



***WIFC/WDEZ/WHRM
Rib Mountain
Spurious Emission and
Intermodulation Report***

October 16, 2003

Presented by:

Ralph E. Evans
Evans Associates
210 S. Main Street
Thiensville, WI 53092
262-242-6000 Phone ♦ 262-242-6045 Fax
iii@evansassoc.com
www.evansassoc.com



Rib Mountain Spurious and Intermodulation Report

Abstract

This engineering statement has been prepared by Ralph E. Evans, of Evans Associates, TeleCommunications Consultants in Thiensville, Wisconsin, on behalf of Midwest Communications Incorporated, licensee of FM stations WIFC and WDEZ in Wausau, Wisconsin, and the Educational Communications Board, licensee of FM station WHRM also assigned to Wausau. The purpose of this document is to demonstrate compliance with the FCC's spectral purity emission requirements as specified in the construction permits of these three stations by documenting a lack of harmful intermodulation and spurious products as radiated from the new antenna.

Description of Facilities

WIFC, WDEZ and WIFC have each moved their operations to a new tower and transmitter facility at the top of Rib Mountain near Wausau, and are now sharing a combined 10-bay 3-around panel antenna. WHRM operates on 90.9 MHz., WIFC operates on 95.5 MHz., and WDEZ operates on 101.5 MHz; these three stations are multiplexed into the panel antenna using an ERI 3-station cavity combiner.

Readings and Analysis

The three stations were activated into the antenna for the first time on October 8, 2003. The old antenna facility was maintained until fine adjustments were completed on October 13, 2003. The readings tabulated and analyzed in this exhibit are divided into two parts:

1. Spectrum Analyzer Measurements: These measurements were taken using a portable broadband Singer Antenna and a Tektronix 7L13 Spectrum Analyzer.
2. IM Field Strength Measurements: These measurements were taken at the combiner output using a Potomac FIM 71 field strength meter.

The following persons took the readings described in this document on October 8, 2003:

1. Spectrum Analyzer Measurements (Attachment 1): Mr. Nels Harvey of Evans Associates
2. IM Field Strength Measurements (Attachment 2): Mr. Jeff Taylor of Electronics Research, Inc.

1. Attachment 1: Spectrum Analysis

Attachment #1 shows digital photographs of the far-field spectrum analysis. These displays were taken across the range from 0.1 to 150 MHz. to demonstrate a lack of spurious and harmonic emissions. The spurious analysis included all stations currently mounted on the Rib mountain

tower, including a low-power translator at 91.9 MHz.. Figure 13, attached, shows a photograph of the 3-station combiner network.

The table below describes the purpose of each spectrograph, along with the results of the analysis:

Picture #	Description	Analysis
1	Existing Spectrum, no transmitters on	No spurious Signals Noted
2	Existing Spectrum – close in detail	No spurious Signals Noted
3	Existing spectrum - Wide band	No spurious Signals Noted
4	WHRM On – 10 MHz/div	No spurious Signals Noted
5	WHRM On – 5 MHz./div (close in)	No spurious Signals Noted
6	WHRM On – 50 MHz./div Wideband	No spurious Signals Noted
7	WHRM & WIFC - 10 MHz./div	No spurious Signals Noted
8	WHRM & WIFC – 5 MHz./div	No spurious Signals Noted
9	WHRM & WIFC – 50 MHz./div	No spurious Signals Noted
10	All Transmitters – 10 MHz./div	No spurious Signals Noted
11	All Transmitters – 5 MHz./div	No spurious Signals Noted
12	All Transmitters – 50 MHz./div	No spurious Signals Noted
13	Peak Display showing 91.9 Translator	No spurious Signals Noted

It is the conclusion of this engineer that the new 3-station facility is operating within the terms and conditions of applicable FCC Rules and Regulations.

2. Attachment 2: Intermodulation Study

The Electronics Research field team conducted the IM portion of the site proof. The full report is attached hereto as Attachment #2. The table below shows the results of the FIM IM field measurements:

Table 3 Intermodulation Measurements

Product Frequency (MHz)	Carrier Frequency (MHz)	Interfering Frequency (MHz)	Pad (dB)	Bandpass Filter Loss (dB)	Full Scale Range (dBμ)	Scale reading (dB)	Adjusted Level (dBμ)	Carrier Reference Level (dBμ) (See Table 1)	Level Referenced to Carrier (dB)
79.9	90.9	101.9	3	11.5	20	-14.3	20.2	133.5	113.3
86.3	90.9	95.5	3	10.2	20	-8.2	25.0	133.5	108.5
89.1	95.5	101.9	3	10.7	20	<-20	13.7	133.3	119.6
89.9	90.0	91.9	3	10.2	20	-3.0	30.2	133.5	103.3
99.1	95.5	91.9	3	10.0	20	-8.1	24.9	133.3	108.4
100.1	95.5	90.9	3	9.1	20	-1.7	30.4	133.3	102.9
108.3	101.9	95.5	3	9.8	20	-14.8	18.0	132.7	114.7
111.9	101.9	91.9	3	9.6	20	<-20	12.6	132.7	120.1
112.9	101.9	90.9	3	9.8	20	-8.5	24.3	132.7	108.4



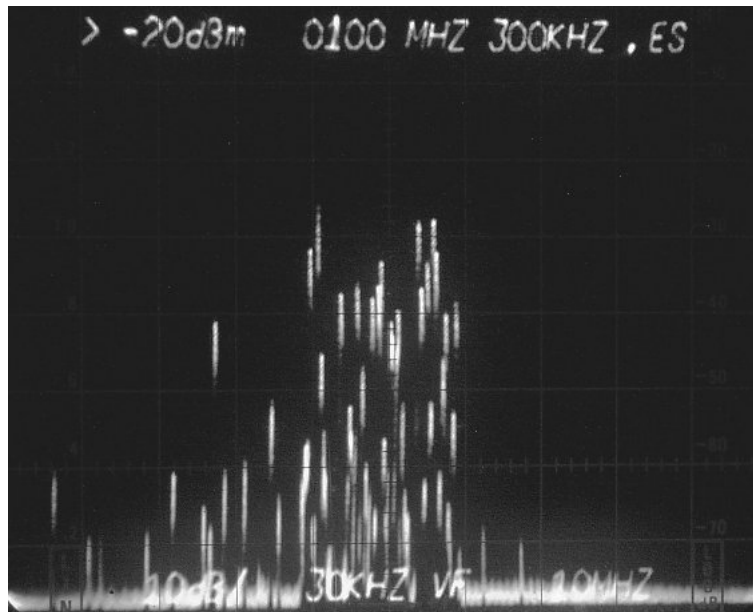
Rib Mountain Spurious and Intermodulation Report

As a result of these measurements, both the antenna manufacturer and this engineer agree that there are no measurable frequency components that exceed FCC limits.

Respectfully Submitted,

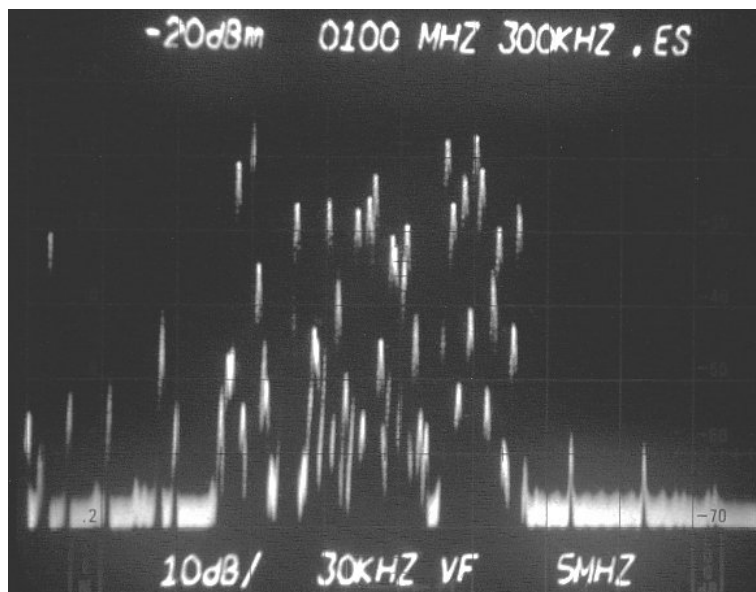
Ralph E. Evans
Communications Consultant

