

**Test Report on the XT 150  
(150 Watt FM Transmitter unit)  
per FCC Certification Approval Process**

**Prepared by BEXT Inc.  
Jan. 2004**

## INTRODUCTION

This test report serves the purpose of providing test result and measurement information for the Federal Communications Commission Certification (FCC) Approval Process. Certification of the equipment unit is based on the representations and test results submitted by the manufacturer to the FCC, as described in FCC ruling Part 2.907 subpart (a).

The XT 150 FM Transmitter is comprised of several interconnected modules mounted internally on the main chassis, facilitating removal and substitution. The Power Output Control, Audio Input Level Control and Analog Meter for measurement of the operating parameters are all mounted on the front panel of this transmitter unit. The AC Power Line, Audio Input, RF Output and Telemetry Connectors are mounted on the rear panel of this transmitter unit.

The test results presented in this report are generated from the laboratory of Bext Inc., generated from testing took place between January 27<sup>th</sup>, 2004 to February 4<sup>th</sup>, 2004.

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## **GENERAL NOTES**

This manual serves the purpose of interpreting the Federal Communications Commission regulations, and to provide instructions for duplicating all test measurements within this manual.

For “Equipment Authorization”, the FCC requires the manufacturer to complete the tests and keep test records on file for two years after the last equipment is manufactured. The FCC also requires the users and customers to verify periodically that the authorized equipment unit is compliant, also that the certifications attached to the equipment units subsequently marketed by the authorization grantee are identical to the sample equipment unit tested, as “identical” is defined in the FCC ruling Part 2.908. In the case of an FCC agent requires to conduct an inspection or visit to the user’s site, they will require an Owner’s Manual that is supplied with every equipment unit (XT 150).

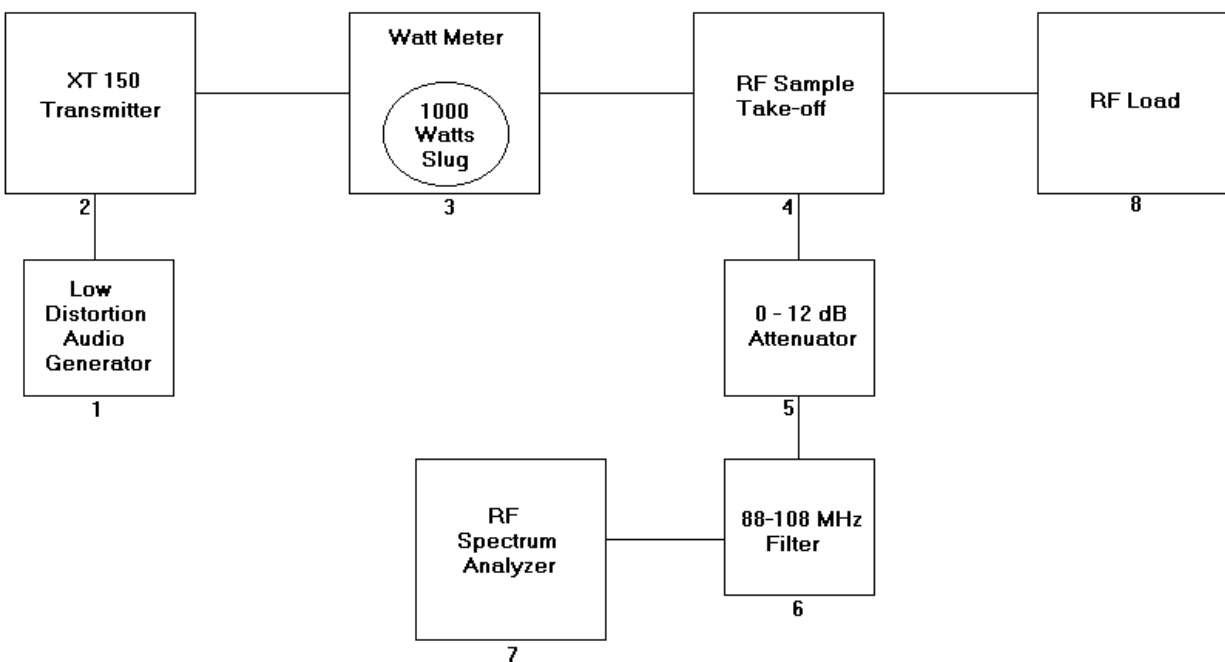
The instructions for these tests are written for the clarification to the customers of the testing procedures and to reproduce the tests.

