

Nemko Test Report: 3L0484RUS1Rev2

Applicant: Nexus Broadcast

Equipment Under Test: STL Transmitter
(E.U.T.)

In Accordance With: FCC Part 74, Subpart D

Tested By: Nemko Dallas Inc.
802 N. Kealy
Lewisville, TX 75057-3136

Authorized By:



Tom Tidwell, Frontline Manager

Date: 1/5/04

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Section 1. Summary of Test Results

Manufacturer: Nexus Broadcast

Model No.: STL Transmitter

Serial No.: 43227

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 74, Subpart D.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. NONE

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Summary Of Test Data

RF Power Output	74.461	Complies
Audio Frequency Response	TIA EIA-603.3.2.6	Complies
Audio Low-Pass Filter Response	TIA EIA-603.3.2.6	NA
Modulation Limiting	TIA EIA-603.3.2.6	NA
Occupied Bandwidth	74.462	Complies
Spurious Emissions at Antenna Terminals	74.462	Complies
Field Strength of Spurious Emissions	74.462	Complies
Frequency Stability	74.464	Complies

Footnotes:

- 1) The unit does not have a low pass filter.
- 2) The device does not have limiting capabilities.

All testing was performed at full rf output power of 10 watts

Section 2. General Equipment Specification**Transmitter****Supply Voltage Input:** 120 Vac**Frequency Range:** 940-965 MHz**Tunable Bands:** 940-965 MHz**Necessary Bandwidth:** 50 kHz

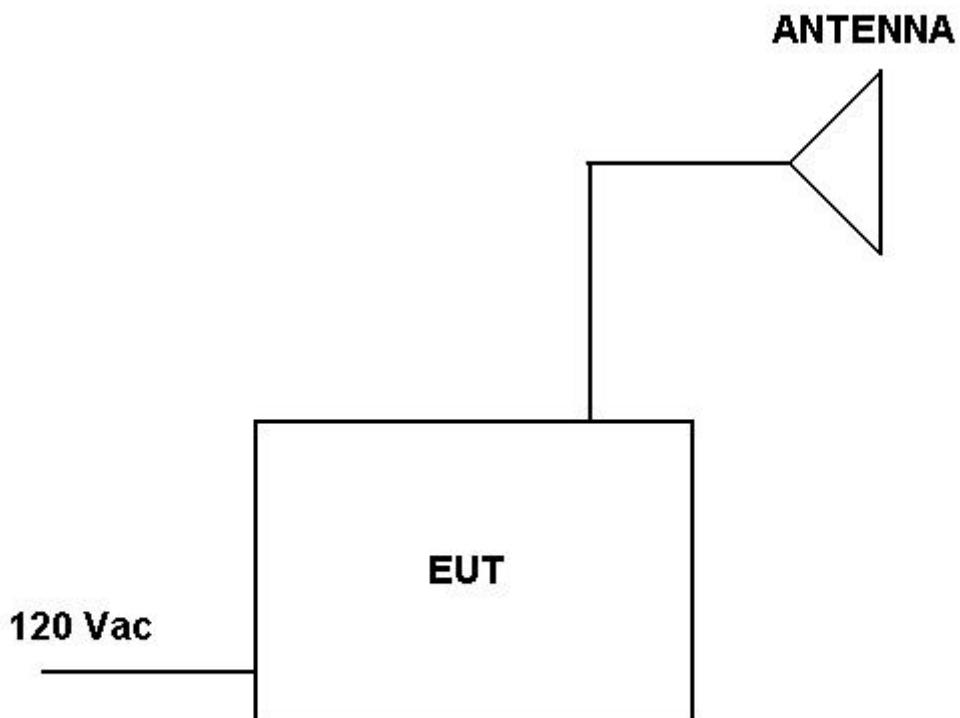
Type(s) of Modulation:	F3E	F1D	F2D	D7W	Other
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Emission Designator: 50K0F3E**Output Impedance:** 50 ohms**RF Power Output (rated):** 5 Watts – 10 Watts**Duty Cycle:** NA**Channel Spacing(s):** 50 kHz**Operator Selection of Operating Frequency:** Manual**Power Output Adjustment Capability:** Manual

