Nemko Test Report:	2L0354RUS1
Applicant:	Broadcast Electronics 4100 N 24th Street Quincy, IL 62305
Equipment Under Test: (E.U.T.)	SRPT-40A/150
In Accordance With:	**FCC Part 74, Subpart D** Remote Pickup Transmitter
Tested By:	Nemko Dallas Inc. 802 N. Kealy Lewisville, TX 75057-3136
Authorized By:	 David Light, Wireless Group Supervisor
Date:	10 July 2002
Total Number of Pages:	39

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Section 1. Summary of Test Results

Manufacturer: Broadcast Electronics

Model No.: SRPT-40A/150

Serial No.: S01

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.
See " Summary of Test Data".

Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
RF Power Output	74.461	Complies
Audio Frequency Response	TIA EIA-603.3.2.6	Complies
Modulation Limiting	TIA EIA-603.3.2.6	Complies
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:

.

Section 2. General Equipment Specification

Transmitter

Supply Voltage Input: 120 Vac

Frequency Range: 150 – 174 MHz

Necessary Bandwidth: 25 kHz
30 kHz

Type(s) of Modulation:

F3E (Voice)	F1D	F2D	D7W (QAM)	Other
☒	☐	☐	☐	☐

Internal/External Data Source:

Emission Designator: 25K0F3E
30K0F3E

Output Impedance: 50 ohms

RF Power Output (rated): 60 W

Duty Cycle: Continuous

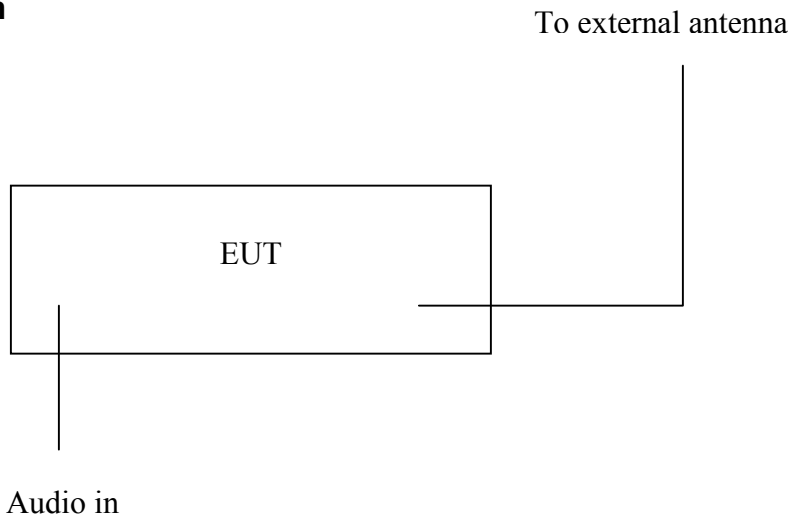
Operator Selection of Operating Frequency: The operator can dial-up any frequency between 150 and 174 MHz that is divisible by 5 or 6.25 KHz

Power Output Adjustment Capability: Adjustable by installer. Maximum 60 W.

System Description

The SRPT-40A/150 is a remote pickup transmitter for use in remote broadcast applications. The manufacturer does not provide the antenna. The antenna is mounted such that the radiating elements are separated at least 2 meters from nearby persons.

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.1046
TESTED BY: Tom Tidwell	DATE: 7/1/02

Measurement Results: Complies.

Measurement Data:

Frequency (MHz)	Measured Power (W)	Rated Power (W)
160	60.0	60.0

Measurement Conditions:

Temperature: 27 °C
Humidity: 44 %

Measurement Uncertainty: +/- 0.6 dB

Equipment Used: 406, 1056

Section 4. Modulation Characteristics

NAME OF TEST: Modulation Characteristics	PARA. NO.: 2.1047
TESTED BY: Tom Tidwell	DATE: 7/1/02

Measurement Results: Complies.

Measurement Data: See following pages

Measurement Conditions: Temperature: 27 °C
Humidity: 44 %

Measurement Uncertainty: +/- 0.7 dB, +/- 1 x 10^{-11} ppm

Description of modulation: Modulation is standard FM. The modulating information is voice.

Section 4.1 Audio Frequency Response

NAME OF TEST: Audio Frequency Response	PARA. NO.: 2.1047
TESTED BY: Tom Tidwell	DATE: 7/1/02

Data Plot **Audio Frequency Response**

Page 1 of 2 Complete X

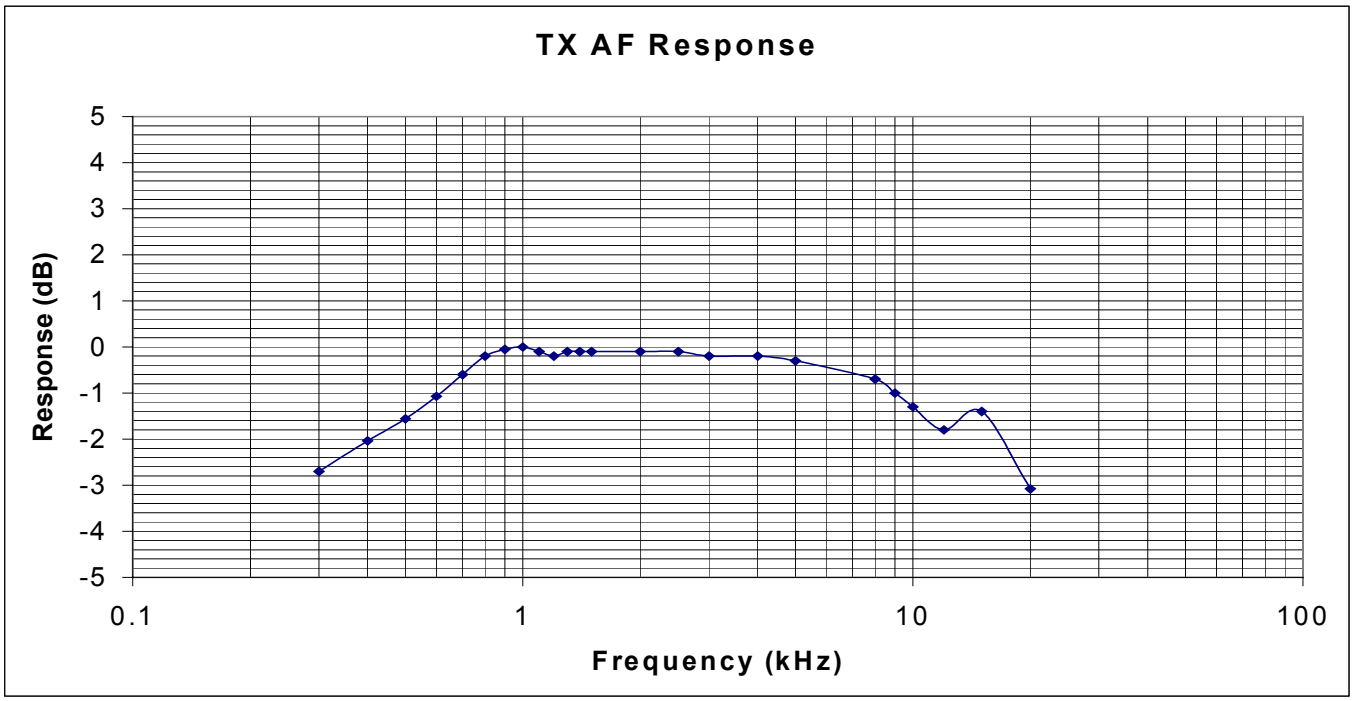
Job No.:	2L0354R	Date:	7/1/2002
Specification:	CFR 47, Part 74	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	44
E.U.T.:	Remote Pickup Transmitter		
Configuration:	60 W rf output		
Sample No.:	4		
Location:	Lab 1	RBW:	Refer to plots
Detector Type:	Peak	VBW:	Refer to plots

Test Equipment Used

Antenna:		Directional Coupler:	1054
Pre-Amp:		Cable #1:	1082
Filter:		Cable #2:	
Receiver:		Cable #3:	
Attenuator #1	1471	Cable #4:	
Attenuator #2:	1478	Mixer:	

Additional equipment used: 1051 (CMTA 54 Radio Test Set)