## TESTING CONDITIONS

The conditions of the laboratory and equipment setting are listed as follow:

- A) The Testing Frequency of the XT 150 was set in the center of the band at 98MHz, along at 88 MHz and 108 MHz for comparable results.
- B) The Output Power of the XT 150 was at 150 Watts throughout the entire testing process.
- C) An AC input of 117 vac was implemented during the testing of the XT 150 unit.
- D) All Audio Signal Levels were made with a function generator, with output selection at 600 ohms, connected to the XT 150 unit in parallel with a 50 ohm Load. If an Audio Generator is used, then a 600 ohm Load should be used.

### BLOCK DIAGRAM of CERTIFICATION TEST PROCEDURE



\* For details of the equipments please see the next section.

## EQUIPMENT LIST (USED FOR CERTIFICATION TEST PROCEDURE)

- |   |                               |                       |
|---|-------------------------------|-----------------------|
| 1) 600 $\Omega$ Low Distortion Audio Generator<br><i>Last Calibration: 04/09/2003</i> | Brand: <i>Hameg</i>           | Model: <i>HM 8037</i> |
| 2) 150W FM Transmitter  | Brand: <i>Bext</i>            | Model: <i>XT 150</i>  |
| 3) 50 ohm Watt Meter<br><i>Last Calibration: 04/25/2003</i>                           | Brand: <i>Bird</i>            | Model: <i>43P</i>     |
| 4) 20-1000MHz Sample Take-Off   | Brand: <i>Bird</i>            | Model: <i>4275</i>    |
| 5) 0.5W VHF Attenuator  | Brand: <i>Hewlett Packard</i> | Model: <i>355C</i>    |
| 6) -40 dBm Band Stop Filter   | Brand: <i>RVR</i>             | Model: <i>B.S.</i>    |
| 7) RF Spectrum Analyzer<br><i>Last Calibration: 09/24/2003</i>                        | Brand: <i>Aicom</i>           | Model: <i>3030TG</i>  |
| 8) 600W RF Dummy Load   | Brand: <i>Bird</i>            | Model: <i>8401</i>    |

\*The Equipment Devices listed below are not shown in the block diagram of previous section.

- |  |                                   |                             |
|--|-----------------------------------|-----------------------------|
| 9) Climate Temperature Chamber                               | Brand: <i>A.C.S.</i>              | Model: <i>TY56010</i>       |
| 10) Thermometer<br><i>Last Calibration: 11/03/2003</i>       | Brand: <i>Wavetek</i>             | Model: <i>Meterman 37XR</i> |
| 11) Frequency Counter<br><i>Last Calibration: 04/11/2003</i> | Brand: <i>Rohde &amp; Schwarz</i> | Model: <i>FMAB</i>          |

## MEASUREMENT TECHNIQUES

All measurements are made with the steady output power of 150 watts from the XT 150 FM transmitter unit (refer to Equipment List No. 2). The output power of the XT 150 unit is then feed through the Watt Reading Meter (refer to Equipment List No. 3).

The frequency stability during warm up period, measurement was conducted by setting the XT 150 unit to the frequency of 98 MHz, while the transmitter unit's output power is feed into the RF Dummy Load through the Watt Reading Meter and the Sample Take Off (refer to Equipment List No. 4), while the RF is feed through the Sample Take Off, the Attenuator (refer to Equipment List No. 5) and the Band Stop (refer to Equipment List No. 6) into the RF Spectrum Analyzer (refer to Equipment List No. 7), where most of the measurements are made. Throughout the 4 hours of constant operation of the XT 150 unit, the frequency was constantly observed on the RF Spectrum Analyzer. The Spectrum Analyzer was set to 500 kHz per division on the display screen during observation.

For ensuring frequency stability, the frequency of 88 MHz, 98 MHz and 108 MHz are used for measurement, and we derived with the results that are shown in the test reports.

