Excellence in Compliance Testing

FCC Part 15 Subpart C Certification

Test Report

FCC ID: OUERFT1TX

FCC Rule Part: 15.231

ACS Report Number: 06-0488-15C

Manufacturer: Paul C. Buff Inc.
Model: RFT1TX

Test Begin Date: December 18, 2006
Test End Date: April 26, 2007

Report Issue Date: April 30, 2007

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612

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This report contains 12 pages

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Internal Photographs
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1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15.231, Subpart C of the FCC's Code of Federal Regulations.

1.2 Product Description

1.2.1 General

The RFT1 Photo Flash Trigger System consists of a transmitter and a minimum of one receiver. The transmitter incorporates a three section DIP switch used to select one of eight unique codes, or addresses. The transmitter is normally mounted atop a professional SLR-type camera using the hot shoe mounting fixment. The transmitter is self-contained, and is powered by a primary battery.

Applicant Information:
Paul C. Buff Inc.
2725 Bransford Ave.
Nashville, TN, 37204

Detailed photographs of the EUT are filed separately with this filing.

1.2.2 Intended Use

The RFT1TX is intended to be used as a wireless flash trigger for photography applications.

1.3 Test Methodology and Considerations

The purpose of compliance testing the equipment under test was supplied with an external trigger cable fitted with a 9VDC battery which was used to continuously trigger the transmitter. This modified trigger cable is not utilized in the normal operation of the device and was supplied for the sole purpose of providing an appropriate mode of operation for testing.

2.0 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment. In addition, ACS is compliant to ISO 17025 as certified by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program. The following certification numbers have been issued in recognition of these accreditations and certifications:

FCC Registration Number: 89450
Industry Canada Lab Code: IC 4175
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

NVLAP Lab Code: 200612-0

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

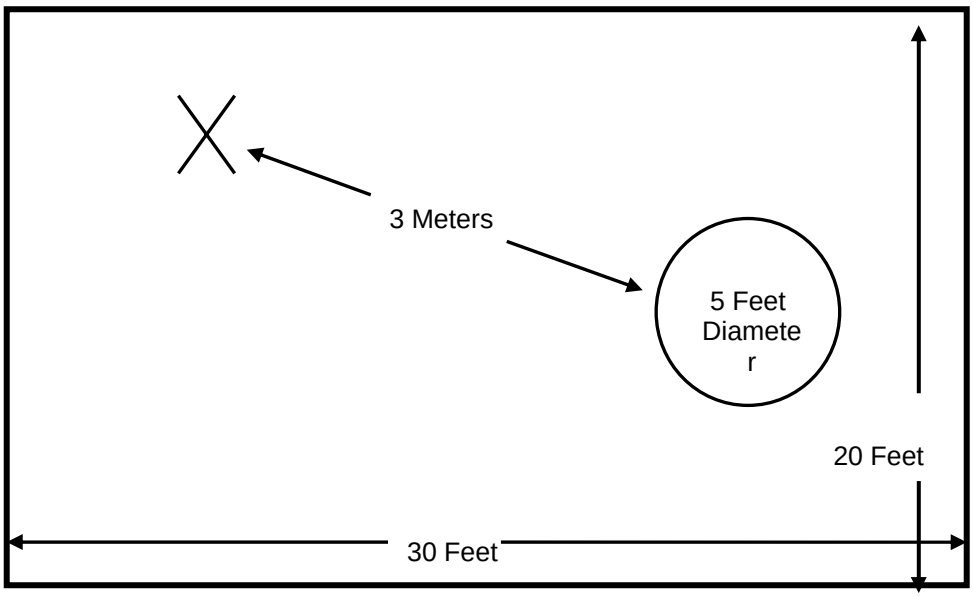

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

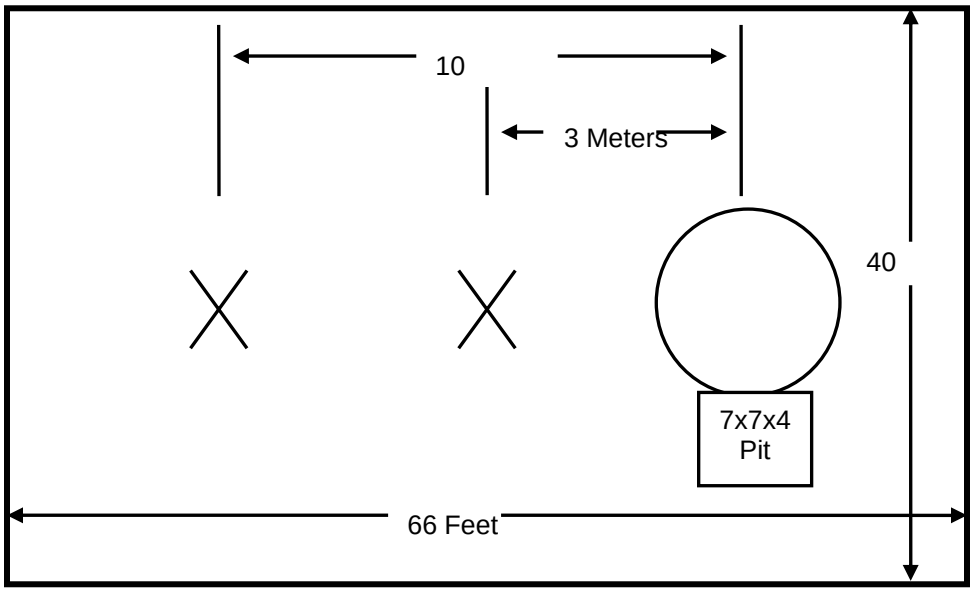

Figure 2.3-2: Open Area Test Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2006
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2006

4.0 LIST OF TEST EQUIPMENT

All test equipment used for regulatory testing is calibrated yearly or according to manufacturer's specifications.

Table 4.0-1: Test Equipment

Asset ID	Manufacturer	Model Number	Serial Number	Equipment Type	Cal Due
1	Rohde & Schwarz	ESMI - Display	833771/007	Spectrum Analyzers	03/05/08
2	Rohde & Schwarz	ESMI-Receiver	839587/003	Spectrum Analyzers	03/05/08
25	Chase	CBL6111	1043	Antennas	05/30/07
73	Agilent	8447D	2727A05624	Amplifiers	05/10/07
167	ACS	Chamber EMI Cable Set	167	Cables	01/05/08
211	Eagle	C7RFM3NFNM	HLC-700	Filters	01/08/08
283	Rohde & Schwarz	FSP40	1000033	Spectrum Analyzers	11/09/08
329	A.H.Systems	SAS-571	721	Antennas	08/24/07
338	Hewlett Packard	8449B	3008A01111	Amplifiers	09/26/07
343	Florida RF Cables	SMRE-200W-12.0-SMRE	N/A	Cables	09/01/07
344	Florida RF Cables	SMS-290AW-480.0-SMR	N/A	Cables	09/01/07

5.0 SUPPORT EQUIPMENT

Table 5-3: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number	FCC ID
The EUT was tested as a stand alone device and no support equipment was utilized.					

