L.S. Compliance, Inc.
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Cedarburg, WI 53012
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COMPLIANCE TESTING OF:

Magnetek SLTX
(VHF 72-76 MHz, 100 mW / 750 mW)

PREPARED FOR:

Magnetek
Attn.: Mr. Daniel Beilfuss
N49 W13650 Campbell Drive
Menomonee Falls, WI 53051

TEST REPORT NUMBER:

305517 (includes 306107)

TEST DATE(S):

December 13, 2005 and January / February of 2006

Table of Contents

1. L. S. Compliance In Review

L.S. Compliance - Accreditations and Listing's

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025 : 2005
with Electrical (EMC) Scope of Accreditation
A2LA Certificate Number: 1255.01

Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948
FCC Registration Number: 90756

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1
File Number: IC 3088-A

On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1
File Number: IC 3088

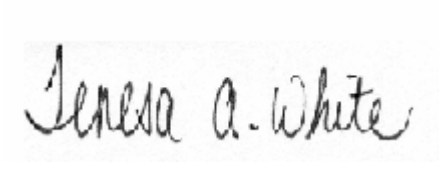
U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a U. S. Competent Body operating under the U. S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility –Council Directive 2004/108/EC (formerly 89/336/EEC, Article 10.2).
Date of Validation: January 16, 2001

Validated by the European Commission as a U.S. Notified Body operating under the U.S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.

Date of Validation: November 20, 2002
Notified Body Identification Number: 1243

2. Signature Page



Prepared By: March 7, 2006

Teresa A. White, Document Coordinator Date

Tested and

Approved By March 7, 2006

Kenneth L. Boston, EMC Lab Manager Date
PE #31926 Licensed Professional Engineer
Registered in the State of Wisconsin, United States

3. Product and General Information

Manufacturer:	Magnetek
Model No.:	SLTX
Serial No.:	prototypes
Description:	FM transmitter

4. Product Description

The SLTX VHF Transmitter is a 100mW / 750mW data transmitter. The RF board is factory configurable for either 100mW or 750mW output power and any four frequencies in the 72 – 76 MHz range. Any one of the four channels available is user selectable via jumpers on the RF board.

The SLTX transmitter is typically used as a wireless remote control for large machinery such as an overhead crane.

5. Test Requirements

The above mentioned tests were performed in order to determine the compliance of the EUT system with limits contained in various provisions of Title 47 CFR, FCC Part 90, and Part 2:

All radiated emissions tests were performed to measure the emissions in the frequency bands described by the above sections, and to determine whether said emissions are below the limits established by the above sections. These tests were performed in accordance with the procedure described in the American National Standard for methods of measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2003). Another document used as reference for the EMI receiver specification was the International Special Committee on Radio Interference CISPR 16-1 (2003).

6. Summary of Test Report

DECLARATION OF CONFORMITY

The SLTX VHF transmitter was found to **MEET** the requirements as described within the specification of Title 47 CFR FCC, Part 90, for a portable FM transmitter.

7. Introduction

During December of 2005 and January/February of 2006, a series of Radiated and Conducted Emission tests were performed on several samples of the SLTX transmitter, here forth referred to as the "*Equipment Under Test*" or "*EUT*". The two models tested all use the same RF transmitter topology and are used to transmit digitized audio. These tests were performed using the procedures outlined in ANSI C63.4-2003 for intentional radiators, with further test methods described in E.A./TIA 603.1. These tests were performed by Kenneth Boston, EMC Lab Manager of L.S. Compliance, Inc.

8. Purpose

All Radiated and Conducted Emission tests upon the EUT were performed to measure the emissions in the frequency bands described in title 47 CFR, FCC Part 90 to determine whether these emissions are below the limits expressed within the standards. These tests were performed in accordance with the procedure described in the American National Standard for methods of measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2003). Another document used as a reference for the EMI Receiver specification was the Comite International Special Des Perturbations Radioelelectriques CISPR 16-1, 2003.

9. Radiated Emissions Test

Test Setup

The test setup was assembled in accordance with Title 47, CRF FCC Part 90 and ANSI C63.4-2001. The essential radio transceiver found in all models is the same, and therefore radiated tests are performed on both samples to determine the worst case. Each EUT was placed on an 80cm high non-conductive table, centered on a flush mounted 2-meter diameter turntable inside the 3 Meter Semi-Anechoic, FCC listed Chamber located at L. S. Compliance, Inc., Cedarburg, Wisconsin. The EUT was operated in continuous operation mode, using battery power as provided by the manufacturer. The applicable limits apply at a 3 meter distance. The calculations to determine the limits are detailed in the following pages. Please refer to Appendix A for a list of the test equipment. The EUT was operated on one of two (2) standard channels:

Channel (low): 72.01 MHz
Channel (high): 75.99 MHz

Test Procedure

Radiated Emission measurements were performed on the EUT in the 3 Meter Semi-Anechoic, FCC listed Chamber, located at L. S. Compliance, Inc. in Cedarburg, Wisconsin. The frequency range from 30 MHz to 800 MHz was scanned, and levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on the non-conductive table (or pedestal) in the 3 Meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the test object. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. The maximum radiated emissions were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities.

Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at a N.I.S.T. traceable site. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and a HP 8546A EMI Receiver. The resulting correction factors and the cable loss factors from these calibrations were entered into the HP 8546A EMI Receiver database. As a result, the data taken from the HP 8546A EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The HP 8546A EMI Receiver was operated with a bandwidth of 120 kHz for measurements below 1 GHz. The Peak and Quasi-Peak Detector functions were utilized.

Test Results

The EUT was found to MEET the Radiated Emissions requirements of Title 47 CFR, FCC Part 90 for a Frequency Modulated mobile transmitter. The frequencies with significant signals were recorded and plotted as shown in the Data Charts and Graphs.

CALCULATION OF RADIATED EMISSIONS LIMITS (for 90.210 and 2.1053 compliance)

FIELD STRENGTH OF PART 90 LIMIT OF -13 DBM, AT R = 3 METERS DISTANCE

FROM THE STANDARD REFERENCE FORMULA FOR POWER TRANSMITTED VERSUS ELECTRIC FIELD:

$$Pt = (R^{**}) \times |E|^{**} / 30$$

Then to convert to dB:

$$Pt = 20\log|E| + 20\log(R) - 10\log(30)$$

Insert additional terms to convert watts to milli-watts (in dB) and volts to micro-volts (in dBuV):

$$Pt = 20\log|Euv| - 20\log(1{,}000{,}000) + 10\log(1000) + 20\log(3) - 10\log(30)$$

$$Pt = 20\log|Euv| - 120 + 30 + 9.54 - 14.77$$

$$Pt = 20\log|Euv| - 95.23$$

OR; $20\log|Euv| = Pt \text{ (in dBm)} + 95.23$

$|E|$ (in dBuV) = -13 dBm + 95.23 = 82.23 dBuV/m , at 3 meters

Note: Limits are conservatively rounded to the nearest whole number.

