NVLAP Lab Code 200087-0

APPLICATION
FOR
GRANT of CERTIFICATION
REPORT
FOR

MODEL: Internal Tx Unit
PN 1475 381-101-SSS

FOR

HONEYWELL FMT. LLC

2000 East 9th Street

Kansas City, MO 64131-3095

Test Report Number 070712

Authorized Signatory Scot D Rogers

Scot D. Rogers

NVLAP Lab Code 200087-0

Rogers Labs, Inc.

4405 West 259th Terrace
Louisburg, KS 66053
Telephone / Fax (913) 837-3214

TEST REPORT
For
APPLICATION of CERTIFICATION
For
HONEYWELL FMT. LLC

2000 East 9th Street
Kansas City, MO 64131-3095
Phone: (816) 997-4556
Mr. Leonard H Moore
Compliance Engineer

Model: Internal Tx Unit
Low Power Intermittent Transmitter
Frequency: 916.5 MHz

FCC ID: VGKSSSINT

Test Date: July 12, 2007

Certifying Engineer: Scot D Rogers

Scot D. Rogers
ROGERS LABS, INC.
4405 West 259th Terrace
Louisburg, KS 66053
Phone: (913) 837-3214
FAX: (913) 837-3214

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In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2005, Part 2 Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.915, 2.925, 2.926, 2.1031 through 2.1057, applicable paragraphs of Part 15C, the following report is submitted.

Applicant Honeywell FMT. LLC
2000 East 9th Street
Kansas City, MO 64131-3095

Model Internal Tx Unit

FCC ID VGKSSSINT

Opinion / Interpretation of Results

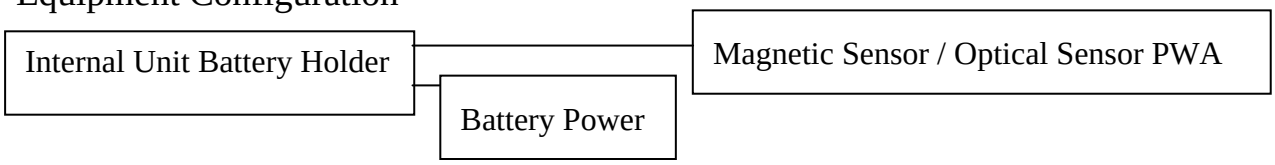
Emissions Testing Standard Referenced	Results
Emissions per CFR47, 15.231	Complies

Equipment Function and Configuration

Equipment Function

The EUT operates as a low power license exempt intentional radiator operating at 916.5 MHz and governed under CFR47 15.231 for periodic operation above 70 MHz. The device design allows the EUT to transmit door/drawer position of a secure facility inside a safe. The EUT senses a change of door/drawer status and transmits a signal to alert an external receiver indicating an open door/drawer state. The EUT allows for connection to a single cell battery for power and is functional once power is supplied. The EUT allows for interfacing with sensor circuitry allowing for optical and/or magnetic sensors enabling the transmitter function. The EUT offers no transmitter power adjustment to the end user.

Equipment Configuration



List of Test Equipment

A Hewlett Packard 8591EM and or 8562A Spectrum Analyzer was used as the measuring device for the emissions testing. The analyzer settings used are described in the following table. Refer to the Appendix for a complete list of Test Equipment.

HP 8591EM SPECTRUM ANALYZER SETTINGS		
CONDUCTED EMISSIONS		
RBW	AVG. BW	DETECTOR FUNCTION
9 kHz	30 kHz	Peak/Quasi Peak
RADIATED EMISSIONS (30 – 1000 MHz)		
RBW	AVG. BW	DETECTOR FUNCTION
120 kHz	300 kHz	Peak/Quasi Peak
HP 8562A SPECTRUM ANALYZER SETTINGS		
RADIATED EMISSIONS (1 – 40 GHz)		
RBW	AVG. BW	DETECTOR FUNCTION
1 MHz	1 MHz	Peak/Average
ANTENNA CONDUCTED EMISSIONS:		
RBW	AVG. BW	DETECTOR FUNCTION
120 kHz	300 kHz	Peak

CFR47 2.1033(b) Application for Certification

(1) Manufacturer: HONEYWELL FMT. LLC
2000 East 9th Street
Kansas City, MO 64131-3095
Phone: (816) 997-4556

(2) FCC Identification: Model: Internal Tx Unit
FCC ID: VGKSSSINT S/N: BBN-01105-K06

(3) Copy of the installation and operating manual:
Refer to exhibit for Draft Instruction Manual.

(4) Description of circuits: Refer to Exhibit for Circuit description and Theory of operation.

(5) Block Diagram: Refer to Exhibit for Block Diagram.

(6) Test report of measurements as required are contained in this document.

(7) Photographs or drawing of the Equipment and Identification information: Refer to Exhibit for required Photographs.

(8) Peripheral Equipment required: The EUT offers connection to sensing switches.

