Cert. No. 1152.01
Electrical (EMC)

DATE: 27 May 2004

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

EMC Test

for

EMTS Inc.

Equipment under test:

IntegrAlarm Remote Siren/Strobe Unit

(Transmitter Section)

IA-SRN1

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
E. Pitt, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

This report must not be reproduced, except in full, without the written permission of I.T.L. (Product Testing) Ltd.
This report relates only to items tested.

Cert. No. 1152.01
Electrical (EMC)

Measurement/Technical Report for

EMTS Inc.

IntegrAlarm Remote Siren/Strobe Unit

(For Transmitter Section)

IA-SRN1

FCC ID:RUF150706

27 May 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
prepared by:
Ishaishou Raz
ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
e-mail Sraz@itl.co.il

Applicant for this device:
(different from "prepared by")
Doron Lavee
EMTS Inc.
300 Alden Road
Markham, Ontario, L3R4C1
Canada
Tel: +1-905-946-8589
Fax: +1-905-947-0138
e-mail: doronl@aqi.co.il

TABLE OF CONTENTS

1. GENERAL INFORMATION ---------- 5
- 1.1 Administrative Information 5
- 1.2 List of Accreditations 6
- 1.3 Product Description 7
- 1.4 Test Methodology 8
- 1.5 Test Facility 9
- 1.6 Measurement Uncertainty 9

2. PRODUCT LABELING ---------- 10

3. SYSTEM TEST CONFIGURATION ---------- 12
- 3.1 Justification 12
- 3.2 EUT Exercise Software 12
- 3.3 Special Accessories 12
- 3.4 Equipment Modifications 12
- 3.5 Configuration of Tested System 13

4. BLOCK DIAGRAM ---------- 13
- 4.1 Schematic Block/Connection Diagram 13
- 4.2 Theory of Operation 13

5. CUSTOMER'S DECLARATION ---------- 14

6. CONDUCTED AND RADIATED MEASUREMENT PHOTOS ---------- 15

7. CONDUCTED EMISSION DATA ---------- 16
- 7.1 Test Specification 16
- 7.2 Test Procedure 16
- 7.3 Measured Data 17
- 7.4 Test Instrumentation Used, Conducted Measurement 20

8. SPURIOUS RADIATED EMISSION, BELOW 1 GHZ ---------- 21
- 8.1 Test Specification 21
- 8.2 Test Procedure 21
- 8.3 Measured Data 21
- 8.4 Test Instrumentation Used, Radiated Measurements 22
- 8.5 Field Strength Calculation 23

9. SPURIOUS RADIATED EMISSION ABOVE 1 GHZ ---------- 24
- 9.1 Radiated Emission Above 1 GHz 24
- 9.2 Test Data 24
- 9.3 Test Instrumentation Used, Radiated Measurements Above 1 GHz 33

10. MAXIMUM TRANSMITTED PEAK POWER OUTPUT ---------- 34
- 10.1 Test procedure 34
- 10.2 Results table 35
- 10.3 Test Equipment Used. 36

11. PEAK POWER OUTPUT OUT OF 902-928 MHZ BAND ---------- 37
- 11.1 Test procedure 37
- 11.2 Results table 45
- 11.3 Test Equipment Used. 45

12. 20 DB BANDWIDTH ---------- 46
- 12.1 Test procedure 46
- 12.2 Results table 47
- 12.3 Test Equipment Used. 48

13. BAND EDGE SPECTRUM ---------- 49
- 13.1 Test procedure 49
- 13.2 Results table 51
- 13.3 Test Equipment Used. 52

14. ANTENNA GAIN ----------53

15. R.F EXPOSURE/SAFETY----------54

16. PHOTOGRAPHS OF TESTED E.U.T. ----------55

17. APPENDIX A - CORRECTION FACTORS ----------59

17.1 Correction factors for CABLE.....59
17.2 Correction factors for CABLE.....60
17.3 Correction factors for CABLE.....61
17.4 Correction factors for CABLE.....62
17.5 Correction factors for CABLE.....63
17.6 Correction factors for LOG PERIODIC ANTENNA 64
17.7 Correction factors for LOG PERIODIC ANTENNA 65
17.8 Correction factors for BICONICAL ANTENNA.....66
17.9 Correction factors for BICONICAL ANTENNA.....67
17.10 Correction factors for ACTIVE LOOP ANTENNA 68
17.11 Correction factors for Double-Ridged Waveguide Horn 69
17.12 Correction factors for Double-Ridged Waveguide Horn 70
17.13 Correction factors for Horn Antenna 71
17.14 Correction factors for BICONICAL ANTENNA.....72
17.15. Correction factors for BICONICAL ANTENNA.....73

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 Remote Siren/Strobe Unit
Equipment Model No.:	IA-SRN1
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	02.05.04
Start of Test:	02.05.04
End of Test:	24.05.04
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 includes a Control Panel and a number of wireless peripheral units. The system operates 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. The system operates on 56 pseudo random selected channels. Time and frequency synchronization is maintained by a synchronization signal transmitted by the system Control Panel to the various peripherals (including the IA SRN-1) every 3 minutes. The IntegrAlarm system is a two-way communication system; every data or command packet is validated using a high level of error detection code (CRC) and acknowledged back to the transmitting source. Automatic repeat request (ARQ) is provided in case of unacknowledged data or command packet.

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

Door / window magnetic sensor.
PIR motion detector.
Smoke detector.

5-function key fob (handheld remote control).
Remote siren / strobe.

The IntegrAlarm model IA-SRN1 remote siren / strobe unit consists of an RF transceiver, a micro-controller with non-volatile memory, siren generator and amplifier, a piezo element and horn, a high voltage power supply and a discharge tube, a power supply with back-up batteries, and a wall mounted mains isolation transformer, 115 to 12 VAC.

The remote siren / strobe unit is composed of the following principal parts:

Top cover in two sections: opaque white and transparent red.
Siren / strobe unit base with siren piezo element and horn, battery holder for 6 NiCad rechargeable batteries and two tamper switch actuators.
RF / controller, siren and strobe circuitry PCB with strobe discharge tube.
6 AA NiCad rechargeable batteries (7.2 V).
Wall mounted mains isolation transformer, 115 to 12 VAC.

The IA-SRN1 remote siren receiver continuously monitors the control panel synchronization and command packets. Upon receiving a command packet that contains the correct system and peripheral ID, the IA-SRN1 remote siren controller will acknowledge the receive packet and activate the siren in the requested pattern with or without the strobe.

In case of tamper, the IA-SRN1 sends an alarm packet to the control panel that in turn activates the siren if the system is armed.

Automatic transmission / reception periodic test, programmable from the control panel, periodically verifies the IA-SRN1 remote siren operation.

Communication principle – two-way.

Operating frequency range – 903.5-913.5 MHz (Transmitter)
916.5-926.5MHz (Receiver).

Mode of operation – frequency hopping; every packet is transmitted on a different pseudo random selected frequency.

Packet transmission duration – less than 10 milliseconds.

Packet transmission destination address – destination ID and system ID.

Received packet validation check – CRC.

Received valid packet acknowledgment – each received valid packet is acknowledged by the addressed destination.

Automatic repeat request (ARQ) – in case of unacknowledged data packet.

Automatic periodic test (programmable by the control panel) – periodic transmission of a test data packet and receipt of acknowledgment.

Siren – 110 dbA, dual tone 1400 Hz and 3000 Hz.

Siren patterns – Fire (ANSI S3.41 Temporal Pattern), General Alarm (0.25 sec alternate 1400/3000 Hz).

Strobe flash peak power – 150 watt min.

Strobe flash repetition rate – 1.5 flashes/sec.

Automatic self-test (transmission of a data packet and receipt of acknowledgment).

Power source – mains voltage with step-down isolation transformer 115 to 12 VAC.

Back-up batteries - 6 AA NiCad rechargeable batteries.

Back-up time for fully charged battery – 1 hour minimum.

Unit dimensions (mm): L-230, W-130, D-50.

Weight (grams): 950 including backup batteries and mains 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

FCC ID: RUF150706
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference and
(2) This device must accept any interference received, including interference that may cause undesired operation.

Figure 1. FCC Label

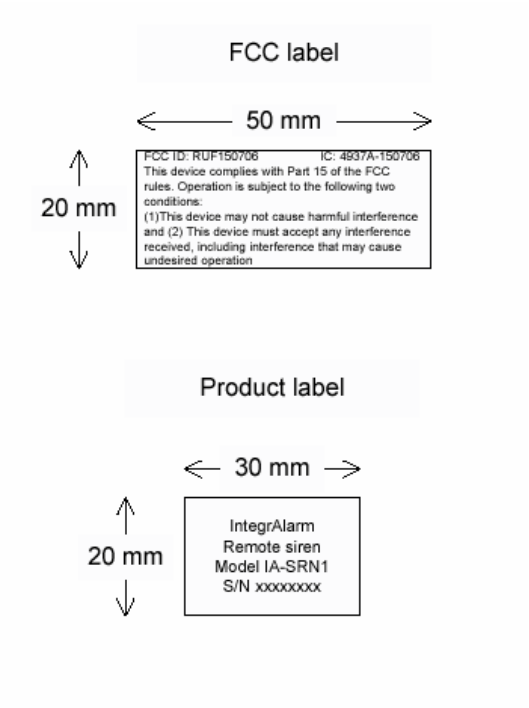

Figure 2. Product/FCC Label

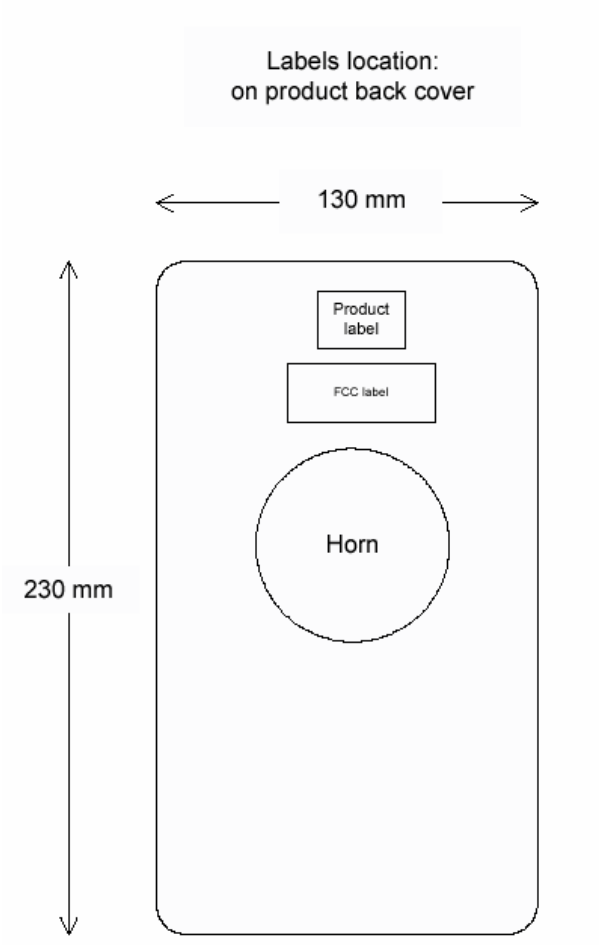

Figure 3. Location of Label on EUT

3. System Test Configuration

3.1 Justification

The E.U.T. is a fixed wall mounted installation, mounted in the vertical position.

