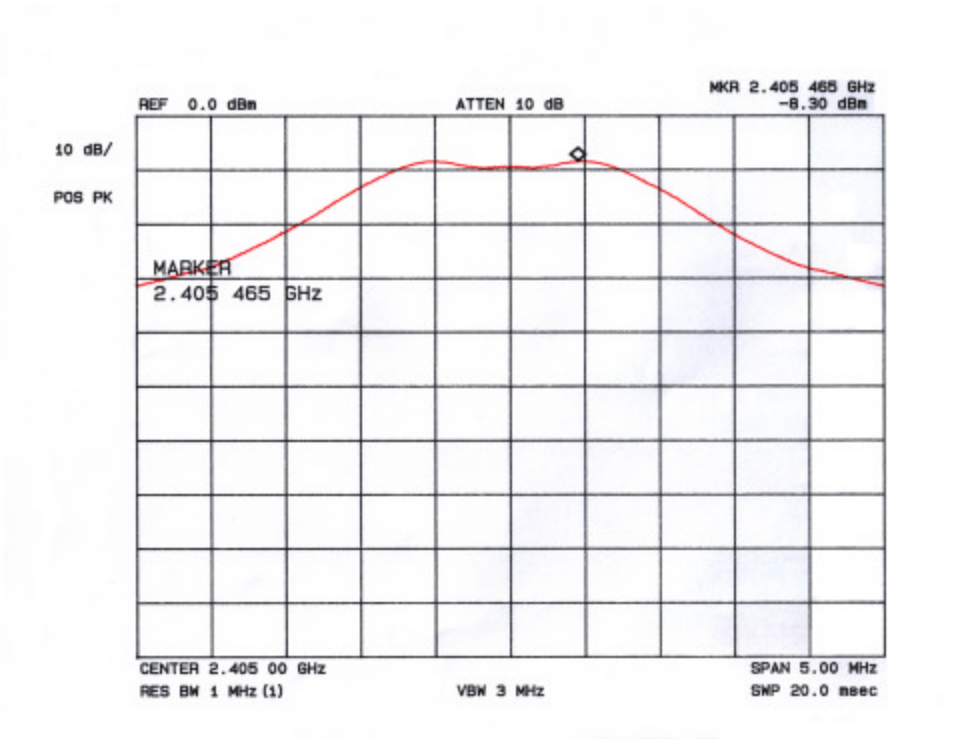
MEASUREMENT DATA: See Peak level, indicated by the Display Line, in the following Plots and Table.

Frequency	Raw Measurement RBW=1MHz	Cable Loss Correction	Corrected RBW=1MHz	Corrected RBW=2MHz Note 1	Peak Power Note 2
(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(Watt)
2405	-8.3	0.6	-7.7	-4.7	0.00034
2445	-8.6	0.6	-8.0	-5.0	0.00032
2480	-11.2	0.6	-10.6	-7.6	0.00017

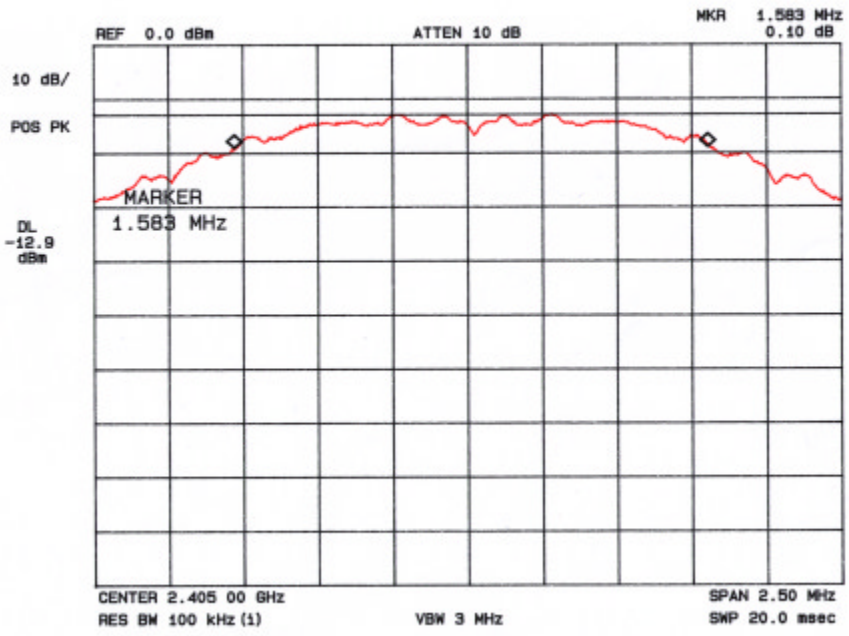
Note 1: The measured level, in dBm, is corrected by:
$P_{(2MHz)} = PdBm_{(1MHz)} + 10Log(2MHz/1MHz) = P_{(1MHz)} + 3.0dB$

Note 2: The level in Watts is corrected by:
$P_{(w)} = ((10^{(Pdbm)/10)})/1000)$

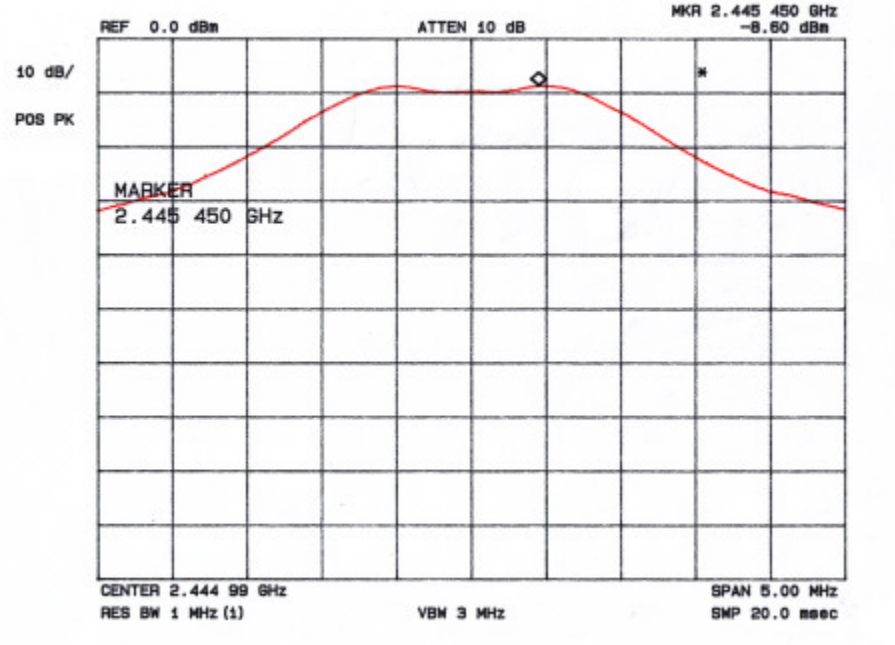
PERFORMANCE: Complies.



