

Serial No. GM25004f  
FCC ID: CEXFW8R  
FCC ID: CEXFW7Q

**FCC TEST REPORT  
FOR THE  
QUANTUM INSTRUMENTS, INC.  
FREEWIRE PHOTOGRAPHIC DEVICE  
REMOTE CONTROL RECEIVERS (FW7Q/FW8R)**

**Prepared for:**

Quantum Instruments, Inc.  
1075 Stewart Ave.  
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**Submitted by:**

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**Quantum Instruments, Inc.**  
**FCC Tests**  
**By**  
**Green Mountain Electromagnetics, Inc.**  
**Middlebury, Vermont**

**Unit: FreeXWire Photographic Device Remote Control Receivers (FW7Q & FW8R)**

**Evaluated: December 15, 2004 to January 18, 2005**

**I. Applicable Standards:**

The unit described in this report was measured for certification with the Code of Federal Regulations Chapter 47 – "Telecommunication, Part 2 – Frequency Allocations and Radio Treaty Matters: General Rules and Regulations, Subpart J – Equipment Authorization Procedures (2002)." Measurements required were per paragraphs, 2.1051 Spurious Emissions at Antenna Terminals, and 2.1053 Field Strength of Spurious Radiation.

The unit was also measured for verification of compliance with "CFR47, Part 15 – Radio Frequency Devices, Subpart C: Intentional Radiators, Paragraph 15.209, Radiated Emissions Limits."

Measurement procedures were in accordance with ANSI C63.4, "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2000)."

## **II. Unit Tested:**

The Quantum Instruments, Inc. FW7Q and FW8R receivers are the portion of the remote control attached to a flash unit. The FW7Q and FW8R use DC power and have a 433-MHz receiver. It consists of the two-piece plastic enclosure with manual switch hardware, the transmit circuit, the electronics, and the antenna. The FW7Q is directly attached to the flash unit and the FW8R is cabled. The table below describes the units tested to determine compliance with the standards:

Model/P/N	Manufacturer	H/W/D in cm	Serial Number
FW8R	Quantum Instruments, Inc.	10/7/3	ENG001
FW7Q	Quantum Instruments, Inc.	10/7/3	ENG001

The highest frequency investigated is ten times the highest fundamental (4.33 GHz).

## **III. Measurement Location:**

The GME laboratory and Open Area Test Site (OATS) are located at 219 Blake Roy Road, Middlebury, VT. The OATS is a 3-meter site complete with antenna positioner, ground plane and motorized turntable. The OATS is constructed in accordance with ANSI C63.7-1992 and complies with the requirements for radiated emissions testing in ANSI C63.4-2000 and CISPR 16-1993. The electromagnetic laboratory is constructed in accordance with CE immunity standards and ANSI C63.4-2000 (conducted emissions).

GME is internationally accredited by the American Association for Laboratory Accreditation (A2LA) and meets the quality requirements in ISO/IEC 17025 (1999), "General Requirements for the Competence of Testing and Calibration Laboratories."

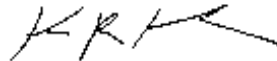
**IV. Summary of Results:**

The Quantum Instruments, Inc. FW7Q and FW8R receivers comply with the requirements in CFR 47, Paragraphs 2 and 15. Section IX contains the results summarized in the table below.

	Test	Mode/Port	CFR 47 Paragraph	Frequency Range/Level	Specified Values	Measured Values
1	Conducted Spurious	Transmit	<b>2.1051</b>	1 MHz to 4.33 GHz	>20 dB Attenuation	>20 dB Attenuation
2	Radiated Emissions	Enclosure	<b>15.209</b> <b>2.1053</b>	1.705 - 30 MHz 30 - 88 MHz 88 - 216 MHz 216 - 960 MHz 960 - 4339 MHz	49.5 dBuV/m 40 dBuV/m 43.5 dBuV/m 46 dBuV/m 54 dBuV/m	Within All Limits at 3 Meters

Testing was performed by Kyle R. Kowalczyk, president, Green Mountain Electromagnetics and requested by:

Quantum Instruments, Inc.  
1075 Stewart Ave.  
Garden City, New York 11530  
USA



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Kyle R. Kowalczyk  
1/18/05

**V. Measuring Equipment:**

The table below describes the instrumentation used by Green Mountain Electromagnetics to perform this testing:

Unit	Manufacturer	Model	Serial #	Last Cal.	Next Cal.
Spectrum Analyzer	Hewlett-Packard	8592	3624A00631	1/13/04	1/30/05
Amplifier	Hewlett-Packard	8447 D	2944A07313	5/17/04	5/17/05
Signal Generator	Hewlett-Packard	E4421B	US38220195	10/20/04	10/20/05
Plotter	Hewlett-Packard	7475A	2517A05281	n/a	n/a
Broadband E-field Antenna	Antenna Research Associates	LPB-2513/A	1125	11/2/04	11/2/05

## **VI. Equipment and Cable Configuration:**

GME witnessed the unit in satisfactory condition for testing, however the manufacturer is responsible for ensuring that the equipment under test (EUT) represents the product line. The manufacturer is also responsible for the EMC test plan and for assuring that this report is consistent with that plan. The EUT configuration was arranged to produce maximum radiated emissions as shown in the block diagram below, as well as in the photograph in Section VIII. The equipment was subjected to complete emissions tests.

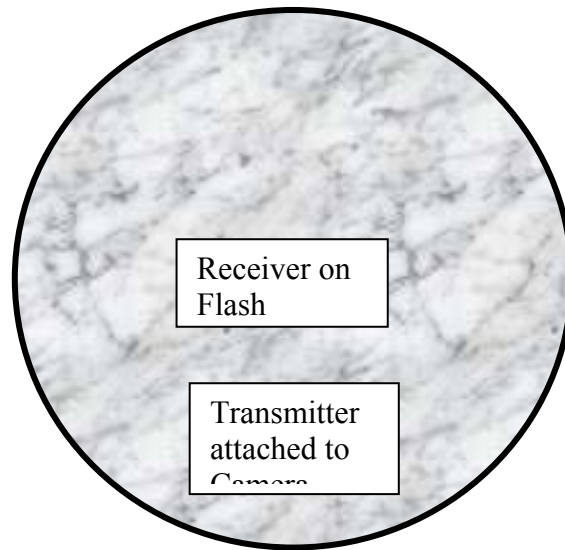


Figure 1 – Block Diagram of EUT on Turntable

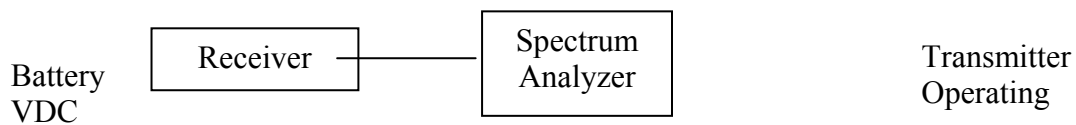
The EUT was operating in a continuous mode utilizing and testing its remote control functions. The EUT was also set to self-test upon power up.

## **VII. Measurement Procedures for FCC Tests:**

### **1. Conducted Spurious.**

Specification: Attenuation >20 dB

- a. Set up EUT and test instrumentation in laboratory.
  - i. Connect EUT to battery power and operate companion unit.
- b. Verify spectrum analyzer and EUT operation.
  - i. Use internal spectrum analyzer attenuator.
- c. Verify EUT frequency with non-contact probe and spectrum analyzer.
- d. Operate EUT at normal power and modulation.
- e. Record level displayed on analyzer.



Block Diagram of Procedure 1.

## **VII. Measurement Procedures for FCC Tests Cont'd:**

### **2. Radiated Emissions.**

Frequency range: 1.7 MHz to 30 MHz

Limit: 49.5 dBuV/m @ 3 meters

Frequency range: 30 MHz to 88 MHz

Limit: 40 dBuV/m @ 3 meters

Frequency range: 88 kHz to 216 MHz

Limit: 43.5 dBuV/m @ 3 meters

Frequency range: 216 MHz to 960 MHz

Limit: 46 dBuV/m @ 3 meters

Frequency range: 960 MHz to 4339 MHz

Limit: 54 dBuV/m @ 3 meters

- a. Set up instrumentation at open area test site.
  - i. Mount EUT on turntable and broadband antenna on antenna positioner.
  - ii. Record temperature, humidity and atmospheric pressure.
  - iii. Measurement distance is 3 meters and antenna scan height is varied from 1 to 4 meters.
- b. Verify spectrum analyzer and antenna operation.
  - i. Spectrum analyzer is connected to antenna.
  - ii. Preamplifier is inserted between antenna and analyzer to ensure analyzer noise threshold is at least 6 dB below specification limit (not normally necessary below 30 MHz).
- c. Set up, power and operate EUT as described in Section VI.
- d. Perform preliminary evaluation of equipment in the near field.
  - i. Vary antenna height, antenna polarization, and antenna orientation to EUT.
  - ii. Repeat step d.i. while evaluating electromagnetic radiation in the 1-MHz to 4.33-GHz spectrum.
  - iii. Ensure appropriate resolution bandwidth is set and less than or equal to VBW.
  - iv. Near field measurements of unit emissions are made at ambient frequencies.
- e. Determine frequencies and equipment orientations that produce maximum radiation.
  - i. Identify any processor, clock and beat frequencies, and harmonics.
- f. Perform final evaluation of unit by recording spectrum analyzer data on the plotter.
  - i. Ensure the EUT is producing the maximum radiation found in step e.
  - ii. Collect data over the entire frequency range.
  - iii. Identify all ambient signals.



**VIII. Test Setup Photograph for FCC Tests:**

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.

## **IX. Measurement Results for FCC Tests:**

### **1. Conducted Spurious.**

Specification: Attenuation > 20 dB from Fundamental

No Antenna Conducted Spurious within 20 dB

### **2. Radiated Emissions.**

The table below contains the spectrum analyzer output and the correction factors necessary to apply the limit to the data.

