Cert. No. 1152.01
Electrical (EMC)

DATE: 02 March 2004

I.T.L. (PRODUCT TESTING) LTD.

FCC EMC Test

for

EMTS Inc.

Equipment under test:

IntegrAlarm Control Panel

(Transmitter Section)

IA-CP1

Approved by:_____
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

Cert. No. 1152.01
Electrical (EMC)

Measurement/Technical Report for

EMTS Inc.

IntegrAlarm Control Panel

(For Transmitter Section)

IA-CP1

FCC ID:RUF150701

02 March 2004

This report concerns: Original Grant x Class II change

Class B verification ____ Class A verification_____Class I change

Equipment type: Radio Telemetry Transmitter
Request Issue of Grant:
__x__Immediately upon completion of review

Limits used:
CISPR 22 _____ Part 15 __x

Measurement procedure used is ANSI C63.4-2001.

Application for Certification
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Applicant for this device:
(different from "prepared by")
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1. General Information

1.1 Administrative Information

Manufacturer:	EMTS Inc.
Manufacturer's Address:	300 Alden Road Markham, Ontario L3E4C1 Canada Tel: +1-905-946-8589 Fax: +1-905-947-0138
Manufacturer's Representative:	Doron Lavee
Equipment Under Test (E.U.T):	IntegrAlarm Control Panel
Equipment Model No.:	IA-CP1
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	07.01.04
Start of Test:	07.01.04
End of Test:	26.02.04
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15, Sub-part C

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), File No. IC 4025.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The IntegrAlarm wireless security system consisting of a Control Panel and a number of wireless peripheral units. This is a two way system operating on the ISM wireless band of 902-928 MHz, in frequency hopping mode, transmitting short (about 10 ms) packets of data, with each packet transmitted on a different frequency. Every packet is validated by means of a 16 bits CRC and ARQ (Autometic Repeat Request) ensure a new concept of reliability in wireless security systems. Time and frequency synchronization is maintained by a synchronization signal transmitted by the system Control Panel to the various peripherals every 3 minutes. The system operates on 56 pseudo random selected channels.

The IntegrAlarm Control Panel includes a digital communicator for reporting of events to the Central Station and a voice communicator for reporting of events to up to six regular PSTN subscribers.

The IntegrAlarm System offers several options for access to the operational system functions:

By means of the control panel keypad and display.

By means of a hand-held remote control (with up to five functions).

By means of any local or remote PSTN telephone.

By means of a local PC.

By means of a remote PC.

Voice guidance and voice help (optional dual-language) ensure ease of system operation in all access options listed above. A voice mailbox is also available.

The IntegrAlarm is designed for easy and quick installation; it can be programmed by any person with minimal computer skills, on a local PC with IntegrAlarm programming software. The system can also be installed and programmed by means of the Control Panel keypad and display. Technical assistance for installation and programming can be obtained from the Central Station service provider or the EMTS company web site. Upload/download of the complete Control Panel setup may be implemented by the Central Station or by a PC with the IntegrAlarm software package.

In its present configuration, the system includes five types of peripheral units:

Door / window sensor IntegrAlarm model IA-DWC1.

PIR sensor IntegrAlarm model IA-PIR1.

Smoke detector IntegrAlarm model IA-SMK1.

Handheld 5 functions keyfob IntegrAlarm model IA-FOB1.

Remote siren IntegrAlarm model IA-SRN1.

Installation instructions for the IntegrAlarm peripherals appear in the User and Installer Manuals for the respective units.

The Control Panel consists of an RF transceiver, a micro-controller, a non-volatile memory, a power supply, a user interface, a siren, a buzzer, a tamper switch and a battery.

The Control Panel is composed of the following principal parts:

Mounting plate.

Control Panel unit with keypad, display, electronic assembly, siren, speaker, microphone, 4 LEDs and battery compartment.

6 NiCd size AA batteries.

Wall mounted AC adapter (120 VAC to 9 VAC insulation transformer)

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2001. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing December 12, 2003).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Radiated Emission

The Open Site complies with the ±4 dB Normalized Site Attenuation requirements of ANSI C63.4-2001. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. Product Labeling

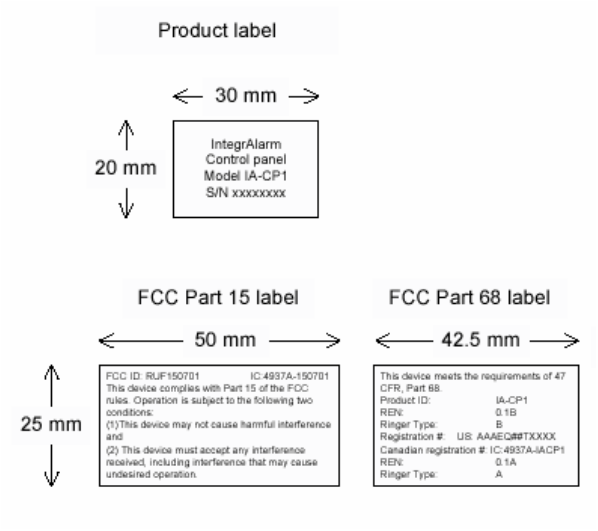

Figure 1. FCC Label

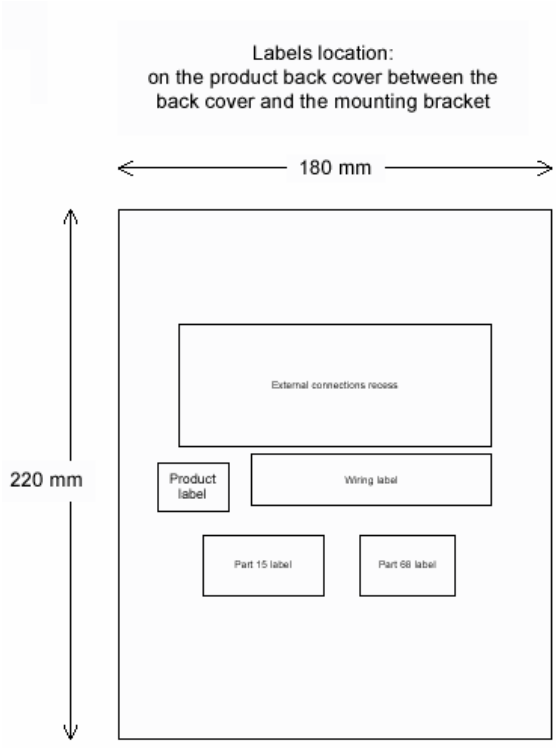

Figure 2. Location of Label on EUT

3. System Test Configuration

3.1 Justification

The control panel is a wall mounted, fixed installation.

The receiver section was tested separately to Sub-part B. The receiver input bandwidth matches the hopping channel bandwidths of the corresponding transmitters and shift in synchronizations with the transmitted signals.

It is impossible to test the IA-CP1 under normal operating conditions. This is because the data packets transmitted by the IntegrAlarm system are too short (<10 ms) for the system to be tested for emission levels by any standard test equipment. Moreover, because the system operates in frequency hopping mode, with each packet transmitted on a different frequency, no standard test equipment is capable of synchronizing with the system for test purposes.

Accordingly, the IA-CP1 EUT is provided with a Test Mode pushbutton switch on the PCB. Test Mode includes three transceiver options. One press of the Test Mode button selects continuous reception, a second press selects continuous transmission of carrier wave only, a third press selects continuous transmission of modulated signal, and a fourth press returns the EUT to normal operating mode. If continuous transmission of modulated signal is selected, the EUT will transmit binary data (1 – 0 – 1 – 0 ...) at its normal transmission rate.

Test Mode transmission / reception takes place on one of four predefined frequencies (903.500, 913.500, 916.500 or 926.500 MHz). The default is 903.500 MHz. The IA-CP1 tamper switch is used to change the frequency while the EUT is in Test Mode.

During the conducted emissions and spurious radiated emissions tests, the telephone cable, line cable and X10 cable were not connected.

3.2 EUT Exercise Software

The EUT does not include dedicated exercise software. The test procedure for the EUT is described in Section 3.1 above.

3.3 Special Accessories

No special accessories were needed to achieve compliance.

3.4 Equipment Modifications

1. The four separated ground areas on the component side of the PCB were connected together to form one common ground.
2. The following elements were removed from the power supply circuitry: L1, L2, L10, and L11.

Note: The above corrective actions were implemented to reduce radiated emission levels.
Since inductors were also removed from the power supply (which may increase conducted emission levels), Conducted emission on AC power lines was re-tested.

3.5 Configuration of Tested System

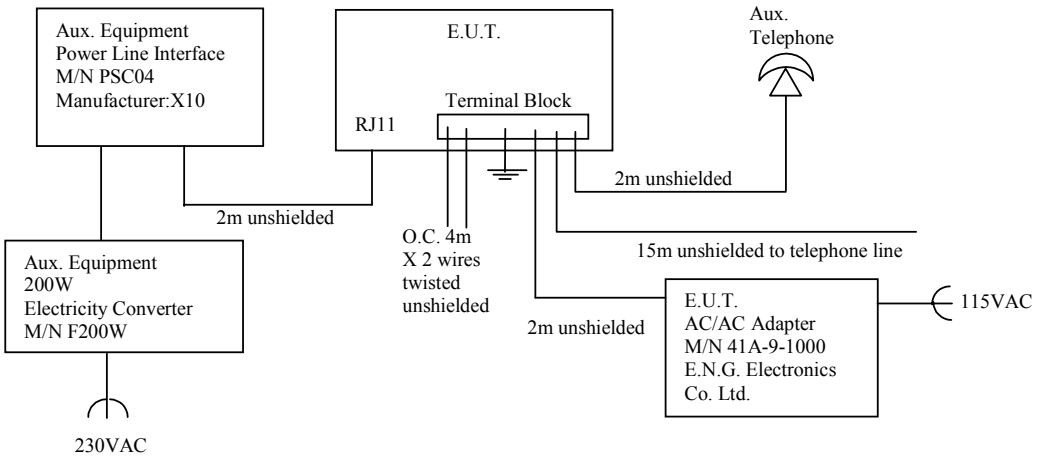

Figure 3. Configuration of Tested System

4. Block Diagram

4.1 Schematic Block/Connection Diagram

Intentionally Blank for Reasons of Confidentiality

Figure 4. E.U.T. Block Diagram

4.2 Theory of Operation

The IA-CP1 is part of the IntegrAlarm System. This system consists of a Control Panel and a number of Wireless Peripheral Units, such as wireless security sensors, wireless environmental sensors and wireless actuators such as sirens/strobes. Two-way digital communication between the Control Panel and the Wireless Peripheral Units provides full control and supervision of the system by the CP and the Central Station operator.

