TEMPEST INC.

112 Elden Street **Herndon, Virginia 20170**
(703) "TEMPEST" (836-7378) **FAX:(703) 709-9565**
info-2007@tempest-inc.com **http://www.tempest-inc.com**
**** Our 22nd Year in Business: 1985 - 2007 ****

Results of Electromagnetic Compatibility Testing Performed in Accordance with Title 47, Part 15 of the United States Code of Federal Regulations on the Model ESTX Transmitter of the eStrap™ System, a Strap-Controlled Guitar Expression System made by Atlantic Quality Design, Inc. 562 Oak Hill Road, Fincastle Virginia 24090

Prepared by:

_____

Louis T. Gnecco, M.S.E.E., President
Certified Electromagnetic Compatibility Engineer: Cert.# EMC-000544-NE

August 6, 2007

Abstract

As requested by purchase order # 10140 issued by Atlantic Quality Design, Inc., during the period of August 1 - 6, 2007 TEMPEST INC. performed the Electromagnetic Compatibility Tests required for intentional radiators by Title 47, Part 15 of the United States Code Of Federal Regulations on the Model ESTX Transmitter of the eStrap™ system, a strap-controlled guitar expression system made by Atlantic Quality Design, Inc.

The eStrap™ system is called the "Strap-Controlled Expression System with Classic Wah." It consists of a transmitter and a receiver.

The transmitter is a battery-powered device that mounts on the shoulder strap of an electric guitar. Inside the transmitter is a strain gauge. It measures the varying amount of tension that the musician puts on the shoulder strap as he plays. The transmitter converts the strain gauge reading to a digital signal, operating in bursts at approximately 60 times per second. The digital signal is then used to modulate the frequency of a 916 MHz carrier. This FM signal is radiated by a short, flexible wire that forms a 1/4 wave rod antenna.

Normally placed approximately ten feet from the transmitter, the receiver is powered by an a.c. adapter. The receiver detects the digital FM signal produced by the transmitter and uses it digitally to create special effects on the guitar's music, all under the control of the musician

This report only presents the results of testing performed on the Model ESTX Transmitter, FCC ID # VHOESTX.

Receiver testing is described in a separate report.

The Transmitter's radiated emissions were measured, as required for intentional radiators by Title 47 of the United States Code of Federal Regulations, Part 15, sections 15.33(a,) 15.33(a)(1), 15.209(a), 15.249(3)(c), 15.249(3)(d.)

The testing was performed in accordance with ANSI C63.4-2003.

The field strength of the fundamental transmit frequency did not exceed 50 millivolts per meter at 3 meters.

None of the first ten harmonics were found to exceed 500 microvolts per meter at 3 meters.

No other emissions were found to exceed 200 microvolts per meter at 3 meters.

The eStrap™ Transmitter that was tested complies with the requirements of Title 47, Part 15 of the United States Code of Federal Regulations for Intentional radiators.

Table of Contents

List of Illustrations

The following illustrations are also submitted electronically as .jpg files:

List of Tables

Reference Documents:

(a) United States Code of Federal Regulations, Title 47, Part 15

(b) ANSI C63.4-2003: "American National Standard for Methods of Measurement of Radio-Noise Emissions of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"

(c) "Results of Electromagnetic Compatibility Testing Performed in Accordance with Title 47, Part 15 of the United States Code of Federal Regulations on the Model ESRX Receiver of the eStrap™ System,
a Strap-Controlled Guitar Expression System made by
Atlantic Quality Design, Inc. 562 Oak Hill Road, Fincastle Virginia 24090"
TEMPEST INC.: August 6, 2007

1.0 Introduction.

As requested by purchase order #10140 issued by Atlantic Quality Design, Inc., during the period of August 1 - 6, 2007 TEMPEST INC. performed Electromagnetic Compatibility tests in accordance with References (a) and (b) on the Model ESTX Transmitter of the eStrap™ system made by Atlantic Quality Design, Inc. of Fincastle, Virginia

1.1 Purpose.

The purpose of this test was to determine if the eStrap™ Transmitter complies with the requirements of Reference (a.)