Field (dBuV/m) = Vmeas (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) - Amp Gain (dB).

Freq MHz	Pol H/V	RBW kHz	VBW kHz	Vmeas dBuV	AF dB1/m	Amp dB	Cable dB	Field dBuV/m	Duty dB	Limit dBuV/m	Dev dB
1	H	9	9	32	24.2	29	1	28.2	0	49.5	-21.3
1	V	9	9	31	24.2	29	1	27.2	0	49.5	-22.3
10	H	9	9	31	20.1	29	1	23.1	0	49.5	-26.4
10	V	9	9	32	20.1	29	1	24.1	0	49.5	-25.4
30	H	120	300	40	18.6	29	1	30.6	0	40	-9.4
30	V	120	300	39	18.6	29	1	29.6	0	40	-10.4
40	H	120	300	44	18.3	29	1	34.3	0	40	-5.7
40	V	120	300	46	18.3	29	1	36.3	0	40	-3.7
50	H	120	300	39	15.1	29	2	27.1	0	40	-12.9
50	V	120	300	40	15.1	29	2	28.1	0	40	-11.9
60	H	120	300	50	11.1	29	2	34.1	0	40	-5.9
60	V	120	300	47	11.1	29	2	31.1	0	40	-8.9
70	H	120	300	53	8.1	29	2	34.1	0	40	-5.9
70	V	120	300	51	8.1	29	2	32.1	0	40	-7.9
80	H	120	300	52	9.8	29	2	34.8	0	40	-5.2
80	V	120	300	44	9.8	29	2	26.8	0	40	-13.2
90	H	120	300	45	10.9	29	2	28.9	0	43.5	-14.6
90	V	120	300	41	10.9	29	2	24.9	0	43.5	-18.6
100	H	120	300	43.5	12.2	29	3	29.7	0	43.5	-13.8
100	V	120	300	43	12.2	29	3	29.2	0	43.5	-14.3

Table 1 – Corrected Radiated Emissions Data and FCC Limit

**IX. Measurement Results for FCC Tests Cont'd:**

**2. Radiated Emissions Cont'd.**

The table below contains the spectrum analyzer output and the correction factors necessary to apply the limit to the data.

Freq MHz	Pol H/V	RBW kHz	VBW kHz	Vmeas dBuV	AF dB1/m	Amp dB	Cable dB	Field dBuV/m	Duty dB	Limit dBuV/m	Dev dB
125	H	120	300	43.5	12.9	29	3	30.4	0	43.5	-13.1
125	V	120	300	42	12.9	29	3	28.9	0	43.5	-14.6
150	H	120	300	43.5	11.1	29	4	29.6	0	43.5	-13.9
150	V	120	300	43	11.1	29	4	29.1	0	43.5	-14.4
175	H	120	300	44	10.9	29	4	29.9	0	43.5	-13.6
175	V	120	300	45	10.9	29	4	30.9	0	43.5	-12.6
200	H	120	300	46	11.3	29	4	32.3	0	43.5	-11.2
200	V	120	300	43	11.3	29	4	29.3	0	43.5	-14.2
250	H	120	300	38	13.4	29	4	26.4	0	46	-19.6
250	V	120	300	39	13.4	29	4	27.4	0	46	-18.6
300	H	120	300	41	14.9	28	4	31.9	0	46	-14.1
300	H	120	300	41	14.9	28	4	31.9	0	46	-14.1
500	H	120	300	46	18.6	28	5	41.6	0	46	-4.4
500	V	120	300	45	18.6	28	5	40.6	0	46	-5.4
600	H	120	300	40	19.7	28	5	36.7	0	46	-9.3
600	V	120	300	43	19.7	28	5	39.7	0	46	-6.3
700	H	120	300	44	20.2	28	5.5	41.7	0	46	-4.3
700	V	120	300	43	20.2	28	5.5	40.7	0	46	-5.3
800	H	120	300	38	21.5	28	6	37.5	0	46	-8.5
800	V	120	300	39	21.5	28	6	38.5	0	46	-7.5

Table 1 Cont'd – Corrected Radiated Emissions Data and FCC Limit

**IX. Measurement Results for FCC Tests Cont'd:**

**6. Radiated Emissions Cont'd.**

The table below contains the spectrum analyzer output and the correction factors necessary to apply the limit to the data.

Freq MHz	Pol H/V	RBW kHz	VBW kHz	Vmeas dBuV	AF dB1/m	Amp dB	Cable dB	Field dBuV/m	Duty dB	Limit dBuV/m	Dev dB
959	H	120	300	37	22.4	27	7	39.4	0	46	-6.6
959	V	120	300	39	22.4	27	7	41.4	0	46	-4.6
960	H	120	300	38	22.4	27	7	40.4	0	46	-5.6
960	V	120	300	37	22.4	27	7	39.4	0	46	-6.6
1000	H	1000	1000	34	24.2	27	8	39.2	0	54	-14.8
1000	V	1000	1000	32	24.2	27	8	37.2	0	54	-16.8

Table 1 Cont'd – Corrected Radiated Emissions Data and FCC Limit