

ROGERS LABS, INC.

4405 West 259th Terrace
Louisburg, KS 66053
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ENGINEERING TEST REPORT FOR APPLICATION of GRANT of CERTIFICATION

FOR
CFR 47, PART 15C - INTENTIONAL RADIATORS
Paragraphs 15.247
Spread Spectrum Frequency Hopping System
Operating in the 2400-2483.5 MHz band

For

GARMIN INTERNATIONAL, INC.

1200 East 151st Street
Olathe, KS 66062
Doug Kealey,
Compliance Engineer

802.11 Compliant Wireless Handheld PC
Model: IQUE M5
Frequency 2400-2483.5 MHz
FCC ID#: IPH-00793

Test Date: July 15, 2004

Certifying Engineer: *Scot D. Rogers*

Scot D. Rogers
ROGERS LABS, INC.
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FORWARD:

The following information is submitted for consideration in obtaining a Grant of Certification for an intentional radiator operating as a spread spectrum frequency hopping intentional radiator per CFR Paragraph 15.247 in the 2400-2483.5 MHz band.

Name of Applicant: GARMIN INTERNATIONAL, INC.
1200 East 151st Street
Olathe, KS 66062

Model: IQUE M5

FCC I.D.: IPH-00793

Frequency Range: 2400-2483.5 MHz.

Operating Power: 0.001 W (measured at antenna connection on PCB).

1) Applicable Standards & Test Procedures

a) In accordance with the Federal Communications Code of Federal Regulations, dated October 1, 2003, Part 2, Subpart J, Paragraphs 2.907, 2.911, 2.913, 2.925, 2.926, 2.1031 through 2.1057, applicable parts of paragraph 15, Part 15C paragraphs 15.247, and FCC document DA00-705 the following is submitted:

b) Test procedures used are the established Methods of Measurement of Radio Noise Emissions as described in the ANSI 63.4-1992 Document FCC and documents DA00-1407 and DA00-705.

2.1033(b) Application for Certification

- (1) Manufacturer: GARMIN INTERNATIONAL, INC.
1200 East 151st Street
Olathe, KS 66062
- (2) Identification: Model: IQUE M5
FCC I.D.: IPH-00793
- (3) Instruction Book:
Refer to Exhibit for Instruction Manual.
- (4) Description of Circuit Functions:
Refer to Exhibit of Operational Description.
- (5) Block Diagram with Frequencies:
Refer to Exhibit of Operational Description.
- (6) Report of Measurements:
Follows in this Report.
- (7) Photographs: Construction, Component Placement, etc.:
Refer to Exhibit for photographs of equipment.
- (8) Peripheral Equipment The unit was tested with and without attachment of the AC wall adapter used to charge the batteries
- (9) Transition Provisions of 15.37 are not being requested.
- (10) Frequency hopping Spread Spectrum transmitters:
Compliance with 15.247(a)(1) and the receiver bandwidth requirement are demonstrated in this report and exhibits.
- (11) Not Applicable. The EUT is not a Scanning Receiver.
- (12) Not Applicable. The EUT does not operate in the 59 - 64 GHz frequency band.

2) Equipment Tested

<u>Equipment</u>	<u>Model</u>	<u>FCC I.D.#</u>
EUT	IQUE M5	IPH-00793

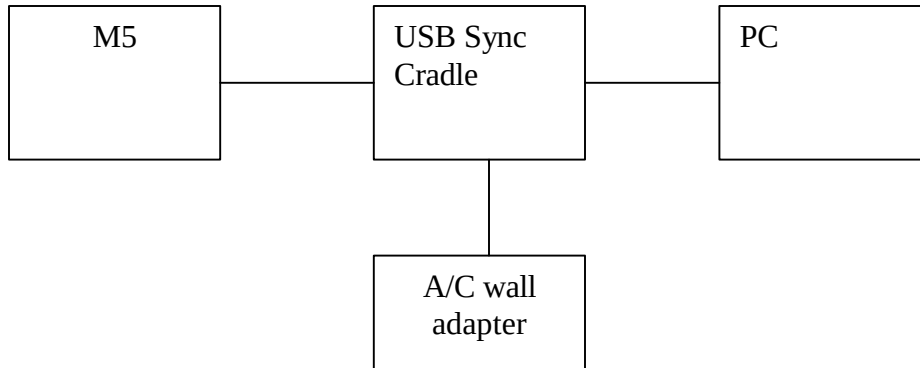
3) Equipment Function and Testing Procedures

The EUT is a 2400-2483.5 MHz radio transmitter used to transmit data using the 802.11 (Blue Tooth) specifications for wireless computer links. The IQUE M5 incorporates a wireless link used for transmitting data information to/from the EUT to other Blue Tooth compliant devices. The unit typically operates from an internal pack and has a wall mount power supply for battery charging operations. The unit may be connected to a computer through a USB port and has no other provisions to connect to external peripheral equipment. The unit was tested for compliance to CFR 47 Part 15 Unintentional radiators using the USB cable provided by the manufacturer. The EUT was tested in all standard equipment configurations and through all modes of operation.

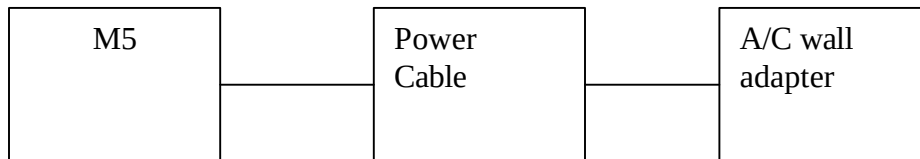
4) Equipment and Cable Configurations

Configuration options for the EUT

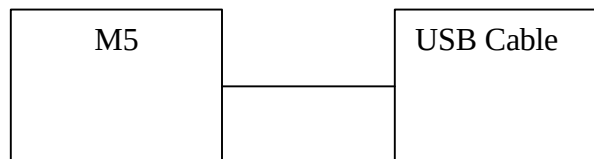
M5 connected to USB Sync cradle assembly (GPN: 011-01051-00), A/C wall adapter (GPN: 36200034-00) and PC.



M5 connected to Power cable (GPN: 32000186-60) and A/C wall adapter (GPN: 36200034-00).



M5 connected to USB cable (GPN: 32000186-30)



The EUT was tested all configurations with test data taken.

Data represented in this report was taken with the EUT connected to the power cable and A/C wall adapter. The USB configurations data was reported in a self certification of unintentional radiators report since the transmitter section is not in use in USB applications.

Conducted Emission Test Procedure

The unit typically operates from an internal battery pack and the manufacturer supplied A/C wall supply transformer used to maintain the internal batteries. For testing purposes the manufacturer supplied wall transformer was used to power the unit. The test setup including the EUT was arranged in a typical equipment configuration and placed on a 1 x 1.5-meter wooden bench, 0.8 meters high located in a screen room. The power lines of the system were isolated from the power source using a standard LISN with a 50 mH choke. EMI was coupled to the spectrum analyzer through a 0.1 mF capacitor internal to the LISN. The LISN was positioned on the floor beneath the wooden bench supporting the EUT. The power lines and cables were draped over the back edge of the table.

Radiated Emission Test Procedure:

The EUT was placed on a rotating 1 x 1.5-meter wooden platform, 0.8 meters above the ground plane at a distance of 3 meters from the FSM antenna. EMI energy was maximized by equipment placement, raising and lowering the FSM antenna, changing the antenna polarization, and by rotating the turntable. Each emission was maximized before data was taken using a spectrum analyzer. Refer to photographs in the test setup exhibit for EUT placement.

5) List of Test Equipment

A Hewlett Packard 8591EM Spectrum Analyzer was used as the measuring device for the emissions testing of frequencies below 1 GHz. A Hewlett Packard 8562A Spectrum Analyzer was used as the measuring device for testing the emissions at frequencies above 1 GHz. The analyzer settings used are described in the following table. Refer to the appendix for a complete list of Test Equipment.

HP 8591 EM ANALYZER SETTINGS		
CONDUCTED EMISSIONS:		
RBW	AVG. BW	DETECTOR FUNCTION
9 kHz	30 kHz	Peak / Quasi Peak
RADIATED EMISSIONS:		
RBW	AVG. BW	DETECTOR FUNCTION
120 kHz	300 kHz	Peak / Quasi Peak
HP 8562A ANALYZER SETTINGS		
RBW	VIDEO BW	DETECTOR FUNCTION
100 kHz	100 kHz	PEAK
1 MHz	1 MHz	Peak / Average

EQUIPMENT	MFG.	MODEL	CAL. DATE	DUE.
LISN	Comp. Design	FCC-LISN-2-MOD.CD	10/03	10/04
LISN	Comp. Design	1762	2/04	2/05
Antenna	ARA	BCD-235-B	10/03	10/04
Antenna	EMCO	3147	10/03	10/04
Antenna	EMCO	3143	5/04	5/05
Analyzer	HP	8591EM	5/04	5/05
Analyzer	HP	8562A	2/04	2/05

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Phone/Fax: (913) 837-3214

Garmin International, Inc.