It is impossible to test the IA-SRN1 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-SRN1 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). Two miniature switches are used on the EUT, one to select the test mode and the second to select the frequency.

3.2 EUT Exercise Software

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

3.3 Special Accessories

No special accessories were needed to achieve compliance.

3.4 Equipment Modifications

No equipment modifications are required and none have been made.

3.5 Configuration of Tested System

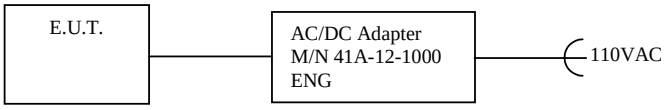

Figure 4. Configuration of Tested System

4. Block Diagram

4.1 Schematic Block/Connection Diagram

Intentionally Blank for Reasons of Confidentiality

4.2 Theory of Operation

The IA-SRN1 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.

The Control Panel may activate the siren and the strobe at any time by transmission of a data packet that contains activation command to the IA-SRN1 receiver, which is always on. The received data packet is decoded and validated by the IA-SNR1 micro-controller, which activates the siren and the strobe as required and transmits back an acknowledgment data packet to the control panel.

The siren is a dual-tone siren which transmits at a level of 110 dB. It sounds three different audio alarm patterns for fire, burglary and general alarms. Of these, the fire alarm is the ANSI S3.41 Temporal Pattern required by the United States National Fire Alarm Code: 0.5 sec "on", 0.5 sec "off", 0.5 sec "on", 0.5 sec "off", 0.5 sec "on", 1.5 sec "off". The strobe flashes every 0.5 sec irrespectively of the audio alarm pattern.

5. 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 Remote Siren model IA-SRN1, FCC ID RUF150706, 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

6. Conducted and Radiated Measurement Photos

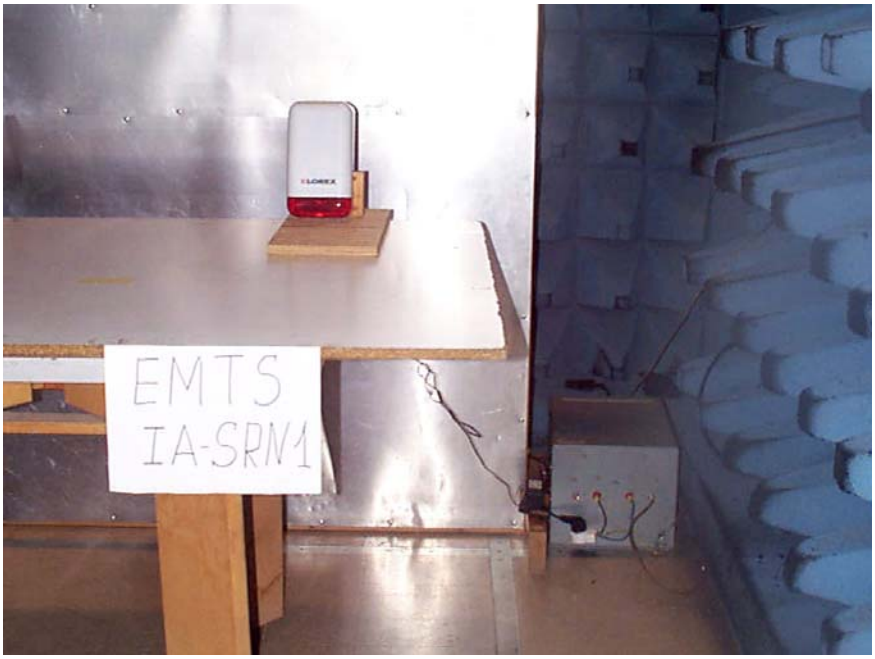

Figure 5. Conducted Emission Test.

Figure 6. Radiated Emission Test.

7. Conducted Emission Data

7.1 Test Specification

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

7.2 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

The E.U.T. was operated in the frequencies of 903.5 and 913.5 MHz.

7.3 Measured Data

JUDGEMENT: Passed by 33.4 dB

The test results for both operating frequencies were the same.

The margin between the emission levels and the specification limit is, in the worst case, 33.4 dB for the phase line at 0.66 MHz and 33.5 dB at 0.49 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 7 to Figure 10.

TEST PERSONNEL:

Tester Signature: _____ Date: 03.06.04

Typed/Printed Name: E. Pitt

Conducted Emission

E.U.T Description	IntegrAlarm Remote Siren/Strobe Unit
Type	IA-SRN1
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)
0.16	25.2	18.4	65.7	Pass	-47.3
0.17	25.8	16.5	65.0	Pass	-48.5
0.27	20.1	17.5	61.3	Pass	-43.8
0.66	33.3	18.0	56.0	Pass	-38.0
16.81	8.6	6.3	60.0	Pass	-53.7
25.64	18.0	16.2	60.0	Pass	-43.8

Figure 7. Detectors: Peak, QUASI-PEAK

Frequency (MHz)	Peak Amplitude (dBµV)	Average Amplitude (dBµV)	Specification (dB µV)	Pass/Fail	Margin (dB)
0.16	25.2	6.7	55.7	Pass	-49.0
0.17	25.8	15.5	55.1	Pass	-39.6
0.27	20.1	11.4	51.2	Pass	-39.8
0.66	33.3	12.6	46.0	Pass	-33.4
16.81	8.6	-0.1	50.0	Pass	-50.1
25.64	18.0	9.6	50.0	Pass	-40.4

Figure 8. Detectors: Peak, AVERAGE .

Conducted Emission

E.U.T Description	IntegrAlarm Remote Siren/Strobe Unit
Type	IA-SRN1
Serial Number:	Not designated

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

Frequency (MHz)	Peak Amplitude (dBµV)	Quasi-peak Amplitude (dBµV)	Specification (dB µV)	Pass/Fail	Margin (dB)
0.17	23.7	18.0	65.2	Pass	-47.2
0.21	14.8	11.4	63.4	Pass	-52.0
0.26	28.9	13.3	61.4	Pass	-48.1
0.49	21.5	19.0	56.2	Pass	-37.2
15.80	9.9	7.7	60.0	Pass	-52.3
26.19	17.4	14.9	60.0	Pass	-45.1

Figure 9. Detectors: Peak, QUASI-PEAK

Frequency (MHz)	Peak Amplitude (dBµV)	Average Amplitude (dBµV)	Specification (dB µV)	Pass/Fail	Margin (dB)
0.17	23.7	15.1	55.2	Pass	-40.1
0.21	14.8	6.9	53.4	Pass	-46.5
0.26	28.9	8.1	51.4	Pass	-43.3
0.49	21.5	12.7	46.2	Pass	-33.5
15.80	9.9	1.0	50.0	Pass	-49.0
26.19	17.4	8.0	50.0	Pass	-42.0

Figure 10. Detectors: Peak, AVERAGE

7.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Calibration	Period
LISN	Fischer	FCC-LISN-2A	127	April 1, 2004	1 year
LISN	Fischer	FCC-LISN-2A	128	April 1, 2004	1 year
Receiver	HP	85420E/85422E	3427A00103/34	February 28, 2004	1 year
Printer	HP	ThinkJet2225	2738508357	N/A	N/A

8. Spurious Radiated Emission, Below 1 GHz

8.1 Test Specification

30kHz-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 30kHz-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.

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 operated in continuous mode.

8.3 Measured Data

The signals in the band 30 kHz – 1.0 GHz were below the spectrum analyzer noise level which is at least 6dB below the specification limit.

TEST PERSONNEL:

Tester Signature: _____ Date:

Typed/Printed Name: E. Pitt

8.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	February 28, 2004	1 year
RF Section	HP	85420E	3427A00103	February 28, 2004	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	April 11, 2004	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 21, 2004	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:

$$FS = RA + AF + CF$$

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 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.)

The E.U.T. was operated in continuous mode.

9.2 Test Data

JUDGEMENT: Passed by dB

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

for 903.5 MHz, 11.7dB margin at 5420.00 MHz frequency, vertical polarization.

for 913.5 MHz, 20.4dB margin at 2740.00 MHz frequency, vertical polarization

The details of the highest emissions are given in Figure 11 to Figure 18.

TEST PERSONNEL:

Tester Signature: _____ Date: 03.06.04

Typed/Printed Name: E. Pitt

Radiated Emission Above 1 GHz

E.U.T Description	IntegrAlarm Remote Siren/Strobe Unit
Type	IA-SRN1
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Frequency range: 1.0 GHz to 9.5 GHz
Test Distance: 3 meters
Detector: Peak
Operating Frequency: 903.5 MHz

Freq. (MHz)	Peak Result (dBµV/m)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
2710.00	47.2**	74.0	-26.8
3614.00	44.9*	74.0	-29.1
4517.00	60.2*	74.0	-13.8
5420.00	54.2*	74.0	-19.8
7227.00	43.2*	74.0	-30.8

Figure 11. Radiated Emission. Antenna Polarization: HORIZONTAL. Detector: Peak

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 Result" 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 Remote Siren/Strobe Unit
Type	IA-SRN1
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Test Distance: 3 meters
Operating Frequency: 903.5 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Result (dBµV/m)	Average Specification (dB µV/m)	Avg. Margin (dB)
2710.00	27.2**	54.0	-26.8
3614.00	24.9*	54.0	-29.1
4517.00	40.2*	54.0	-13.8
5420.00	34.2*	54.0	-19.8
7227.00	23.2*	54.0	-30.8

Figure 12. 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 Result" includes correction factor.

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

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

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

Radiated Emission Above 1 GHz

E.U.T Description	IntegrAlarm Remote Siren/Strobe Unit
Type	IA-SRN1
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: 903.5 MHz

Freq. (MHz)	Peak Result (dBµV/m)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
2710.00	52.9**	74.0	-21.1
3614.00	46.4*	74.0	-27.6
4517.00	58.2*	74.0	-15.8
5420.00	62.3*	74.0	-11.7
7227.00	43.1*	74.0	-30.9

Figure 13. Radiated Emission. Antenna Polarization: VERTICAL. Detector: Peak

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 Result" 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 Remote Siren/Strobe Unit
Type	IA-SRN1
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical
Test Distance: 3 meters
Operating Frequency: 903.5 MHz

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Result (dBµV/m)	Average Specification (dB µV/m)	Avg. Margin (dB)
2710.00	32.9**	54.0	-21.1
3614.00	26.4*	54.0	-27.6
4517.00	38.2*	54.0	-15.8
5420.00	42.3*	54.0	-11.7
7227.00	23.1*	54.0	-30.9

Figure 14. 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 Result" includes correction factor.