Measurement Uncertainty: +/-0.7 dB

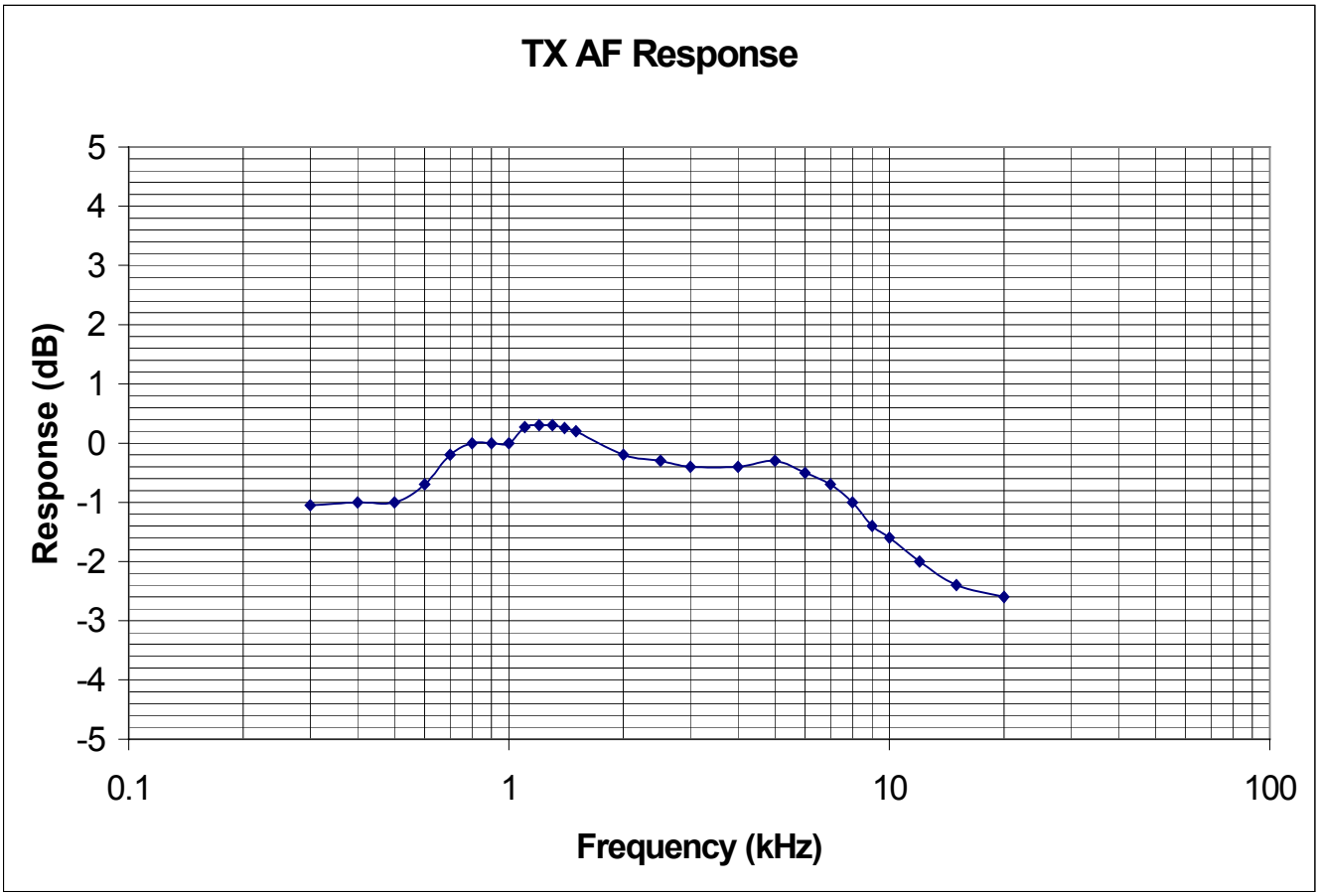


Notes: 30 kHz Audio Board

Data Plot **Audio Frequency Response**

Page 2 of 2

Job No.:	2L0354R	Date:	7/1/2002
Specification:	CFR 47, Part 74	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	44
E.U.T.:	Remote Pickup Transmitter		
Configuration:	60 W rf output		



Notes: **25 kHz Audio Board**

Section 4.2 Modulation Limiting

NAME OF TEST: Modulation Limiting	PARA. NO.: 2.1047
TESTED BY: Tom Tidwell	DATE: 7/1/02

Data Plot — Audio Modulation Limiting

Page 1 of 2 | Complete X | Preliminary:

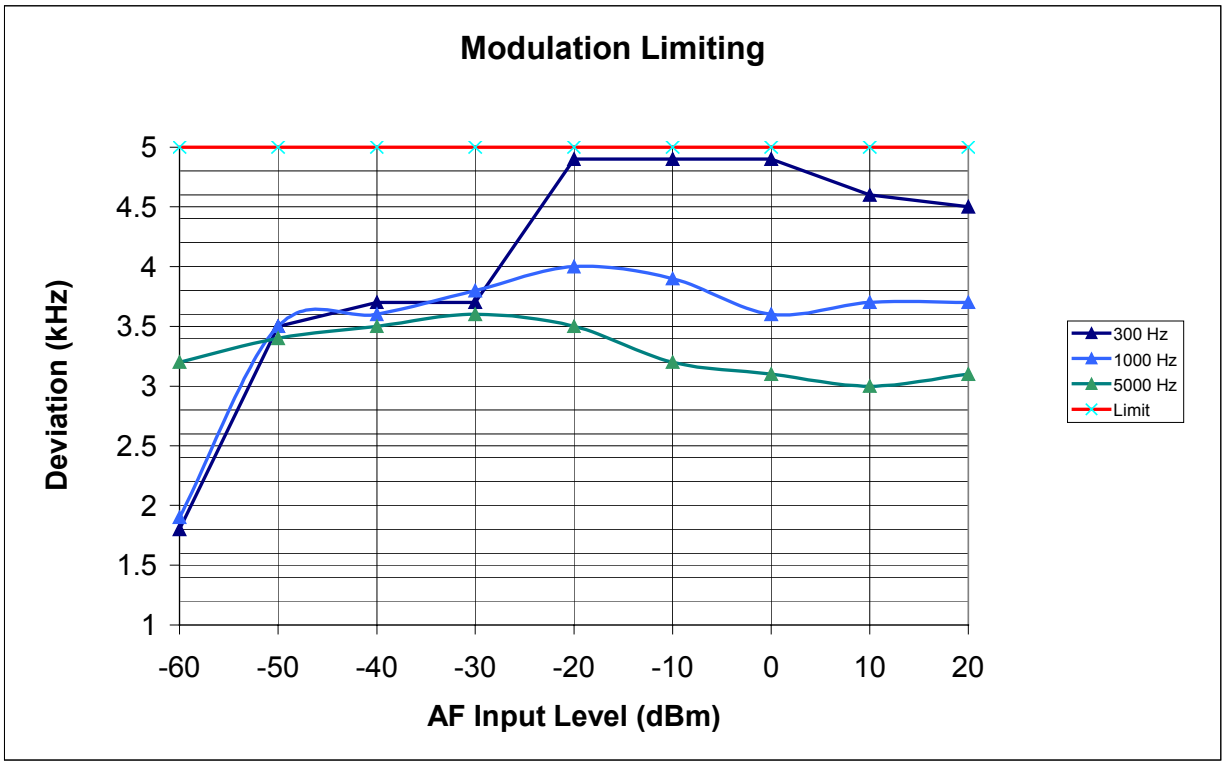
Job No.:	2L0354R	Date:	7/1/2002
Specification:	CFR 47, Part 74	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	44
E.U.T.:	Remote Pickup Transmitter		
Configuration:	60 W rf output		
Sample No.:	4		
Location:	Lab 1	RBW:	Refer to plots
Detector Type:	Peak	VBW:	Refer to plots

Test Equipment Used

Antenna:		Directional Coupler:	1054
Pre-Amp:		Cable #1:	1082
Filter:		Cable #2:	
Receiver:		Cable #3:	
Attenuator #1	1471	Cable #4:	
Attenuator #2:	1478	Mixer:	

Additional equipment used: 1051 (CMTA 54 Radio Test Set)