Measurement of Electromagnetic Radiated Emissions
Within the 3 Meter FCC Listed Chamber
7.2 VDC, 100mW

Manufacturer: Magnetek
Date of Test: Dec 13, 2005
Model Nos.: SLTX VHF FM Transmitter
Voltage: 72 VDC, 100mW
Test Requirements: 90.210, 2.1053

Distance: 3 Meters,	Frequency Range Inspected: 30 to 760 MHz per 2.1057
Configuration: Continuous Transmit,	

Test Equipment Used:

EMI Measurement Instrument: HP 8546A and Agilent E4407B	Biconical Antenna: EMCO 93110B
Double-Ridged Wave Guide/Horn Antenna: EMCO 3115	Log Periodic Antenna: EMCO 43146A

Detector(s) Used:	X	Peak		Quasi-Peak	X	Average

The following table depicts the level of significant radiated emissions found

Frequency (MHz)	Antenna Polarity	Equipment Under Test	Channel #	Antenna Height (meters)	Azimuth (0° - 360°)	EMI Meter Reading (dBμV/m)	90.210Limit (dBμV/m)	Margin (dB)

Notes: A Peak Detector was used in measurements below 1 GHz, and both an Average and a Peak Detector were used in measurements above 1 GHz. All Radiated Spurious Emissions seen were found to be greater than 20 dB below the limits of 82 dB/uV/m, or below the noise floor of the instrumentation. Since the highest peak emissions seen were in the neighborhood of 45 dBμV/m or less, which is almost 40 dB below the radiated equivalent field strength of the -13 dBm limit level, no substitution method measurements were performed.

Measurement of Electromagnetic Radiated Emissions
Within the 3 Meter FCC Listed Chamber
12 VDC, 750mW

Manufacturer:	Magnetek
Date of Test:	Feb 27, 2006
Model No.:	SLTX VHF Transmitter
Voltage :	12 VDC, 750mW

Test Requirements: 90.210, 2.1053

Distance: 3 Meters,	Frequency Range Inspected: 30 to 760 MHz per 2.1057
Configuration: Continuous Transmit,	

Test Equipment Used:

EMI Measurement Instrument: HP 8546A and Agilent E4407B	Biconical Antenna: EMCO 93110B
Double-Ridged Wave Guide/Horn Antenna: EMCO 3115	Log Periodic Antenna: EMCO 43146A

Detector(s) Used:	X	Peak		Quasi-Peak	X	Average

The following table depicts the level of significant radiated emissions found

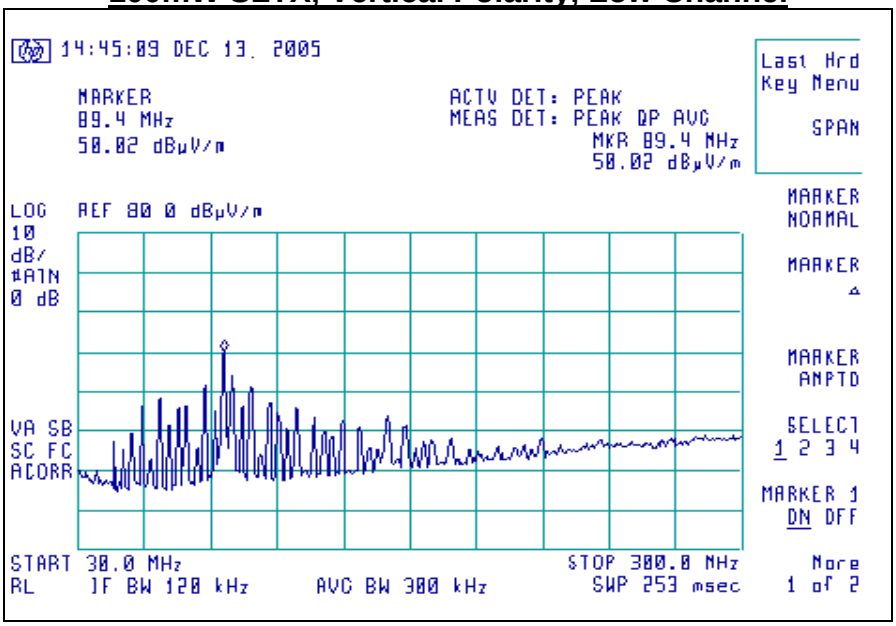
Frequency (MHz)	Antenna Polarity	Equipment Under Test	Channel #	Antenna Height (meters)	Azimuth (0° - 360°)	EMI Meter Reading (dBμV/m)	90.210Limit (dBμV/m)	Margin (dB)

Notes: A Peak Detector was used in measurements below 1 GHz, and both an Average and a Peak Detector were used in measurements above 1 GHz. All Radiated Spurious Emissions seen were found to be greater than 20 dB below the limits of 82 dB/uV/m, or below the noise floor of the instrumentation. Since the highest peak emissions seen were in the neighborhood of 48 dBuV/m or less, which is almost 35 dB below the radiated equivalent field strength of the -13 dBm limit level, no substitution method measurements were performed.

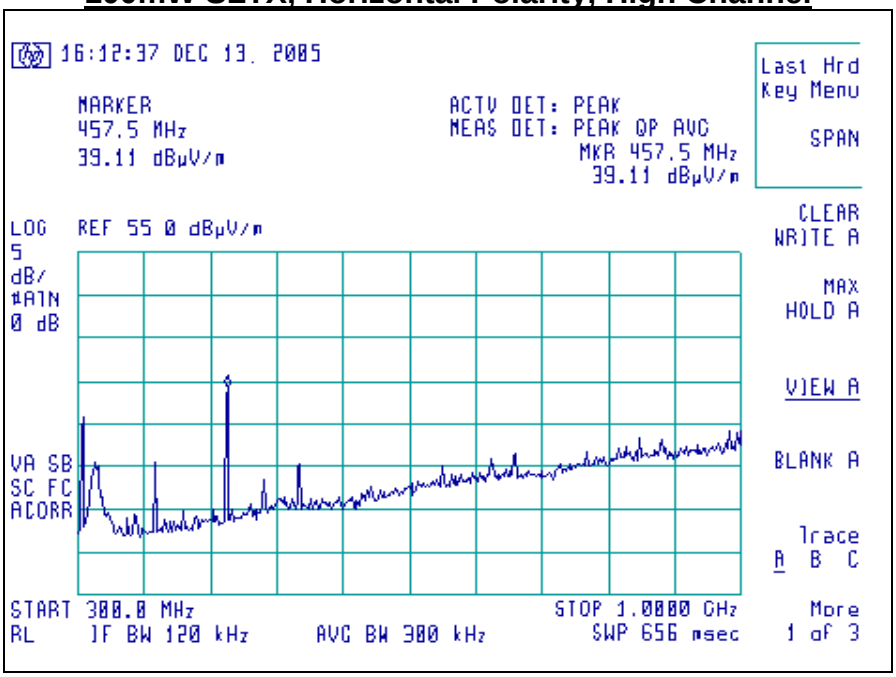
Photos Taken During Radiated Emission Testing