MODEL: IQue M5

Test #: 040715

FCCID#: IPH-00793

Test to: FCC Parts 2 and 15c (15.247)

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6) Units of Measurements

Conducted EMI: Data is in dB μ V; dB referenced to one microvolt.

Radiated EMI: Data is in dB μ V/m; dB/m referenced to one microvolt per meter.

7) Test Site Locations

Conducted EMI: The AC power line conducted emissions tests were performed in a shielded screen room located at Rogers Labs, Inc., 4405 W. 259th Terrace, Louisburg, KS.

Radiated EMI: The radiated emissions tests were performed at the 3 meters, Open Area Test Site (OATS) located at Rogers Labs, Inc., 4405 W. 259th Terrace, Louisburg, KS.

Site Approval: Refer to Appendix for FCC Site Approval Letter, Reference # 90910.

8) SUBPART B – UNINTENTIONAL RADIATORS

Conducted EMI

The EUT was arranged in a typical equipment configuration and placed on a 1 x 15 - meter wooden bench 80 cm above the conducting ground plane, floor of a screen room. The bench was positioned 40 cm away from the wall of the screen room.

The LISN was positioned on the floor of the screen room 80 cm from the rear of the EUT. The manufacturer supplied AC power wall adapter for the EUT was connected to the LISN. A second LISN was positioned on the floor of the screen room 80-cm from the rear of the supporting equipment of the EUT.

All power cords except the EUT were then powered from the second LISN. EMI was coupled to the spectrum analyzer through a 0.1 mF capacitor, internal to the LISN. Power line conducted emissions testing were carried out individually for each current carrying conductor of the EUT.

The excess length of lead between the system and the LISN receptacle was folded back and forth to form a bundle not exceeding 40 cm in length. The screen room, conducting ground plane, analyzer, and LISN were bonded together to the protective earth ground. Preliminary testing was performed to identify the frequency of each radio frequency emission displaying the highest amplitude. The cables were repositioned to obtain maximum amplitude of measured EMI level. Once the worst-case configuration was identified, plots were made of the EMI from 0.15 MHz to 30 MHz then the data was recorded with maximum conducted emissions levels. Refer to figures one and two for plots of the conducted emissions.

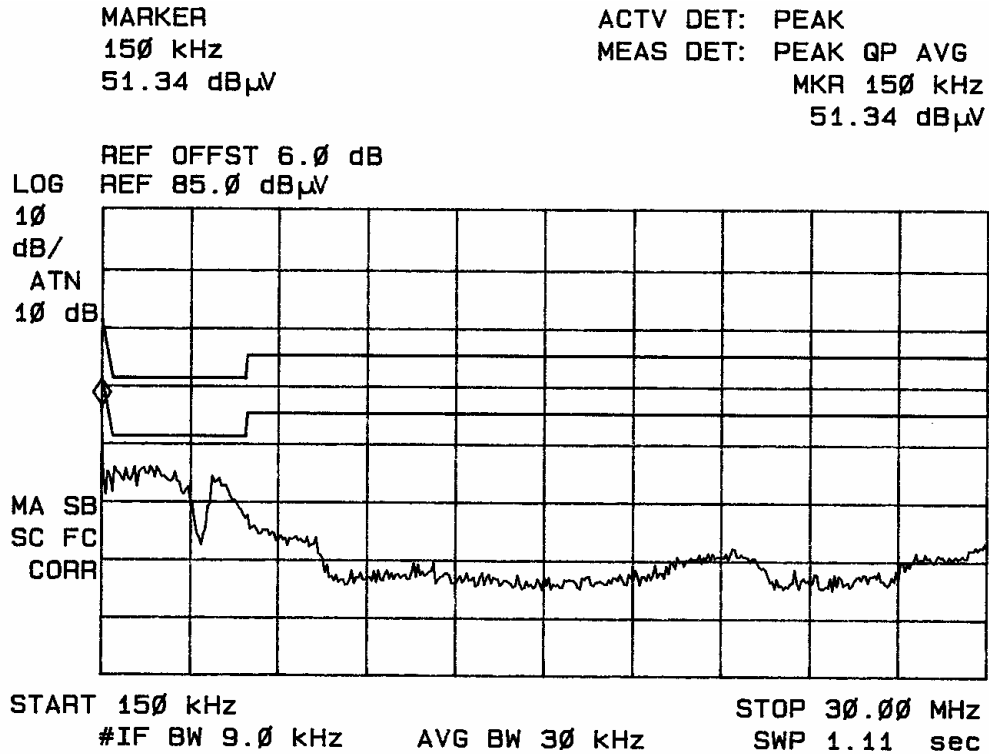


Figure 1 Conducted Emissions Line 1

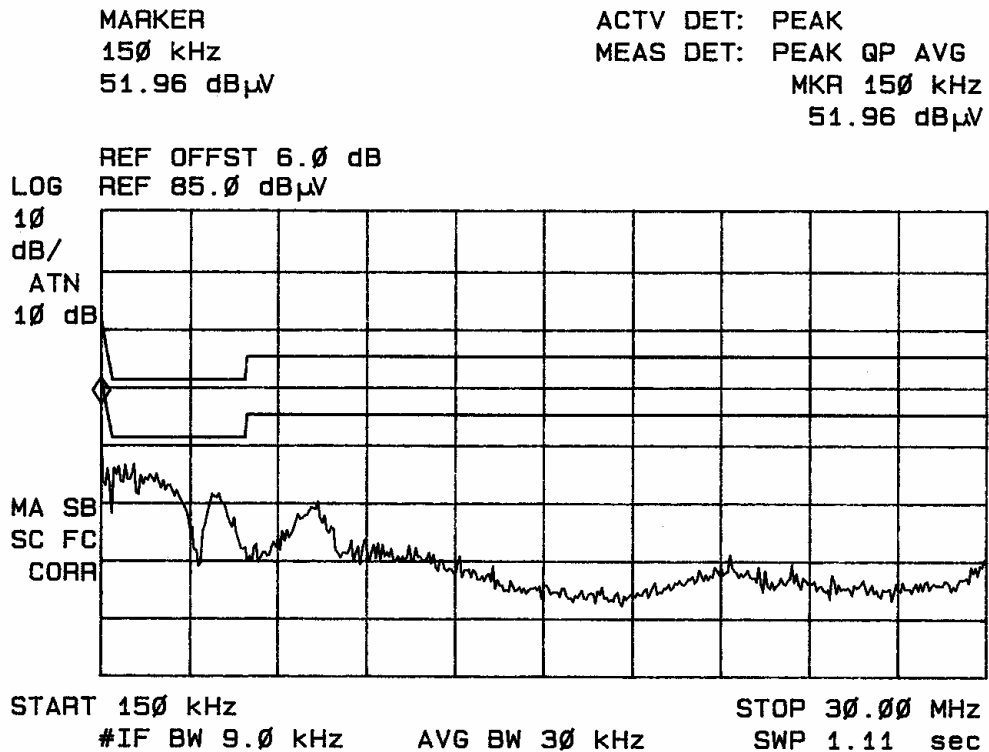


Figure 2 Conducted Emissions Line 2

ROGERS LABS, INC.

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Garmin International, Inc.

MODEL: IQue M5

Test #: 040715

FCCID#: IPH-00793

Test to: FCC Parts 2 and 15c (15.247)

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Radiated EMI

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 measurements were performed to identify the frequencies, which produced the highest emissions. Plots were made of the frequency spectrum from 30 MHz to 3,000 MHz for the preliminary testing. Refer to figures three through six for plots of the radiated emissions spectrum taken in a screen room. The highest radiated emission was then maximized at this location before final radiated emissions measurements were performed. Final data was taken with the EUT located at the OATS at a distance of 3 meters between the EUT and the receiving antenna. The frequency spectrum from 30 MHz to 25,000 MHz was searched for radiated emissions. Measured emission levels were maximized by EUT placement on the table, rotating the turntable through 360 degrees, varying the antenna height between 1 and 4 meters above the ground plane and changing antenna position between horizontal and vertical polarization. Antennas used were Broadband Biconical from 30 to 200 MHz, Biconilog from 30 to 1000 MHz, Log Periodic from 200 MHz to 5 GHz and or, pyramidal horns and/or mixers from 4 GHz to 25 GHz, notch filters and appropriate amplifiers were utilized.

