

Retlif Testing Laboratories

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FCC Part 15 Report of Measurements on

Punchforce Boxing Glove Sensor Unit Transceiver FCC ID: AP8JEHBOPF1

| Customer Name: | HBO/Time Warner |
|-------------------------------|------------------|
| Customer P.O.: | N/A |
| Date of Report: | November 9, 2011 |
| Test Report No.: | R-5449N-1 |
| Test Start Date: | November 1, 2011 |
| Test Finish Date: | November 1, 2011 |
| Test Technician: | M. Seamans |
| Branch Manager: | S. Wentworth |
| Laboratory Supervisor: | T. Hannemann |
| Report Prepared By: | J. Ramsey |
| Government Source Inspection: | N/A |
| | |

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Scott Wentworth Branch Manager

Letto Wenther

NVLAP Approved Signatory

Todd Hannamann Laboratory Supervisor

NARTE Certified ATL-0255-T

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Revision History

Revisions to this document are listed below; the latest revised document supersedes all previous issues of this document.

| Revision | Date | Pages Affected |
|----------|------------------|------------------|
| - | November 9, 2011 | Original Release |



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Test Program Summary

Job Number: R-5449N-1

Customer: HBO/Time Warner

Address: 1100 Avenue of the Americas

New York, NY 10036-6712

Test Sample: Boxing Glove Sensor Unit Transceiver

FCC ID: AP8JEHBOPF1

Brand Name: Punchforce

Model Name: Punchforce

Antenna Type: PCB Chip Antenna

EUT Antenna Connector: None

Power Requirements: 3.7 VDC via Internal Battery

Frequency Band of Operation: 2.400 GHz to 2.4835 GHz

(3) Lowest channel, mid-band channel

Tested Frequencies: and highest channel

Test Specification:

FCC Rules and Regulations Part 15, Subpart C, Paragraph 15.249

Test Procedure:

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

Purpose:

The purpose of this test program was to demonstrate compliance of the Punchforce Boxing Glove Sensor Unit Transceiver to the technical requirements of FCC Part 15.249.

Test Methods:

The following table depicts the test methods that were performed on the EUT and the corresponding test results:

| Testing Date(s) | Test Method | Test Results | |
|------------------|---------------------------------------------|--------------|--|
| November 1, 2011 | 15.249 (a) Fundamental & Harmonic Emissions | Complied | |
| November 1, 2011 | 15.249 (d) Out of Band/Bandedge Emissions | Complied | |
| November 1, 2011 | 15.249 (e) Peak Field Strength | Complied | |

Test Sample Description:

The Punchforce Boxing Glove Sensor Unit Transceiver (EUT) is a self-contained, battery-powered, wireless inertial measurement and radio telemetry device which is placed in a boxing glove and used to send sensor readings (punch speed & force data) to the Base Station Interface during a boxing match. The EUT has no attached cables.



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Test Sample/Test Results Summary:

- The maximized worst case fundamental field strength did not exceed 50 m V/M (94dBμV/M) at a test distance of 3 meters. The measured maximized average field strength was 605 uV/M (55.6 BμV/M) at a frequency of 2473 MHz.
- The field strength of observed harmonic emissions did not exceed 500 μ V/M. No harmonic emissions were observed within 10dB of the specified limit at 3 meter or 1 meter test distances.
- The field strength of non-harmonic out of band emissions were attenuated more than 50dB below the level of the fundamental or to the limits of 15.209 as applicable. No out of band spurious emissions were observed within 10dB of the specified limit at 3 meter or 1 meter test distances.
- The field strength of bandedge emissions were attenuated more than 50dB below the level of the fundamental or to the limits of 15.209 as applicable.
- The maximized peak field strength of the emissions did not exceed the maximum permitted average field strength by more than 20 dB.

