

APPLICANT: BROADCAST ELECTRONICS INC.
FCC ID: DDE-STL-20W-950S

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GENERAL INFORMATION REQUIRED
FOR TYPE ACCEPTANCE

2.1033 BROADCAST ELECTRONICS INC. will manufacture the FCC ID:
DDE-STL-20W-950S in quantity, for use under FCC RULES
PART 74.501, AURAL BROADCAST AUXILIARY STATIONS.

2.1033 (C4) TECHNICAL DESCRIPTION

- (1) Type of Emission: 20K0F3E, 40K0F3E, 194KF3E,
80K0F8E, 280KF8E, 490KF8E

$$B_n = 2M + 2DK$$

$$M = 20000$$

$$D = 22 \text{ kHz (Peak Deviation)}$$

$$K = 1$$

$$B_n = 2(20K) + 2(22K)(1) = 84K$$

ALLOWED AUTHORIZED BANDWIDTH = up to 500 kHz.
74.502(b)(1)

- (2) Frequency Range: 944-952 MHz
TEST FREQ: 950 MHz.

- (3) Power Range and Controls: UNIT has no controls.

- (4) Maximum Output Power Rating: 20 Watts into 50
ohms resistive load.

- (5) DC Voltages and Current into Final Amplifier:

FINAL AMPLIFIER ONLY

$$V_{ce} = 13.5 \text{ Volts}$$

$$I_{ce} = 2.6 \text{ A}$$

- 2.1033 (C.10)(7) Complete Circuit Diagrams: The circuit diagram is
included as EXHIBIT'S 4A-4E. The block diagram
is included as EXHIBIT # 3.
- (8) Instruction book. The instruction manual is in-
cluded as Exhibit 7A-7C.
- (9) Tune-up procedure. The tune-up procedure is given
In Exhibit # 5A-5E.
- (10) Description of all circuitry and devices provided
for determining and stabilizing frequency. See Exhibit
6A-6B.
- (11) Description of any circuits or devices employed
for suppression of spurious radiation, for limit-
ing modulation, and for limiting power.

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This circuitry is described in Exhibits 6A-6B.

Limiting Modulation:

The transmitter audio circuitry is contained in IC1, IC2 and IC3.

The deviation is adjustable depending on the setting of R63.

Limiting Power: The power output is adjusted by R74.

(12) Digital modulation. This unit does not use digital modulation.

2.983(e) The data required by 2.1046 through 2.1057 is submitted below.

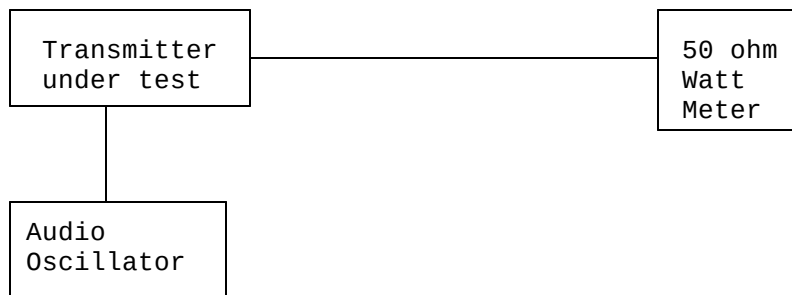
2.1046 RF power output.
RF power was measured with a RF Wattmeter.

OUTPUT POWER: 20 Watts or +43 dBm.

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R.F. POWER OUTPUT TEST PROCEDURE



2.1047(a)(b) Modulation characteristics:

AUDIO FREQUENCY RESPONSE

The audio frequency response was measured in accordance with TIA/EIA Specification 603. The audio frequency response curve is shown on the next page.

The audio signal was fed into a dummy microphone circuit and into the microphone connector. The input required to produce 30 percent modulation level was measured.

2.1047(b) Audio input versus modulation

The audio input level needed for a particular percentage of modulation was measured in accordance with TIA/EIA Specification 603. The audio input curves versus modulation are shown in exhibits 9A - 9C. Curves are provided for audio input frequencies of 300, 1000, and 15000 Hz.

MODULATION LIMITING CHARACTERISTICS SEE PAGES 25-27

AUDIO LOW PASS FILTER

An audio low pass filter is not used in this unit.

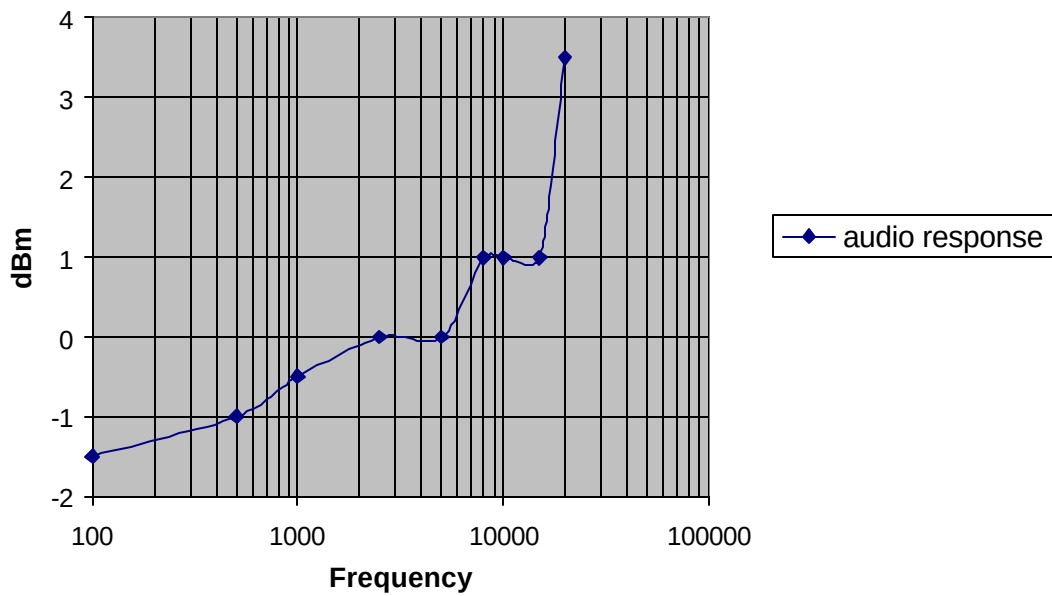
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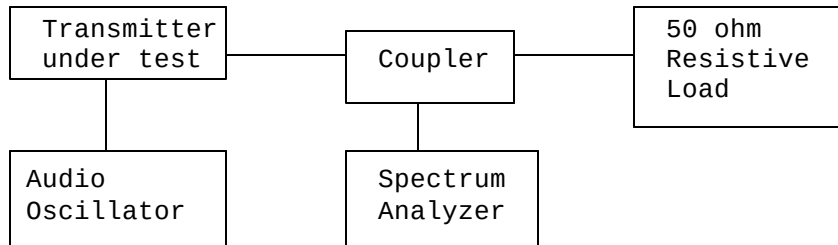
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2.1049