1.2 Test Location.

Testing was performed in the FCC-listed Open Area Test Site of TEMPEST INC.

1.3 Cognizant Personnel.

The following personnel conducted, witnessed, or are cognizant of the test:

Louis T. Gnecco, President
Paula Levin Gnecco Vice President
TEMPEST INC. 112 Elden Street, Herndon, Virginia 20170
(703) 836-7378 e-mail: info-2007@tempest-inc.com

Mr. Hank Wallace, President
Atlantic Quality Designs, Inc.
562 Oak Hill Road, Fincastle, VA 24090
540-966-4356 (v) 540-966-4358 (f)
hwallace@aqdi.com

2.0 Description of the eStrap™ Transmitter.

The eStrap™ Model ESTX Transmitter, FCC ID # VHOESTX, is part of the "Strap-Controlled Expression System with Classic Wah." a strap-controlled guitar expression system made by Atlantic Quality Design, Inc.

The system consists of a transmitter and a receiver.

The transmitter is a battery-powered device that mounts on the shoulder strap of an electric guitar. Inside the transmitter is a strain gauge. It measures the varying amount of tension that the musician puts on the shoulder strap as he plays. The transmitter converts the strain gauge reading to a digital signal, operating in bursts at approximately 60 times per second. The digital signal is then used to modulate the frequency of a 916 MHz carrier. This FM signal is radiated by a short, flexible wire that forms a 1/4 wave rod antenna.

The transmitter employs a phase-locked loop using the following local oscillators: 3.578 MHz, 7.159 MHz

The transmitter that was tested came with no serial number, so it was marked "TX-1" with an indelible marker.

Normally placed approximately ten feet from the transmitter, the model ESRX receiver draws 9 Volts of d.c. power at 200 milliamperes, supplied by a 110 Volt a.c. outlet adapter. The receiver detects the FM signal produced by the transmitter and uses it to digitally create special effects on the guitar's music, all under the control of the musician.

3.0 Test Procedures.

As described below, testing was performed in accordance with references (a) and (b.) Radiated emissions were measured.

3.1 Instruments.

Table 1 is a list of the instruments used. No ancillary equipment was needed to make the eStrap™ Transmitter operate normally.

A double-ridged waveguide horn antenna, a log periodic antenna, a biconical antenna, an active rod antenna, and two Hewlett-Packard spectrum analyzers were used in a 3 meter Open Area Test Site to detect radiated emissions.

3.2 Calibration Check.

Using their internal calibration sources, the calibration of the spectrum analyzers was verified both immediately before and immediately after the test.

3.3 Dynamic Range and Detection System Sensitivity Tests.

Before testing, the dynamic range of the instrumentation was determined to be 80 dB, and the detection system sensitivity was -95 dBm.

3.4 Local Interference Test.

With the eStrap™ Transmitter turned off, the ambient signals in the Open Area Test Site were measured and recorded, to verify that any signals being measured were coming from the eStrap™ Transmitter, and not from other local sources, such as cellular telephones. Preliminary measurements were made in the laboratory to identify the frequencies emitted by the eStrap Transmitter.

3.5 Measurements.

All measurements were performed in accordance with reference (b.)

3.5.1 Radiated Measurements.

The eStrap™ Transmitter was placed normally, with its antenna facing upward, on a nonconductive turntable 3 meters from the antenna hoist. It was then rotated about 360 degrees in 16 equal increments of 22.5 degrees each, as recommended by reference (b.) With the exception of the active rod antenna, the receiving antennas were raised from 1 to 4 meters above the ground plane while the emissions were measured. The peak values of the signals detected from the eStrap™ Transmitter were recorded in dBm. These were converted to μV/m using the following formulas:

Field strength (dBμV/m) = measured level (dBm) +107 dB
+ antenna factor (dB) + cable loss (dB)

Field Strength in dBμV/m = 20 Log $_{10}$ (Field Strength in μV/m)

Field Strength (μV/m) = Anti Log $_{10}$[(Field Strength in dBμV/m) / 20]

3.5.2 Cables.

For measurements below 1 GHz, 55 feet of RG-223 coaxial cable were used. The cable loss was measured before the test, and ranged from less than 1 dB to a maximum of 8 dB at 1 GHz.

For measurements above 1 GHz, 20 feet of constant-phase cable were used. The cable loss ranged from less than 1 dB at 1 GHz to 9 dB at 11 GHz.

4.0 Results.

As shown in Table 2, The eStrap™ Transmitter passed all tests.
Radiated emissions were limited to the main carrier frequency of 916 MHz, whose field strength was well within the limits of reference (a.)
Preliminary laboratory tests detected the first, second and third harmonics at very low levels. No harmonics were found in the open area test site.

The transmitter's signal has a unique pattern which consists of approximately 60 Hz bursts of digital FM. This enabled the test engineer to differentiate it from ambient signals at nearby frequencies.

The field strength of the fundamental transmit frequency did not exceed 50 millivolts per meter at 3 meters.

None of the first ten harmonics were found to exceed 500 microvolts per meter at 3 meters.

No other emissions were found to exceed 200 microvolts per meter at 3 meters.

5.0 Conclusions.

The eStrap™ Transmitter that was tested complies with the requirements of Reference (a) for intentional radiators.

Illustrations.

Figure 1: eStrap™ Transmitter

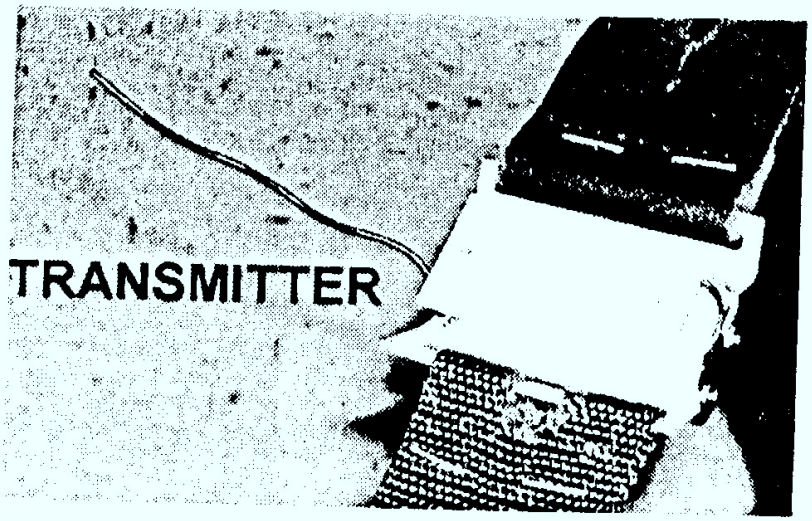
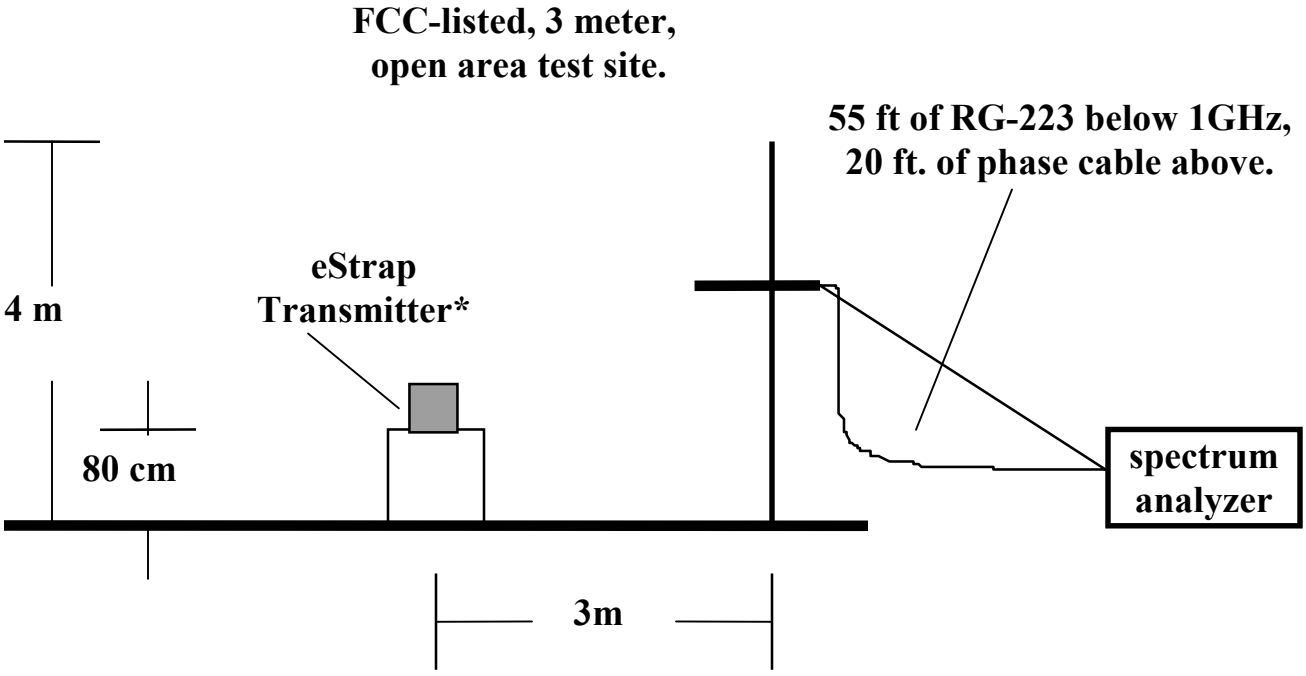


Figure 2: Block Diagram of Test Setup,
Radiated Emissions



* powered by 2 internal AAA batteries.

Tables.

Table 1: Instruments

Mfg.	Model	Name	Serial No.	calibrated:	Due date:
Hewlett-Packard	141T	Spectrum Analyzer Display	TI-98	12/26/06	12/26/07
"	8555A	RF Section	TI-750	"	"
"	8552B	IF Section	TI-751	"	"
Hewlett-Packard	141T	Spectrum Analyzer Display	2506A-23966	12/06	12/07
"	8553B	RF Section	050301	"	"
"	8552B	IF Section	050302	"	"
ETS	3115	Double-Ridged waveguide Horn Antenna	0007 1511	4/24/07	4/24/10
Tensor	4104	Biconical antenna	2154	12/27/06	12/27/07
TEMPEST INC.	NA 200/2G	Log Periodic Antenna	82	12/20/06	12/20/07
EMCO	3301B	active rod antenna	2883	12/06	12/07

Cable C1: 55 ft. of RG-223 with BNC male connectors: checked on 7/31/07
Cables C2: 20 ft (total) of constant-phase cable with SMA connectors: checked on 7/31/07.

Spectrum analyzer calibration was spot checked both before and after each test.

Table 2: Data

No radiated emissions, harmonics, or spurious signals were found below or above the transmitter's frequency of 916 MHz.

Vertical polarization, antenna height: 1 meter.

Frequency accuracy: 2% Amplitude accuracy: +/- 2 dB

Frequency MHz	Level dBm	level dBμV rms	Antenna Factor, dB	Cable loss,* dB	Level dBμV/m	Level μV/m	Limit at 3 meters, μV/m
transmitter's signal & ambients at harmonic frequencies: horn antenna, vertical polarization							
916	-74	33	24	1	58	800	50,000
1832	-95**	12	27	3	42	128	500
2748	-95**	12	29	4	45	200	500
3764	-95**	12	32	4	48	256	500

*20 feet of constant-phase cable ** O.A.T.S. ambient

Typical ambient Signals - Biconical antenna - vertical polarization							
20	-80	27	14	<1	46	200	200
58	-80	27	10	1	47	70	200
66	-40	67	10	1	78	8000	200
70	-82	25	7	1	33	30	200
Typical ambient signals- Log Periodic Antenna - Vertical polarization							
418	-77	30	11	3	44	160	200
525	-46	61	14	4	79	8000	200
1000	-78	29	14	7	50	333	200

*55 feet of RG-223

Appendix A: Cross-reference.

As a courtesy to the reviewer, the following is a cross reference between this report and the documentation requirements of Ref. (b).

Requirement	Section	Page
10.1.1	Abstract	2
10.1.2	Abstract	2
10.1.3	Figure 2	12
10.1.4	Table 1	15
10.1.5	Table 2	17
10.1.6	Section 1.1	5
10.1.7	Section 3.0	7
10.1.8	Table 2	17
10.1.8.1	Table 2	17
10.1.8.2	Table 2	17
10.1.8.3 - 10.1.8.9	not applicable	
10.1.10	Section 4.0	9
10.1.11	Title page	1
10.1.12 - 10.1.13	not applicable	

TO
Mr. Hank Wallace, President
Atlantic Quality Designs, Inc.
562 Oak Hill Road, Fincastle, VA 24090
540-966-4356 (v) 540-966-4358 (f)
hwallace@aqdi.com

References:

(a) Industry Canada Standard # RSS-210 Issue 7 of June 2007:
"Radio Standards Specification Low Power Licence-exempt Radiocommunication (all Frequency Bands): Category I Equipment." section A1.1.3

(b) Industry Canada Standard # RSS-Gen::
"Radio Standards Specification General Requirements and Information for the Certification of Radiocommunication Equipment." Section 4.4.1

(c) "Results of Electromagnetic Compatibility Testing Performed in Accordance with
Title 47, Part 15 of the United States Code of Federal Regulations
on the Model ESTX Transmitter of the eStrap System, a Strap-Controlled Guitar Expression System made by Atlantic Quality Design, Inc. 562 Oak Hill Road, Fincastle Virginia 24090" TEMPEST INC. August 6, 2007

Dear Sir:

As requested by a verbal purchase order issued by Atlantic Quality Design, Inc., on September 19, 2007 TEMPEST INC. performed occupied bandwidth tests on the Model ESTX Transmitter, FCC ID # VHOESTX, of the eStrap system, a strap-controlled guitar expression system made by Atlantic Quality Design, Inc.

The purpose of this test was to determine if the transmitter meets the 99% occupied bandwith requirements of reference (a.)

The transmitter is a battery-powered device that mounts on the shoulder strap of an electric guitar. Inside the transmitter is a strain gauge. It measures the varying amount of tension that the musician puts on the shoulder strap as he plays. The transmitter converts the strain gauge reading to a digital signal, operating in bursts at approximately 60 times per second. The digital signal is then used to modulate the frequency of a 916 MHz carrier. This FM signal is radiated by a short flexible wire that forms a 1/4 wave rod antenna.

Radiated measurements were made at distance of one meter in a 10 ft x 12 ft x 8 ft high r.f. shielded chamber which was fully lined with microwave absorbing material. A TEMPEST INC. model NA-200/2G log periodic antenna was used with a Hewlett-Packard 141T/8555A/8556B spectrum analyzer.

A scan width of 100 kHz/division (a span width of 1 MHz) was selected. In accordance with Reference (b,) a resolution bandwidth of 10 kHz (1% of the span width) was used.

This test determined that the 99% occupied bandwith was 150 kHz.

Reference (a) states that the 99% occupied bandwidth must not exceed 0.5% of the center frequency, or 4.58 MHz in this case.

The transmitter complies with the requirements of Reference (a.)

Reference (c) presents further information about the transmitter.

Yours truly,

Louis T. Gnecco M.S.E.E., President
Certified Electromagnetic Compatibility Engineer: Cert. # EMC-000544-NE