



DATE: 10 February 2004

I.T.L. (PRODUCT TESTING) LTD.
EMC Test
for
EMTS Inc.

Equipment under test:

**IntegrAlarm Remote Keyfob
(Transmitter Section)**

IA-FOB1*

*See customer's statement on page 5.

Approved by: I. Raz
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.



Measurement/Technical Report for EMTS Inc.

IntegrAlarm Remote Keyfob (For Transmitter Section)

IA-FOB1

FCC ID:RUF150702

10 February 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

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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 Remote Keyfob

Equipment Model No.: IA-FOB1 (See customer's statement on following page)

Equipment Serial No.: Not designated

Date of Receipt of E.U.T: 10.12.03

Start of Test: 10.12.03

End of Test: 11.12.03

Test Laboratory Location: I.T.L (Product Testing) Ltd.
Kfar Bin Nun,
ISRAEL 99780

Test Specifications: FCC Part 15, Sub-part C



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

December 15, 2003

DECLARATION

I HEREBY DECLARE THAT THE FOLLOWING PRODUCTS:

IA-FOB1

ARE IDENTICAL ELECTRONICALLY, PHYSICALLY, AND
MECHANICALLY TO:

IA-REU1

Please relate to them all (from an EMC point of view) as the
same product.

Thank you,

A handwritten signature in black ink that appears to read 'D. Lavee'.

Doron Lavee
Engineering Manager
EMTS Inc.

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



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. 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.

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

- Door/window sensor.
- PIR sensor.
- Smoke detector.
- 5-function keyfob (handheld remote control unit).
- Remote siren.

The multifunction keyfob consists of an RF transceiver, a micro-controller, a keypad and a battery.

The multifunction keyfob is composed of the following principal parts:

- RF/controller PCBB assembly with LED.
- Housing with keypad.
- Battery, 2 X N1/3 cells

Operating frequency band – ISM 902-928 MHz. The transmitter frequency range of operation is 903.5-913.5 MHz.

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

Data packet transmission duration – less than 10 milliseconds.

Data packet validity check – CRC.

Transmission and reception verification – two-way communication; each received packet is acknowledged, with an automatic repeat request (ARQ) in case of unacknowledged data packet.

Functions – 5 keys: Home, Away, Off (Disarm), Accessories (PGM) and Panic.

Power source – two 3V Lithium MNO₂ cells type 1/3 N x 2.

Remote control dimensions (mm): L-76, W-48, D-16.

Weight, including battery (grams): 35.

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

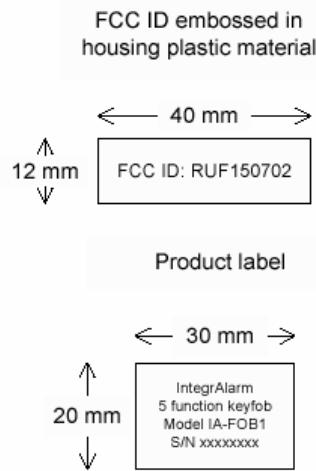


Figure 1. FCC Label

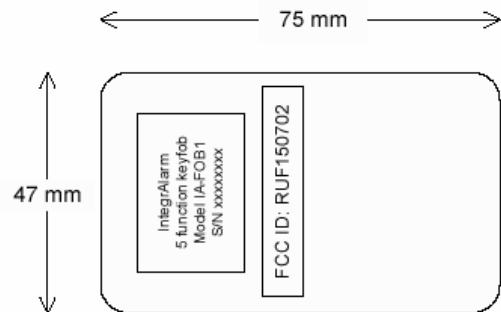


Figure 2. Location of Label on EUT

3. System Test Configuration

3.1 ***Justification***

The product is hand held.

To determine the E.U.T. orientation for the spurious radiated emissions tests, the product carrier field level was measured in three orthogonal directions of the E.U.T. The vertical position was selected as the worst case final orientation position.

It is impossible to test the IA-FOB-1 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-FOB-1 EUT is provided with special Test Mode software.

Pressing the AUX button on the keypad operates the EUT in Test Mode. Test Mode includes three transceiver options. One press of the AUX button selects continuous reception, a second press selects continuous transmission of carrier wave only, and a third press selects continuous transmission of modulated signal. 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-FOB-1 PANIC switch is used to change the frequency while the EUT is in Test Mode.

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***

No modifications were needed to achieve compliance.

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-FOB-1 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 a key is pressed on the IA-FOB-1 keypad, the IA-FOB-1 sends an event data packet to the Control Panel. This is indicated by a red LED (visible through a hole in the IA-FOB-1 outer cover) which illuminates momentarily on the IA-FOB-1. The Control Panel then sends back an acknowledgment data packet, which is indicated by a green LED (visible through a hole in the IA-FOB-1 outer cover) which illuminates momentarily on the IA-FOB-1, and takes the appropriate action. If the HOME or AWAY key is pressed, the Control Panel arms the system if it is disarmed, or disarms the system if it is armed. If the AUX key is pressed, the Control Panel operates the X-10 or PGM device governed by the IA-FOB-1 is operated (whether or not the Control Panel is armed). If the PANIC key is pressed, the Control Panel sends an alarm code to the monitoring service via PSTN (whether or not the Control Panel is armed).



5. Customer's Declaration

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

February 09, 2004

DECLARATION

To Whom It May Concern,

I hereby declare that the product, IntegrAlarm IA-FOB1 Remote Keyfob, FCC ID RUF150702, 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).

Thank you,

A handwritten signature in black ink that appears to read 'D Lavee'.

Doron Lavee
Engineering Manager
EMTS Inc.

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

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6. Spurious Radiated Measurement Photos



Figure 5. Spurious Radiated Emission Test. Front

7. Spurious Radiated Emission, Below 1 GHz

7.1 Test Specification

30kHz-1000 MHz, FCC, Part 15, Subpart C

7.2 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.



7.3 **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: 07.01.04

Typed/Printed Name: E. Pitt



7.4 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



7.5 ***Field Strength Calculation***

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

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

FS: Field Strength [dB μ v/m]

RA: Receiver Amplitude [dB μ v]

AF: Receiving Antenna Correction Factor [dB/m]

CF: Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

8. Spurious Radiated Emission Above 1 GHz

8.1 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 and a High Pass Filter were 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.)

8.2 Test Data

JUDGEMENT: Passed by 10.8 dB

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

for 903.5 MHz, 15.6 dB at 2710.00 MHz frequency, horizontal polarization.

for 913.5 MHz, 10.8 dB at 2740.00 MHz frequency, vertical polarization

The details of the highest emissions are given in Figure 6 to Figure 13.