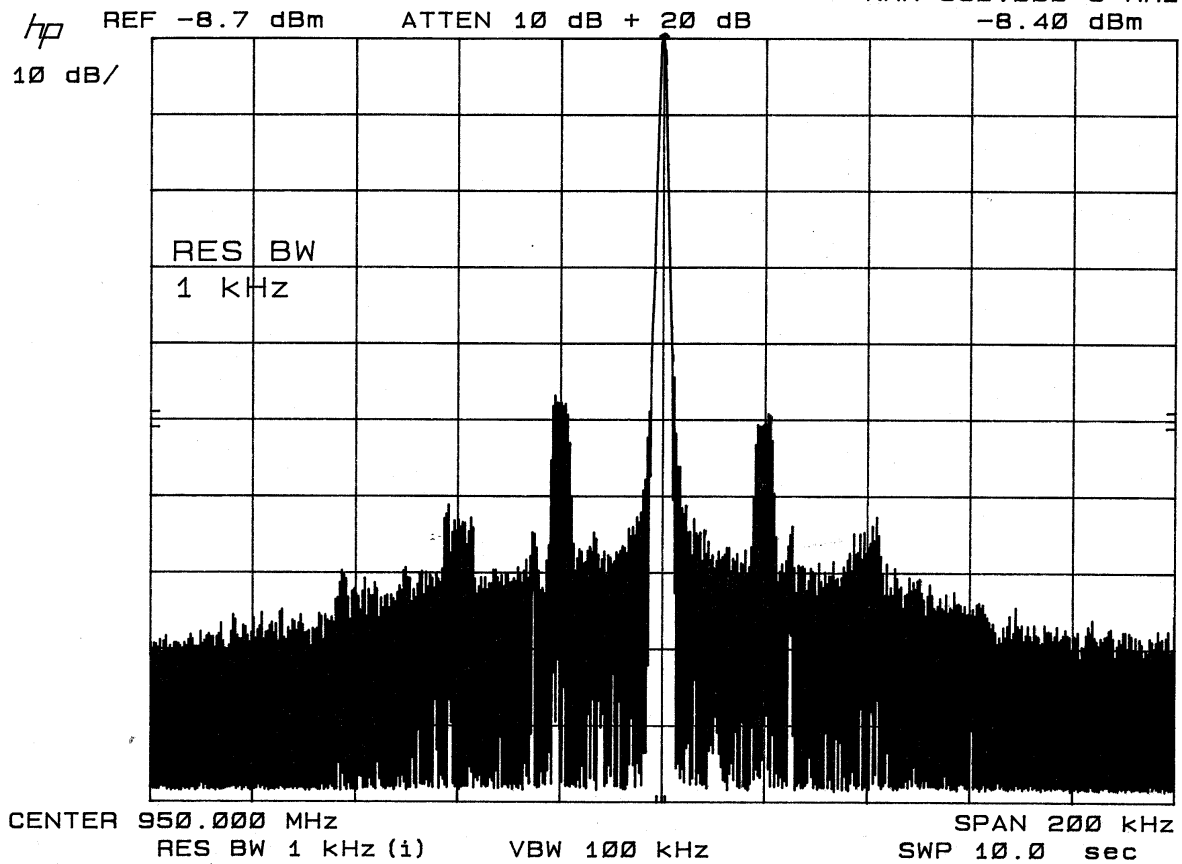
Occupied bandwidth:

Data in the plots show that all sidebands between 50 & 100% of the authorized bandwidth are attenuated by at least 25dB. From 100 to 250% of the authorized bandwidth they are attenuated by at least 35dB and beyond 250% $43 \log(P_o)$ dB. The plot shows the transmitter modulated with 15000 Hz (the highest modulation frequency), adjusted for 50% modulation plus 16 dB. The spectrum analyzer was set with the unmodulated carrier at the top of the screen. The test procedure diagram and occupied bandwidth plots follow.

OCCUPIED BANDWIDTH MEASUREMENT



Test Equipment Setup



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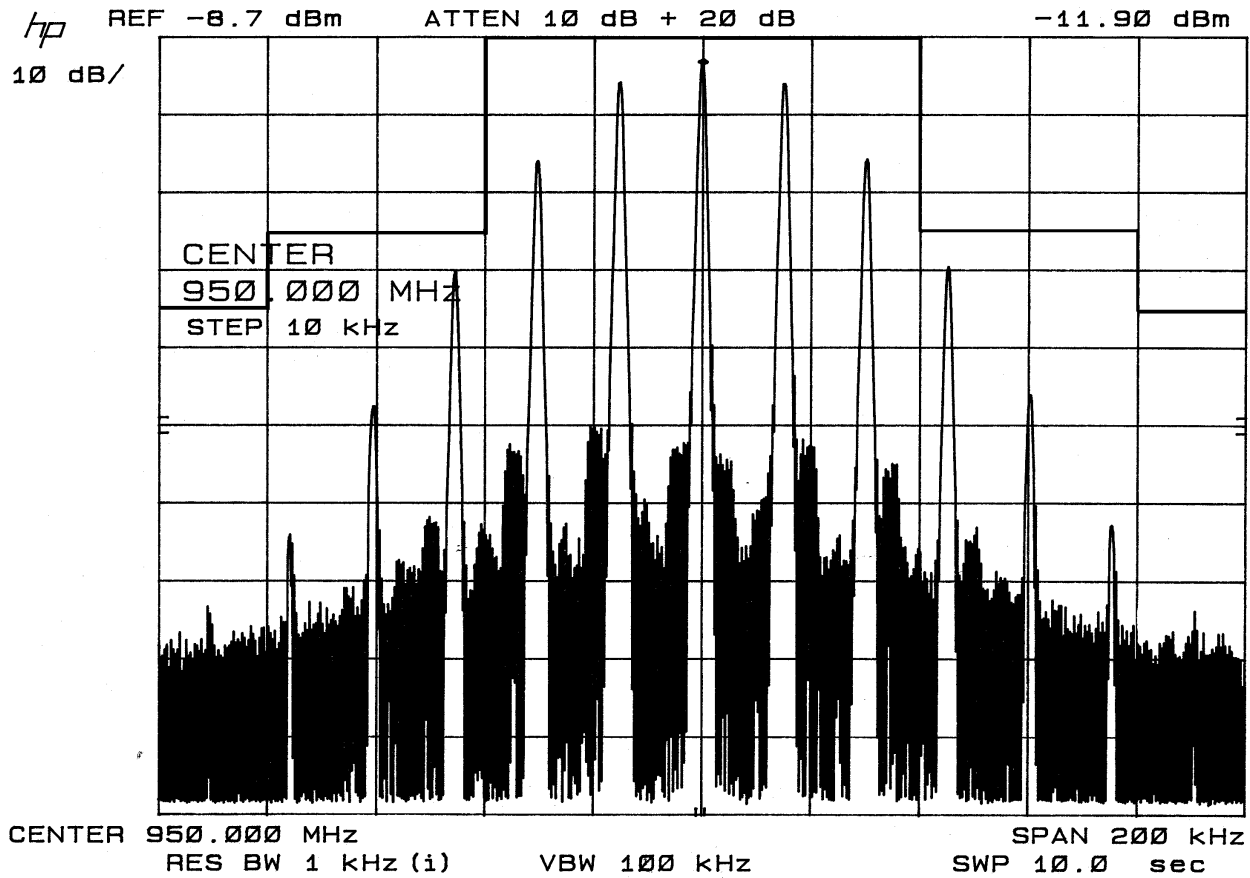
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15 kHz TONE
20 kHz DEVIATION