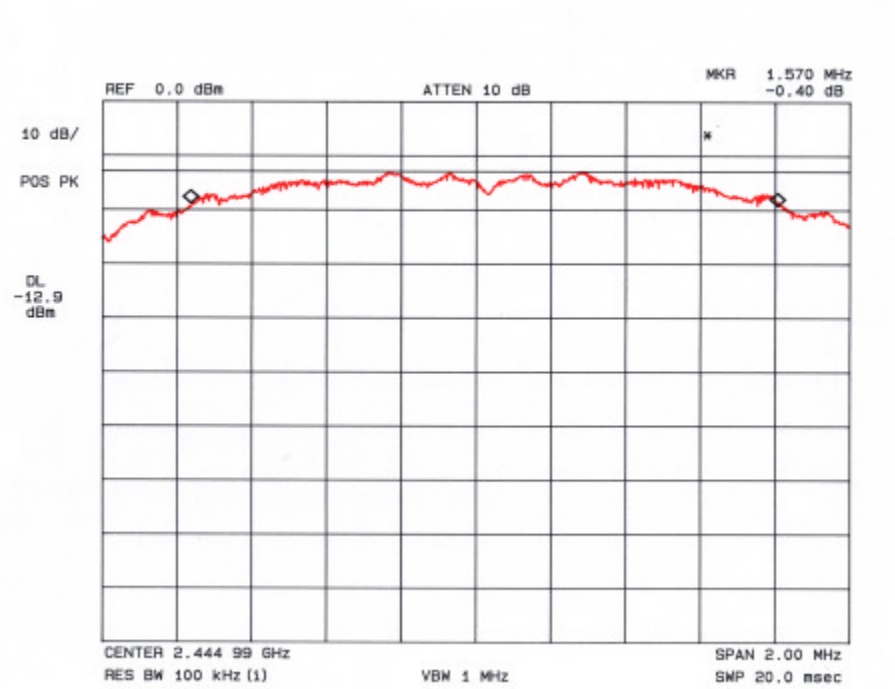
Plot 1 - Peak Power 2405 MHz



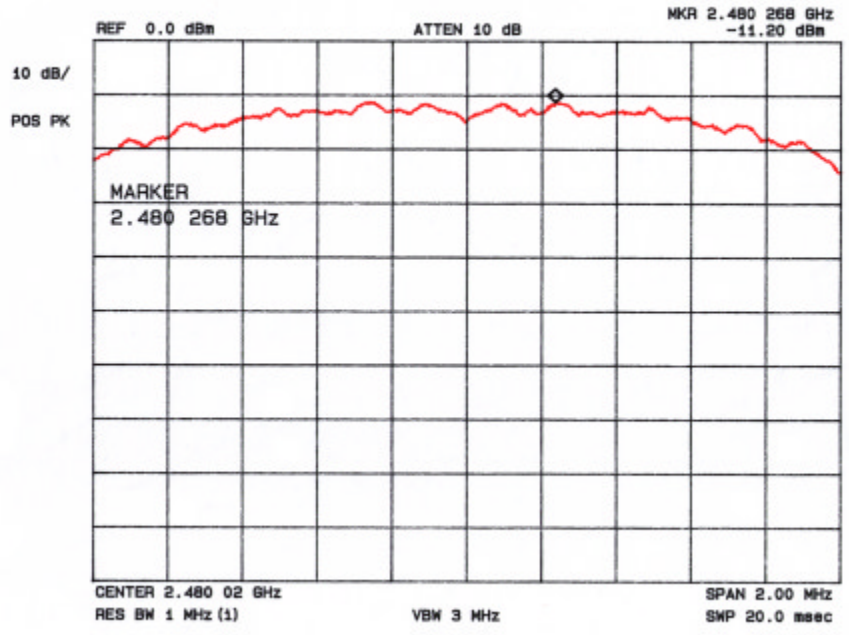
Plot 2 - Bandwidth 2405 MHz



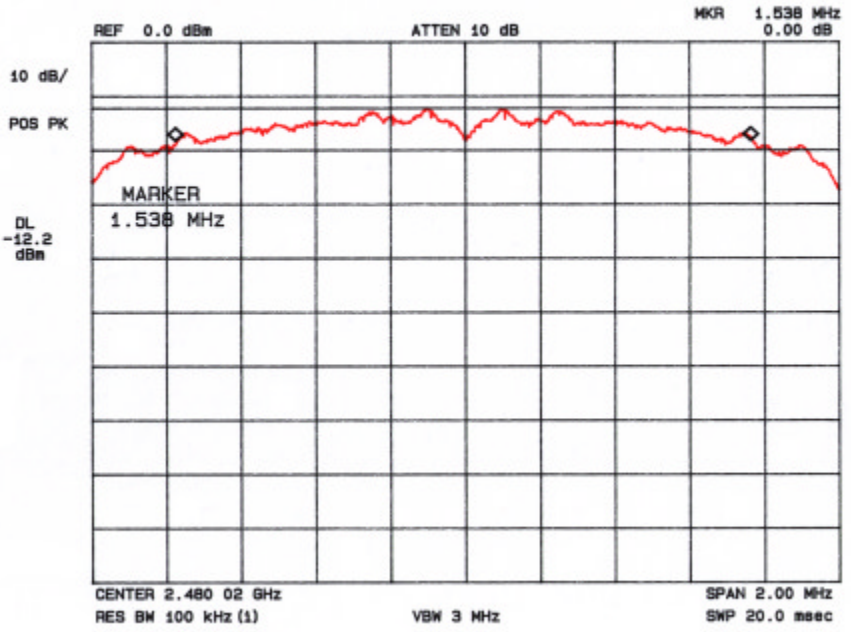
Plot 3 - Peak Power 2455 MHz



Plot 4 - Bandwidth 2455 MHz



Plot 5 - Peak Power 2480 MHz



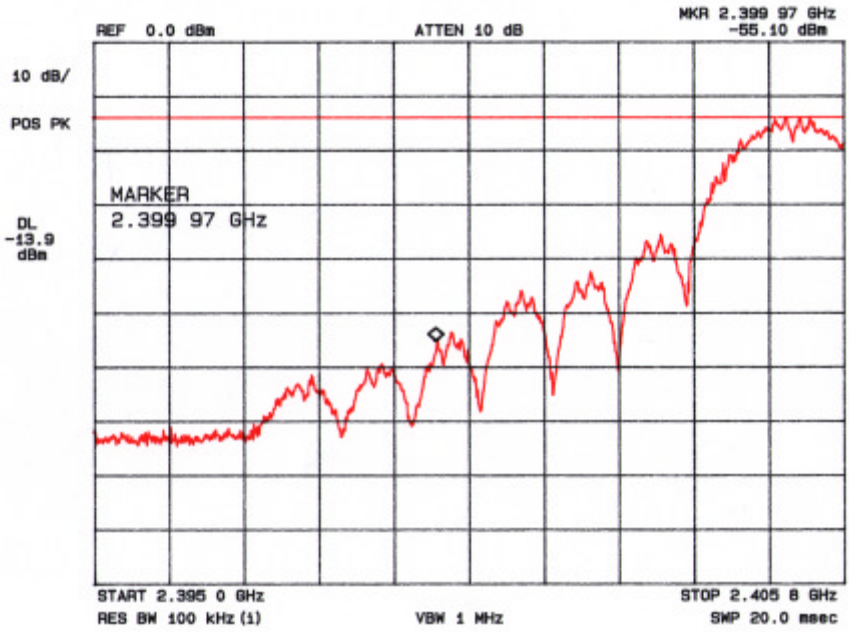
Plot 6 - Bandwidth 2480 MHz

Part 6 - RF Safety

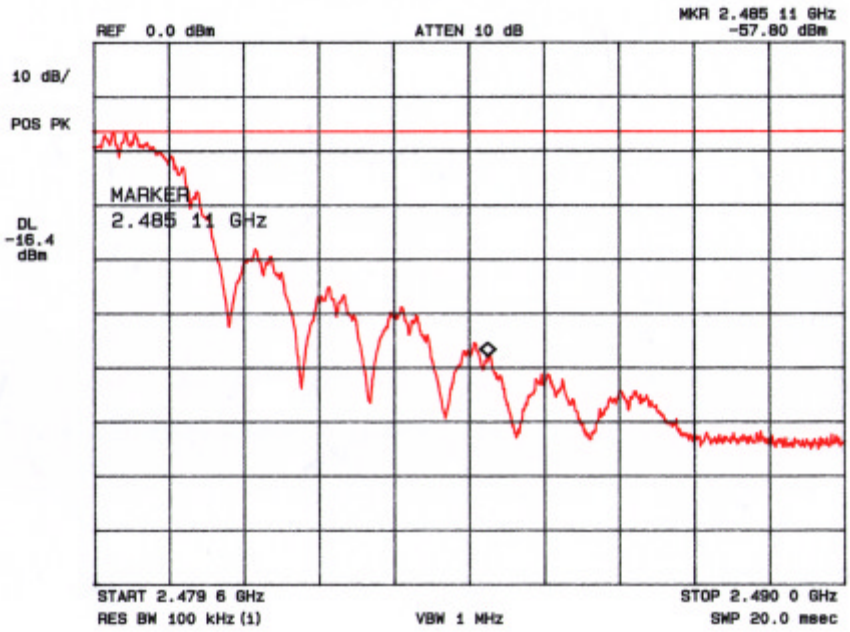
DATE:	March 23, 2007
TEST STANDARD:	FCC CFR47, Part 15, Subpart C 15.247(b)(5) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.
METHOD OF ASSESSMENT:	The Peak RF power is less then 1Watt and is using a 2.9dBi antenna. The product is used in an unlicensed band and meets the requirements of § 2.1091. The user is required to keep the transmitter a minimum of 20 centimeters away from themselves. The User Manual contains the warning as required by § 2.1091.
PERFORMANCE:	Complies.

Part 7 - Conducted Spurious Emissions

DATE:	March 23, 2007
TEST STANDARD:	FCC CFR47, Part 15, Subpart C 15.247(d) 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).
TEST VOLTAGE:	120Vac, 60Hz
TEST SETUP:	The Conducted measurement was taken from the antenna port using a 1meter cable connected directly to the Spectrum Analyzers RF input. In order to perform the tests, the Q52 was programmed for Continuous Transmission on the required Frequency Channel. The Q52 was tested for using channels 11 (2405MHz), 19 (2445MHz) and 26(2480MHz).
MINIMUM STANDARD:	Using a RBW = 100kHz, Conducted Spurious emissions from the RF antenna port must be 20dB below the peak level measured within the band using a RBW=100kHz.
METHOD OF MEASUREMENT:	The equipment was set up in on the labs test bench with a horizontal Ground Plane. The Programming PC was connected to the Q52 using an Ethernet connection. The Q52 Antenna port was connected to the Spectrum Analyzer using a 1-meter low-loss RF cable. The Q52 was investigated from 9KHz to 25GHz for each Frequency.
DEVICE DESCRIPTIONS:	As described in the Equipment Under Test Section, above in Part 1.
CABLE DESCRIPTIONS:	cables as specified in **Section 1 – Cabling**
MEASUREMENT DATA:	See attached Plots for Band Edge plots: All spurious emissions within 9KHz to 25GHz were more then 40dB below the Peak Power level.
PERFORMANCE:	Complies.



2400 Bandedge



2483.5 Bandedge

Part 8 - Radiated Spurious Emissions

DATE: March 16, 2007

TEST STANDARD: FCC CFR47, Part 15, Subpart C 15.247(d)
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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP:

Freq. Range Measured	9kHz – 25000 MHz
Test Distance	1 to 3m
Test Instrumentation resolution	100 KHz (30 MHz to 1000 MHz) 1MHz (1000 MHz to 25000 MHz)
Receive Ant. Scan Height	1m – 4m
Receive Ant. Polarization	Vertical and Horizontal.

The equipment was set up in a 3-meter open field test site. Emissions in both horizontal and vertical polarizations were measured while rotating the EUT on a turntable to maximize the emissions signal strength.

The Antenna Port of the Q52 was terminated and the Q52 was connected to a Remote laptop using the Ethernet Port. The Q52 was programmed to transmit continuously for each Frequency under test.

MINIMUM STANDARD: Using a RBW = 100kHz, Radiated Spurious emissions from the RF antenna port must be below the levels defined in 15.209, in the Restricted bands as defined in section 15.205.

METHOD OF MEASUREMENT: The equipment was set up in a 3-meter open field test site. Tests were performed at both 3 meters and 1 meter using the manufacturer's specified normal cabling configuration, with all cables over 1 meter in length bundled at 1 meter and retained from the floor. A typical application was tested.

Emissions in both horizontal and vertical polarization's were measured while rotating the EUT on a turntable to maximize the emissions signal strength.

For frequencies above 5GHz, the HP Microwave Amplifier was used to increase the systems sensitivity. Since all measured peaks were less then the limit line, a filter was not used.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above in Part 1.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MEASUREMENT DATA:

No frequencies from the transmitter were detected 30MHz to 25GHz. The only Frequencies detected from the Q52 were the Un-Intentional emissions from the Digitial circuitry as contained in Appendix B.

PERFORMANCE: Complies.

Part 9 - Power Spectral Density

DATE: March 23, 2007

TEST STANDARD: FCC CFR47, Part 15, Subpart C 15.247(e)
For digitally modulated 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. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The Spectral Density level was a Conducted measurement taken from the antenna port using a 1meter cable connected directly to the Spectrum Analyzers RF input.

In order to perform the tests, the Q52 was programmed for Continuous Transmission on the required Frequency Channel.

The Q52 was tested for using channels 11 (2405MHz), 19 (2445MHz) and 26(2480MHz).

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MINIMUM STANDARD: using a RBW = 3kHz, the Peak Power Density must be below 8dBm.

METHOD OF MEASUREMENT: The equipment was set up in on the labs test bench with a horizontal Ground Plane. The Programming PC was connected to the Q52 using an Ethernet connection. The Antenna port was connected directly to the Spectrum Analyzer using a 1Meter low-loss RF cable. Due to the low power levels, no attenuator was used on the Spectrum Analyzer input.