Setup for the Radiated Emissions Test

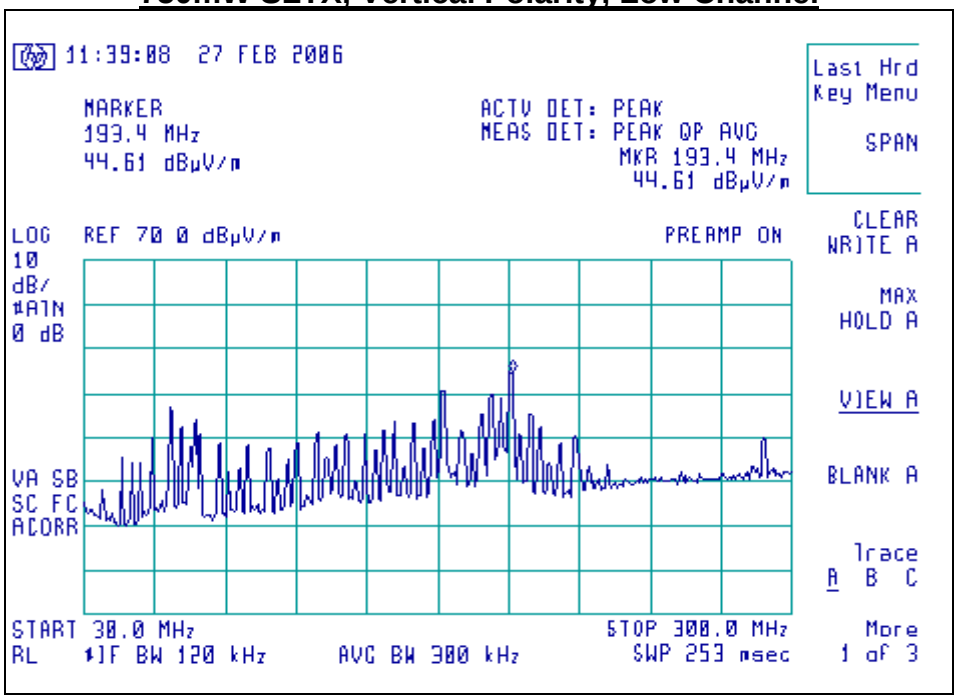
Graphs made during Radiated Emission Testing
100mW SLTX, Vertical Polarity, Low Channel



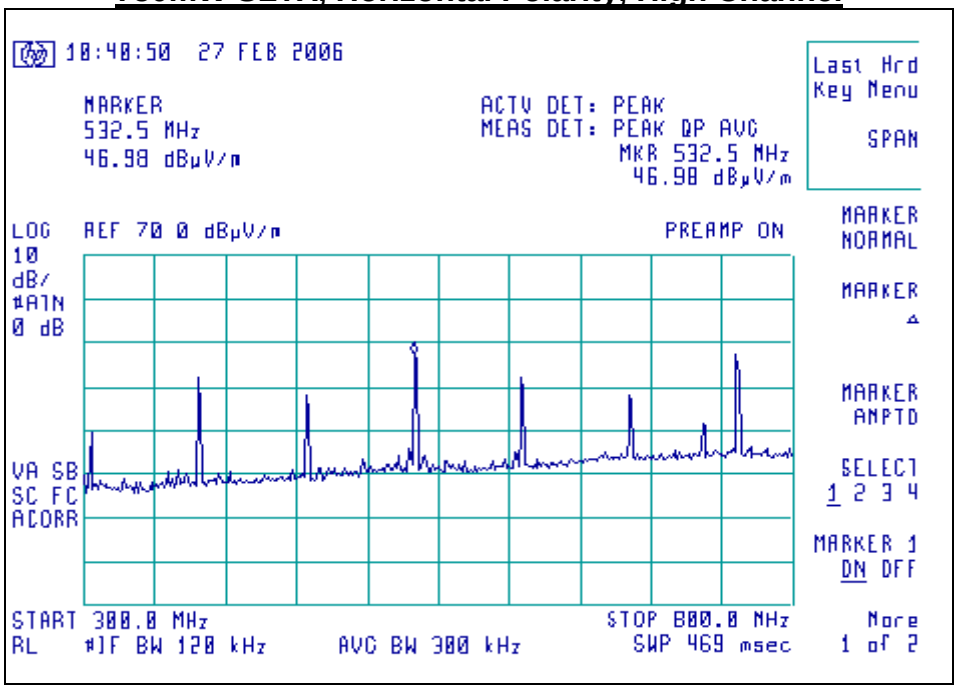
100mW SLTX, Horizontal Polarity, High Channel



750mW SLTX, Vertical Polarity, Low Channel



750mW SLTX, Horizontal Polarity, High Channel



10. **Power Output 47 CFR 2.1046**

For the FCC Part 2.1046 measurement, the output of the SLTX transmitter sample was connected via a short jumper cable, through a 10 dB Attenuator to the input of the HP E4407B Spectrum Analyzer. The unit was configured to run in a normal continuous transmit mode, while being supplied with a random, internal full-frequency digital audio signal as a modulation source. The HP receiver was set to a 100 kHz Bandwidth, and the transmit signal was then stored, with the peak signal level recorded. This power level was collected for two channels and can be seen in the chart presented below.

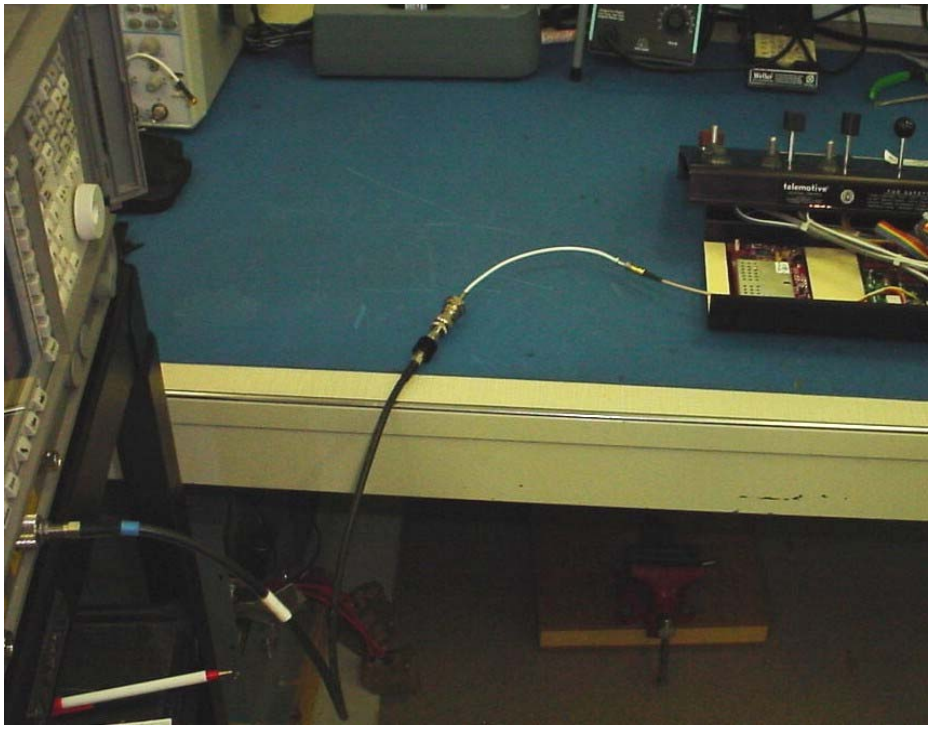
750mW SLTX

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
Low	72.01	30.0	28.5	1.5
High	75.99	30.0	28.7	1.3