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

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

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

Radiated Emission Above 1 GHz

E.U.T Description	IntegrAlarm Remote Siren/Strobe Unit
Type	IA-SRN1
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal
Frequency range: 1.0 GHz to 9.5 GHz
Test Distance: 3 meters
Detector: Peak
Operating Frequency: 913.5 MHz

Freq. (MHz)	Peak Result (dBµV/m)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
2740.00	46.4**	74.0	-27.6
3654.00	38.5*	74.0	-35.5
4567.00	48.4*	74.0	-25.6
7308.00	44.3*	74.0	-29.7

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

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 Result" 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 Remote Siren/Strobe Unit
Type	IA-SRN1
Serial Number:	Not designated

Specification: FCC, Part 15, Subpart C

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

Frequency range: 1.0 GHz to 9.5 GHz
Detector: Average

Freq. (MHz)	Average Result (dBµV/m)	Average Specification (dB µV/m)	Avg. Margin (dB)
2740.00	26.4**	54.0	-27.6
3654.00	18.5*	54.0	-35.5
4567.00	28.4*	54.0	-25.6
7308.00	24.3*	54.0	-29.7

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 Result" includes correction factor.

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

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

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

Radiated Emission Above 1 GHz

E.U.T Description	IntegrAlarm Remote Siren/Strobe Unit
Type	IA-SRN1
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: 913.5 MHz

Freq. (MHz)	Peak Result (dBµV/m)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
2740.00	53.6**	74.0	-20.4
3654.00	45.3*	74.0	-28.7
4567.00	45.9*	74.0	-28.1
7308.00	44.9*	74.0	-29.1

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

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 Result" 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 Remote Siren/Strobe Unit
Type	IA-SRN1
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: Average

Freq. (MHz)	Average Result (dBµV/m)	Average Specification (dB µV/m)	Avg. Margin (dB)
2740.00	33.6**	54.0	-20.4
3654.00	25.3*	54.0	-28.7
4567.00	25.9*	54.0	-28.1
7308.00	24.9*	54.0	-29.1

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

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.

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 Result" includes correction factor.

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

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

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

9.3 Test Instrumentation Used, Radiated Measurements Above 1 GHz

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3411A00102	February 28, 2004	1 year
RF Section	HP	85420E	3427A00103	February 28, 2004	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	29845	March 17, 2004	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	October 14, 2003	1 year
Spectrum Analyzer	HP	8592L	3926A01204	February 28, 2004	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

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=1dB. 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.

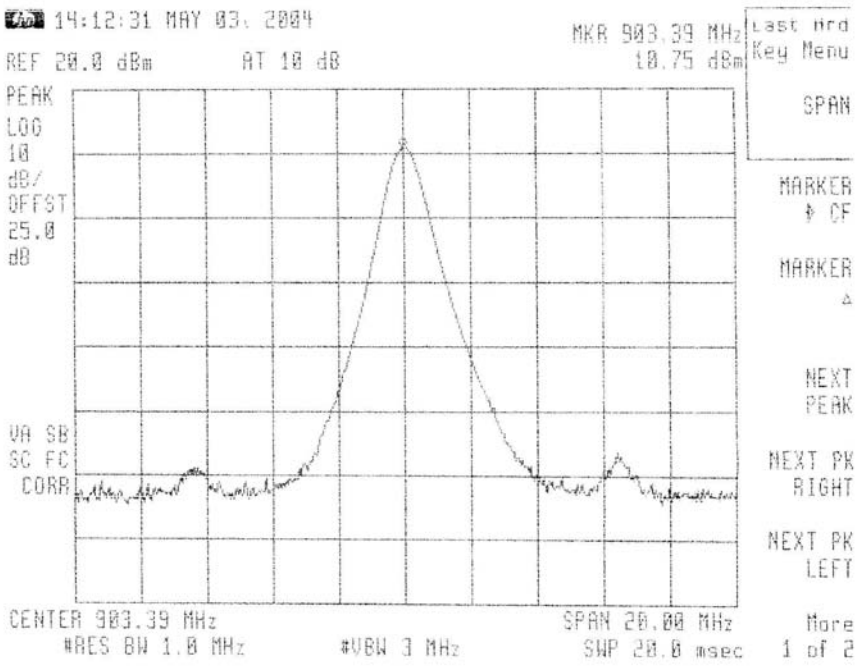

Figure 19.— 903.5 MHz

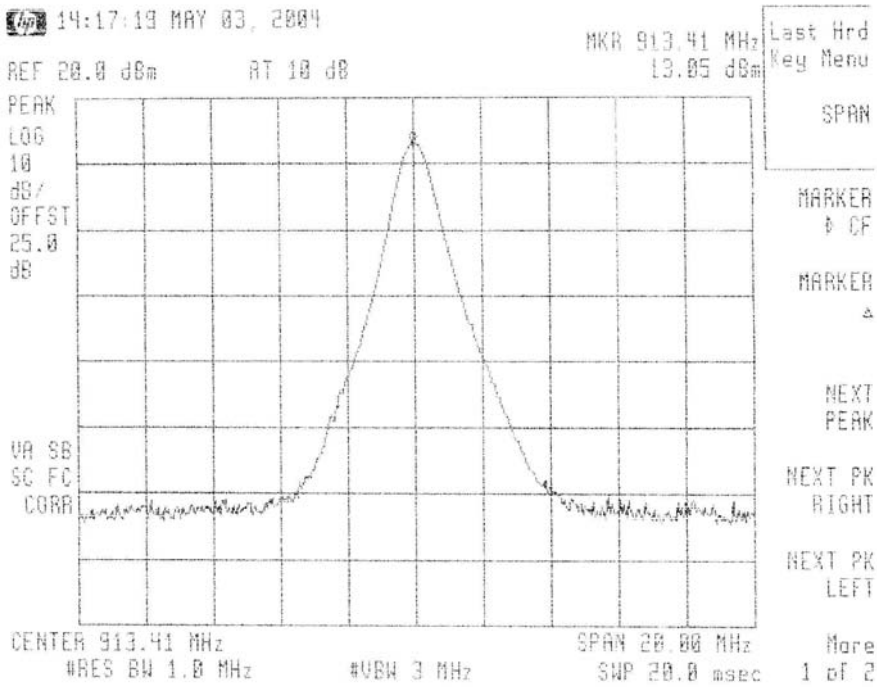

Figure 20.— 913.5 MHz

10.2 Results table

E.U.T. Description: IntegrAlarm Remote Siren/Strobe Unit
Model No.: IA-SRN1
Serial Number: Not Designated
Specification: FCC Part 15, Subpart C

Operation Frequency (MHz)	Peak Power Reading (dBm)	Specification (dBm)	Margin (dB)
903.5	10.8	30.0	-19.2
913.5	13.1	30.0	-16.9

Figure 21 Maximum Power Output

JUDGEMENT: Passed by 16.9 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 03.06.04

Typed/Printed Name: E. Pitt

10.3 Test Equipment Used.

Peak Power Output

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2004	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 22 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.

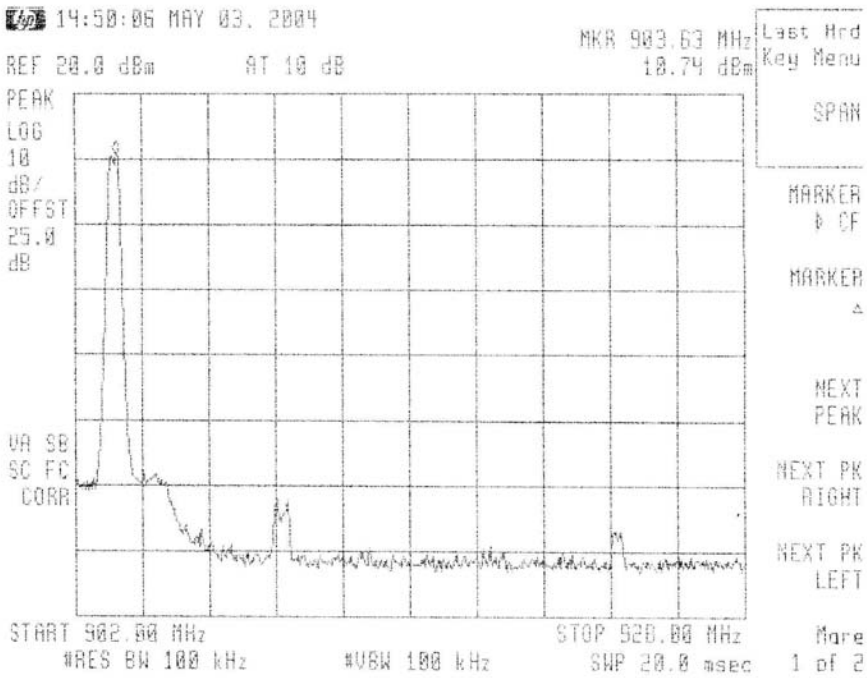

Figure 23.— 903.5 MHz

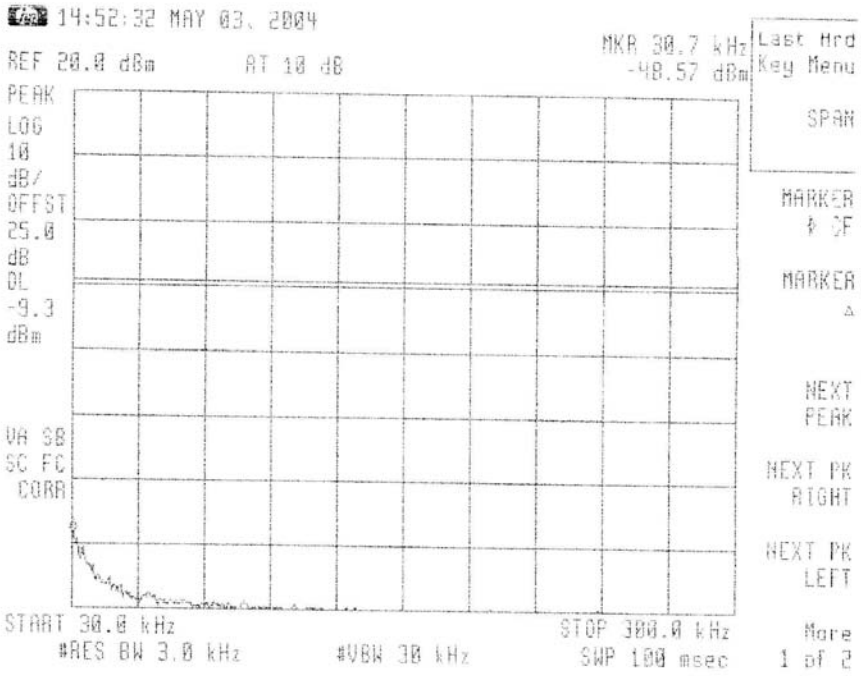

Figure 24.— 903.5 MHz

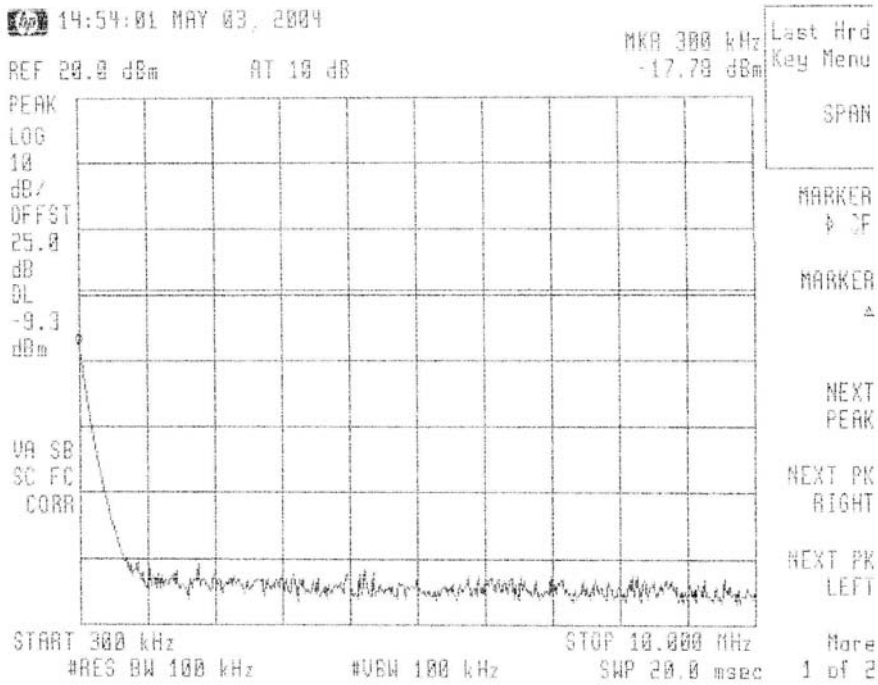

Figure 25.— 903.5 MHz

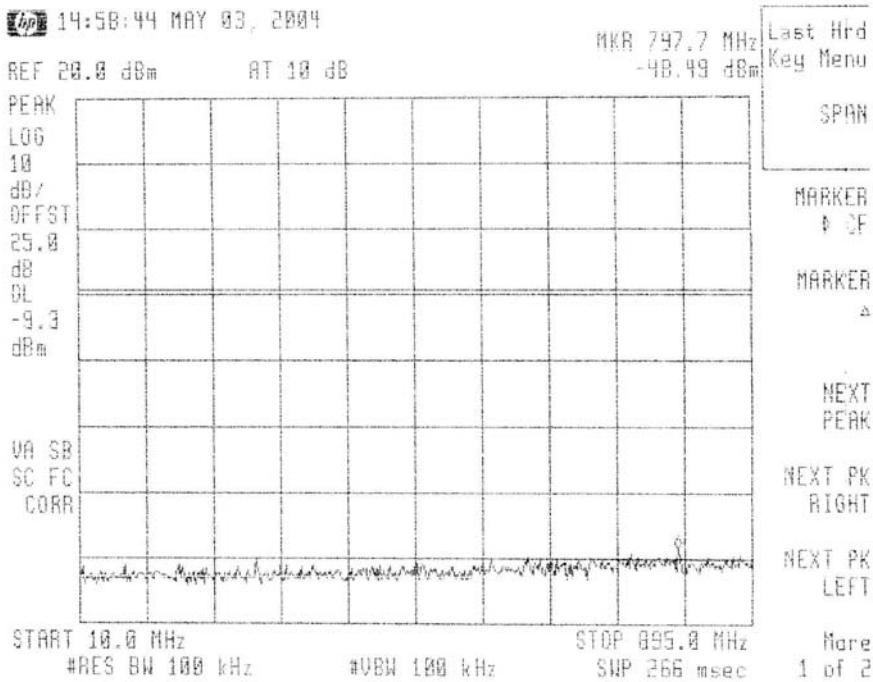

Figure 26.— 903.5 MHz

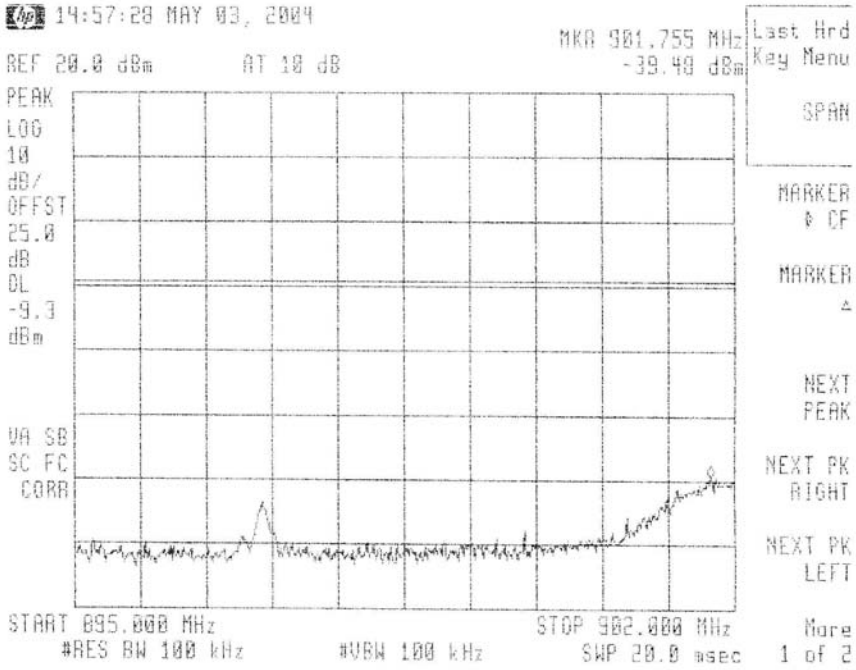

Figure 27.— 903.5 MHz

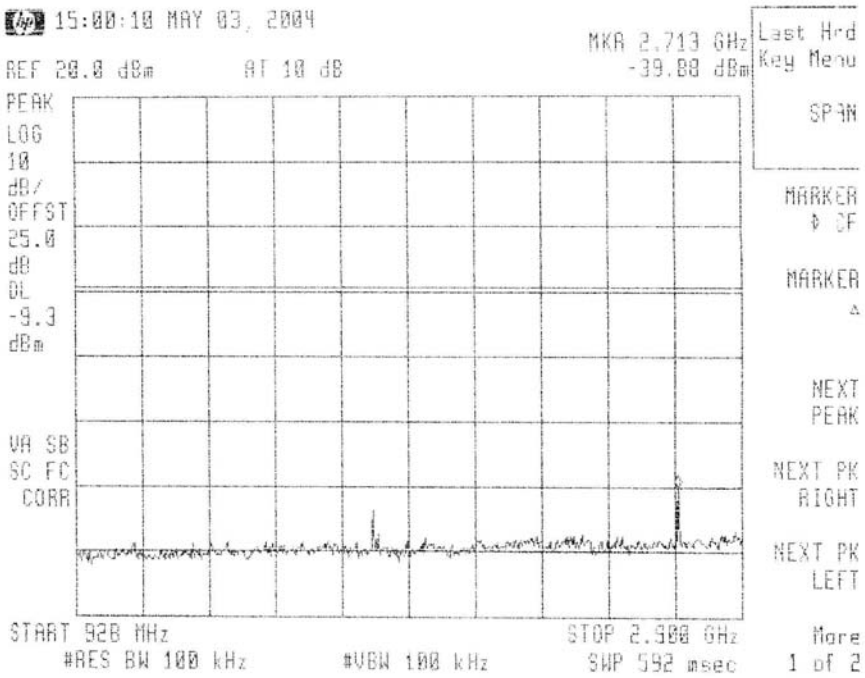

Figure 28.— 903.5 MHz

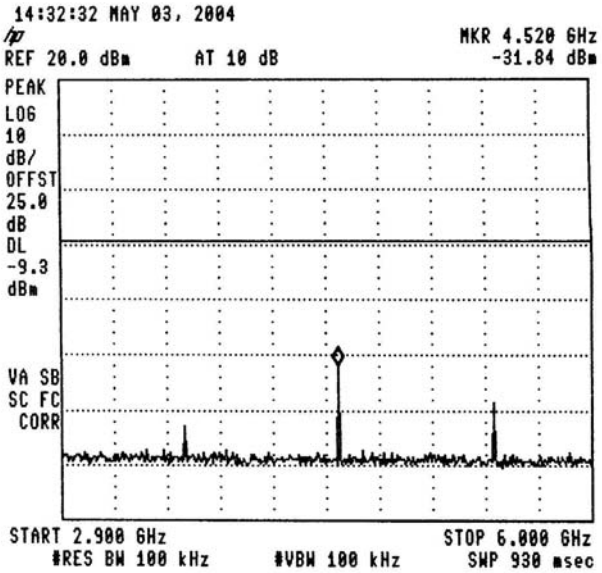

Figure 29.— 903.5 MHz

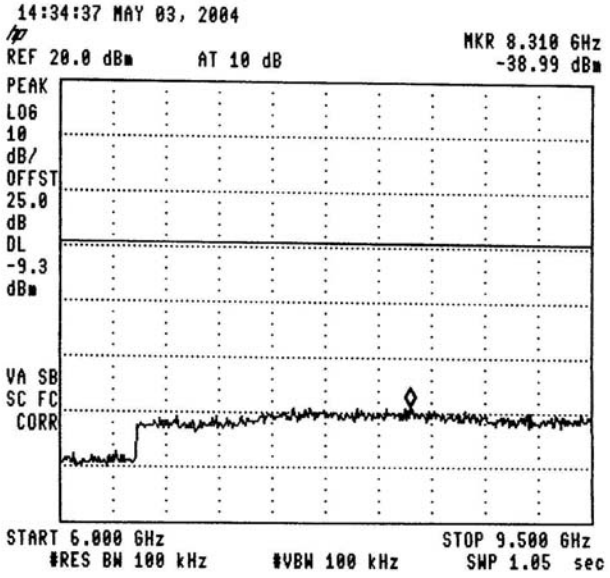

Figure 30.— 903.5 MHz

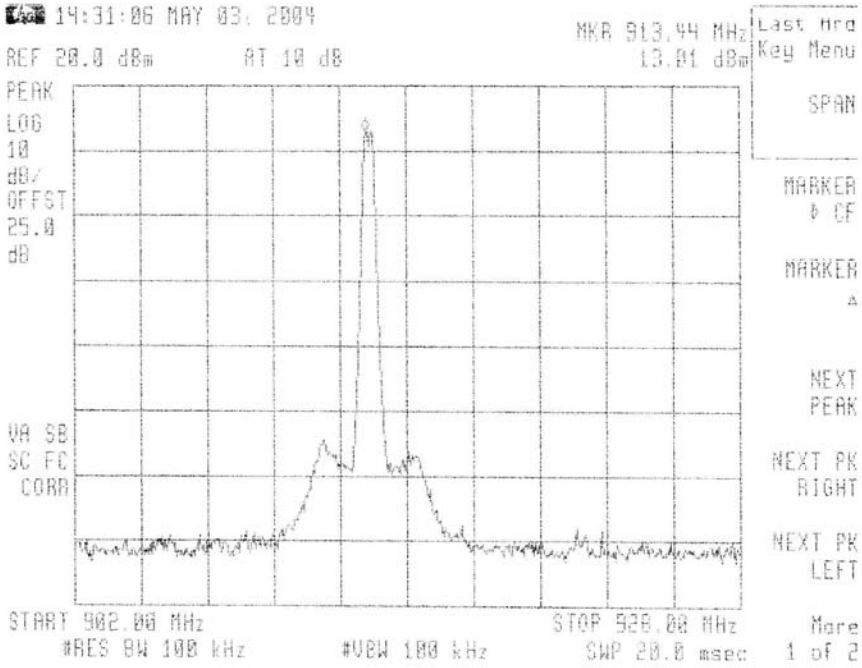

Figure 31.— 913.5 MHz

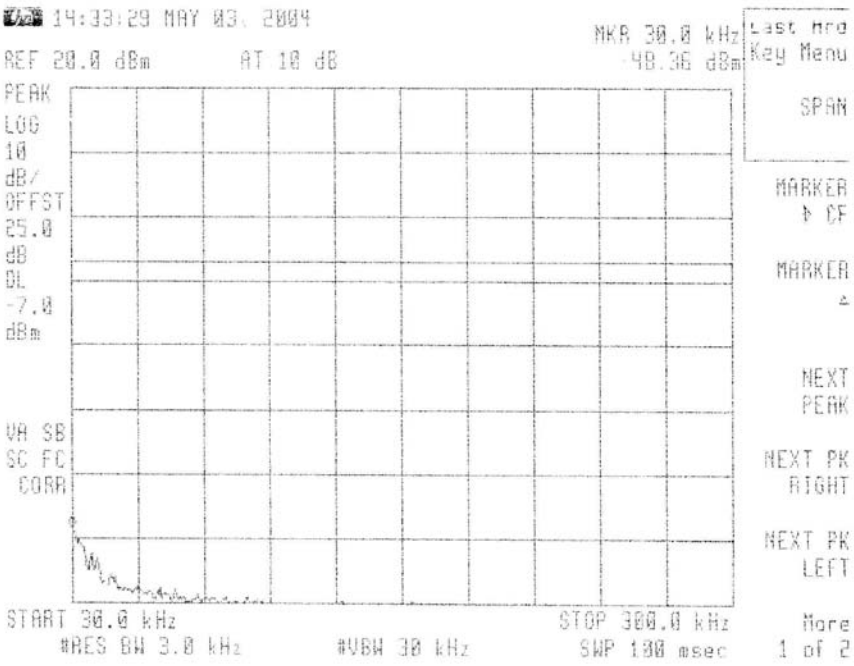

Figure 32.— 913.5 MHz

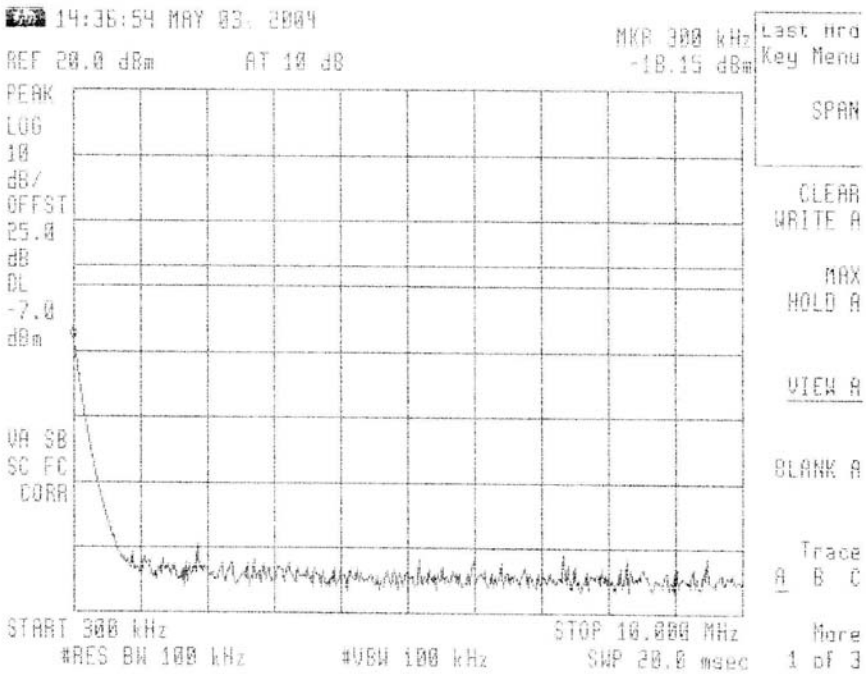

Figure 33.— 913.5 MHz

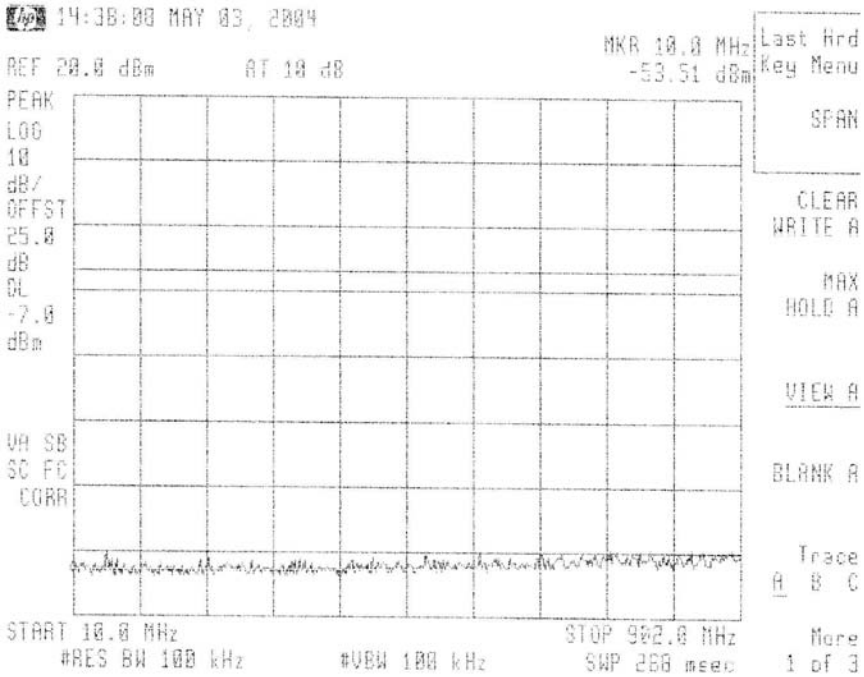

Figure 34.— 913.5 MHz

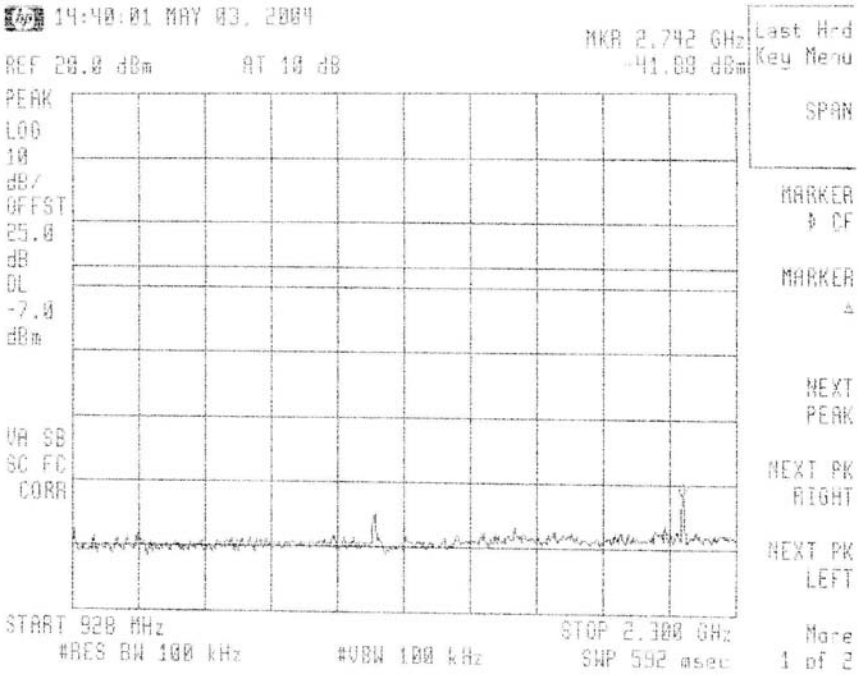

Figure 35.— 913.5 MHz

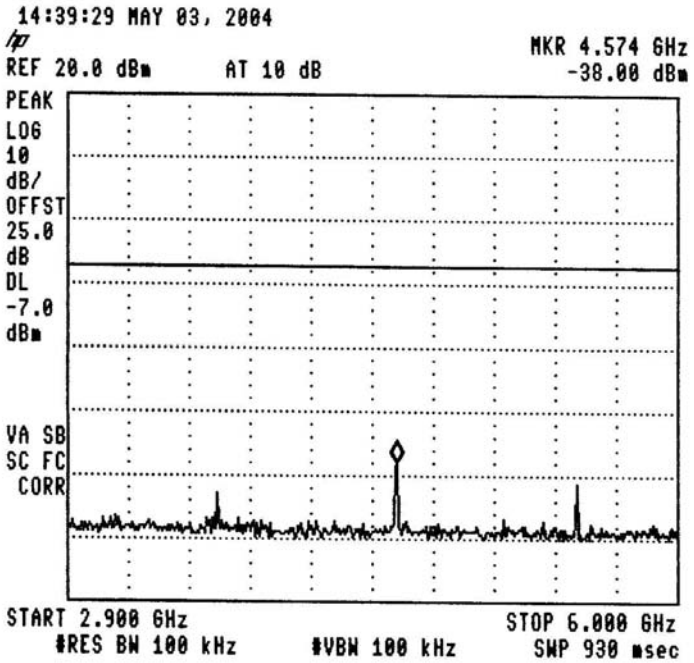

Figure 36.— 913.5 MHz

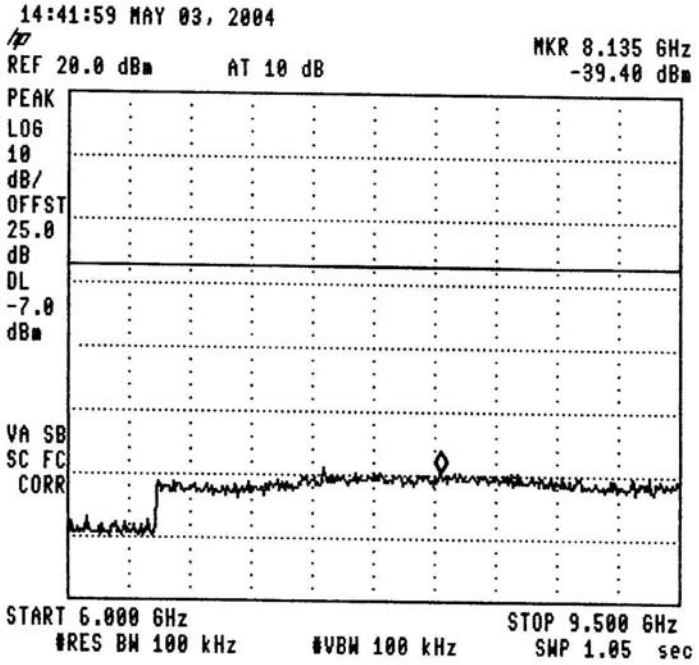

Figure 37.— 913.5 MHz

11.2 Results table

E.U.T. Description: IntegrAlarm Remote Siren/Strobe Unit
Model No.: IA-SRN1
Serial Number: Not Designated
Specification: FCC Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Reading (dBc)	Specification (dBc)	Margin (dB)
903.5	42.6	20.0	22.6
913.5	51.0	20.0	31.0

Figure 38 Peak Power Output of 902-928 MHz Band

JUDGEMENT: Passed by 22.6 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 03.06.04

Typed/Printed Name: E. Pitt

11.3 Test Equipment Used.

Peak Power Output Out of 902-928 MHz Band

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2004	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 39 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.

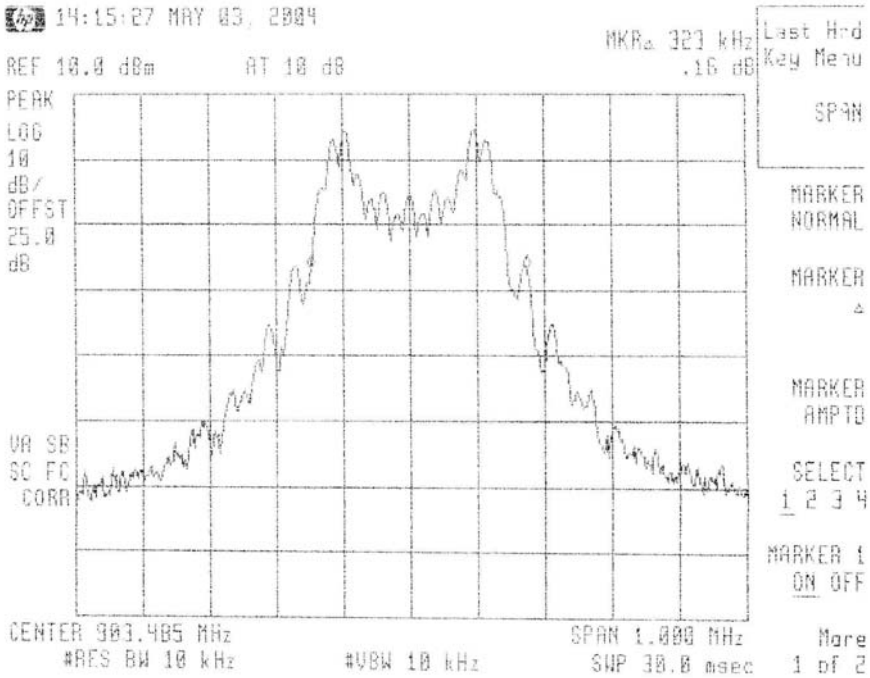

Figure 40 — 903.5 MHz

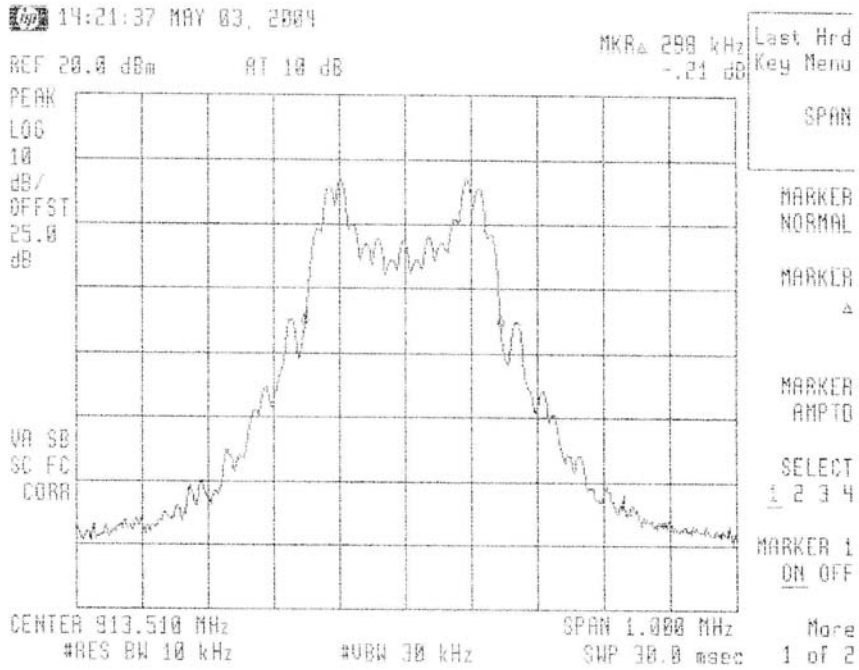

Figure 41 — 913.5 MHz

12.2 Results table

E.U.T. Description: IntegrAlarm Remote Siren/Strobe Unit
Model No.: IA-SRN1
Serial Number: Not Designated
Specification: FCC Part 15, Subpart C: (15.247-a2)

Operation Frequency (MHz)	Reading (kHz)	Specification (kHz)	Margin (kHz)
903.5	323	500	177
913.5	298	500	202

Figure 42 20 dB Bandwidth

JUDGEMENT: Passed by 177 kHz

TEST PERSONNEL:

Tester Signature: _____ Date: 03.06.04

Typed/Printed Name: E. Pitt

12.3 Test Equipment Used.

6 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2004	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 43 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 (903.5 MHz) and the highest operation frequency (913.5 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 903.5 MHz and 913.5 MHz correspondingly.

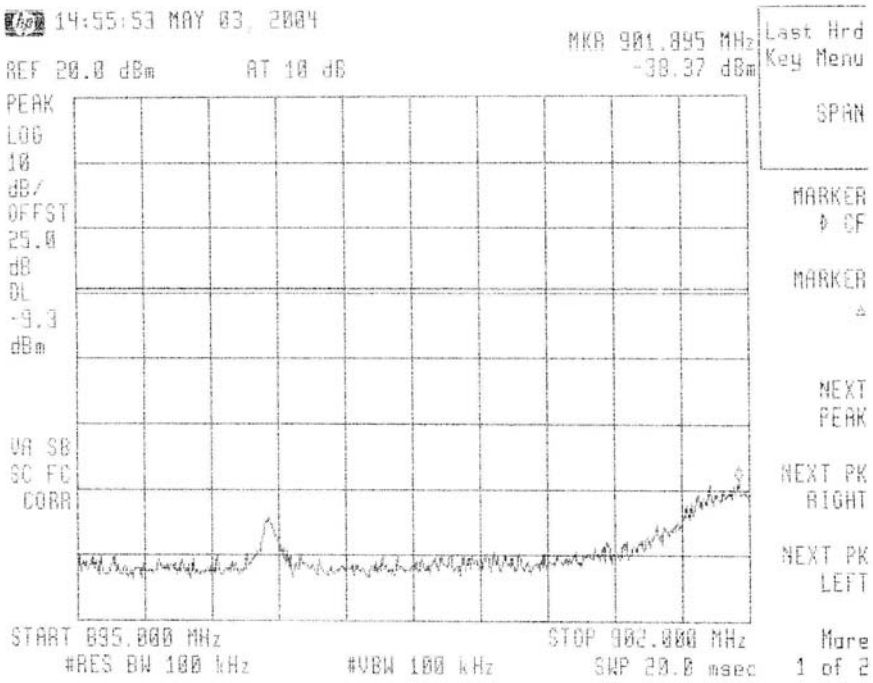

Figure 44 — 903.5 MHz

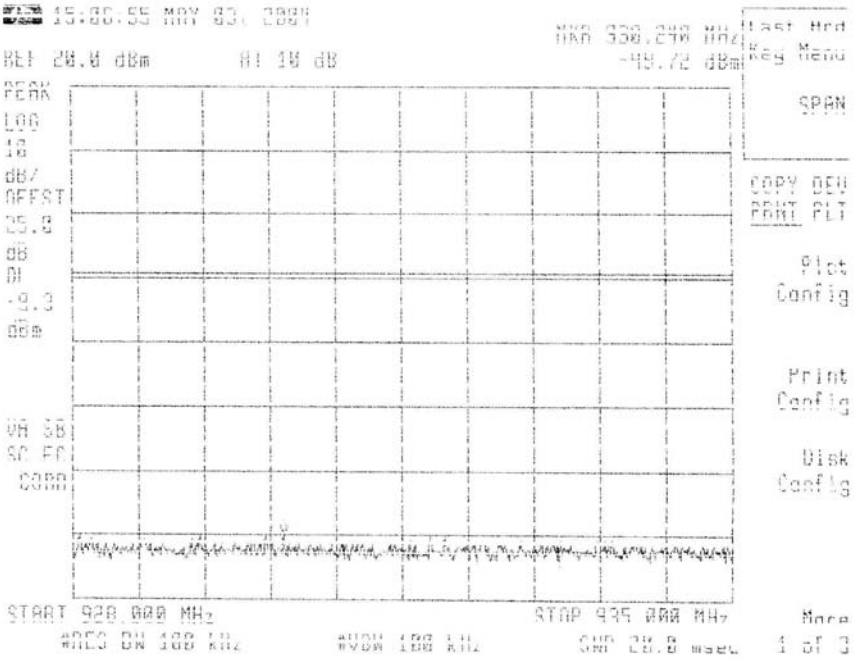

Figure 45 — 903.5 MHz

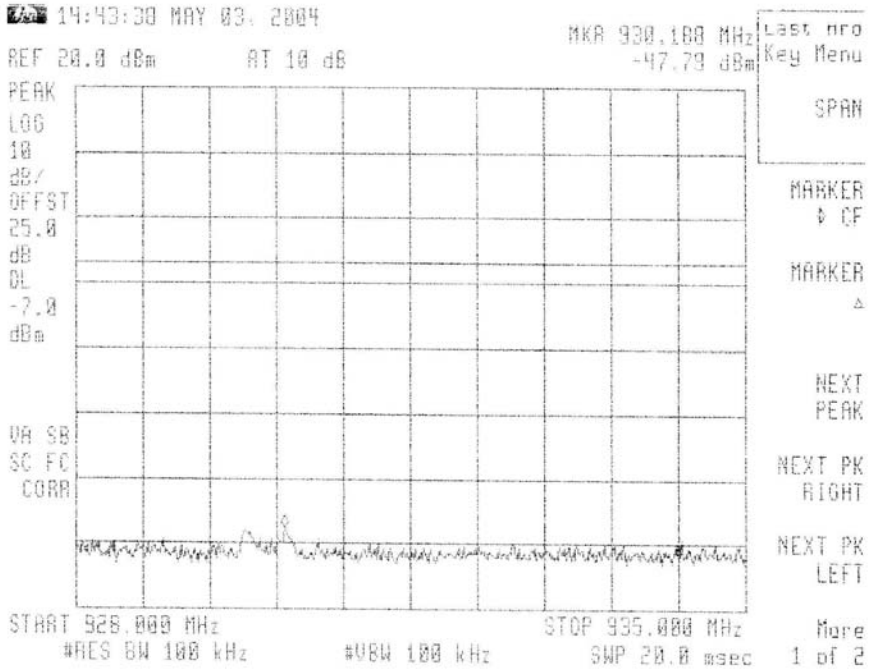

Figure 46 — 913.5 MHz

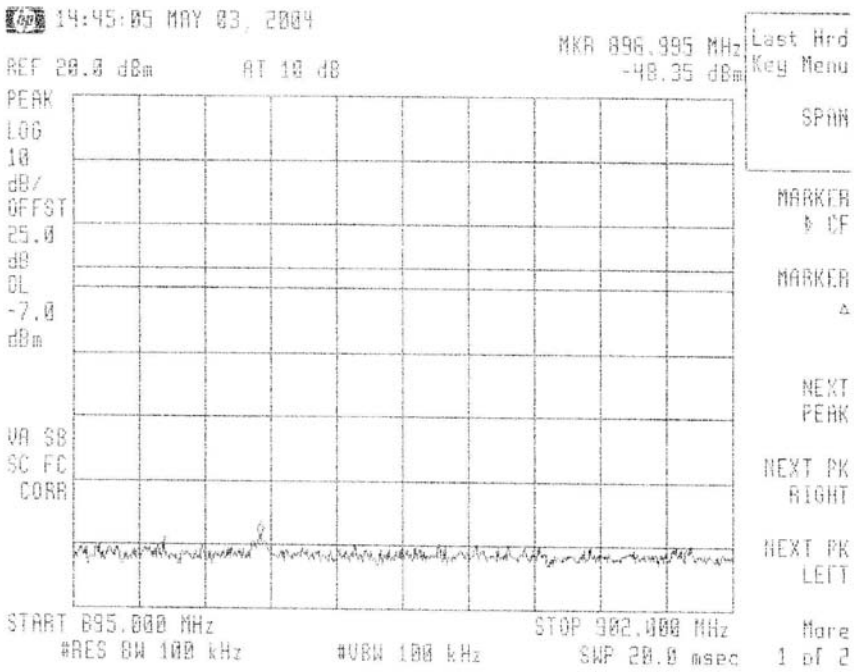

Figure 47 — 913.5 MHz

13.2 Results table

E.U.T. Description: IntegrAlarm Remote Siren/Strobe Unit
Model No.: IA-SRN1
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)
903.5	901.895	49.2	20.0	29.2
913.5	930.188	60.8	20.0	40.8

Figure 48 Band Edge Spectrum

JUDGEMENT: Passed by 29.2 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 03.06.04

Typed/Printed Name: E. Pitt

13.3 Test Equipment Used.

Band edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2004	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 49 Test Equipment Used

14. Antenna Gain

The gain of the antenna is + 4 dBi.

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

May 01, 2004

IntegrAlarm Remote Siren / Strobe model IA-SRN1, FCC ID RUF150706

This is to confirm that the antenna used in the above model has a maximum gain of + 4 dbi.

EMTS Inc.

D Lavee

Doron Lavee
Engineering Manager
EMTS Inc.

Date: January 7, 2004

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: +13.1dBm =20.4mW (max. measured power)

G_T- Antenna Gain: +4dBi = 2.5

R- Distance from Transmitter using 20cm worst case

(c) The peak power density is :

$$S_p = \frac{20.4x2.5}{4\pi(20)^2} = 10.2x10^{-3}\frac{mW}{cm^2}$$

(d) The duty cycle of transmission in actual worst case is 10msec “on” and this cycle may be repeated three times in thirty minutes (See Note below).

The average power over 30 minutes is:

$$P_{AV} = \frac{20.4 \times 30}{30 \times 60 \times 1000} = 3.4 \times 10^{-4} mW$$

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

$$S_{AV} = \frac{3.4 \times 10^{-4} \times 2.5}{4\pi(20)^2} = 1.7X10^{-5}\frac{mW}{cm^2}$$

(f) This is more than 5 orders of magnitude below the FCC limit.

Note: Under normal conditions a peripheral unit transmits a test message once every hour for a period of 10ms. In case this message is not acknowledged by the central unit, the peripheral will repeat this message after 200 ms on a different frequency. This cycle may be repeated 3 times, each transmission on a different frequency.