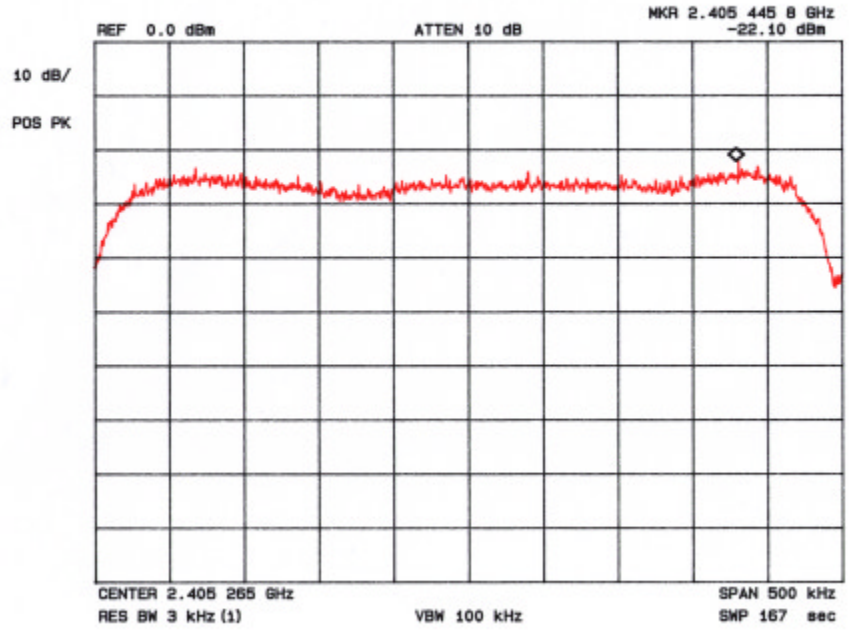
DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above in Part 1.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

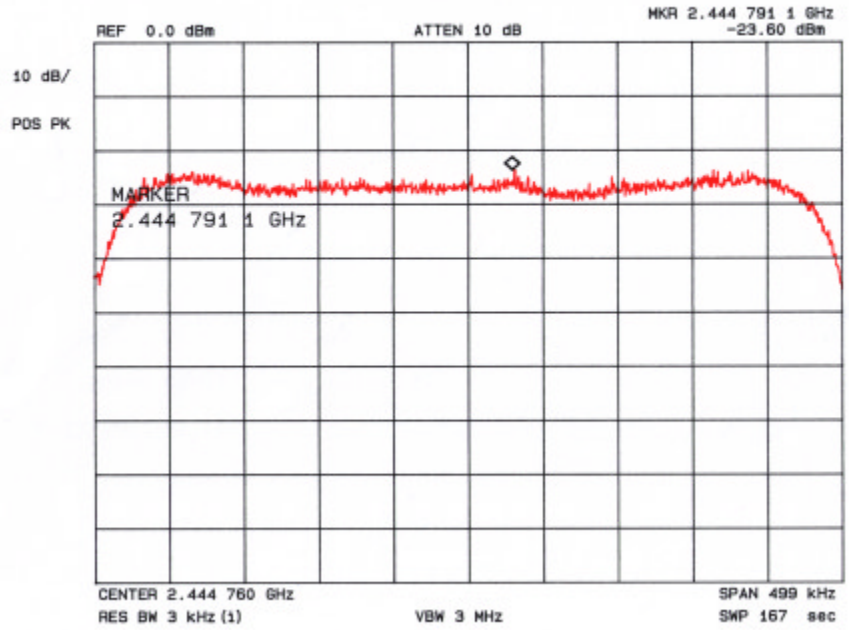
MEASUREMENT DATA: See attached Plots after the Peak Power section and the table:

Frequency	**Power Spectral Density (with corrections)**
(MHz)	(dBm)
2405	-22.1
2445	-23.6
2480	-23.2

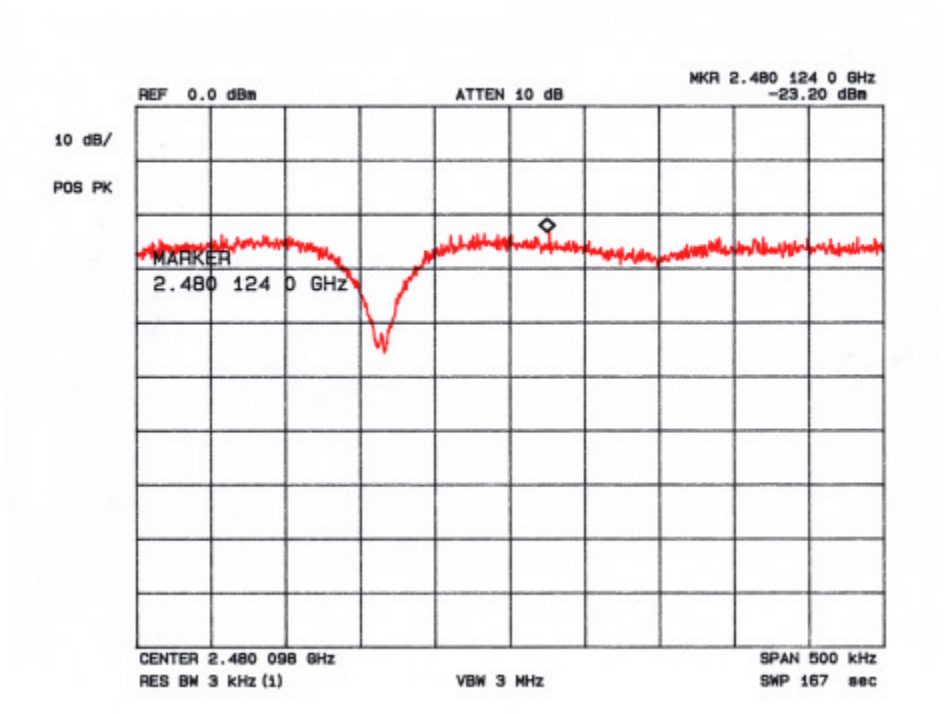
PERFORMANCE: Complies.



Power Spectral Density – 2405 MHz



Power Spectral Density – 2445 MHz



Power Spectral Density – 2480 MHz

Section III: Report of Measurements to Industry Canada Spectrum Management and Telecommunications Policy and Radio Standards Specification

General

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with IC ICES-003 – Interference-Causing Equipment Standard for Digital Apparatus, RSS-Gen Radio Standards General Requirements and RSS-210 Low-power Licence-exempt Radiocommunication Devices Annex 8 Digital Modulation Systems Operating in the 2400-2483.5 MHz Band.

The specific sections used for RSS-210 compliance is contained in the sections relating to Digital Modulation Systems. Testing was performed in accordance with procedures as outlined in RSS-Gen and RSS-210.

Requirements for Intentional Radiators

According to IC RSS-Gen 2.1.1 this product is classified as a Category I Transmitter and comprises radio devices where a TAC, issued by the Certification and Engineering Bureau of Industry Canada or, a certificate issued by a recognized Certification Body (CB), is required pursuant to sections 4(2) of the *Radiocommunication Act* and 21(1) of the *Radiocommunication Regulations*. A test report shall be required and the device shall be properly labelled. Additionally, this equipment is also covered by RSS-Gen 2.3 Licence-exempt Low-power Radiocommunication Devices (LPDs). Licence-exempt low-power radiocommunication devices are devices which have intentional and unwanted emissions of very low signal levels such that they can co-exist with licensed radio services. LPDs are required to operate on a **"no-interference no-protection"** basis (i.e. they may not cause radio interference and cannot claim protection from interference).

Labeling and Markings

You should refer to the clauses of IC ICES-003, RSS-Gen and RSS-100 for information to be contained on the label as well as information about the label.

According to IC ICES-003 6.2 and the Annex the following statements, in both languages, must be included on the identification label:

> This Class B digital apparatus complies with Canadian ICES-003.
> Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

According to IC RSS-Gen Each Equipment subject to certification under the applicable RSSs, shall be permanently labelled on each item, or as an inseparable combination. The label must contain the following information for full compliance:

(a) the certification number, prefixed by the term "IC:";

(b) the manufacturer's name, trade name or brand name; and

(c) a model name or number.

According to IC RSS-100 Section 4. Labeling of Certified Radio Equipment, Certified radio equipment must be labelled with a unique certification/registration number, which consists of the Company Number (CN), assigned by the Bureau, followed by the Unique Product Number (UPN), assigned by the TAC or Certificate holder.
The certification/registration number shall appear as follows:
"IC:XXXXXX-YYYYYYYY"
Where:

- "XXXXXX-YYYYYYYY" is the certification/registration number;
- "XXXXXX" is the Company Number (CN), made of at most 6 alphanumeric characters (A-Z, 0-9), assigned by Industry Canada;
- "YYYYYYYY" is the Unique Product Number (UPN), made of at most 8 alphanumeric characters (A-Z, 0-9) assigned by the applicant; and
- The letters "IC" have no other meaning or purpose than to identify the Industry Canada certification number/registration number.

Permitted alphanumerical characters used in the CN and UPN are limited to capital letters (A-Z) and digits (0-9). Other characters, such as #, / or -, shall not be used.

All Category I radio equipment intended for use in Canada must permanently display on each transmitter, receiver, or inseparable combination thereof, the information required above. This information must be affixed by Labeling or other means, in such a manner as not to be removable except by destruction or defacement.

User Manual Statements

According to IC ICES-003 6.2 and the Annex the following statements, in both languages, must be included on the identification label and could be included in the User Manual:

This Class B digital apparatus complies with Canadian ICES-003

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

According to IC RSS-Gen you will require the following statement:

"Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device."

Since you have a detachable Antenna, you will require the following statements (Replace [x] and [y] with the correct numbers)

"To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that permitted for successful communication."

"This device has been designed to operate with the antennas listed below, and having a maximum gain of [x] dB. Antennas not included in this list or having a gain greater than [x] dB are strictly prohibited for use with this device. The required antenna impedance is [y] ohms."

(Include a list of Approved Antenna Manufacturers and Part Numbers)

According to IC RSS-102 Section 6.2, It must be noted that the certification applicant/grantee is responsible for providing proper instructions for the user of the radio device, as well as any usage restrictions. Since this is classified as a mobile unit, you will have to ensure that the user maintains a 20cm distance between the Antenna and the User when the unit is in operation. This could be the same information as outlined in you FCC statement According to FCC Section 2.1091, a caution statement about the RADIOFREQUENCY RADIATION EXPOSURE limitation of a separation of at least 20 centimeters is required.

§ 2.1091 (b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term ''fixed location'' means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20-centimeter separation requirement.