Sample Calculations:

RFS = Radiated Field Strength

dBμV/m @ 3m = dBμV + A.F. - Amplifier Gain

dBμV/m @ 3m = 57.7 + 14.3 - 30

= 42.0

MARKER
48.5 MHz
34.94 dBμV

ACTV DET: PEAK
MEAS DET: PEAK QP
MKR 48.5 MHz
34.94 dBμV

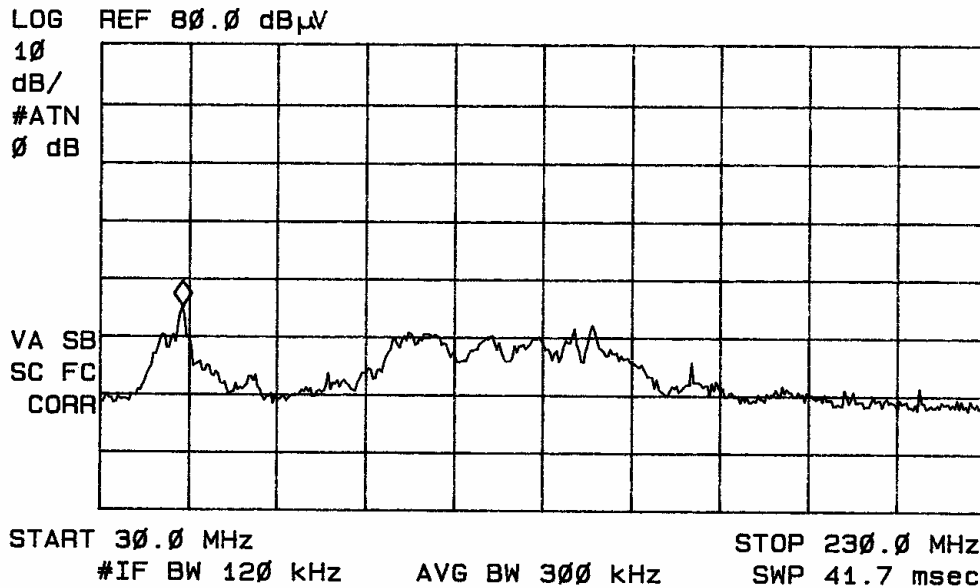


Figure 3 Radiated Emissions taken at 1meter in screen room

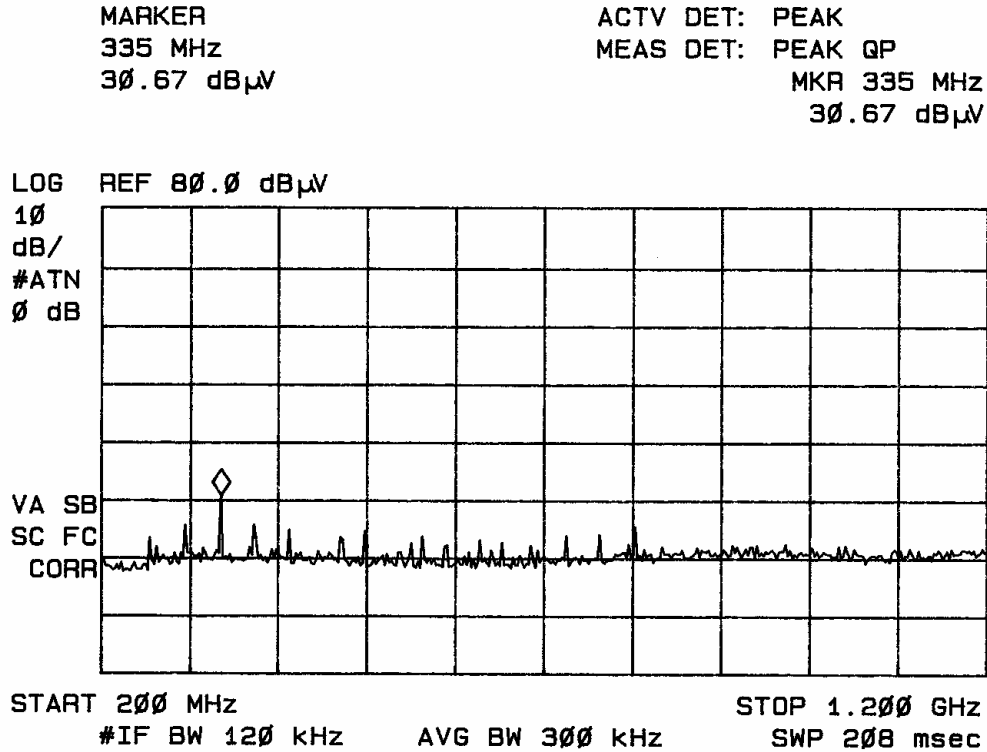


Figure 4 Radiated Emissions taken at 1 meter in screen room

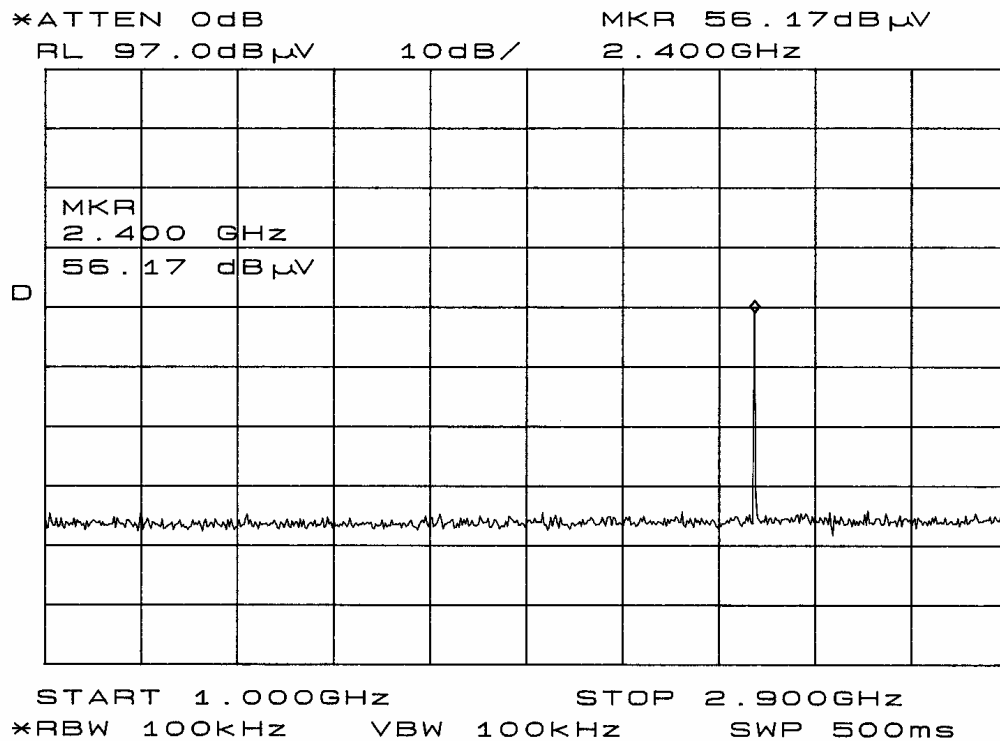


Figure 5 Radiated Emissions taken at 1 meter in screen room

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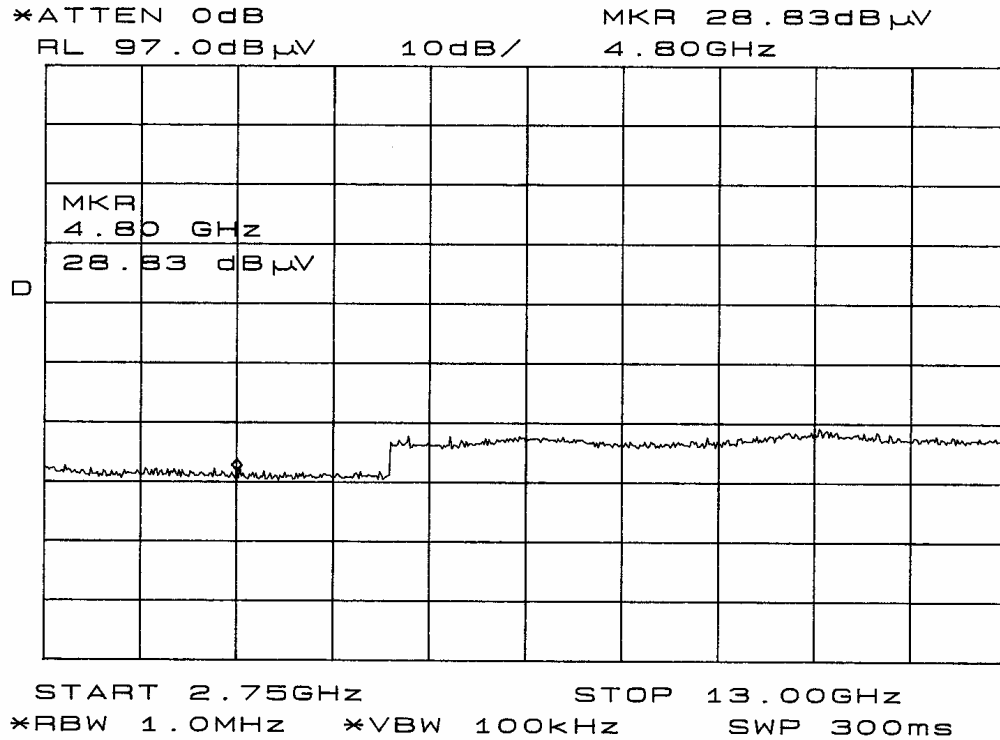


Figure 6 Radiated Emissions taken at 1 meter in screen room

Data: Conducted Emissions (7 Highest Emissions)

Frequency band (MHz)	L1 Level (dB μ V)			L2 Level (dB μ V)			CISPR 22 Limit Q.P. Ave(dB μ V)
	Peak	Q.P.	Ave	Peak	Q.P.	Ave	
0.15 - 0.5	51.3	48.3	37.1	52.0	48.3	37.1	66 - 56 / 56 - 46
0.5 - 5	40.9	36.1	23.7	41.2	37.6	25.3	56 / 46
5 - 10	31.5	26.5	18.8	33.9	29.0	22.0	60 / 50
10 - 15	21.1	16.4	9.9	28.1	22.1	14.6	60 / 50
15 - 20	24.5	20.1	14.1	22.1	18.2	12.0	60 / 50
20 - 25	26.0	22.2	16.2	24.3	19.9	13.7	60 / 50
25 - 30	27.7	21.7	15.0	23.0	18.4	11.8	60 / 50

Other emissions present had amplitudes atleast 10 dB below the limit.

Data: General Radiated Emissions from EUT (6 Highest Emissions)

Frequency in MHz	FSM Horz. (dBµV)	FSM Vert. (dBµV)	A.F. (dB/m)	Amp. Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	FCC Class B Limit @ 3m (dBµV/m)
331.5	57.7	54.3	14.3	30	42.0	38.6	46.0
370.5	44.2	47.8	15.6	30	29.8	33.4	46.0
409.5	46.3	44.1	16.7	30	33.0	30.8	46.0
721.5	43.0	39.6	21.2	30	34.2	30.8	46.0
760.5	41.0	37.9	22.3	30	33.3	30.2	46.0
799.5	44.7	37.4	22.2	30	36.9	29.6	46.0

Other emissions present had amplitudes at least 15 dB below the limit.

Summary of Results for Conducted Emissions

The conducted emissions for the EUT meet the requirements for CISPR 22 and FCC Part 15B CLASS B Digital Devices. The EUT had a 17.7 dB (Quasi-Peak) minimum margin below the limit, and an 18.9 dB minimum margin below the CISPR average limit. Measurements were taken using the peak, quasi peak, and average, measurement function for each emissions amplitude and were below the limits stated in the specification. Other emissions were present with recorded data representing worst-case amplitudes.

Summary of Results for Radiated Emissions

The radiated emissions for the EUT meet the requirements for CISPR 22 and FCC Part 15B CLASS B Digital Devices. The EUT had a 4.0 dB minimum margin below the Quasi-Peak limit. Other emissions were present with amplitudes at least 51 dB below the limit.

Statement of Modifications and Deviations

No modifications to the EUT were required for the unit to meet the CISPR 22 or FCC Part 15B Class B emissions standards. There were no deviations to the specifications.

9) Subpart C - Intentional Radiators

As per CFR Part 15, Subpart C, paragraphs 15.203, 15.205, and 15.247 the following information is submitted.

15.203 Antenna Requirements

The unit is produced with a permanently attached antenna and is not user serviceable or removable. The requirements of 15.203 are met; there are no deviations or exceptions to the specification.

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. No other significant emission was observed which fell into the restricted bands of operation.

Sample Calculations:

$$\begin{aligned}\text{RFS (dB}\mu\text{V/m @ 3m)} &= \text{FSM (dB}\mu\text{V)} + \text{A.F. (dB)} - \text{Gain (dB)} \\ &= 34.8 + 6.9 - 30 \\ &= 11.7\end{aligned}$$

Data: Emissions in Restricted Bands

Frequency in MHz	FSM Horz. (dBµV)	FSM Vert. (dBµV)	A.F. (dB/m)	Amp. Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	FCC Class B Limit @ 3m (dBµV/m)
117.9	34.8	43.8	6.9	30	11.7	20.7	43.5
128.9	37.1	40.3	7.9	30	15.0	18.2	43.5
253.5	45.5	42.4	12.4	30	27.9	24.8	46.0
331.5	57.7	54.3	14.3	30	42.0	38.6	46.0
409.5	46.3	44.1	16.7	30	33.0	30.8	46.0
4802.6	23.5	23.1	43.5	22.5	44.5	44.1	54.0
4880.0	23.3	22.6	43.3	22.5	44.1	43.4	54.0
4958.0	24.8	23.7	43.1	22.5	45.4	44.3	54.0
7319.9	26.6	27.0	38.0	22.5	42.1	42.5	54.0
7437.5	26.6	27.0	37.8	22.5	41.9	42.3	54.0

Summary of Results for Radiated Emissions in Restricted Bands:

The radiated emissions for the EUT meet the requirements for FCC Part 15C Intentional Radiators. The EUT had a 4.0 dB minimum margin below the limits. No other emissions were found in the restricted frequency bands. Other emissions were present with amplitudes at least 1 dB below the FCC Limits.

15.209 Radiated Emissions Limits; General Requirements**Radiated EMI**

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 measurements were performed to identify the frequencies, which produced the highest emissions. Emissions were

checked in the screen room from 30 to 25,000 MHz and plots were made of the frequency spectrum from 30 MHz to 31,000 MHz for the preliminary testing. The highest radiated emission was then remaximized at this location 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 25,000 MHz was searched for radiated emissions. Measured emission levels were maximized by EUT placement on the table, 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, Biconilog from 30 MHz to 1000 MHz, Log Periodic from 200 MHz to 5 GHz, and/or Pyramidal Horns from 4 GHz to 25 GHz.

Sample Calculations:

RFS = Radiated Field Strength

dB μ V/m @ 3m = dB μ V + A.F. - Amplifier Gain

dB μ V/m @ 3m = 57.7 + 14.3 - 30

= 42.0

Data: General Radiated Emissions from EUT (6 Highest Emissions)

Frequency in MHz	FSM Horz. (dBµV)	FSM Vert. (dBµV)	A.F. (dB/m)	Amp. Gain (dB)	RFS Horz. @ 3m (dBµV/m)	RFS Vert. @ 3m (dBµV/m)	FCC Class B Limit @ 3m (dBµV/m)
331.5	57.7	54.3	14.3	30	42.0	38.6	46.0
370.5	44.2	47.8	15.6	30	29.8	33.4	46.0
409.5	46.3	44.1	16.7	30	33.0	30.8	46.0
721.5	43.0	39.6	21.2	30	34.2	30.8	46.0
760.5	41.0	37.9	22.3	30	33.3	30.2	46.0
799.5	44.7	37.4	22.2	30	36.9	29.6	46.0

Other emissions present had amplitudes at least 10 dB below the limit.

Summary of Results for Radiated Emissions:

The radiated emissions for the EUT meet the requirements for FCC Part 15C Intentional Radiators. The EUT had a 4.0 dB minimum margin below the quasi-peak limits. Other emissions were present with amplitudes at least 15 dB below the FCC limits.

15.247 Operation in the Band 2400-2483.5 MHz

The power output was measured both at the antenna port as an antenna conducted emission and on an open area test site at a three-meter distance. Data was taken per Paragraph 2.1046(a) and 15.247. The 2400 and 2483.5 MHz band edges are protected due to the channel selections used for frequency of operation. Refer to figures seven through eleven showing plots of the antenna conducted emissions spectrum taken in a screen room. Refer to figures eleven

through eighteen showing plots taken for the EUT displaying compliance with the specifications.

(a) The EUT is a frequency hopping spread spectrum intentional radiator utilizing at least 15 hopping channels.

The 20-dB bandwidth of 940 kHz meets the requirements with channel spacing of 1 MHz with the average time of occupancy on any frequency not greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Information showing compliance for time of occupancy and hopping sequence are displayed below.

The IQUE M5 continuously steps through a list of 79 channel frequencies, dwelling on channel for 639.5 microseconds per frequency. This equates to 639.5 ms multiplied by 79 channels taking 50.521 ms to complete one cycle. The specification requires the average time of occupancy on any channel not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels (0.4 multiplied by 79 equates to 31.6 seconds). During a 31.6 second period, each channel will be active for $31.6/50.56$ or 625 times. Since the channel is active for 639.5 ms, the total channel occupancy for a 31.6 second interval is 625 multiplied by 639.5, which equals 0.4 Seconds, which meets the requirement. The frequencies are spaced 1 megahertz apart and the sequence determined at random. A typical random lookup table is shown below.

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
33	2434	73	2474	19	2420	56	2457
34	2435	10	2411	68	2469	57	2458
4	2405	58	2459	25	2426	44	2445
15	2416	17	2418	16	2417	65	2466
8	2409	43	2444	70	2471	2	2403
59	2460	14	2415	49	2450	51	2452
41	2442	11	2412	27	2428	31	2432
35	2436	20	2421	52	2453	79	2480
72	2473	54	2455	48	2449	28	2429
62	2463	18	2419	78	2479	30	2431
40	2441	53	2454	50	2451	5	2406
38	2439	39	2440	24	2425	29	2430
66	2467	47	2448	69	2470	74	2475
75	2476	42	2443	71	2472	60	2461
9	2410	77	2478	64	2465	63	2464
6	2407	21	2422	45	2446	32	2433
1	2402	36	2437	55	2456	22	2423
3	2404	61	2462	12	2413	23	2424
46	2447	67	2468	26	2427	76	2477
13	2414	37	2438	7	2408		

(b) The maximum peak output power of the unit was measured both at the antenna terminal and at the open area test site

The amplitudes of each emission and spurious emission were measured at a distance of 3 meters from the FSM antenna at the OATS. 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, Log Periodic Antenna for 200 to 5000 MHz, Pyramidal Horn antennas and/or mixers from 4 GHz to 25 GHz. Emissions were measured in dBmV/m at three-meters.

Sample calculation.

$$\begin{aligned}
 \text{dB}\mu\text{V/m@ 3m} &= \text{FSM} + \text{A.F.} - \text{cable loss} - \text{amplifier gain} \\
 &= 81.5 + 33.9 - 2.5 - 25 \\
 &= 92.9
 \end{aligned}$$

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Phone/Fax: (913) 837-3214

Garmin International, Inc.

MODEL: IQue M5

Test #: 040715

FCCID#: IPH-00793

Test to: FCC Parts 2 and 15c (15.247)

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(c) The band edges are protected due to the frequency of operation of the EUT.

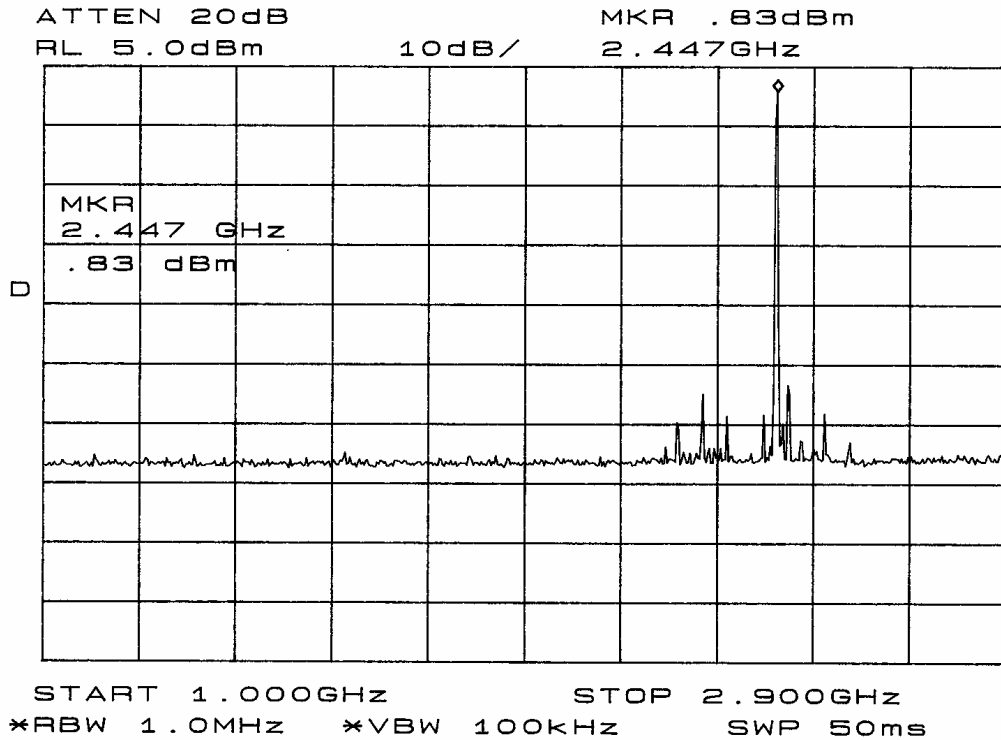


Figure 7 Antenna Conducted Emissions taken in screen room

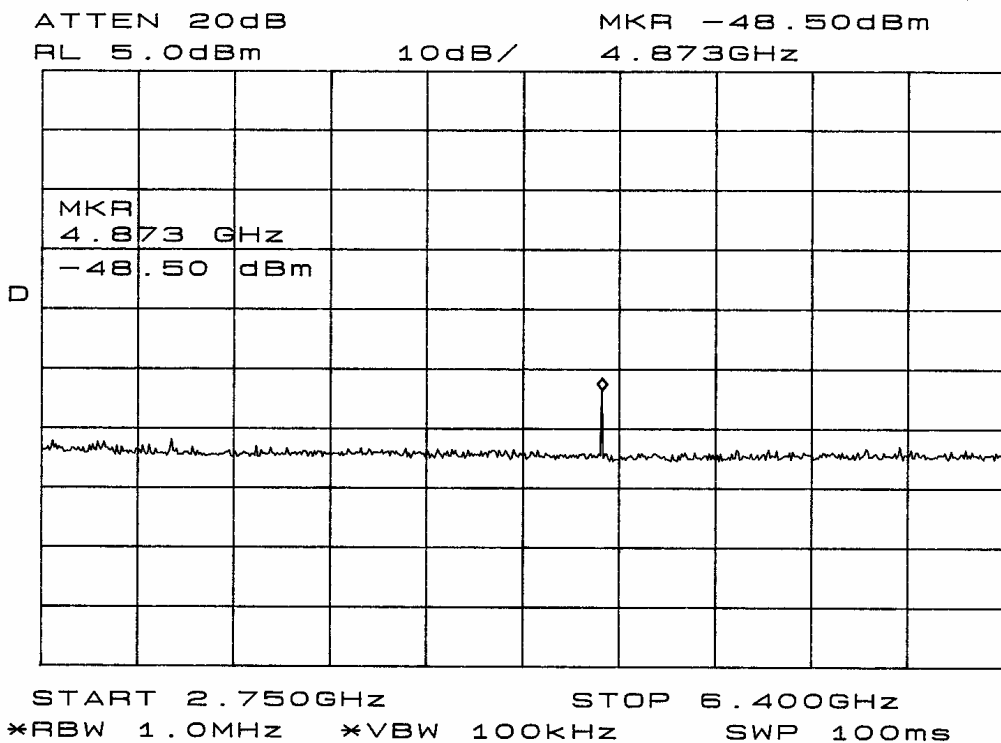


Figure 8 Antenna Conducted Emissions taken in screen room

ROGERS LABS, INC.

Garmin International, Inc.

4405 W. 259th Terrace

MODEL: IQue M5

Louisburg, KS 66053

Test #: 040715

FCCID#: IPH-00793

Phone/Fax: (913) 837-3214 Test to: FCC Parts 2 and 15c (15.247)

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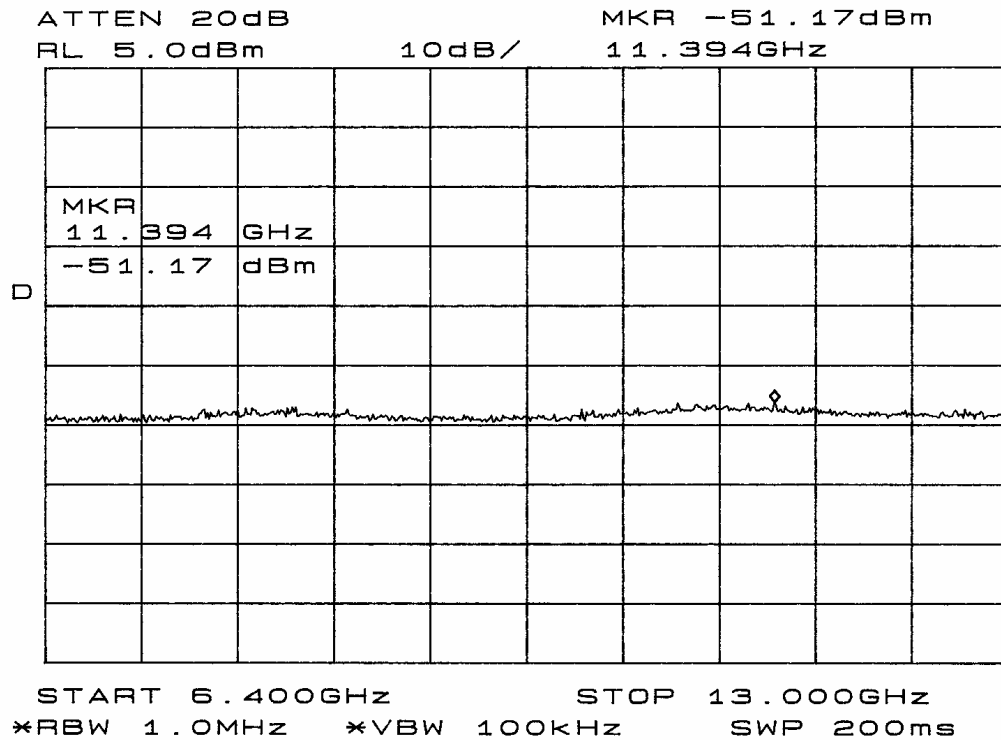


Figure 9 Antenna Conducted Emissions taken in screen room

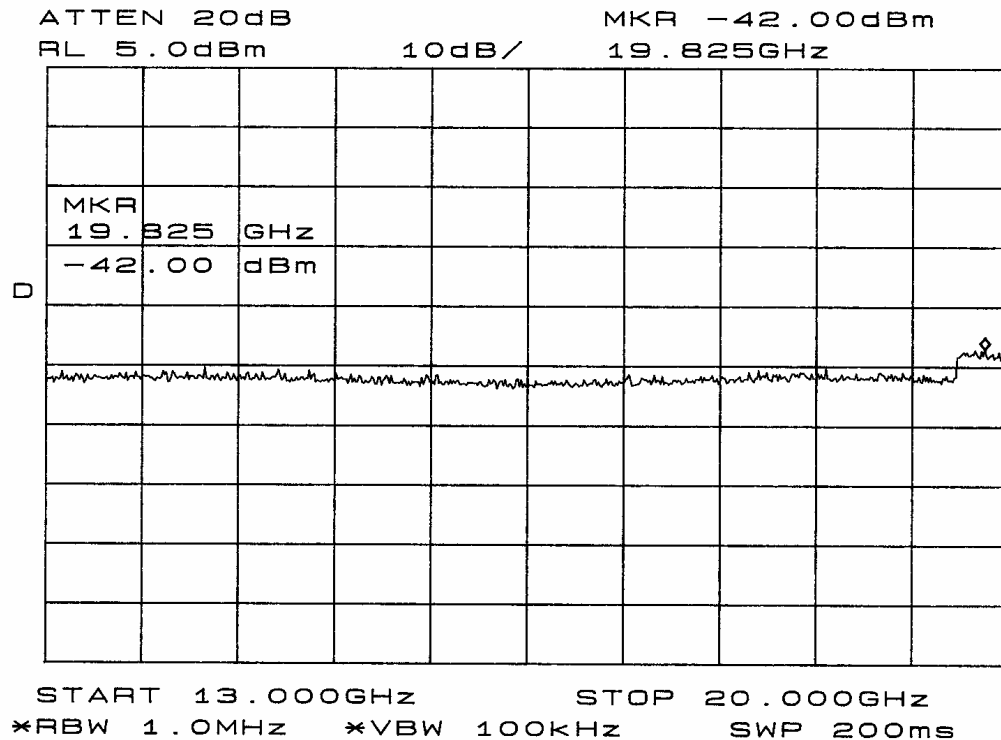


Figure 10 Antenna Conducted Emissions taken in screen room

ROGERS LABS, INC.

4405 W. 259th Terrace

Louisburg, KS 66053

Phone/Fax: (913) 837-3214

Garmin International, Inc.

MODEL: IQue M5

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Test to: FCC Parts 2 and 15c (15.247)

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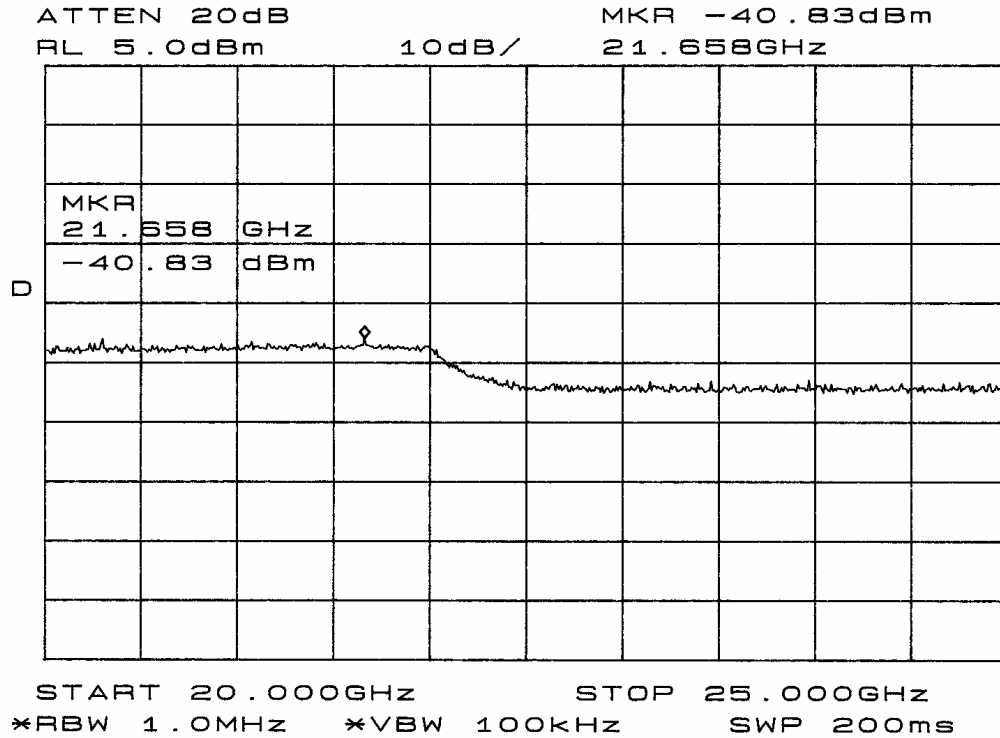


Figure 11 Antenna Conducted Emissions taken in screen room

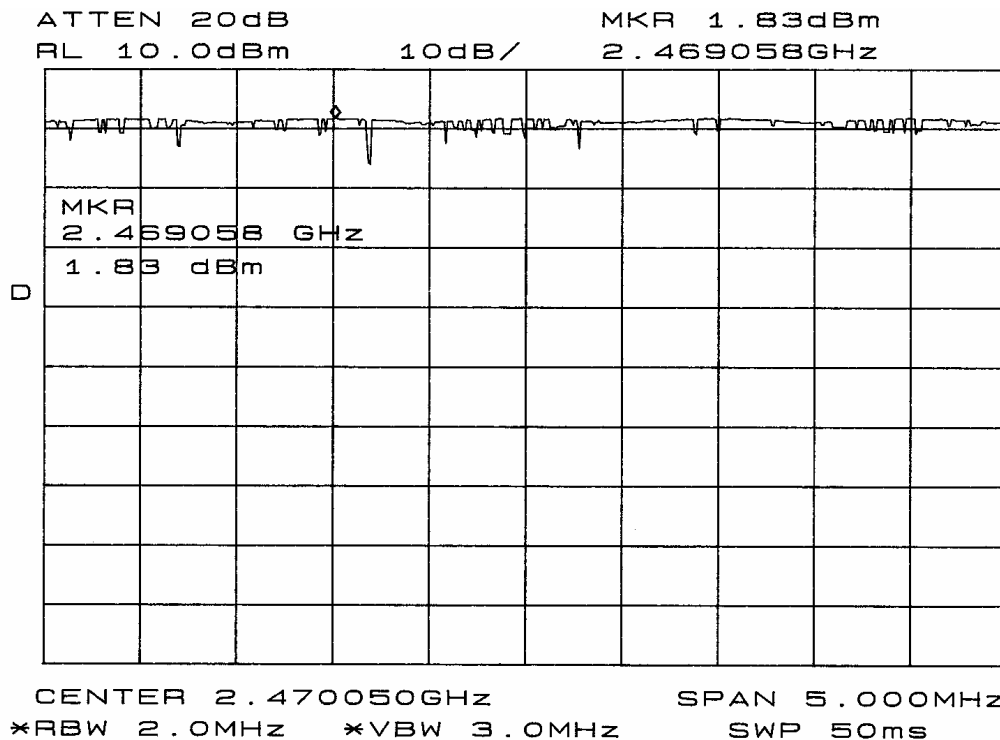


Figure 12 Maximum Power output

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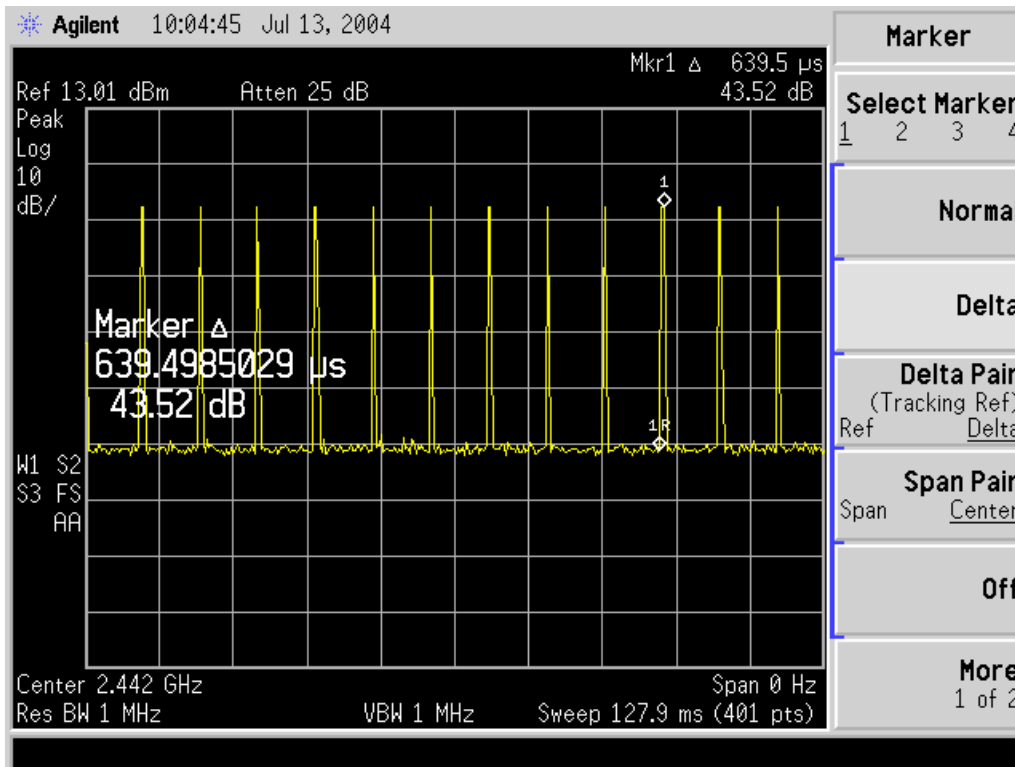


Figure 13 Dwell Time of Occupancy.

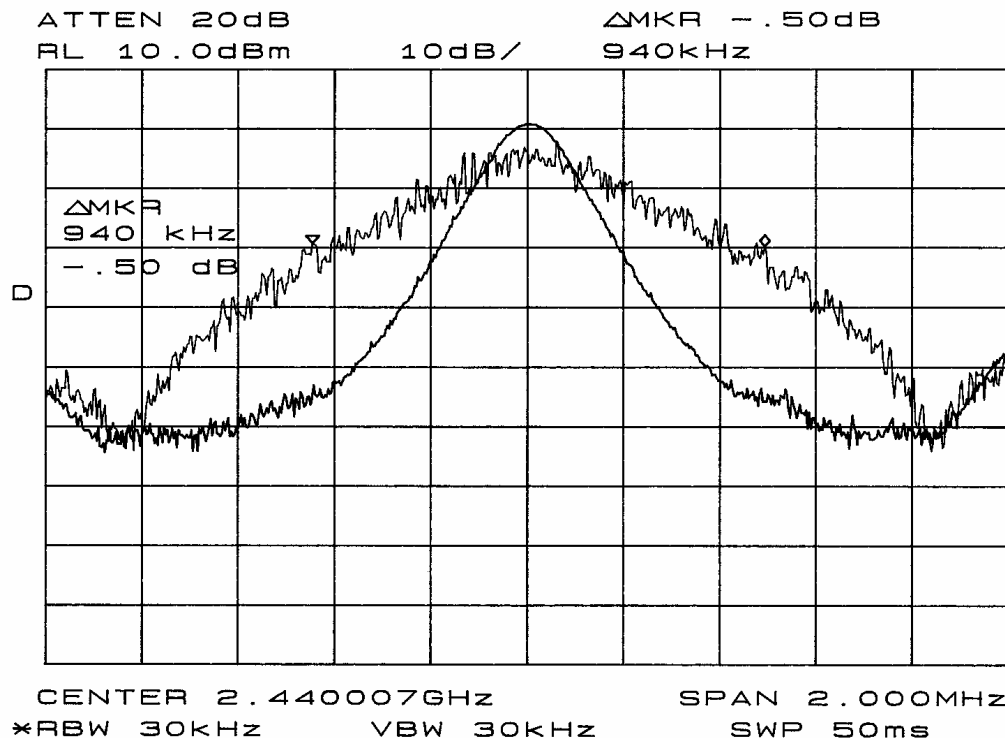


Figure 14 20-dB bandwidth.

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Louisburg, KS 66053

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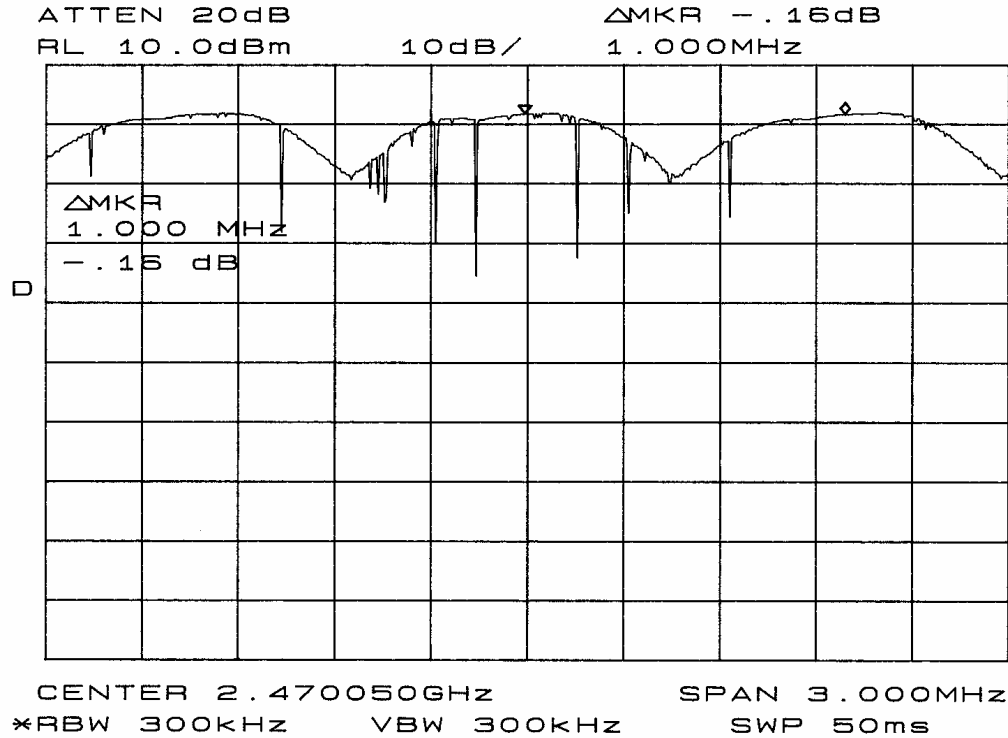


Figure 15 Channel Spacing.

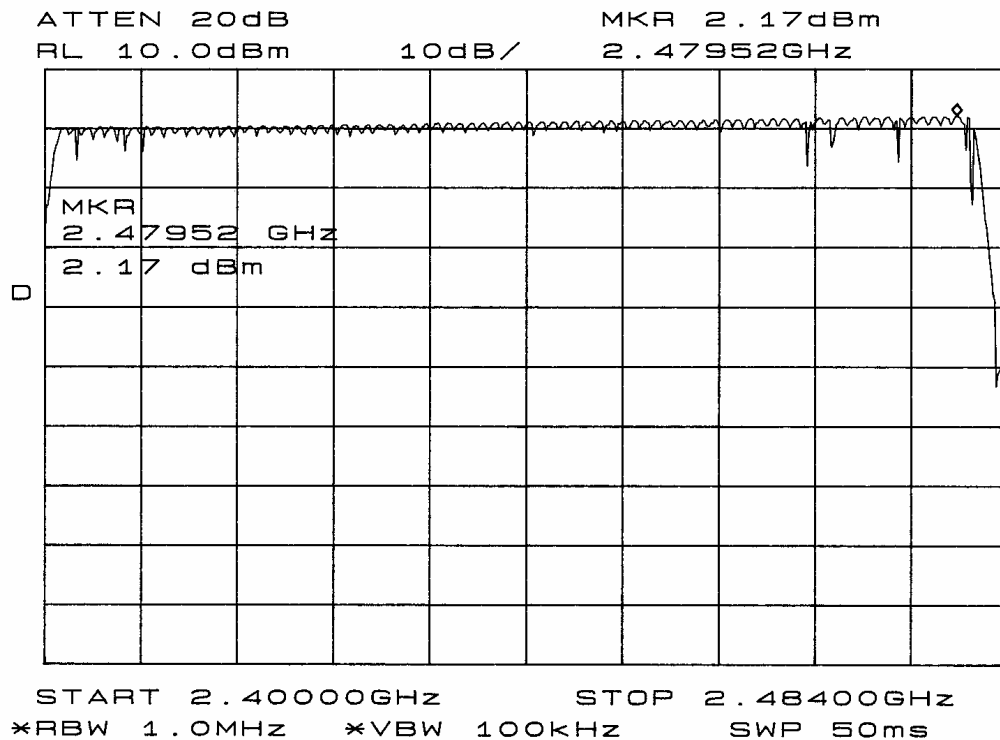


Figure 16 plot showing at least 79 hopping channels.

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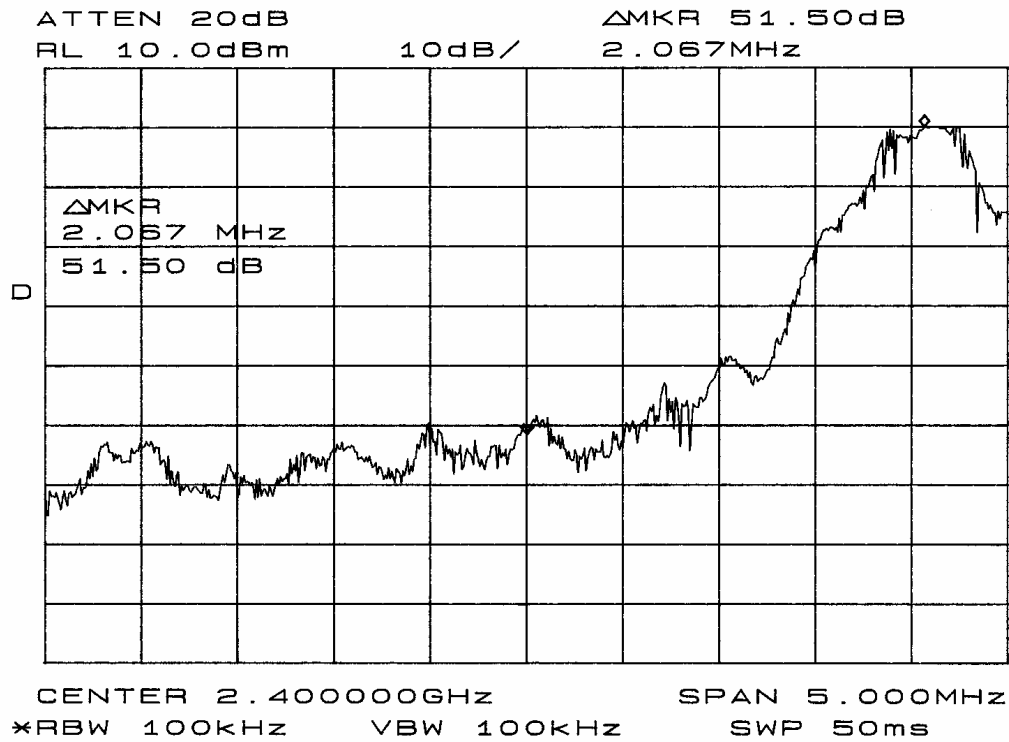


Figure 17 Band Edge Clearances

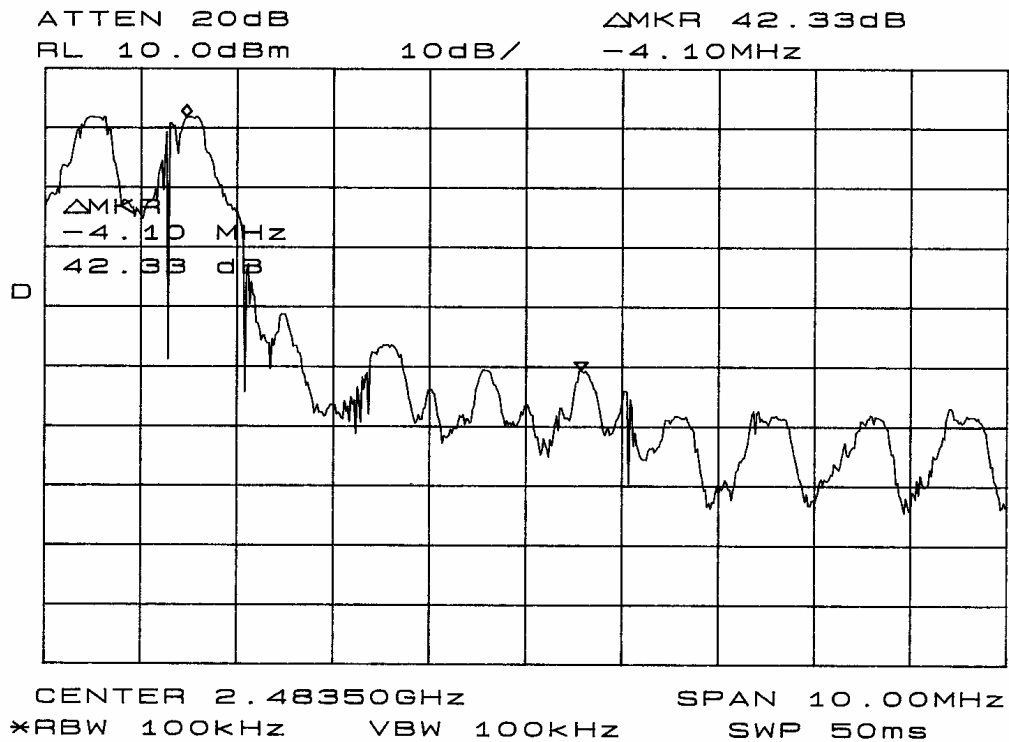


Figure 18 Band Edge Clearances

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Data: Radiated Emissions from EUT

Emission Frequency (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)
2401.3	81.5	73.5	33.9	22.5	92.9	84.9	--
4802.6	23.5	23.1	43.5	22.5	44.5	44.1	54.0
7203.0	26.8	26.5	38.0	22.5	42.3	42.0	54.0
2440.0	81.7	72.3	33.9	22.5	93.1	83.7	--
4880.0	23.3	22.6	43.3	22.5	44.1	43.4	54.0
7319.9	26.6	27.0	38.0	22.5	42.1	42.5	54.0
2479.5	82.7	73.3	33.9	22.5	94.1	84.7	--
4958.0	24.8	23.7	43.1	22.5	45.4	44.3	54.0
7437.5	26.6	27.0	37.8	22.5	41.9	42.3	54.0

Summary of Results for Radiated Emissions of Intentional Radiator

The EUT had an 8.6 dB margin below the limit for the harmonic emissions. The radiated emissions for the EUT meet the requirements for FCC Part 15.247 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 10 dB below the FCC Limits. The specification of 15.247 are met, there are no deviations or exceptions to the requirements.

Statement of Modifications and Deviations

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

Model: IQUE M5

1. Test Equipment List
2. Rogers Qualifications
3. FCC Site Approval Letter

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:
Scope: Tektronix 2230	2/04
Wattmeter: Bird 43 with Load Bird 8085	2/04
Power Supplies: Sorensen SRL 20-25, SRL 40-25, DCR 150, DCR 140	2/04
H/V Power Supply: Fluke Model: 408B (SN: 573)	2/04
R.F. Generator: HP 606A	2/04
R.F. Generator: HP 8614A	2/04
R.F. Generator: HP 8640B	2/04
Spectrum Analyzer: HP 8562A,	2/04
Mixers: 11517A, 11970A, 11970K, 11970U, 11970V, 11970W	
HP Adapters: 11518, 11519, 11520	
Spectrum Analyzer: HP 8591 EM	5/04
Frequency Counter: Leader LDC 825	2/04
Antenna: EMC0 Biconilog Model: 3143	5/04
Antenna: EMC0 Log Periodic Model: 3147	10/03
Antenna: Antenna Research Biconical Model: BCD 235	10/03
Antenna: EMC0 Dipole Set 3121C	2/04
Antenna: C.D. B-101	2/04
Antenna: Solar 9229-1 and 9230-1	2/04
Antenna: EMC0 6509	2/04
Audio Oscillator: H.P. 201CD	2/04
R.F. Power Amp 65W Model: 470-A-1010	2/04
R.F. Power Amp 50W M185 - 10-501	2/04
R.F. PreAmp CPPA - 102	2/04
LISN 50 μ Hy/50 ohm/0.1 μ f	10/03
LISN Compliance Eng. 240/20	2/04
Peavey Power Amp Model: IPS 801	2/04
Power Amp A.R. Model: 10W 1010M7	2/04
Power Amp EIN Model: A301	2/04
ELGAR Model: 1751	2/04
ELGAR Model: TG 704A-3D	2/04
ESD Test Set 2010i	2/04
Fast Transient Burst Generator Model: EFT/B101	2/04
Current Probe: Singer CP105	2/04
Current Probe: Solar 9108 - 1N	2/04
Field Intensity Meter: EFM- 018	2/04
KEYTEK Ecat Surge Generator	2/04
Shielded Room 5 M x 3 M x 3.0 M (101 dB Integrity)	
5/20/2004	

ROGERS LABS, INC.

4405 W. 259th Terrace

Louisburg, KS 66053

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Garmin International, Inc.

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Test #: 040715

FCCID#: IPH-00793

Test to: FCC Parts 2 and 15c (15.247)

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QUALIFICATIONS
Of
SCOT D. ROGERS, ENGINEER
ROGERS LABS, INC.

Mr. Rogers has approximately 16 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:

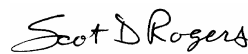
Systems Engineer: A/C Controls Mfg. Co., Inc.
6 Years

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

July 15, 2004
Date

1/11/03

FEDERAL COMMUNICATIONS COMMISSION

**Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046**

August 15, 2003

Registration Number: 90910

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

Attention: Scot Rogers

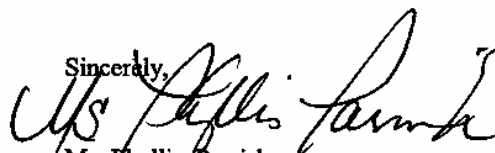
Re: Measurement facility located at Louisburg
3 & 10 meter site
Date of Renewal: August 15, 2003

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,



Ms. Phyllis Parrish
Information Technician

ROGERS LABS, INC.

4405 W. 259th Terrace

Louisburg, KS 66053

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