(9) Transition Provisions of 15.37: The transition provisions of 15.37 are not requested.

(10) Scanning receiver certification: The equipment is not a scanning receiver.

(11) Application for certification of transmitter operating within the 59-64 GHz range: Not applicable to this certification request as the equipment does not operate in the 59-64 GHz frequency band.

(12) Application for certification of software defined equipment: Not applicable as the equipment is not software defined.

CFR47 15 Subpart C - Intentional Radiators

As per CFR47 Part 15, Subpart C the following information is submitted for consideration in obtaining a grant of certification for unlicensed low power intentional radiators operating under provision of CFR47 15.231.

CFR47 15.203 Antenna Requirements

The unit is produced with a permanently attached antenna inside the plastic case. No provisions for modification or alterations of the antenna configuration are available to the end user. The requirements of 15.203 are met there are no deviations or exceptions to the specification.

CFR47 15.205 Restricted Bands of Operation

Spurious emissions falling in the restricted frequency bands of operation were measured at the OATS. The EUT utilizes frequency, determining circuitry, which generates harmonics falling in the restricted bands. Emissions were checked at the OATS, using appropriate antennas or pyramidal horns, amplification stages, and a spectrum analyzer. Peak and average amplitudes of frequencies above 1000 MHz were compared to the required limits with worst-case data presented below. Test procedures of ANSI 63.4-2003 paragraphs 13.1 and 8.3.1.2 were used during testing. No other significant emission was observed which fell into the restricted bands of operation. Computed emission values take into account the measured radiated field strength, receive antenna correction factor, amplifier gain stage, and test system cable losses.

Sample Calculations:

Computed Peak (dBµV/m @ 3m) = FSM (dBµV) + A.F. (dB) - Gain (dB)
= 46.0 + 34.1 - 30
= 50.1

CFR47 15.205 Emissions Data in Restricted Bands

Emission Frequency (MHz)	Peak FSM Horz. (dBµV)	Peak FSM Vert. (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	Limit @ 3m (dBµV/m)
2749.6	46.0	48.7	34.1	30	50.1	52.8	54.0
3666.2	42.8	38.0	39.1	30	51.9	47.1	54.0
4582.7	46.8	46.3	32.5	30	49.3	48.8	54.0

Other emissions present presented amplitudes at least 20 dB below the required limits.

CFR47 15.205 Summary of Results for Radiated Emissions in Restricted Bands

The radiated emissions for the EUT meet the requirements for FCC CFR47 Part 15.205 restricted bands of operation. The EUT had a 1.2 dB minimum margin below the limits. No other emissions found in the restricted bands.

CFR47 15.207 Conducted emissions limits; general requirements

CFR47 15.207 AC Line Conducted EMI

The EUT operates solely form DC power supplied from battery power and offers no connection to utility power. Therefore, no AC power line conducted emissions testing was performed and the equipment complies with the requirements.

CFR47 15.207 Summary of Results for AC Line Conducted General Emissions

The conducted emissions for the EUT meet the requirements for FCC Part 15C Intentional Radiators. The EUT operates solely form DC power supplied from battery power and offers no connection to utility power.

CFR47 15.209 Radiated emissions limits; general requirements

CFR47 15.209 General Radiated EMI

Test procedures of ANSI 63.4-2003 paragraphs 13.1 and 8.3.1.2 were used during radiated emissions testing. The EUT was arranged in a typical equipment configuration and operated through all of its various modes. Preliminary testing was performed in a screen room with the EUT positioned 1 meter from the FSM. Radiated emissions investigations were performed to identify the frequencies, which produced the highest emissions. Plots were made of the radiated emission frequency spectrum from 30 MHz to 10,000 MHz for the preliminary testing. Refer to figures 1 through 5 showing the worst-case radiated emission spectrum displayed on the spectrum analyzer taken in a screen room. The highest radiated emission was then re-maximized at the OATS site before final radiated emissions measurements were performed. Final data was taken with the EUT located at the open field test site at a distance of 3 meters between the EUT and the receiving antenna. The frequency spectrum from 30 MHz to 10,000 MHz was searched for radiated emissions. Peak and average amplitudes of frequencies above 1000 MHz were compared to the required limits with worst-case data presented below. Measured emission levels were maximized by EUT placement on the table, changing cable location, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna polarization between horizontal and vertical. Antennas used were Broadband Biconical from 30 MHz to 200 MHz, Log Periodic from 200 MHz to 5 GHz, and/or Biconilog from 30 MHz to 1000 MHz, Pyramidal Horns from 5 GHz to 25 GHz, and amplification stages.

Sample Calculations: RFS = Radiated Field Strength
dBµV/m @ 3m = dBµV + A.F. - Amplifier Gain
dBµV/m @ 3m = 38.6 + 7.7 - 30
= 16.3

CFR47 15.209 General Radiated Emissions Data

Emission Freq. (MHz)	FSM Horz. (dBµV)	FSM Vert. (dBµV)	Ant. Factor (dB)	Amp Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	Limit @ 3m (dBµV/m)
84.0	38.6	32.5	7.7	30	16.3	10.2	43.5

Other emissions present presented amplitudes at least 20 dB below limits.

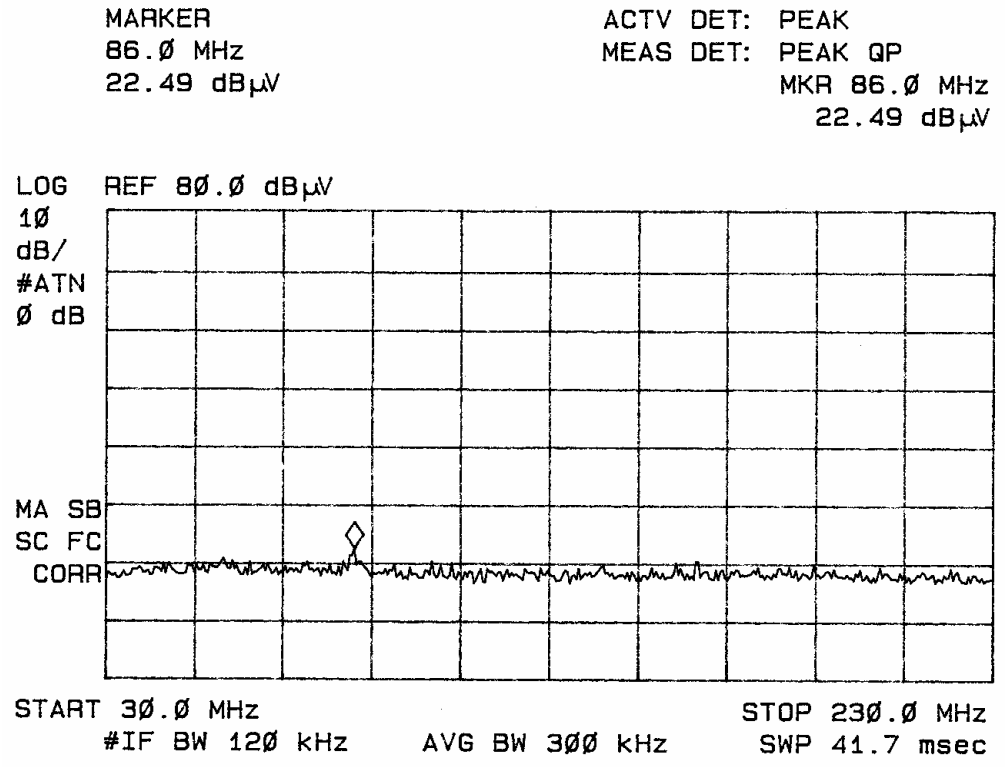


Figure one Peak Radiated Emissions taken at 1 meter in screen room.

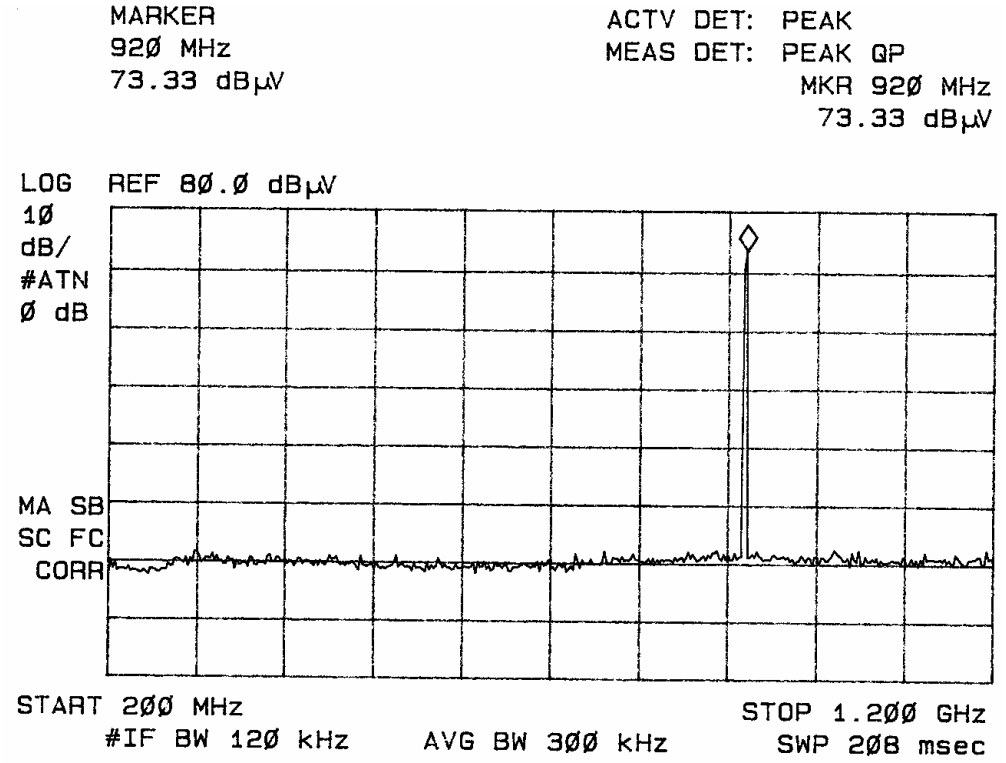


Figure two Peak Radiated Emissions taken at 1 meter in screen room.

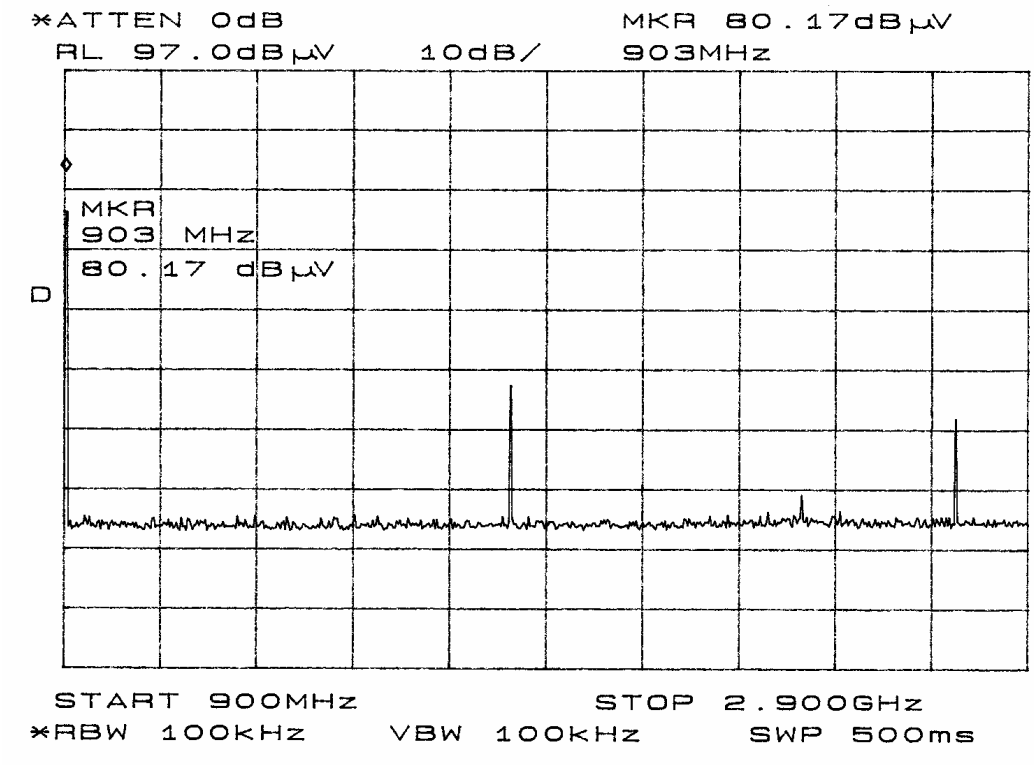


Figure three Peak Radiated Emissions taken at 1 meter in screen room.