Measurement Uncertainty: +/-0.7 dB

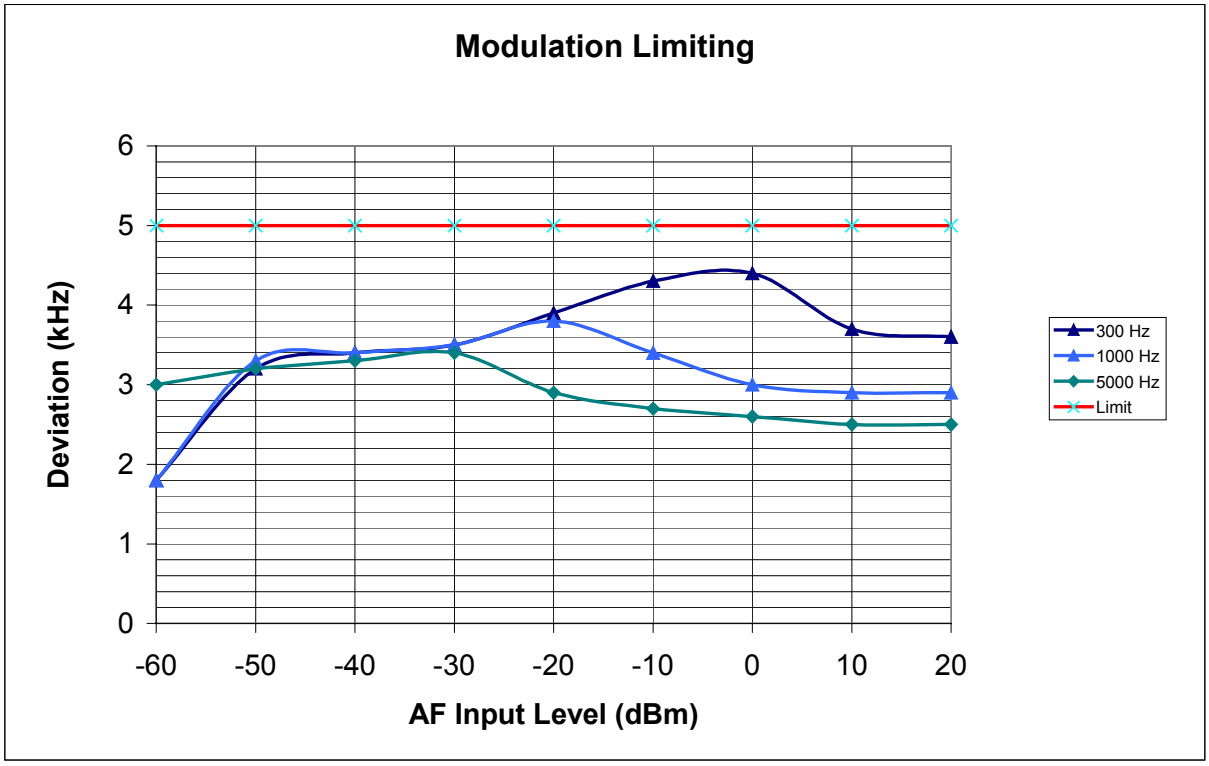


Notes:
30 kHz Audio Board
Instantaneous deviation: 3.7 kHz
Peak Deviation: 3.6 kHz)

Data Plot **Audio Modulation Limiting**

Page 2 of 2

Job No.:	2L0354R	Date:	7/1/2002
Specification:	CFR 47, Part 74	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	44
E.U.T.:	Remote Pickup Transmitter		
Configuration:	60 W rf output		



Notes:
25 kHz Audio Board
Instantaneous deviation: 3.7 kHz)
Peak Deviation: (3.2 kHz)

Section 5. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: Tom Tidwell	DATE: 7/1/02

Measurement Results: Complies.

Measurement Data: See attached data

Measurement Conditions: Temperature: 27 °C
Humidity: 44 %

Measurement Uncertainty: +/- 1.7 dB

Data Plot — Occupied Bandwidth

Page 1 of 4 Complete X

Job No.: 2L0354R Date: 7/1/2002 Preliminary:

Specification: 74.462(c)(3) Temperature(°C): 27

Tested By: Tom Tidwell Relative Humidity(%) 44

E.U.T.: Remote Pickup Transmitter

Configuration: 60 W rf output

Sample Number: 4

Location: Lab 1 RBW: Refer to plots

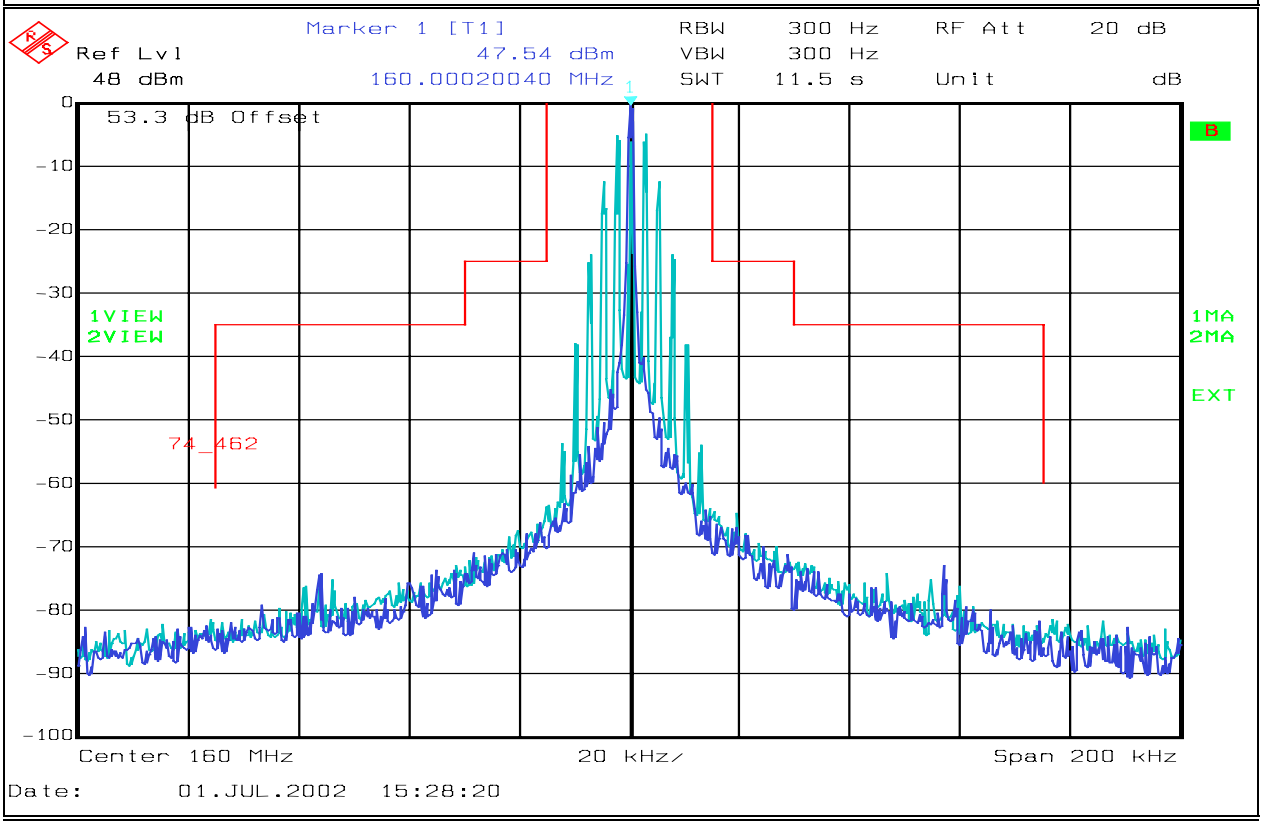
Detector Type: Peak VBW: Refer to plots

Test Equipment Used

Antenna:		Directional Coupler:	1054
Pre-Amp:		Cable #1:	1082
Filter:		Cable #2:	1629
Receiver:	1036	Cable #3:	
Attenuator #1	1478	Cable #4:	
Attenuator #2:	1471	Mixer:	

Additional equipment used: 1051 (CMTA 54 Test Set)

Measurement Uncertainty: +/-1.7 dB



Notes: **160 MHz**

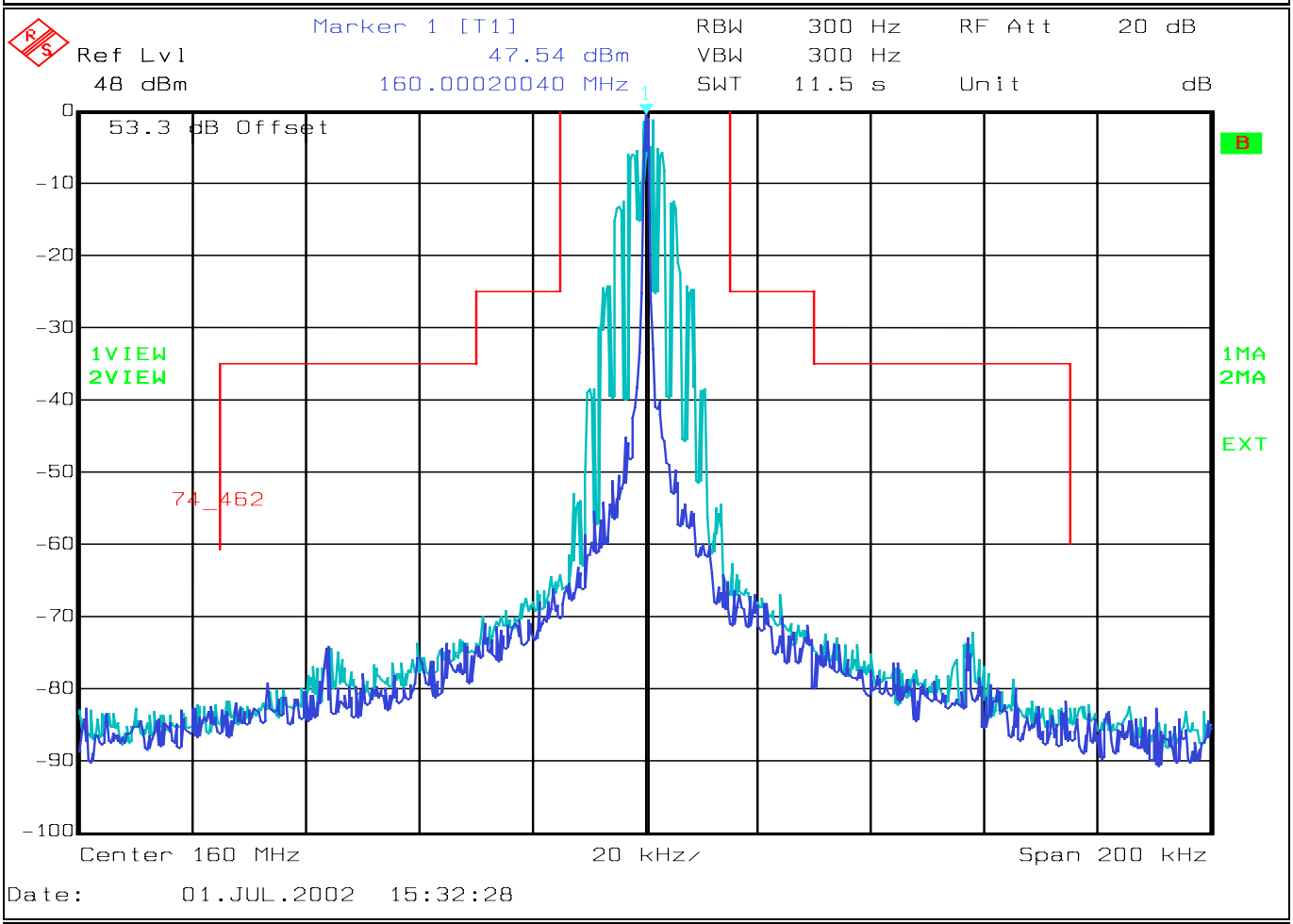
Modulation: 2.5 kHz tone at 16 dB overdrive without encoding

30 kHz authorized BW

Data Plot — Occupied Bandwidth

Page 2 of 4

Job No.:	2L0354R	Date:	7/1/2002
Specification:	74.462(c)(3)	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	44
E.U.T.:	Remote Pickup Transmitter		
Configuration:	60 W rf output		



Notes:

160 MHz

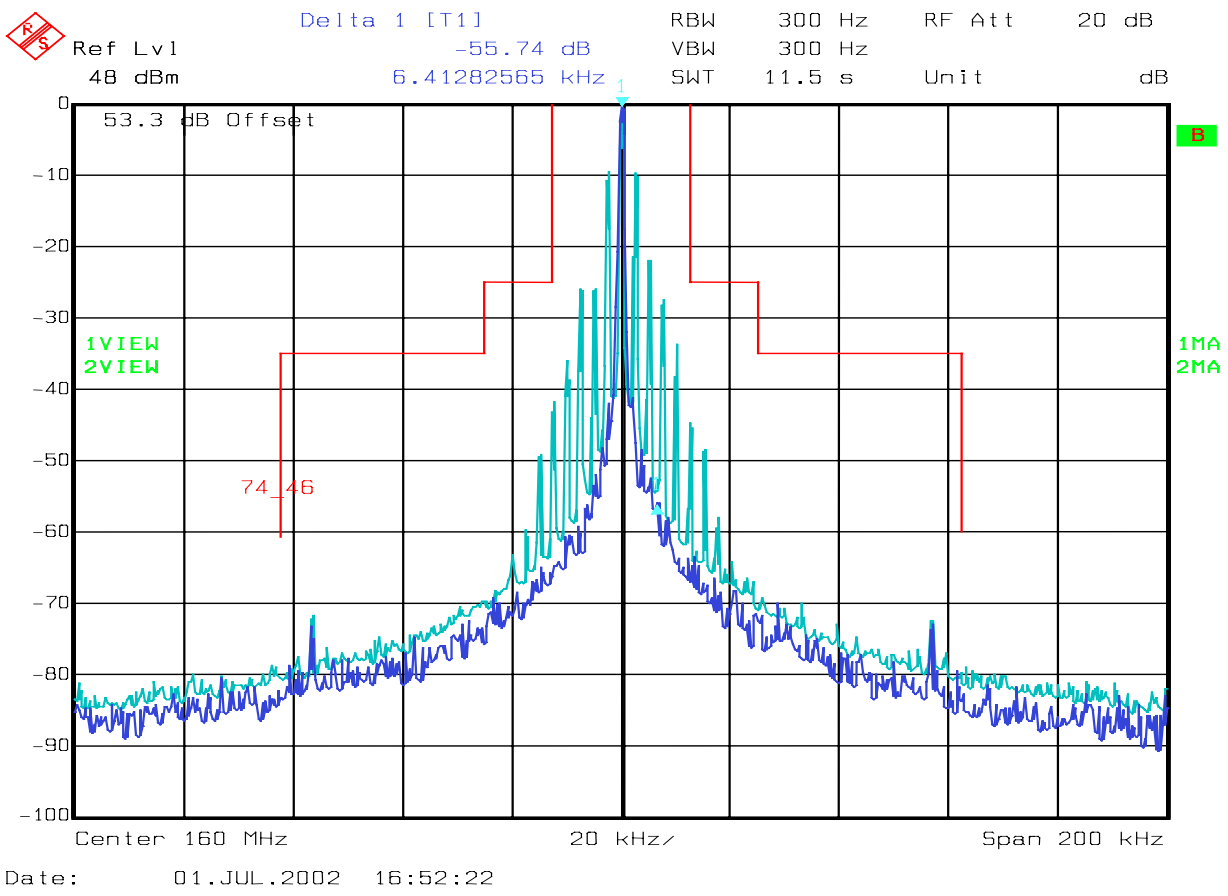
Modulation: 2.5 kHz tone at 16 dB overdrive with encoding

30 kHz authorized BW

Data Plot — Occupied Bandwidth

Page 3 of 4

Job No.:	2L0354R	Date:	7/1/2002
Specification:	74.462(c)(3)	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	44
E.U.T.:	Remote Pickup Transmitter		
Configuration:	60 W rf output		