Emission levels are also tested with different harmonics: 2<sup>nd</sup> ( $98 \text{ MHz} * 2 = 196 \text{ MHz}$ ), 3<sup>rd</sup> ( $98 \text{ MHz} * 3 = 294 \text{ MHz}$ ) and 4<sup>th</sup> ( $98 \text{ MHz} * 4 = 392 \text{ MHz}$ ) Harmonics are used to test the level of dB respectively.

## DESCRIPTION OF FCC TEST PERFORMED ON FM TRANSMITTERS UNDER THE “CERTIFICATION” PROCESS

### Type of Test:

FM Transmission System Requirements

### FCC Reference:

Part 73.317 subparts (a,b,c,d)

### Test Description as Quoted from the “Code of Federal Regulations” Book:

“FM broadcast stations employing transmitters authorized after January 1, 1960, must maintain the bandwidth occupied by their emissions in accordance with the specification detailed below. FM Broadcast stations employing transmitters installed or type accepted before January 1, 1960, must achieve the highest degree of compliance with these specifications practicable with their existing equipment. In either case, should harmful interference to other authorized stations occur, the licensee shall correct the problem promptly or cease operation.”

“Any emission appearing on a frequency removed from the carrier by between 120 kHz and 240 kHz inclusive must be attenuated at least 25 dB below the level of the unmodulated carrier. Compliance with this requirement will be deemed to show the occupied bandwidth to be 240 kHz or less.”

“Any emission appearing on a frequency removed from the carrier by more than 240 kHz and up to and including 600 kHz must be attenuated at least 35 dB below the level of the unmodulated carrier.”

“Any emission appearing on a frequency removed from the carrier by more than 600 kHz must be attenuated at least  $43 + 10 \log_{10}(\text{Power, in watts})$  dB below the level of the unmodulated carrier, or 80 dB, whichever is the lesser attenuation.”

### Test Result:

15 kHz audio tone at 600 ohm from the low distortion audio generator (refer to Equipment List No. 1) was feed into the mono input of the XT 150 unit at 0 dBm, as 75 MHz was read on the RF Spectrum Analyzer (refer to Equipment List No. 7). The emission level at the upper and lower sidebands of 240 kHz was -47 dBm.

## DESCRIPTION OF FCC TEST PERFORMED ON FM TRANSMITTERS UNDER THE “CERTIFICATION” PROCESS

### Type of Test:

Carrier Frequency Departure Tolerance at Warm Up Period

### FCC Reference:

Part 73.1545 subpart (b)

### Test Description as Quoted from the “Code of Federal Regulations” Book:

(For FM Stations) “The departure of the carrier or center frequency of an FM station with an authorized transmitter output power more than 10 watts may not exceed  $\pm 2000\text{Hz}$  from the assigned frequency.”

### Test Result:

From the initialization of the XT 150 unit it needs 500 $\mu\text{S}$  to be stabilized on the frequency of 98.00 MHz. Within the 4 hours of operation there was no detection of any frequency shift. Observation was made using the RF Spectrum Analyzer (refer to Equipment List No. 7).



## DESCRIPTION OF FCC TEST PERFORMED ON FM TRANSMITTERS UNDER THE “CERTIFICATION” PROCESS

### Type of Test:

Frequency Stability

### FCC Reference:

Part 73.1545 subpart (b)

### Test Description as Quoted from the “Code of Federal Regulations” Book:

“The frequency stability shall be measured with variation of primary supply voltage as follows: Vary the primary supply voltage from 85 to 115 percent of the nominal value.”

(For FM Stations) “The departure of the carrier or center frequency of an FM station with an authorized transmitter output power more than 10 watts may not exceed  $\pm 2000$  Hz from the assigned frequency.”

### Test Result:

Less than  $\pm 500$  Hz from the set testing frequency of 88 MHz, 98 MHz and 108 MHz measured with the RF Spectrum Analyzer (refer to Equipment List No. 7), which is equipped with internal frequency counter.

## DESCRIPTION OF FCC TEST PERFORMED ON FM TRANSMITTERS UNDER THE “CERTIFICATION” PROCESS

### Type of Test:

Conducted Harmonics

### FCC Reference:

Part 73.317

### Test Description as Quoted from the “Code of Federal Regulations” Book:

“Any emission appearing on a frequency removed from the carrier by more than 600 kHz must be attenuated at least  $43 + 10 \log_{10}(\text{Power, in watts})$  dB below the level of the unmodulated carrier, or 80 dB, whichever is the lesser attenuation.”

### Test Result:

90 dB measured at 2<sup>nd</sup> Harmonics (196 MHz) to the Fundamental Frequency of 98.00 MHz

89 dB measured at 3<sup>rd</sup> Harmonics (294 MHz) to the Fundamental Frequency of 98.00 MHz

99 dB measured at 4<sup>th</sup> Harmonics (392 MHz) to the Fundamental Frequency of 98.00 MHz

All the measurements listed above are generated from use of the RF Spectrum Analyzer and the band stop. At 600 kHz above and below the unmodulated reference frequency, the emission was not detectable out of 2<sup>nd</sup> Harmonic.

## DESCRIPTION OF FCC TEST PERFORMED ON FM TRANSMITTERS UNDER THE “CERTIFICATION” PROCESS

### Type of Test:

Carrier Frequency Departure Tolerance with Temperature

### FCC Reference:

Parts 2.1055 subpart (3) and 73.1545 subpart (b)

### Test Description as Quoted from the “Code of Federal Regulations” Book:

“From 0° to + 50° centigrade for equipment to be licensed for use in the Radio Broadcast Services under Part 73. Frequency shall be made at extremes of the specified temperature range at the intervals of not more than 10° centigrade through the range.”

(For FM Stations) “The departure of the carrier or center frequency of an FM station with an authorized transmitter output power more than 10 watts may not exceed  $\pm 2000$  Hz from the assigned frequency.”

### Test Result:

Using the Climate Temperature Chamber (refer to Equipment List No. 9), Thermometer (refer to Equipment List No. 10), and the Frequency Counter (refer to Equipment List No. 11), the measurement of frequency for the XT 150 unit, operating at 150 Watts output power, under different temperature settings (0°, 10°, 20°, 25°, 30°, 40°, 50°) are shown below, with the carrier frequency departure not exceeding  $\pm 2000$  Hz from the assigned frequency.

Temperature	Frequency (MHz)	Change (MHz)
25°C	98.000005	0.000000
0°C	98.000075	0.000070
10°C	98.000049	0.000044
20°C	98.000021	0.000016
30°C	97.999989	0.000016
40°C	97.999965	0.000040
50°C	97.999935	0.000070

## STATEMENT OF CONFORMITY

This equipment unit has been tested based on the accordance with the requirements within the Commission regulations. To the best of my knowledge, these tests were performed using measurement procedures consistent with the industry or Commission Standards. The tested equipment unit is in compliance with the industry standards as specified herein. I further certify that the listed measurements were made by the following company and at the following testing location.

Company Name: *Bext Inc.*  
Location: *San Diego, California*  
Test Date: *January 27<sup>th</sup>, 2004*  
Type of Equipment: *FM Transmitter*  
Equipment Model: *XT 150*  
Engineer Performed Test: *David Petrik*

Test	FCC Reference	Result
FM Transmission System Requirements	Part 73.317	Passed
Carrier Frequency Departure Tolerance at Warm Up Period	Part 73.1545	Passed
Frequency Stability	Part 73.1545	Passed
Conducted Harmonics	Part 73.317	Passed
Carrier Frequency Departure Tolerance with Temperature	Parts 2.1055 and 73.1545	Passed

Witness: *Jeff Bourque*  
Company: *Bourque Engineering Co.*  
Location: *San Diego, California*

### Test Engineer Background:

*Tests were performed by Mr. Dave Petrik, holder of the FCC General Class Lifetime License; S.B.E. Senior Broadcast Radio Engineer Title, Certification No. 4303, with expiration date of 01/01/2008; S.B.E. Television Operator Certification No. 61654; and Broadcast Networking Technologist Certification No. 80090.*

\*Note: All Tests were conducted in the laboratory of Bext Inc.

**AC Input Current Measurements for XT 300 Unit with 106 vac Supply**

	Typical Current (amps)	Power Supply (vac)	Power Output (W)	Efficiency (%)
Current at Full Output	1.5	117	150	85.47