System Description

This is a broadcast link transmitter.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: David Light	DATE: 12/22/03

Measurement Results: Complies.**Measurement Data:**

Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)
950	37.9	37
950	39.9	40

Measurement Conditions:Temperature: 22 °C
Humidity: 40 %**Measurement Uncertainty:** +/- 1.7 dB**Test equipment used:** 1464-1054-1625

Section 4. Modulation Characteristics

NAME OF TEST: Modulation Characteristics	PARA. NO.: 2.1047
TESTED BY: Tom Tidwell	DATE: 12/22/03

Measurement Results: Complies.

Measurement Data: See following pages

Measurement Conditions: Temperature: **22** °C
Humidity: **40** %

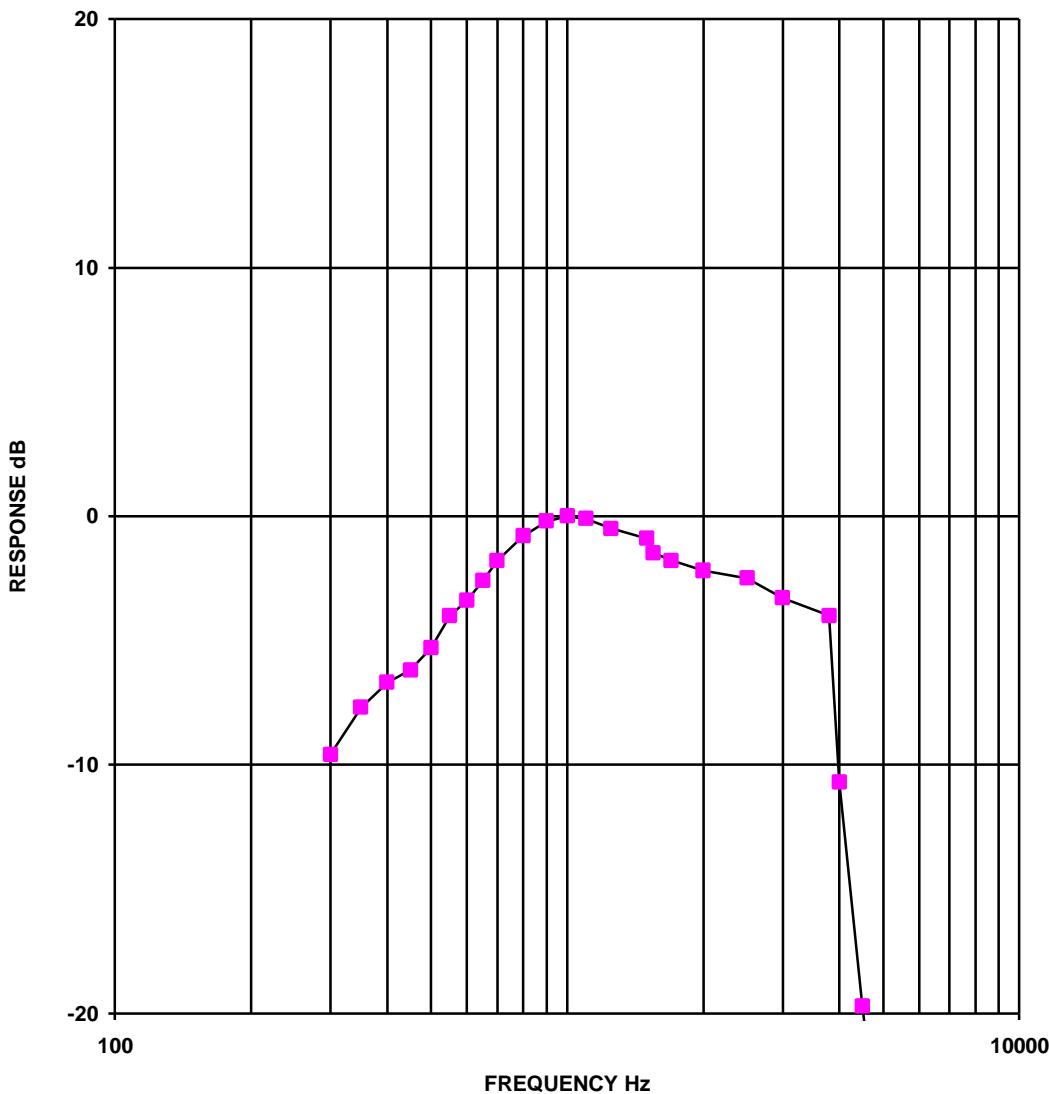
Measurement Uncertainty: **+/- 1.7 dB**

Description of modulation: Voice modulation

Description of baseband filtering: There is no audio limiting in this device. This device is used in conjunction with a modulation monitor that provides baseband processing. In order to test bandwidth and spurious emissions on this device the carrier was modulated to a level required to produce 80% modulation.

Section 4.1 Audio Frequency Response

NAME OF TEST: Audio Frequency Response	PARA. NO.: 2.1047
TESTED BY: Tom Tidwell	DATE: 12/22/03

**Graph 1**

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Section 5. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: David Light	DATE: 12/23/03

Measurement Results: Complies.

Measurement Data: See attached data

Test Data – Occupied Bandwidth

Nemko Dallas, Inc.

Dallas Headquarters:

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Lewisville, TX 75057

Tel: (972) 436-9600

Fax: (972) 436-2667

Data Plot		Occupied Bandwidth			
Page <u>1</u> of 1				Complete <input checked="" type="checkbox"/> X	
Job No.:	3L0484	Date:	12/23/2003	Preliminary:	<u> </u>
Specification:	74.535 (a)(1)	Temperature(°C):	22		
Tested By:	David Light	Relative Humidity(%):	40		
E.U.T.:	FM BROADCAST LINK TRANSMITTER				
Configuration:	TX 2.5 kHz Tone Modulated @ +/- 20 kHz deviation w/ 19 kHz subcarrier				
Sample Number:	1	RBW:	1 kHz		
Location:	Lab 2	VBW:	1 kHz	Measurement	