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

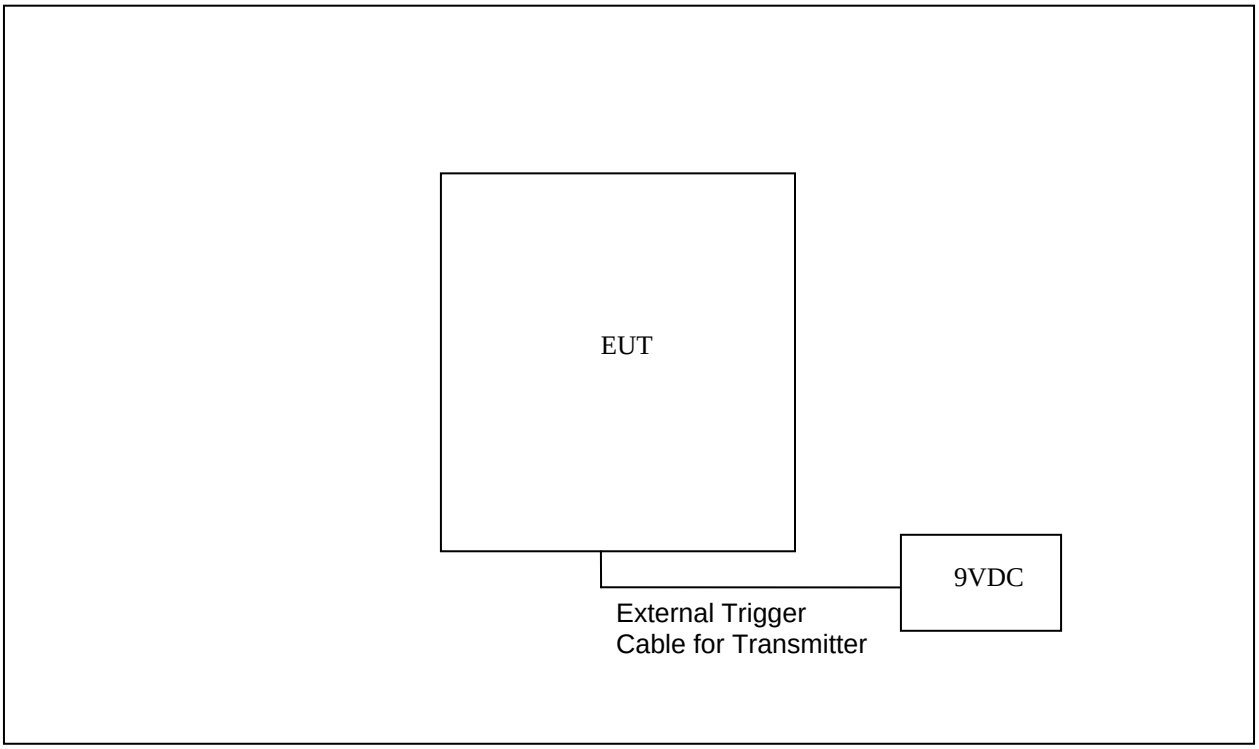

Figure 6.0-1: EUT Test Setup

7.0 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement - FCC Section 15.203

The EUT employs an integrated helical antenna thus meeting the requirements of 15.203.

7.2 FCC Section 15.231a (1) – Periodic Operation

7.2.1 Test Methodology

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter after 5 seconds of being released. A transmitter activated automatically shall cease transmission within 5 seconds after activation.

The RFT1TX is activated by one of three means: The TEST button may be pressed; The special camera hot shoe adapter terminals may be connected by a low resistance; The 2.5 mm sync input jack terminals may be connected by a low resistance. All means of activation provide the same response.

For this evaluation the transmitter was activated using the test button.

7.2.2 Test Results

The results are shown in Figure 7.2.2-1.

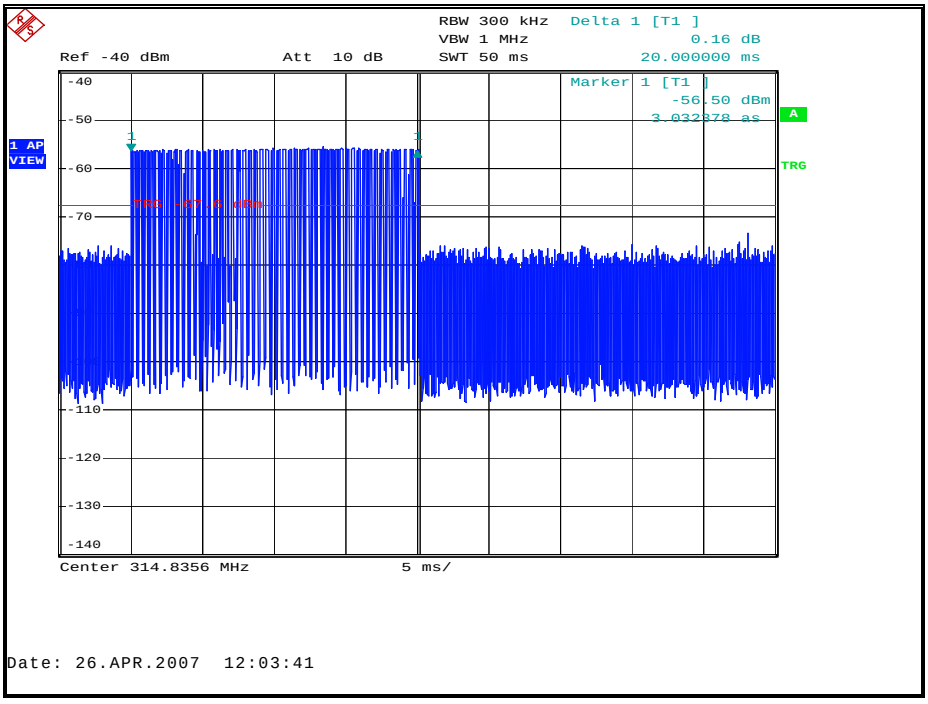

Figure 7.2.2-1

7.3 FCC Section 15.231c - Occupied Bandwidth

7.3.1 Test Methodology
The bandwidth of the emission shall be no wider than 0.25% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

7.3.2 Test Results
The 20dB bandwidth was measured as 62kHz. 0.25% of the center frequency 315MHz is equivalent to 787.5kHz. Therefore the 20dB bandwidth of the emission is less than 0.25% of the center frequency. The results are shown in Figure 7.3.2-1.

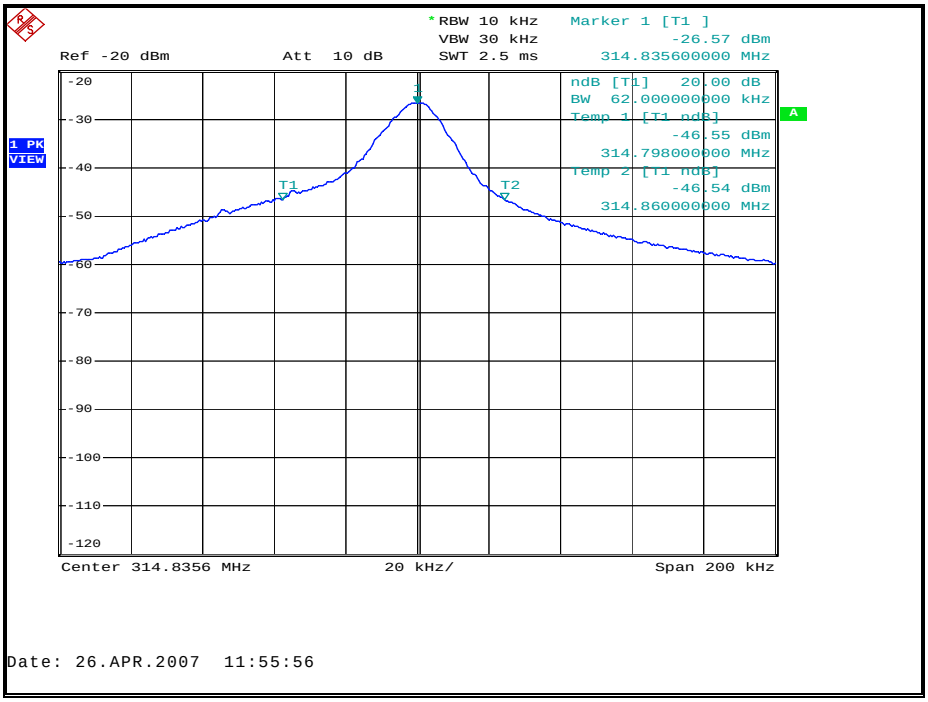

Figure 7.3.2-1

7.4 FCC Section 15.231 (b) – Field Strength of Emissions

7.4.1 Test Methodology
Radiated emissions tests were made over the frequency range of 30MHz to 3.15GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements were made with the Spectrum Analyzer's resolution bandwidth set to 120KHz for measurements below 1000MHz and 1MHz for measurements above 1000MHz. All measurements were made using a peak detector and reduced by the duty cycle correction factor to be applied to the average limits according to 15.35. The provisions of Part 15.205 were also demonstrated were appropriate.

The EUT was modified to operate utilizing a continuous trigger for this test.

7.4.2 Duty Cycle Correction Factor
For average radiated measurements, the measured level was reduced by a factor 16.32dB to account for the duty cycle of the EUT. The duty cycle was determined to be 15.28% within a 100ms period. The duty cycle correction factor is determined using the formula: 20log (0.1528) = -16.32dB. Further justification of the duty cycle can be found in the Theory of Operation contained in this filing.

7.4.3 Test Results

The results for the fundamental and spurious emissions are shown in Table 7.4.3-1

Table 7.4.3-1 - Field Strength of Emissions

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Fundamental Frequency										
314.84	91.90	91.90	H	-9.95	81.95	65.63	95.6	75.6	13.67	9.99
314.84	78.21	78.21	V	-10.41	67.80	51.49	95.6	75.6	27.81	24.13
Spurious Emissions										
629.68	41.80	41.80	H	-3.11	38.69	22.37	75.6	55.6	36.93	33.24
629.68	42.56	42.56	V	-2.81	39.75	23.43	75.6	55.6	35.86	32.18
944.52	52.72	52.72	H	2.73	55.45	39.13	75.6	55.6	20.17	16.48
944.52	53.02	53.02	V	2.84	55.86	39.54	75.6	55.6	19.76	16.08
1259.36	49.99	49.99	H	-9.29	40.70	24.38	75.6	55.6	34.92	31.23
1259.36	51.08	51.08	V	-9.04	42.04	25.72	75.6	55.6	33.57	29.89
1574.21	47.90	47.90	H	-6.91	40.99	24.68	74.0	54.0	33.01	29.32
1574.21	48.31	48.31	V	-6.65	41.66	25.34	74.0	54.0	32.34	28.66

7.4.4 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T = Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U = Uncorrected Reading
R_C = Corrected Level
AF = Antenna Factor
CA = Cable Attenuation
AG = Amplifier Gain
DC = Duty Cycle Correction Factor

Example Calculation: Peak
Corrected Level: 91.90 – 9.95 = 81.95 dBuV
Margin: 95.6dBuV – 81.95 dBuV = 13.67 dB

Example Calculation: Average
Corrected Level: 91.90 – 9.95 – 16.32 = 65.63 dBuV
Margin: 75.6dBuV – 65.63 dBuV = 9.99 dB

8.0 CONCLUSION

In the opinion of ACS, Inc. the RFT1TX, provided by Paul C. Buff Inc., meets the requirements of FCC Part 15.231 subpart C.