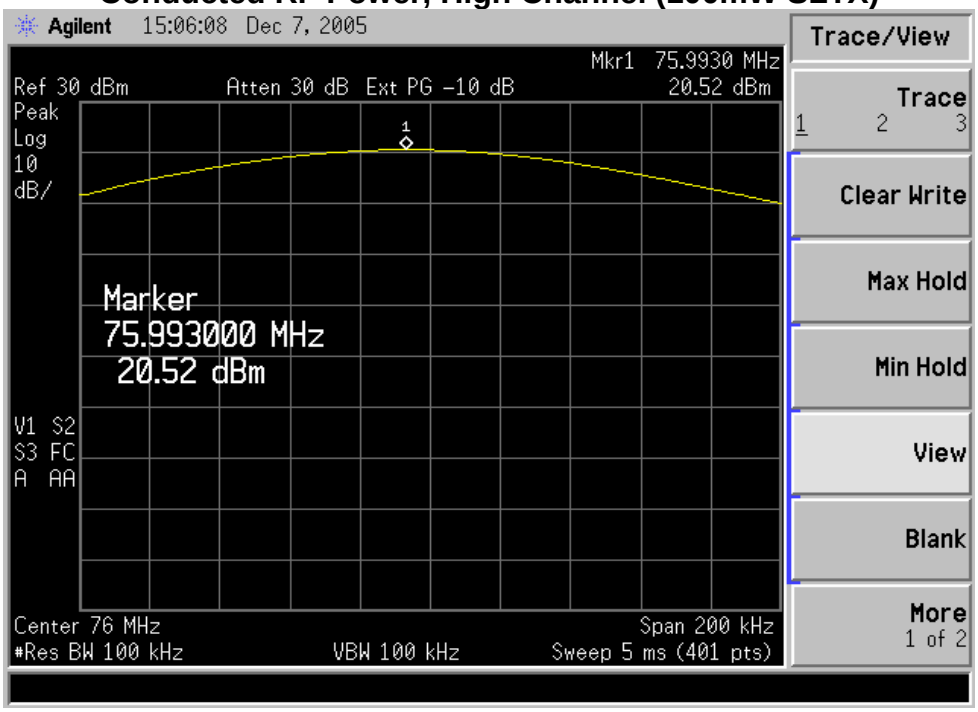
100mW SLTX

CHANNEL	CENTER FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
Low	72.01	30.0	20.00	10.00
High	75.99	30.0	20.50	9.50

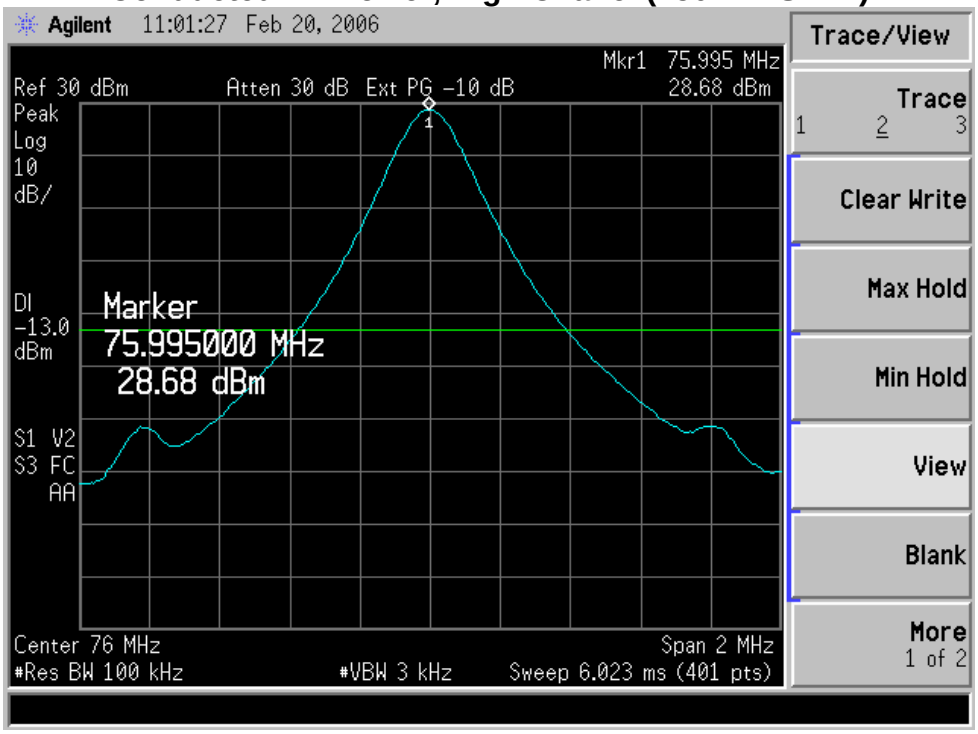
View of Test Setup During the Conducted RF measurements, Table-Top Unit



Conducted RF Power, High Channel (100mW SLTX)



Conducted RF Power, High Chanel (750mW SLTX)



11. **Conducted Spurious Emissions: 47 CFR 2.1051**

750mW SLTX

FCC Part 2.1051 requires an antenna conducted measurement of conducted harmonic and spurious levels, as reference to the carrier frequency in a 30 kHz bandwidth. For this test, the transmitter was directly connected to the HP E4407B Spectrum Analyzer, through a very short Coaxial Cable and a 40 DB Attenuator. Plots were then taken, with any noticeable spurious or harmonic signals identified. The highest spurious signal seen was while transmitting on the high channel (75.99 MHz) which was measured at -18.3 dBm (frequency of 75.7 MHz) in a 30 kHz bandwidth, which is about 5.3 dB below the -13.0 dBm limit.

750mW SLTX

Channel (Center Freq.)	Frequency (MHz)	Limit (dBm)	Measured Power (dBm)	Margin (dB)
72.01	12.8	-13.0 dBm	-30.3	17.3
72.01	38.4	-13.0 dBm	-31.1	18.1
72.01	64.0	-13.0 dBm	-27.8	14.8
72.01	71.5	-13.0 dBm	-29.8	16.8
72.01	71,7	-13.0 dBm	-19.3	6.3
72.01	72.3	-13.0 dBm	-20.7	7.7
72.01	72.6	-13.0 dBm	-30.6	17.6
72.01	80.0	-13.0 dBm	-28.5	15.5
72.01	144.1	-13.0 dBm	-34.3	21.3
75.99	38.4	-13.0 dBm	-31.5	18.5
75.99	64.0	-13.0 dBm	-30.6	17.6
75.99	75.2	-13.0 dBm	-31.9	18.9
75.99	75.5	-13.0 dBm	-28.0	15.0
75.99	75.7	-13.0 dBm	-18.3	5.3
75.99	76.3	-13.0 dBm	-19.9	6.9
75.99	76.5	-13.0 dBm	-29.3	16.3
75.99	76.8	-13.0 dBm	-31.9	18.9
75.99	88.0	-13.0 dBm	-30.3	17.3
75.99	152.0	-13.0 dBm	-34.5	21.5