16. Photographs of Tested E.U.T.

Figure 50 Front View

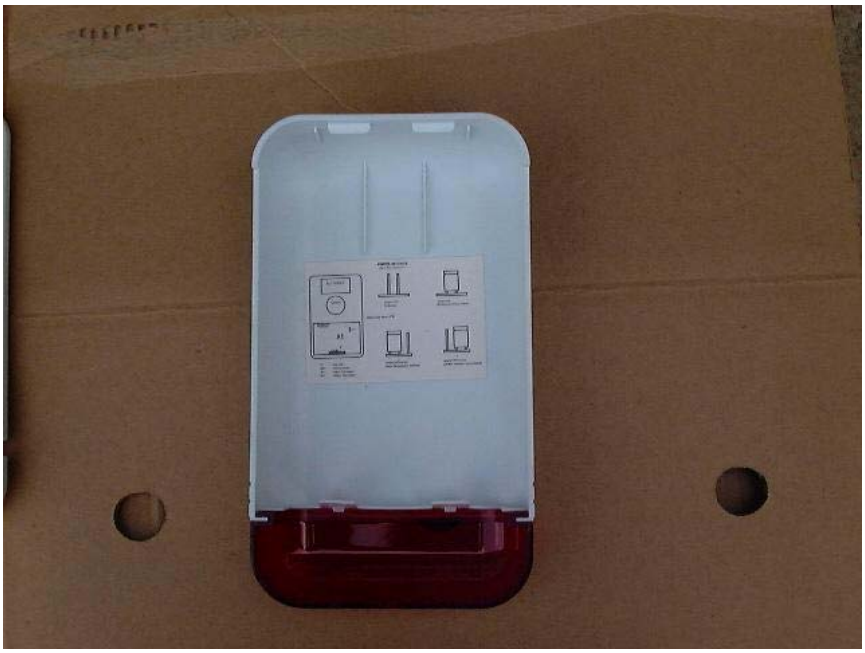

Figure 51 Front Cover Internal View

Figure 52 Rear Cover

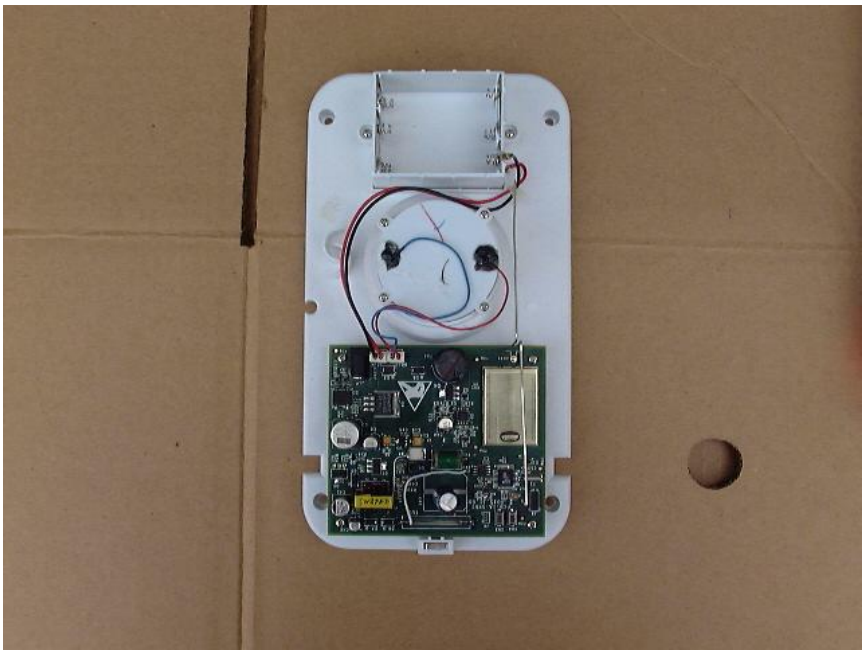

Figure 53 Unit Without Cover

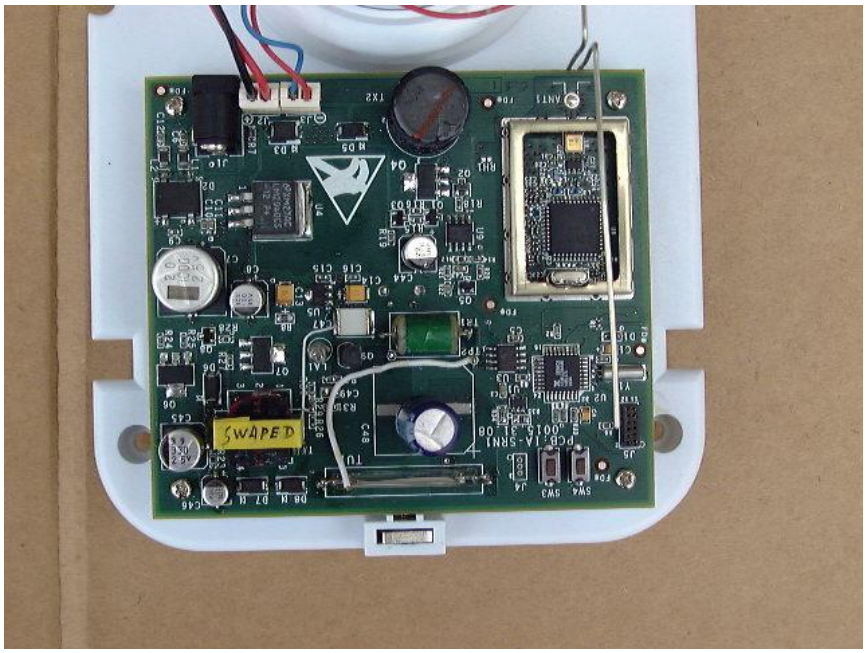

Figure 54 PCB in Unit

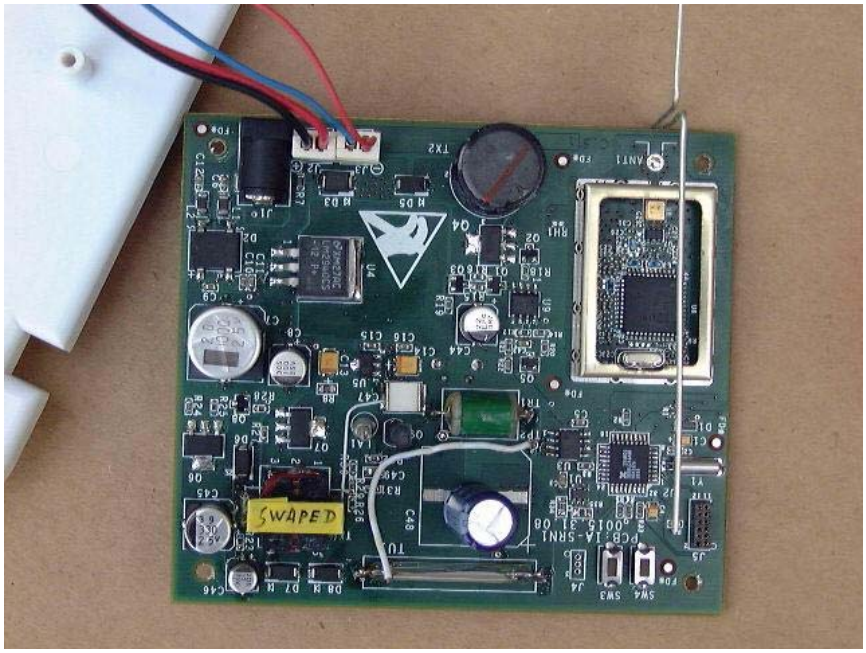

Figure 55 PCB Side 1 Without Shield

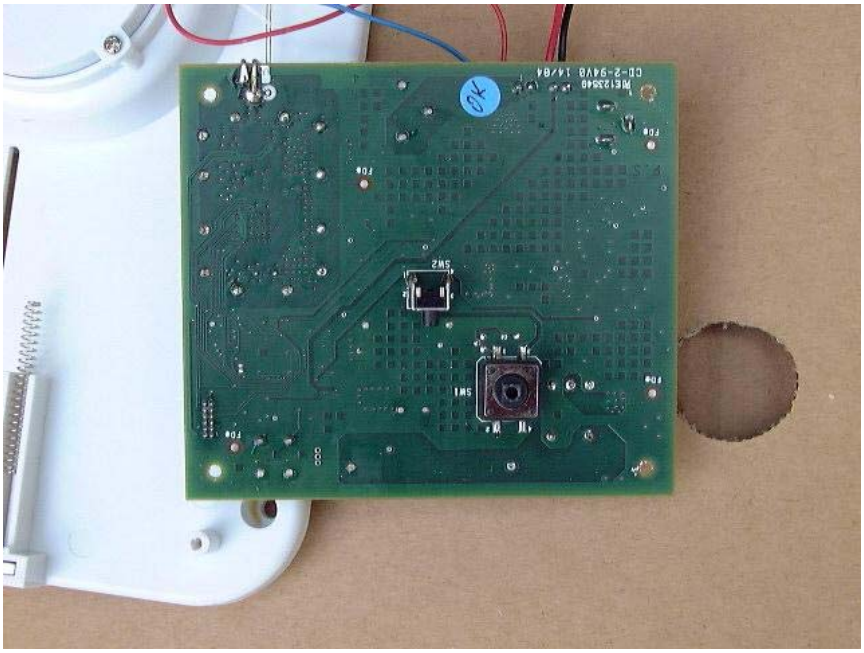

Figure 56 PCB Side 2

17. APPENDIX A - CORRECTION FACTORS

17.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.5
20.0	0.7
30.0	1.0
40.0	1.2
50.0	1.3
60.0	1.5
70.0	1.6
80.0	1.7
90.0	1.8
100.0	1.9
150.0	2.4
200.0	2.7
250.0	3.0
300.0	3.3
350.0	3.7
400.0	4.0
450.0	4.3
500.0	4.7
600.0	4.9
700.0	5.4
800.0	5.8
900.0	6.3
1000.0	6.7

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.5
1400.0	8.2
1600.0	9.0
1800.0	9.6
2000.0	10.7
2300.0	11.1
2600.0	11.8
2900.0	12.8

NOTES:

1. *The cable type is RG-214.*
2. *The overall length of the cable is 27 meters.*
3. *The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".*

17.2 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.

2. The overall length of the cable is 10 meters.

17.3 Correction factors for CABLE

from EMI receiver to test antenna

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.1
20.0	0.1
30.0	0.2
40.0	0.2
50.0	0.2
60.0	0.2
70.0	0.3
80.0	0.3
90.0	0.3
100.0	0.3
150.0	0.4
200.0	0.4
250.0	0.4
300.0	0.5
350.0	0.6
400.0	0.6
450.0	0.6
500.0	0.7
600.0	0.8
700.0	0.8
800.0	1.0
900.0	1.1
1000.0	1.1

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	1.4
1400.0	1.5
1600.0	1.5
1800.0	1.7
2000.0	1.7
2300.0	2.0
2600.0	2.1
2900.0	2.2

NOTES:

1. The cable type is RG-214.

2. The overall length of the cable is 5.5 meters.

17.4 Correction factors for CABLE

from EMI receiver
to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.

2. The cable is used for measurements above 2.9 GHz.

3. The overall length of the cable is 10 meters.

17.5 Correction factors for CABLE

from EMI receiver to test antenna at 10 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.6
20.0	1.1
30.0	1.3
40.0	1.6
50.0	1.7
60.0	1.9
70.0	2.0
80.0	2.2
90.0	2.3
100.0	2.4
150.0	3.1
200.0	3.6
250.0	4.2
300.0	4.5
350.0	4.8
400.0	5.2
450.0	5.5
500.0	6.2
600.0	6.4
700.0	7.0
800.0	7.5
900.0	8.1
1000.0	8.6

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	9.7
1400.0	10.5
1600.0	11.5
1800.0	12.6
2000.0	13.5
2300.0	14.3
2600.0	15.5
2900.0	16.4

NOTES:

1. The cable type is RG-214.

2. The overall length of the cable is 34 meters.

3. The above data is located in file 34M10MO.CBL on the disk marked "Radiated Emissions Tests EMI Receiver".

17.6 Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A
at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	11.4
400.0	14.5
500.0	15.2
600.0	17.3
700.0	19.0
850.0	20.1
1000.0	22.2

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.2
400.0	14.4
500.0	15.2
600.0	17.2
700.0	19.0
850.0	20.1
1000.0	22.1

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
3. *The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

17.7 Correction factors for LOG PERIODIC ANTENNA

Type SAS-200/511
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. *Antenna serial number is 253.*
2. *The above lists are located in file number SAS3M0.ANT for a 3 meter range.*
3. *The files mentioned above are located on the disk marked "Antenna Factors".*

17.8 Correction factors for BICONICAL ANTENNA

Type BCD-235/B,
at 3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.

2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

17.9 Correction factors for BICONICAL ANTENNA

Type BCD-235/B,
10 meter range

FREQUENCY (MHz)	AFE (dB/m)
30.0	12.1
40.0	10.6
50.0	10.6
60.0	8.9
70.0	8.5
80.0	9.6
90.0	9.4
100.0	9.6
110.0	10.3
120.0	10.7
130.0	12.6
140.0	12.7
150.0	12.7
160.0	13.8
170.0	13.7
180.0	14.9
190.0	13.4
200.0	13.1
210.0	14.0
220.0	14.5
230.0	15.8
240.0	16.0
250.0	16.6
260.0	16.7
270.0	18.3
280.0	18.5
290.0	19.3
300.0	20.9

NOTES:

1. *Antenna serial number is 1041.*
2. *The above list is located in file 41BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".*

17.10 Correction factors for ACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2

17.11 Correction factors for Double-Ridged Waveguide Horn

Model: 3115, S/N 29845
at 1 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.5	5.8	10.0	37.9	12.3
1.5	25.8	8.0	10.5	38.0	12.6
2.0	27.8	8.5	11.0	38.2	12.8
2.5	28.5	9.7	11.5	38.8	12.6
3.0	30.1	9.6	12.0	38.7	13.1
3.5	31.3	9.8	12.5	38.7	13.5
4.0	32.8	9.5	13.0	39.7	12.8
4.5	32.4	10.8	13.5	40.0	12.8
5.0	33.8	10.4	14.0	40.8	12.4
5.5	34.3	10.8	14.5	40.3	13.1
6.0	34.6	11.1	15.0	39.0	14.8
6.5	34.9	11.5	15.5	37.4	16.6
7.0	35.9	11.2	16.0	37.6	16.7
7.5	37.0	10.7	16.5	39.0	15.5
8.0	36.9	11.3	17.0	41.3	13.5
8.5	37.3	11.5	17.5	44.3	10.8
9.0	37.5	11.8	18.0	46.7	8.6
9.5	37.4	12.3			

17.12 Correction factors for Double-Ridged Waveguide Horn

Model: 3115, S/N 29845
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

17.13 Correction factors for *Horn Antenna*

Model: SWH-28
at 1 meter range.

FREQUENCY (GHz)	AFE (dB /m)	Gain (dB1)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

17.14 Correction factors for BICONICAL ANTENNA

Type 3109,
1.0 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	11.1
30.0	12.0
40.0	12.0
50.0	11.4
60.0	10.3
70.0	10.7
80.0	8.3
90.0	9.0
100.0	10.0
110.0	11.6
120.0	13.6
130.0	14.2
140.0	13.5
150.0	12.7
160.0	12.7
170.0	13.6
180.0	15.3
190.0	14.6
200.0	14.7
210.0	15.3
220.0	15.8
230.0	17.0
240.0	18.0
250.0	18.1
260.0	18.0
270.0	17.5
280.0	18.2
290.0	19.7
300.0	21.8

NOTES:

1. Antenna serial number is 3244.

2. The above list is located in file 44BIC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver"

17.15. Correction factors for BICONICAL ANTENNA

Type 3109,
3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	18.4
30.0	14.0
40.0	12.3
50.0	10.6
60.0	8.3
70.0	8.7
80.0	7.2
90.0	8.6
100.0	10.1
110.0	11.2
120.0	11.8
130.0	12.3
140.0	12.7
150.0	12.5
160.0	12.4
170.0	12.1
180.0	12.2
190.0	12.8
200.0	13.7
210.0	14.5
220.0	15.4
230.0	15.9
240.0	16.3
250.0	16.7
260.0	17.1
270.0	17.2
280.0	17.5
290.0	18.1
300.0	18.9

NOTES:

1. Antenna serial number is 3244.

2. The above list is located in file 44BIC3M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver"