Intec Automation Inc.,

M5208EVB

Report of Measurements

per

Industry Canada RSS-210 Issue 5 + Amends. 1 to 4 – 6.2.2(o)

and

FCC CFR47 Part 15/B; FCC CFR47 Part 15/C – 15.247

Revision 1.0

September 6, 2005

Approved by		
Checked by	Robert Stirling, P.Eng.	Date

Protocol Labs, Abbotsford BC, Canada
FCC Registration Number 96437
Industry Canada Registration Number IC3384

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Section I: Information for Test Report of Measurements

Testing Details

TESTED BY: David Johanson

TEST CONDITIONS: Temperature and Humidity: 20.4°C, 53%

TEST VOLTAGE: 9Vdc via Power supply operating at 120 Vac 60Hz, 240 Vac 50Hz

Test Facilities

Protocol Labs
28945 McTavish Rd.
Abbotsford BC, Canada, V4X 2E7

FCC Registration Number 96437
Industry Canada Registration Number IC3384

Test Equipment List

EMISSIONS:

Device	Model Number	Serial No.	Last Cal	Next Cal
Antenna	EMCO 6912	380	11/10/04	11/10/05
Antenna	LPA-30	563	13/10/04	13/10/05
Antenna	3105	2024	25/02/05	25/02/06
LISN	Solar 8012-50-R-24-BNC	863092	22/10/04	22/10/05
Tower	Rhientech Labs	Custom	NR	NR
Turntable	Protocol	Custom	NR	NR
Flicker and Harmonics Analyzer	Thurlby Thandar Instruments HA1600 Power and Harmonics Analyzer	140108	06/07/04	06/07/05
Low Distortion AC Power Source	LaPlace Instruments AC1000	138041	06/07/04	06/07/05
High Frequency Stack				
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	22/03/05	22/03/06
RF-Preselector	Hewlett Packard 85685A	3107A01222	22/03/05	22/03/06
Quasi-PeakAdapter	Hewlett Packard 85650A	2043A00240	22/03/05	22/03/06

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 Tested:

NAME: Intec Automation Inc.

ADDRESS: 2751 Arbutus Rd.
Victoria BC Canada V8N 5X7

CONTACT: Mr. Bob Furber

EMAIL: bob@steroidmicros.com

NUMBER: 250-721- 5150

Equipment Under Test

THE TEST SYSTEM:

EUT:

Manufacturer: Intec Automation Inc
Part Number: M5208EVB
Serial Number: ENG01

AUX EQUIP: Power Adapter

Manufacturer: Cincon Electronics Inc.
Part Number: TR10R090
Serial Number: ENG02

Test Software: Windows Hyperterminal
Rev #: V. 1.2

CABLING:

Cable	Pins	Connector	Load/Termination	Shielded	Ferrites
18-2 AWG	2	5mm Terminal	Power	No	No
CAT5e	8	RJ45	LAN	No	No
RS-232	9	DB-9	Serial	No	No

CONCLUSION: The Intec Automation Inc M5208EVB complies with the requirements of FCC CFR47 Part 15/B, FCC CFR47 Part 15/C. The M5208EVB also complies with the requirements of Industry Canada RSS-210 as a Category I indoor device.

Section II: IC RSS-210 Iss.5 & FCC CFR47 Part 15/B Report of Measurements

Markings

According to FCC Section 15.19, and ICES 003, a statement similar to the following must be included on an identification label, which also uniquely identifies the Manufactured date, either explicitly or through a Serial number etc.:

> "This equipment complies with FCC Rules, Part 15 and Industry Canada's ICES 003 for a Class B Digital Device. Operation is subject to two conditions:
>
> 1) This device may not cause harmful interference, and
>
> 2) This device must accept any interference that may cause any undesired operation"

Additionally, If the manufacturer markets product to Quebec, the following supplemental information should be added to the label:

> "Cet Apparreil numerique de la Classe A respecte toutes les exigences du Reglement sur le material broilleur du Canada."

Labeling

According to FCC Section 15.105, and ICES 003, the following statement must be included in a prominent location in your User's 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 when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

It is also required according to FCC Part B Section 15.21 that a caution is included such as:

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

This product is License Exempt for both FCC and IC, there is a requirement for this product to be submitted for certification and requires both an FCC ID and an IC ID number to be added to the labels in accordance with FCC CFR47 Part 2 subpart J (2.901 to 2.956) as well as IC Self-Marking standards.

Section III: IC RSS-210 Issue 5 + Amends. 1 to 4Emissions Testing

Test Results - Summary

Testing was performed pursuant to Industry Canada RSS-210 Issue 5 Section 6.2.2(o) with Amendments 1 through 4.

Test	Standard	Description	Result
Radiated Emissions Idle Mode sublclause 8.2	EN55022 Class B Limits	The radiated emissions are measured in the 30-1000Mhz range	Complies
Conducted Emissions Idle Mode subclause 8.3	EN55022 Class B Limits	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0 MHz range.	Complies
Radiated Emissions Transmit Mode	RSS-210 6.2.2(o)(b); 6.3	The radiated emissions are measured in the 30-24000Mhz range	Complies
Conducted Emissions Transmit Mode	RSS-210 6.6	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.45 - 30.0 MHz range Quasi-Peak 250uV(48dBuV)	Complies
Spectral Density Emissions	RSS-210 6.2.2(o)(b)	Spectral Density shall not be greater then 8dBm in any 3kHz band during a time interval exceeding 1,0 seconds; 50milliwatts per MHz	Complies
Output Power and EIRP Emissions	RSS-210 6.2.2(o)(b)	Output power shall not exceed 1.0 Watt	Complies

Part 1 - Radiated Emission Testing

DATE: August 2, 2005

TEST STANDARD: EN55022

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	Maximum Field Strength dBμV/m at 10 m
30 - 230	40.0
230 - 1000	47.0
Notes: 1. The lower limit shall apply at the transition frequency 2. additional provisions may be required for cases where interference occurs	

METHOD OF MEASUREMENT: The equipment was set up in a 3 meter open field test site, 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 were measured while rotating the EUT on a turntable to maximize the emissions signal strength and the results recorded on the attached plots.

Due to the presence of high ambient noise making it impossible to measure an emission at the required distance, the measurement was performed at 3meters distance and the limit is adjusted per EN61000-6-3:2001

$$L2 = L1(d1/d2)$$

Where L1 is the specified limit in μV/m at the distance d1 L2 is the new limit at the new distance d2.

All frequencies 30-2000GHz were tested at 3m and all frequencies 2GHz and up were tested at 1meter in accordance with ANSI c63.4

MEASUREMENT DATA: See Appendix C for Plots

EMISSIONS DATA: See Table 10 in Appendix C for corresponding frequencies.

PERFORMANCE: Complies.

Part 2 - Conducted Emission Testing

DATE: August 02, 2005

TEST STANDARD: EN55022

MINIMUM STANDARD: Class B Limit:

TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus. The equipment was operated and tested at 120Vac 60Hz as well as 240Vac 50Hz

MINIMUM STANDARD: Class B Limit:

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

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer with 9kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 9kHz bandwidth, CISPR Quasi-Peak detector as well as an averaging meter.

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

MEASUREMENT DATA: See Appendix C for Plots,

EMISSIONS DATA: See Tables 1through 8 in Appendix C for corresponding frequencies.

PERFORMANCE: Complies.

Part 3 - Radiated Emissions – Transmit Mode

DATE:	August 02, 2005
TEST STANDARD:	RSS-210 Iss.5 6.2.2(o)(b) – Direct Sequence Systems 2400-2483.5MHz
MINIMUM STANDARD:	6.2.2(o)(e1) – Out of Band Emissions: In any 100 kHz bandwidth outside the operating frequency bands, between 30 MHz and 5 times the carrier frequency, the unwanted emission spectral density shall be either at least 20 dB below the inband spectral density, or shall not exceed the levels specified in Table 3, whichever is less stringent.
TEST SETUP:	Refer to setup in Part 1 above.
METHOD OF MEASUREMENT:	Measurements were made using a spectrum analyzer with 9kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 9kHz bandwidth, CISPR Quasi-Peak detector as well as an averaging meter.
DEVICE DESCRIPTIONS:	As described in the Equipment under Test Section, above.
EMISSIONS DATA:	See Plots and Tables 1,2 and 3 in Appendix A for corresponding frequencies.
PERFORMANCE:	Complies.

Part 4 - Conducted Emission Testing – Transmit Mode

DATE: August 02, 2005

TEST STANDARD: RSS-210 Iss.5 6.6 – Transmitter AC Wireline Conducted Emissions

TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus. The equipment was operated and tested at 120Vac 60Hz as well as 240Vac 50Hz

MINIMUM STANDARD: (a) On any frequency or frequencies within the band of 0.45-30 MHz, the measured RF voltage (CISPR meter) shall not exceed 250 microvolts (across 50 ohms).

(b) Transmitters marketed for use only in a commercial, industrial or business environment and not intended for use in homes are permitted a limit of 1000 microvolts (0.45 - 1.705 MHz) and 3000 microvolts (1.705 - 30 MHz).

All applications not residential Frequency (MHz)	Residential Frequency (MHz)	Conducted Limit (dBµV)	
		Quasi-Peak(µV)	Quasi-Peak(dBµV)
	0.45 - 30	250	48
.45 – 1.705		1000	60
1.705 - 30		3000	69.5

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer with 9kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 9kHz bandwidth, CISPR Quasi-Peak detector as well as an averaging meter.

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

EMISSIONS DATA: See Tables 1,2,3,4,5 and 6 in Appendix C for corresponding frequencies.

PERFORMANCE: Complies.

Part 5 - Spectral Density Emissions Testing

DATE: August 02, 2005

TEST STANDARD: RSS-210 Iss.5 6.2.2(o)(b) – Direct Sequence Systems 2400-2483.5MHz

MINIMUM STANDARD: 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.

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer with 9kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 9kHz bandwidth, CISPR Quasi-Peak detector as well as an averaging meter. Since the antenna is an etched trace on the EUT, the measurement could not be a conducted measurement done directly on the board. The procedures used to indicate compliance were done in accordance with RSS-212 (3.2). Measurements were made at 1 meter, setting the frequency on a continuous broadcast. The Antenna was connected directly to the Spectrum Analyzer without using a Microwave Amplifier.
The Gain of the antenna was recorded as 0dBd. This translates to Gi=2.15dBi and Gn=1.64. Gn was used to calculate the power.
The following formula was used to convert the maximum field strength (FS) in volts/meter to the EUT output power (TP) in watts:

$$TP = ((FS \times D)2) / (30 \times G)$$

where D is the distance in meters between the two antennas and G is the EUT antenna numerical gain referenced to isotropic gain.