TEST PERSONNEL:

Tester Signature: Pitt

Date: 07.01.04

Typed/Printed Name: E. Pitt



Radiated Emission Above 1 GHz

E.U.T Description: IntegrAlarm Remote Keyfob
Type: IA-FOB1
Serial Number: Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal Frequency range: 1.0 GHz to 9.3 GHz
Test Distance: 3 meters Detector: Peak
Operating Frequency: 903.5 MHz

Freq. (MHz)	Peak Amp (dB μ V/m)	Correction Factors (dB)	Peak. Specification (dB μ V/m)	Peak. Margin (dB)
2710.00	58.4	43.5**	74.0	-15.6
3614.00	47.7	6.0*	74.0	-26.3
4517.00	45.8	8.3*	74.0	-28.2

**Figure 6. 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.

* 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 Keyfob
Type IA-FOB1
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: Average
Operating Frequency: 903.5 MHz

Freq. (MHz)	Average Amp (dB μ V/m)	Correction Factors (dB)	Average Result (dB μ V/m)	Average Specification (dB μ V/m)	Peak. Margin (dB)
2710.00	53.0	43.5**	33.0	54.0	-21.0
3614.00	39.3	6.0*	19.3	54.0	-34.7
4517.00	42.1	8.3*	22.1	54.0	-31.9

**Figure 7. 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.

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

** Correction Factor = Antenna Factor + Cable Loss

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

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 Remote Keyfob
Type IA-FOB1
Serial Number: Not designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Vertical Frequency range: 1.0 GHz to 9.3 GHz
Test Distance: 3 meters Detector: Peak
Operating Frequency: 903.5 MHz

Freq. (MHz)	Peak Amp (dB μ V/m)	Correction Factors	Peak. Specification (dB μ V/m)	Peak. Margin (dB)
2710.00	56.4	43.5**	74.0	-17.6
3614.00	49.7	6.0*	74.0	-24.3
4517.00	44.8	8.3*	74.0	-29.2

**Figure 8. 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.

* 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 Keyfob
Type IA-FOB1
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: Average
Operating Frequency: 903.5 MHz

Freq. (MHz)	Average Amp (dB μ V/m)	Correction Factors (dB)	Average Result (dB μ V/m)	Average Specification (dB μ V/m)	Peak. Margin (dB)
2710.00	54.0	43.5**	34.0	54.0	-20.0
3614.00	41.3	6.0*	21.3	54.0	-32.7
4517.00	39.1	8.3*	19.1	54.0	-34.9

**Figure 9. 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.

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

** Correction Factor = Antenna Factor + Cable Loss

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

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 Remote Keyfob
Type: IA-FOB1
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 Amp (dB μ V/m)	Correction Factors (dB)	Peak. Specification (dB μ V/m)	Peak. Margin (dB)
2740.00	61.2	43.5**	74.0	-12.8
3654.00	46.8	6.0*	74.0	-27.2
4567.00	44.4	8.3*	74.0	-29.6

Figure 10. 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.

* 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 Keyfob
Type IA-FOB1
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: Average
Operating Frequency: 913.5 MHz

Freq. (MHz)	Average Amp (dB μ V/m)	Correction Factors (dB)	Average Result (dB μ V/m)	Average Specification (dB μ V/m)	Peak. Margin (dB)
2740.00	57.0	43.5**	37.0	54.0	-17.0
3654.00	39.5	6.0*	19.5	54.0	-34.5
4567.00	41.2	8.3*	21.2	54.0	-32.8

**Figure 11. 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.

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

** Correction Factor = Antenna Factor + Cable Loss

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

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 Remote Keyfob
Type: IA-FOB1
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 Amp (dB μ V/m)	Correction Factors (dB)	Peak. Specification (dB μ V/m)	Peak. Margin (dB)
2740.00	63.2	43.5**	74.0	-10.8
3654.00	45.8	6.0*	74.0	-28.2
4567.00	42.4	8.3*	74.0	-31.6

**Figure 12. 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.

* 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 Keyfob
Type IA-FOB1
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: Average
Operating Frequency: 913.5 MHz

Freq. (MHz)	Average Amp (dB μ V/m)	Correction Factors (dB)	Average Result (dB μ V/m)	Average Specification (dB μ V/m)	Peak. Margin (dB)
2740.00	58.0	43.5**	38.0	54.0	-16.0
3654.00	38.5	6.0*	18.5	54.0	-35.5
4567.00	42.2	8.3*	22.2	54.0	-31.8

**Figure 13. 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.

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

** Correction Factor = Antenna Factor + Cable Loss

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

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

Average Result = Average Amp + Duty Cycle Factor

8.3 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

9. Maximum Transmitted Peak Power Output

9.1 Test procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through a 20dB attenuator 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.