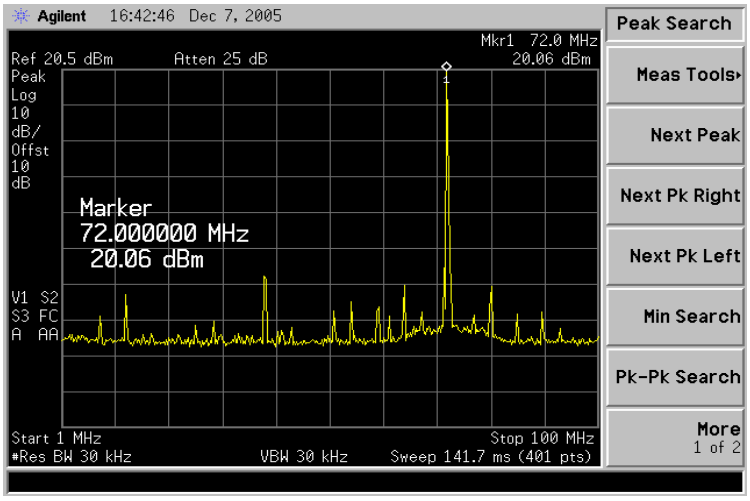
100mW SLTX

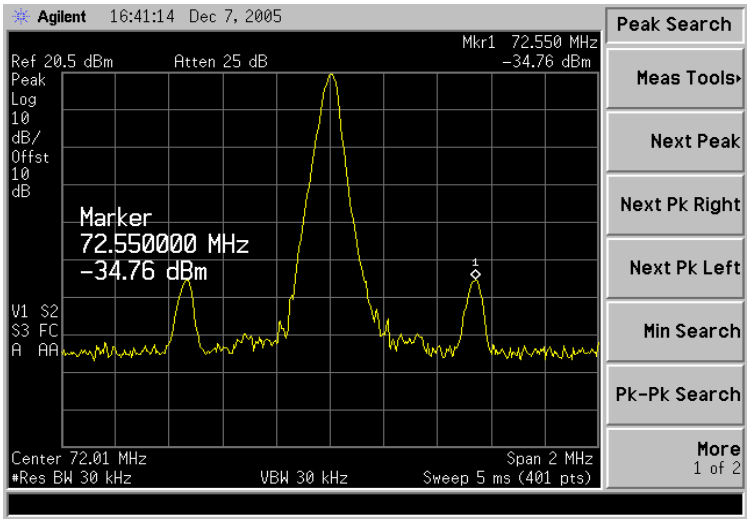
FCC Part 2.1051 requires an antenna conducted measurement of conducted harmonic and spurious levels, as reference to the carrier frequency in a 30 kHz bandwidth. For this test, the transmitter was directly connected to the HP E4407B Spectrum Analyzer, through a very short Coaxial Cable and a 10 DB Attenuator. Plots were then taken, with any noticeable spurious or harmonic signals identified. No significant levels at any spurious products could be found within -20 dBc of the fundamental of the transmitter. The highest spurious signal seen was at 38.6 MHz, which was measured at -31.7 dBm in a 30 kHz bandwidth, which is about 18.7 dB below the -13.0 dBm limit.

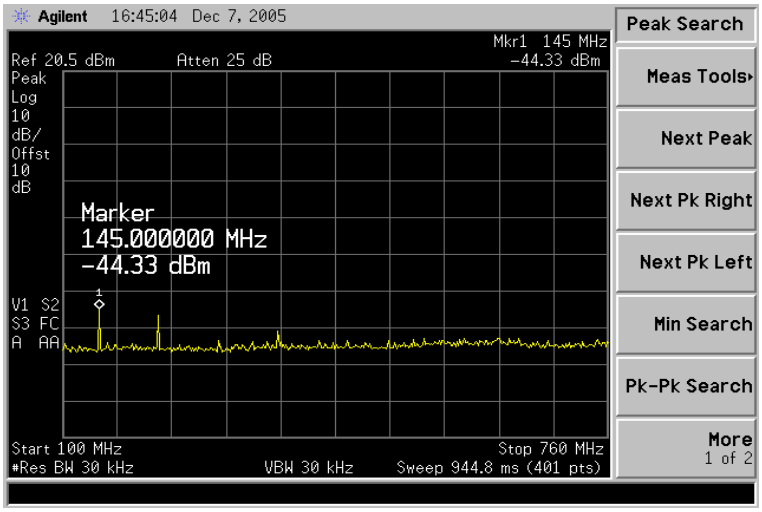
100mW SLTX

CHANNEL	Test FREQ (MHz)	LIMIT (dBm)	MEASURED POWER (dBm)	MARGIN (dB)
72.01	38.4	-13.0 dBm	-37.1	24.1
72.01	71.5	-13.0 dBm	-35.0	22.0
72.01	72.6	-13.0 dBm	-34.8	21.8
75.99	38.6	-13.0 dBm	-31.7	18.7
75.99	75.4	-13.0 dBm	-33.8	20.8
75.99	76.5	-13.0 dBm	-35.2	22.2

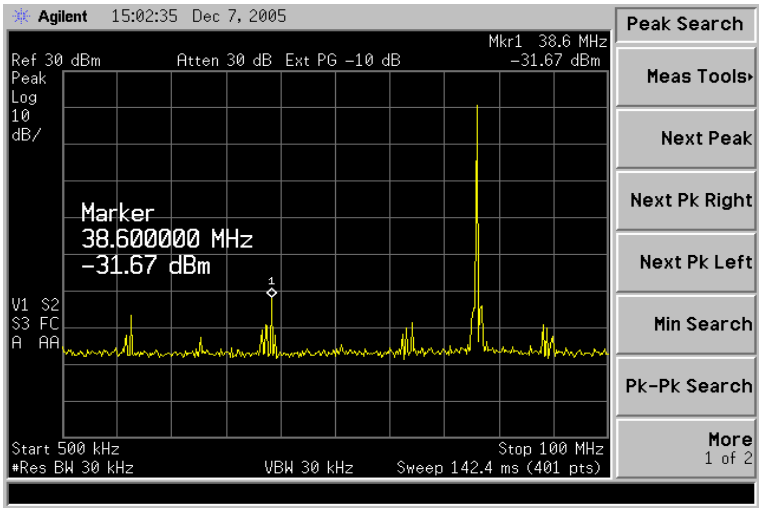
Conducted Spurious measurements, Low Channel (100mW SLTX)