IC Test Results Summary

Test	Standard	Description	Result
Unintentional Radiated Emissions - Idle Mode	IC ICES-003 Class B Limits; RSS-Gen (6.a)	The radiated emissions are measured in the 30-1000Mhz range	Complies
Unintentional AC Mains Conducted Emissions - Idle Mode	IC ICES-003 Class B Limits; RSS-Gen (7.2.2)	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0 MHz range.	Complies
Intentional Radiated Emissions - Transmit Mode	RSS-210 Annex 8.2(1)	Bandwidth	Complies
Intentional Radiated Emissions - Transmit Mode	RSS-210 Annex 8.4(4)	RF Power Output	Complies
Intentional Radiated Emissions - Transmit Mode	RSS-Gen (5.5) RSS-102 (4.3)	RF Safety	Complies
Intentional Radiated Emissions - Transmit Mode	RSS-210 Annex 8.5	Conducted Spurious Emissions	Complies
Intentional Radiated Emissions - Transmit Mode	RSS-210 Annex 8.5	Radiated Spurious Emissions	Complies
Intentional Radiated Emissions - Transmit Mode	RSS-210 Annex 8.2(2)	Power Spectral Density	Complies

Part 1 - Unintentional Radiated Emission Testing

DATE: March 16, 2007

TEST STANDARD: IC ICES-003 – Class B
RSS-Gen (6.a)

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The Q52 was tested in its normal mode of operation, when not in communications with a ZigBee device. In this mode of operation, the Q52 transmitter is making periodic broadcasts, looking for a ZigBee device to communicate with. The Q52 was attached to a remotely located laptop personal Computer using the Ethernet Port

MINIMUM STANDARD: IC ICES-003 – Class B

Frequency	**Field Strength**	
MHz	Requirement dBµV/m at 10m	Equivalent dBµV/m at 3m
30 - 230	30	39.5
230 - 1000	37	46.5

METHOD OF MEASUREMENT: The equipment was set up in a 3-meter open field test site. Tests were performed using the manufacturer's specified normal cabling configuration, with all cables over 1 meter in length bundled at 1 meter and retained from the floor. A typical application was tested.

Emissions in both horizontal and vertical polarization's were measured while rotating the EUT on a turntable to maximize the emissions signal strength.

In cases where the presence of high ambient noise makes it impossible to measure an emission at the required distance, the measurement is performed at a closer distance and the limit is adjusted per CISPR 16-2-3:2003

20 Log (D1/D2)
Where D1 = New Distance D2 = Required Distance The result is added or subtracted to the required emission level to ensure compliance at the new distance.

All frequencies 30-2000GHz were tested at 3m and all frequencies 2GHz and up were tested at 1meter in accordance with CISPR 16-2-3:2003

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MEASUREMENT DATA: See Appendix B for corresponding frequencies tables and plots

PERFORMANCE: Complies.

Part 2 - AC Mains Conducted Emission Testing

DATE: June 15, 2007

TEST STANDARD: IC ICES-003 Class B
IC RSS-Gen (7.2.2)

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus. The equipment was operated and tested at 120Vac 60Hz. The Q52 was tested with various power supplies to ensure compliance. The Q52 was tested in its normal mode of operation, when not in communications with a ZigBee device. In this mode of operation, the Q52 transmitter is making periodic broadcasts, looking for a ZigBee device to communicate with. The Q52 was also tested in a contiuous Transmission mode. The Q52 was attached to a remotely located laptop personal Computer using the Ethernet Port

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	**Conducted Limit** (dBµV)	
	Quasi-Peak	Average
0.15 - 0.50	66-56	56-46
0.50 - 5	56	46
5 - 30	60	50

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer with 10kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 10kHz bandwidth, CISPR Quasi-Peak detector as well as an average detector meter.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MEASUREMENT DATA: See Appendix B for corresponding frequencies tables and plots

PERFORMANCE: Complies.

Part 3 - Bandwidth

DATE: February 02, 2007

TEST STANDARD: RSS-210 Annex 8.2(1)
For systems using digital modulation techniques:
The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The Bandwidth was a Conducted measurement taken from the antenna port using a 1meter cable connected directly to the Spectrum Analyzers RF input.

In order to perform the tests, the Q52 was programmed for Continuous Transmission on the required Frequency Channel.

The Q52 was tested for using channels 11 (2405MHz), 19 (2445MHz) and 26(2480MHz).

MINIMUM STANDARD: using a RBW = 100kHz, the 6dB bandwidth must be greater than 500kHz.

METHOD OF MEASUREMENT: The equipment was set up in on the labs test bench with a horizontal Ground Plane. The Programming PC was connected to the Q52 using an Ethernet connection. The Antenna port was connected directly to the Spectrum Analyzer using a 1Meter low-loss RF cable. Due to the low power levels, no attenuator was used on the Spectrum Analyzer input.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above in Part 1.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MEASUREMENT DATA: See Plots in Section II Part 5 after the Peak Power section and the table:

Frequency	6dB Bandwidth
(MHz)	(MHz)
2405	1.583
2445	1.570
2480	1.538

PERFORMANCE: Complies.

Part 4 - Power Output

DATE: March 23, 2007

TEST STANDARD: RSS-210 Annex 8.4(4)
For systems employing digital modulation techniques operating in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands, the maximum peak conducted power shall not exceed 1 W.

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The Peak Power level was a Conducted measurement taken from the antenna port using a 1meter cable connected directly to the Spectrum Analyzers RF input.

In order to perform the tests, the Q52 was programmed for Continuous Transmission on the required Frequency Channel.

The Q52 was tested for using channels 11 (2405MHz), 19 (2445MHz) and 26(2480MHz).

MINIMUM STANDARD: When using a Spectrum Analyzer the RBW > (6dB Bandwidth 1.5MHz), the maximum peak conducted power of 1Watt.

METHOD OF MEASUREMENT: The equipment was set up in on the labs test bench with a horizontal Ground Plane. The Programming PC was connected to the Q52 using an Ethernet connection. The Antenna port was connected directly to the Spectrum Analyzer using a 1Meter low-loss RF cable. Due to the low power levels, no attenuator was used on the Spectrum Analyzer input.

Peak Measurements were taken using the Spectrum Analyzer set to a RBW=1MHz. The Transmitter was measured at 3 frequencies.
Since the requirement is for a Modulated signal measurement at a RBW greater then the 6dB bandwidth, the preferred selected RBW=2MHz. The measurement was taken with RBW=1MHz. This measurement is corrected for cable loss and from dBµV to dBm and then is corrected to RBW=2 and then converted to Watts.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above in Part 1.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MEASUREMENT DATA: See Peak level, indicated by the Display Line, in the Section II Part 5 Plots and this Table.

Frequency	Raw Measurement RBW=1MHz	Cable Loss Correction	Corrected RBW=1MHz	Corrected RBW=2MHz Note 1	Peak Power Note 2
(MHz)	(dBm)	(dB)	(dBm)	(dBm)	(Watt)
2405	-8.3	0.6	-7.7	-4.7	0.00034
2445	-8.6	0.6	-8.0	-5.0	0.00032
2480	-11.2	0.6	-10.6	-7.6	0.00017

Note 1: The measured level, in dBm, is corrected by:
$P_{(2MHz)} = PdBm_{(1MHz)} + 10Log(2MHz/1MHz) = P_{(1MHz)} + 3.0dB$

Note 2: The level in Watts is corrected by:
$P_{(w)} = ((10^{(Pdbm)/10)})/1000)$

PERFORMANCE: Complies.

Part 5 - RF Safety

DATE:	March 23, 2007
TEST STANDARD:	RSS-Gen (5.5) RSS-102 (4.3) Mobile radios (not portables, see 2.2 for definition) are exempt from RF evaluation if the operating frequency is below 1.5 GHz with effective radiated power (ERP) of 1.5 watts or less (i.e. EIRP of 2.5 watts or less) or above 1.5 GHz with ERP of 3 watts or less (i.e. EIRP of 5 watts or less).
METHOD OF ASSESSMENT:	The Peak RF power is less then 1Watt and is using a 2dBi antenna. The product is used in an unlicensed band and meets the requirements of RSS-102 (4.3). The user is required to keep the transmitter a minimum of 20 centimeters away from themselves as required by RSS-102 (2.2) The User Manual contains the warning as required by RSS-102 (6.2).
PERFORMANCE:	Complies.

Part 6 - Conducted Spurious Emissions

DATE:	March 23, 2007
TEST STANDARD:	RSS-210 Annex 8.5 In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.
TEST VOLTAGE:	120Vac, 60Hz
TEST SETUP:	The Conducted measurement was taken from the antenna port using a 1meter cable connected directly to the Spectrum Analyzers RF input. In order to perform the tests, the Q52 was programmed for Continuous Transmission on the required Frequency Channel. The Q52 was tested for using channels 11 (2405MHz), 19 (2445MHz) and 26(2480MHz).
MINIMUM STANDARD:	Using a RBW = 100kHz, Conducted Spurious emissions from the RF antenna port must be 20dB below the peak level measured within the band using a RBW=100kHz.
METHOD OF MEASUREMENT:	The equipment was set up in on the labs test bench with a horizontal Ground Plane. The Programming PC was connected to the Q52 using an Ethernet connection. The Q52 Antenna port was connected to the Spectrum Analyzer using a 1-meter low-loss RF cable. The Q52 was investigated from 9KHz to 25GHz for each Frequency.
DEVICE DESCRIPTIONS:	As described in the Equipment Under Test Section, above in Part 1.
CABLE DESCRIPTIONS:	cables as specified in **Section 1 – Cabling**
MEASUREMENT DATA:	See attached Plots in Section II Part 7 for Band Edge plots: All spurious emissions within 30MHz to 24GHz were more then 40dB below the Peak Power level. No Harmonic emissions were detected for any of the investigated Channels.
PERFORMANCE:	Complies.

Part 7 - Radiated Spurious Emissions

DATE: March 16, 2007

TEST STANDARD: RSS-210 Annex 8.5
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP:

Freq. Range Measured	9kHz – 25000 MHz
Test Distance	1 to 3m
Test Instrumentation resolution	100 KHz (30 MHz to 1000 MHz) 1MHz (1000 MHz to 25000 MHz)
Receive Ant. Scan Height	1m – 4m
Receive Ant. Polarization	Vertical and Horizontal.

The equipment was set up in a 3-meter open field test site. Emissions in both horizontal and vertical polarizations were measured while rotating the EUT on a turntable to maximize the emissions signal strength.
The Antenna Port of the Q52 was terminated and the Q52 was connected to a Remote laptop using the Ethernet Port. The Q52 was programmed to transmit continuously for each Frequency under test.

MINIMUM STANDARD: Using a RBW = 100kHz, Radiated Spurious emissions from the RF antenna port must be below the levels defined in Tables 2 and 3, in the Restricted bands as defined in Table 1.

Frequency	**Field Strength at 3m**	
MHz	µV/m at 3m	dBµV/m at 3m
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 - above	500	54.0

METHOD OF MEASUREMENT: The equipment was set up in a 3-meter open field test site. Tests were performed at both 3 meters and 1 meter using the manufacturer's specified normal cabling configuration, with all cables over 1 meter in length bundled at 1 meter and retained from the floor. A typical application was tested.