Spectrographic Measurements – Attachment 1-1



Picture 1

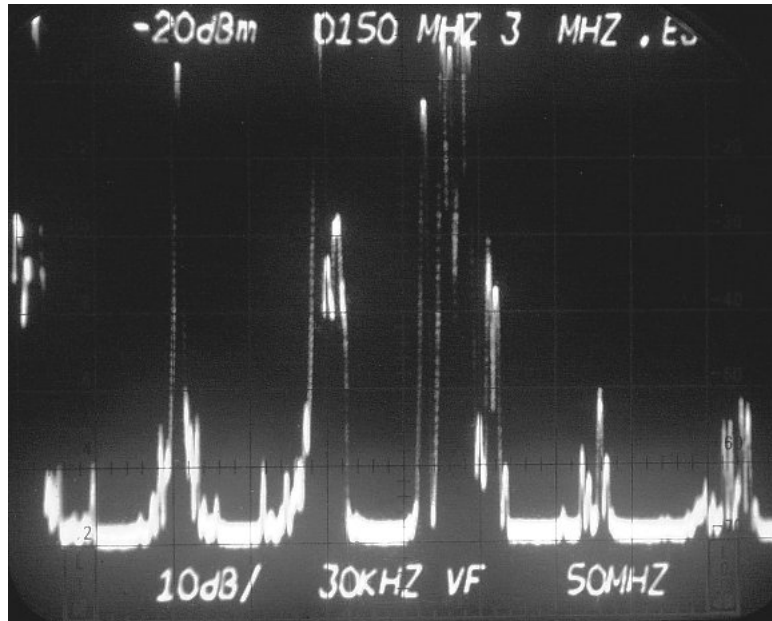
Existing Spectrum with no Transmitters on/ Center 100 MHz at 10 MHz per Division



Picture 2

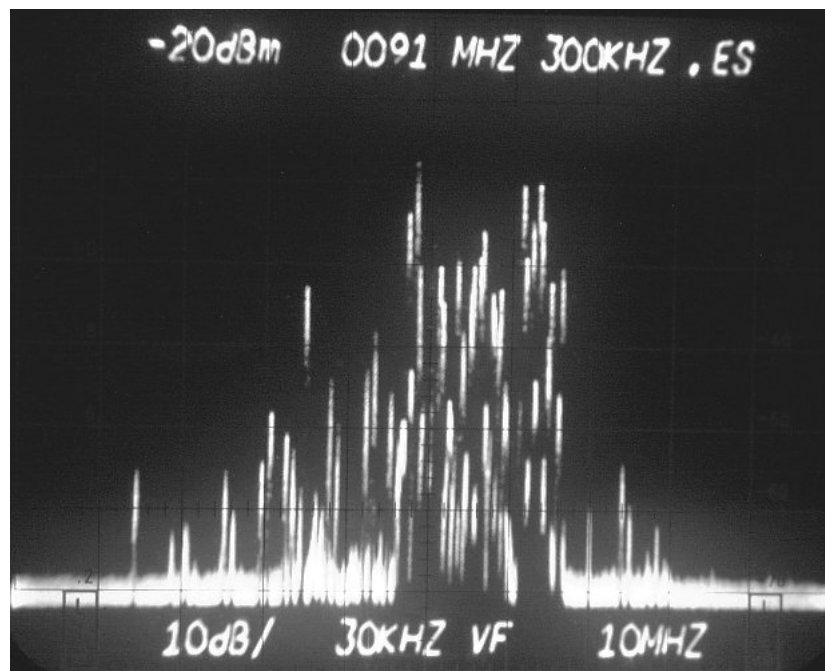
Existing Spectrum with no Transmitters on/ Center 100 MHz at 5 MHz per Division

Spectrographic Measurements – Attachment 1-2



Picture 3

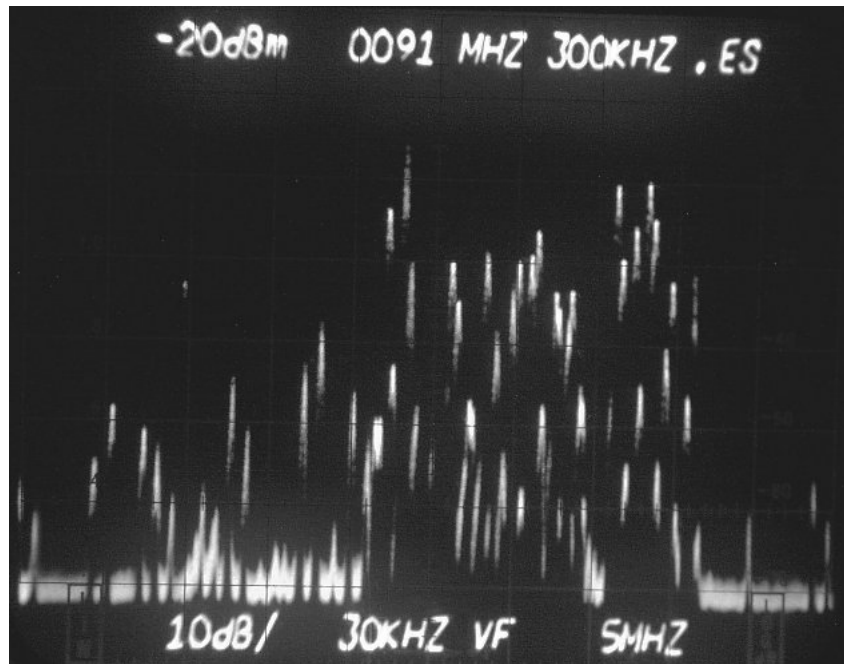
Existing Spectrum with no Transmitters on/Center 150 MHz at 50 MHz per Division



Picture 4

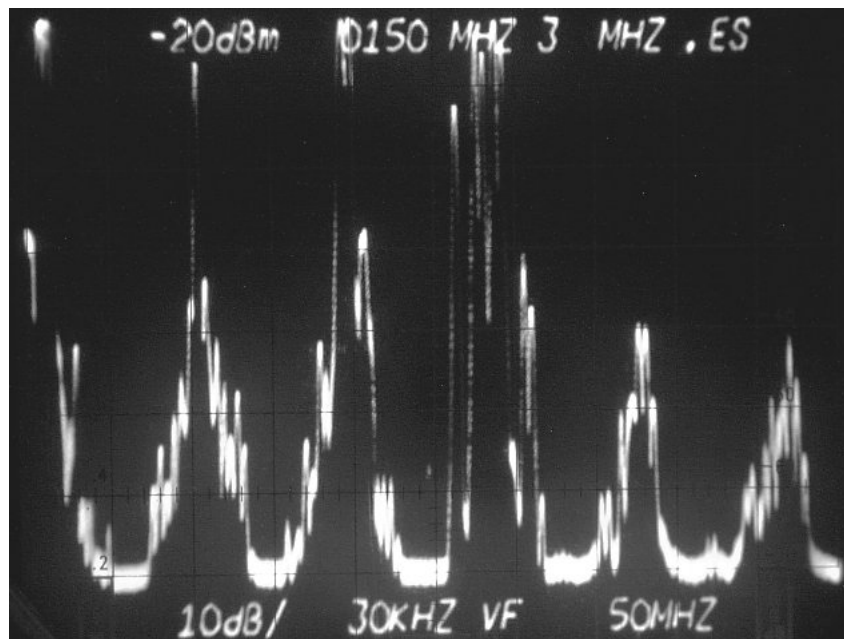
Existing Spectrum with 90.9 Transmitter on/Center 91 MHz at 10 MHz per Division

Spectrographic Measurements – Attachment 1-3



Picture 5

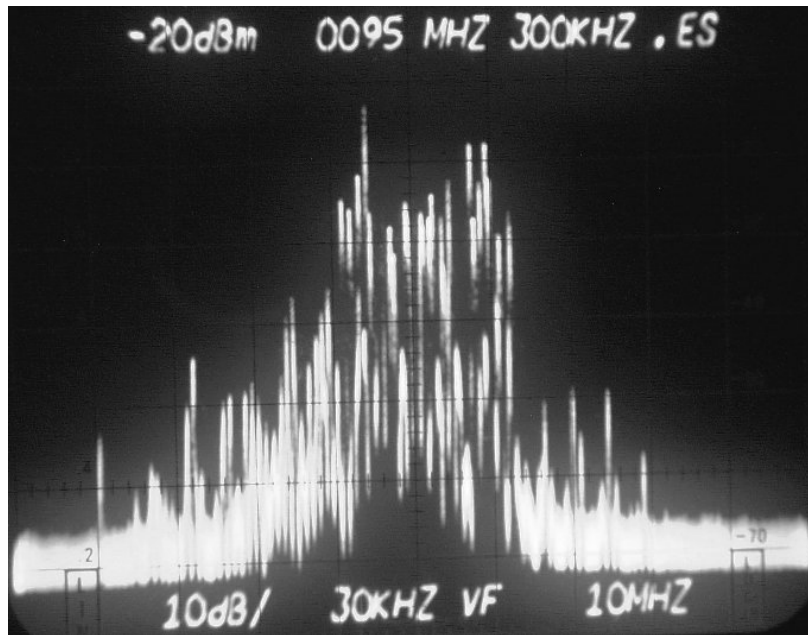
Spectrum with 90.9 Transmitter on/Center 91 MHz at 5 MHz per Division



Picture 6

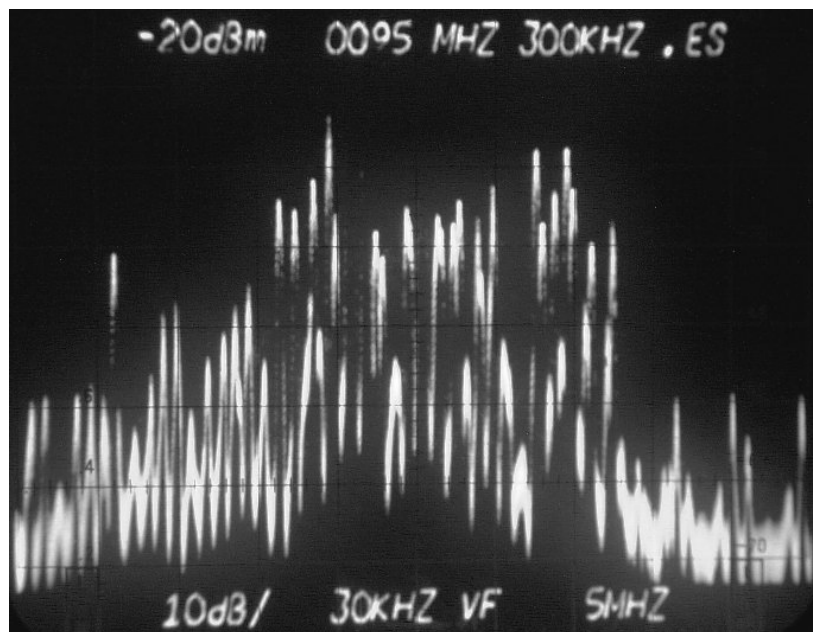
Spectrum with 90.9 Transmitter on/Center 150 MHz at 50 MHz per Division

Spectrographic Measurements – Attachment 1-4



Picture 7

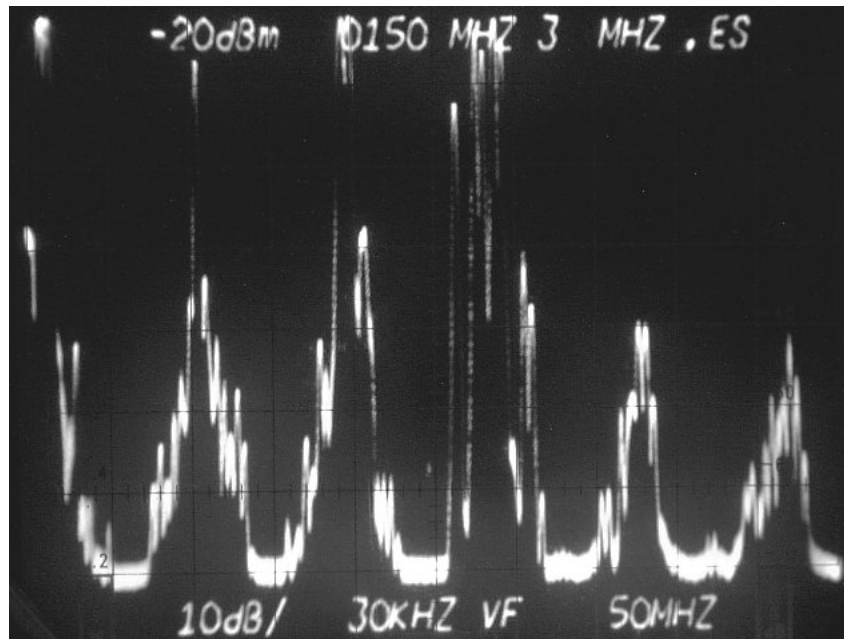
Spectrum with 90.9 and 95.5 Transmitters on/Center 95 MHz at 10 MHz per Division



Picture 8

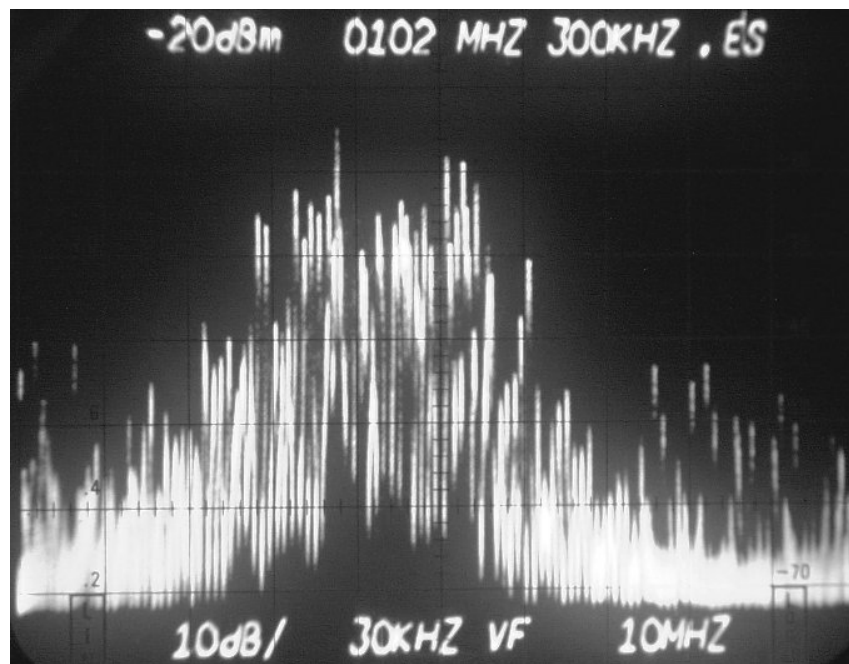
Spectrum with 90.9 and 95.5 Transmitters on/Center 95 MHz at 5 MHz per Division

Spectrographic Measurements – Attachment 1-5



Picture 9

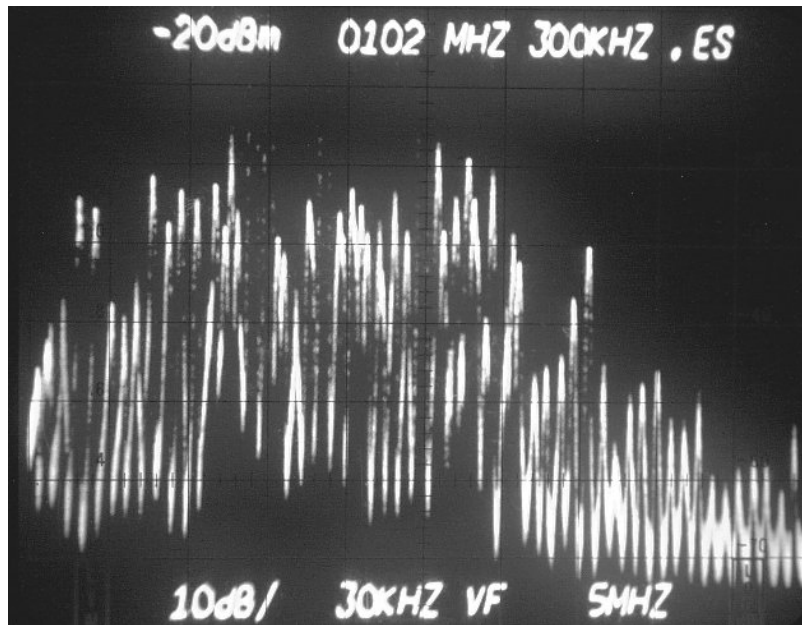
Spectrum with 90.9 and 95.5 Transmitters on/Center 150 MHz at 50 MHz per Division



Picture 10

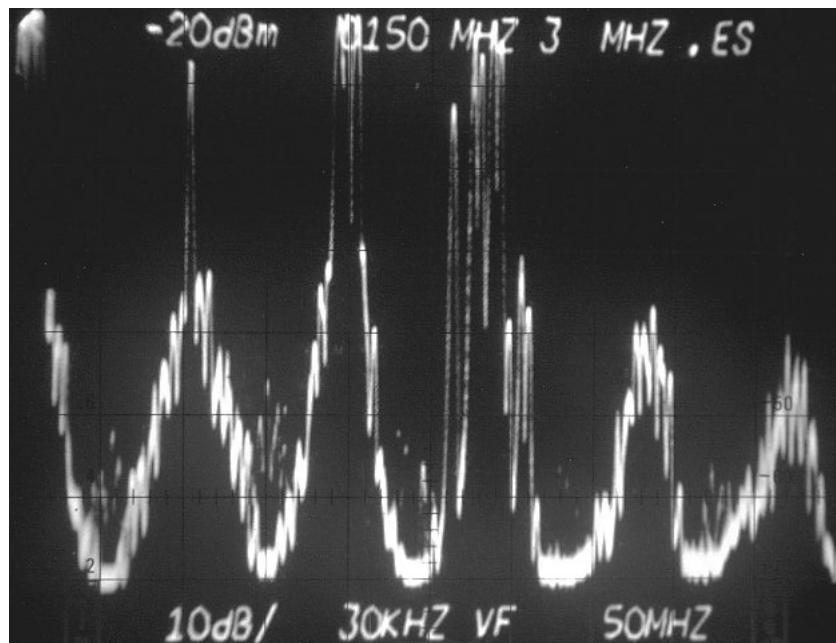
Spectrum with all Transmitters on/Center 102 MHz at 10 MHz per Division

Spectrographic Measurements – Attachment 1-6



Picture 11

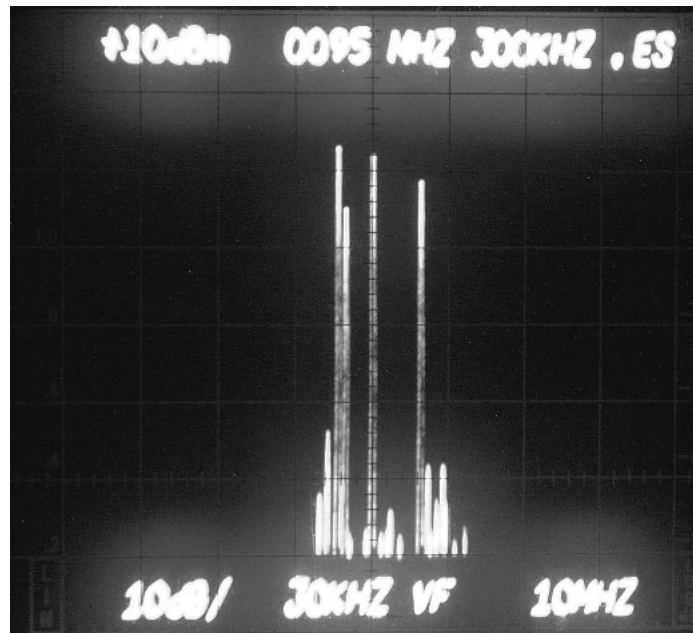
Spectrum with all Transmitters on/Center 102 MHz at 5 MHz per Division



Picture 12

Spectrum with all Transmitters on/Center 150 MHz at 50 MHz per Division

Spectrographic Measurements – Attachment 1-7



Picture 13

Display of Transmitters at their Peaks/Peak 91.9 not part of study



Picture 14

Combiner Network