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OCCUPIED BANDWIDTH PLOT

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MR 950.000 9 MHz
-11.90 dBm



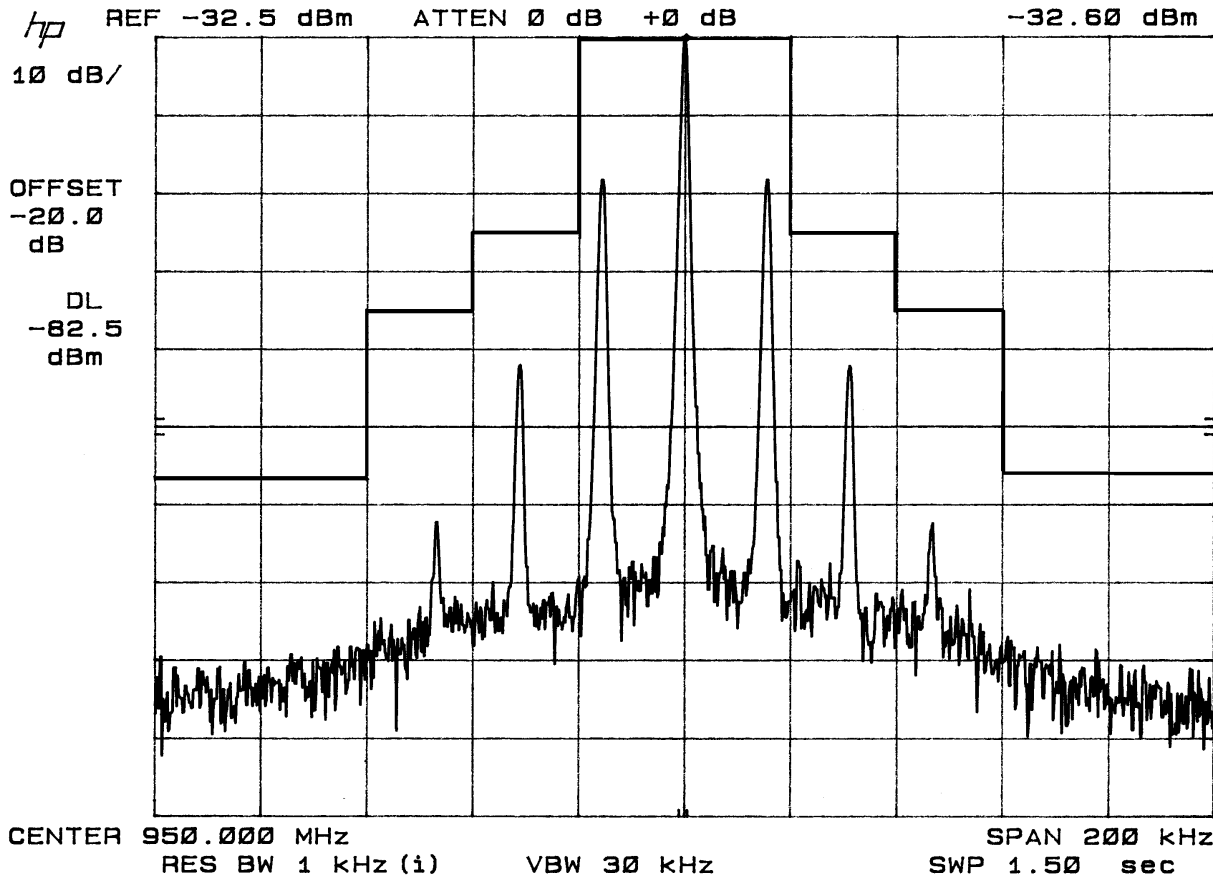
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MKR 950.000 2 MHz



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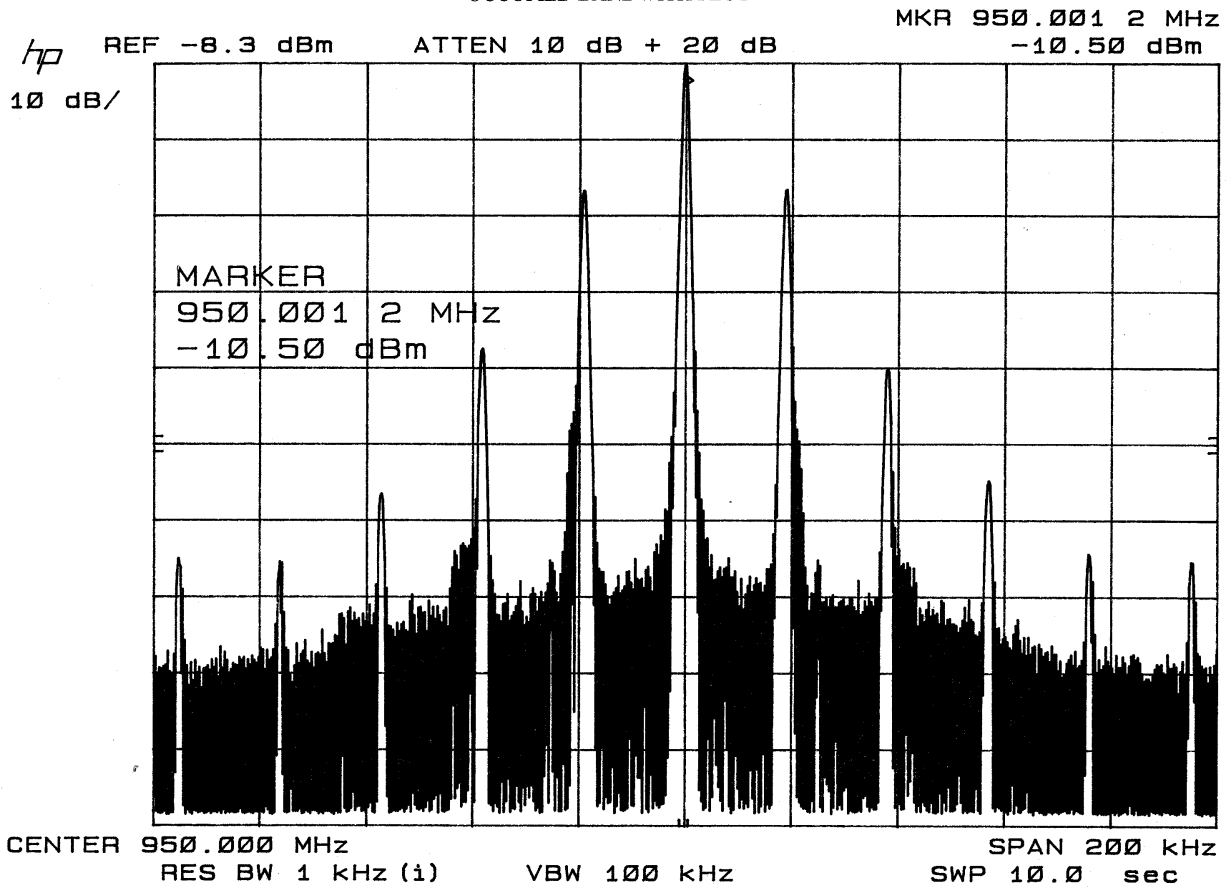
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19.0 kHz PILOT
6.5 kHz DEVIATION

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OCCUPIED BANDWIDTH PLOT PAGE : 9



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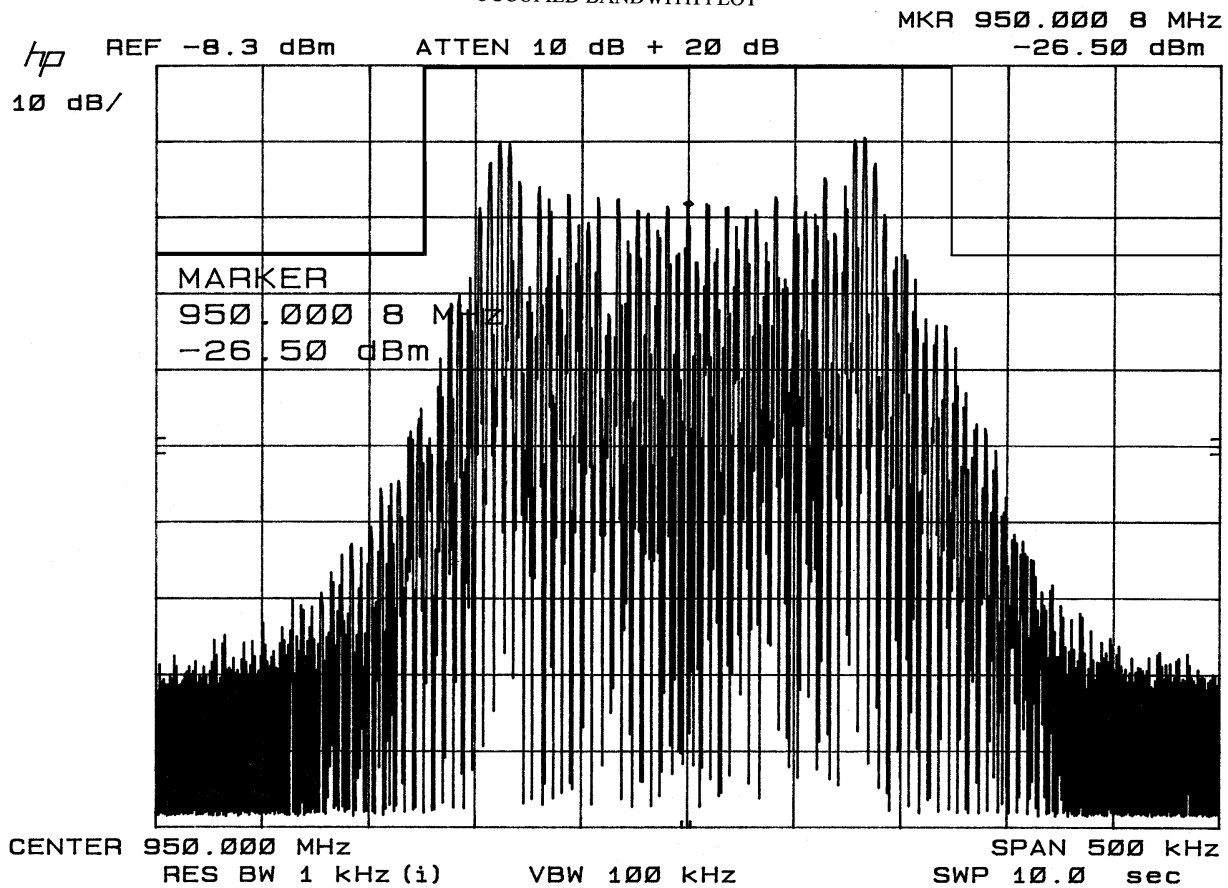
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PILOT DEVIATION = 6.5
TOTAL DEVIATION = 86.1+6.5