Detector Type:	Peak			Distance: NA m	
Test Equipment Used					
Antenna:	Directional Coupler:		1054		
Pre-Amp:	Cable #1:		1625		
Filter:	Cable #2:				
Receiver:	Cable #3:				
Attenuator #1	Cable #4:				
Attenuator #2:	Mixer:				
Additional equipment used:					
Measurement Uncertainty:	+/-1.7 dB				
<p>Notes:</p> <hr/> <hr/> <hr/>					

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EQUIPMENT: STL Transmitter

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Section 6. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals PARA. NO.: 2.1051

TESTED BY: David Light

DATE: 12/23/03

Measurement Results: Complies.

Measurement Data: See attached data

Test Data – Spurious Emissions

Nemko Dallas, Inc.

Dallas Headquarters:

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Tel: (972) 436-9600

Fax: (972) 436-2667

<u>Data</u>		<u>Spurious Emissions at Antenna</u>	
Page <u>1</u> of <u>1</u>		Complete <input checked="" type="checkbox"/> Preliminary: _____	
Job No.:	3L0484	Date:	12/23/200
Specification:	74.535(a)(1)	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%):	40
E.U.T.:	FM BROADCAST LINK TRANSMITTER		
Configuration:	Tx 2.5 kHz Tone modulated at +/- 20 kHz deviation W/ 19 kHz subcarrier		
Sample Number:	1	RBW:	1 MHz
Location:	Lab 2	VBW:	1 MHz
Detector Type:	Peak	Measurement	
		Distance: NA m	
<u>Test Equipment</u>			
Antenna:	_____	Directional Coupler:	1054
Pre-Amp:	_____	Cable #1:	1625
Filter:	_____	Cable #2:	_____
Receiver:	1464	Cable #3:	_____
Attenuator #1	_____	Cable #4:	_____
Attenuator #2:	_____	Mixer:	_____
Additional equipment used:	1055-1056		
Measurement Uncertainty:	+/-1.7 dB		
ATTEMPTED: 20dB RL: 40. 0dBm			
MKR -18. 33dBm 2.838GHz			
Notes: _____ _____ _____			

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EQUIPMENT: STL Transmitter

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Section 7. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1053
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TESTED BY: David Light	DATE: 12/23/03
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Measurement Results: Complies.

