



## Measurement of Frequency Stability From a Model STXe 500 LPFM Broadcast Transmitter

Date Tested : April 17<sup>th</sup>, 2014  
Test Personnel : Douglas Foote  
Specification : 47 CFR 73.1545 *Carrier frequency departure tolerances*

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### REVISION HISTORY

<b>Revision</b>	<b>Date</b>	<b>Description</b>
-	22 Apr 2014	Initial Release



## 2 INTRODUCTION

### 2.1 Scope of Tests

This document represents the results of the series of carrier frequency stability measurements performed on model STXe 500, LPFM Broadcast Transmitter, (hereinafter referred to as the EUT). The EUT was manufactured and tested by BEI Electronics LLC located in Quincy, IL.

### 2.2 Purpose

The test series, using the required measurements of 47 CFR 2.1055, was performed to certify that the EUT meets the FCC 47 CFR 73.1545 *Carrier frequency departure tolerances* requirement.

### 2.3 Deviations, Additions and Exclusions

There were no deviations, additions to, or exclusions from the test specification during this test series.

### 2.4 Laboratory Conditions

The ambient temperature at the time of the test was 22°C and the relative humidity was 48%

## 3 APPLICABLE DOCUMENTS

The following documents of the exact issue designated form part of this document to the extent specified herein:

- FCC 47 CFR 73.1545 "Carrier frequency departure tolerances.", dated 10-1-12
- FCC 47 CFR 2.1055 "Measurements required: Frequency Stability.", dated 10-1-09

## 4 EUT SETUP AND OPERATION

### 4.1 General Description

The EUT is a 500W FM Broadcast Transmitter, Part No. STXe 500. A block diagram of the EUT setup is shown as Figure 1.

#### 4.1.1 Power Input

The EUT obtained 115V 60Hz single-phase power via a 3 wire, 1.8 meter long, unshielded power cord.

#### 4.1.2 Peripheral Equipment

A BEI Electronics LLC XPi 10esp GPS locked 10MHz output was used as the timing reference for the Hewlett Packard HP5316B Universal Frequency Counter to acquire accurate frequency readings.



#### 4.1.3 Interconnect Cables

The EUTs signal input and output ports were filled as follows:

<b>EUT Port</b>	<b>Cable</b>
1 PPS IN	Not Connected
10MHz IN	Not Connected
Ethernet	Connected to a Netgear FS576 Ethernet Switch, via a 7.62 meter long CAT 5 cable
COM IN	Not Connected
COM OUT	Not Connected
EXC RF OUT	Connected to a HP 5316B Universal Counter, via a 1 meter long coaxial cable
PA RF IN	Not Connected
AES1	Not Connected
LEFT	Not Connected
RIGHT	Not Connected
SCA2	Not Connected
19kHz OUT	Not Connected
SCA1	Not Connected
RDS	Not Connected
RF OUT	Not Connected

#### 4.1.4 Grounding

The EUT was grounded only through the ground wire of its input power cord



#### 4.2 Operational Mode

For all tests the EUT and all peripheral equipment were energized. The EUT audio source was set to Composite with no external audio connection. The EUT was set to transmit a 100.0 MHz unmodulated carrier signal. The EXC RF Out port was connected to a HP 5316B Universal Counter for frequency measurement.

#### 4.3 EUT Modifications

No modifications were required for compliance with the FCC requirements.

### 5 TEST INSTRUMENTATION

#### 5.1 Test Instrumentation

The test instrumentation and auxiliary equipment used during tests are listed in Table 9-1.

### 6 TEST PROCEDURES

#### 6.1 Carrier Frequency Stability

##### 6.1.1 Requirements

The frequency of the carrier shall remain within +/- 2000Hz from the selected frequency.

##### 6.1.2 Procedures

After a warm-up period of one hour at rated AC input voltage at 0°C, the operating frequency at 85%, 100%, and 115% of the rated AC supply voltage was measured and recorded. This test was repeated (including the 1 hour of stabilization before each measurement) at 10°C, 20°C, 25°C, 30°C, 40°C, and 50°C.

##### 6.1.3 Results

The results are presented on page 9 of this report. As can be seen from the data, all frequency deviations were well within the +/- 2000Hz limit.



## 7 OTHER TEST CONDITIONS

### 7.1 Test Personnel and Witnesses

All tests were performed by qualified personnel from BEI Electronics LLC.

### 7.2 Disposition of the EUT

The EUT and all associated equipment is located in the RF test lab of BEI Electronics LLC.

## 8 CONCLUSIONS

It was determined that the BEI Electronics LLC model STXe 500 LPFM Broadcast Transmitter does meet the frequency stability requirements of FCC 47 CFR 73.1545

## 9 CERTIFICATION

BEI Electronics LLC certifies that the information contained in this report was obtained under the conditions which meet or exceed those specified in the test specifications. The data presented in this test report pertains to the EUT at the test date.

## 10 EQUIPMENT LIST

**Table 9-1 Equipment List**

Equipment Description	Manufacturer	Model No.	Frequency Range
GPS 10.0MHz LOCKED REFERENCE	BEI ELECTR. LLC	XPi10esp	10.0MHz
UNIVERSAL COUNTER W/ OPTION 001	HEWLETT PACKARD	5316B	30Hz-100MHz
ENVIRONMENTAL CHAMBER	SUN SYSTEMS	EC16HA	NA
MULTIMETER 1	FLUKE	75 SERIES II	NA
THERMOCOUPLE MODULE	FLUKE	80TK	NA
THERMOCOUPLE	FLUKE	6425 K-TYPE	NA
MULTIMETER 2	FLUKE	77 III	NA
VARIABLE AUTOTRANSFORMER	POWERSTAT	116B	50/60Hz
FAST ETHERNET SWITCH	NETGEAR	FS516	10/100Mbps



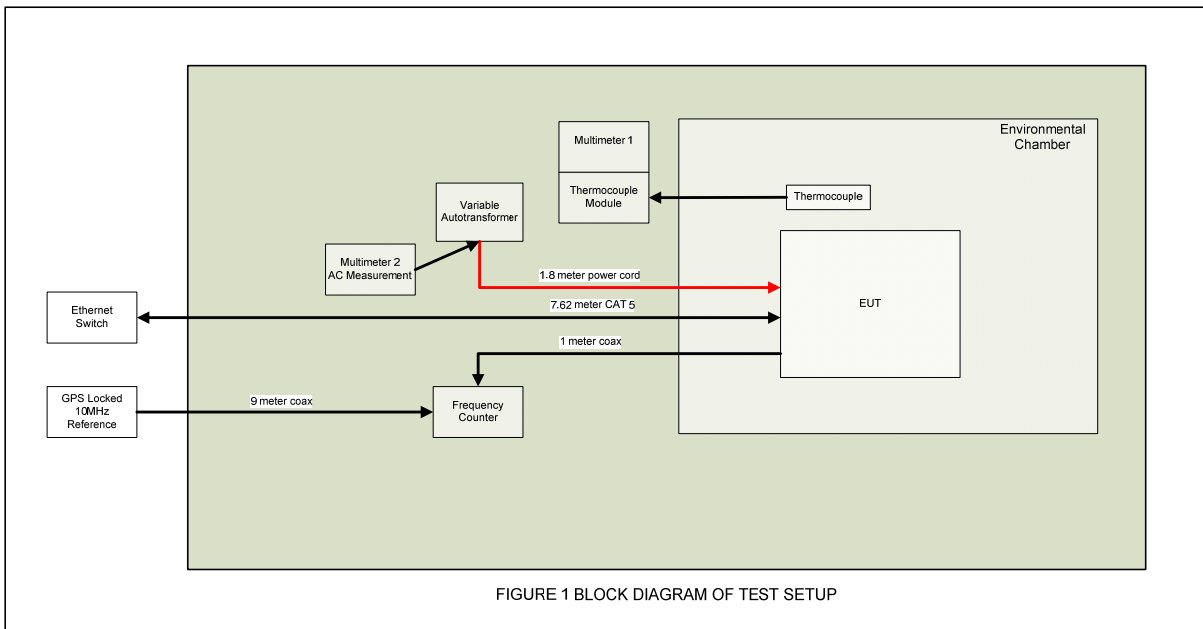


Figure 2: Setup for carrier frequency departure tolerance testing (shown with the door open to observe EUT positioning)



DATA PAGE

MANUFACTURER : BEI Electronics LLC  
 MODEL : STXe 500  
 SERIAL NO. : None Assigned  
 SPECIFICATION : 47 CFR 73.1545 *Carrier frequency departure tolerances*  
 DATE : April 17, 2014

<u>Temp</u> <u>(°C)</u>	<u>Voltage</u> <u>(AC)</u>	<u>Frequency</u> <u>(Hz)</u>	<u>Nominal</u> <u>Frequency</u> <u>(Hz)</u>	<u>Difference</u> <u>(Hz)</u>	<u>Limit</u> <u>(Hz)</u>
0	115	100000012	100000000	12	+/- 2000
0	97	100000013	100000000	13	+/- 2000
0	133	100000013	100000000	13	+/- 2000
10	115	99999990	100000000	-10	+/- 2000
10	97	99999990	100000000	-10	+/- 2000
10	133	99999990	100000000	-10	+/- 2000
20	115	99999948	100000000	-52	+/- 2000
20	97	99999948	100000000	-52	+/- 2000
20	133	99999948	100000000	-52	+/- 2000
25	115	99999923	100000000	-77	+/- 2000
25	97	99999922	100000000	-78	+/- 2000
25	133	99999922	100000000	-78	+/- 2000
30	115	99999905	100000000	-95	+/- 2000
30	97	99999905	100000000	-95	+/- 2000
30	133	99999905	100000000	-95	+/- 2000
40	115	99999890	100000000	-110	+/- 2000
40	97	99999890	100000000	-110	+/- 2000
40	133	99999890	100000000	-110	+/- 2000
50	115	99999851	100000000	-149	+/- 2000
50	97	99999851	100000000	-149	+/- 2000
50	133	99999851	100000000	-149	+/- 2000