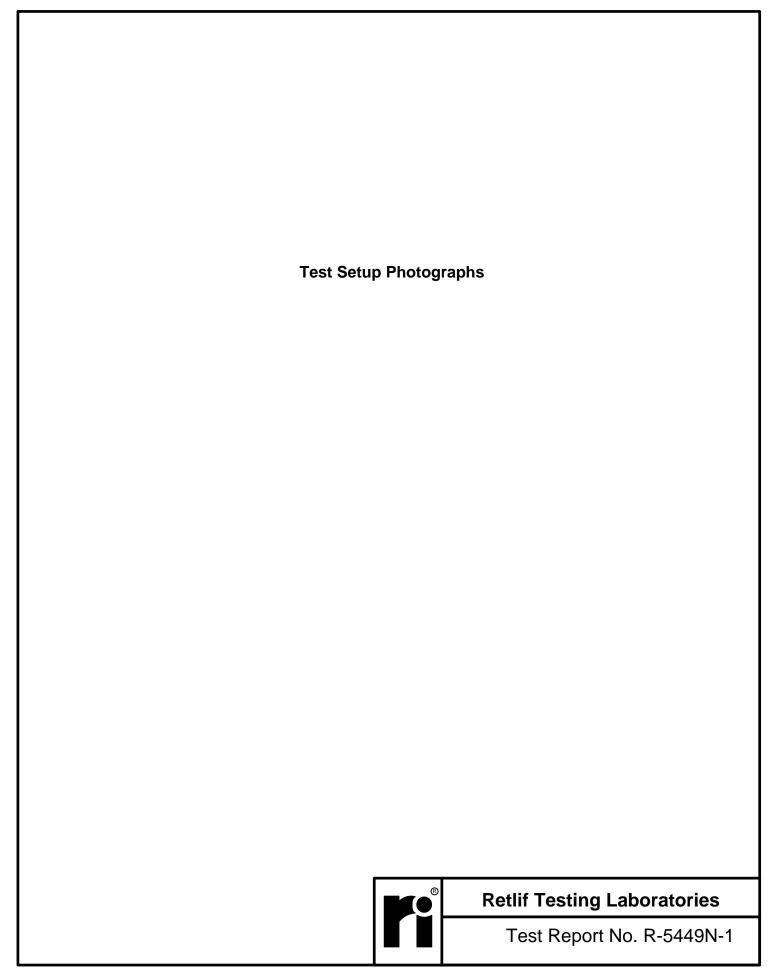
Measurement Procedures:

15.249 (a/d) Field Strength of Fundamental, Harmonic and Out of Band/Band Edge Emissions (Radiated Emissions)

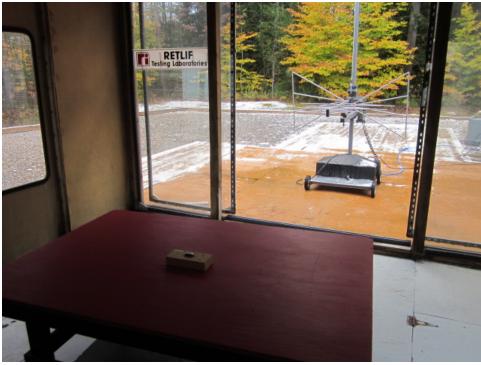
The field strength of the fundamental, harmonic and out of band/bandedge emissions were measured in the frequency range of 30 MHz to 25 GHz. The EUT was placed on a 80cm high wooden test stand located 3 meters from the test antenna on a FCC listed open area test site. Emissions from the EUT were maximized and the field strength of each observed emission was measured, recorded and compared to the specified limits of 15.249 (a)/(d)/(e)/15.209 as appropriate. Peak field strength of emissions were measured, recorded and verified to meet the specified limit (limit corresponds to 20dB above the maximum permitted average limit). When necessary, the marker/delta method was used to verify bandedge compliance.



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Test Setup Photograph(s) Radiated Emissions



30 to 1000 MHz, Horizontal Antenna Polarization



30 to 1000 MHz, Vertical Antenna Polarization



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Test Setup Photograph(s) Radiated Emissions



1 to 18 GHz, Horizontal Antenna Polarization



1 to 18 GHz, Vertical Antenna Polarization



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Test Setup Photograph(s) Radiated Emissions



18 to 26.5 GHz, Horizontal Antenna Polarization



18 to 26.5 GHz, Vertical Antenna Polarization



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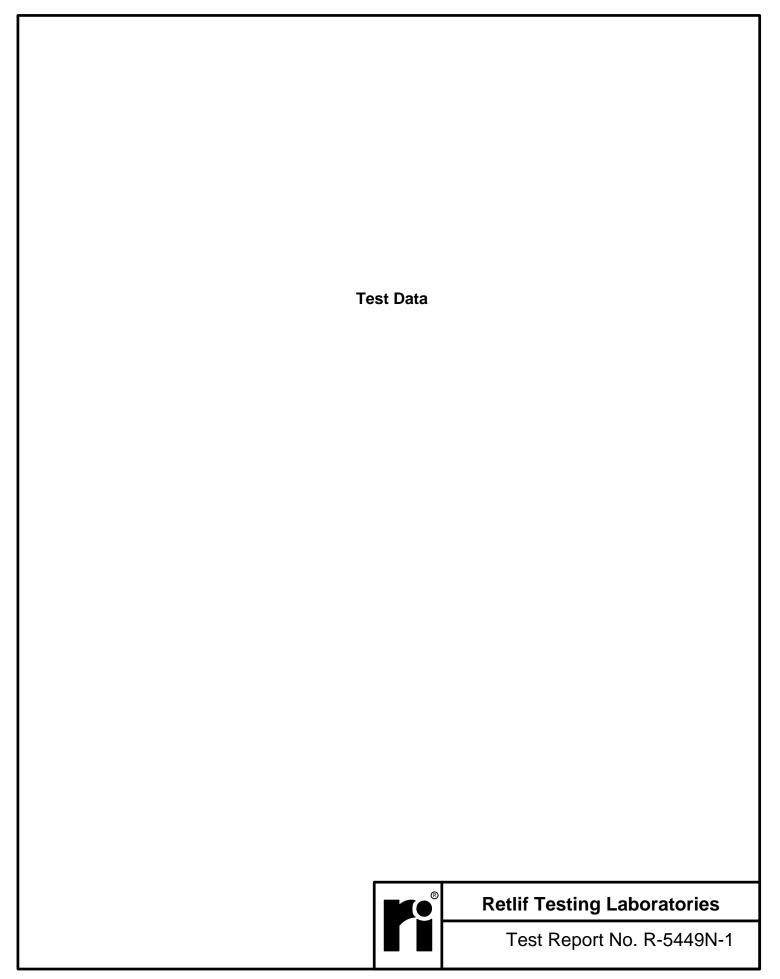
Equipment Lists

Radiated Emissions

| EN | Manufacturer | Description | Range | Model No. | Cal Date | Due Date |
|-------|-----------------|--------------------------------|-------------------|---------------|-------------|--------------|
| 1232 | AGILENT / HP | PRE-AMPLIFIER | 1 - 26.5GHz | 8449B | 5/10/2011 | 5/10/2012 |
| 3258 | EMCO | DOUBLE RIDGED GUIDE ANTENNA | 1 GHZ - 18GHZ | 3115 | 1/12/2011 | 1/12/2012 |
| 5070C | ANDREW | COAXIAL CABLE | 10 kHz - 18 GHz | 25' | 10/26/2011 | 10/26/2012 |
| 5070J | ANDREW | COAXIAL CABLE | | 2' | 10/26/2011 | 10/26/2012 |
| R444 | AGILENT / HP | SPECTRUM ANALYZER ANTENNA | 100 Hz - 26.5 GHz | E7405A;A | 6/4/2010 | 6/4/2012 |
| 3430 | MCS | HORN ANTENNA | 18 GHz - 26.5 GHz | K-5039 | 1/13/2011 | 1/13/2012 |
| 4029 | RETLIF | OPEN AREA TEST SITE | 3 / 10 Meters | RNH | 8/21/2009 | 8/21/2012 |
| 5070 | ROHDE & SCHWAR | Z EMI TEST RECEIVER | 20 Hz - 40 GHz | ESIB40 | 1/20/2011 | 1/20/2012 |
| 5152 | GENERAL TECHNIC | CS Control Computer | | INDUSTRIAL PC | No Calibrat | ion Required |
| 8165 | EMCO | BICONILOG | 26 - 2000 MHz | 3142 | 6/13/2011 | 6/13/2012 |



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RETLIF TESTING LABORATORIES TABULAR DATA SHEET Test Method: Fundamental Field Strength & Harmonics Customer: Home Box Office, Inc. Job No: R-5449N-1 Test Sample: Boxing Glove Sensor Unit Transceiver Model No: 110 Punchforce Serial No: **Test Specification:** FCC Part 15 Paragraph: 15.249 (a) **Operating Mode:** Transmitting signal Technician: M.Seamans Date: November 1, 2011 Notes: Average Readings to Average Limits Antenna Postion Meter Limit Transmit Test Correction Corrected Converted **EUT Orientation** Reading at 3 Meters Frequency Reading Factor Reading Frequency MHz MHz Polarization/Axis dBuV dΒ dBuV/m uV/m uV/m 2408.00 55.10 453.94 50000.00 2408.21 V/X -1.96 53.14 4816.00 -500.00 7224.00 _ 500.00 9632.00 500.00 12040.00 500.00 14448.00 500.00 500.00 16856.00 19264.00 -----500.00 500.00 21672.00 24080.00 500.00 At the harmonic frequencies where no meter reading is recorded, there was no harmonic observed above the baseline of the spectrum analyzer which was a minimum of 10 dB below the limit. Data Sheet 1 of 1 R-5449N-1

RETLIF TESTING LABORATORIES TABULAR DATA SHEET Test Method: Fundamental Field Strength & Harmonics Customer: Home Box Office, Inc. Job No: R-5449N-1 Test Sample: Boxing Glove Sensor Unit Transceiver Model No: 110 **Punchforce** Serial No: **Test Specification:** FCC Part 15 Paragraph: 15.249 (a) **Operating Mode:** Transmitting signal Technician: M.Seamans Date: November 1, 2011 Notes: Average Readings to Average Limits Antenna Postion Meter Limit Transmit Test Correction Corrected Converted **EUT Orientation** Reading at 3 Meters Frequency Reading Factor Reading Frequency MHz MHz Polarization/Axis dBuV dΒ dBuV/m uV/m uV/m 53.85 2453.00 492.61 50000.00 2453.41 V/X 55.71 -1.86 4906.00 -500.00 7359.00 500.00 9812.00 500.00 12265.00 500.00 500.00 14718.00 500.00 17171.00 19624.00 -----500.00 500.00 22077.00 24530.00 500.00 At the harmonic frequencies where no meter reading is recorded, there was no harmonic observed above the baseline of the spectrum analyzer which was a minimum of 10 dB below the limit. Data Sheet 1 of 1 R-5449N-1

RETLIF TESTING LABORATORIES TABULAR DATA SHEET Test Method: Fundamental Field Strength & Harmonics Customer: Home Box Office, Inc. Job No: R-5449N-1 Test Sample: Boxing Glove Sensor Unit Transceiver Model No: 110 Punchforce Serial No: **Test Specification:** FCC Part 15 Paragraph: 15.249 (a) **Operating Mode:** Transmitting signal Technician: M.Seamans Date: November 1, 2011 Notes: Average Readings to Average Limits Antenna Postion Meter Limit Transmit Test Correction Corrected Converted **EUT Orientation** Reading at 3 Meters Frequency Frequency Reading Factor Reading MHz MHz Polarization/Axis dBuV dΒ dBuV/m uV/m uV/m 2473.00 57.40 55.64 605.34 50000.00 2473.16 H/Z -1.76 4946.00 -500.00 7419.00 _ 500.00 9892.00 500.00 12365.00 500.00 500.00 14838.00 500.00 17311.00 19784.00 -----500.00 500.00 22257.00 24730.00 500.00 At the harmonic frequencies where no meter reading is recorded, there was no harmonic observed above the baseline of the spectrum analyzer which was a minimum of 10 dB below the limit. Data Sheet 1 of 1 R-5449N-1

RETLIF TESTING LABORATORIES TABULAR DATA SHEET Test Method: Peak Field Strength Customer: Home Box Office, Inc. Job No: R-5449N-1 Test Sample: Boxing Glove Sensor Unit Transceiver Model No: 110 **Punchforce** Serial No: **Test Specification:** FCC Part 15 Paragraph: 15.249 (e) **Operating Mode:** Transmitting signal Technician: M.Seamans Date: November 1, 2011 Notes: Peak Readings to Peak Limits (20dB above average limits) Antenna Postion Meter Limit Transmit Test Correction Corrected Converted **EUT Orientation** Reading at 3 Meters Frequency Reading Factor Reading Frequency MHz MHz Polarization/Axis dBuV dΒ dBuV/m uV/m uVm 2408.00 86.49 84.53 16846.12 500000.00 2408.21 V/X -1.96 5000.00 4816.00 -7224.00 5000.00 9632.00 5000.00 12040.00 5000.00 14448.00 5000.00 5000.00 16856.00 19264.00 -----5000.00 5000.00 21672.00 24080.00 5000.00 At the harmonic frequencies where no meter reading is recorded, there was no harmonic observed above the baseline of the spectrum analyzer which was a minimum of 10 dB below the limit. Data Sheet 1 of 1 R-5449N-1

RETLIF TESTING LABORATORIES TABULAR DATA SHEET Test Method: Peak Field Strength Customer: Home Box Office, Inc. Job No: R-5449N-1 Test Sample: Boxing Glove Sensor Unit Transceiver Model No: 110 Punchforce Serial No: **Test Specification:** FCC Part 15 Paragraph: 15.249 (e) **Operating Mode:** Transmitting signal Technician: M.Seamans Date: November 1, 2011 Notes: Peak Readings to Peak Limits (20dB above average limits) Antenna Postion Meter Limit Transmit Test Correction Corrected Converted **EUT Orientation** Reading at 3 Meters Frequency Reading Factor Reading Frequency MHz MHz Polarization/Axis dBuV dΒ dBuV/m uV/m uVm 84.96 17701.09 500000.00 2453.00 2453.41 V/X 86.82 -1.86 5000.00 4906.00 -7359.00 5000.00 9812.00 5000.00 12265.00 5000.00 5000.00 14718.00 5000.00 17171.00 19624.00 -----5000.00 5000.00 22077.00 24530.00 5000.00 At the harmonic frequencies where no meter reading is recorded, there was no harmonic observed above the baseline of the spectrum analyzer which was a minimum of 10 dB below the limit. Data Sheet 1 of 1 R-5449N-1

RETLIF TESTING LABORATORIES TABULAR DATA SHEET Test Method: Peak Field Strength Customer: Home Box Office, Inc. Job No: R-5449N-1 Test Sample: Boxing Glove Sensor Unit Transceiver Model No: 110 **Punchforce** Serial No: **Test Specification:** FCC Part 15 Paragraph: 15.249 (e) **Operating Mode:** Transmitting signal Technician: M.Seamans Date: November 1, 2011 Notes: Peak Readings to Peak Limits (20dB above average limits) Antenna Postion Meter Limit Transmit Test Correction Corrected Converted **EUT Orientation** Reading at 3 Meters Frequency Reading Factor Reading Frequency MHz MHz Polarization/Axis dBuV dΒ dBuV/m uV/m uVm 2473.00 86.40 20892.96 500000.00 2473.16 H/X 88.16 -1.76 5000.00 4946.00 -7419.00 5000.00 9892.00 5000.00 12365.00 5000.00 5000.00 14838.00 5000.00 17311.00 19784.00 -----5000.00 5000.00 22257.00 24730.00 5000.00 At the harmonic frequencies where no meter reading is recorded, there was no harmonic observed above the baseline of the spectrum analyzer which was a minimum of 10 dB below the limit. Data Sheet 1 of 1 R-5449N-1

RETLIF TESTING LABORATORIES EMISSIONS DATA SHEET Out of Band Radiated Emissions 30 MHz to 26.5 GHz Test Method: Home Box Office, Inc. R-5449N-1 Customer Job No. Boxing Glove Sensor Unit Transceiver **Test Sample** Model No. 110 Punchforce Serial No. FCC Part 15 Subpart C Test Specification: Paragraph: 15.249 (d) Operating Mode: Transmitting signal Technician: M.Seamans Date: November 1, 2011 Notes: Test Distance: 3 Meters Test Antenna Turntable Uncorrected Correction Corrected Limit at 3 Meters Position Frequency Position Reading Factor Reading MHz (H/V) - Height Degrees dBuV dΒ dBuV/m dBuV/m 40.0 30.00 40.0 88.00 88.00 43.5 216.00 _ ----43.5 216.00 46.0 960.00 46.0 -960.00 54.0 _ 26500.00 54.0 No EUT emissions were observed above the noisefloor of the test equipment which was a minimum of 10dB below the specified test limit. Data Sheet 1 of 1 R-5449N-1

RETLIF TESTING LABORATORIES TABULAR DATA SHEET Test Method: Band Edge R-5449N-1 Customer: Home Box Office, Inc. Job No: Test Sample: Boxing Glove Sensor Unit Transceiver Part No: Punchforce Serial No: 110 **Test Specification:** FCC Part 15 Paragraph: 15.249 (d) Operating Mode: Transmitting signal Technician: M.Seamans Date: November 1, 2011 Notes: Peak Readings Test Distance 3 Meters, The EUT was transmitting at the high and low channel frequencies during these measurements. Meter Correction Corrected Test Reading Limit Frequency Reading Factor MHz dBuV dΒ dBuV/m dBuV/m 2400.00 44.08 -1.96 42.12 54.0 2483.50 42.09 40.33 -1.76 54.0 Data Sheet 1 of 1 R-5449N-1