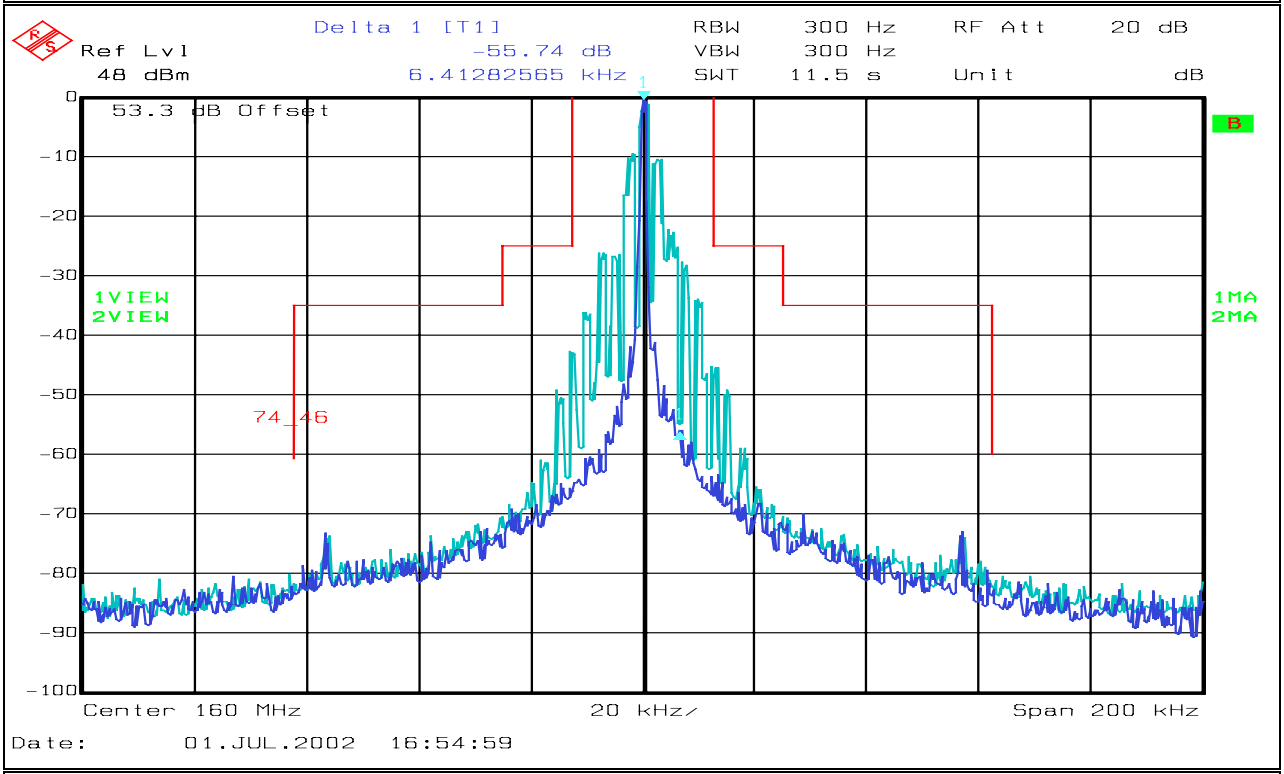


Notes:
160 MHz
Modulation: 2.5 kHz tone at 16 dB overdrive without encoding
25 kHz authorized BW

Test Plot: **Occupied Bandwidth**

Page 4 of 4

Job No.:	2L0354R	Date:	7/1/2002
Specification:	74.462(c)(3)	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	44
E.U.T.:	Remote Pickup Transmitter		
Configuration:	60 W rf output		



Notes: **160 MHz**
Modulation: 2.5 kHz tone at 16 dB overdrive with encoding
25 kHz authorized BW

Section 6. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.1051
TESTED BY: Tom Tidwell	DATE: 7/1/02

Measurement Results: Complies.

Measurement Data: See attached data

Measurement Conditions: Temperature: 27 °C
Humidity: 44 %

Measurement Uncertainty: +/- 1.7 dB

Data Plot

Spurious Emissions at Antenna Terminals

Page 1 of 3

Complete X
Preliminary:

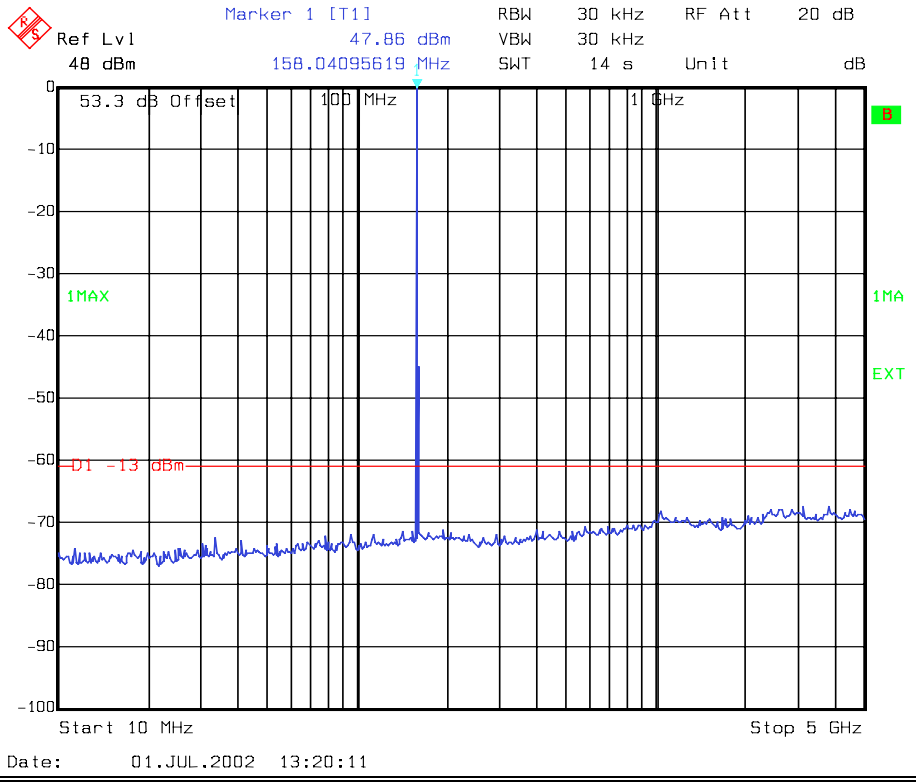
Job No.:	2L0354R	Date:	7/1/2002
Specification:	74.462(c)(3)	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	44
E.U.T.:	Remote Pickup Transmitter		
Configuration:	60 W rf output		
Sample Number:	4		
Location:	Lab 1	RBW:	30 kHz
Detector Type:	Peak	VBW:	30 kHz

Test Equipment Used

Antenna:		Directional Coupler:	1054
Pre-Amp:		Cable #1:	1082
Filter:		Cable #2:	1629
Receiver:	1036	Cable #3:	
Attenuator #1	1478	Cable #4:	
Attenuator #2:	1471	Mixer:	

Additional equipment used:

Measurement Uncertainty: +/-1.7 dB

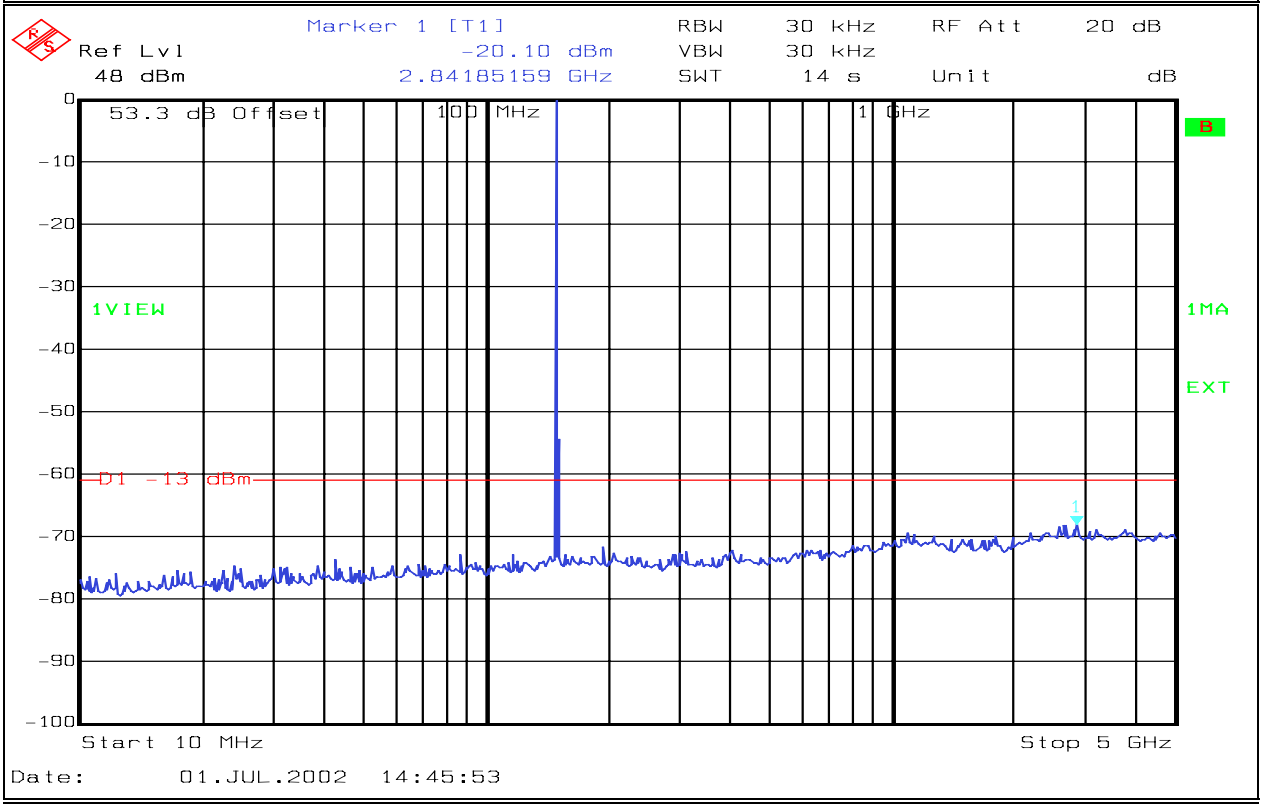


Notes: **160 MHz**

Data Plot **Spurious Emissions at Antenna Terminals**

Page 2 of 3

Job No.:	2L0354R	Date:	7/1/2002
Specification:	74.462(c)(3)	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	44
E.U.T.:	Remote Pickup Transmitter		
Configuration:	60 W rf output		