Emissions in both horizontal and vertical polarization's were measured while rotating the EUT on a turntable to maximize the emissions signal strength.

For frequencies above 5GHz, the HP Microwave Amplifier was used to increase the systems sensitivity. Since all measured peaks were less then the limit line, a filter was not used.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above in Part 1.

CABLE DESCRIPTIONS: cables as specified in **Section 1 – Cabling**

MEASUREMENT DATA: No frequencies from the transmitter were detected 30MHz to 25GHz. The only Frequencies detected from the Q52 were the Un-Intentional emissions from the Digitial circuitry as contained in Appendix B.

PERFORMANCE: Complies.

Part 8 - Power Spectral Density

DATE: February 02, 2007

TEST STANDARD: RSS-210 Annex 8.2(2)
The transmitter power spectral density (into the antenna) shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0-second duration. This power spectral density shall be determined in accordance with the provisions of Section A8.4 below. The same method of determining the conducted output power shall be used to determine the power spectral density.

TEST VOLTAGE: 120Vac, 60Hz

TEST SETUP: The Spectral Density level was a Conducted measurement taken from the antenna port using a 1meter cable connected directly to the Spectrum Analyzers RF input.

In order to perform the tests, the Q52 was programmed for Continuous Transmission on the required Frequency Channel.

The Q52 was tested for using channels 11 (2405MHz), 19 (2445MHz) and 26(2480MHz).

MINIMUM STANDARD: using a RBW = 3kHz, the Peak Power Density must be below 8dBm.

METHOD OF MEASUREMENT: The equipment was set up in on the labs test bench with a horizontal Ground Plane. The Programming PC was connected to the Q52 using an Ethernet connection. The Antenna port was connected directly to the Spectrum Analyzer using a 1Meter low-loss RF cable. Due to the low power levels, no attenuator was used on the Spectrum Analyzer input.

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above in Part 1.

CABLE DESCRIPTIONS: cables as specified in **Section 1 - Cabling**

MEASUREMENT DATA: See Plots after the Section II Part 9 Spectral Density section and the table:

Frequency	**Power Spectral Density (with corrections)**
(MHz)	(dBm)
2405	-22.1
2445	-23.6
2480	-23.2

PERFORMANCE: Complies.

Appendix A: Report of Measurements of EUT Photos

Q52 Front View - Figure 1

Q52 Front View Close-up - Figure 2

Appendix B: Report of Measurements Data & Plots

Radiated and Conducted Emissions per:
FCC/IC Class B - Standards: FCC Part 15.107, 15.207; IC ICES-003, RSS-210

Un-Intentional Radiated Emissions

Q52 Module – Tested while in Continuous Transmission Mode.

Table 1: FCC Class B - 3m

Frequency (MHz)	Pol	Hgt (m)	Angle (deg)	Uncor-Pk (dBµV)	Tot Corr (dB)	Peak (dBµV/m)	QP Lmt (dBµV/m)	DelLim-Pk (dB)	Quasi-Peak (dBµV/m)	DelLim-QPk (dB)
73.70473	Vert	1	190	25.1	10.6	35.7	40.0	-4.3	30.8	-9.2
74.99990	Vert	1	200	21.1	10.7	31.8	40.0	-8.3	27.6	-12.4
100.03850	Vert	1	0	26.2	12.1	38.3	43.5	-5.2	28.7	-14.8
100.48200	Vert	1	260	15.4	12.1	27.5	43.5	-16.0	23.0	-20.5
144.00000	Vert	1	90	11.4	14.1	25.5	43.5	-18.0	22.0	-21.5
175.00000	Vert	1	20	8.9	15.0	23.9	43.5	-19.6	19.8	-23.8

Table 2: ICES-003 Class B – 3m

Frequency (MHz)	Pol	Hgt (m)	Angle (deg)	Uncor-Pk (dBµV)	Tot Corr (dB)	Peak (dBµV/m)	QP Lmt (dBµV/m)	DelLim-Pk (dB)	Quasi-Peak (dBµV/m)	DelLim-QPk (dB)
73.70473	Vert	1	190	25.1	10.6	35.7	39.5	-3.8	30.8	-8.7
74.99990	Vert	1	200	21.1	10.7	31.8	39.5	-7.8	27.6	-11.9
100.03850	Vert	1	0	26.2	12.1	38.3	39.5	-1.2	28.7	-10.8
100.48200	Vert	1	260	15.4	12.1	27.5	39.5	-12.0	23.0	-16.5
144.00000	Vert	1	90	11.4	14.1	25.5	39.5	-14.0	22.0	-17.5
175.00000	Vert	1	20	8.9	15.0	23.9	39.5	-15.6	19.8	-19.8

AC MAINS Conducted Emissions

Q52 Module using the "A Qualities MD350603 power supply – while operating in Normal Mode.

Table 1: Line 1- Peaks 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.4166	41.9	-5.6
0.4393	41.4	-5.6
0.3708	42.6	-5.8
0.3931	42.1	-5.8
0.4681	40.7	-5.8
0.3480	42.8	-6.2

Table 2: Line 2- Peaks 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.5094	44.4	-1.6
0.4756	44.3	-2.1
0.4607	44.2	-2.4
0.5287	43.5	-2.5
0.5633	43.4	-2.6
0.4370	44.0	-3.1

Q52 Module using the "A Qualities MD350603 power supply – while operating in Transmit Mode.

Table 3: Line 1- Peaks 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.4188	41.9	-5.5
0.4416	41.4	-5.6
0.4631	40.9	-5.7
0.3951	42.1	-5.8
0.3708	42.5	-5.9
0.5014	39.6	-6.4

Table 4: Line 2- Peaks 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.4988	44.2	-1.8
0.4656	44.2	-2.3
0.5515	43.3	-2.7
0.4416	44.2	-2.8
0.4188	43.8	-3.6
0.5846	42..3	-3.7

Q52 Module using the "Imation JOD-4801-011R power supply – while operating in Normal Mode.

Table 5: Line 1- Peaks 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.6099	34.9	-11.1
0.2196	41.1	-11.7
0.6329	34.2	-11.8
0.1864	42.1	-12.0
0.4101	35.6	-12.0
0.4370	35.1	-12.0

Table 6: Line 2- Peaks 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.6430	35.6	-10.4
0.6296	35.4	-10.6
0.6067	34.8	-11.2
0.6925	33.5	-12.5
0.5693	33.2	-12.8
0.1650	42.3	-12.9

Q52 Module using the "Imation JOD-4801-011R power supply – while operating in Transmit Mode.

Table 7: Line 1- Peaks 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.6430	36.0	-10.0
0.6035	35.9	-10.1
0.2291	41.1	-11.3
0.4559	35.3	-11.4
0.1694	43.4	-11.5
0.6229	34.2	-11.8

Table 8: Line 2- Peaks 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.6465	35.5	-10.5
0.6099	35.2	-10.8
0.3214	38.7	-10.9
0.6296	34.8	-11.2
0.1524	44.4	-11.4
0.1914	41.3	-12.6

Q52 Module using the "Condor 3A-061WP05 power supply – while operating in Normal Mode.

Table 9: Line 1- Peaks 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.4324	47.7	0.5
0.3748	47.6	-0.7
0.4988	45.1	-0.9
0.3407	45.8	-3.3
0.6852	42.1	-3.9
0.4439	42.9	-4.3

Table 10: Line 1 Average 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.4346	39.9	-7.2
0.4988	37.3	-8.7
0.3728	39.4	-9.0
0.7418	32.9	-13.1
0.6852	32.6	-13.4
0.8074	31.8	-14.2

Table 11: Line 2- Peaks 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3748	52.7	4.4
0.4324	49.6	2.4
0.3689	48.5	0.0
0.3197	49.5	-0.2
0.4988	45.5	-0.5
0.3131	48.5	-1.3

Table 12: Line 2 Average 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3708	48.3	-0.1
0.4346	43.4	-3.7
0.4988	41.6	-4.4
0.3197	40.8	-8.9
0.3407	39.1	-10.0
0.3147	39.4	-10.4

Q52 Module using the "Condor 3A-061WP05 power supply – while operating in Transmit Mode.

Table 13: Line 1- Peaks 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3708	50.7	2.3
0.4370	45.5	-1.6
0.3164	46.3	-3.5
1.058	42.2	-3.8
0.3808	43.9	-4.3
0.3098	45.5	-4.4

Table 14: Line 1 Average 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3708	42.6	-5.8
0.4346	40.6	-6.7
0.4961	38.7	-7.3
0.3131	43.9	-14.9
0.6229	29.4	-16.6
0.3425	31.7	-17.4

Table 15: Line 2- Peaks 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3728	54.7	6.3
0.4324	48.8	1.6
0.5041	46.4	0.4
0.2493	51.5	-0.2
0.7458	45.8	-0.2
0.4416	46.7	-0.3

Table 16: Line 2 Average 120Vac, 60Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3728	47.9	-0.5
0.4346	43.2	-3.9
0.4988	40.9	-5.1
0.2480	43.8	-8.0
0.7458	37.6	-8.4
0.6852	37.3	-8.7

Q52 Module using the "Condor 3A-061WP05 power supply – while operating in Normal Mode.

Table 17: Line 1- Peaks 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3808	49.9	1.7
0.4324	46.5	-0.7
0.3131	47.3	-2.5
0.9314	43.5	-2.5
0.3669	45.6	-2.9
0.2454	48.5	-3.4

Table 18: Line 1 Average 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3728	40.5	-7.9
0.3788	39.9	-8.4
0.3114	41.2	-8.7
0.3197	38.9	-10.8
0.3443	37.3	-11.7
0.4324	35.1	-12.1

Table 19: Line 2- Peaks 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3788	49.3	1.0
0.7497	44.8	-1.2
0.4324	45.5	-1.7
0.3214	47.8	-1.8
0.3650	46.8	-1.8
0.8074	44.1	-1.9

Table 20: Line 2 Average 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3728	38.1	-10.3
0.3788	37.8	-10.5
0.3462	36.5	-12.5
0.3499	36.0	-12.9
0.4324	33.3	-13.9
0.3555	34.8	-14.0

Q52 Module using the "Condor 3A-061WP05 power supply – while operating in Transmit Mode.