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OCCUPIED BANDWIDTH PLOT

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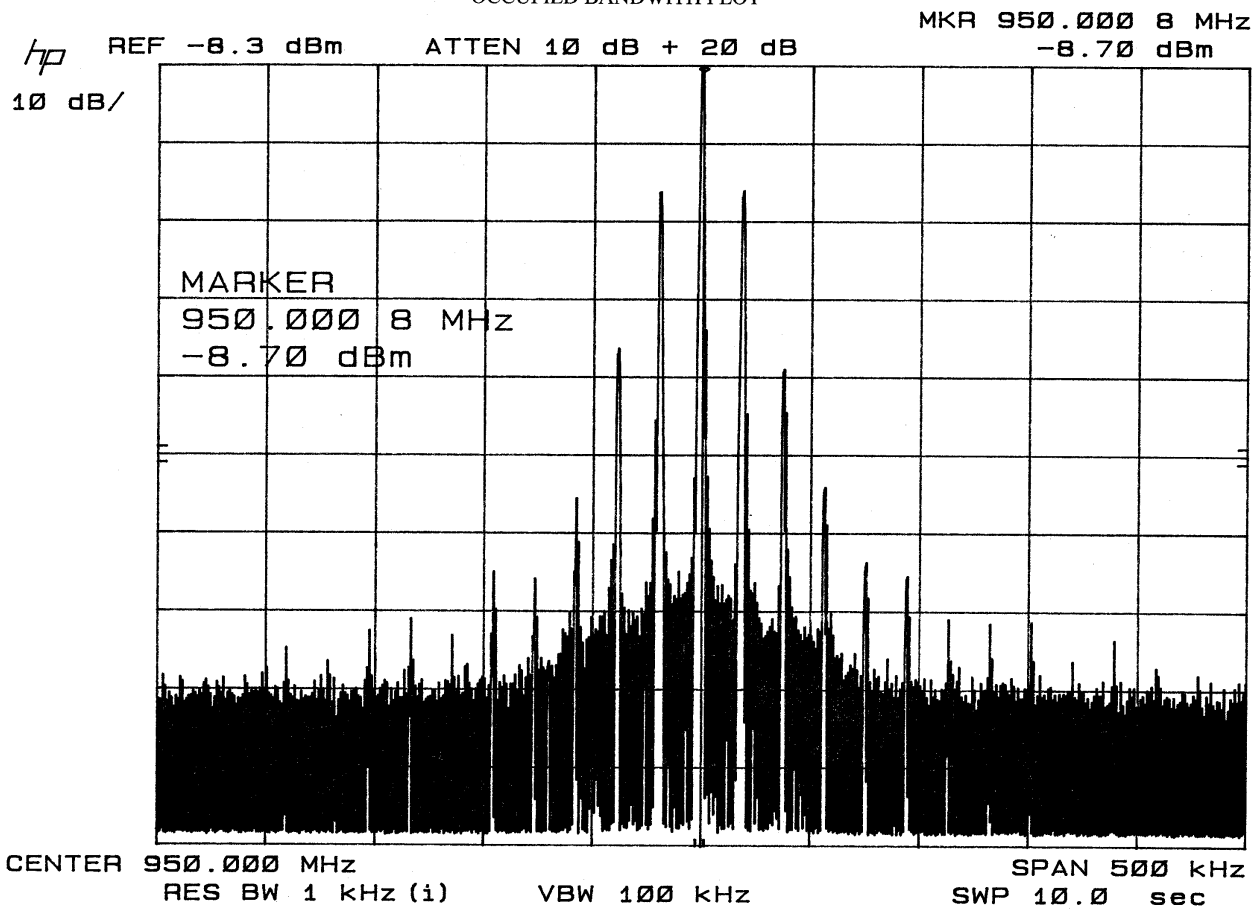
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19 KHZ PILOT DEVIATION
with 7 kHz Deviation

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OCCUPIED BANDWIDTH PLOT

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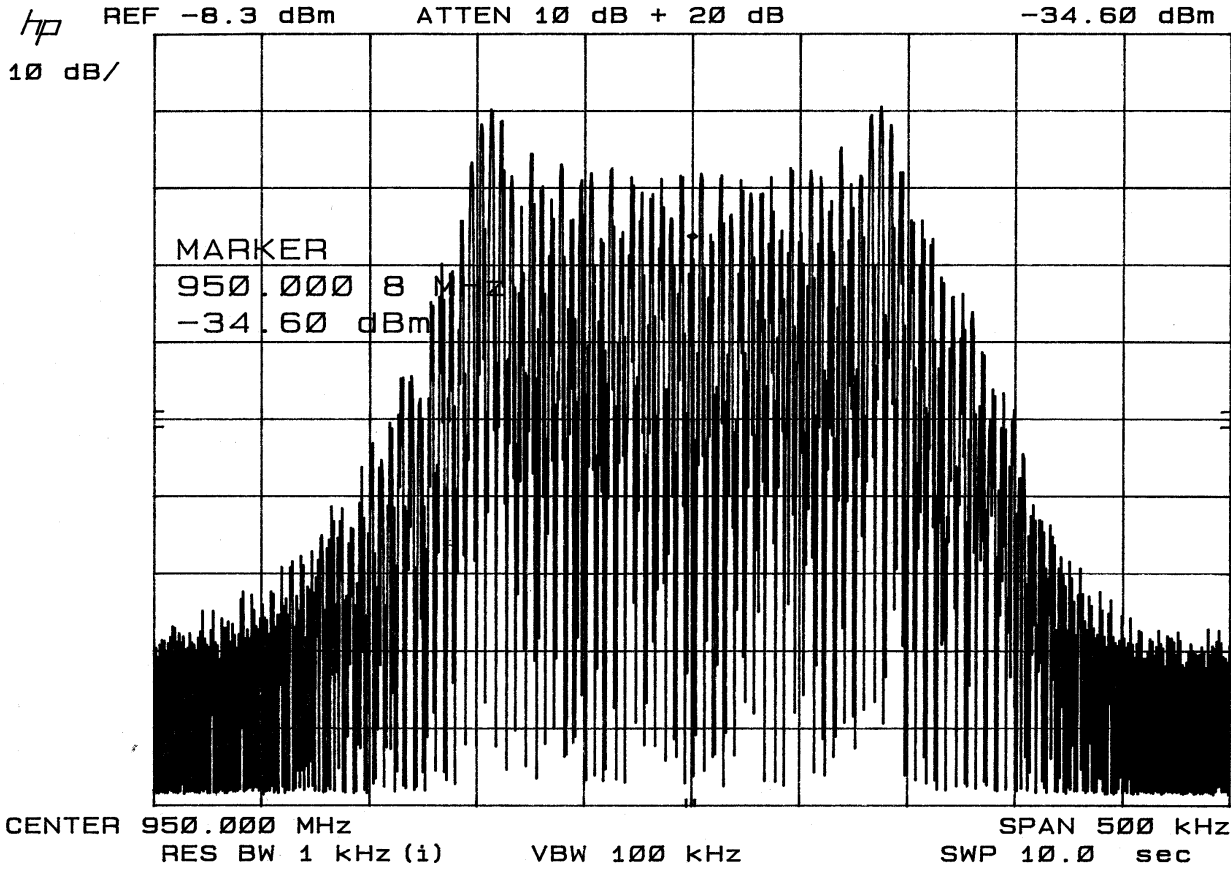
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OCCUPIED BANDWIDTH PLOT

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TOTAL DEVIATION 98.5 kHz
19 kHz Pilot w 7 kHz Deviation

MR 950.000 8 MHz
-34.60 dBm



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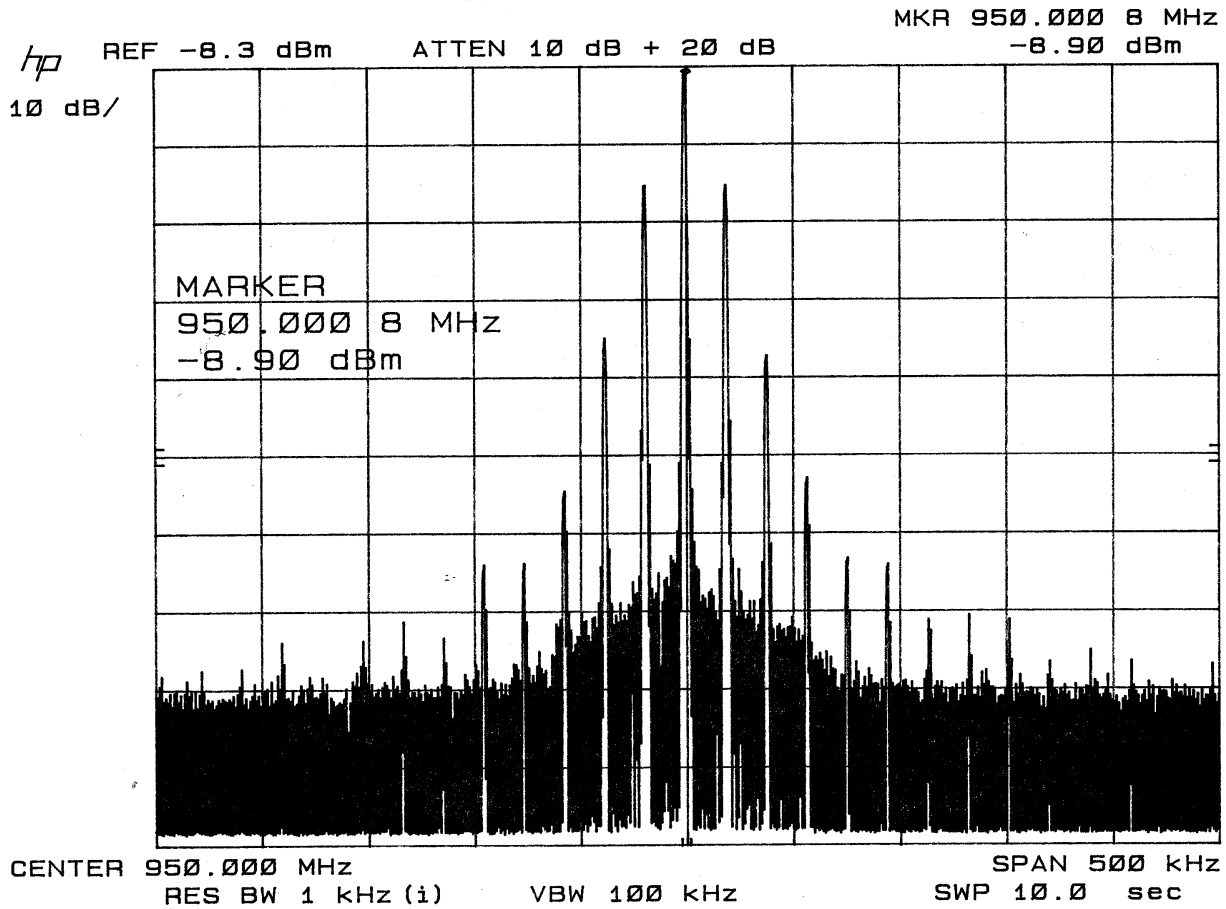
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7.5 deviation pilot

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JOB # : 250U1
OCCUPIED BANDWIDTH PLO1

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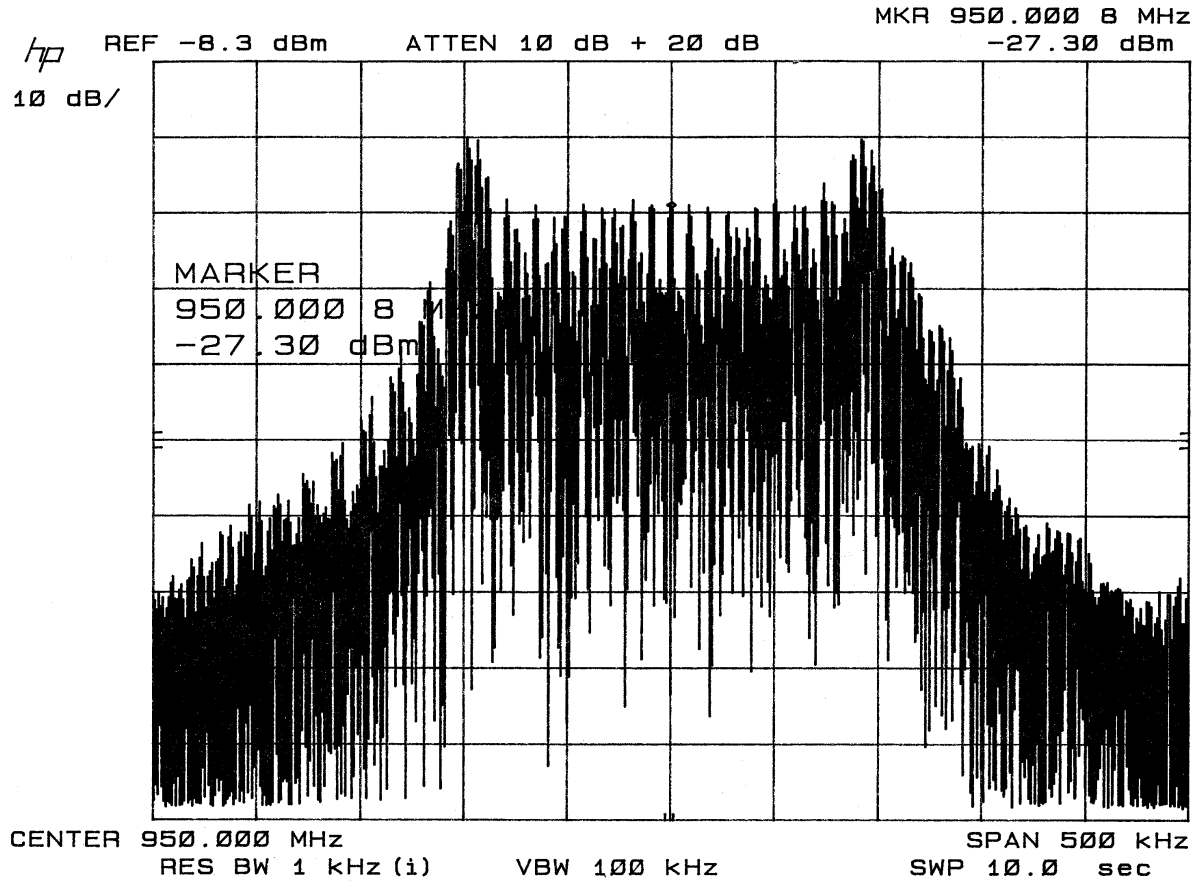
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7.5 kHz Pilot
100 kHz TOTAL DEVIATION

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OCCUPIED BANDWIDTH PLOT

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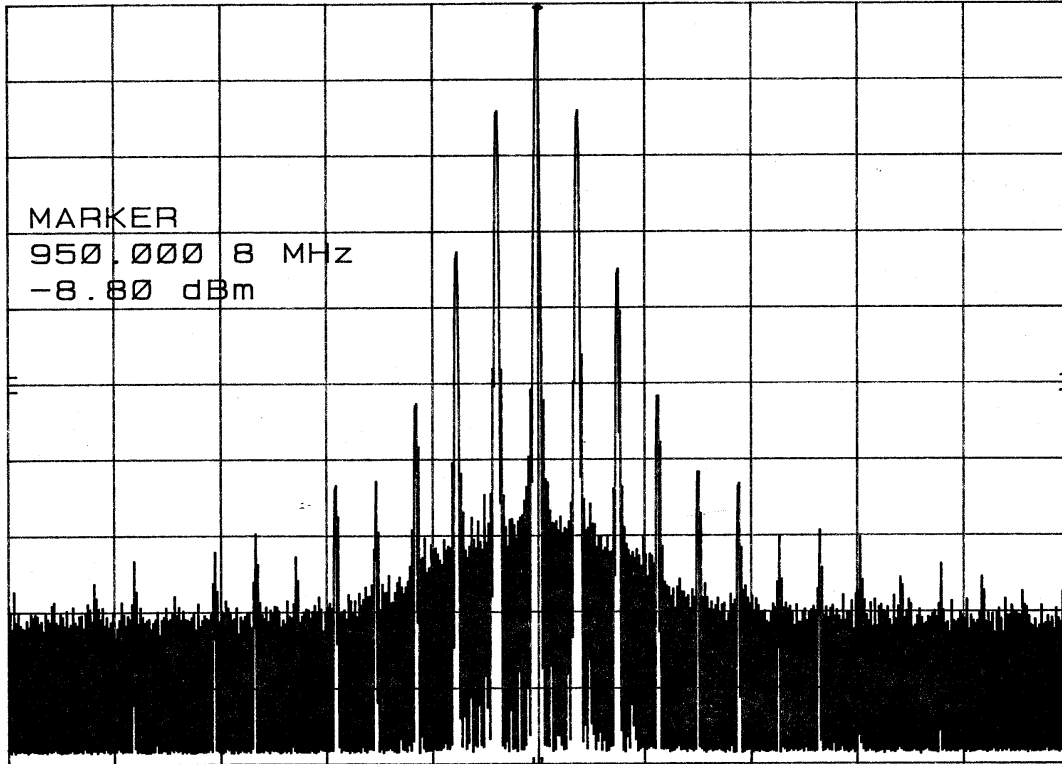
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8.5 DEVIATION 19 kHz PILOT

MKA 950.000 8 MHz
-8.80 dBm

hp
10 dB/

REF -8.3 dBm ATTEN 10 dB + 20 dB



CENTER 950.000 MHz

RES BW 1 kHz (i)

VBW 100 kHz

SPAN 500 kHz
SWP 10.0 sec

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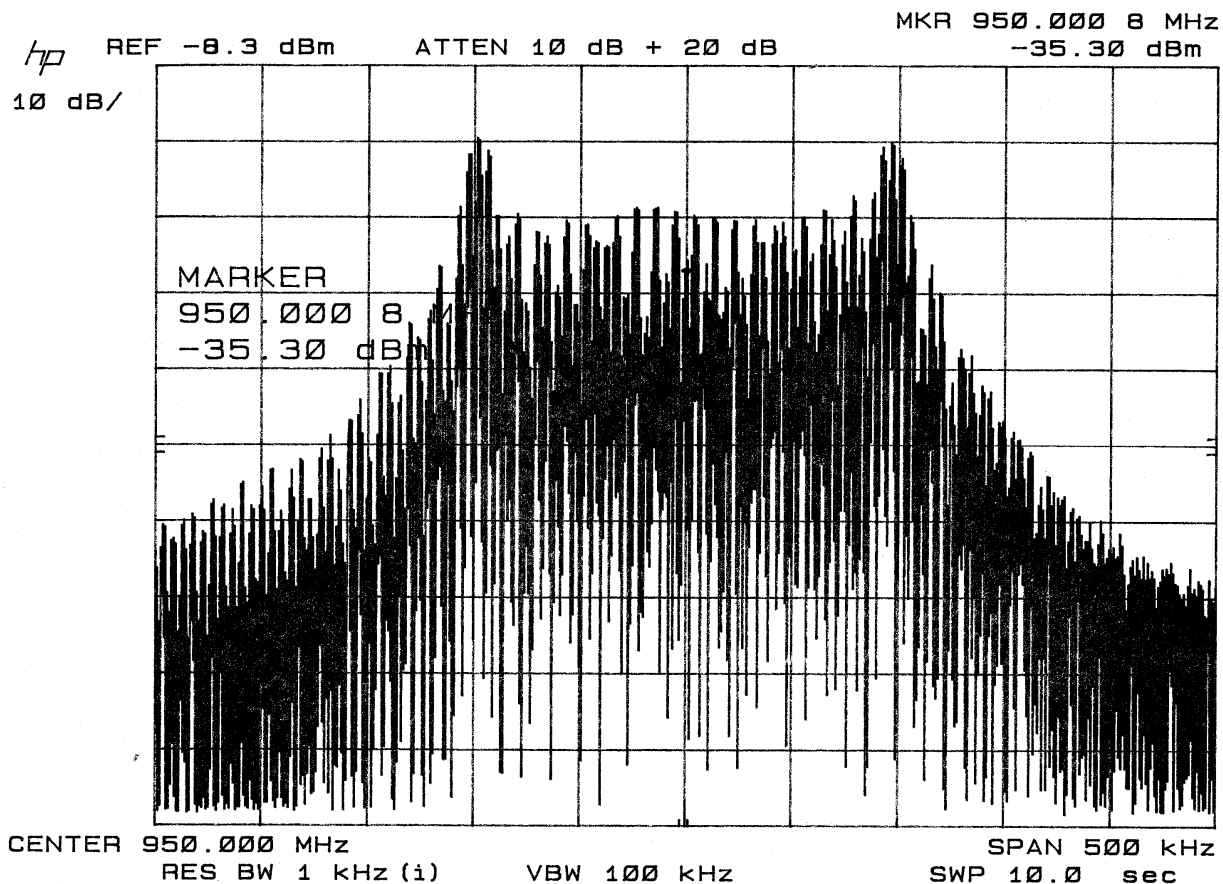
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8.5 kHz deviation Pilot
100.5 kHz total

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OCCUPIED BANDWIDTH PLOT

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Spurious emissions at antenna terminals(conducted):

Data on the following page shows the level of conducted spurious responses. The carrier was modulated 100% using a 2500Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard TIA/EIA-603.

REQUIREMENTS: Emissions must be $43 + 10\log(P_o)$ dB below the mean power output of the transmitter.

$$43 + 10\log(20) = 56.01 \text{ dB}$$

EMISSION FREQUENCY MHz	DB BELOW CARRIER
950.00	00.0
1900.00	-80.0
2850.00	-81.0
3800.00	-72.0
4750.01	-91.0
5700.00	-89.0
6650.00	-88.0
7600.00	-89.0
9500.00	-90.0

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2.1053(a)(b) Field strength of spurious emissions:

NAME OF TEST: RADIATED SPURIOUS EMISSIONS

REQUIREMENTS: Emissions must be $43 + 10\log(P_o)$ dB below the mean power output of the transmitter.

$$43 + 10 \log(20) = 56.01 \text{ dB}$$

TEST DATA:

Emission Frequency MHz	Attn dBc	Margin dB
950.00	0.00	00.0
1,900.00	79.6	23.59
2,850.00	57.19	1.18
3,800.00	85.0	28.99
4,750.00	65.20	9.19
5,700.00	70.14	14.13
6,650.00	66.14	10.13
7,600.00	75.65	19.64
8,550.00	88.44	32.43
9,500.00	78.18	22.17

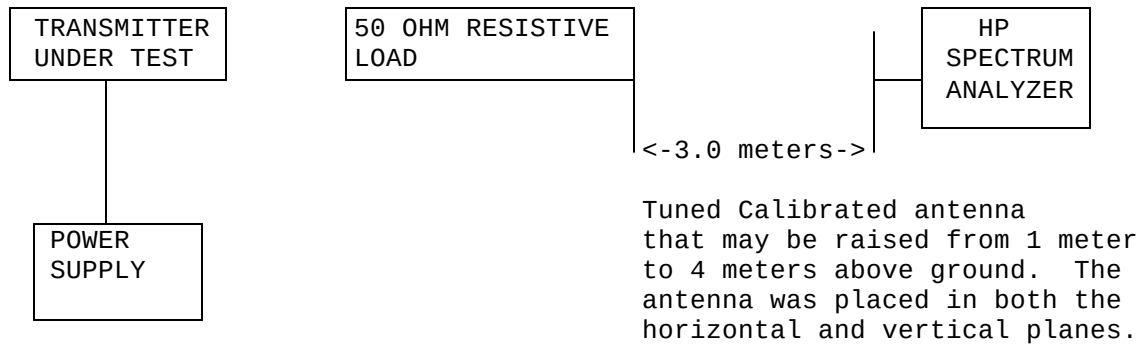
METHOD OF MEASUREMENT: The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per TIA/EIA STANDARD 603 using the substitution method. Measurements were made at the open field test site of TIMCO ENGINEERING, INC. located at 849 N.W. State Road 45, Newberry, FL 32669.

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Method of Measuring Radiated Spurious Emissions



Equipment placed on a rotatable platform, 80 cm above ground.

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2.1055
74.561

Frequency stability:

Temperature and voltage tests were performed to verify that the frequency remains within the .0050%, (50 ppm)(74.561) specification limit.

The test was conducted as follows: The transmitter was placed in the temperature chamber at 25 degrees C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15 second intervals. The worse case number was taken. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30 degrees C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15 second intervals. The worst case number was recorded. This procedure was repeated in 10 degree increments up to +50 degrees C.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 950.001 500

TEMPERATURE°C	FREQUENCY_MHz	PPM
-30	950.002 650	+1.21
-20	950.002 840	+1.41
-10	950.002 911	+1.49
0	950.002 853	+1.42
10	950.002 433	+0.98
20	950.001 918	+0.44
30	950.001 514	+0.01
40	950.001 602	+0.11
50	950.001 535	+0.04

RESULTS OF MEASUREMENTS: The maximum frequency variation over the temperature range +1.4 ppm.

This unit is powered by AC mains. No frequency variation was noted over a +/- 15% variation in the input voltage.

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TEST EQUIPMENT LIST

1. Spectrum Analyzer: HP 8566B-Opt 462, S/N 3138A07786, w/ preselector HP 85685A, S/N 3221A01400, Quasi-Peak Adapter HP 85650A, S/N 3303A01690 & Preamplifier HP 8449B-OPT H02, S/N 3008A00372
2. Biconnical Antenna: Eaton Model 94455-1, S/N 1057,
3. Biconnical Antenna: Electro-Metrics Model BIA-25, S/N 1171
4. Log-Periodic Antenna: Electro-Metrics Model EM-6950, S/N 632
5. Log-Periodic Antenna: Electro-Metrics Model LPA-30, S/N 409
6. Double-Ridged Horn Antenna: Electro-Metrics Model RGA-180, 1-18 GHz, S/N 2319
7. 18-26.3GHz Systron Donner Standard Gain Horn #DBE-520-20
8. Horn 40-60GHz: ATM Part #19-443-6R
9. Line Impedance Stabilization Network: Electro-Metrics Model EM-7820, w/NEMA Adapter S/N 2682
10. Temperature Chamber: Tenney Engineering Model TTRC, S/N 11717-7
11. Frequency Counter: HP Model 5385A, S/N 3242A07460
12. Peak Power Meter: HP Model 8900C, S/N 2131A00545
13. Open Area Test Site #1-3meters
14. Signal Generator: HP 8640B, S/N 2308A21464
15. Signal Generator: HP 8614A, S/N 2015A07428
16. Passive Loop Antenna: EMC0 Model 6512, 9KHz to 30MHz, S/N 9706-1211
17. Dipole Antenna Kit: Electro-Metrics Model TDA-30/1-4, S/N 153
18. AC Voltmeter: HP Model 400FL, S/N 2213A14499
19. Digital Multimeter: Fluke Model 8012A, S/N 4810047
20. Digital Multimeter: Fluke Model 77, S/N 43850817
21. Oscilloscope: Tektronix Model 2230, S/N 300572

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NAME OF TEST: POWER LINE CONDUCTED INTERFERENCE

RULES PART NUMBER: 15.107

MINIMUM REQUIREMENTS:	FREQUENCY <u>MHz</u>	LEVEL <u>uV</u>
	0.450-30	250

TEST PROCEDURE: ANSI STANDARD C63.4-1992

THE HIGHEST EMISSION READ FOR LINE 1 WAS 48.358 uV @ 570 kHz.

THE HIGHEST EMISSION READ FOR LINE 2 WAS 9.109 uV @ 17.94 MHz.

THE FOLLOWING GRAPHS REPRESENT THE EMISSIONS READ FOR POWERLINE CONDUCTED FOR THIS DEVICE.

TEST RESULTS: Both lines were observed. The measurements indicate that the unit appear to meet the FCC requirements for this class of equipment.

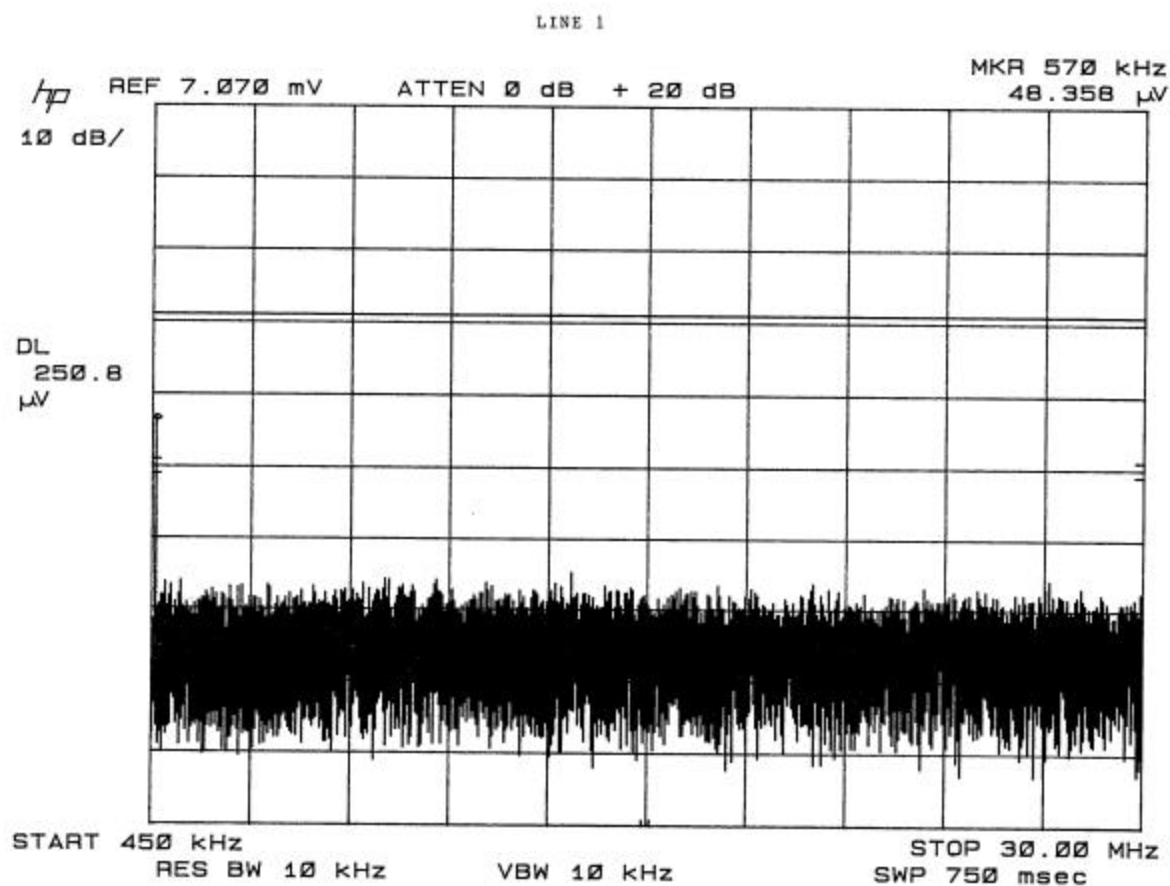
PERFORMED BY: JOE SCOGLIO

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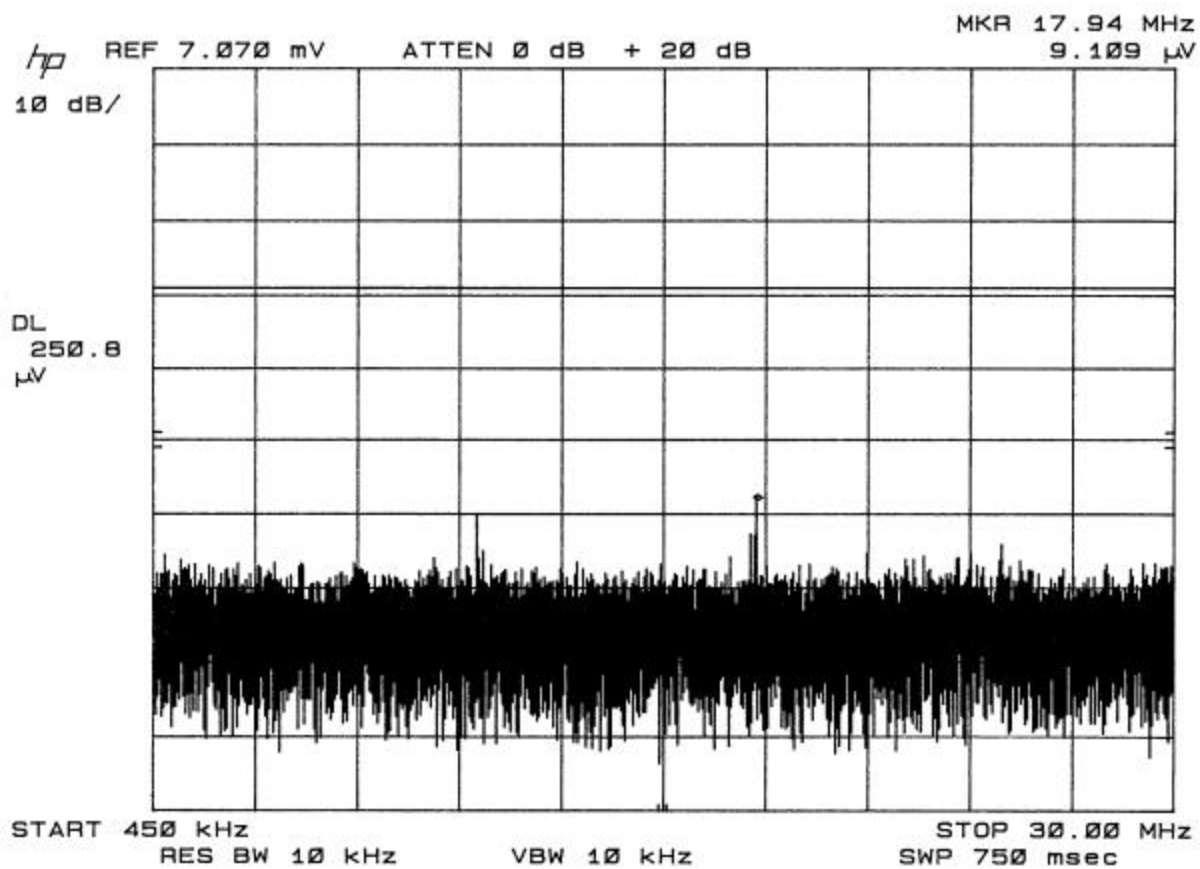
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LINE 2



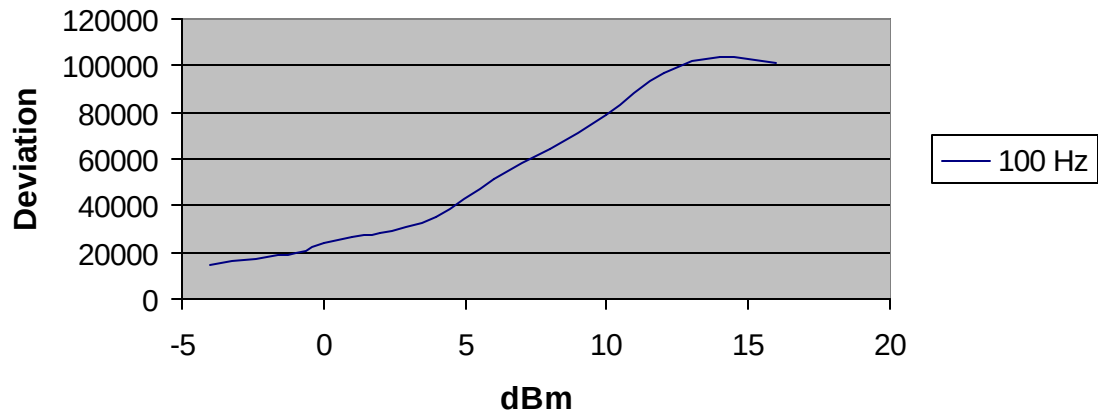
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Modulation Limiting
Broadcast Electronics, Inc.
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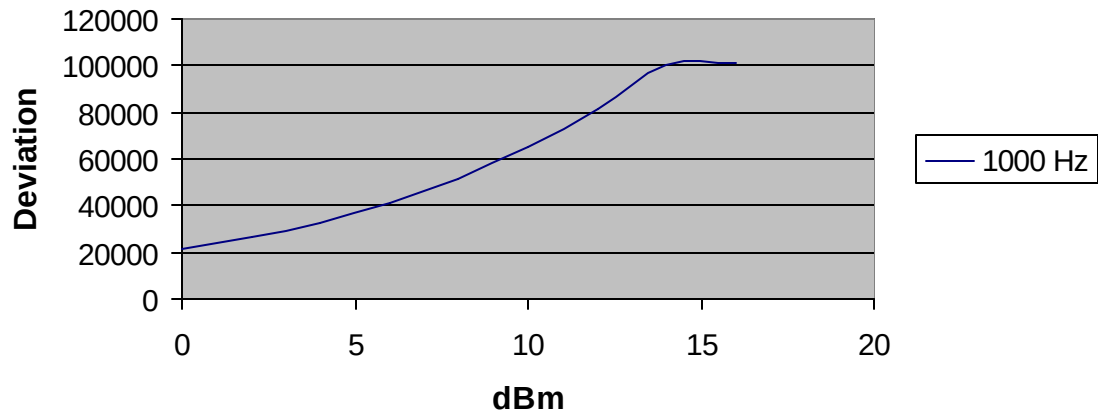


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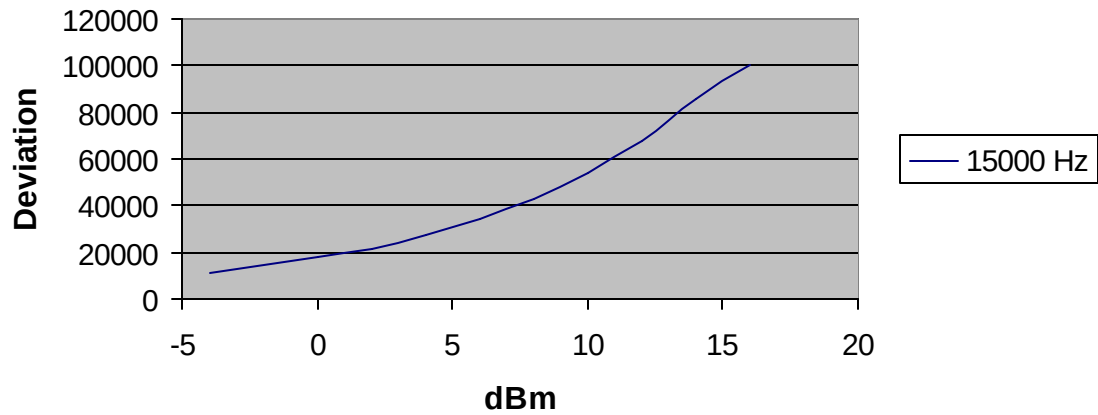
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