Each time any sensor (door/window, smoke detector, PIR) is activated, the sensor in question sends an event data packet to the IA-CP1. The Control Panel then sends back an acknowledgment data packet and displays a suitable message on the MMI display and/or generates an audio alarm via buzzer and/or fire siren (where appropriate). If the IntegrAlarm System is armed, the Control Panel then sends a suitable code to the monitoring service (central station) via PSTN.

In addition, if any sensor is tampered with, it sends an alarm data packet to the Control Panel. The Control Panel then sends back an acknowledgment data packet to the sensor in question and sends an alarm code to the monitoring service via PSTN (even if the Control Panel is not armed). If the IA-CP1 itself is tampered with, it also sends an alarm code to the monitoring service via PSTN.

5. Conducted and Radiated Measurement Photos

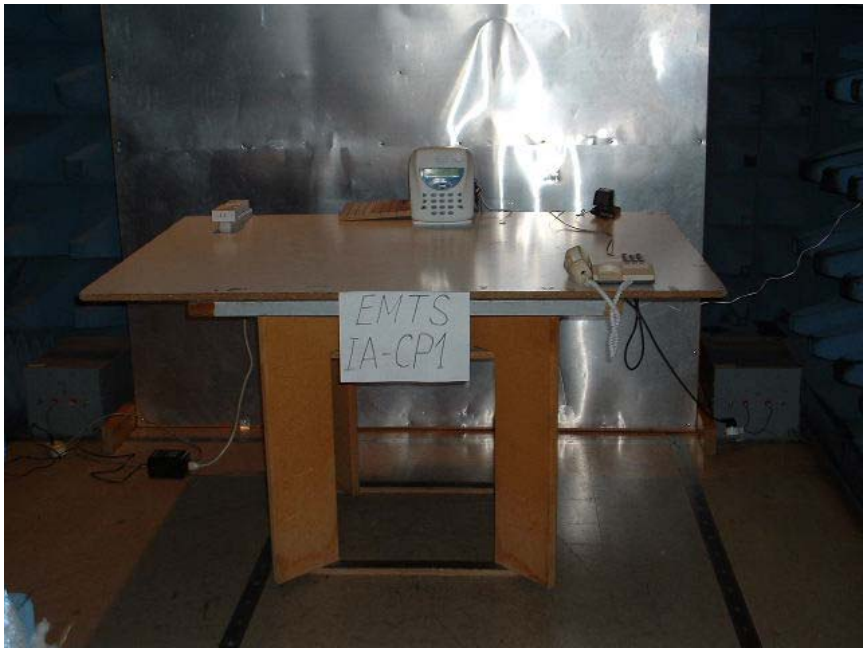

Figure 5. Conducted Emission Test. Front

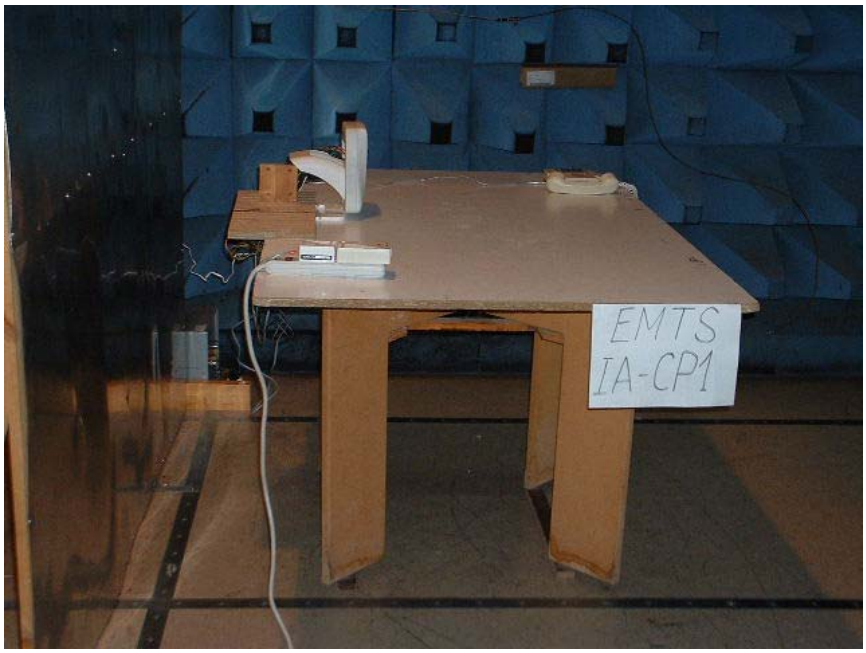

Figure 6. Conducted Emission Test. Side

Figure 7. Radiated Emission Test. Front

Figure 8. Radiated Emission Test. Front

Figure 9. Radiated Emission Test. Side

6. Conducted Emission Data

6.1 Test Specification

F.C.C., Part 15, Subpart B: Class B

6.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room (see section 3), with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via 50 Ohm / 50 µHn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak detector

6.3 Measured Data

JUDGEMENT: Passed by 14.6 dB

The margin between the emission levels and the specification limit is, in the worst case, 16.1 dB for the phase line at 2.46 MHz and 14.6 dB at 2.46 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart B, Class B specification requirements.

The details of the highest emissions are given in Figure 10 to Figure 13.

TEST PERSONNEL:

Tester Signature: _____ Date: 03.03.04

Typed/Printed Name: Y. Mordukhovitch

Conducted Emission

E.U.T Description	IntegrAlarm Control Panel
Type	IA-CP1
Serial Number:	Not designated

Specification:	F.C.C., Part 15, Subpart B: Class B
Lead:	Phase
Detectors:	Peak, Quasi-peak, Average

Frequency (MHz)	Peak Amplitude (dBµV)	Quasi-peak Amplitude (dBµV)	Specification (dB µV)	Pass/Fail	Margin (dB)
2.46	30.6	30.0	56.0	Pass	-26.0
4.92	25.1	24.4	56.0	Pass	-31.6
7.37	21.6	20.6	60.0	Pass	-39.4
12.29	28.1	27.4	60.0	Pass	-32.6
17.20	24.6	23.7	60.0	Pass	-36.3
18.66	26.3	25.0	60.0	Pass	-35.0

Figure 10. Detectors: Peak, QUASI-PEAK

Frequency (MHz)	Peak Amplitude (dBµV)	Average Amplitude (dBµV)	Specification (dB µV)	Pass/Fail	Margin (dB)
2.46	30.6	29.9	46.0	Pass	-16.1
4.92	25.1	24.3	46.0	Pass	-21.7
7.37	21.6	20.4	50.0	Pass	-29.6
12.29	28.1	27.3	50.0	Pass	-22.7
17.20	24.6	23.4	50.0	Pass	-26.6
18.66	26.3	23.6	50.0	Pass	-26.4

Figure 11. Detectors: Peak, AVERAGE .

Conducted Emission

E.U.T Description	IntegrAlarm Control Panel
Type	IA-CP1
Serial Number:	Not designated

Specification:	F.C.C., Part 15, Subpart B: Class B
Lead:	Neutral
Detectors:	Peak, Quasi-peak

Frequency (MHz)	Peak Amplitude (dB µV)	Quasi-peak Amplitude (dB µV)	Specification (dB µV)	Pass/Fail	Margin (dB)
2.46	31.9	31.4	56.0	Pass	-24.6
4.92	26.4	25.8	56.0	Pass	-30.2
7.37	22.2	21.3	60.0	Pass	-38.7
12.29	27.0	26.3	60.0	Pass	-33.7
17.20	20.5	19.4	60.0	Pass	-40.6
18.66	20.5	19.2	60.0	Pass	-40.8

Figure 12. Detectors: Peak, QUASI-PEAK

Frequency (MHz)	Peak Amplitude (dBµV)	Average Amplitude (dBµV)	Specification (dB µV)	Pass/Fail	Margin (dB)
2.46	31.9	31.4	46.0	Pass	-14.6
4.92	26.4	25.8	46.0	Pass	-20.2
7.37	22.2	21.1	50.0	Pass	-28.9
12.29	27.0	26.2	50.0	Pass	-23.8
17.20	20.5	19.0	50.0	Pass	-31.0
18.66	20.5	17.6	50.0	Pass	-32.4

Figure 13. Detectors: Peak, AVERAGE

6.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Calibration	Period
LISN	Fischer	FCC-LISN-2A	127	March 12, 2003	1 year
LISN	Fischer	FCC-LISN-2A	128	March 12, 2003	1 year
Receiver	HP	85420E/85422E	3427A00103/34	January 31, 2003	1 year
Printer	HP	ThinkJet2225	2738508357	N/A	N/A

7. Customer's Declaration

EMTS INC.
300 Alden Road
Markham, Ontario L3R 4C1
Canada

March 02, 2004

DECLARATION

To Whom It May Concern,

I hereby declare that the product, IntegrAlarm Smoke Detector model IA-SMK1, FCC ID RUF150705, complies with the following requirements of Part 15, Sub-part C, Section 15.247:

1. Number of hopping frequencies, Section 15.247 (a) (1).
2. Channel average time occupancy, Section 15.247 (a) (1).
3. Channel frequency separation, Section 15.247 (a) (1).
4. Receiver B.W. matching to transmitter B.W., Section 15.247 (a) (1).
5. Non-coordination requirement, Section 15.247 (a) (h).

Thank you,

D Lavee

Doron Lavee
Engineering Manager
EMTS Inc.

Tel. (905) 946-8477
Fax (905) 947-0138

8. Spurious Radiated Emission, Below 1 GHz

8.1 Test Specification

9kHz-1000 MHz, FCC, Part 15, Subpart C

8.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9kHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

In the frequency range 30-1000MHz, the readings were maximized by adjusting the antenna height between 1-4 meters. The turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

Turning the E.U.T on and off.
Using a frequency span less than 10 MHz.
Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

The E.U.T was tested in the operating frequencies of 916.5 and 926.5 MHz.

8.3 Test Data

JUDGEMENT: Passed by 6.2 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification. The margin between the emission level and the specification limit is 6.2 dB in the worst case at the frequency of 133.29 MHz, horizontal and vertical polarizations for the operating frequencies of 916.5 and 926.5 MHz.

The signals in the band 9 kHz – 30 MHz for the operating frequencies 916.5 and 926.5 MHz were below the spectrum analyzer noise level which is at least 6dB below the specification limit.

The details of the highest emissions are given in Figure 14.

TEST PERSONNEL:

Tester Signature: _____ Date: 03.03.04

Typed/Printed Name: E. Pitt

Radiated Emission

E.U.T Description	IntegrAlarm Control Panel
Type	IA-CP1
Serial Number:	Not designated

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal + Vertical
Antenna: 3 meters distance
Operating Frequencies: 916.5; 926.5 MHz

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

Frequency (MHz)	Peak Amp (dBµV/m)	QP Amp (dBµV/m)	Correction (dB)	Specification (dBµV/m)	Margin (dB)
114.64	29.9	27.1	13.3	43.5	-16.4
130.63	38.9	36.1	13.9	43.5	-7.4
133.29	39.9	37.3	14.1	43.5	-6.2
162.64	33.1	29.3	15.3	43.5	-14.2
242.65	34.4	26.5	19.8	46.0	-19.5
282.61	35.1	31.2	22.0	46.0	-14.8
400.57	32.5	30.0	18.5	46.0	-16.0
611.07	34.6	28.8	22.4	46.0	-17.2

Figure 14. Radiated Emission. Antenna Polarization: HORIZONTAL. Detectors: Peak, Quasi-peak

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

8.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	January 31, 2003	1 year
RF Section	HP	85420E	3427A00103	January 31, 2003	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	April 20, 2003	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 20, 2003	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 17, 2003	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet 2225	2738508357.0	N/A	N/A

8.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[dB\mu v/m]\ FS = RA + AF + CF$$

FS:	Field Strength [dBμv/m]
RA:	Receiver Amplitude [dBμv]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

9. Spurious Radiated Emission Above 1 GHz

9.1 Test Specification

1000-9500 MHz, FCC, Part 15, Subpart C

9.2 Radiated Emission Above 1 GHz

The E.U.T operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.
In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used. The test distance was 3 meters.
In the frequency range 2.9-9.5 GHz, a spectrum analyzer including a low noise amplifier was used. The test distance was 3 meters. During peak measurements, the I.F. bandwidth was 1 MHz, and video bandwidth 3 MHz. During average measurements, the I.F. bandwidth was 1 MHz and video bandwidth was 100 Hz. The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

9.3 Test Data

JUDGEMENT: Passed by 15.7 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification. The worst cases were:

for 916.5 MHz, 15.8 dB margin at 2749.30 MHz frequency, horizontal polarization.

for 926.5 MHz, 15.7 dB margin at 2779.40 MHz frequency, horizontal polarization

The details of the highest emissions are given in Figure 15 to Figure 22.

TEST PERSONNEL:

Tester Signature: _____ Date: 03.03.04

Typed/Printed Name: E. Pitt

Radiated Emission Above 1 GHz

E.U.T Description	IntegrAlarm Control Panel
Type	IA-CP1
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Test Distance: 3 meters
Operating Frequency: 916.433 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Peak

Freq. (MHz)	Peak Amp (dBµV/m)	Correction Factor (dB)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
2749.30	58.2	35.3**	74.0	-15.8
3666.70	50.5	7.6*	74.0	-23.5
4582.10	41.6	10.3*	74.0	-32.4
7331.50	43.9	16.6*	74.0	-30.1
8247.90	45.3	17.7*	74.0	-28.7
9164.30	46.2	19.3*	74.0	-27.8

Figure 15. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Peak

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp." includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description IntegrAlarm Control Panel
Type IA-CP1
Serial Number: Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Test Distance: 3 meters
Operating Frequency: 9163.43 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Amp (dBμV/m)	Correction Factor (dB)	Average Result (dBμV/m)	Average Specification (dB μV/m)	Avg. Margin (dB)
2749.30	58.2	35.3**	38.2	54.0	-15.8
3666.70	50.5	7.6*	30.5	54.0	-23.5
4582.10	41.6	10.3*	21.6	54.0	-32.4
7331.50	43.9	16.6*	23.9	54.0	-30.1
8247.90	45.3	17.7*	25.3	54.0	-28.7
9164.30	46.2	19.3*	26.2	54.0	-27.8

Figure 16. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp." includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Duty Cycle Factor = $20\log\frac{10}{100} = -20dB$

Note: Maximum transmission "ON" time is 10 msec.

"Average Result" = Average Amp + Duty Cycle Factor

Radiated Emission Above 1 GHz

E.U.T Description	IntegrAlarm Control Panel
Type	IA-CP1
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical
Frequency range: 1.0 GHz to 9.5 GHz
Test Distance: 3 meters
Detector: Peak
Operating Frequency: 916.433 MHz

Freq. (MHz)	Peak Amp (dBμV/m)	Correction Factor (dB)	Peak. Specification (dB μV/m)	Peak. Margin (dB)
2749.30	52.3	35.3**	74.0	-21.7
3666.70	51.0	7.6*	74.0	-23.0
4582.10	41.2	10.3*	74.0	-32.8
7331.50	44.2	16.6*	74.0	-29.8
8247.90	45.3	17.7*	74.0	-28.7
9164.30	46.2	19.3*	74.0	-27.8

Figure 17. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Peak

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp." includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description IntegrAlarm Control Panel
Type IA-CP1
Serial Number: Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical
Test Distance: 3 meters
Operating Frequency: 916.433 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Amp (dBμV/m)	Correction Factor (dB)	Average Result (dBμV/m)	Average Specification (dB μV/m)	Avg. Margin (dB)
2749.30	52.3	35.3**	32.3	54.0	-21.7
3666.70	51.0	7.6*	31.0	54.0	-23.0
4582.10	41.2	10.3*	21.2	54.0	-32.8
7331.50	44.2	16.6*	24.2	54.0	-29.8
8247.90	45.3	17.7*	25.3	54.0	-28.7
9164.30	46.2	19.3*	26.2	54.0	-27.8

Figure 18. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp." includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Duty Cycle Factor = $20\log\frac{10}{100} = -20dB$

Note: Maximum transmission "ON" time is 10 msec.

"Average Result" = Average Amp + Duty Cycle Factor

Radiated Emission Above 1 GHz

E.U.T Description	IntegrAlarm Control Panel
Type	IA-CP1
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Test Distance: 3 meters
Operating Frequency: 926.45 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Peak

Freq. (MHz)	Peak Amp (dBµV/m)	Correction Factor (dB)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
2779.40	58.3	35.3**	74.0	-15.7
3705.80	50.9	7.5*	74.0	-23.1
4532.30	41.5	10.3*	74.0	-32.5
7411.60	44.3	16.8*	74.0	-29.7
8338.10	45.0	17.7*	74.0	-29.0
9264.50	46.0	21.4*	74.0	-28.0

Figure 19. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Peak

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp." includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description IntegrAlarm Control Panel
Type IA-CP1
Serial Number: Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Test Distance: 3 meters
Operating Frequency: 926.45 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Amp (dBμV/m)	Correction Factor (dB)	Average Result (dBμV/m)	Average Specification (dB μV/m)	Avg. Margin (dB)
2779.40	58.3	35.3**	38.3	54.0	-15.7
3705.80	50.9	7.5*	30.9	54.0	-23.1
4532.30	41.5	10.3*	21.5	54.0	-32.5
7411.60	44.3	16.8*	24.3	54.0	-29.7
8338.10	45.0	17.7*	25.0	54.0	-29.0
9264.50	46.0	21.4*	26.0	54.0	-28.0

Figure 20. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp." includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

"Duty Cycle Factor" = $20\log\frac{10}{100} = -20dB$

Note: Maximum transmission "ON" time is 10 msec.

"Average Result" = Average Amp + Duty Cycle Factor

Radiated Emission Above 1 GHz

E.U.T Description	IntegrAlarm Control Panel
Type	IA-CP1
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical
Test Distance: 3 meters
Operating Frequency: 913.5 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Peak

Freq. (MHz)	Peak Amp (dBµV/m)	Correction Factor (dB)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
2779.40	57.3	35.3**	74.0	-16.7
3705.80	49.2	7.5*	74.0	-24.8
4532.30	40.6	10.3*	74.0	-33.4
7411.60	44.1	16.8*	74.0	-29.9
8338.10	45.0	17.7*	74.0	-29.0
9264.50	46.0	21.4*	74.0	-28.0

Figure 21. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Peak

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp." includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

Radiated Emission Above 1 GHz

E.U.T Description IntegrAlarm Control Panel
Type IA-CP1
Serial Number: Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical
Test Distance: 3 meters
Operating Frequency: 926.45 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Amp (dBμV/m)	Correction Factor (dB)	Average Result (dBμV/m)	Average Specification (dB μV/m)	Avg. Margin (dB)
2779.40	57.3	35.3**	37.3	54.0	-16.7
3705.80	49.2	7.5*	29.2	54.0	-24.8
4532.30	50.6	10.3*	20.6	54.0	-33.4
7411.60	44.1	16.8*	24.1	54.0	-29.9
8338.10	45.0	17.7*	25.0	54.0	-29.0
9264.50	46.0	21.4*	26.0	54.0	-28.0

Figure 22. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp." includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Preamplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss

"Duty Cycle Factor" = $20\log\frac{10}{100} = -20dB$

Note: Maximum transmission "ON" time is 10 msec.