Table 21: Line 1- Peaks 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3708	51.1	2.7
0.4988	48.2	2.2
0.4370	48.2	1.1
0.8741	45.2	-0.8
0.8160	44.2	-1.8
0.3147	47.9	-1.9

Table 22: Line 1 Average 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3708	41.3	-7.1
0.3114	40.9	-9.0
0.4346	37.8	-9.3
0.8074	34.2	-11.8
0.8695	34.1	-11.9
0.3480	36.0	-13.0

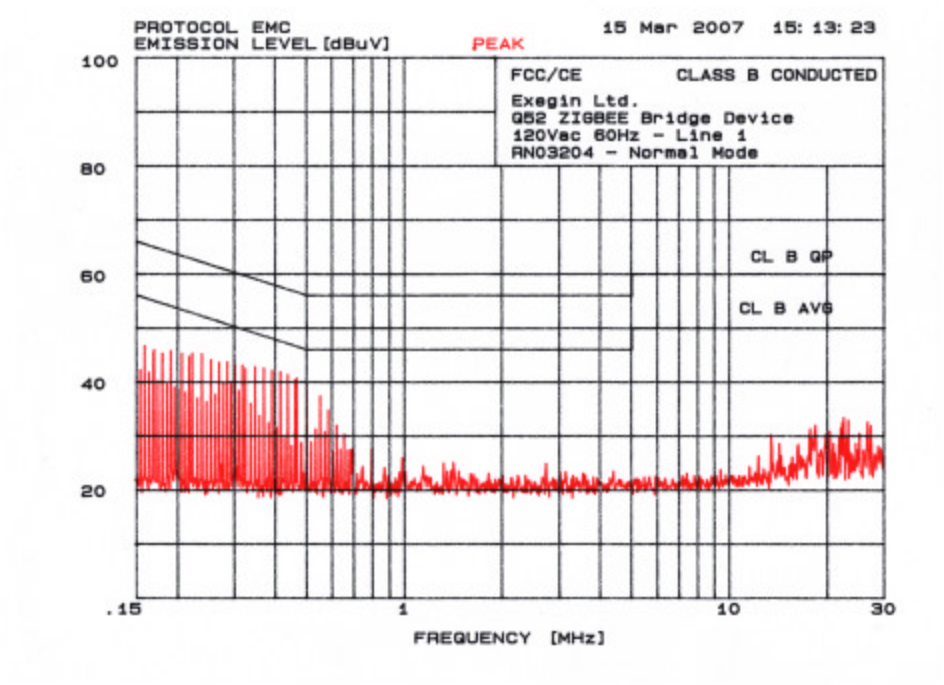
Table 23: Line 2- Peaks 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3114	53.4	3.5
0.3768	51.3	3.0
0.3197	50.1	0.4
0.2441	51.8	-0.1
0.9265	44.8	-1.2
0.2520	50.2	-1.4

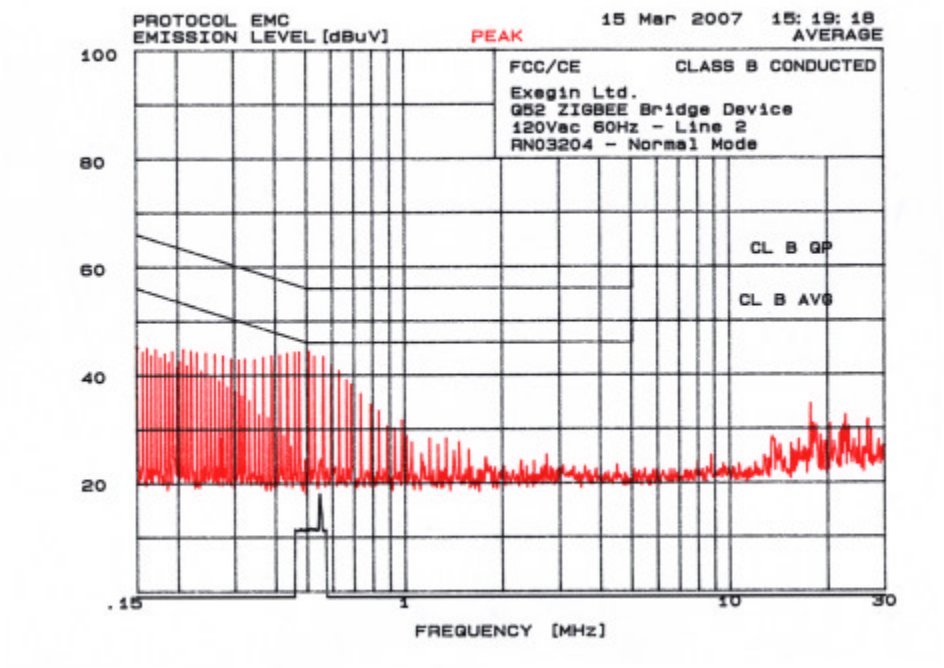
Table 24: Line 2 Average 240Vac, 50Hz

Frequency (MHz)	Peak (dBµV)	DelLim-Pk (dB)
0.3728	40.4	-8.0
0.3098	41.2	-8.7
0.4301	38.2	-9.0
0.8031	34.5	-11.5
0.4935	33.7	-12.4
0.2480	39.3	-12.5

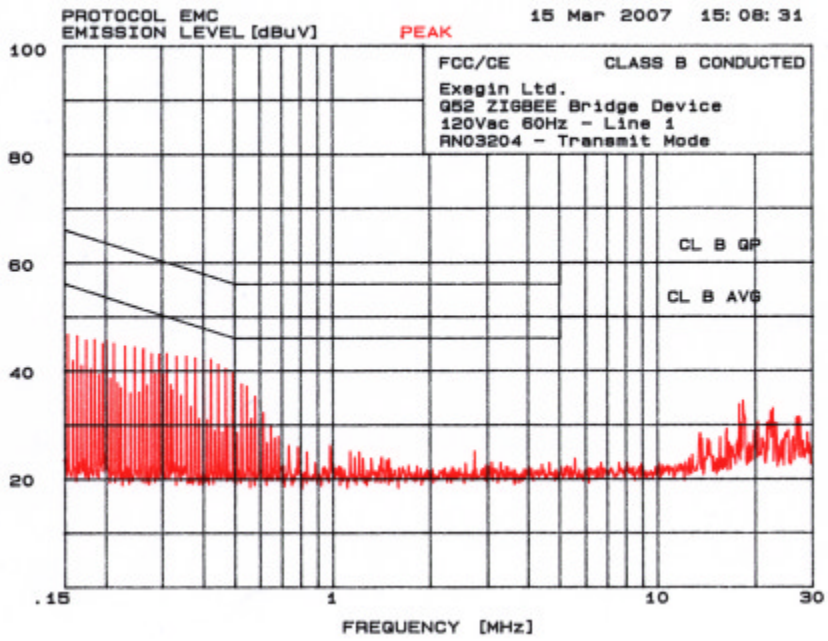
Plots using Aqualities MD350603 120Vac to 6Vdc Power Supply



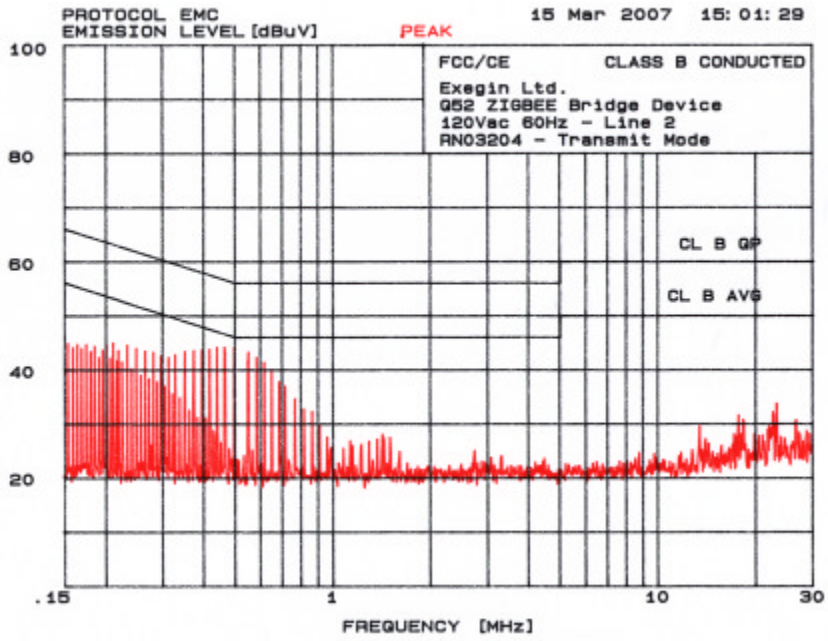
Plot 1 – Line 1 – 120Vac, 60Hz Line – in Normal Mode