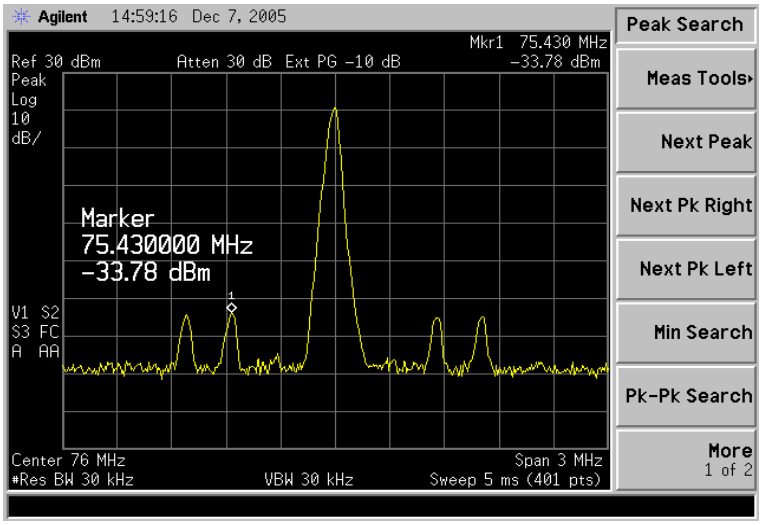


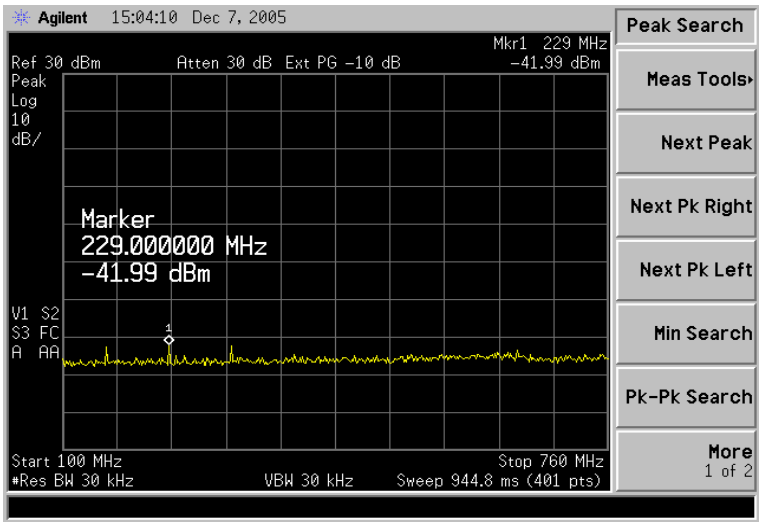




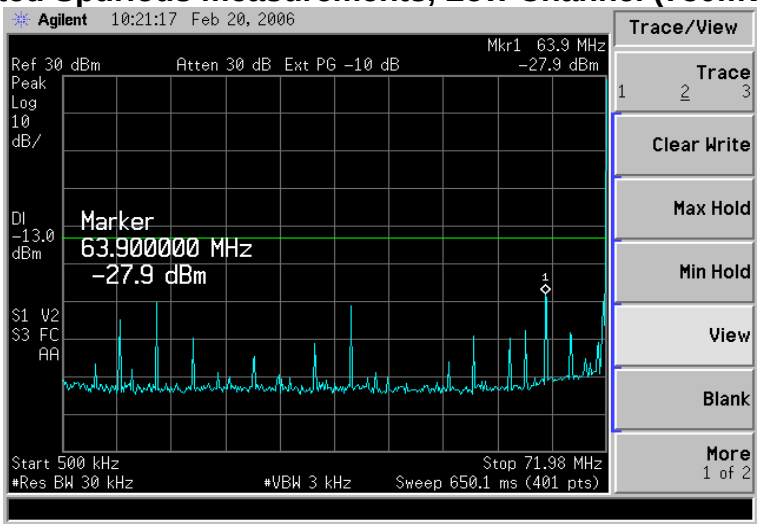
Conducted Spurious measurements, High Channel (100mW SLTX)

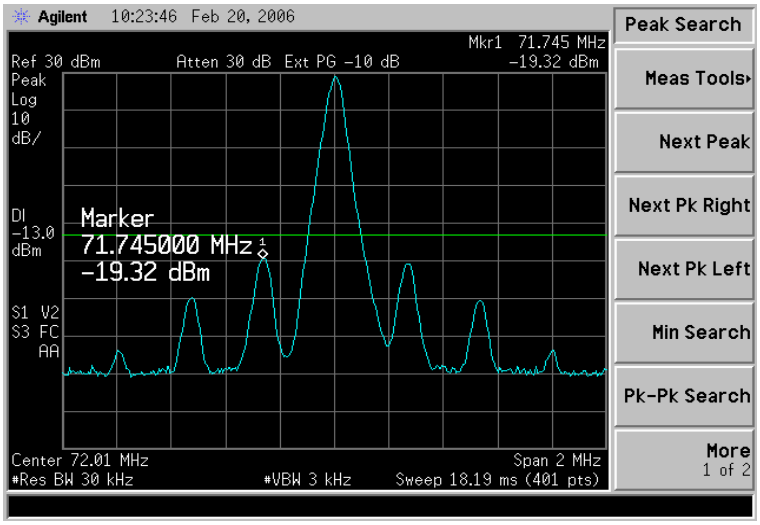


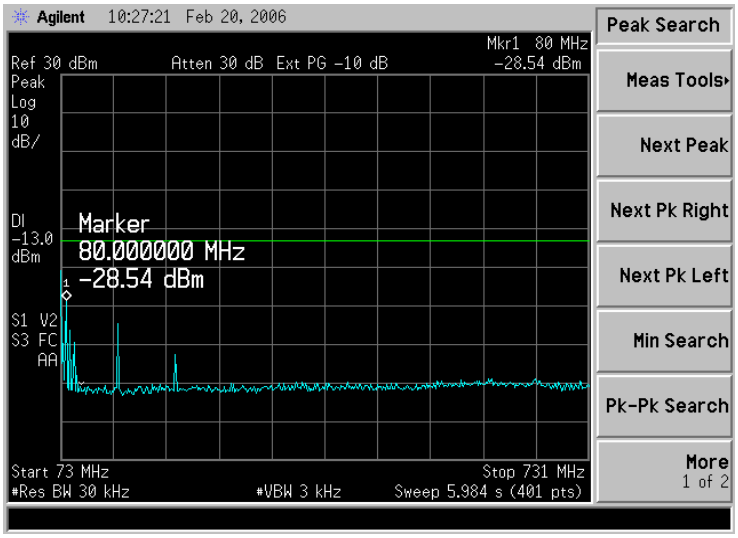




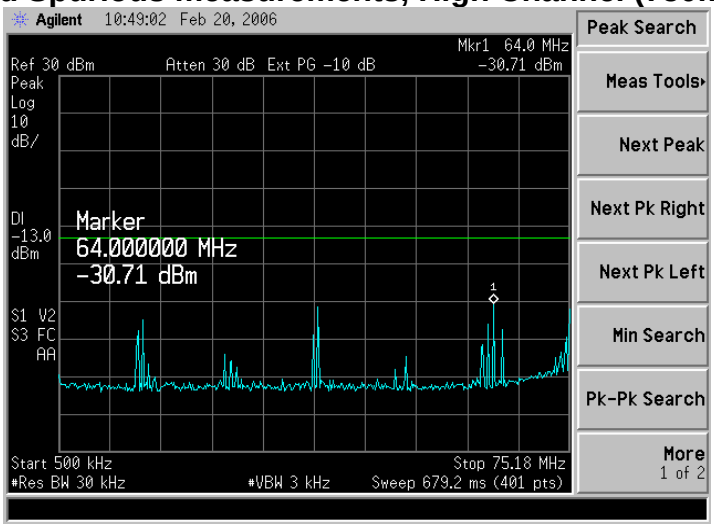
Conducted Spurious measurements, Low Channel (750mW MLTX)