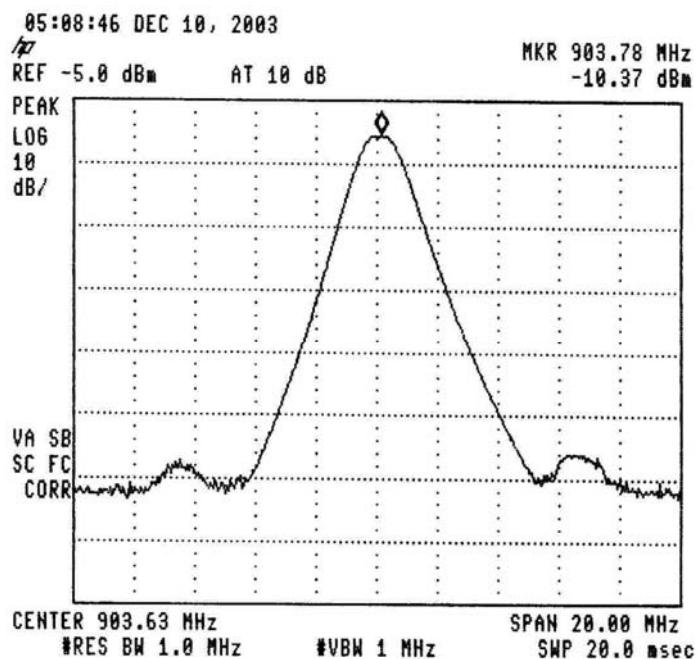


Figure 14.— 903.5 MHz

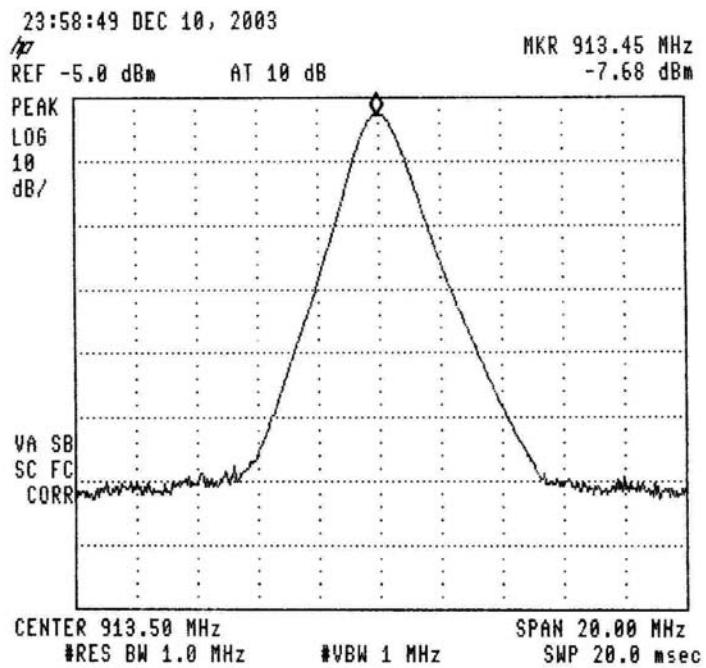


Figure 15.— 913.5 MHz

9.2 Results table

E.U.T. Description: IntegrAlarm Remote Keyfob

Model No.: IA-FOB1

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)
903.5	-10.4	22.0	11.6	30.0	-18.4
913.5	-7.7	22.0	14.3	30.0	-15.7

Figure 16 Maximum Power Output

JUDGEMENT: Passed by 15.7 dB

TEST PERSONNEL:

Tester Signature: E. Pitt

Date: 07.01.04

Typed/Printed Name: E. Pitt



9.3 **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

Figure 17 Test Equipment Used

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

10.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through EXT ATT=20dB 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.

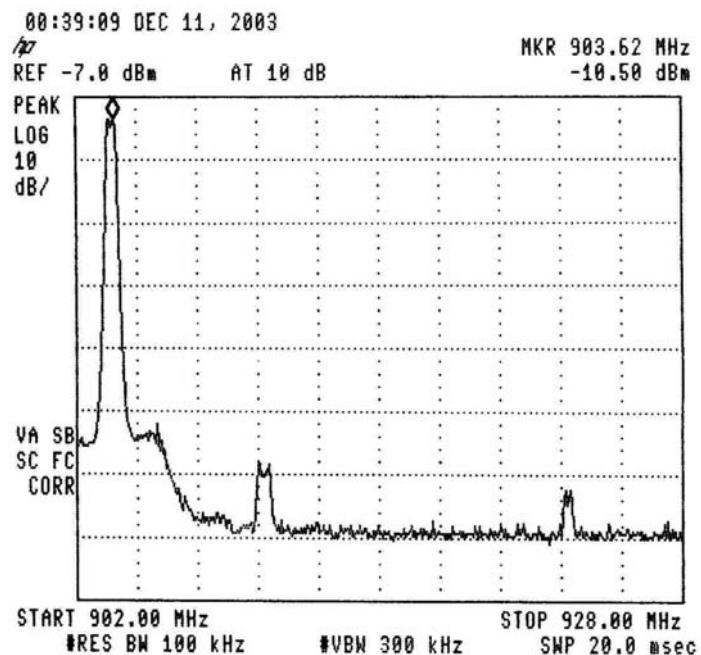


Figure 18.— 903.5 MHz

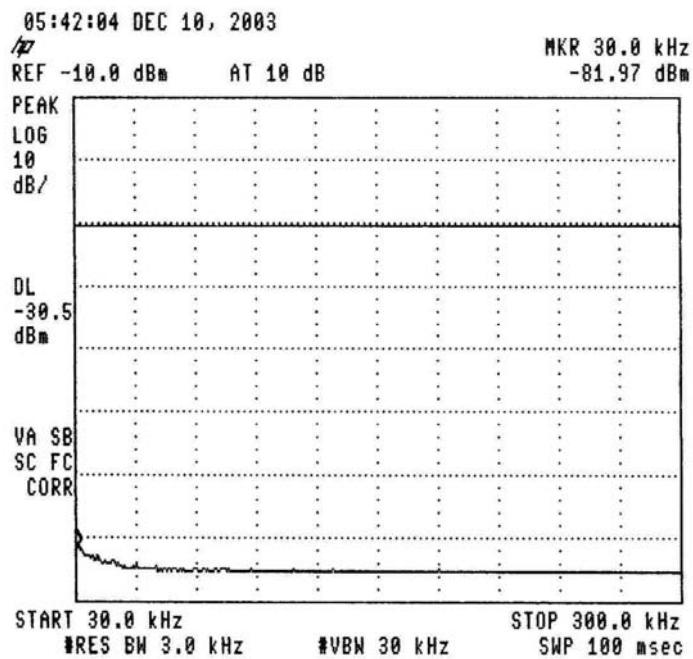


Figure 19.— 903.5 MHz

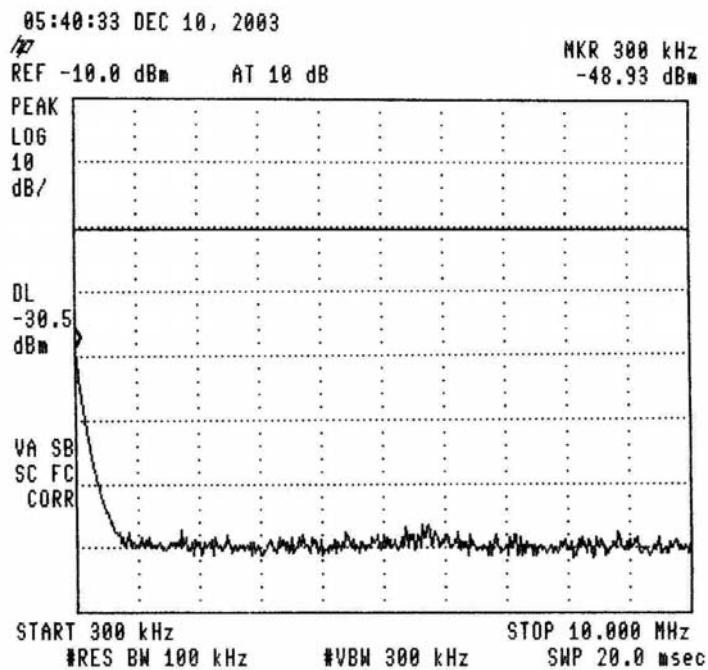


Figure 20.— 903.5 MHz

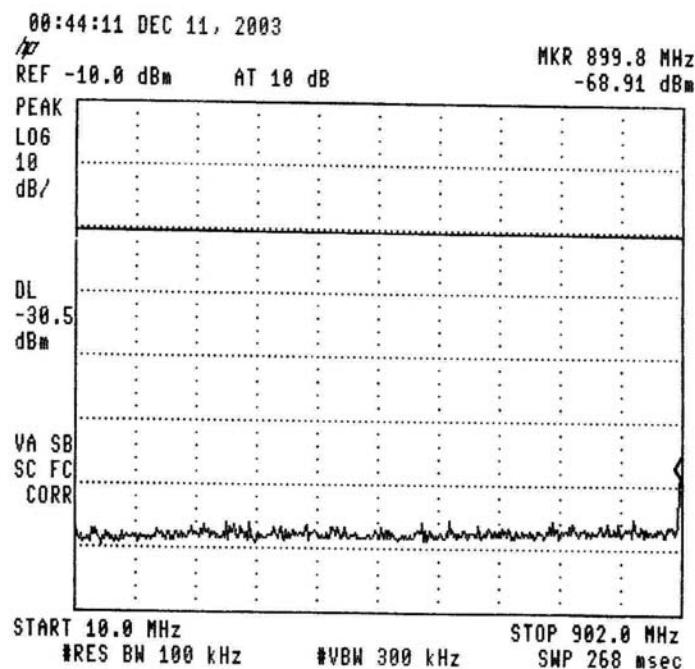


Figure 21.— 903.5 MHz

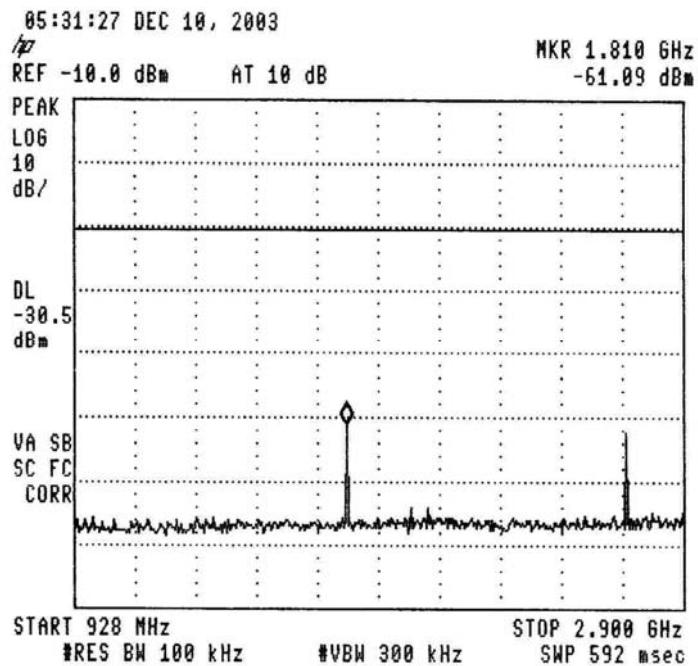


Figure 22.— 903.5 MHz

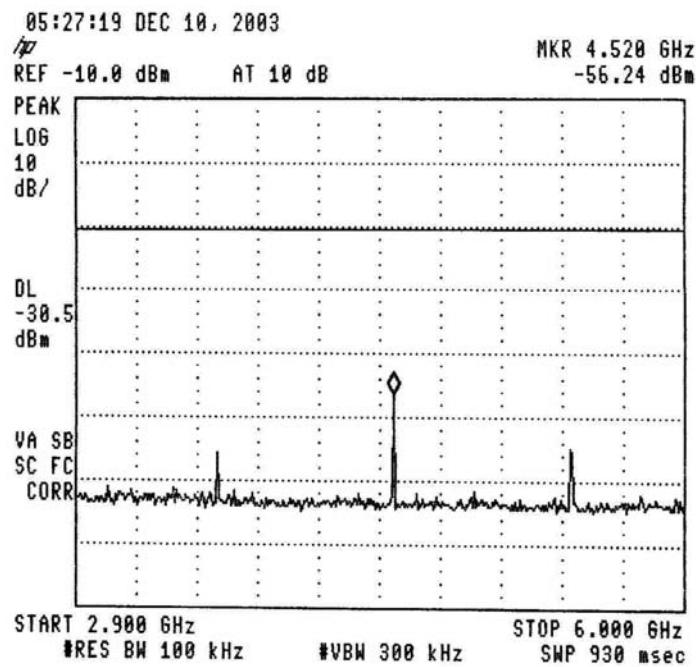


Figure 23.— 903.5 MHz

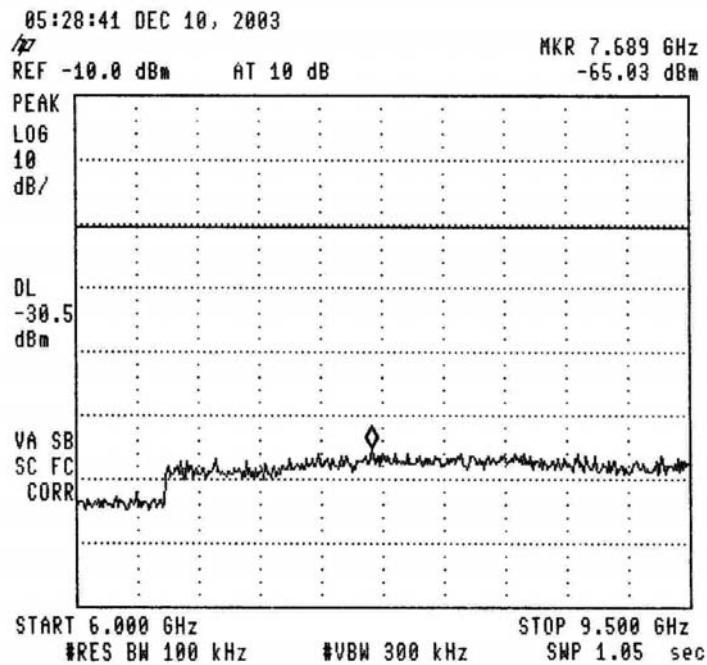


Figure 24.— 903.5 MHz

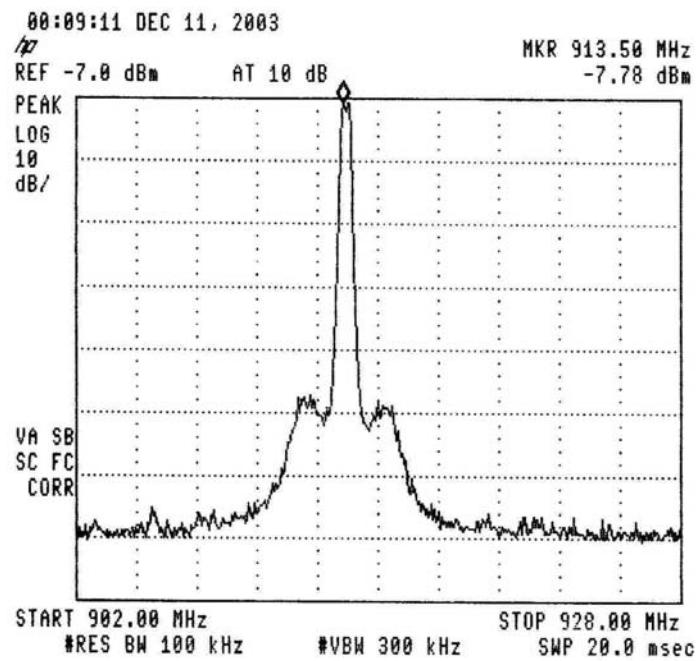


Figure 25.— 913.5 MHz

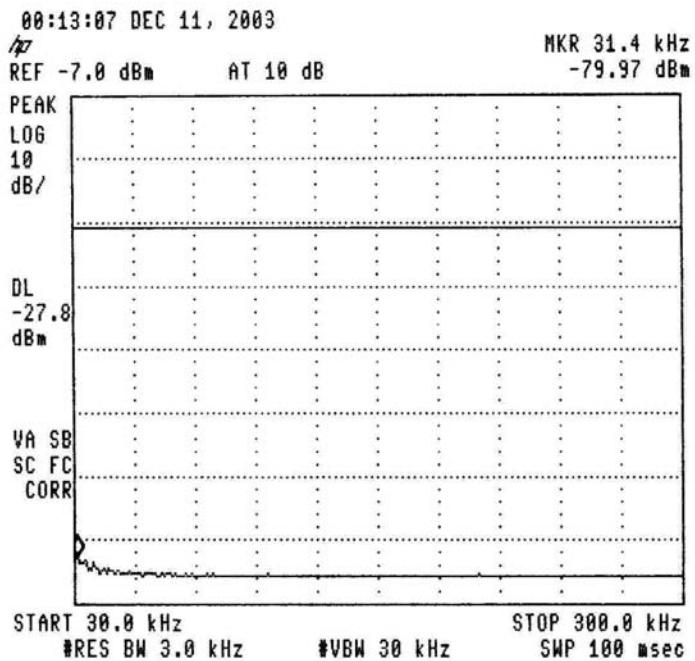


Figure 26.— 913.5 MHz

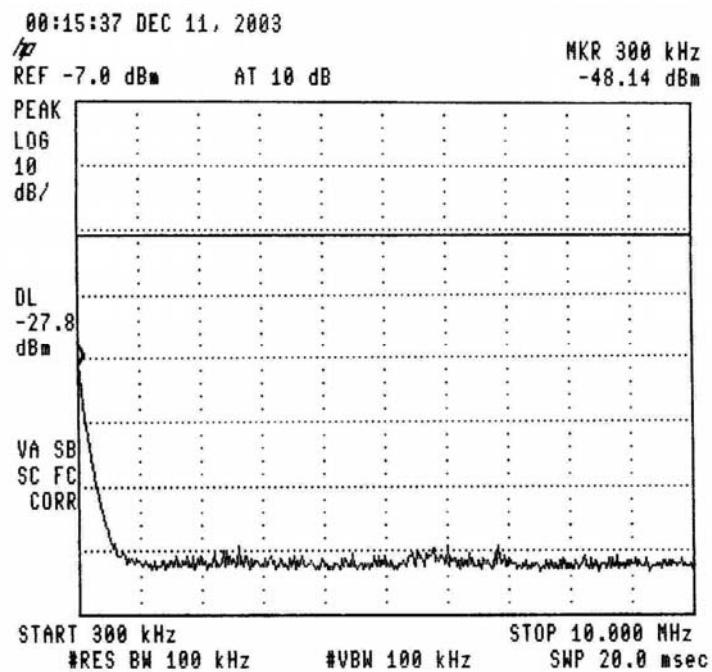


Figure 27.— 913.5 MHz

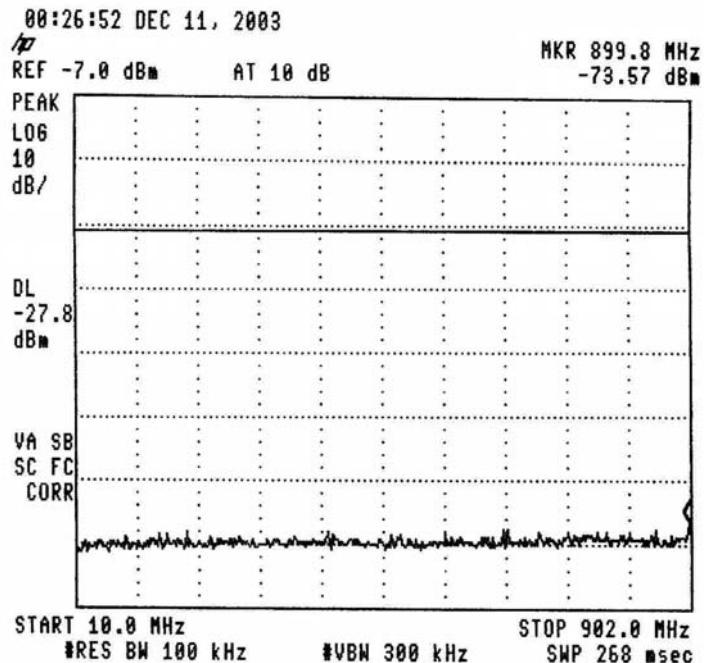


Figure 28.— 913.5 MHz

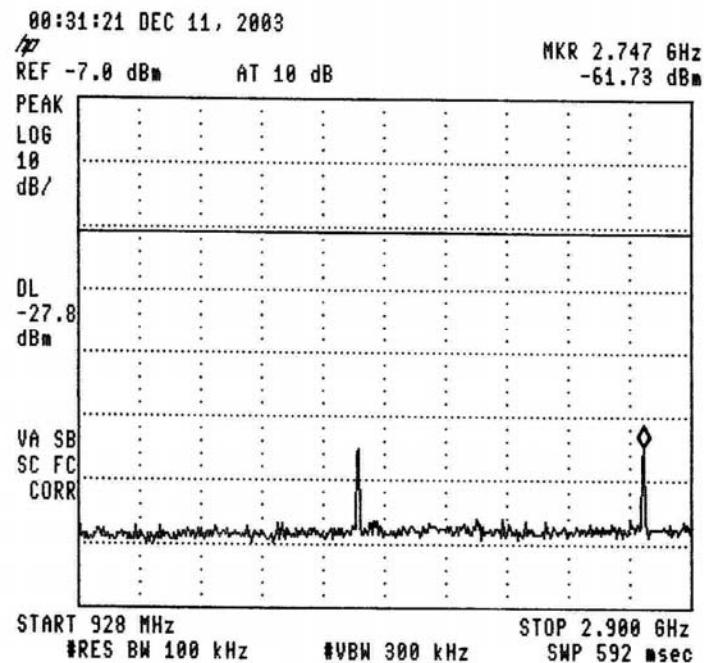


Figure 29.— 913.5 MHz

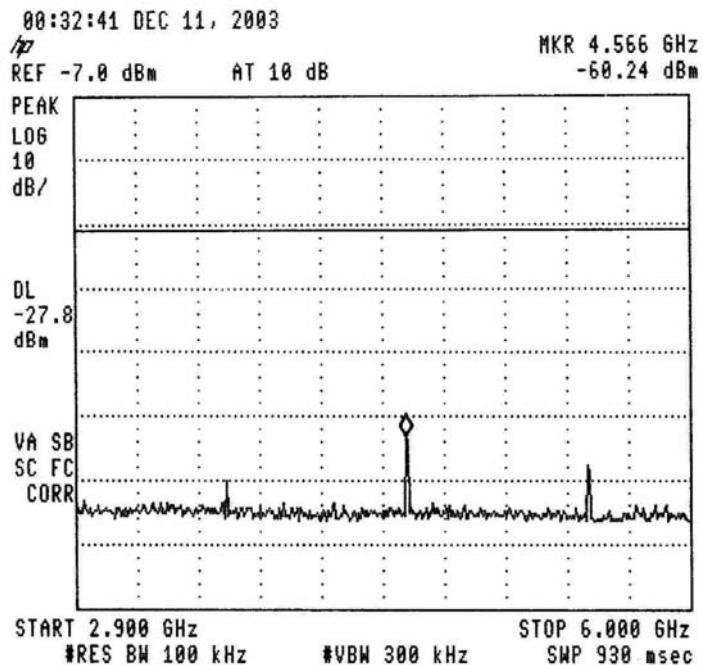


Figure 30.— 913.5 MHz

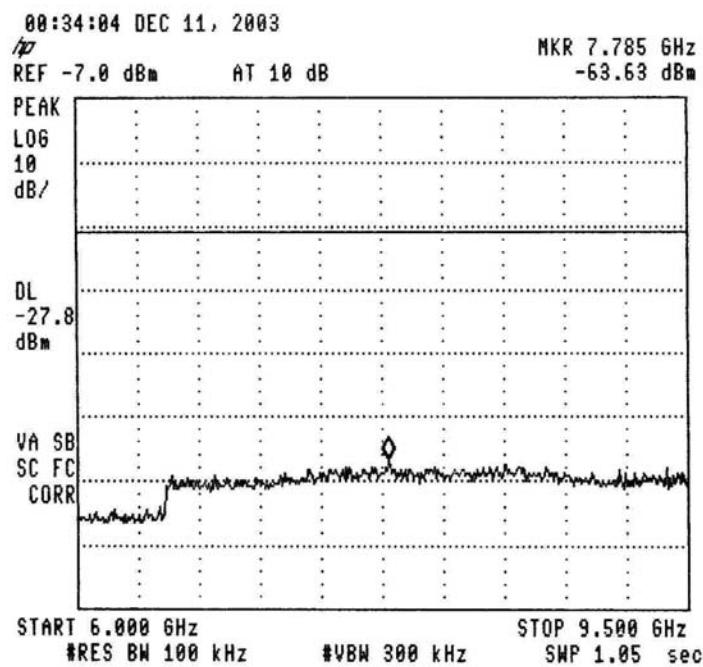


Figure 31.— 913.5 MHz

10.2 Results table

E.U.T. Description: IntegrAlarm Remote Keyfob

Model No.: IA-FOB1

Serial Number: Not Designated

Specification: FCC Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Reading (dBc)	Specification (dBc)	Margin (dB)
903.5	38.4	20.0	18.4
915.5	40.4	20.0	20.4

Figure 32 Peak Power Output of 902-928 MHz Band

JUDGEMENT: Passed by 18.4 dB

TEST PERSONNEL:

Tester Signature: E. Pitt

Date: 07.01.04

Typed/Printed Name: E. Pitt



10.3 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

Figure 33 Test Equipment Used

11. 20 dB Bandwidth

11.1 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 an appropriate coaxial cable and EXT ATT. 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.

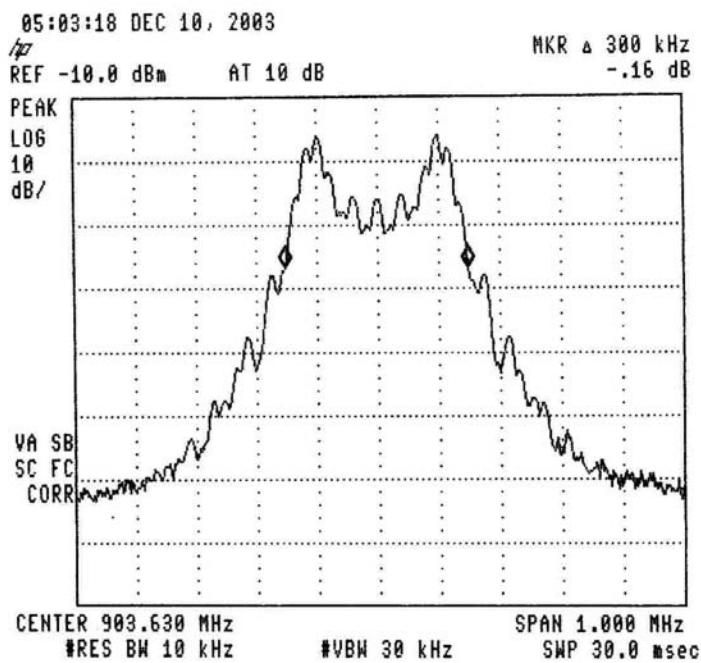


Figure 34 — 903.5 MHz

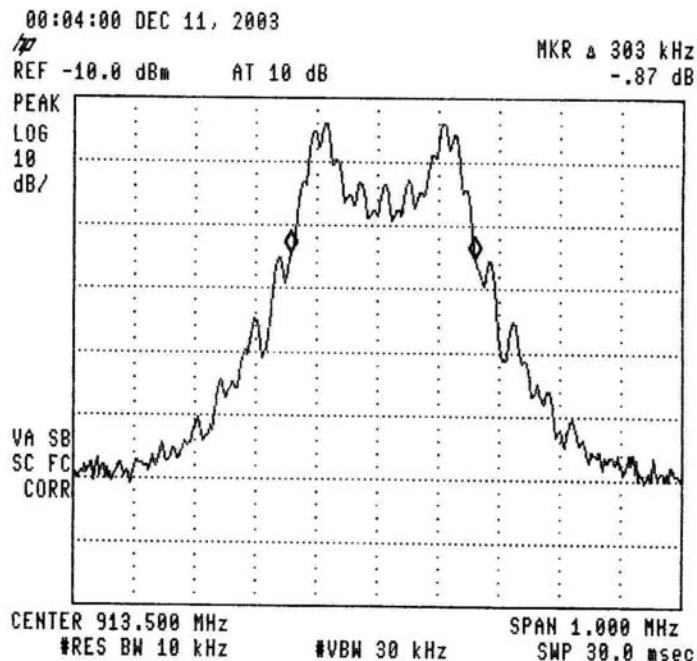


Figure 35 — 913.5 MHz

11.2 Results table

E.U.T. Description: IntegrAlarm Remote Keyfob
 Model No.: IA-FOB1
 Serial Number: Not Designated
 Specification: FCC Part 15, Subpart C: (15.247-a2)

Operation Frequency (MHz)	Reading (kHz)	Specification (kHz)	Margin (kHz)
903.5	300.0	500.0	-200.0
913.5	303.0	500.0	-197.0

Figure 36 20 dB Bandwidth

JUDGEMENT: Passed by 197.0 kHz

TEST PERSONNEL:

Tester Signature: E. Pitt Date: 07.01.04

Typed/Printed Name: E. Pitt



11.3 **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

Figure 37 Test Equipment Used

12. Band Edge Spectrum

[In Accordance with section 15.247(c)]

12.1 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 an EXT ATT 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.

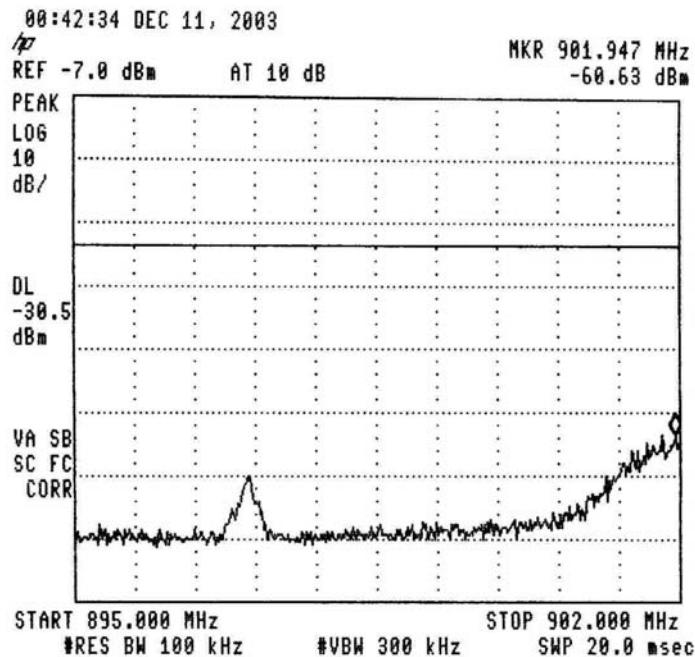


Figure 38 — 903.5 MHz

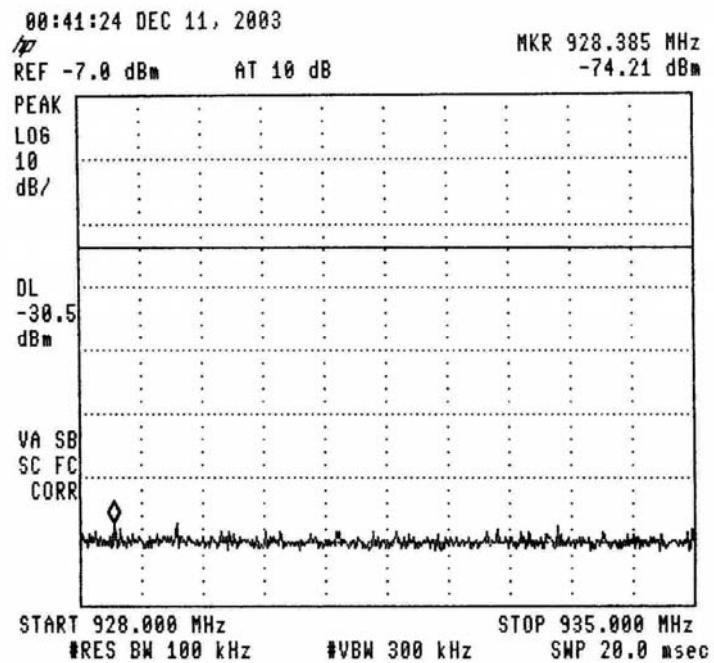


Figure 39 — 903.5 MHz

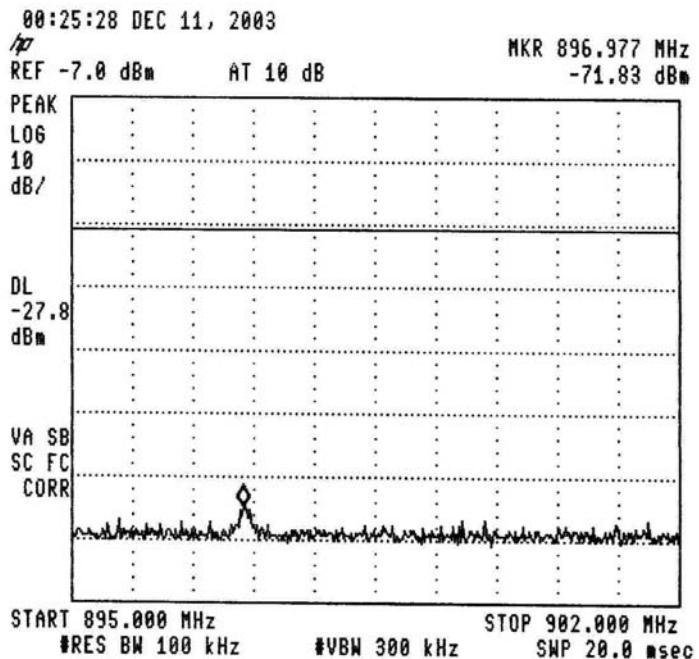


Figure 40 — 913.5 MHz

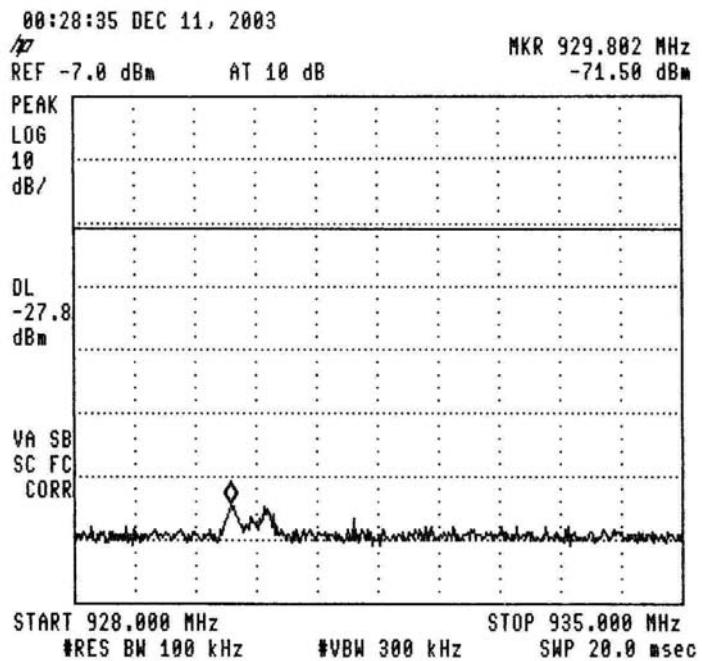


Figure 41 — 913.5 MHz

12.2 Results table

E.U.T. Description: IntegrAlarm Remote Keyfob

Model No.: IA-FOB1

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	901.947	50.1	20.0	30.1
913.5	929.802	63.7	20.0	43.7

Figure 42 Band Edge Spectrum

JUDGEMENT: Passed by 30.1 dB

TEST PERSONNEL:

Tester Signature: E. Pitt

Date: 07.01.04

Typed/Printed Name: E. Pitt



12.3 **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

Figure 43 Test Equipment Used

13. Antenna Gain

The gain of the antenna is -1dBi.

QUICK DATA SHEET

LNX
TECHNOLOGIES
WIRELESS MADE SIMPLE

JJB Series
Ultra-Compact Antenna

ANT-916-JJB-RA
ANT-916-JJB-ST

DESCRIPTION

The JJB-Series packs near the performance of a conventional monopole into an incredibly compact 7mm-diameter package. These antennas are ideal for any OEM application requiring a compact, cosmetically attractive, low-cost antenna solution. The antenna features a through-hole feedline which attaches directly to a user's PCB. Internal or external mounting is possible.

FEATURES

- Ultra-Compact
- Very Low Cost
- High-Performance (-1dBi Typical)
- Low VSWR (<2.0)
- Good Usable Bandwidth (900-930MHz)
- Easily Concealed Internally
- Direct PCB Mount

ORDERING INFORMATION

PART #	DESCRIPTION
ANT-***-JJB-RA	JJB Perm. Ultra-Miniature
ANT-***-JJB-ST	Straight version of JJB
***= 868, 916-(902-928MHz)	

PHYSICAL DIMENSIONS

ANT-*-JJB-RA**
Right-Angle Version

ANT-*-JJB-ST**
Straight Version

NOTE: For hand application only. Flux Feed-Pin prior to soldering. Solder quickly to avoid damage.

SPECIFICATIONS

Wavelength:	1/4 Wave
Designed for Match:	50Ω
Typical VSWR:	Center <1.7 Over Bandwidth <2.1
Typical Center:	916MHz
Usable Bandwidth:	30MHz (900-930MHz)
Typical Gain (Relative to Isotropic)	-1dBi
Element:	Precision Helical

TYPICAL SWR

CH1 S₁₁ SWR

1: 1.8423	2: 1.2685	3: 1.4181
902MHz	916MHz	928MHz
START 850 880 900 MHz	REF 1	STOP 1 880 900 920 MHz
916.000 900.000 MHz	2: 1.2685	916.000 900.000 MHz

SMITH CHART

CH1 S₁₁ 1: 0.971 2: -0.5352 3: -13.957
916MHz 916MHz 928MHz

CH1 S₁₁ 1: 0.971 2: -0.5352 3: -13.957
916.000 900.000 MHz 916.000 900.000 MHz

All measurements made using 1.5" x 3.5" groundplane counterpoise.

For additional information: Linx Technologies 1-800-736-6677

This is a preliminary data sheet. Recipient understands any or all of the above specifications are subject to change without notice and proceeds with integration at own risk.

Revised 4/29/03

14. R.F Exposure/Safety

The E.U.T. is a remote control hand-held device, using an integral monopole antenna. The typical distance between the E.U.T. and the body (excluding hands, wrists, feet, and ankles) of the user is 0.3m in normal use.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements and OET Bulletin 65, Supp. C, Table 1 requirements

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

$$S = \frac{903.5}{1500} = 0.60 \frac{mW}{cm^2}$$

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, +12.6dBm at 913.5 MHz)

G_T- Antenna Gain: -1dBi = 0.79

R- Distance from Transmitter using 20cm worst case

(c) The peak power density is :

$$S_p = \frac{31.6 \times 0.79}{4\pi(20)^2} = 4.97 \times 10^{-3} \frac{mW}{cm^2}$$

(d) The duty cycle of transmission in actual worst case is 10msec “on” and 200msec “Off”.

The average power over 30 minutes is:

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

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

$$S_{AV} = \frac{1.58 \times 0.79}{4\pi(20)^2} = 0.25 \times 10^{-3} \frac{mW}{cm^2}$$

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

15. Photographs of Tested E.U.T.



Figure 44 Top View



Figure 45 Bottom View



Figure 46 Bottom View Battery Cover Removed



Figure 47 Top Cover Internal View



Figure 48 PCB in Unit



Figure 49 PCB Side 1

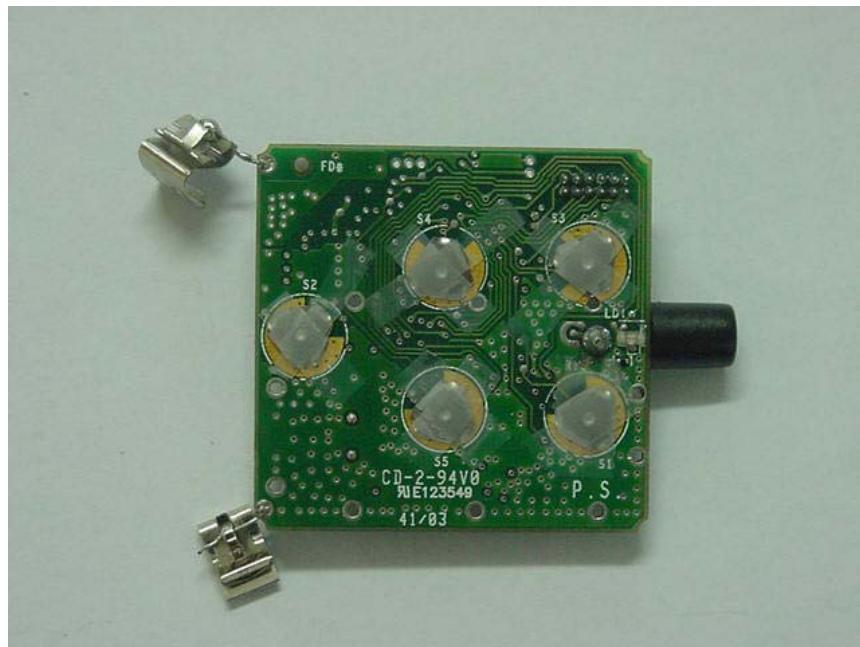


Figure 50 PCB Side 2