Plot 2 - Line 2 – 120Vac, 60Hz Neutral – in Normal Mode

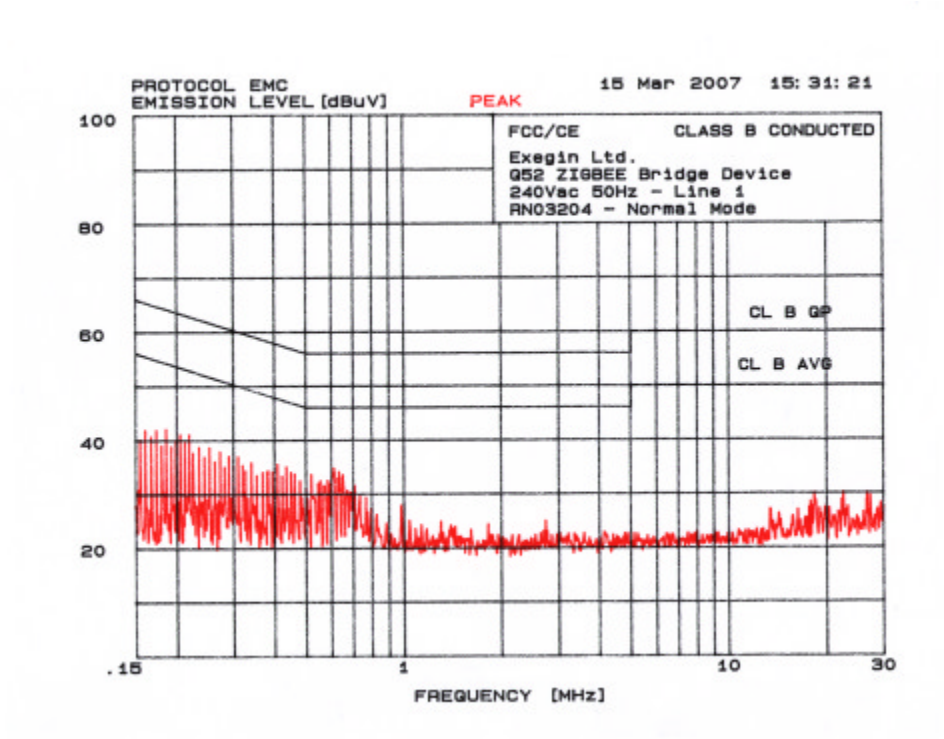


Plot 3 – Line 1 – 120Vac, 60Hz Line – in Transmit Mode

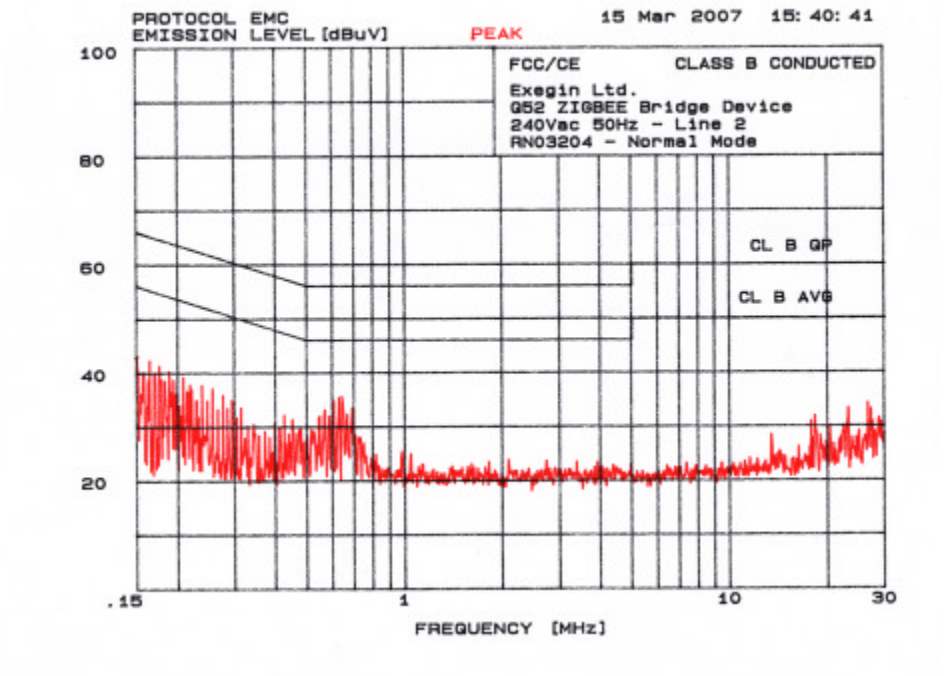


Plot 4 - Line 2 – 120Vac, 60Hz Neutral – in Transmit Mode

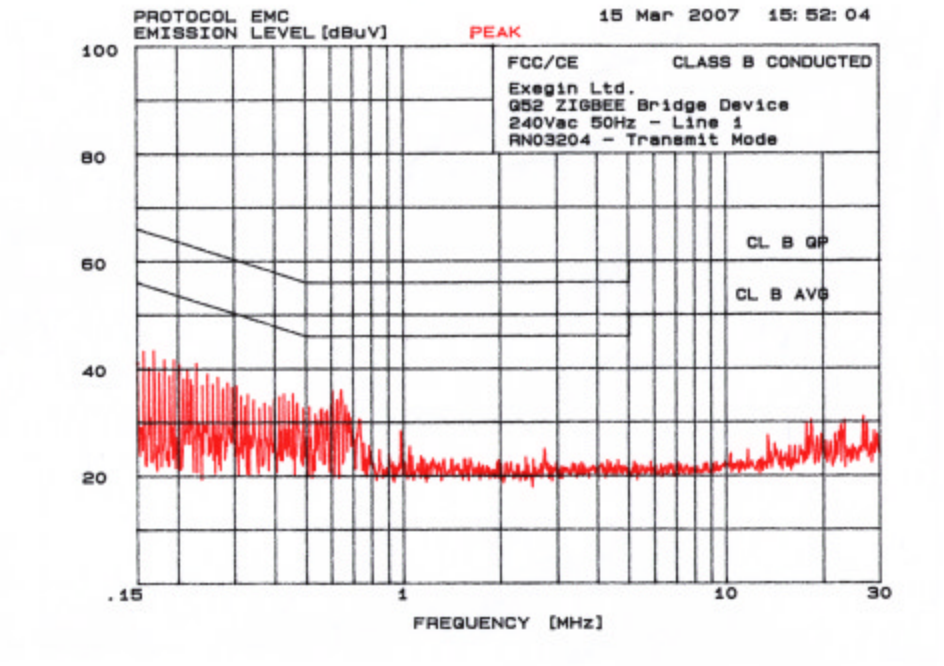
Plots Using Imation JOD-4801-011R 240Vac to 5Vdc Power Supply



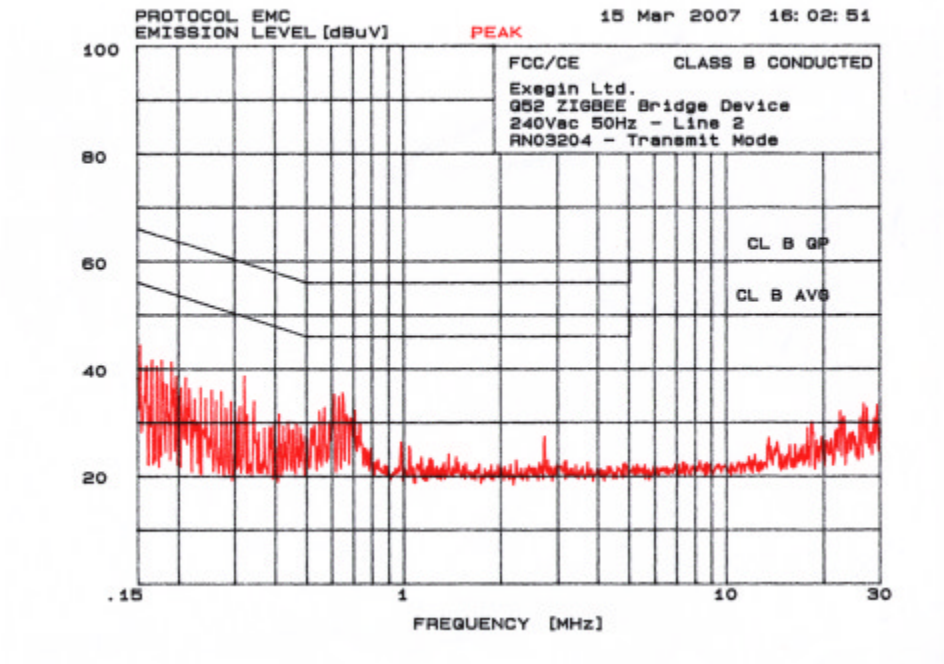
Plot 5 – Line 1 – 240Vac, 50Hz Line – in Normal Mode



Plot 6 - Line 2 – 240Vac, 50Hz Neutral – in Normal Mode

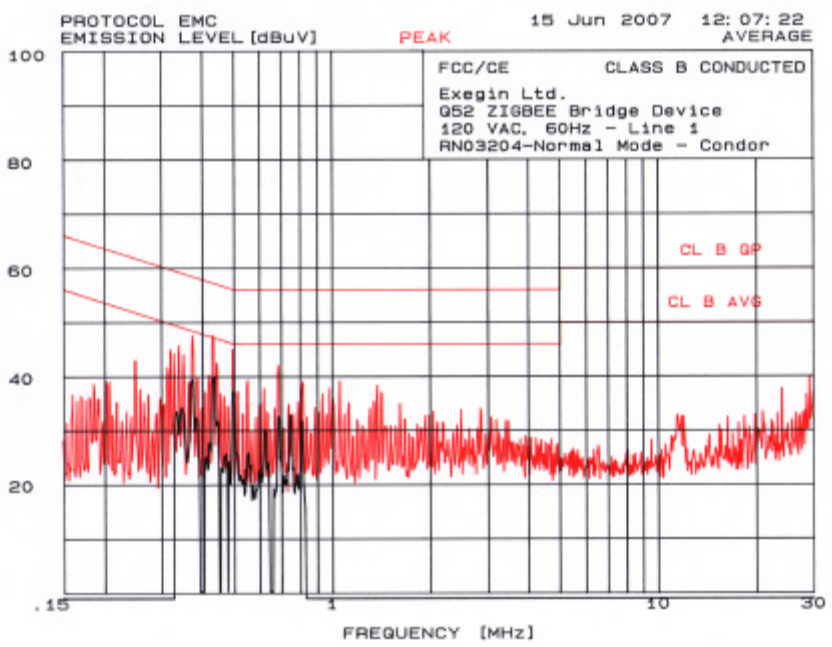


Plot 7 – Line 1 – 240Vac, 50Hz Line - in Transmit Mode

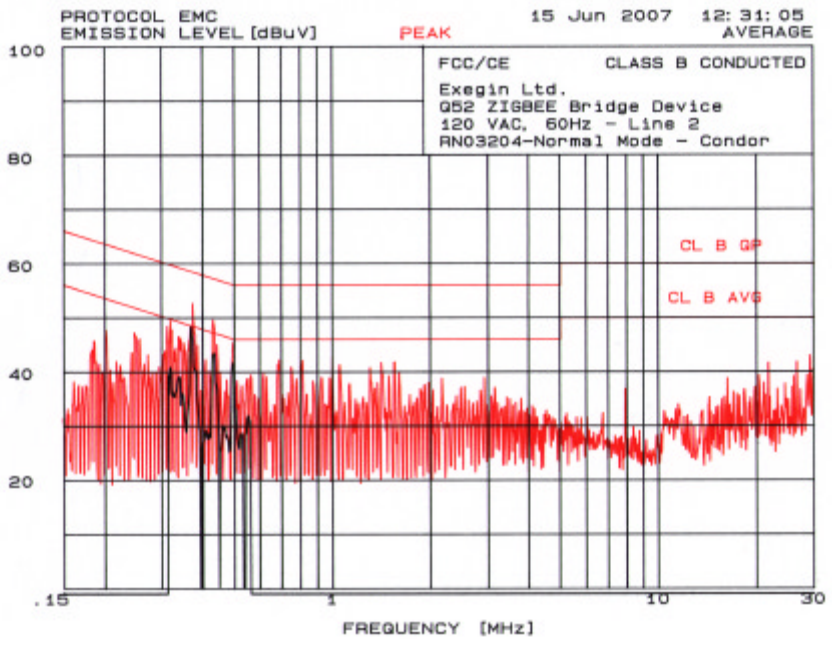


Plot 8 - Line 2 – 240Vac, 50Hz Neutral - in Transmit Mode

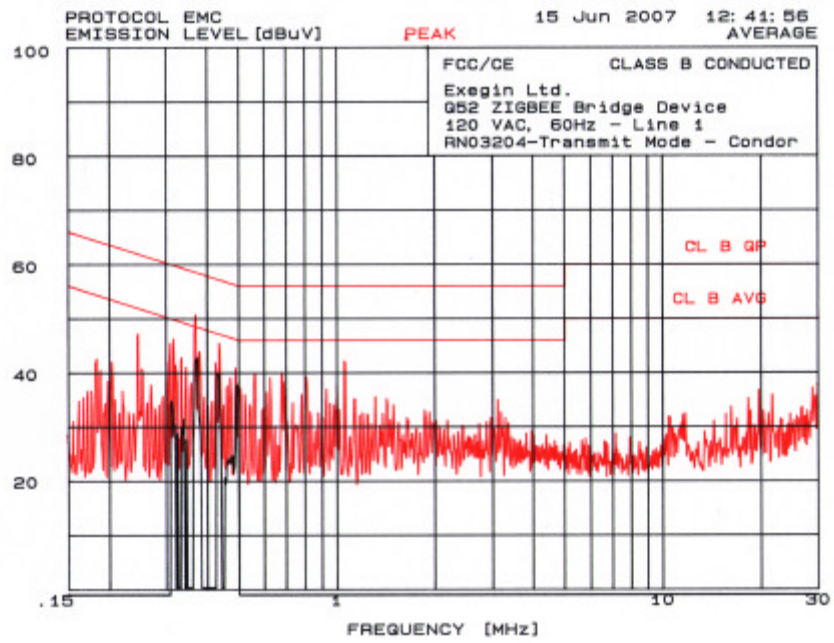
Plots using Condor 3A-061WP05 100-240Vac to 5Vdc Power Supply