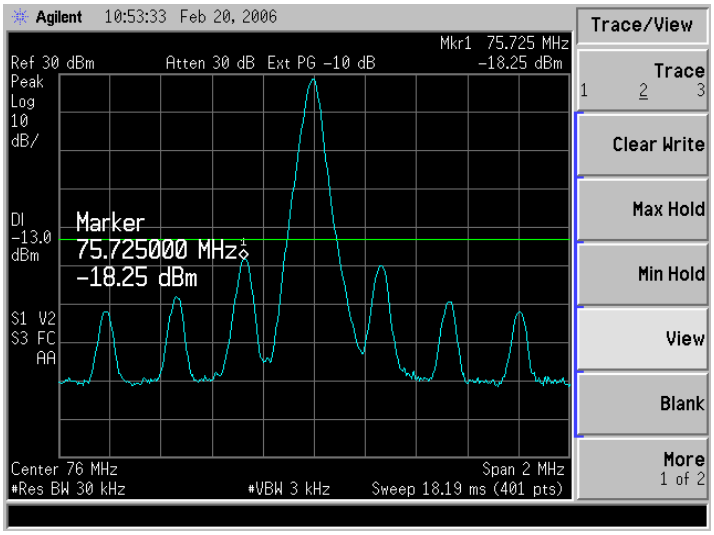


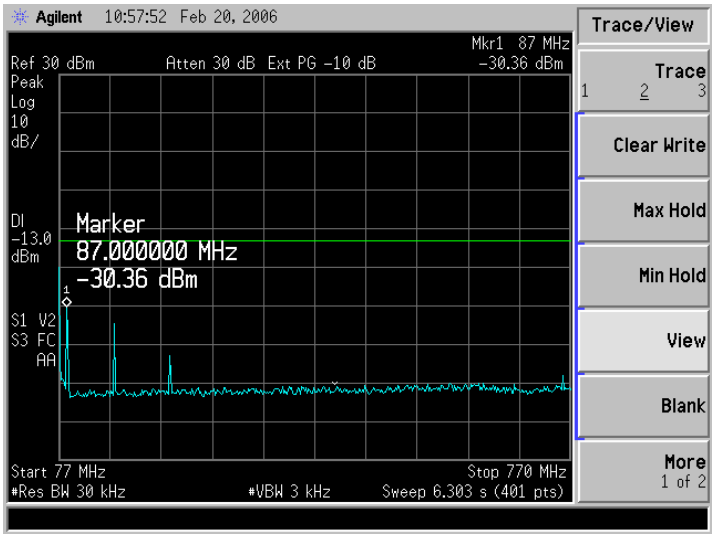




Conducted Spurious measurements, High Channel (750mW MLTX)







12. Bandwidth Measurements 47 CFR 2.1049

Direct measurement of the transmitted signal, via a cabled connection to the HP E4407B Analyzer, was then used to determine the signal bandwidth. For each of the representative channels, refer to the graphs found on the following pages. Resolution bandwidth for the graphs was set to 300 Hz, with one channel re-tested at 1 kHz RBW to speed up the plot formation, in order to identify the envelope shape of the pulsed data modulation.

Calculation of 90.210 (c) emission mask in the 72-76 MHz band:

(1) On any frequency from the center of the authorized channel to 5.0 kHz removed from center frequency: Zero dB.

(2) On any frequency removed from the center of the authorized channel by a displacement frequency (f_d in kHz) of more than 5.0 kHz but no more than 10 kHz: At least 83 log (Fd/5) dB.

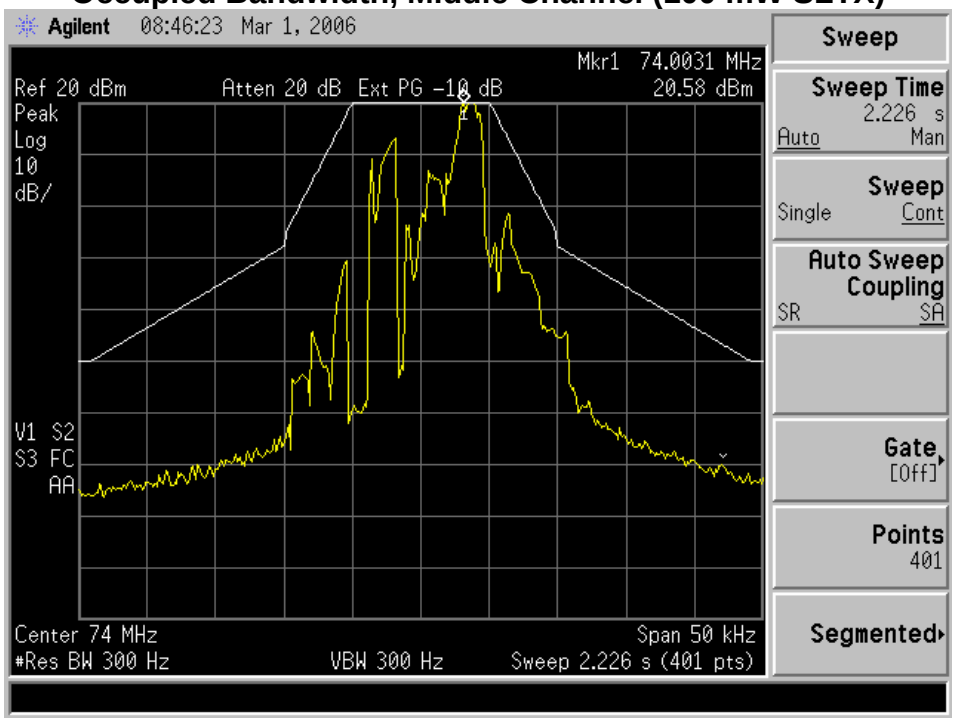
(3) On any frequency removed from the center of the authorized band by a displacement frequency (f_d in kHz) of more than 10 kHz but no more than 50 khz : At least 29 log (Fd**/11) dB or 50 dB, whichever is the lesser attenuation.

(4) On any frequency removed from the center of the authorized band by a displacement frequency (f_d in kHz) of more than 50 khz: at least 43 db,

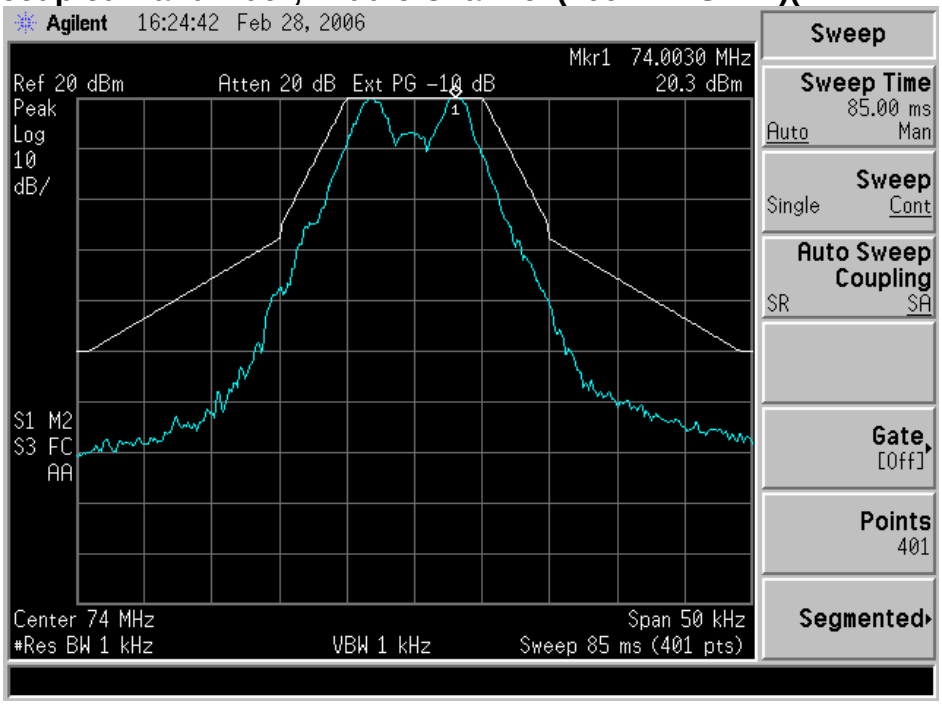
The test condition is presented in Tabular form below, which forms an emission mask which is used to approximate the limits to which the modulation components are compared with.

90.210 (c)	**Absolute Frequency Offset Range: $\|f_d\|$**	**Attenuation relative to Carrier power (P).**
1	0 to 5 KHz	0 dB
2	5 to 10 khz	0 to 24.9 dB
3a	10 to 24 khz	27.8 to 50 dB
3b	24 to 50 khz	50 dB
4	Greater than 50 khz	43 dB (-13 dBm)

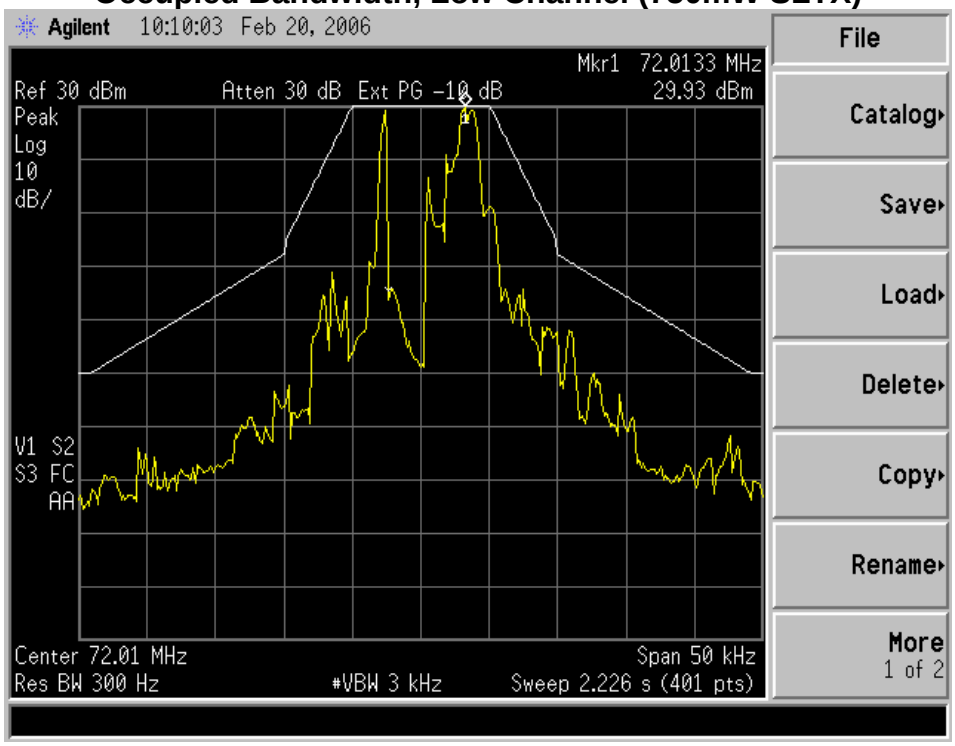
Occupied Bandwidth, Middle Channel (100 mW SLTX)



Occupied Bandwidth, Middle Channel (100 mW SLTX)(1khz RBW)



Occupied Bandwidth, Low Channel (750mW SLTX)



Occupied Bandwidth, High Channel (750mW SLTX)

13. Frequency Stability (47 CFR 2.1055; 90.213a)

Mobile stations below 2W output power must have an absolute frequency stability of **50 ppm** when operating with a 20 kHz bandwidth.

Test in accordance to conditions called out in Part 2.995 (a) (1): Frequency stability must be measured from **–30 to 50 degrees centigrade for (b) steps of 10 degrees** Allowing for thermal equilibrium, the measurement was performed after the desired temperature was maintained for 30 minutes.

The frequency measurements were made with the FM signal fixed upon the 'mark' signal of the FM/FSK transmission. From this standpoint, the maximum frequency delta of the modulated signal, from lowest to highest temperature is 47.2 - 40.5 ppm; or 6.7 ppm total.

Temperature (degree C)	Frequency (MHz)	Frequency Delta (kHz)	Frequency Delta (PPM)
-30	74.00338	3.38	45.6
-20	74.00325	3.25	43.9
-10	74.00350	3.5	47.2
0	74.00350	3.5	47.2
10	74.00350	3.5	47.2
20	74.00338	3.38	45.6
30	74.00313	3.13	42.2
40	74.00313	3.13	42.2
50	74.00300	3.0	40.5
22 (room)	74.00300	3.0	40.5

Note: Power Stability over this range is +.9 dBm to -0,1 dbm.

APPENDIX A

Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	9/27/05	9/27/06
AA960031	HP	119474A	3107A01708	Transient Limiter	Note 1	Note 1
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	9/27/05	9/27/06
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	9/27/05	9/27/06
AA960081	EMCO	3115	6907	Double Ridge Horn Antenna	12/07/05	12/07/06
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	12/29/05	12/29/06
EE960004	EMCO	2090	9607-1164	Device Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	9/29/05	9/29/06
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	9/29/05	9/29/06
N/A	LSC	Cable	0011	3 Meter ½" Armored Cable	Note 1	Note 1
N/A	LSC	Cable	0050	10 Meter RG 214 Cable	Note 1	Note 1
N/A	Pasternack	Attenuator	N/A	10 dB Attenuator	Note 1	Note 1

Note 1 - Equipment calibrated within a traceable system.

Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level, using a coverage factor of k=2.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V