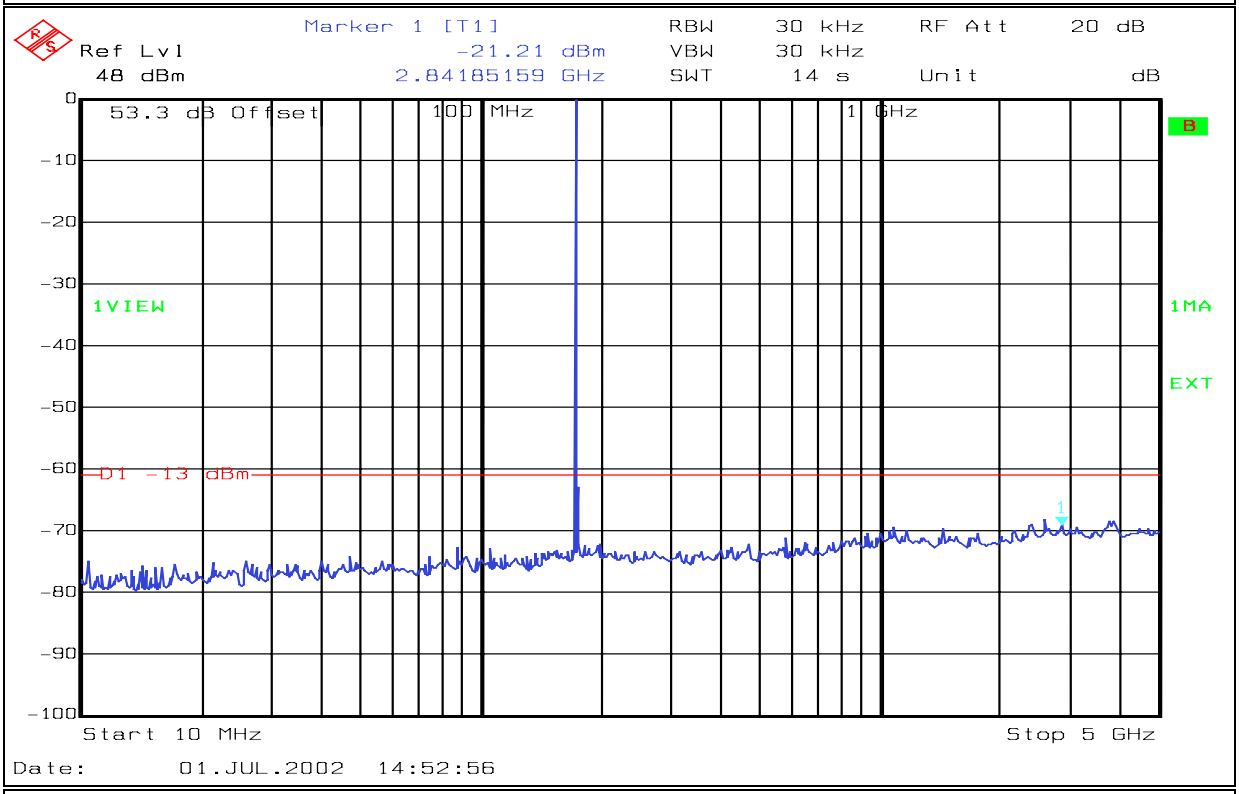


Notes: **150 MHz**

Data Plot **Spurious Emissions at Antenna Terminals**

Page 3 of 3

Job No.:	2L0354R	Date:	7/1/2002
Specification:	74.462(c)(3)	Temperature(°C):	27
Tested By:	Tom Tidwell	Relative Humidity(%)	44
E.U.T.:	Remote Pickup Transmitter		
Configuration:	60 W rf output		



Notes: **174 MHz**

Section 7. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.1053
TESTED BY: Tom Tidwell	DATE: 7/2/02

Measurement Results: Complies.

Measurement Data: See attached data

Measurement Conditions: Temperature: 25 °C
Humidity: 52 %

Measurement Uncertainty: +/- 3.6 dB

Test Data - Radiated Emissions

ERP Substitution Method

Page 1 of 1 Complete X
Job No.: 2L0354R Date: 7/2/02 Preliminary
Specification: Temperature(°C): 25
Tested By: Tom Tidwell Relative Humidity(%) 52
E.U.T.: SRPT-40A/150
Configuration: TX full power(60W) at 160 MHz into load
Sample No: 1
Location: AC 3 RBW: 1 MHz Measurement
Detector Type: Peak VBW: 1 MHz Distance: 3 m

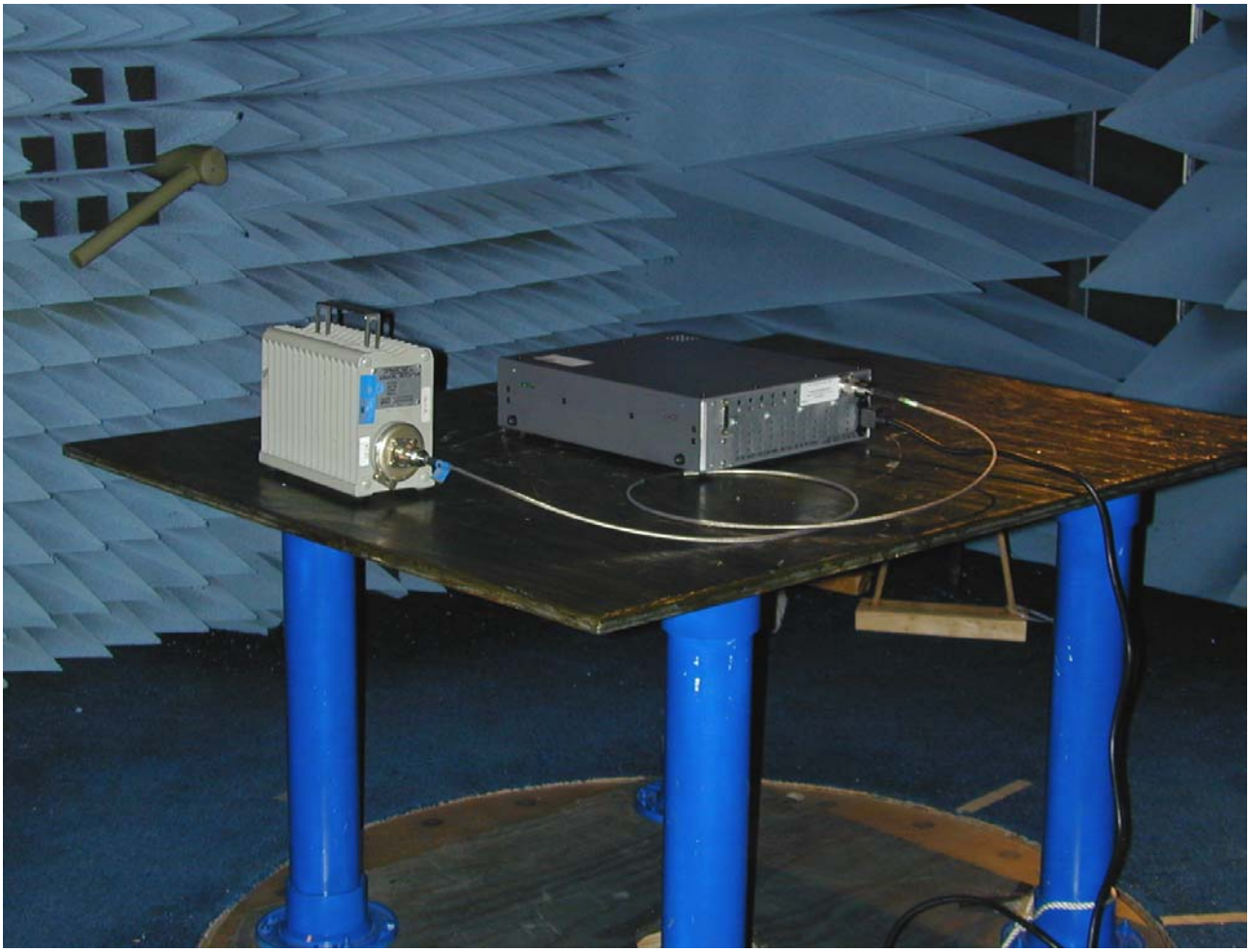
Test Equipment Used

Antenna: Directional Coupler:
Pre-Amp: 791 Cable #1: 1046
Filter: Cable #2: 1484
Receiver: 1464 Cable #3: 1485
Attenuator #1 Cable #4:
Attenuator #2: Mixer:
Additional equipment used:
Measurement Uncertainty: +/-3.6 dB