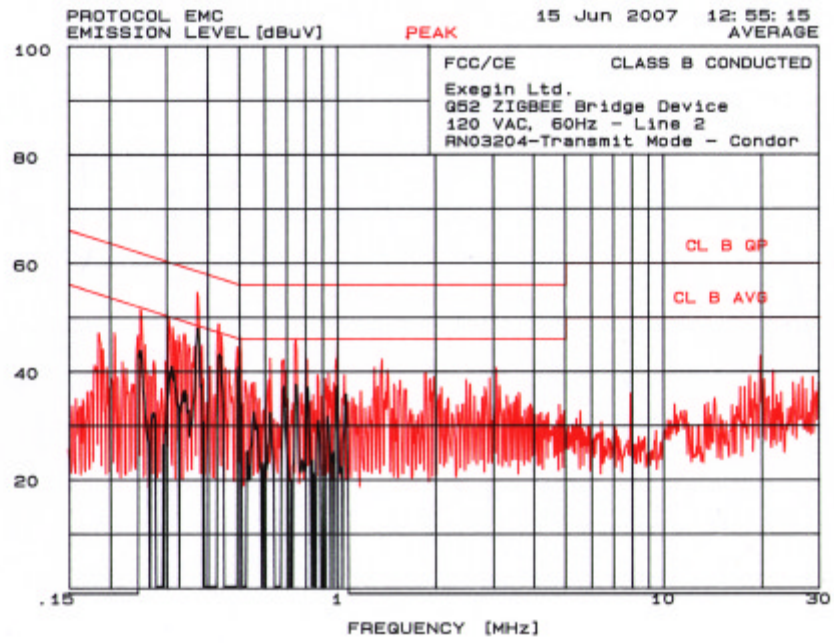
Plot 9 - Line 1 – 120Vac, 60Hz Neutral - in Normal Mode



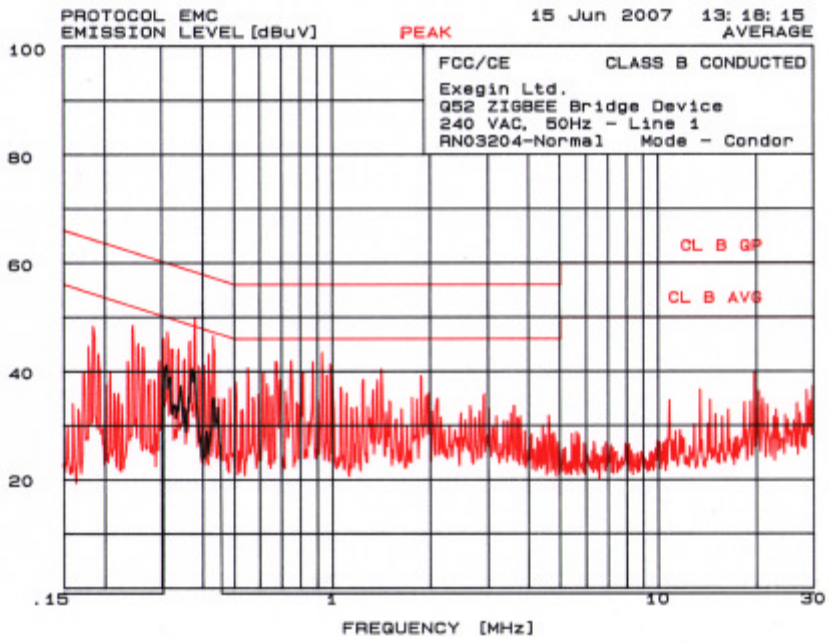
Plot 10 - Line 2 – 120Vac, 60Hz Line - in Normal Mode



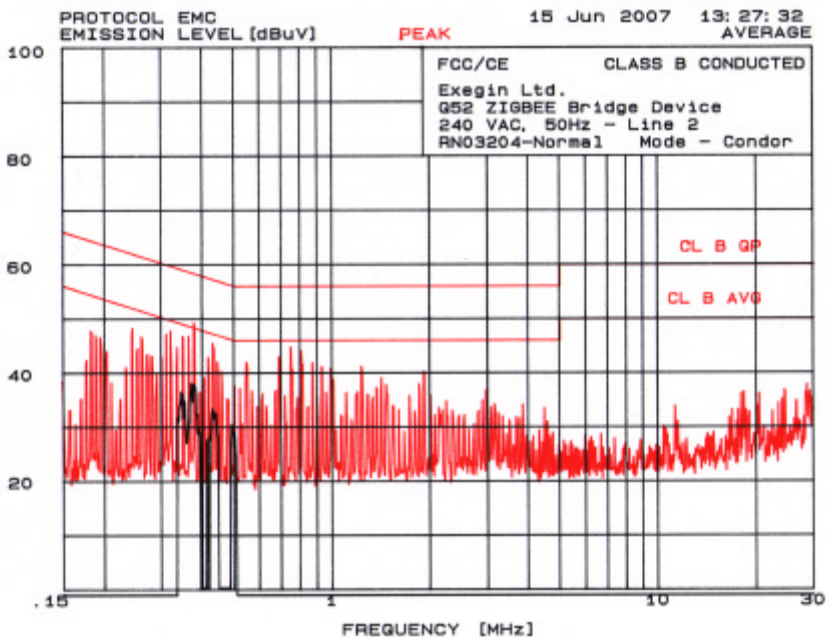
Plot 11 - Line 1 – 120Vac, 60Hz Neutral - in Transmit Mode



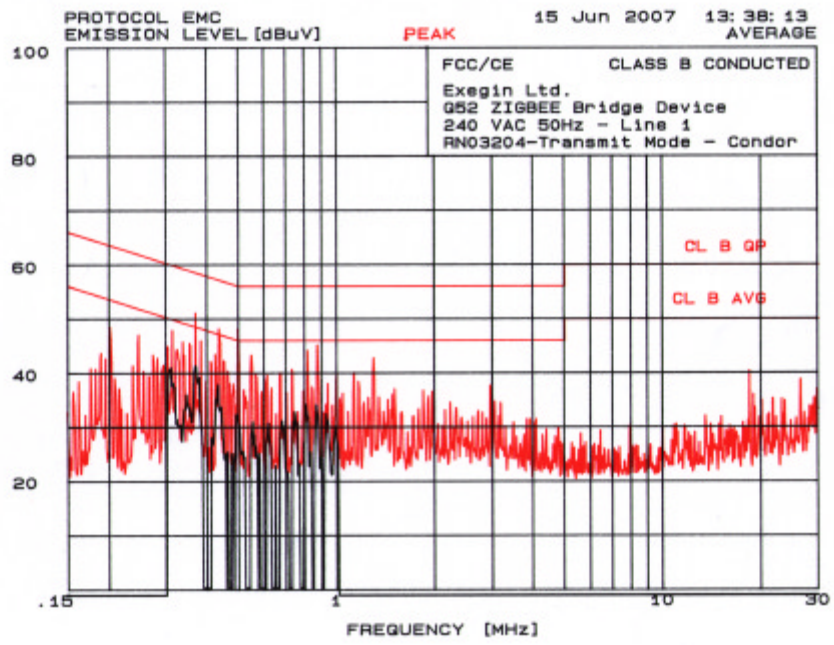
Plot 12 - Line 2 – 120Vac, 60Hz Line - in Transmit Mode



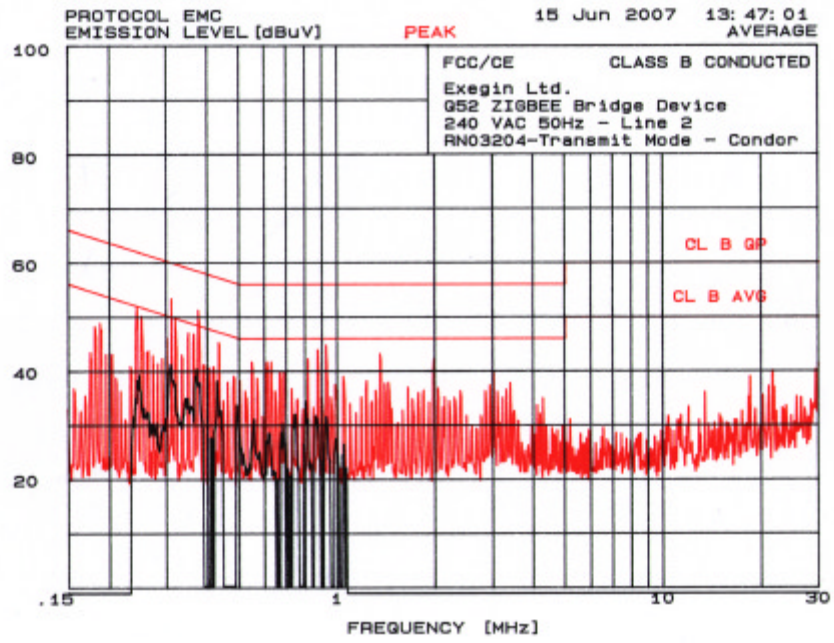
Plot 13 - Line 1 – 240Vac, 50Hz Neutral - in Normal Mode



Plot 14 - Line 2 – 240Vac, 50Hz Line - in Normal Mode



Plot 15 - Line 1 – 240Vac, 50Hz Neutral - in Transmit Mode



Plot 16 - Line 2 – 240Vac, 50Hz line - in Transmit Mode