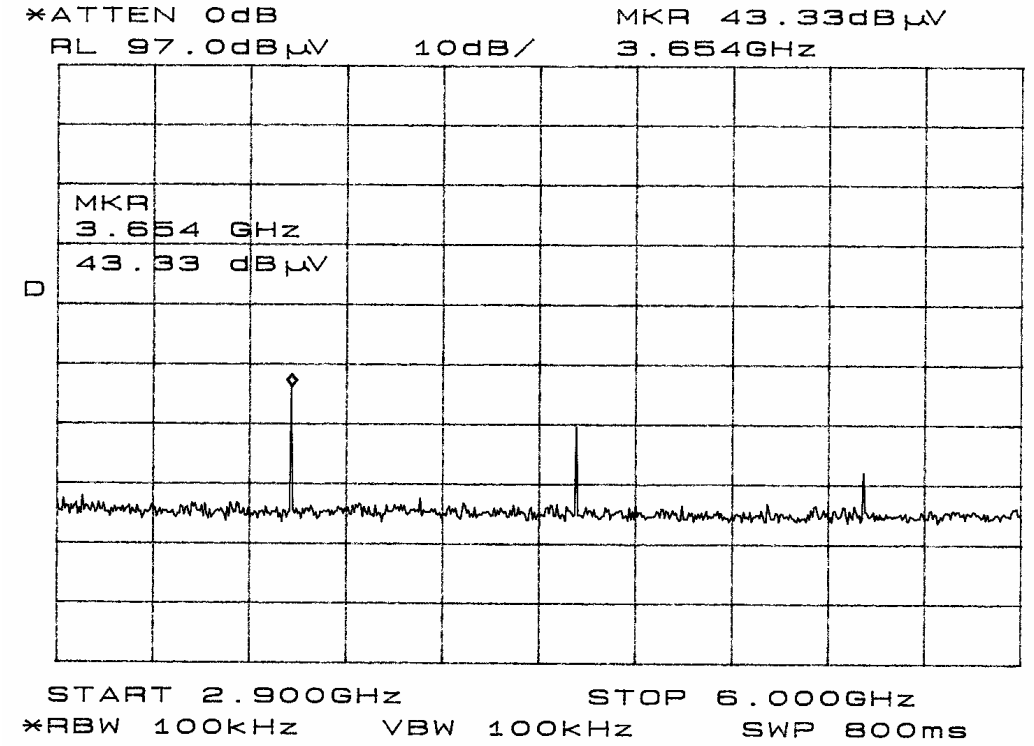


Figure four Peak Radiated Emissions taken at 1 meter in screen room.

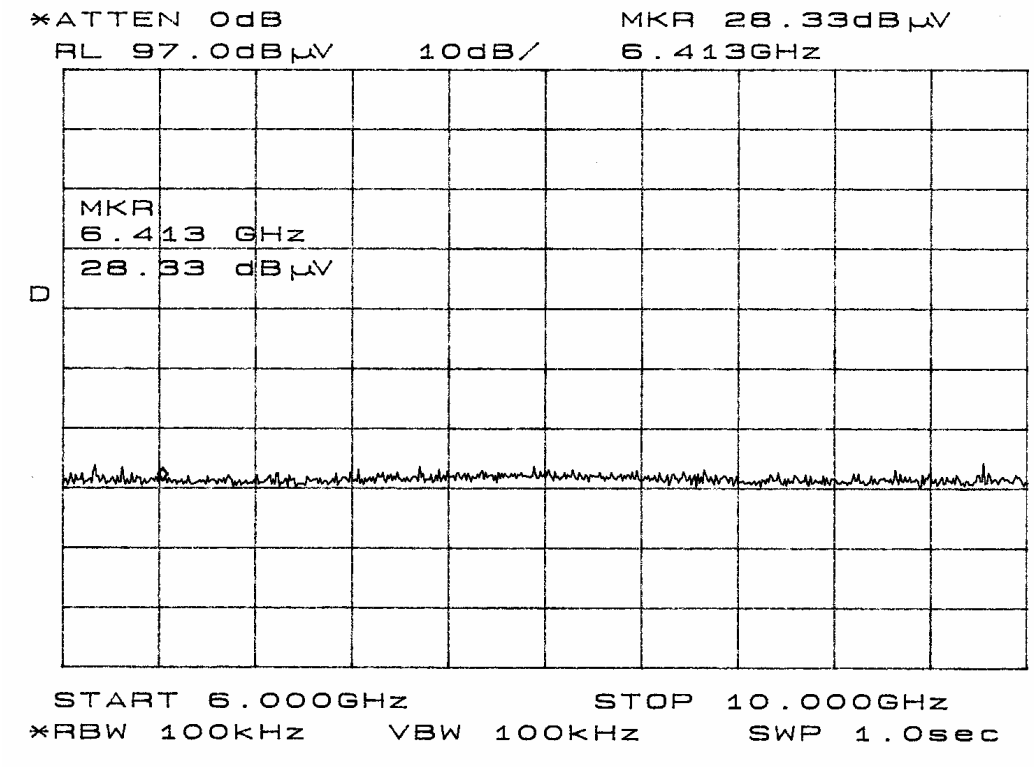


Figure five Peak Radiated Emissions taken at 1 meter in screen room.

CFR47 15.209 Summary of Results for General Radiated Emissions

The radiated emissions for the EUT meet the requirements for FCC Part 15C Intentional Radiators. The EUT had a 27.2 dB minimum margin below the limits. Other emissions were present with amplitudes at least 20 dB below the FCC Limits.

CFR47 15.231 Periodic Operation Above 70 MHz

Test procedures of ANSI 63.4-2003 paragraphs 13.1 and 8.3.1.2 were used during testing. The power output was measured on an open area test site @ 3 meters distance. The power output was measured on an open field test site @ 3 meters. Data was taken per Paragraph 2.1046(a) and 15.231. The EUT was placed on a wooden turntable 0.8 meters above the ground plane and at a distance of 3 meters from the FSM antenna. The equipment operates at such short duty cycle during normal operation fundamental emission measurements were taken using quasi-peak amplitude. The quasi-peak amplitude of the carrier and peak amplitudes of harmonic frequencies were measured using a spectrum analyzer. The quasi-peak or peak amplitude of the emission was then recorded from the analyzer display. The transmitter is automatically activated upon sensing a change in state of the door/drawer unlock sensors. Upon activation, the transmitter powers the final amplifier and broadcasts data for 32mS, off time for 82 mS, repeats three time and then returns to sense mode. Using the reduction factor of 20log(32mS/100mS) equating to 9.9 dB to reduce the measured quasi-peak emissions, the unit demonstrates compliance to the requirements. A change of state could occur up to eight times a day. The transmitter design thus complies with the requirements of CFR47 15.231 periodic operations ending transmission within 5 seconds and less than 2 seconds operation per hour. Emissions radiated outside of the specified bands, and operation in the restricted bands, comply with the requirements of 15.205 and 15.209. The amplitude of each emission was measured at the OATS at a distance of 3 meters from the FSM antenna. The amplitude of each emission was maximized by varying the FSM antenna height, polarization, and by rotating the turntable. A Biconilog Antenna was used for measuring emissions from 30 to 1000 MHz, a Log Periodic Antenna for 200 to 5000 MHz, and Pyramidal Horn Antennas from 4 GHz to 25 GHz. Emissions were measured in dBµV/m @ 3 meters.