"Average Result" = Average Amp + Duty Cycle Factor

9.4 Test Instrumentation Used, Radiated Measurements Above 1 GHz

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3411A00102	January 31, 2003	1 year
RF Section	HP	85420E	3427A00103	January 31, 2003	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	ThinkJet2225	2738508357	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 31,2003	2 year
Double Ridged Waveguide Horn Antenna	EMCO	3115	9702-5111	May 1, 2003	1 year
Horn Antenna	ARA	SWH-28	1007	October 28, 2003	1 year
Band Pass Filter	SERNO	22102-0001	322	August 15, 2003	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	April 10, 2003	1 year
Spectrum Analyzer	HP	8592L	3926A01204	January 31,2003	1 year
Attenuator	MACOM	ATT-10	N/A	July 27, 2003	1 year
Attenuator	MACOM	ATT-20	N/A	July 27, 2003	1 year

10. Maximum Transmitted Peak Power Output

10.1 Test procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through EXT ATTT=24dB and an appropriate coaxial cable. Special attention was taken to prevent Spectrum Analyzer RF input overload. The Spectrum Analyzer was set to 1 MHz resolution BW. Peak power level was measured at selected operation frequencies.

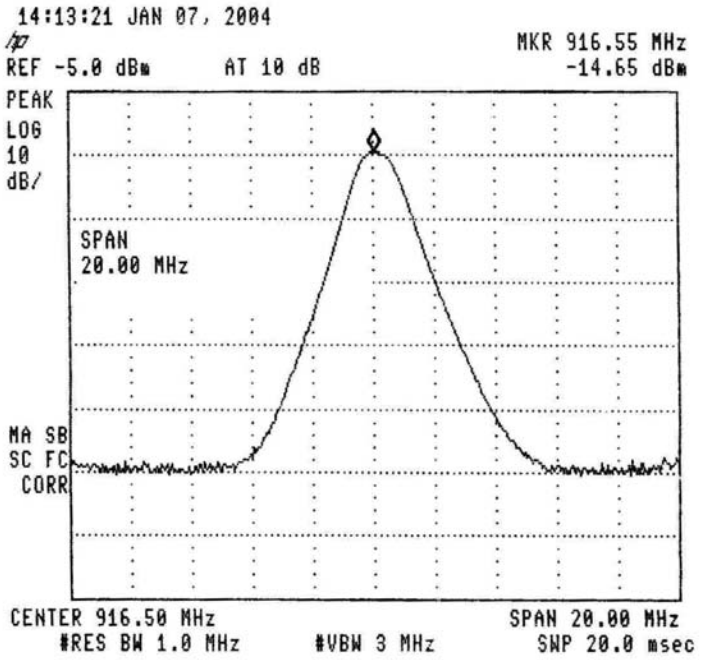

Figure 23.— 916.5 MHz

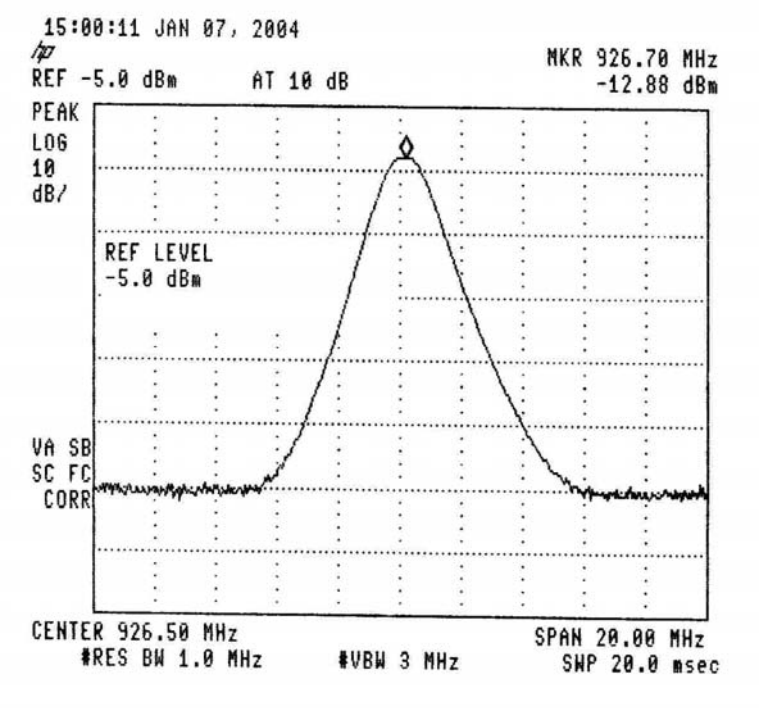

Figure 24.— 913.5 MHz

10.2 Results table

E.U.T. Description: IntegrAlarm Control Panel
Model No.: IA-CP1
Serial Number: Not Designated
Specification: FCC Part 15, Subpart C

Operation Frequency (MHz)	Reading (dBm)	EXT ATT + CL (dB)	Final Result (dBm)	Specification (dBm)	Margin (dB)
916.5	14.7	24.5	9.8	30.0	-20.2
926.5	12.9	24.5	11.6	30.0	-18.4

Figure 25 Maximum Power Output

JUDGEMENT: Passed by 18.4 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 03.03.04

Typed/Printed Name: Y. Mordukhovitch

10.3 Test Equipment Used.

Peak Power Output

Instrument	Manufacture	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	January 31, 2003	1 year
Cable	Avnet	MTS	N/A	September 9, 2003	1 year
Attenuator	MACOM	M3933/25-74	0056	November 13, 2003	1 year
Attenuator	MACOM	M3933/25-74	0202	November 13, 2003	1 year
Attenuator	MACOM	M3933/25-74	0211	November 13, 2003	1 year

Figure 26 Test Equipment Used

11. Peak Power Output Out of 902-928 MHz Band

11.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through a 24dB attenuator and an appropriate coaxial cable. The spectrum analyzer was set to 3.0 kHz resolution BW for the frequency range 30 kHz-300kHz and 100 kHz resolution BW for the frequencies above 300 kHz. The frequency range from
30 kHz to 9.5 GHz was scanned. Level of spectrum components out of the 902-928 MHz was measured at the selected operation frequencies.

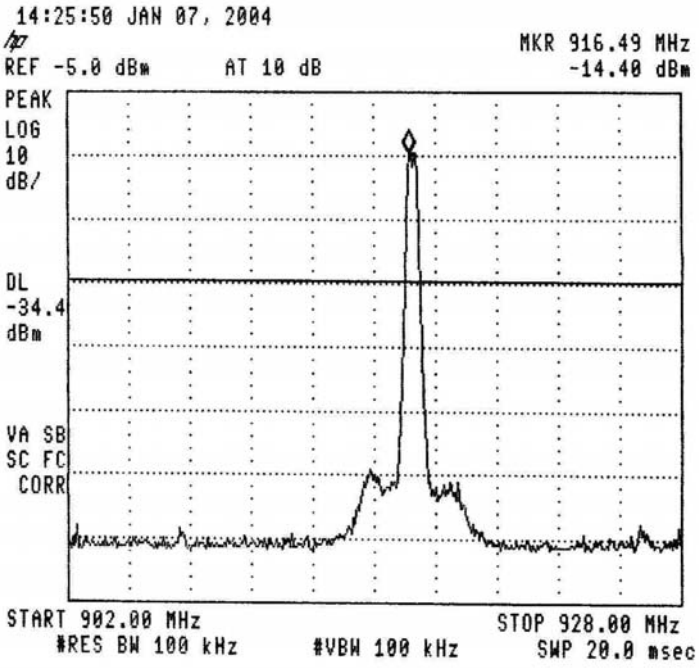

Figure 27.— 916.5 MHz

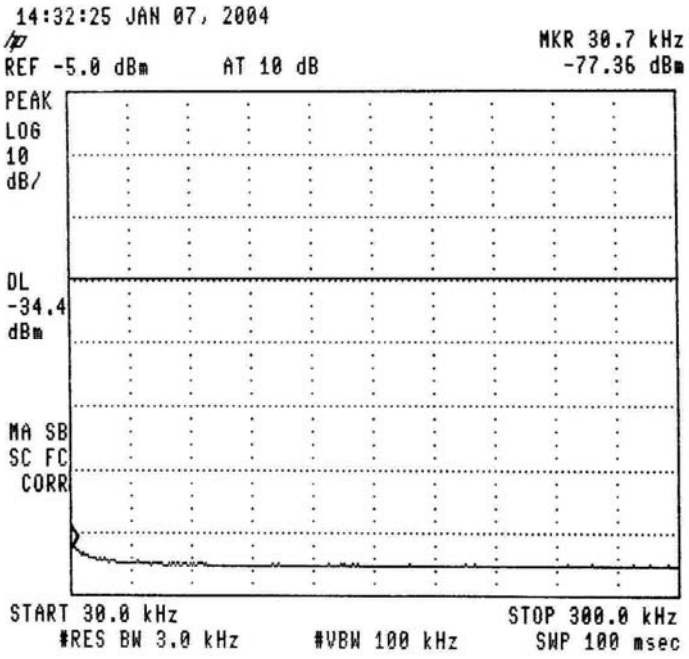

Figure 28.— 916.5 MHz

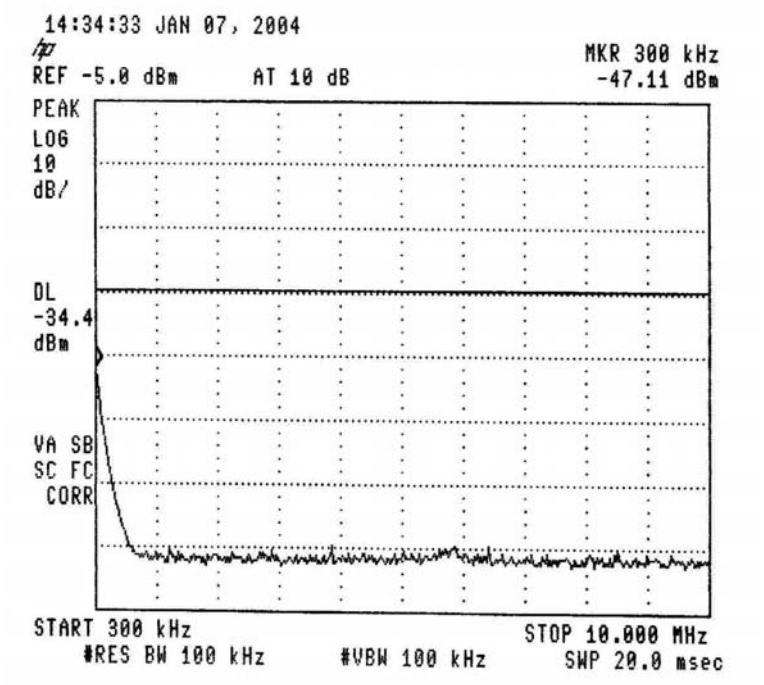

Figure 29.— 916.5 MHz

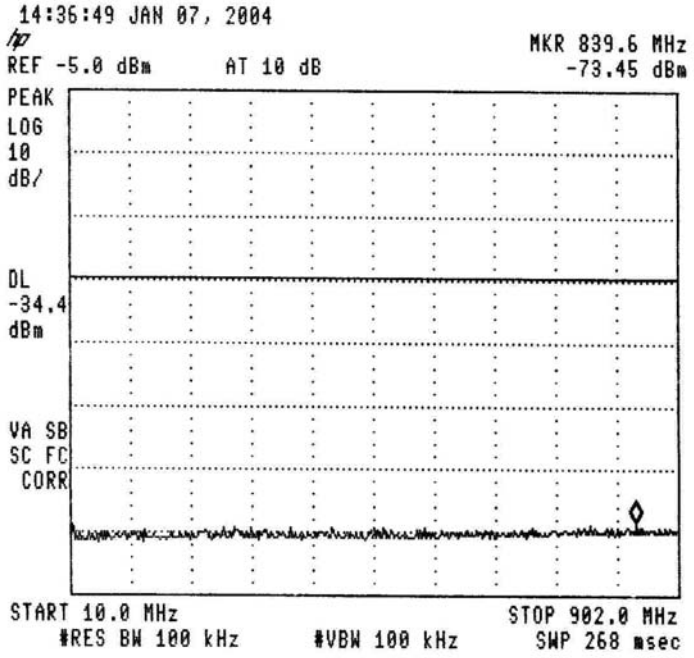

Figure 30.— 916.5 MHz

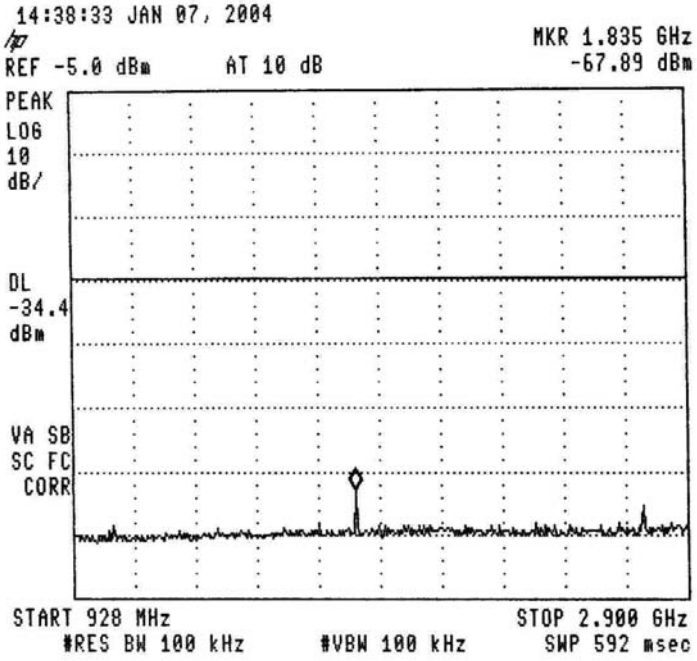

Figure 31.— 916.5 MHz

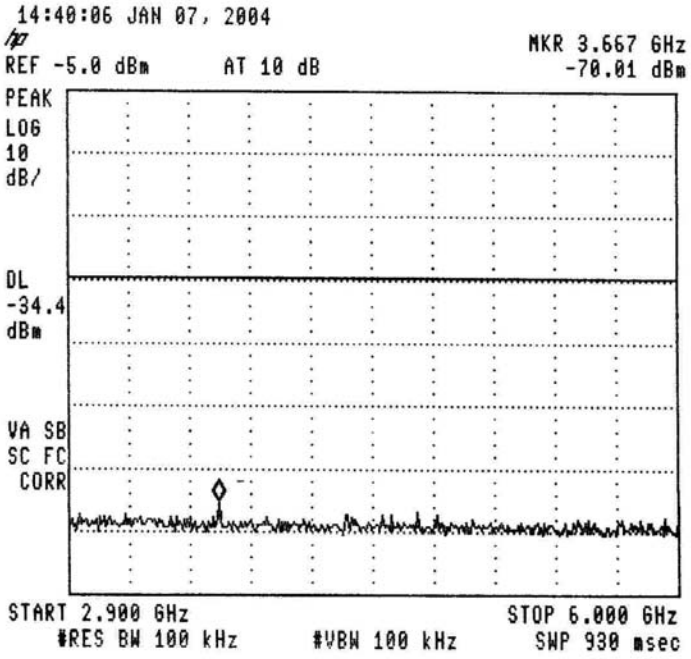

Figure 32.— 916.5 MHz

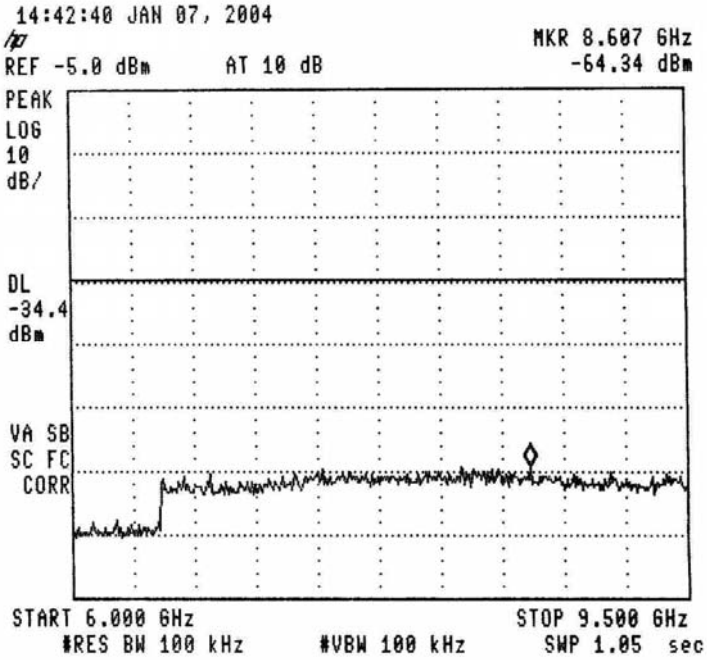

Figure 33.— 916.5 MHz

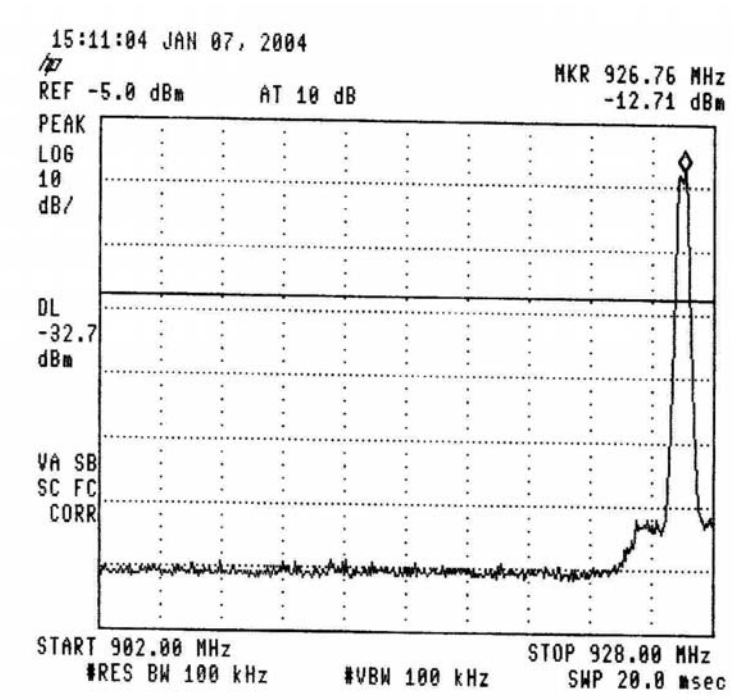

Figure 34.— 926.5 MHz

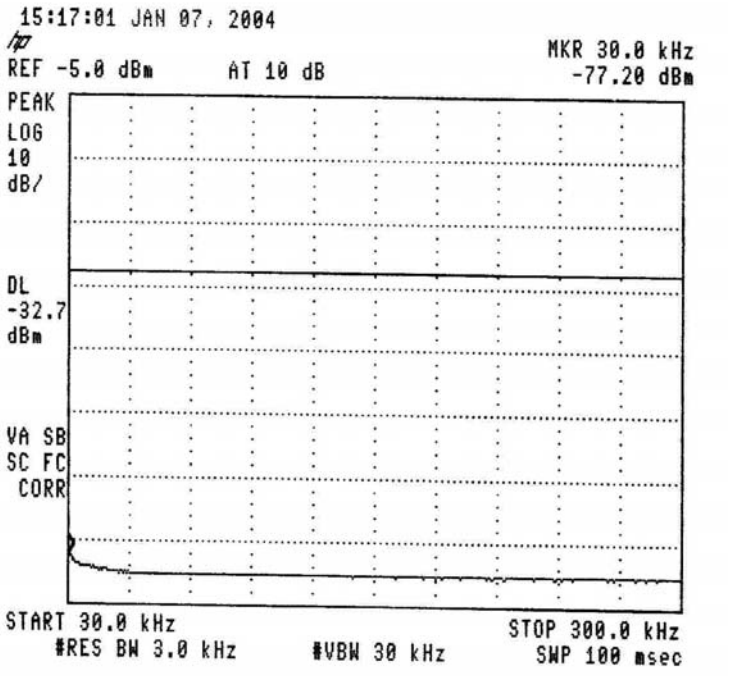

Figure 35.— 926.5 MHz

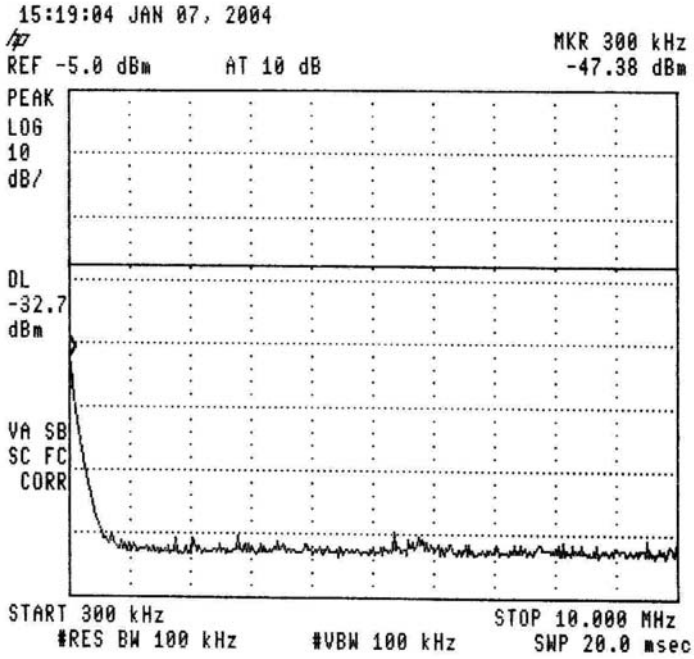

Figure 36.— 926.5 MHz

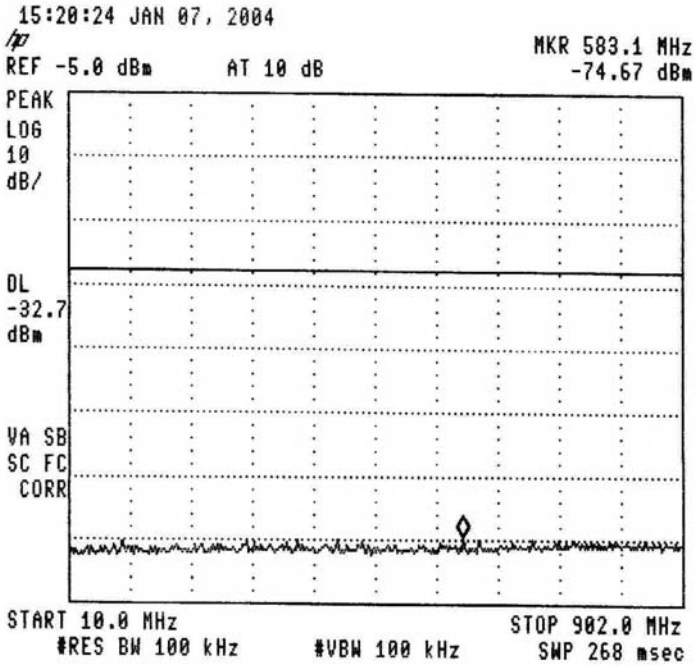

Figure 37.— 926.5 MHz

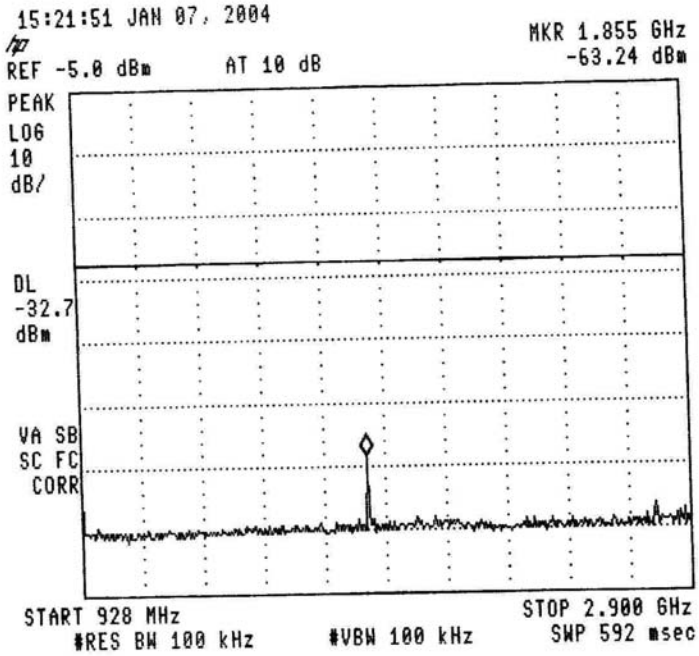

Figure 38.— 926.5 MHz

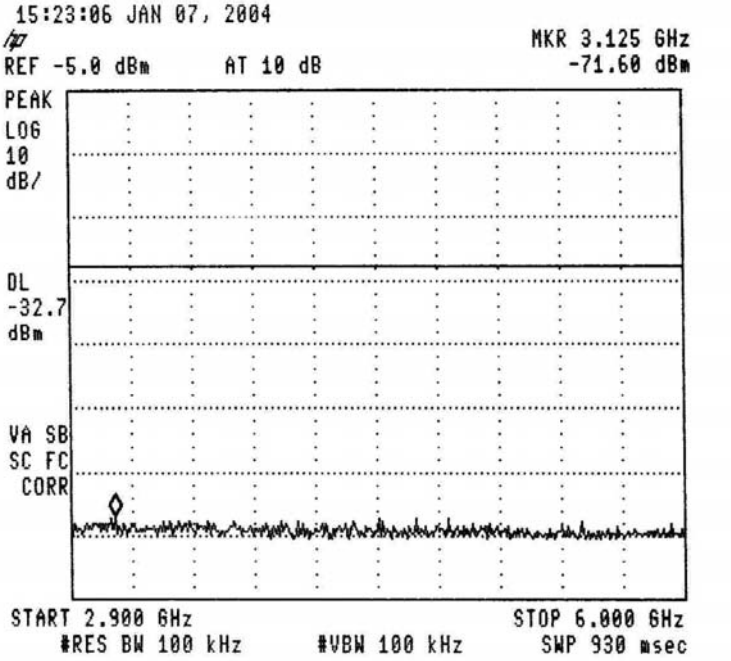

Figure 39.— 926.5 MHz

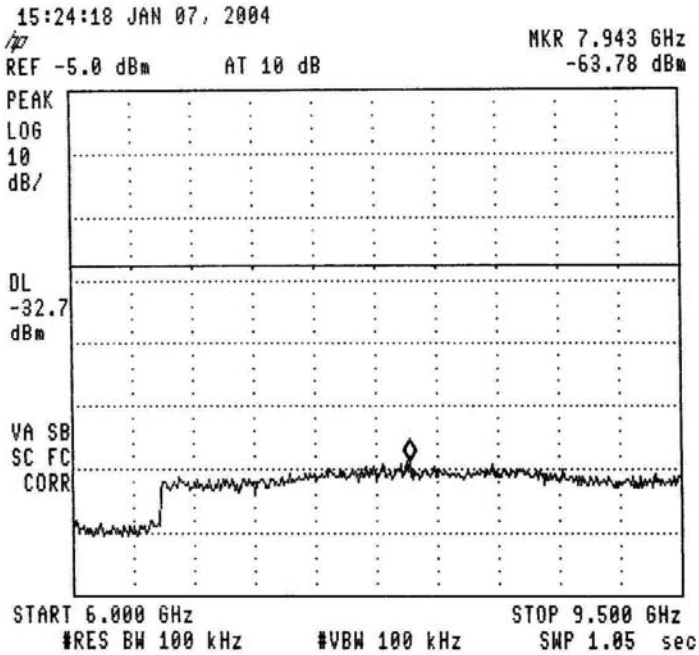

Figure 40.— 926.5 MHz

11.2 Results table

E.U.T. Description: IntegrAlarm Control Panel
Model No.: IA-CP1
Serial Number: Not Designated
Specification: FCC Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Reading (dBc)	Specification (dBc)	Margin (dB)
916.5	32.7	20.0	12.7
926.5	34.7	20.0	14.7

Figure 41 Peak Power Output of 902-928 MHz Band

JUDGEMENT: Passed by 12.7 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 03.03.04

Typed/Printed Name: Y. Mordukhovitch

11.3 Test Equipment Used.

Peak Power Output Out of 902-928 MHz Band

Instrument	Manufacture	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	January 31, 2003	1 year
Cable	Avnet	MTS	N/A	September 20, 2003	1 year
Attenuator	MACOM	M3933/25-74	0056	November 13, 2003	1 year
Attenuator	MACOM	M3933/25-74	0202	November 13, 2003	1 year
Attenuator	MACOM	M3933/25-74	0211	November 13, 2003	1 year

Figure 42 Test Equipment Used

12. 20 dB Bandwidth

12.1 Test procedure

The E.U.T. was set to the applicable test frequency. The E.U.T. antenna terminal was connected to the spectrum analyzer through a 24dB attenuator and an appropriate coaxial cable. The spectrum analyzer was set to 10 kHz resolution BW. The spectrum bandwidth of the E.U.T. at the point of 20 dB below maximum peak power was measured and recorded.

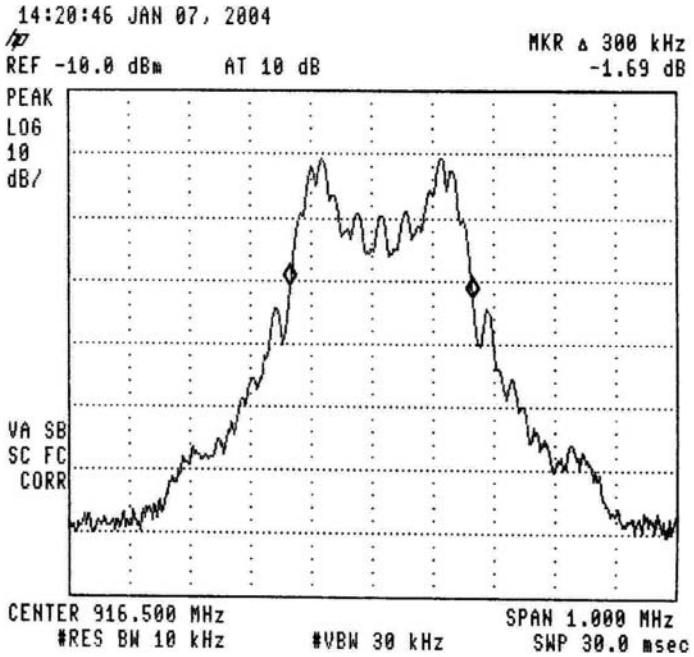

Figure 43 — 916.5 MHz

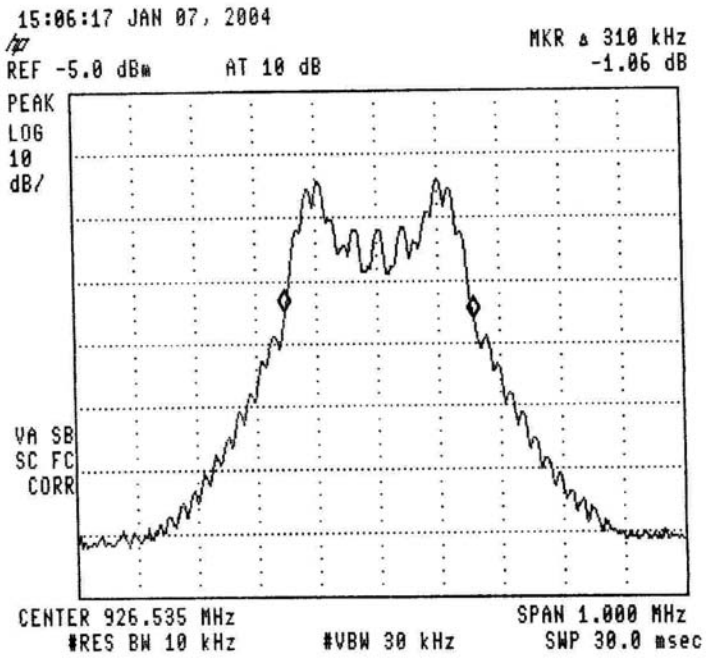

Figure 44 — 926.5 MHz

12.2 Results table

E.U.T. Description: IntegrAlarm Control Panel
Model No.: IA-CP1
Serial Number: Not Designated
Specification: FCC Part 15, Subpart C: (15.247-a2)

Operation Frequency (MHz)	Reading (kHz)	Specification (kHz)	Margin (kHz)
916.5	300	500	-200
926.5	310	500	-190

Figure 45 20 dB Bandwidth

JUDGEMENT: Passed by 190 kHz

TEST PERSONNEL:

Tester Signature: _____ Date: 03.03.04

Typed/Printed Name: Y. Mordukhovich

12.3 Test Equipment Used.

6 dB Minimum Bandwidth

Instrument	Manufacture	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	January 31, 2003	1 year
Cable	Avnet	MTS	N/A	September 20, 2003	1 year
Attenuator	MACOM	M3933/25-74	0056	November 13, 2003	1 year
Attenuator	MACOM	M3933/25-74	0202	November 13, 2003	1 year
Attenuator	MACOM	M3933/25-74	0211	November 13, 2003	1 year

Figure 46 Test Equipment Used

13. Band Edge Spectrum

[In Accordance with section 15.247(c)]

13.1 Test procedure

Enclosed are spectrum analyzer plots for the lowest operation frequency (916.5 MHz) and the highest operation frequency (926.5 MHz) in which the E.U.T. is planned to be used.

The E.U.T. antenna terminal was connected to the spectrum analyzer through a 24dB attenuator and an appropriate coaxial cable. The spectrum analyzer was set to 100 kHz resolution BW. Maximum power level below 902 MHz and above 928 MHz was measured relative to power level at 916.5 MHz and 926.5 MHz correspondingly.

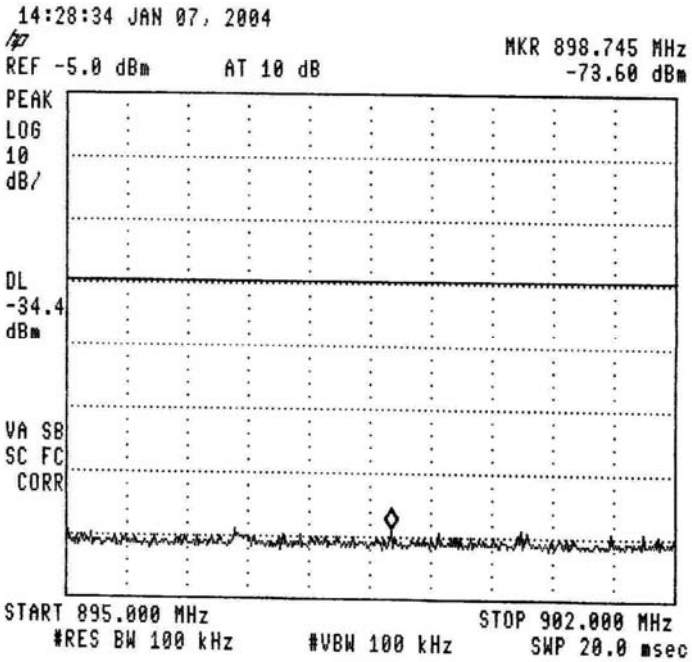

Figure 47 — 916.5 MHz

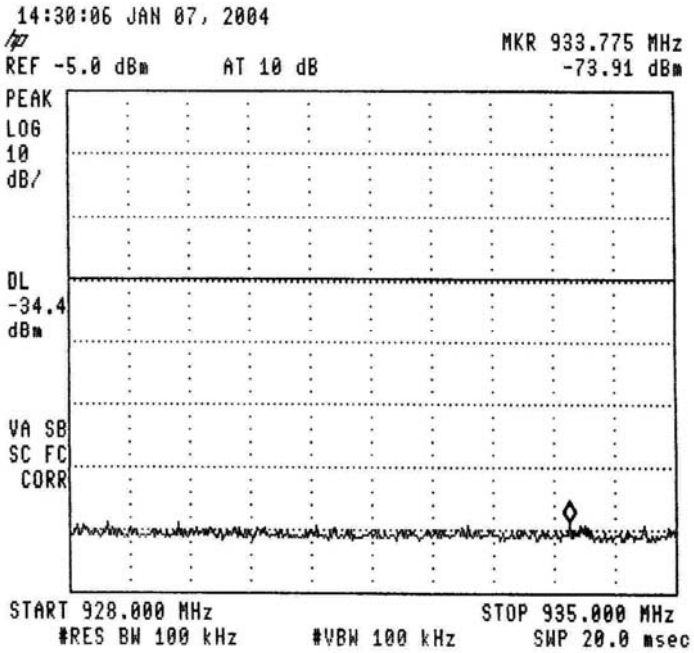

Figure 48 — 916.5 MHz

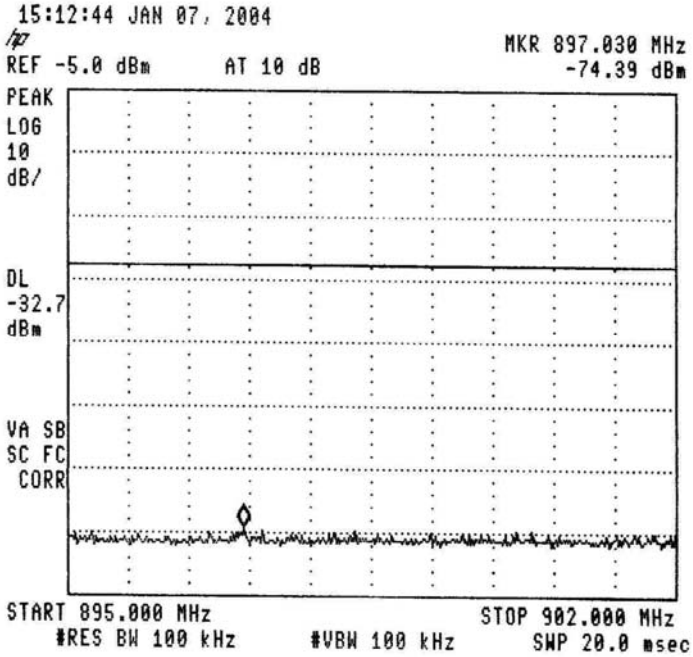

Figure 49 — 926.5 MHz

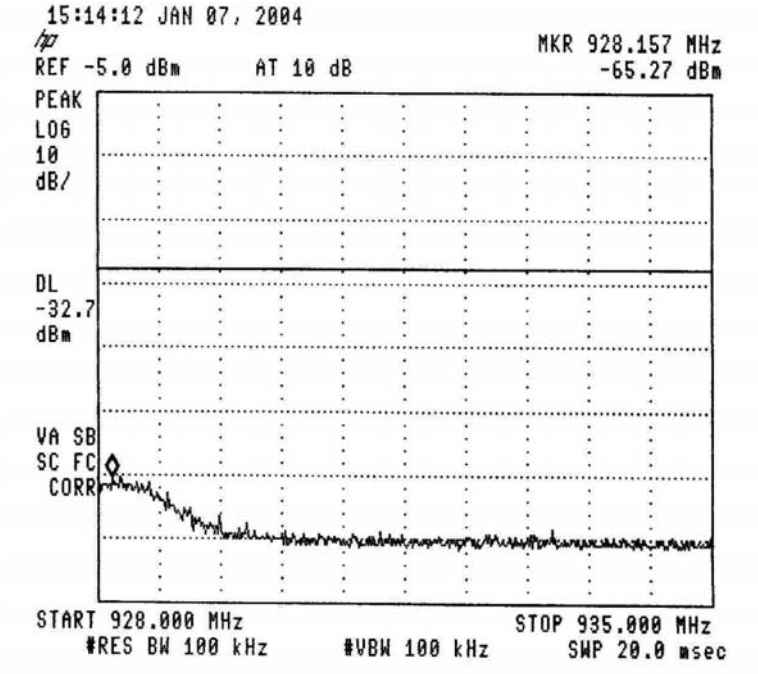

Figure 50 — 926.5 MHz

13.2 Results table

E.U.T. Description: IntegrAlarm Control Panel
Model No.: IA-CP1
Serial Number: Not Designated
Specification: FCC Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBc)	Specification (dBc)	Margin (dB)
916.5	898.745	59.2	20	39.2
926.5	928.157	52.6	20	32.6

Figure 51 Band Edge Spectrum

JUDGEMENT: Passed by 32.6 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 03.03.04

Typed/Printed Name: Y. Mordukhovitch

13.3 Test Equipment Used.

Band edge Spectrum

Instrument	Manufacture	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	January 31, 2003	1 year
Cable	Avnet	MTS	N/A	September 20, 2003	1 year
Attenuator	MACOM	M3933/25-74	0056	November 13, 2003	1 year
Attenuator	MACOM	M3933/25-74	0202	November 13, 2003	1 year
Attenuator	MACOM	M3933/25-74	0211	November 13, 2003	1 year

Figure 52 Test Equipment Used

14. Antenna Gain

The gain of the antenna is +2dBi.

EMTS INC.
300 Alden Road
Markham, Ontario L3R 4C1
Canada

February 23, 2004

IntegrAlarm IA-CP1 Control Panel (FCC ID RUF150701)
RF/controller module, antenna

This is to confirm that the antenna used with the above module is a printed circuit board, vertical half wavelength dipole antenna with a maximum gain of +2 dbi..

EMTS Inc.

D Lavee

Doron Lavee
Engineering Manager

Tel. (905) 946-8477
Fax (905) 947-0138

15. R.F Exposure/Safety

The E.U.T. is a wall mounted, fixed installation. The typical distance between the E.U.T. and the general population in normal use is at least 0.5m.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) Considering the worst case FCC limit at the operating frequency of 903.5 MHz the FCC limit is:

$$S = \frac{903.5}{1500} = 0.6\frac{mW}{cm^2}$$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is given by:

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Power: +15dBm =31.6mW (max. measured power, +11.6dBm at 926.5 MHz)

G_t- Antenna Gain: +2dBi = 1.58

R- Distance from Transmitter using 20cm worst case

(c) The peak power density is :

$$S_p = \frac{31.6x1.58}{4\pi(20)^2} = 9.93x10^{-3}\frac{mW}{cm^2}$$

$$P_{AV} = \frac{31.6\times 10}{200} = 1.58mW$$

(d) Considering the worst case transmission of 10 msec. “ON” and 200 msec. “OFF” (repetitive transmissions), the average power over 30 minutes is:

(e) The averaged power density of the E.U.T. is:

$$S_{AV} = \frac{1.58X1.58}{4\pi(20)^2} = 0.5X10^{-3}\frac{mW}{cm^2}$$

(f) This is more than 3 orders of magnitude below the FCC limit.

16. Photographs of Tested E.U.T.

Figure 53 Front View

Figure 54 Rear View With Battery Cover Closed

Figure 55 Rear View With Battery Cover Open

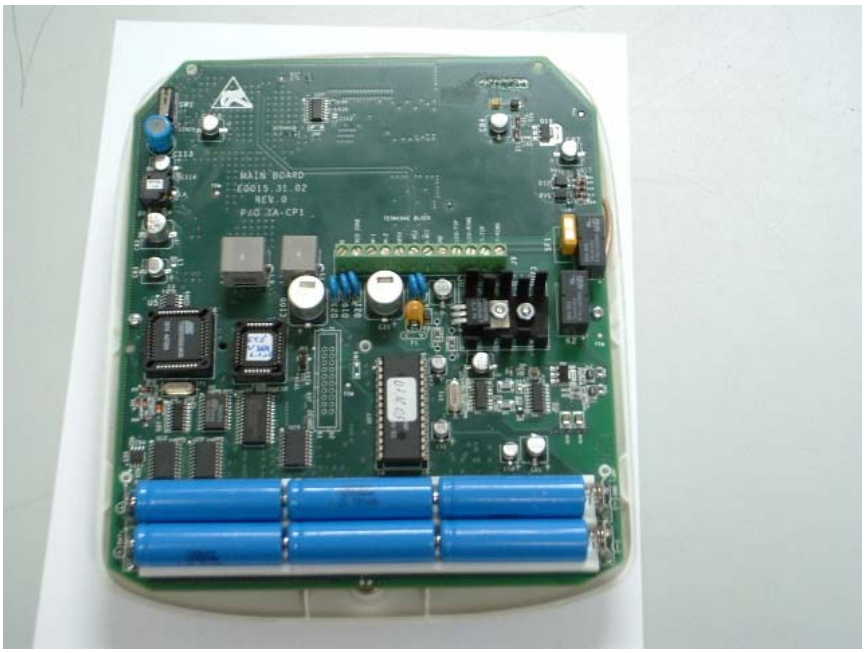

Figure 56 PCB 1 in Unit

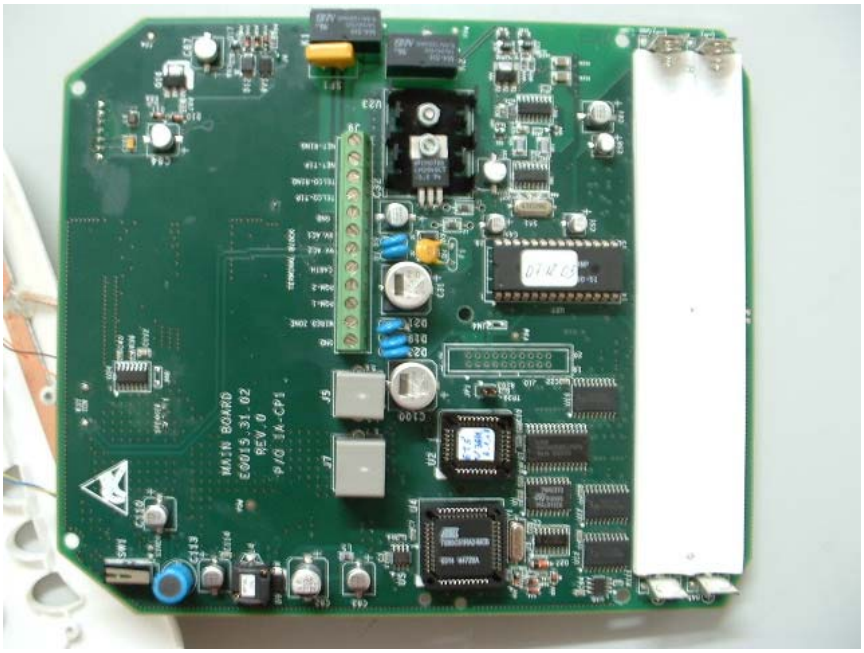

Figure 57 PCB 1 Side 1 Without Batteries

Figure 58 PCB 1 Side 2

Figure 59 PCB 1 Side 2 Without Shield

Figure 60 PCB 2 in Unit

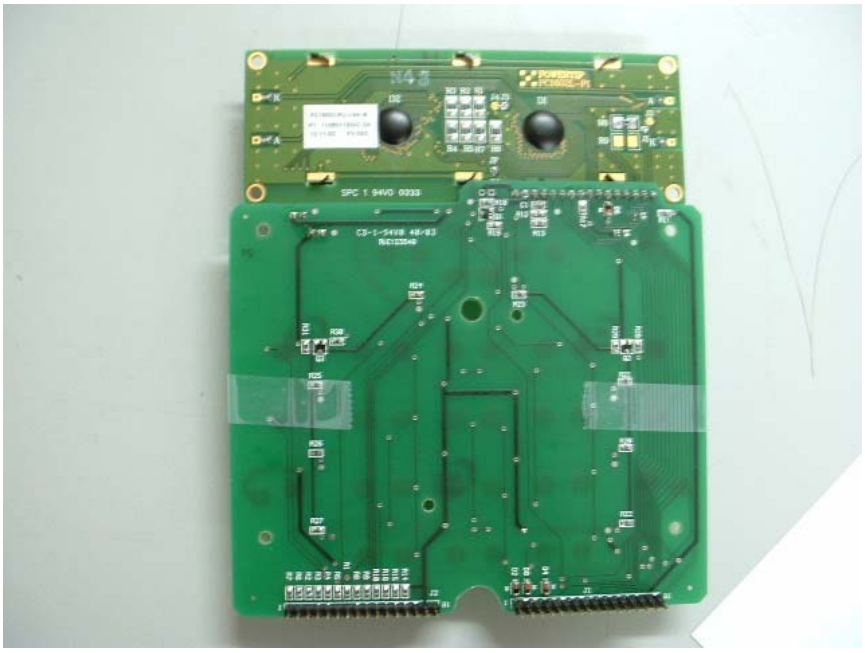

Figure 61 PCB 2 Side 1

Figure 62 PCB 2 Side 2 With Cover (Buttons)

Figure 63 PCB Side 2 PCB 2 Side 2 Without Cover (Buttons)