Measurement Data: See attached data

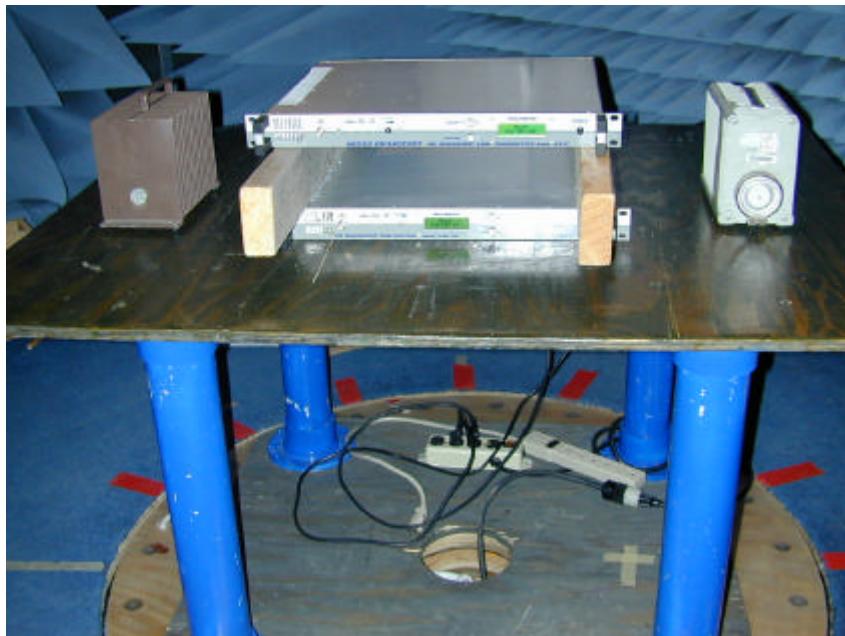
Test Data - Radiated Emissions

Nemko Dallas, Inc.

Dallas Headquarters:
 802 N. Kealy
 Lewisville, TX 75057
 Tel: (972) 436-9600
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EIRP Substitution										
Page 1 of 1										
Job No.:	3L0484		Date: 12/23/03			Complete <input checked="" type="checkbox"/> Preliminary <input type="checkbox"/>				
Specification:	74.535(a)(1)		Temperature(°C):22							
Tested By:	David Light		Relative Humidity(%) 40							
E.U.T.:	FM BROADCAST LINK TRANSMITTER									
Configuration:	TX @ 950.5 MHz at 10 watts									
Sample No:	1									
Location:	AC 3		RBW: 1 MHz			Measurement				
Detector Type:	Peak		VBW: 1 MHz			Distance: 3 m				
Test Equipment										
Antenna:	1304		Directional Coupler:							
Pre-Amp:	1016		Cable #1: 1485							
Filter:			Cable #2: 1484							
Receiver:	1464		Cable #3:							
Attenuator #1			Cable #4:							
Attenuator #2:			Mixer:							
Additional equipment used:										
Measurement Uncertainty: +/-1.7 dB										
Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)	Limit (dBm)	EIRP (dBm)	EIRP (mW)	Polarity	Comments
1901	-45.0	31.0		31.9	9.4	-13	-36.5	0.0002	V	
2851.5	-48.7	35.5		32.4	10.1	-13	-35.5	0.0003	V	
3802	-58.0	43.3		31.5	10.7	-13	-35.5	0.0003	V	
4752.5	-46.2	44.0		30.2	10.8	-13	-21.6	0.0069	V	
5703	-57.3	39.8		28.3	11.4	-13	-34.4	0.0004	V	
1901	-47.2	33.0		31.9	9.4	-13	-36.7	0.0002	H	
2851.5	-48.0	35.5		32.4	10.1	-13	-34.8	0.0003	H	
4752.5	-45.8	35.5		30.2	10.8	-13	-29.7	0.0011	H	
Notes: Searched spectrum to the 10th harmonic of										

Photographs of Test Setup



Section 8. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: Dustin Oaks	DATE: 12/23/03

Measurement Results: Complies.

Measurement Data: See attached data

Measurement Conditions: Temperature: **20** °C
Humidity: **35** %

Measurement Uncertainty: +/- 1×10^{-7} ppm

Test Equipment Used: 785-283-1629

Standard Test Frequency: 950 MHz Standard Test Voltage: 120 Vac

Temperature	Voltage	Frequency (Hz)	Error (Hz)
20 °C	120	950,000,650.00	650.00
20 °C	102	950,000,650.00	650.00
20 °C	138	950,000,650.00	650.00
10 °C	120	950,000,162.00	162.00
0 °C	120	950,000,712.00	712.00
-10 °C	120	950,001,162.00	1162.00
-20 °C	120	950,001,757.00	1757.00
-30 °C	120	950,001,812.00	1812.00
30 °C	120	950,000,312.00	312.00
40 °C	120	949,999,838.00	-162.00
50 °C	120	949,999,300.00	-700.00

Section 9. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
785	ANALYZER, SPECTRUM	HP 8591E	3412A02996	04/09/03	04/08/04
1629	CABLE, 6 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A
1064	ATTENUATOR	NARDA 776B-20	NONE	CBU	N/A
1054	DUAL DIRECTIONAL COUPLER	NARDA 3020A	34366	CBU	N/A
283	Environmental Chamber with controller # 1189006	ENVIROTRONICS SH27 & 2030-22844	129010083	04/22/03	04/21/04
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	02/11/03	02/11/05
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	07/24/03	07/23/04
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	07/24/03	07/23/04
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	09/22/03	09/22/05
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	10/27/03	10/26/04
1625	CABLE, 18 ft	MEGAPHASE 10311 1GVT4	N/A	03/05/03	03/04/04

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EQUIPMENT: **STL Transmitter**

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Section 10. Test Details

NAME OF TEST: RF Power Output**PARA. NO.: 2.1046****Minimum Standard:** Para. No. 74.461.

(a) Transmitter power is the power at the transmitter output terminals and delivered to any impedance-matched, radio frequency load. For the purpose of this subpart, the transmitter power is the unmodulated carrier power except that for SSB or pulse transmissions, peak envelope power shall be used.

(b) The authorized transmitter power for a remote pickup broadcast station shall be limited to that necessary for satisfactory service and, in any event, shall not be greater than 100 watts, except that a station to be operated aboard an aircraft shall normally be limited to a maximum authorized power of 15 watts. Specific authorization to operate stations on board aircraft with an output power exceeding 15 watts will be issued only upon an adequate engineering showing of need, and of the procedures that will be taken to avoid harmful interference to other licensees.

Method Of Measurement:**Detachable Antenna:**

The peak power at antenna terminals is measured using an in-line peak power meter. Power output is measured with the maximum rated input level.

Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation $GP/4\pi R^2 = E^2/120\pi$ and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,

P = the equivalent isotropic radiated power in watts

E = the maximum measured field strength in V/m

R = the measurement range (3 meters)

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G = the numeric gain of the transmit antenna in relation to an isotropic radiator

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NAME OF TEST: Audio Frequency Response

PARA. NO.: 2.1047

Test Method: TIA/EIA-603

Minimum Standard: None.

NAME OF TEST: Audio Low-Pass Filter Frequency

PARA. NO.: 2.1047

Response

Test Method: TIA/EIA-603

Minimum Standard: None

NAME OF TEST: Modulation Limiting

PARA. NO.: 2.1047

Test Method: TIA/EIA-603

Minimum Standard: 74.462, Table 1

NAME OF TEST: Occupied Bandwidth**PARA. NO.: 2.1049**

Minimum Standard: Para. No. 74.462, see table 1 below for applicable mask.

Table 1

Frequencies (MHz)	Maximum Authorized bandwidth (kHz)	frequency deviation (kHz)	Type of emission 3 4
25.87 to 26.03	40	10	A3,F3,F3Y,F9
26.07 to 26.47	20	5	A3,F3,F3Y,F9
152.87 to 153.35	5 30/60	5/10	A3,F3,F3Y,F9
160.89 to 161.37	60	10	A1,A2,A3,F1,F2,F3,F3Y,F9
161.64 to 161.76	30	5	A1,A2,A3,F1,F2,F3,F3Y,F9
166.25 to 170.15	25	5	A1,A2,A3,F1,F2,F3,F3Y,F9
450 to 455.99 (10 kHz channels)	10	1.5	A1,A2,A3,F1,F2,F3,F9
450.0875 to 455.6125 (25 kHz channels)	25	5	A1,A2,A3,F1,F2,F3,F3Y,F9
450.05 to 455.85 (50 kHz channels)	50	10	A1,A2,A3,F1,F2,F3Y,F9
450.925 and 455.925 (100 kHz channels)	100	35	A1,A2,A3,F1,F2,F3,F3Y,F9

Test Method:

RBW: 1% of emission bandwidth.

VBW: = RBW

NAME OF TEST: Field Strength of Spurious**PARA. NO.: 2.1053****Minimum Standard:** Para. No. 74.462, see table 1 for applicable mask.

(c) The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

- (1) On any frequency removed from the assignment frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: at least 25 dB;
- (2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: at least 35 dB;
- (3) On any frequency removed from the assigned frequency by more than 250 percent on the authorized bandwidth: at least $43 + 10 \log_{10}$ (mean output power, in watts) dB.

Method of Measurement: TIA/EIA-603-1992, Section 2.2.12

The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

NAME OF TEST: Frequency Stability**PARA. NO.: 2.1055****Minimum Standard:**

§74.464 Frequency tolerance. - For operations on frequencies above 25 MHz using authorized bandwidths up to 30 kHz, the licensee of a remote pickup broadcast station or system shall maintain the operating frequency of each station in compliance with the frequency tolerance requirements of §90.213 of this chapter. For all other operations, the licensee of a remote pickup broadcast station or system shall maintain the operating frequency of each station in accordance with the following:

Frequency range	Tolerance (percent)	
	Base station	Mobile station
25 to 30 MHz:		
3 watts or less	.002	.005
Over 3 watts	.002	.002
30 to 300 MHz:		
3 watts or less	.0005	.005
Over 3 watts	.0005	.0005
300 to 500 MHz: All powers	.00025	.0005
300 to 500 MHz: All powers	.00025	.0005

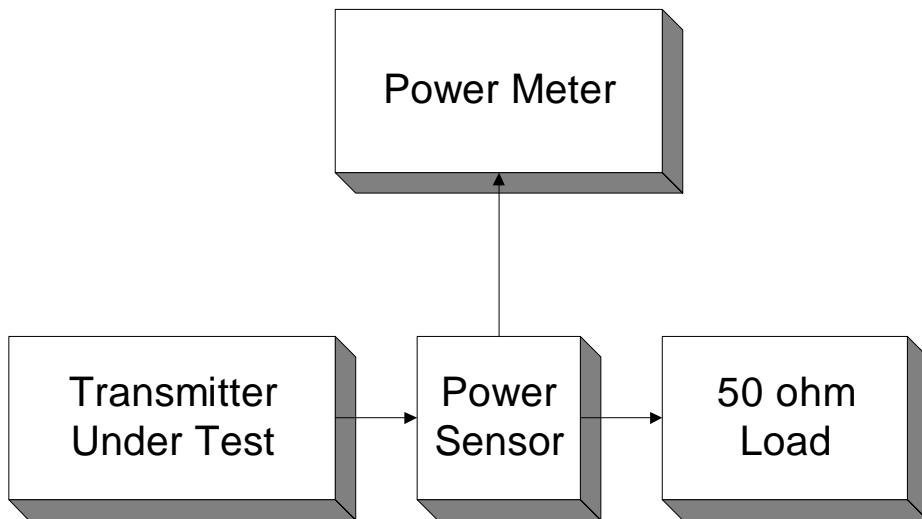
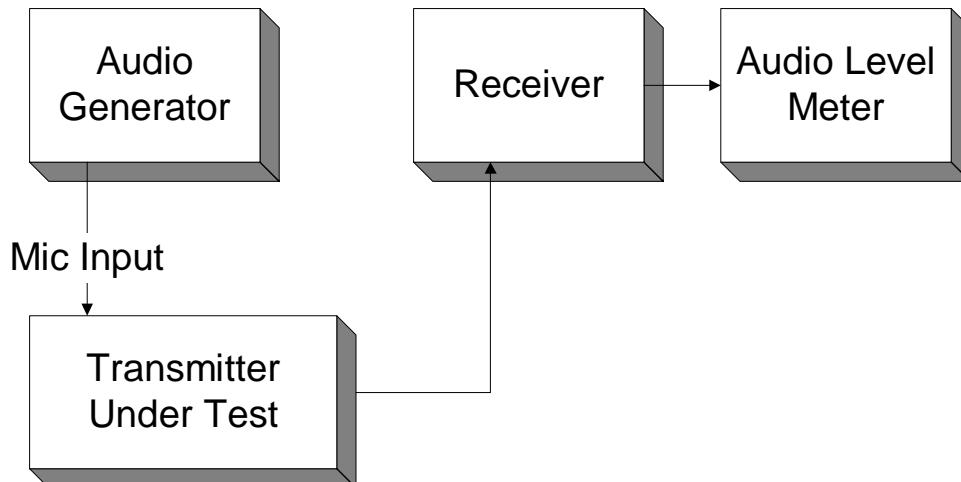
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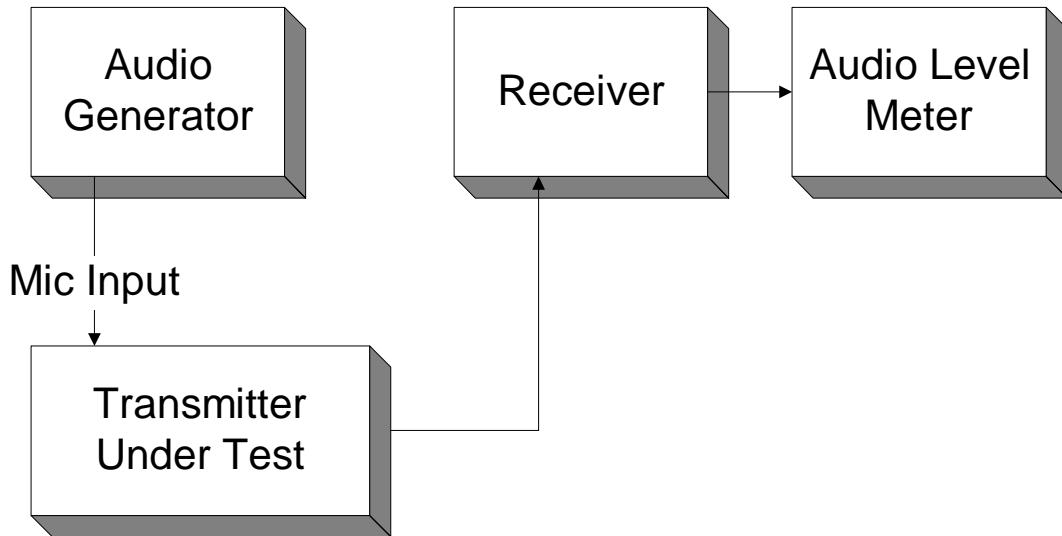
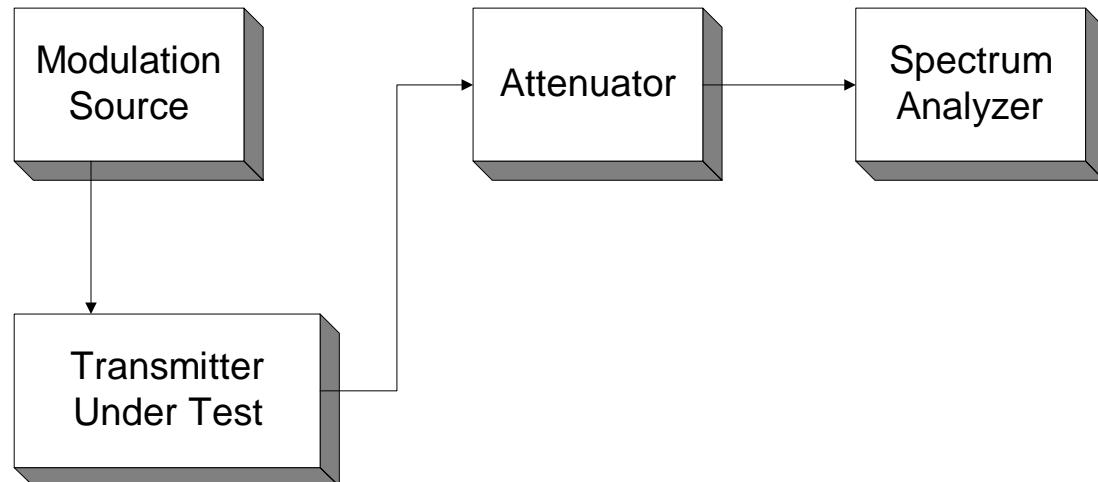
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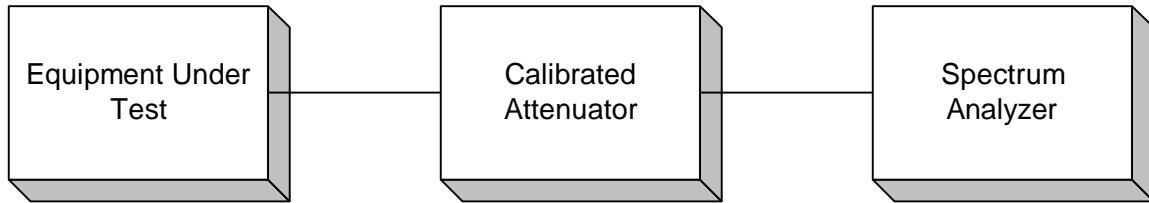
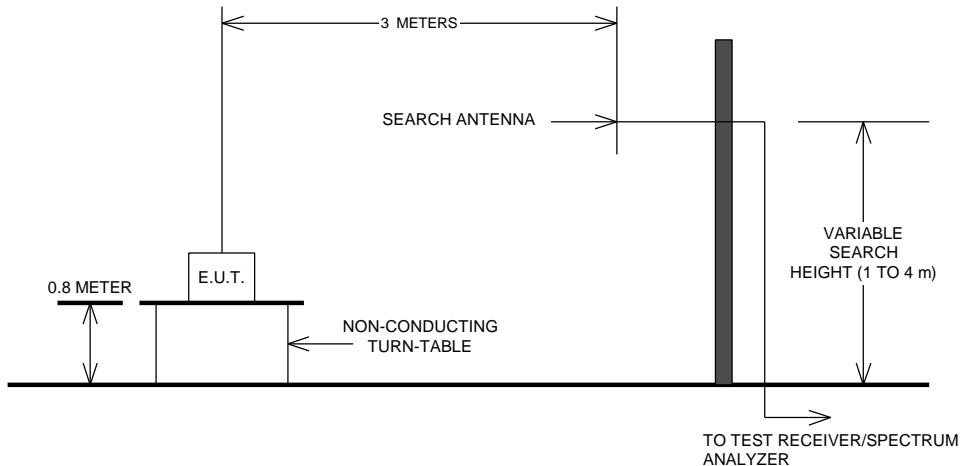
EQUIPMENT: **STL Transmitter**

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Section 11. Test Diagrams

Para. No. 2.985 - R.F. Power Output**Para. No. 2.987(a) - Audio Frequency Response**

Para. No. 2.987(b) - Modulation Limiting**Para. No. 2.989 - Occupied Bandwidth**

Para. No. 2.991 - Spurious Emissions at Antenna Terminals**Para. No. 2.993 - Field Strength of Spurious Radiation****Para. No. 2.995 - Frequency Stability**