Example dBµV/m@ 3m = FSM + A.F. + cable loss - amplifier Gain
= 91.0 + 23.2 – 30
= 79.6 duty cycle reduction of 9.9 dB = 69.7

Per 15.2331© the 20-dB bandwidth of the emission shall be no wider than 0.5% of the fundamental (916.5 MHz). Figure six demonstrates the 20-dB bandwidth of the EUT complies with the requirements.

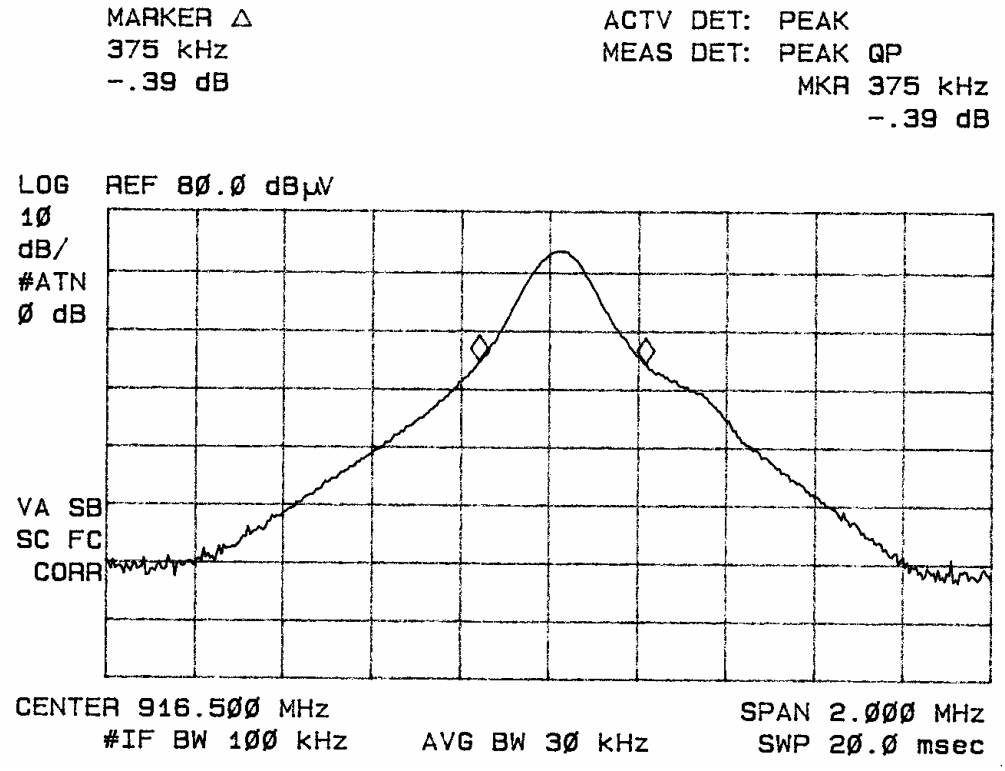


Figure six 20-dB bandwidth plot

CFR47 15.231 Transmitter Radiated Emissions Data

Emission Frequency (MHz)	Hori. FSM Peak (dBµV)	Vert. FSM Peak (dBµV)	Ant. Factor (dB)	Amp. Gain (dB)	RFS Peak @ 3m (dBµV/m)	RFS Average @ 3m (dBµV/m)	Limit @ 3m (dBµV/m)
916.5 (Quasi-peak)	91.0	97.6	23.2	30	79.6	86.2	101.9(peak)
916.5 calculated average emission utilizing duty cycle reduction of 9.9 dB					69.7	76.3	81.9 (ave)
1833.0 (peak)	44.2	51.7	29.0	30	43.2	50.7	61.9 (ave)
2749.6 (peak)	46.0	48.7	34.1	30	50.1	52.8	61.9 (ave)
3666.2 (peak)	42.8	38.0	39.1	30	51.9	47.1	61.9 (ave)
4582.7 (peak)	46.8	46.3	32.5	30	49.3	48.8	61.9 (ave)
5499.2 (peak)	47.5	46.3	33.1	30	50.6	49.4	61.9 (ave)
6415.8 (peak)	30.7	32.0	34.2	30	34.9	36.2	61.9 (ave)

Note: Peak Emission Levels were measured @ 3-meter OATS site.

CFR47 15.231 Summary of Results for Transmitter Radiated Emissions

The EUT had a quasi-peak amplitude emission of 15.7 dB margin below the peak limit of 15.231. The EUT had a calculated average amplitude emission of 5.6 dB margin below the average limit of 15.231. The EUT had peak amplitude of harmonic emissions of 9.1 dB margin below the average limit of 15.231. The radiated emissions for the EUT meet the requirements for FCC CFR47 Part 15.231 Intentional Radiators. There are no measurable emissions in the restricted bands other than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the required Limits.

Statement of Modifications and Deviations

No modifications to the EUT were required for the unit to meet the CFR47 Part 15C emissions standards. There were no deviations or exceptions to the specifications.

Annex

- Annex A, Measurement Uncertainty Calculations
- Annex B, Test Equipment List.
- Annex C, Rogers Qualifications.
- Annex D, FCC Site Approval Letter.
- Annex E, Industry Canada Approval Letter.

Annex A Measurement Uncertainty Calculations

Radiated Emissions Measurement Uncertainty Calculation

Measurement of vertically polarized radiated field strength over the frequency range 30 MHz to 1 GHz on an open area test site at 3m and 10m includes following uncertainty:

Contribution	Probability Distribution	Uncertainty (dB)
Antenna factor calibration	normal (k = 2)	±0.58
Cable loss calibration	normal (k = 2)	±0.2
Receiver specification	rectangular	±1.0
Antenna directivity	rectangular	±0.1
Antenna factor variation with height	rectangular	±2.0
Antenna factor frequency interpolation	rectangular	±0.1
Measurement distance variation	rectangular	±0.2
Site Imperfections	rectangular	±1.5

Combined standard uncertainty $u_C(y)$ is

$$U_c(y) = \pm \sqrt{\left[\frac{1.0}{2}\right]^2 + \left[\frac{0.2}{2}\right]^2 + \left[\frac{1.0^2 + 0.1^2 + 2.0^2 + 0.1^2 + 0.2^2 + 1.5^2}{3}\right]}$$

$U_c(y) = \pm 1.6$ dB

It is probable that $u_C(y) / s(q_k) > 3$, where $s(q_k)$ is estimated standard deviation from a sample of n readings

$$s(q_k) = \sqrt{\frac{1}{(n-1)} \sum_{k-1}^{n} (q_k - \bar{q})^2}$$

unless the repeatability of the EUT is particularly poor, and a coverage factor of k = 2 will ensure that the level of confidence will be approximately 95%, therefore:

$$U = 2\, U_C(y) = 2 \times \pm 1.6 \text{ dB} = \pm 3.2 \text{ dB}$$

Notes:

1.1 Uncertainties for the antenna and cable were estimated, based on a normal probability distribution with k = 2.

1.2 The receiver uncertainty was obtained from the manufacturer's specification for which a rectangular distribution was assumed.

1.3 The antenna factor uncertainty does not take account of antenna directivity.

1.4 The antenna factor varies with height and since the height was not always the same in use as when the antenna was calibrated an additional uncertainty is added.

1.5 The uncertainty in the measurement distance is relatively small but has some effect on the received signal strength. The increase in measurement distance as the antenna height is increased is an inevitable consequence of the test method and is therefore not considered a contribution to uncertainty.

1.6 Site imperfections are difficult to quantify but may include the following contributions:
-Unwanted reflections from adjacent objects.
-Ground plane imperfections: reflection coefficient, flatness, and edge effects.
-Losses or reflections from "transparent" cabins for the EUT or site coverings.
-Earth currents in antenna cable (mainly effect biconical antennas).

The specified limits for the difference between measured site attenuation and the theoretical value (± 4 dB) were not included in total since the measurement of site attenuation includes uncertainty contributions already allowed for in this budget, such as antenna factor.

Conducted Measurements Uncertainty Calculation

Measurement of conducted emissions over the frequency range 9 kHz to 30 MHz includes following uncertainty:

	Probability	Uncertainty
Contribution	Distribution	(dB)
Receiver specification	rectangular	±1.5
LISN coupling specification	rectangular	±1.5
Cable and input attenuator calibration	normal (k=2)	±0.5

Combined standard uncertainty $u_C(y)$ is

$$U_c(y) = \pm \sqrt{\left[\frac{0.5}{2}\right]^2 + \frac{1.5^2 + 1.5^2}{3}}$$

$$U_C(y) = \pm 1.2 \text{ dB}$$

As with radiated field strength uncertainty, it is probable that $u_C(y) / s(q_k) > 3$ and a coverage factor of k = 2 will suffice, therefore:

$$U = 2\, U_C(y) = 2 \times \pm 1.2 \text{ dB} = \pm 2.4 \text{ dB}$$

Annex B Test Equipment List For Rogers Labs, Inc.

The test equipment used is maintained in calibration and good operating condition. Use of this calibrated equipment ensures measurements are traceable to national standards.

List of Test Equipment	Calibration Date
Oscilloscope Scope: Tektronix 2230	2/07
Wattmeter: Bird 43 with Load Bird 8085	2/07
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/07
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/07
R.F. Generator: HP 606A	2/07
R.F. Generator: HP 8614A	2/07
R.F. Generator: HP 8640B	2/07
Spectrum Analyzer: HP 8562A, Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W HP Adapters: 11518, 11519, 11520	2/07
Spectrum Analyzer: HP 8591EM	5/07
Frequency Counter: Leader LDC825	2/07
Antenna: EMCO Biconilog Model: 3143	5/07
Antenna: EMCO Log Periodic Model: 3147	10/06
Antenna: Antenna Research Biconical Model: BCD 235	10/06
Antenna: EMCO Dipole Set 3121C	2/07
Antenna: C.D. B-101	2/07
Antenna: Solar 9229-1 & 9230-1	2/07
Antenna: EMCO 6509	2/07
Audio Oscillator: H.P. 201CD	2/07
R.F. Power Amp 65W Model: 470-A-1010	2/07
R.F. Power Amp 50W M185- 10-501	2/07
R.F. PreAmp CPPA-102	2/07
LISN 50 µHy/50 ohm/0.1 µf	10/06
LISN Compliance Eng. 240/20	2/07
LISN Fischer Custom Communications FCC-LISN-50-16-2-08	2/07
Peavey Power Amp Model: IPS 801	2/07
Power Amp A.R. Model: 10W 1010M7	2/07
Power Amp EIN Model: A301	2/07
ELGAR Model: 1751	2/07
ELGAR Model: TG 704A-3D	2/07
ESD Test Set 2010i	2/07
Fast Transient Burst Generator Model: EFT/B-101	2/07
Current Probe: Singer CP-105	2/07
Current Probe: Solar 9108-1N	2/07
Field Intensity Meter: EFM-018	2/07
KEYTEK Ecat Surge Generator	2/07
Shielded Room 5 M x 3 M x 3.0 M	
5/2/2007	

Annex C Qualifications

SCOT D. ROGERS, ENGINEER

ROGERS LABS, INC.

Mr. Rogers has approximately 17 years experience in the field of electronics. Six years working in the automated controls industry and 6 years working with the design, development and testing of radio communications and electronic equipment.

POSITIONS HELD:

Systems Engineer:	A/C Controls Mfg. Co., Inc.	6 Years
Electrical Engineer:	Rogers Consulting Labs, Inc.	5 Years
Electrical Engineer:	Rogers Labs, Inc.	Current

EDUCATIONAL BACKGROUND:

1) Bachelor of Science Degree in Electrical Engineering from Kansas State University.

2) Bachelor of Science Degree in Business Administration Kansas State University.

3) Several Specialized Training courses and seminars pertaining to Microprocessors and Software programming.

Scot D Rogers

Scot D. Rogers

July 12, 2007

Date

Annex D FCC Site Approval Letter

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

May 16, 2006

Registration Number: 90910

Rogers Labs, Inc.
4405 West 259th Terrace
Louisburg, KS 66053

Attention: Scot Rogers

Re: Measurement facility located at Louisburg
3 & 10 meter site
Date of Renewal: May 16, 2006

Dear Sir or Madam:

Your request for renewal of the registration of the subject measurement facility has been received. The information submitted has been placed in your file and the registration has been renewed. The name of your organization will remain on the list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that the file must be updated for any changes made to the facility and the registration must be renewed at least every three years.

Measurement facilities that have indicated that they are available to the public to perform measurement services on a fee basis may be found on the FCC website www.fcc.gov under E-Filing, OET Equipment Authorization Electronic Filing, Test Firms.

Sincerely,

Phyllis Parrish
Information Technician

NVLAP Lab Code 200087-0

Annex E Industry Canada Site Approval Letter

Industry Canada Industrie Canada

May 23rd, 2006

OUR FILE: 46405-3041
Submission No: 115252

Rogers Labs Inc.
4405 West 259th Terrace
Louisburg, KY
USA 66053

Dear Sir/Madame:

The Bureau has received your application for the Alternate Test Site or OATS and the filing is satisfactory to Industry Canada.

Please reference to the file number **(3041-1)** in the body of all test reports containing measurements performed on the site.

In the future, to obtain or renew a unique registration number, you may demonstrate that the site has been accredited to ANSI C63.4-2003 or later.

If the site is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating conformance with the ANSI standard. The Department will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to exceed two years.

If you have any questions, you may contact the Bureau by e-mail at certification.bureau@ic.gc.ca
Please reference our file number above for all correspondence.

Yours sincerely,

Robert Corey
Manager Certification
Certification and Engineering Bureau
3701 Carling Ave., Building 94
Ottawa, Ontario K2H 8S2

Canada