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

MEASUREMENT DATA:

Frequency	Measured Signal – Peak at 1 meter	Equipment correction	Corrected & converted Signal - Peak at 1m	Corrected & converted Signal - Peak at 1m	Corrected Signal - Peak at 3m	Spectral Density Level – per RSS-210 (3.2)	Spectral Density Level	Limit Line
(MHz)	(dBm)	(dB)	(dBm)	(dBµV)	(dBµV)	(mW)	(dBm)	(dBm)
2404.603	-24.4	29.0	4.7	111.6	102.1	2.9	4.62	8.0
2444.602	-30.5	29.1	-1.4	105.6	96.1	0.726	-1.39	8.0
2479.598	-30.6	29.2	-1.4	105.6	96.1	0.726	-1.39	8.0

EMISSIONS DATA: See Plots 6,7,8 and 9 in Appendix A for corresponding frequencies.

PERFORMANCE: Complies.

Part 6 - Output Power and EIRP Emissions

DATE: August 02, 2005

TEST STANDARD: RSS-210 Iss.5 6.2.2(o)(b) – Direct Sequence Systems 2400-2483.5MHz

MINIMUM STANDARD: 6.2.2(o)(b) – For the band 2400-2483.5 MHz, the transmitter output power shall not exceed 1.0 watt.

TEST SETUP: Refer to setup in Part 1 above.

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer with 9kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 9kHz bandwidth, CISPR Quasi-Peak detector as well as an averaging meter. Since the antenna is a permanently mounted antenna that is an etched trace on the EUT, the measurement could not be a conducted measurement done directly on the board. The procedures used to indicate compliance were done in accordance with RSS-212 (3.2). Measurements were made at 1 meter, setting the frequency on a continuous broadcast. The Antenna was connected to the Spectrum Analyzer using a Microwave Amplifier.

The Gain of the antenna was recorded as 0dBd. This translates to Gi=2.15dBi and Gn=1.64. Gn was used to calculate the power.

The following formula was used to convert the maximum field strength (FS) in volts/meter to the EUT output power (TP) in watts:

$$TP = ((FS \times D)2) / (30 \times G)$$

where D is the distance in meters between the two antennas and G is the EUT antenna numerical gain referenced to isotropic gain.

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

MEASUREMENT DATA:

Frequency	Measured Signal – Peak at 1 meter	Equipment correction	Corrected Signal - Peak at 1m	Corrected Signal - Peak at 3m	Signal - Peak at 3m	Signal Power Level – per RSS-212 (3.2)	Limit Line
(MHz)	(dBµV)	(dB)	(dBµV)	(dBµV)	(V)	(µW)	(W)
2404.814	98.2	-5.52	92.7	83.2	0.014	35.85	1.0
2444.930	93.5	-5.5	88.0	78.5	0.008	11.70	1.0
2480.000	92.6	-5.3	87.3	77.5	0.007	8.96	1.0

EMISSIONS DATA: See Plots 9, 10 and 11 in Appendix A for corresponding frequencies.

PERFORMANCE: Complies.

Section IV: FCC CFR47 Part 15/C Report of Measurements

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; Part 15 – Subpart C - Intentional Radiators.

Additionally, the specific section used for Intentional Radiator compliance is 15.247 – Operation within the band 2400-2483.5MHz – limited to digitally modulated spread spectrum intentional radiator. The procedures used includes the use of the FCC Public Notice FCC 97-114 Appendix C, Guidance on Measurements for Direct Sequence (Digitally Modulated) Spread Spectrum Systems.

Labeling Requirements

Please refer to labeling requirements as outlined above in Section 1.

Test Results - Summary

Testing was performed pursuant to Industry Canada RSS-210 Issue 5 Section 6.2.2(o) with Amendments 1 through 4.

Test	Standard	Description	Result
Radiated Emissions Idle Mode	FCC PART 15 Subpart B Class B Limits	The radiated emissions are measured in the 30-2000Mhz range	Complies
Conducted Emissions Idle Mode	FCC PART 15 Subpart B Class B Limits	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0 MHz range.	Complies
Antenna Requirement	FCC Part 15 Subpart C 15.203	Proper Antenna is specified and used.	Complies
Radiated Emissions Transmit Mode – Digitally Modulated Spread Spectrum Operation	FCC Part 15 Subpart C 15.247	Radiated emission characterstics for Spread Spectrum devices operating in the range 2400-2483.5 that use the Digital Modulation technique. Emissions are measured in the 30-24000Mhz range	Complies

Part 1 - Radiated Emission Testing

DATE: August 2, 2005

TEST STANDARD: FCC CFR47, Part 15, Subpart B

TEST SETUP: 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 and the results recorded on the attached plots. All emissions over 2GHz were measured at 1 meter using the appropriate filters and amplifiers.

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	Maximum Field Strength dBµV/m at 3m
30 - 88	40
88 - 216	43.5
216 - 960	46
960 - 1000	54

DEVICE DESCRIPTIONS: Refer to the Equipment Under Test Section, above, for EUT Descriptions.

CABLE DESCRIPTIONS: No cables required

MEASUREMENT DATA: See Appendix C for Plots.

EMISSIONS DATA: See Table 9 in Appendix C for corresponding frequencies.

PERFORMANCE: Complies.

Part 2 - Conducted Emission Testing

DATE: August 02, 2005

TEST STANDARD: FCC CFR47, Part 15, Subpart B

MINIMUM STANDARD: Class B Limit:

TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus. The equipment was operated and tested at 120Vac 60Hz as well as 240Vac 50Hz

MINIMUM STANDARD: Class B Limit:

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

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer with 9kHz RBW, Peak detector. Any emissions that are close to the limit are measured using a test receiver with 9kHz bandwidth, CISPR Quasi-Peak detector as well as an averaging meter.

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

MEASUREMENT DATA: See Appendix C for Plots,

EMISSIONS DATA: See Tables 1,2,3,4,5,6,7 and 8 in Appendix C for corresponding frequencies.

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 antenna that is permanently etched onto the units circuit board and is not replaceable.

Part 4 - Digitally Modulated Spread Spectrum Operation - 15.247

APPLICABLE REGULATIONS: 3.1

15.247(a) - Operation under the provisions of this Section is limited to frequency hopping and digitally modulated intentional radiators that comply with the following provisions. (Please note that only the applicable regulations are listed):

(2) Systems using digital modulation techniques may operate in the 2400 - 2483.5 MHz bands. The minimum 6-dB bandwidth shall be at least 500 kHz.

(b) The maximum peak 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.

(c) 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section

15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

The limits used for this product under test for emissions that do not fall within the restricted bands of 15.205(a), the limit for the emissions is 20dB below the highest peak.

For emissions that do fall within the restricted bands, the limit is 53.98dBµV/m at 3meters. Where measured frequencies of concern are over 1.0Ghz, we used the Average measurement procedure as outlined in FCC 97-114 Appendix C.

For this EUT, the EUT is designed to be in receive mode until a request for data is received. When the EUT is broadcasting data, the data is transmitted until finished so an Average Correction Factor can not be used.

(d) For digitally modulated systems, the peak 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.

TEST PROCEDURES: 3.2

TEST STANDARD: FCC CFR47, Part 15, Subpart C 15.247
OET Bulletin FCC 97-114 Appendix C – Guidance on Measurements for Direct Sequence Spread Spectrum

DEVICE DESCRIPTIONS: Refer to the Equipment Under Test Section, above, for EUT Descriptions.

TEST SETUP:

Freq. Range Measured	30Mhz – 10000MHz
Test Distance	1 to 3m
Test Instrumentation resolution	120KHz (30MHz to 1000MHz) 1MHz (1000MHz to 25000MHz)
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 and the results recorded on the attached plots. The emissions were tested using radiated test procedures instead of conducted measurement procedures.

The emissions were measured while the unit was in a standby mode and not communicating with any devices (hereafter referred to as Quiescent Mode). This unit was also measured while it was transmitting data (hereafter refereed to as Transmit Mode). To perform the Transmit Mode measurements, the unit was set-up to continuous broadcast at the designated power levels and channels.

This unit was designed to communicate on any one of several channels within the 2400.0 to 2483.5 MHz band. The unit is designed to automatically transmit/receive data on the specified channel that was programmed into the Unit. The transmission power level and bit-rate is set to a fixed rate as specified in the “Zigbee” communication protocol. These units are only designed to communicate point-to-point.

Measurements were performed at the lowest, middle and highest operating frequencies (Channel 1: 2405 MHz; Channel 9: 2445 MHz; Channel 16: 2480 MHz).

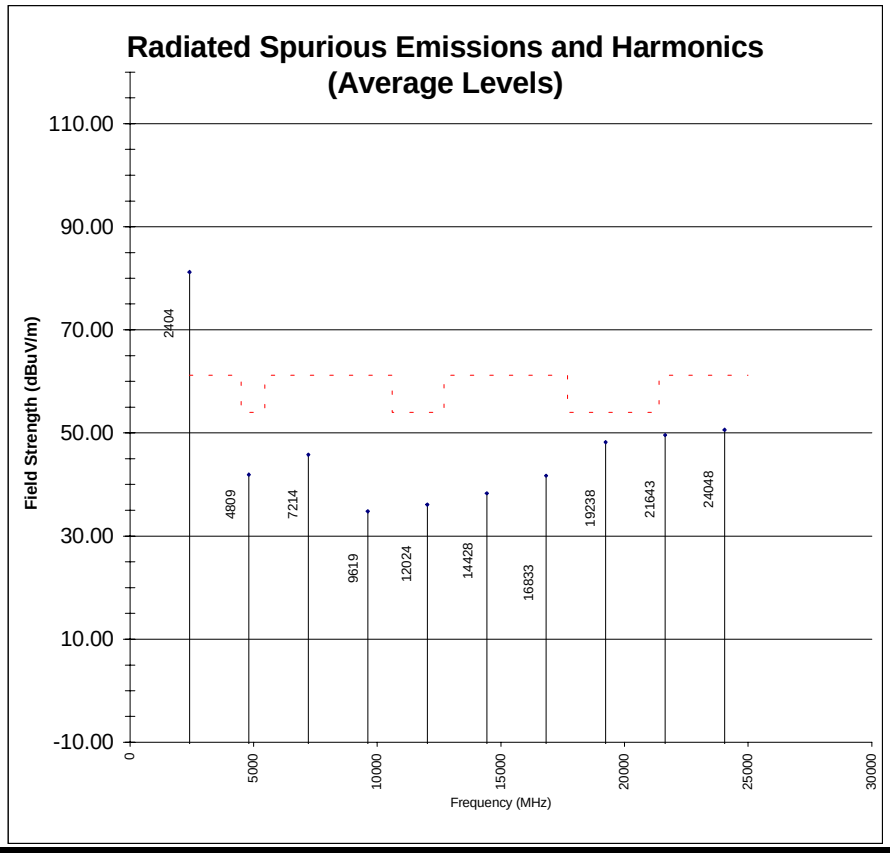
MODIFICATIONS: No modifications have been made to the EUT in order to achieve compliance.

CABLING DETAILS: DB9 Com Port Cable, RJ45 Network Cable. CAT-5e 1 meter

RESULTS: 3.3 To verify compliance, the radiated emission tests were carried out in accordance with part 15.109, 15.205, 15.209 and 15.247. The spectrum was scanned from 0.4MHz to 25000 MHz looking for all Spurious and Harmonic emissions in Quiescent, and Transmit modes. The Quiescent Mode and Transmit mode measurements and plots for Un-intentional emissions 30-1000 MH are contained in Appendix B. The results of the harmonics and spurious frequencies 1000-25000 MHz are contained in the following pages:

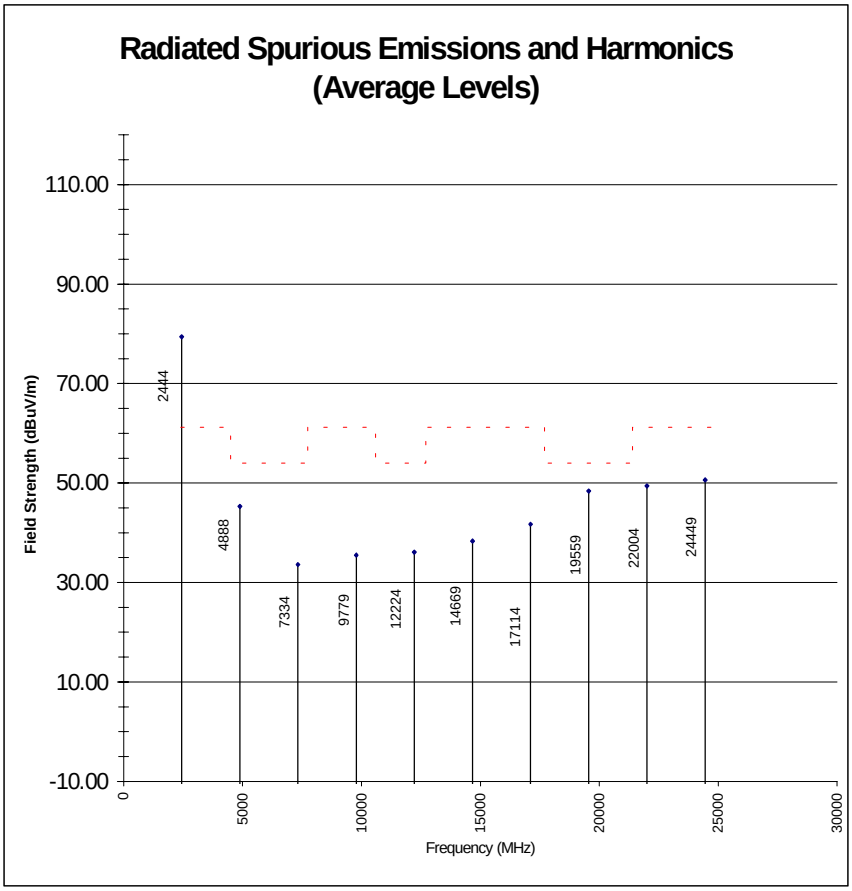
Appendix A: Emissions Plots

Chart 1: 15.247(b,c): 2404 MHz, Low Channel Spurious and Harmonic Emissions



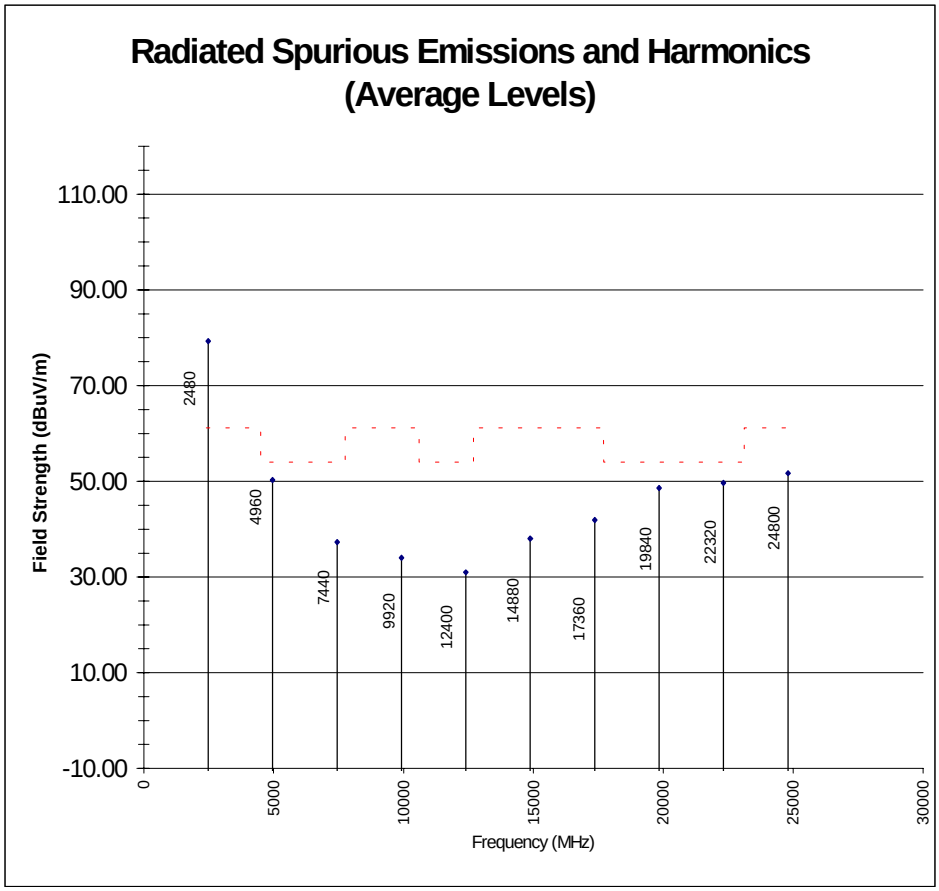
Frequency	Harmonic	Restricted bands (15.205(a))	Measured Signal	Equipment Attenuation	Corrected Peak Signal	Limit Lines	Delta Limit Peak For Freq. outside restricted bands	Delta Limit Average For Freq. inside restricted bands
(MHz)			(dBµV)	(dB)	(dBµV)	(dBµV)	(dBc)	(dBc)
2404.000	1st	N/A	60.7	30.0	81.2	0	NA	NA
4809.000	2nd	4500-5150	42.4	9.0	41.9	54		-12.1
7214.000	3rd	N/A	45.5	9.8	45.8	61.2	-15.4	
9619.000	4th	N/A	27.5	16.8	34.8	61.2	-26.4	
12024.000	5th	10600-12700	31.8	13.8	36.1	54		-17.9
14428.000	6th	N/A	26.7	21.1	38.3	61.2	-22.9	
16833.000	7th	N/A	26.2	25.0	41.7	61.2	-19.5	
19238.000	8th	17000-214000	28.5	29.2	48.2	54		-5.8
21643.000	9th	N/A	29.1	30.0	49.6	61.2	-11.6	
24048.000	10th	N/A	29.1	31.0	50.6	61.2	-10.6	

Chart 2: 15.247(b,c): 2444 MHz, Middle Channel Spurious and Harmonic Emissions



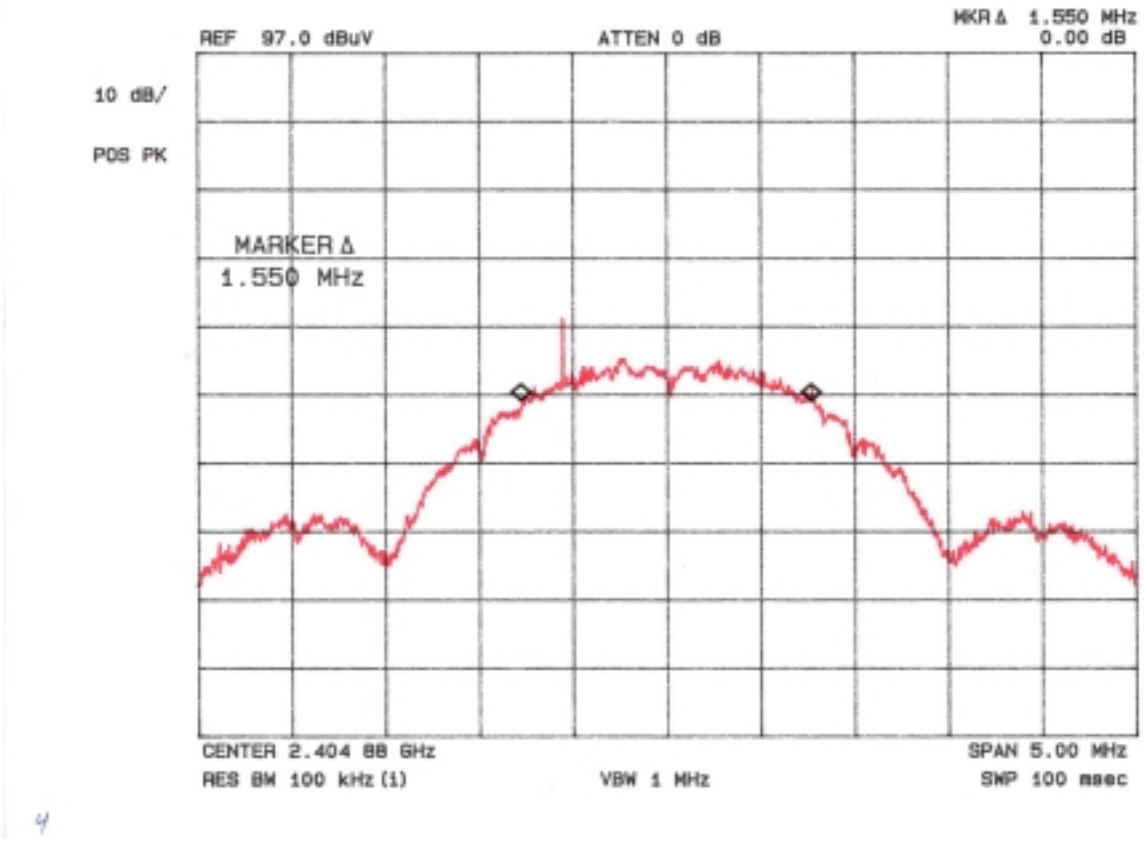
Frequency	Harmonic	Restricted bands (15.205(a))	Measured Signal	Equipment Attenuation	Corrected Peak Signal	Limit Lines	Delta Limit Peak For Freq. outside restricted bands	Delta Limit Average For Freq. inside restricted bands
(MHz)			(dBµV)	(dB)	(dBµV)	(dBµV)	(dBc)	(dBc)
2444.000	1st	N/A	58.9	30.0	79.4	0	NA	NA
4888.000	2nd	4500-5150	45.8	9.0	45.3	54		-8.7
7334.000	3rd	7250-7750	33.3	9.8	33.6	54		-20.4
9779.000	4th	N/A	28.2	16.8	35.5	61.2	-25.7	
12224.000	5th	10600-12700	31.8	13.8	36.1	54		-17.9
14669.000	6th	N/A	26.7	21.1	38.3	61.2	-22.9	
17114.000	7th	N/A	26.2	25.0	41.7	61.2	-19.5	
19559.000	8th	17000-214000	28.7	29.2	48.4	54		-5.6
22004.000	9th	N/A	28.9	30.0	49.4	61.2	-11.8	
24449.000	10th	N/A	29.1	31.0	50.6	61.2	-10.6	

Chart 3: 15.247(b,c): 2480 MHz, Highest Channel Spurious and Harmonic Emissions

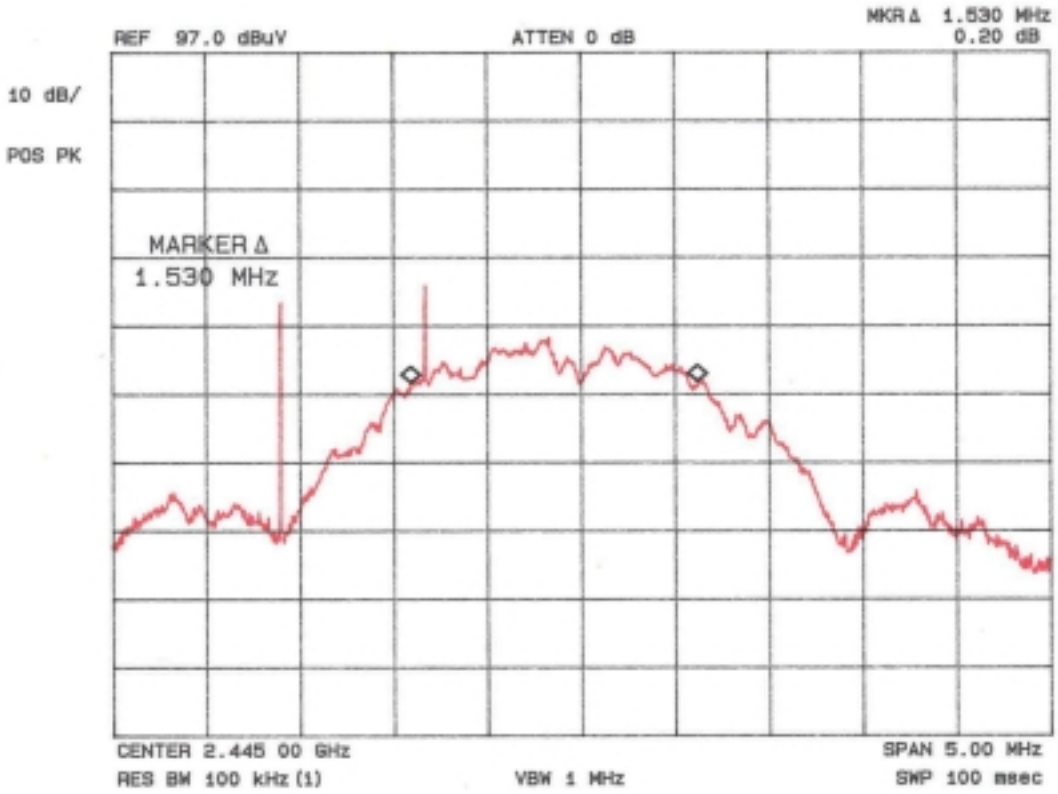


Frequency	Harmonic	Restricted bands (15.205(a))	Measured Signal	Equipment Attenuation	Corrected Peak Signal	Limit Lines	Delta Limit Peak For Freq. outside restricted bands	Delta Limit Average For Freq. inside restricted bands
(MHz)			(dBµV)	(dB)	(dBµV)	(dBµV)	(dBc)	(dBc)
2480.000	1st	N/A	58.8	30.0	79.3	0	NA	NA
4960.000	2nd	4500-5150	50.8	9.0	50.3	54		-3.7
7440.000	3rd	7250-7750	37	9.8	37.3	54		-16.7
9920.000	4th	N/A	26.7	16.8	34.0	61.2	-27.2	
12400.000	5th	10600-12700	26.7	13.8	31.0	54		-23.0
14880.000	6th	N/A	26.4	21.1	38.0	61.2	-23.2	
17360.000	7th	N/A	26.4	25.0	41.9	61.2	-19.3	
19840.000	8th	17000-214000	28.9	29.2	48.6	54		-5.4
22320.000	9th	22010-23120	29.2	30.0	49.7	54		-4.3
24800.000	10th	N/A	30.2	31.0	51.7	61.2	-9.5	

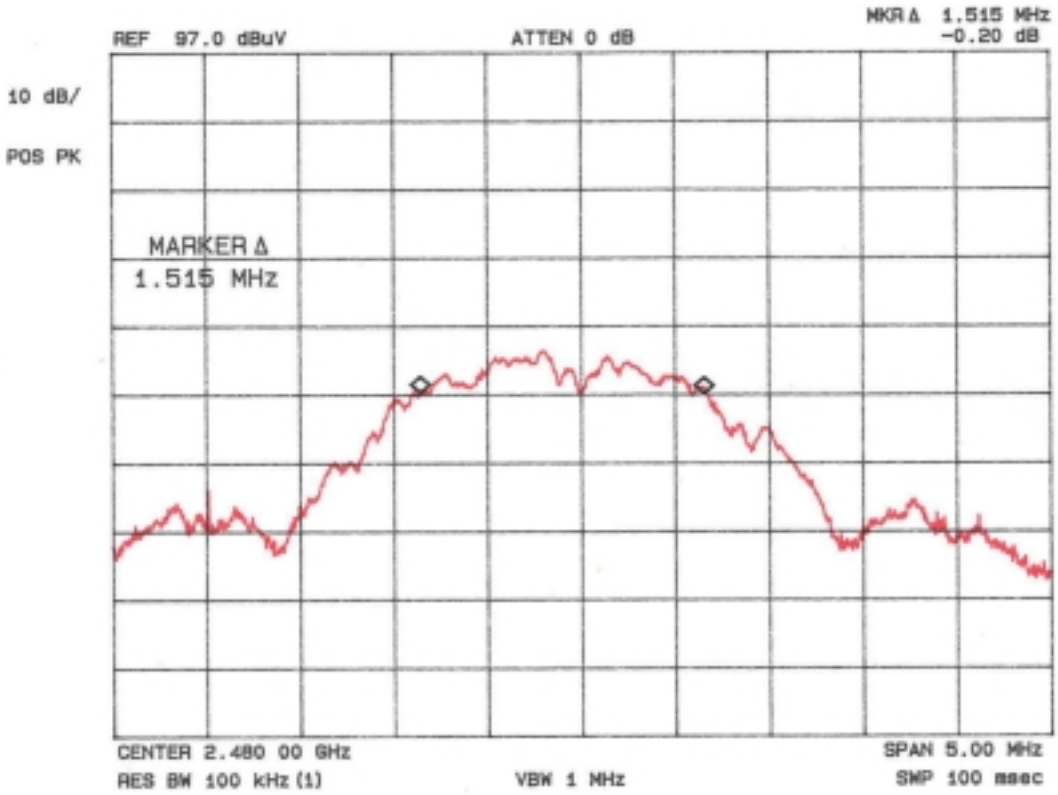
15.247(a)(2) – 6dB Bandwidth



Plot 1: Low Channel (2.405GHz) – operating in Transmit Mode High Power

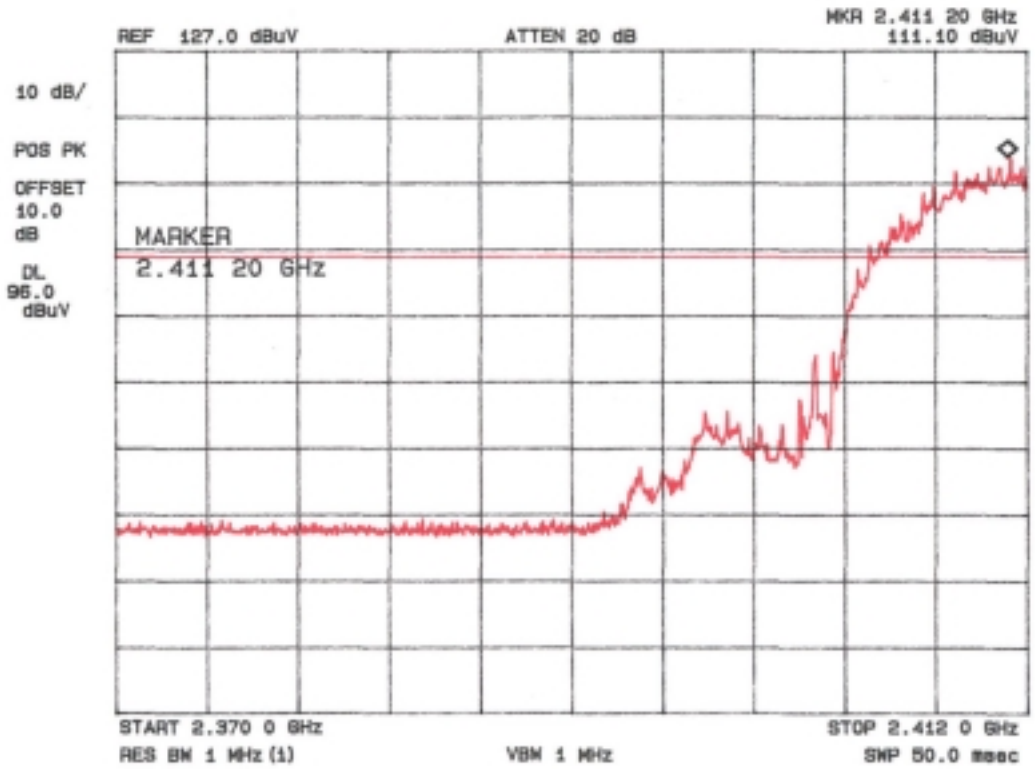


Plot 2: Mid Channel (2.445GHz) – operating in Transmit Mode High Power

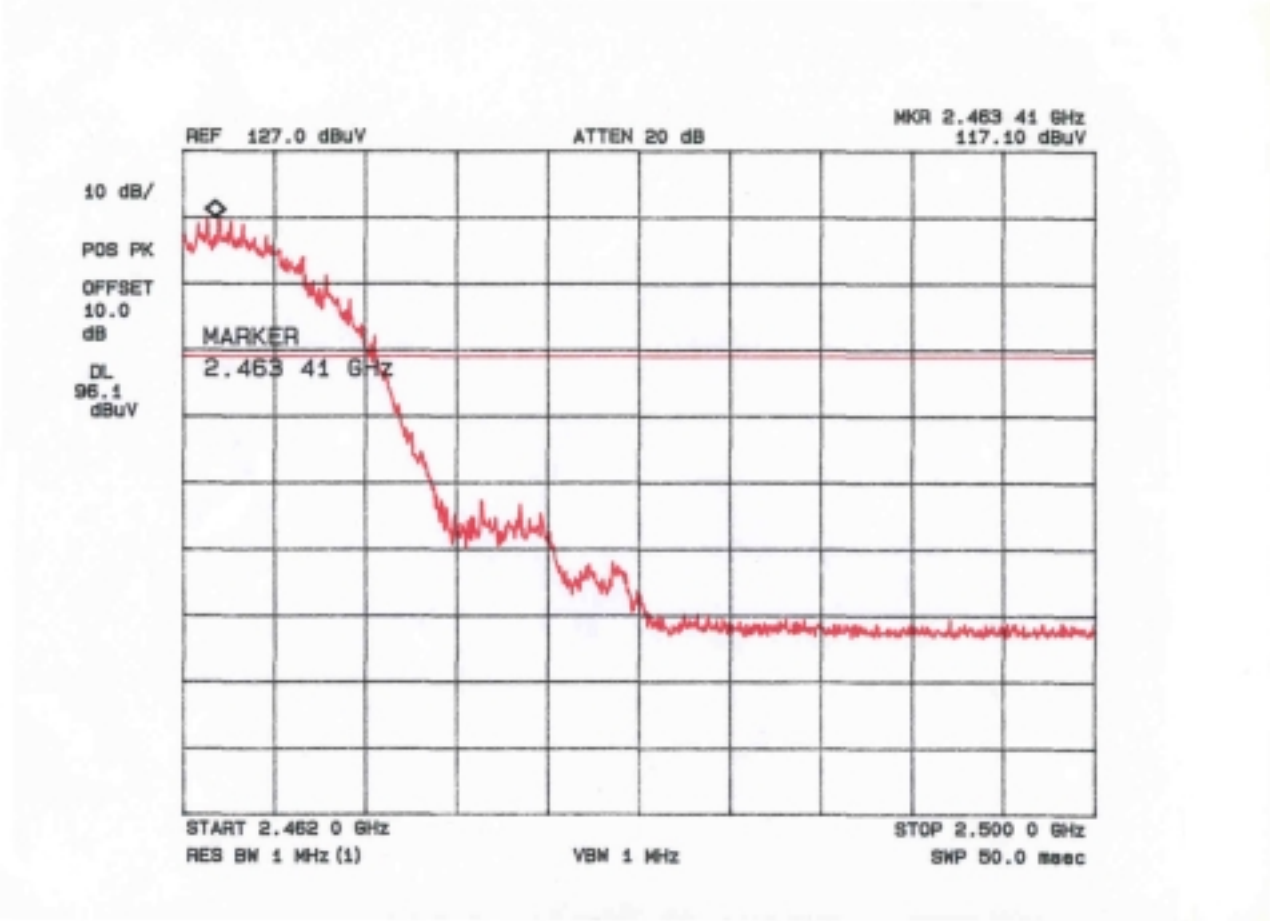


Plot 3: High Channel (2.480GHz) – operating in Transmit Mode High Power

15.247(c) – Band-edge compliance test

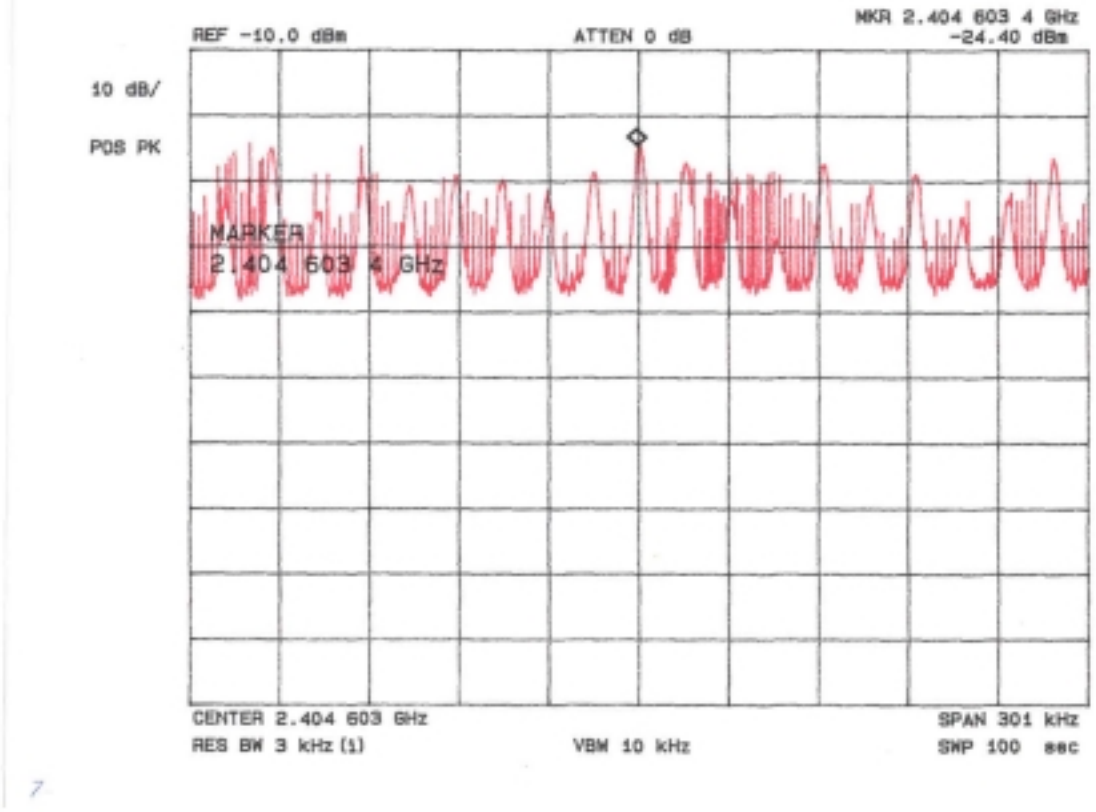


Plot 4: Low Channel – operating in Transmit Mode; High Power



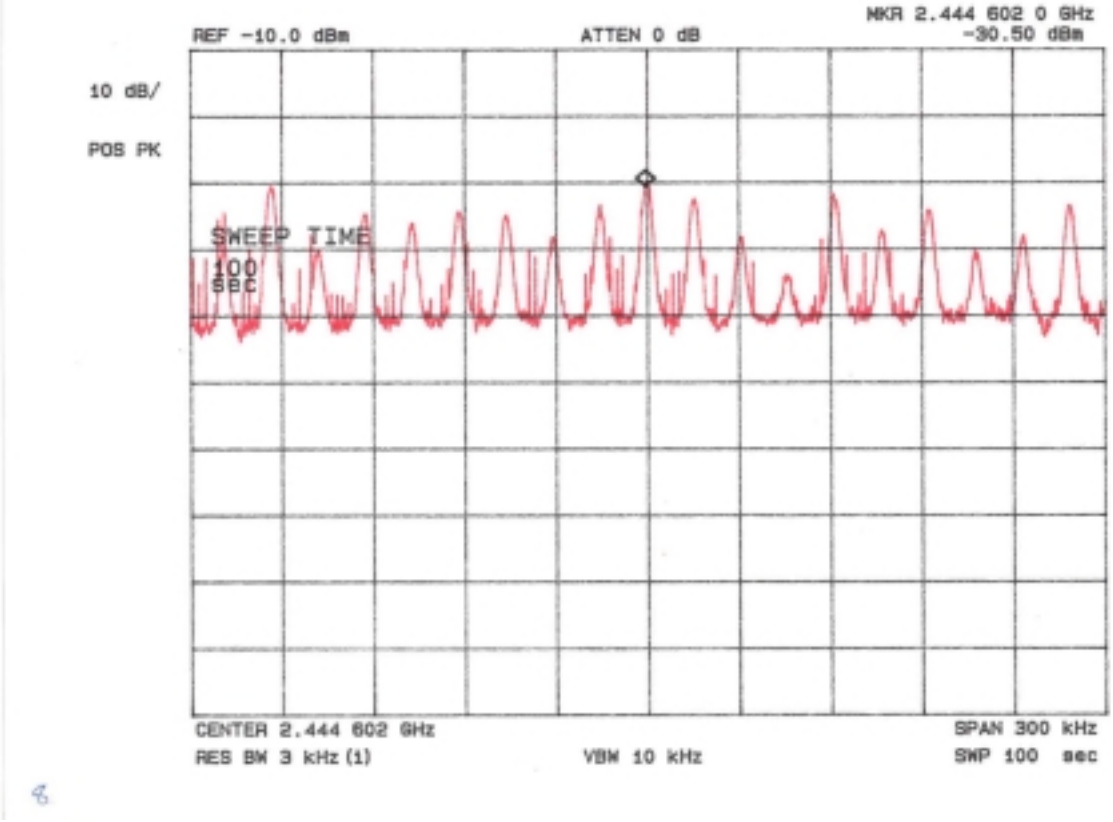
Plot 5: High Channel – operating in Transmit Mode; High Power

15.247(d) – Power Spectral Density



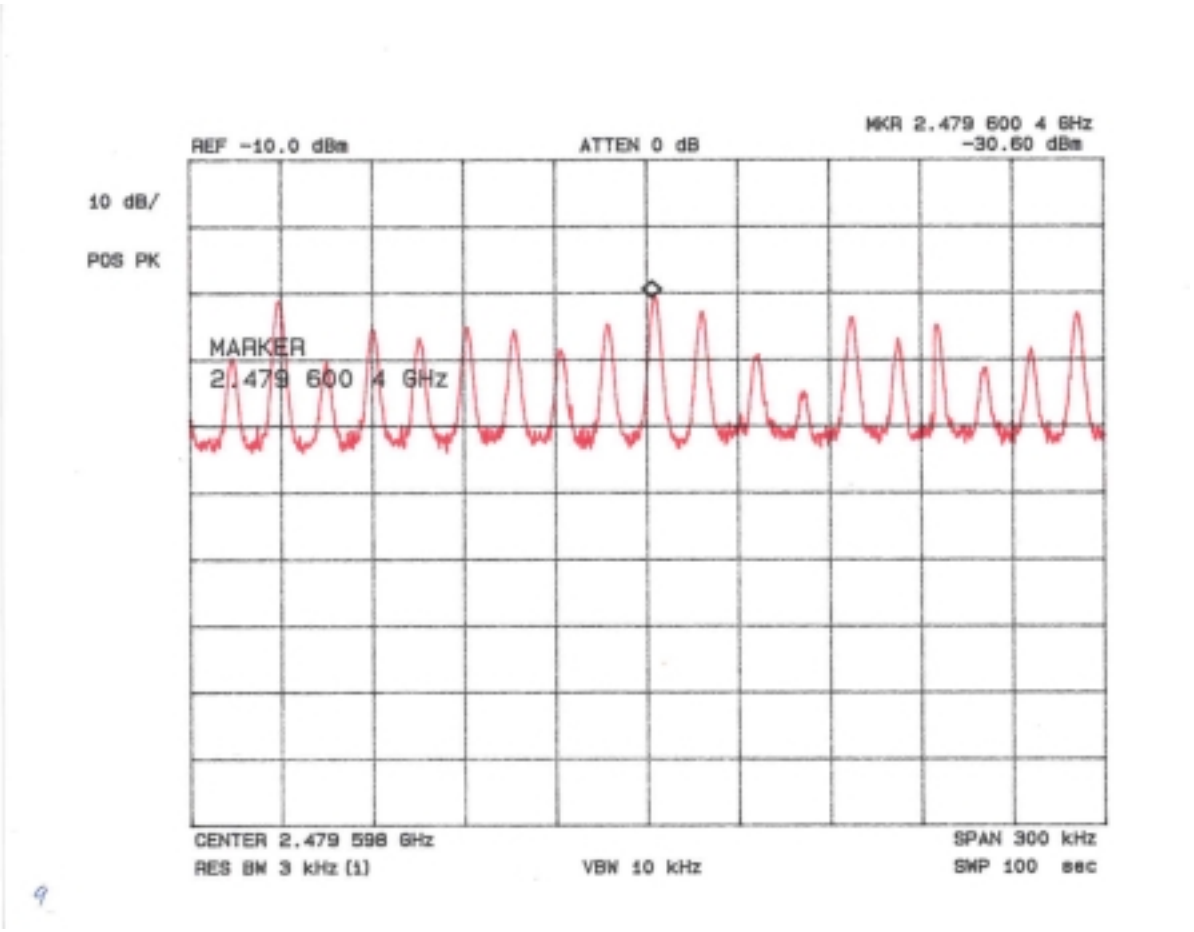
Plot 6: Low Channel – operating in Transmit Mode; High Power

Measured Level: = -24.4dBm



Plot 7: Middle Channel – operating in Transmit Mode; High Power

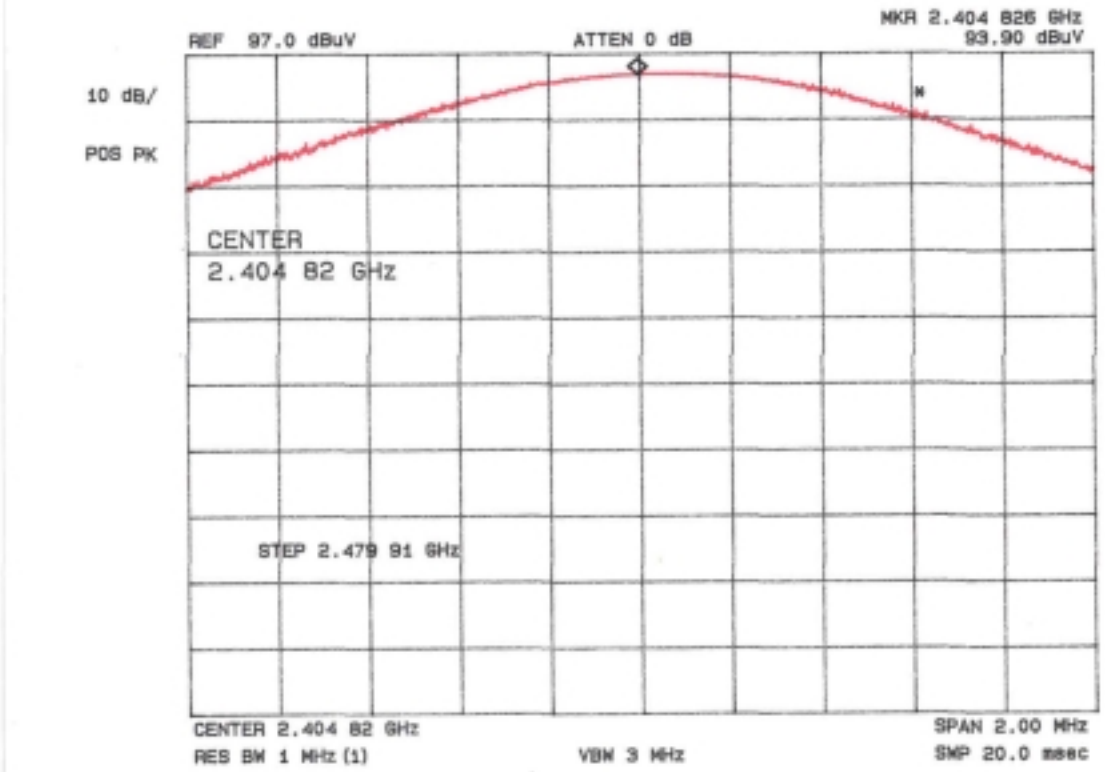
Measured Level: = -30.5dBm



Plot 8: High Channel – operating in Transmit Mode; High Power

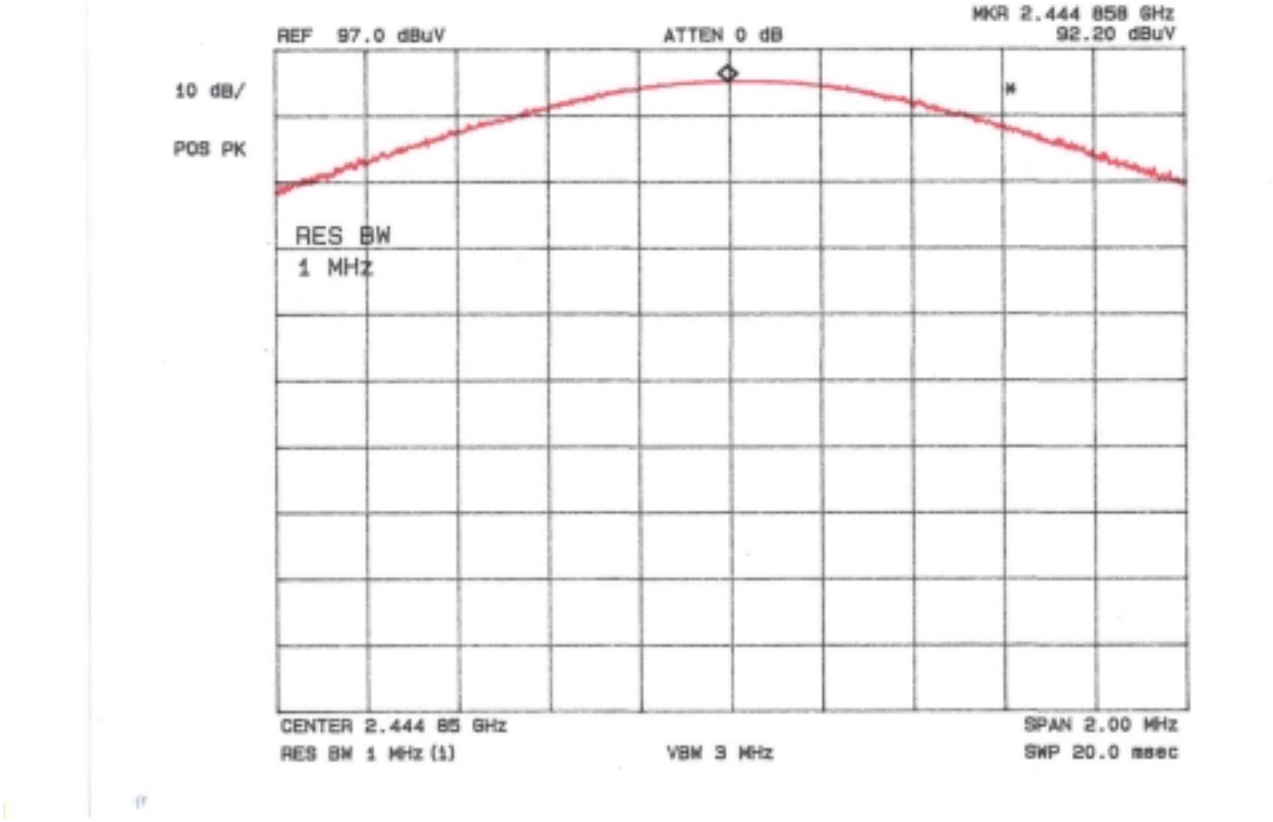
Measured Level: = -30.6dBm

15.247(d) – Power Spectral Density



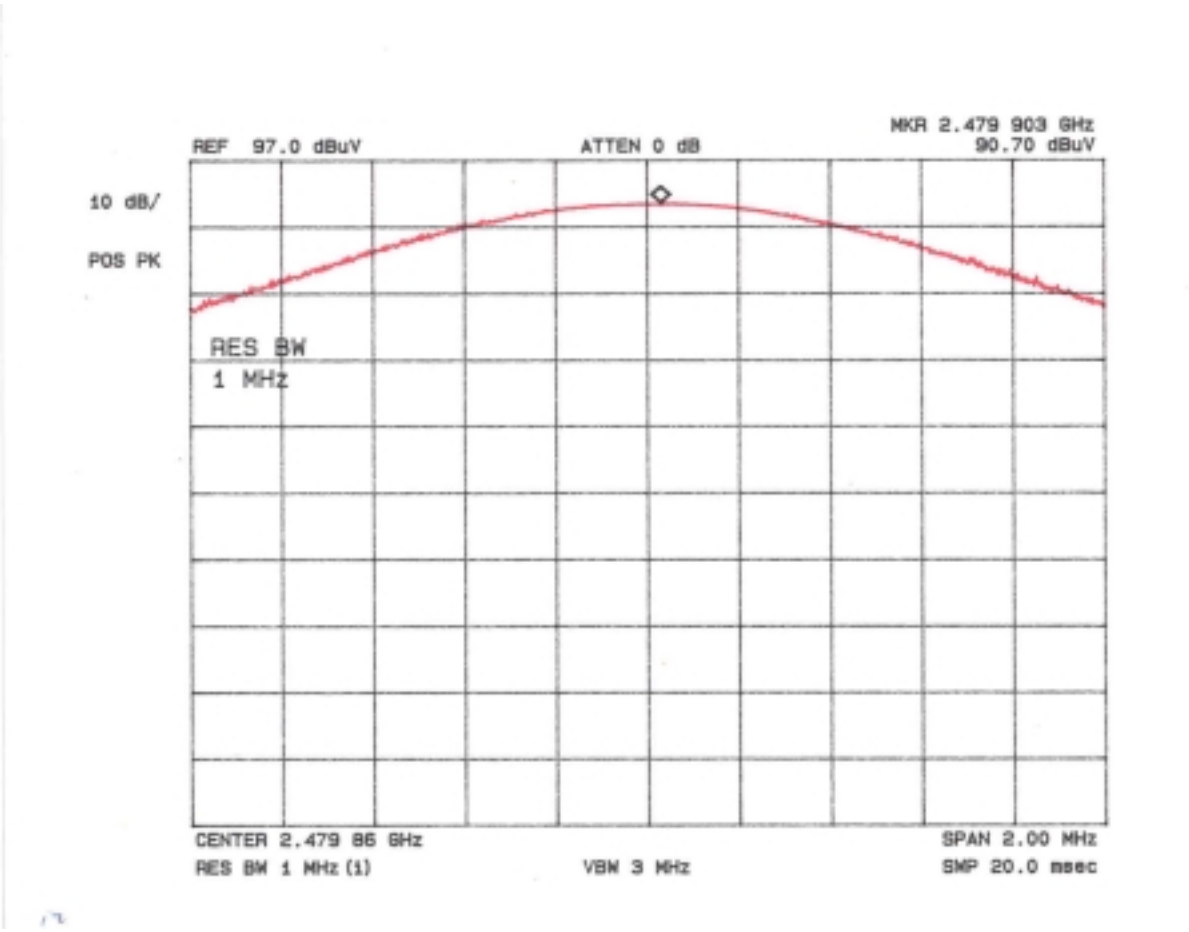
Plot 9: Low Channel – operating in Transmit Mode; High Power

Measured using Microwave Amplifier



Plot 10: Middle Channel – operating in Transmit Mode; High Power

Measured using Microwave Amplifier

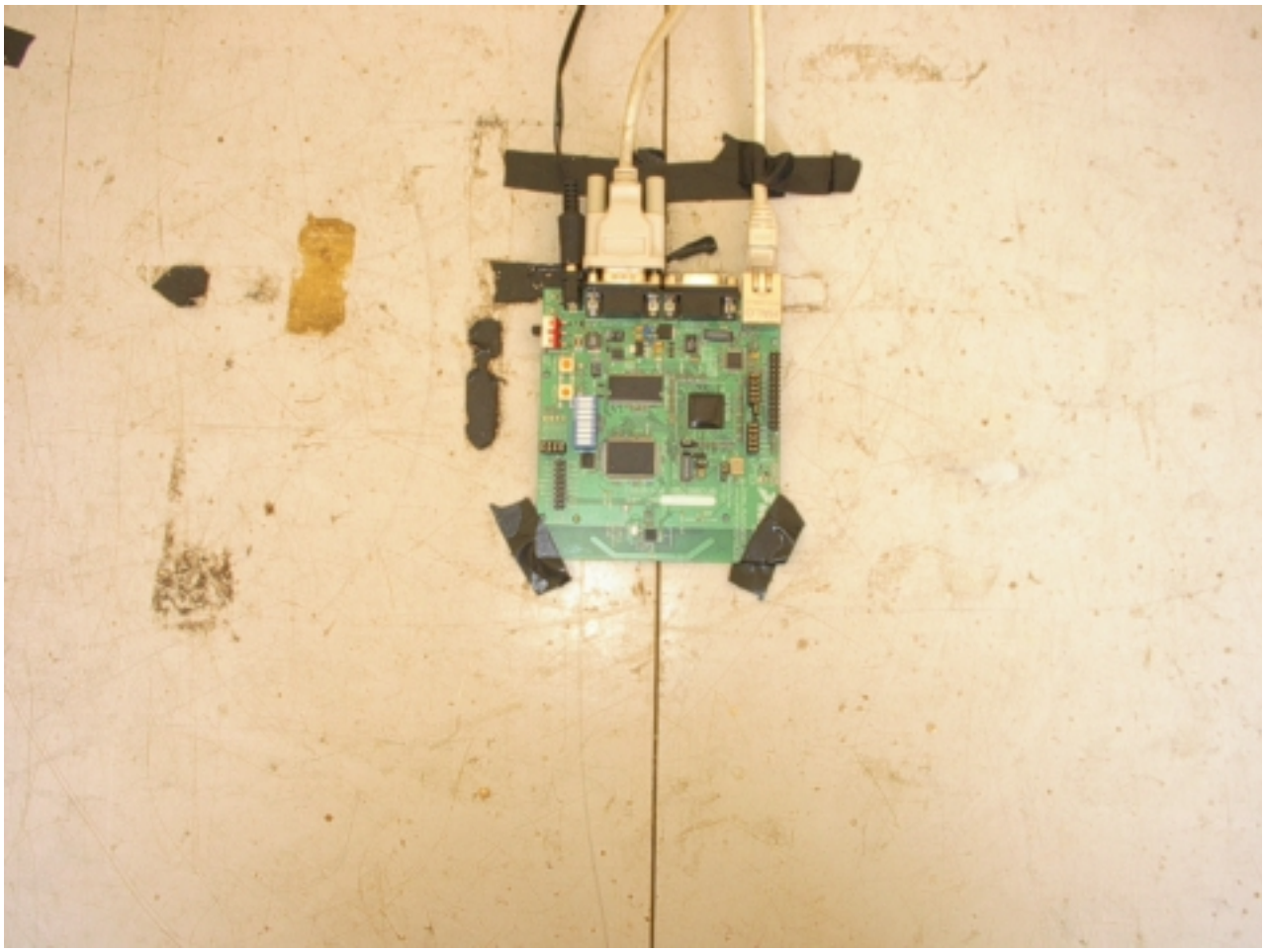


Plot 11: High Channel – operating in Transmit Mode; High Power

Measured using Microwave Amplifier

Appendix B: Photos

Emissions Test Setup Front View



Emissions Test Setup Top View

Appendix C: Measurement Data and Plots

Conducted Emissions Data 120Vac 60Hz; 240Vac 50Hz

Standard: FCC part 15/C 15.207; CISPR22 Class B

Table 1: 120Vac Line 1 Peaks

Frequency (MHz)	Limit (dBµV)	DelLim-Pk (dB)
0.3828	50.0	1.8
2.786	44.1	-1.9
0.6263	43.6	-2.4
0.6709	43.5	-2.5
2.831	43.4	-2.6
1.873	43.2	-2.8
0.7225	43.1	-2.9

Table 2: 120Vac Line 1 Average

Frequency (MHz)	Limit (dBµV)	DelLim-Pk (dB)
0.3808	45.3	-2.9
0.6197	38.2	-7.8
0.6709	37.5	-8.5
2.713	36.6	-9.4
1.815	36.4	-9.6
3.163	35.1	-10.9

Table 3: 120Vac Line 2 Peaks

Frequency (MHz)	Limit (dBµV)	DelLim-Pk (dB)
0.3808	44.5	-3.7
1.853	39.7	-6.3
1.805	39.5	-6.5
1.003	39.4	-6.6
0.6197	39.0	-7.0
1.532	39.0	-7.0
1.903	38.7	-7.3

Table 4: 120Vac Line 2 Average

Frequency (MHz)	Limit (dBµV)	DelLim-Pk (dB)
N/A all levels below Average limit line.		

Table 5: 240Vac Line 1 Peaks

Frequency (MHz)	Limit (dBµV)	DelLim-Pk (dB)
0.1532	70.5	14.7
0.1825	69.0	14.7
0.3081	60.2	10.2
0.5724	52.7	6.7
0.8031	47.6	1.6
1.712	45.4	-0.6
2.615	44.7	-1.3

Table 6: 240Vac Line 1 Average

Frequency (MHz)	Limit (dBµV)	DelLim-Pk (dB)
0.5785	30.7	-15.3
0.6263	30.4	-15.6
0.7225	29.7	-16.3
0.4324	30.8	-16.4
1.641	28.9	-17.1
2.56	28.6	-17.4

Table 7: 240Vac Line 2 Peaks

Frequency (MHz)	Limit (dBµV)	DelLim-Pk (dB)
0.1557	70.9	15.3
0.2173	67.2	14.3
0.4324	56.0	8.8
0.5068	52.4	6.4
0.6816	47.7	1.7
1.581	44.8	-1.2
2.493	42.0	-4.0

Table 8: 240Vac Line 2 Average

Frequency (MHz)	Limit (dBµV)	DelLim-Pk (dB)
1.468	35.0	-11.0
1.356	34.9	-11.1
1.408	34.8	-11.2
1.508	34.7	-11.3
1.163	34.0	-12.0
0.5815	33.5	-12.5

Radiated Emissions – 120 Vac 60Hz

Table 9: FCC Class B - 3m

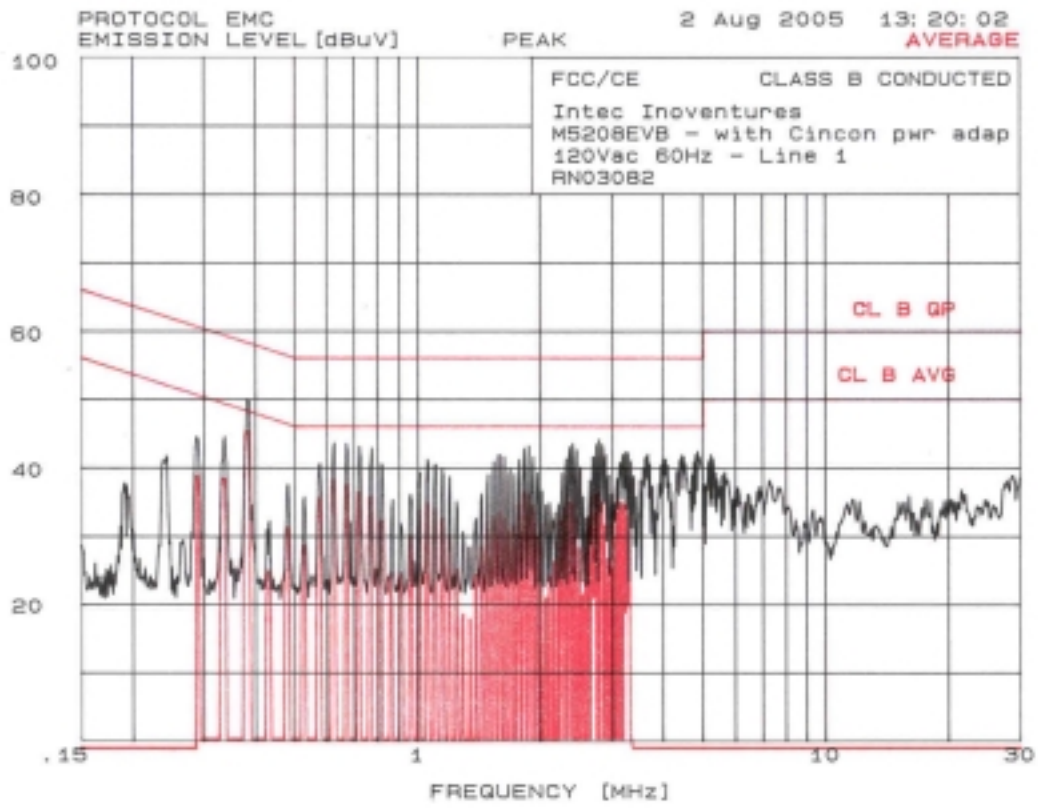
Frequency (MHz)	Pol	Hgt (m)	Angle (deg)	Uncor-Pk (dBµV)	Tot Corr (dB)	Peak (dBµV/m)	QP Lmt (dBµV/m)	DelLim-Pk (dB)	QP (dBµV/m)	DelLim-QP (dB)
83.33857	Vert	0.0	270.00	24.20	10.07	34.27	40.00	-5.73	29.61	-10.39
133.85400	Horz	3.0	110.00	18.10	16.66	34.76	43.50	-8.74		
138.05000	Horz	3.0	100.00	17.70	16.89	34.59	43.50	-8.91		
148.38600	Horz	3.0	90.00	16.80	17.21	34.01	43.50	-9.49		
223.21022	Horz	2.0	140.00	25.10	13.16	38.26	46.00	-7.74	37.61	-8.39
260.40100	Horz	2.0	120.00	23.70	14.87	38.57	46.00	-7.43		
297.51543	Horz	2.0	100.00	21.90	17.18	39.08	46.00	-6.92		
334.90003	Horz	2.0	110.00	25.80	16.98	42.78	46.00	-3.22	42.06	-3.94
833.25533	Horz	2.0	80.00	12.80	25.90	38.70	46.00	-7.30		

Radiated Emission - 240 Vac 50Hz

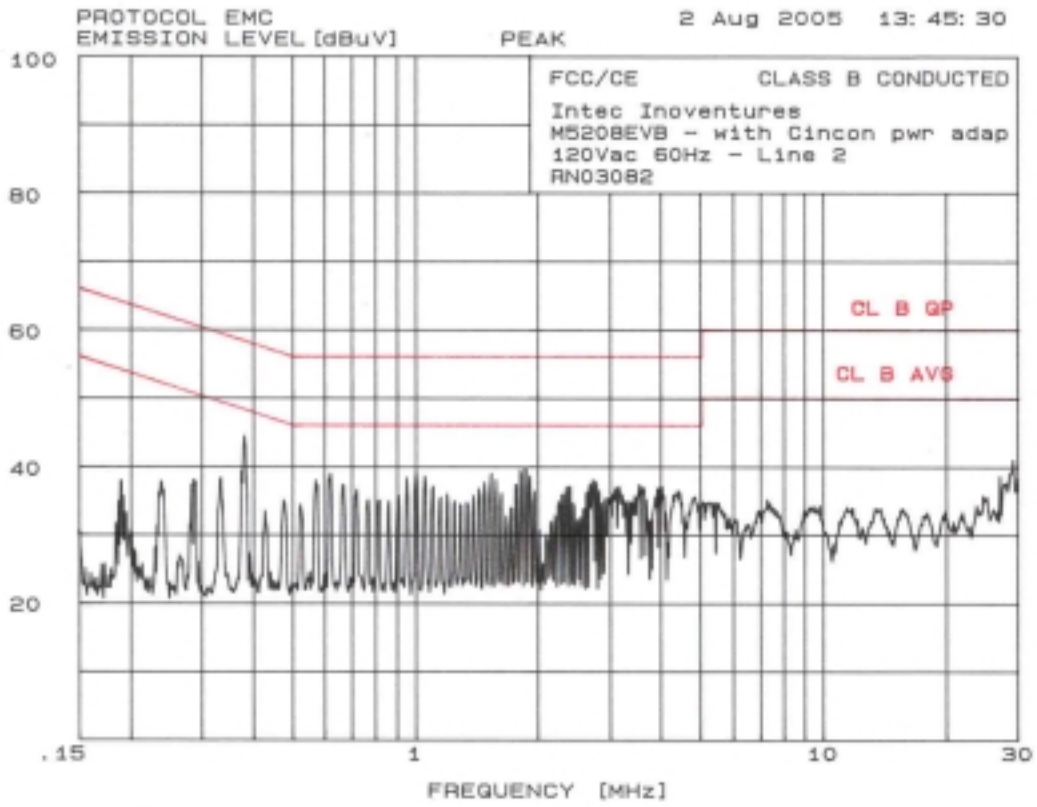
Table 10: CISPR22 Class B – 3m

Frequency (MHz)	Pol	Hgt (m)	Angle (deg)	Uncor-Pk (dBµV)	Tot Corr (dB)	Peak (dBµV/m)	QP Lmt (dBµV/m)	DelLim-Pk (dB)	QP (dBµV/m)	DelLim-QP (dB)
83.33857	Vert	0.0	270.00	24.20	10.07	34.27	39.50	-5.23	29.61	-9.89
133.85400	Horz	3.0	110.00	18.10	16.66	34.76	39.50	-4.74		
138.05000	Horz	3.0	100.00	17.70	16.89	34.59	39.50	-4.91		
148.38600	Horz	3.0	90.00	16.80	17.21	34.01	39.50	-5.49		
223.21022	Horz	2.0	140.00	25.10	13.16	38.26	39.50	-1.24	37.61	-1.89
260.40100	Horz	2.0	120.00	23.70	14.87	38.57	46.50	-7.93		
297.51543	Horz	2.0	100.00	21.90	17.18	39.08	46.50	-7.42		
334.90003	Horz	2.0	110.00	25.80	16.98	42.78	46.50	-3.72	42.06	-4.44
833.25533	Horz	2.0	80.00	12.80	25.90	38.70	46.50	-7.80		

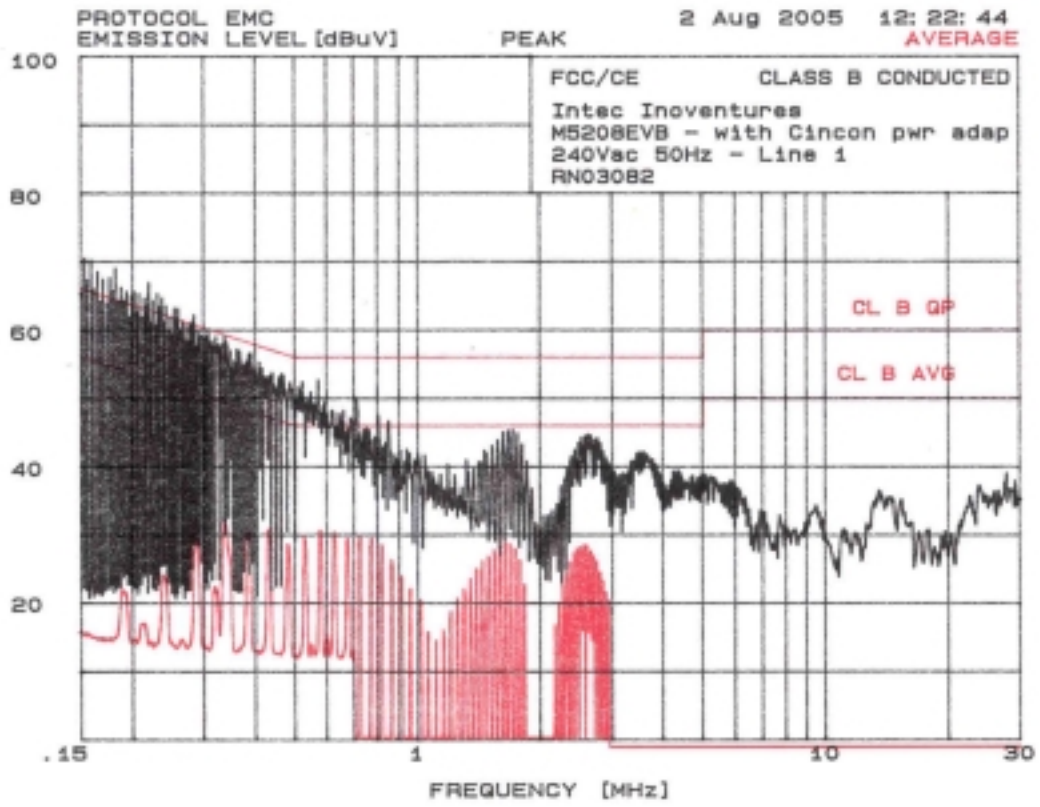
Conducted Emission Plots



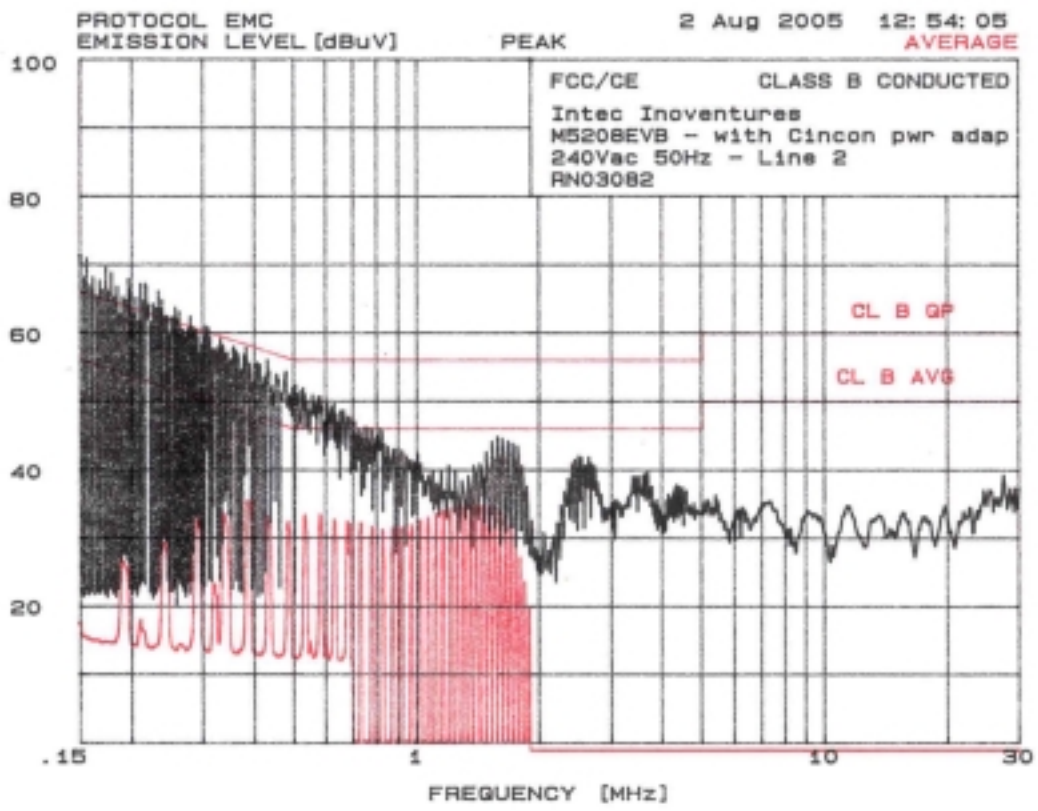
Conducted Emissions 120Vac 60 Hz Line 1



Conducted Emissions 120Vac 60 Hz Line 2



Conducted Emissions 240Vac 50 Hz Line 1



Conducted Emissions 240Vac 50 Hz Line 2