Frequency (MHz)	Meter Reading (dBm)		Substitution Level (dBm)		Substitution Antenna Gain (dBd)		ERP (dBm)	ERP (mW)	Polarity	Comments
320	-54.8		-48.9		0.0		-48.9	0.00	H	
320	-68.5		-62.4		0.0		-62.4	0.0000	V	Noise Floor
480	-45.3		-39.5		0.0		-39.5	0.0001	H	
480	-55.5		-52.0		0.0		-52.0	0.0000	V	
640	-70.0		-61.0		0.0		-61.0	0.0000	H	Noise Floor
640	-70.0		-58.0		0.0		-58.0	0.0000	V	Noise Floor
800	-62.0		-56.4		4.9		-51.5	0.0000	H	
800	-61.0		-53.5		4.9		-48.7	0.0000	V	
960	-65.5		-59.2		5.0		-54.2	0.0000	H	
960	-67.0		-62.4		5.0		-57.4	0.0000	V	Noise Floor
1120	-59.7		-60.0		4.9		-55.2	0.0000	H	
1120	-61.0		-60.5		4.9		-55.7	0.0000	V	
1280	-66.0		-67.5		4.9		-62.7	0.0000	H	
1280	-65.0		-65.7		4.9		-60.9	0.0000	V	
1440	-62.3		-64.4		4.9		-59.6	0.0000	H	
1440	-64.0		-65.3		4.9		-60.5	0.0000	V	
1600	-65.2		-65.2		7.3		-58.0	0.0000	H	
1600	-65.0		-67.0		7.3		-59.8	0.0000	V	
1760	-67.7		-68.0		7.3		-60.8	0.0000	H	Noise Floor
1760	-68.0		-70.3		7.3		-63.1	0.0000	V	Noise Floor
1920	-65.0		-65.3		7.3		-58.1	0.0000	H	Noise Floor
1920	-65.7		-68.0		7.3		-60.8	0.0000	V	Noise Floor

Notes:

Photographs of Test Setup



Section 8. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 2.1055
TESTED BY: Tom Tidwell	DATE: 7/2/02

Measurement Results: Complies.

Measurement Data: See attached data

Measurement Conditions: See data sheet.

Measurement Uncertainty: +/- 1 x 10^{-11} ppm

Frequency Stability

Client: Broadcast Electronics W.O.# 2L0354R

EUT: SRPT-40A/150 S/N: 4 (S#01)

Date: 7/2/02 Tech: T. Tidwell/ Eldon Berry

Test Equipment used: 1026, 1054, 1082, 1471, 1478

Temperature	Voltage	Frequency (MHz)	Tolerance (%)
20 °C	102	159.999933	-0.000042
20 °C	120	159.999940	-0.000037
20 °C	138	159.999950	-0.000031
10 °C		159.999957	-0.000027
0 °C		159.999820	-0.000113
-10 °C		159.999790	-0.000131
-20 °C		159.999740	-0.000163
-30 °C		159.999790	-0.000131
30 °C		160.000008	0.000005
40 °C		159.999980	-0.000012
50 °C		159.999980	-0.000012
50 °C		160.000074	0.000046

Section 9. Test Equipment List

Nemko ID -	Description	Manufacturer Model Number	Serial No.	Cal. Date	Cal. Due Date
1054	DUAL DIRECTIONAL COUPLER	NARDA 3020A	34366	CBU	CBU
1471	10 db Attenuator DC 18 GHz	MCL Inc. BW-S10W2 10db-2WDC	NONE	CBU	CBU
1478	20db Attenuator DC 18 GHz	MCL Inc. BW-S20W6	NONE	CBU	CBU
1082	CABLE 2m	Astrolab 32027-2-29094-72TC	N/A	06/01/02	06/01/03
791	PREAMP, 25dB	ICC LNA25	398	08/16/01	08/16/02
1464	Spectrum analyzer	Hewlett Packard 8563E	3551A04428	01/02/02	07/02/03
1046	Flex cable 1m	Astrolab Inc. 32022-2-29094K-1M	N/A	01/18/02	01/18/03
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	06/01/02	06/01/03
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	06/01/02	06/01/03
1051	Radio Communication Analyzer	Rhode & Schwarz CMTA-54	835875/002	04/11/02	04/11/03
406	POWER METER	HP 436A	2512A22082	04/03/02	04/03/03
1056	POWER SENSOR (2 - 26.5 GHz)	HEWLETT PACKARD 8485A (50ohm,1.0uW-100mW)	2347A02782	09/27/01	09/27/02
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01	06/18/03
1629	CABLE, 6 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	CBU
993	Horn antenna	A.H. Systems SAS-200/571	XXX	01/08/02	01/08/03

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

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 Response	**PARA. NO.: 2.1047**

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
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 plus 10 log10 (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**

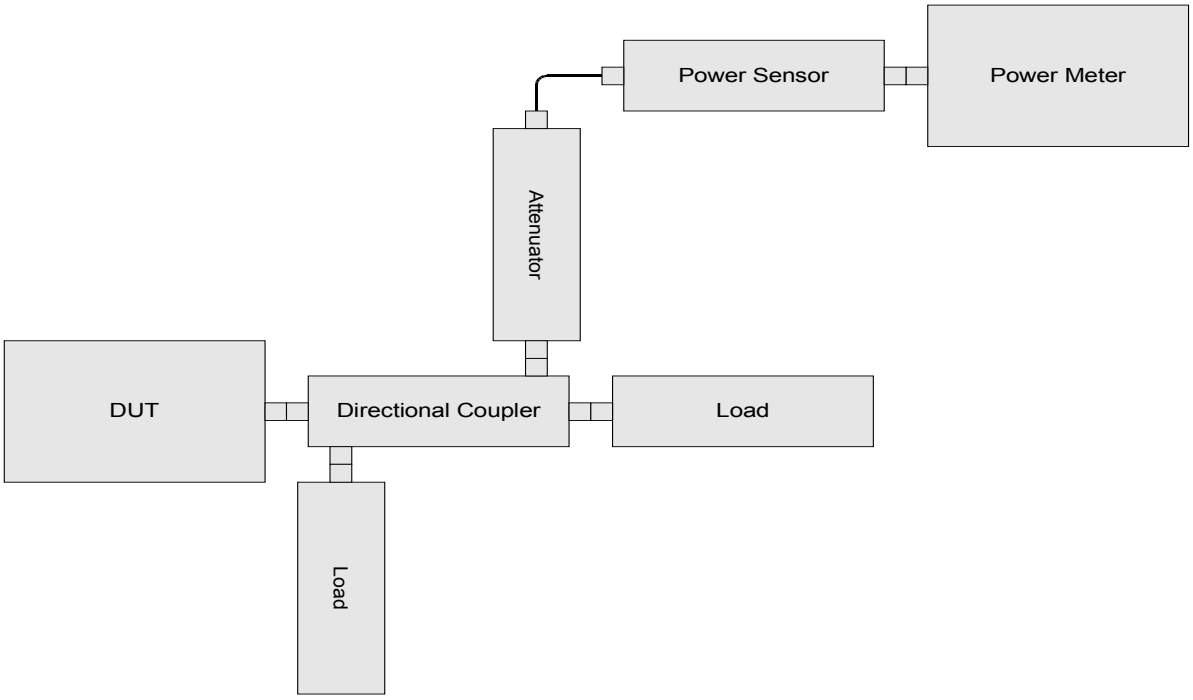
Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

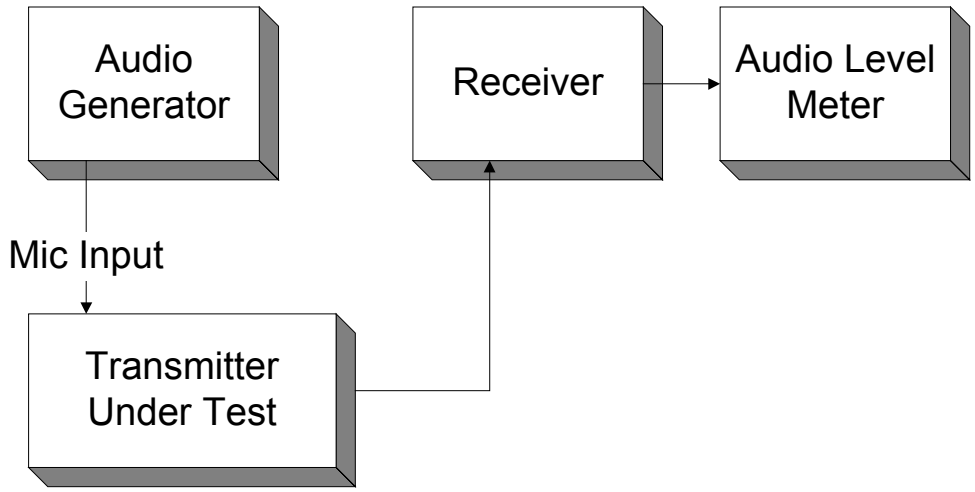
Frequency range	Tolerance (percent) Base station	Mobile station
1.6 to 2.0 MHz:		
200 watts or less	0.01	0.02
Over 200 watt	.005	.02
25 to 30 MHz:		
3 watts or less	.002	.005
Over 3 watts	.002	.002
30 to 300 MHz:		
3 watts or less	.0005	.005
Over 3 watts	.0005	.0005
300 to 500 MHz: All powers	.00025	.0005

Section 11. Test Diagrams

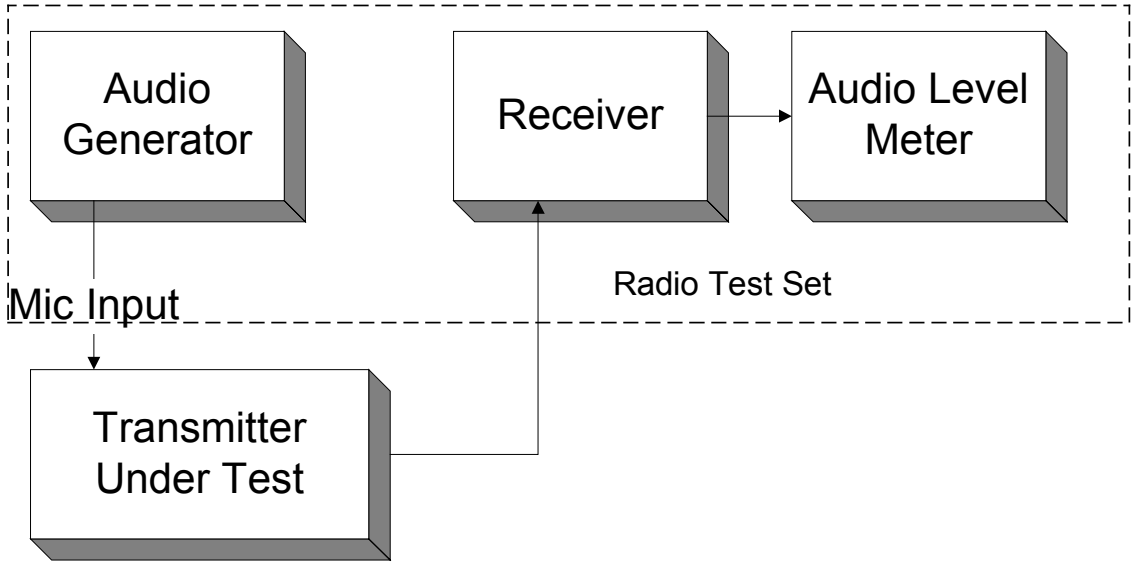
Para. No. 2.985 - R.F. Power Output



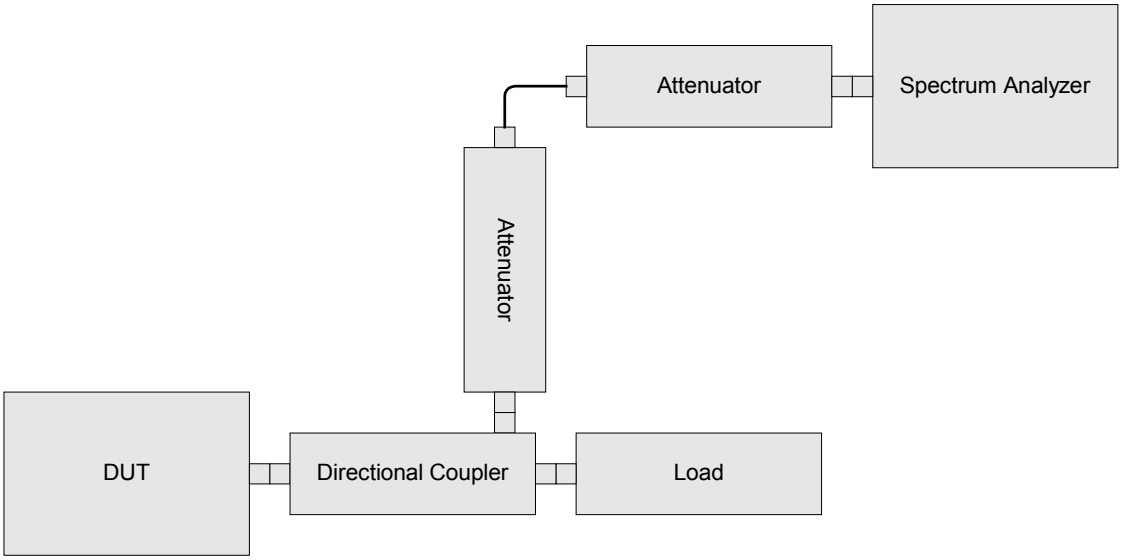
Para. No. 2.987(a) - Audio Frequency Response



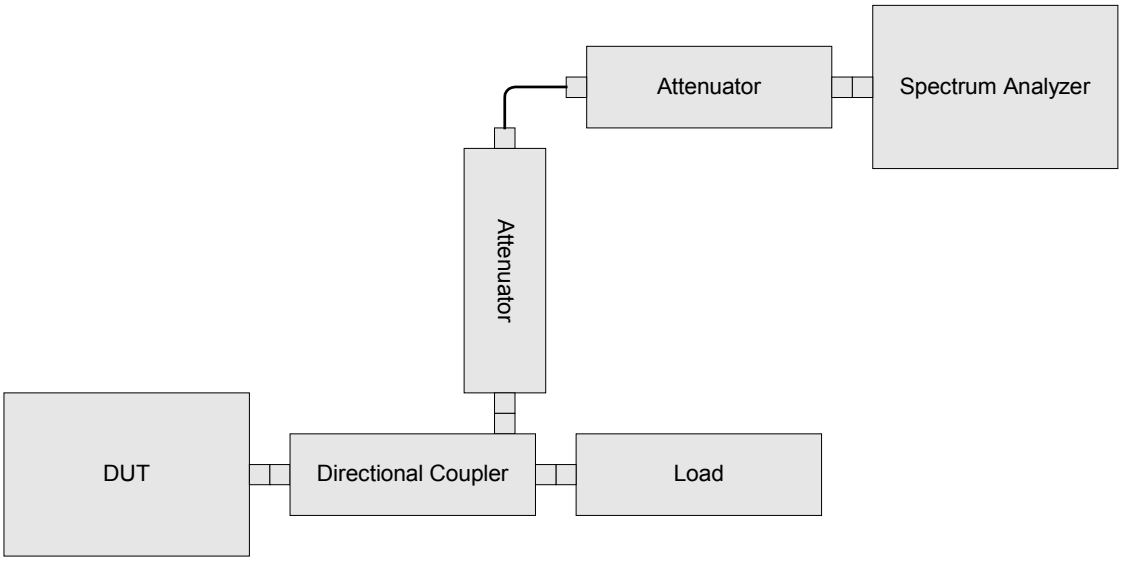
Para. No. 2.987(b) - Modulation Limiting



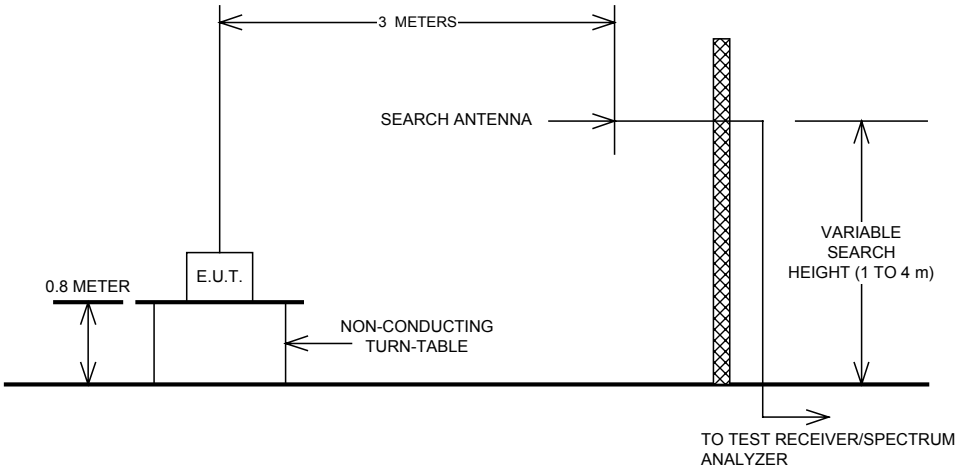
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability