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## ENGINEERING REPORT:

# INTERMODULATION MEASUREMENTS ON COMBINED FM ANTENNA SYSTEM

IDS Building Minneapolis, Minnesota

June 2000

## INTRODUCTION

Spectrum measurements intended to detect unwanted intermodulation products were made on the combined FM antenna system located on the IDS Building, Minneapolis, Minnesota. These were made between 8:00 p.m. and 1:00 a.m. on the night of the 9<sup>th</sup> and morning of the 10<sup>th</sup> of June 2000. The measurements were made with all eight stations operating into the combined Shively Lindenblad master antenna. This transmitting facility will be used as an auxiliary facility. All stations were operating with licensed power with normal modulation while measurements were being made. Spectrum measurements were made to confirm that all operating stations comply with "*§73.317 FM Transmission System Requirements*" as required by the Construction Permits and to assure that the combiner was operating correctly.

## STATIONS

The following stations will operate an auxiliary transmitting facility at this site.

Call	Frequency	Power (ERP)
KQRS	92.5 MHz	36.6 kW
KXXR	93.7 MHz	37.4 kW
KTCZ	97.1 MHz	40.0 kW
KTIS	98.5 MHz	37.7 kW
KSJN	99.5 MHz	40.0 kW
WLOL	100.3 MHz	31.0 kW
KDWB	101.3 MHz	40.0 kW
KEEY	102.1 MHz	40.0 kW
WXPT	104.1 MHz	34.0 kW

## COMBINED ANTENNA MEASUREMENTS PROCEDURE

The measurements were made using a Hewlett Packard 8591E Spectrum Analyzer from the directional coupler sample port (50 dB) in the combined transmission line. A tunable

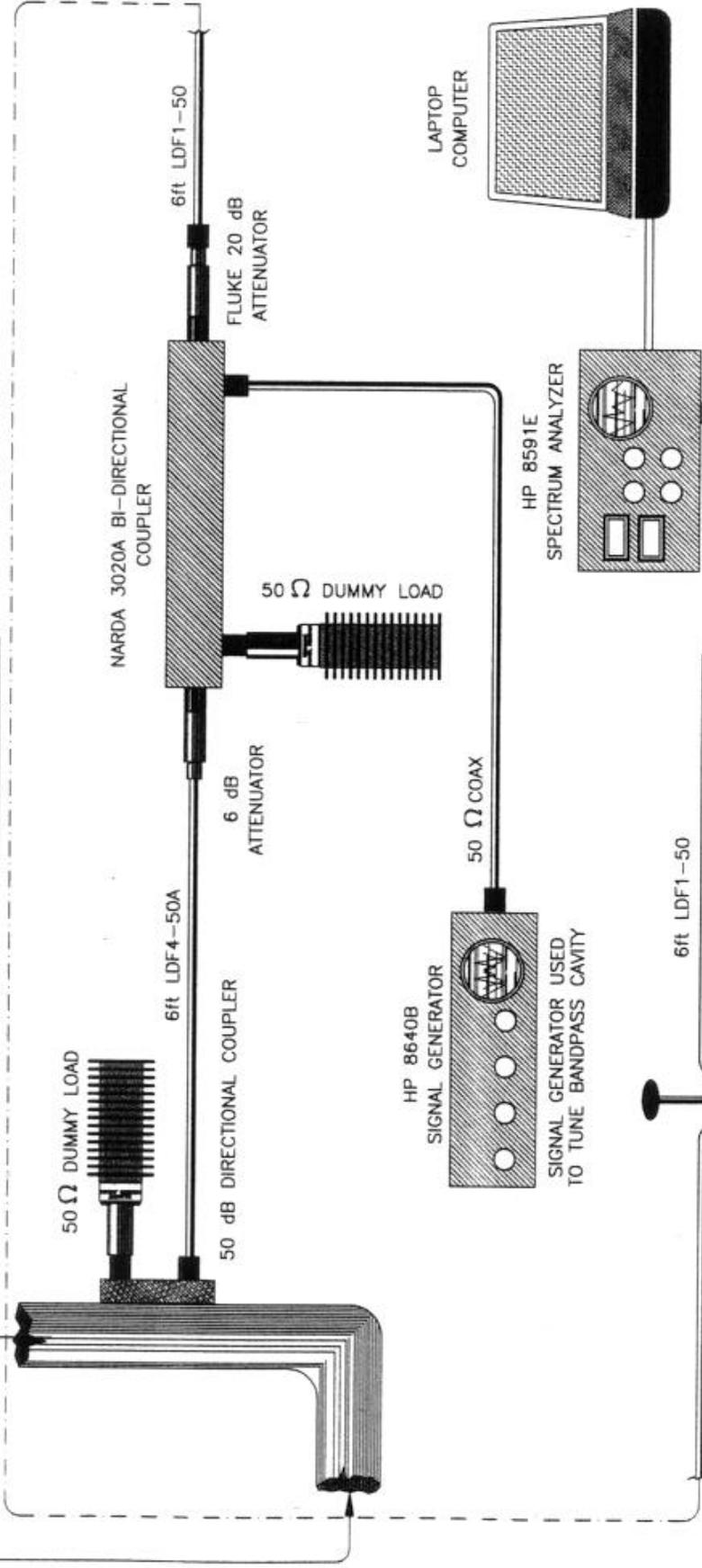
bandpass cavity with a 26 dB of attenuation was used to make measurements at levels more than 80 dB below the FM signals. An additional 8 dB attenuator was used to assure that the Spectrum Analyzer was not producing any internal intermodulation products. A Hewlett Packard 8640B Signal Generator was connected to a Narda 3020A Bi-Directional Coupler to tune the bandpass cavity to the desired frequency. See enclosed Test Setup Diagram.

The bandpass cavity was tuned to the frequency of each of the predicted intermodulation products. Measurements were made on each potential intermodulation product frequencies from 88 MHz to 108 MHz (2A-B and 3A-2B). Frequencies above 108 MHz were swept for any observable intermodulation products. For products that were close in frequency to operating transmitters, the specific carriers were turned off to observe these intermodulation products. Enclosed are the spectral graphs of the measurements. There were no harmonics or mix products that exceed the requirements as set forth in §73.317.

KQRS	92.5 MHz	36.6 kW
KXXR	93.7 MHz	37.4 kW
KTCZ	97.1 MHz	40.0 kW
KTIS	98.5 MHz	37.7 kW
KSJN	99.5 MHz	40.0 kW
WLOL	100.3 MHz	31.0 kW
KDWB	101.3 MHz	40.0 kW
KEYE	102.1 MHz	40.0 kW
WXPT	104.1 MHz	34.0 kW

COMBINED FM SIGNALS

LINDENBLAD ANTENNA FEEDLINE



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SCHEMATIC DIAGRAM  
IDS ANTENNA SYSTEM TEST SETUP  
IDS BUILDING  
MINNEAPOLIS, MN  
6/2000

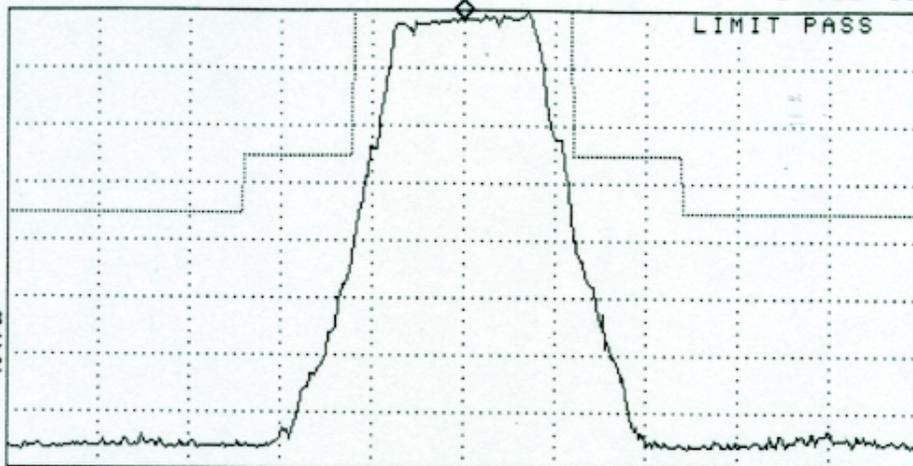
18:05:29 JUN 09, 2000

REF -12.5 dBm AT 10 dB

MKR 92.500 MHz  
-14.22 dBm

PEAK  
LOG  
10  
dB/

MA SB  
SC FC  
CORR



CENTER 92.500 MHz  
RES BW 10 kHz

VBW 10 kHz

SPAN 1.000 MHz  
SWP 30.0 msec

RT

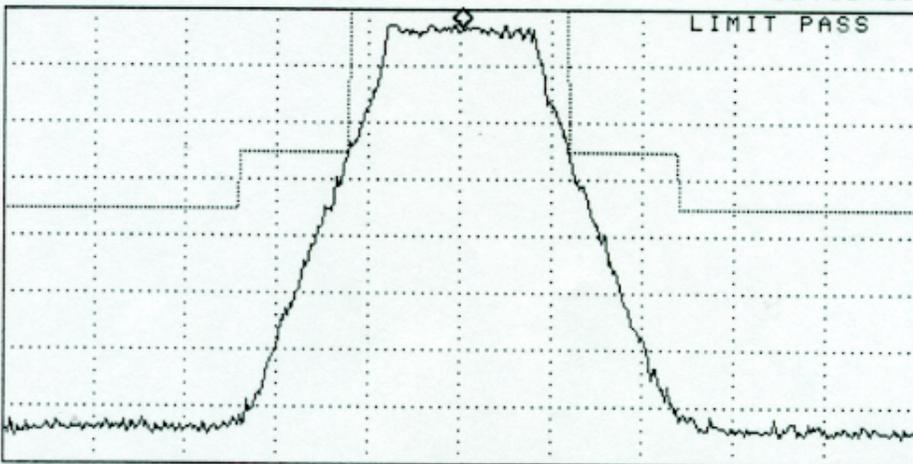
20:11:05 JUN 09, 2000

REF -18.0 dBm AT 10 dB

MKR 93.702 MHz  
-21.02 dBm

PEAK  
LOG  
10  
dB/

MA SB  
SC FC  
CORR



CENTER 93.700 MHz  
RES BW 10 kHz

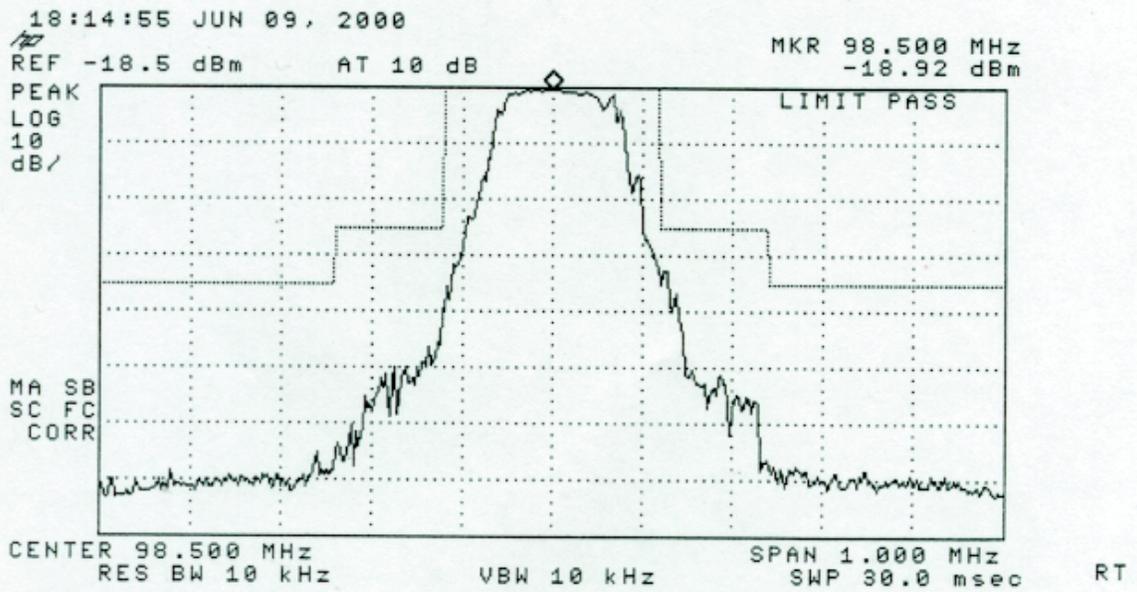
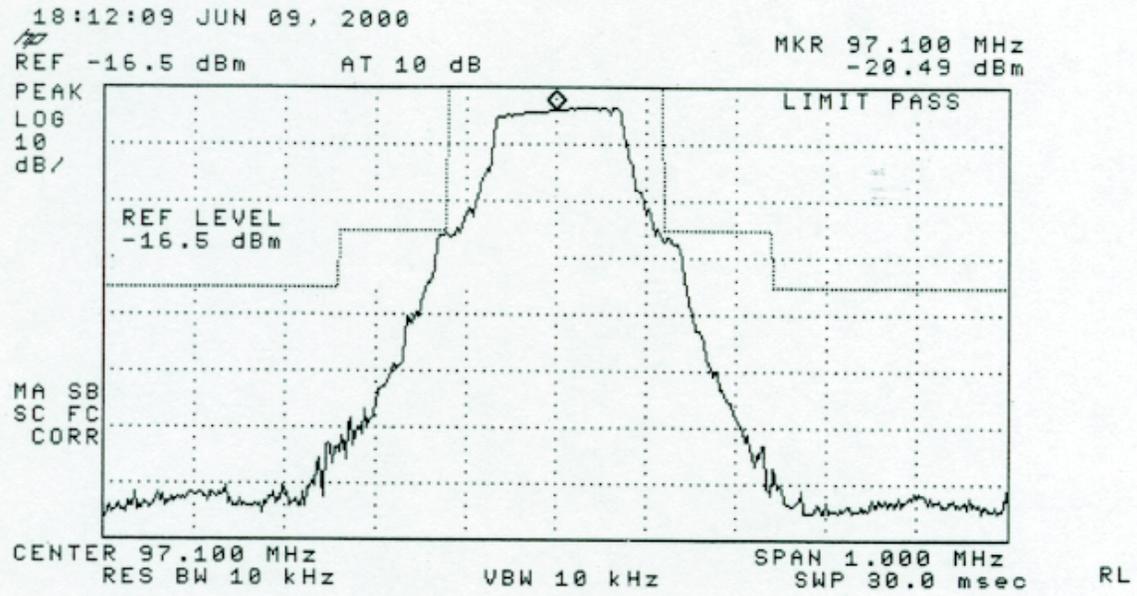
VBW 10 kHz

SPAN 1.000 MHz  
SWP 30.0 msec

RT

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KQRS AND KXXR  
REFERENCE STATION SIGNALS  
IDS BUILDING MINNEAPOLIS, MN JUNE 2000



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KTCZ AND KTIS  
REFERENCE STATION SIGNALS

IDS BUILDING

MINNEAPOLIS, MN

JUNE 2000

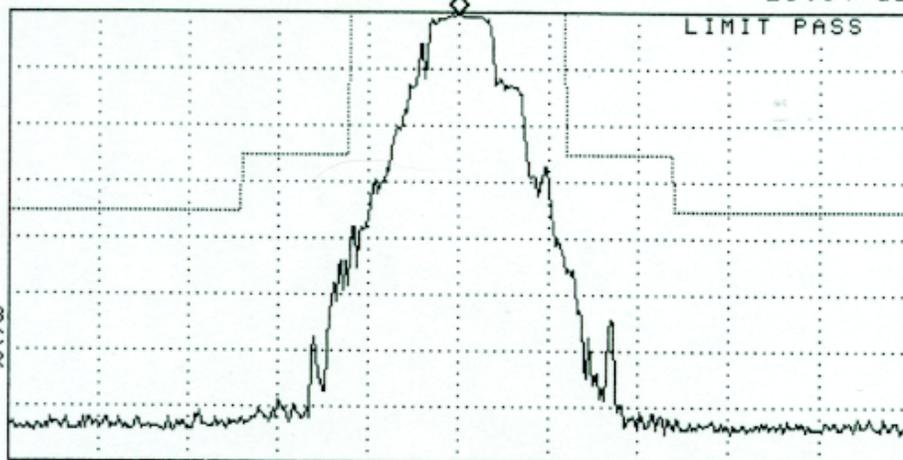
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REF -17.5 dBm AT 10 dB

MKR 99.500 MHz  
-18.04 dBm

PEAK  
LOG  
10  
dB/

MA SB  
SC FC  
CORR



CENTER 99.500 MHz  
RES BW 10 kHz

VBW 10 kHz

SPAN 1.000 MHz  
SWP 30.0 msec

RL

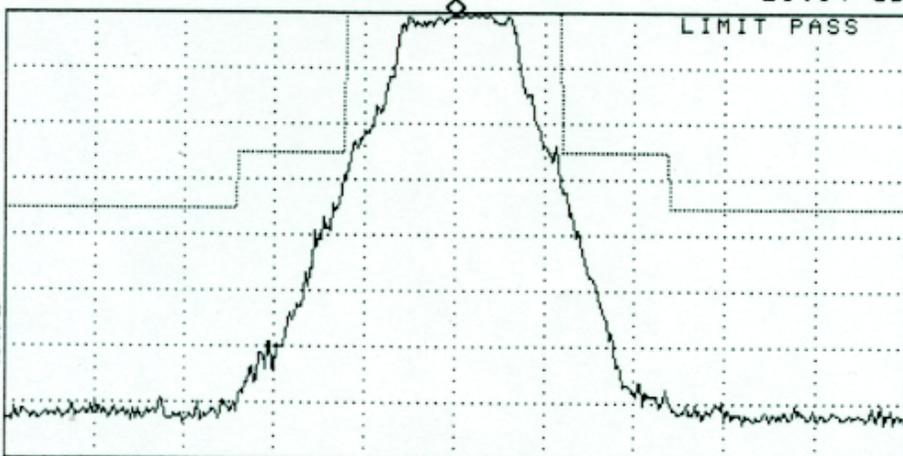
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REF -19.5 dBm AT 10 dB

MKR 100.300 MHz  
-20.34 dBm

PEAK  
LOG  
10  
dB/

MA SB  
SC FC  
CORR



CENTER 100.300 MHz  
RES BW 10 kHz

VBW 10 kHz

SPAN 1.000 MHz  
SWP 30.0 msec

RL

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KSJN AND  
REFERENCE STATION SIGNALS  
IDS BUILDING MINNEAPOLIS, MN JUNE 2000

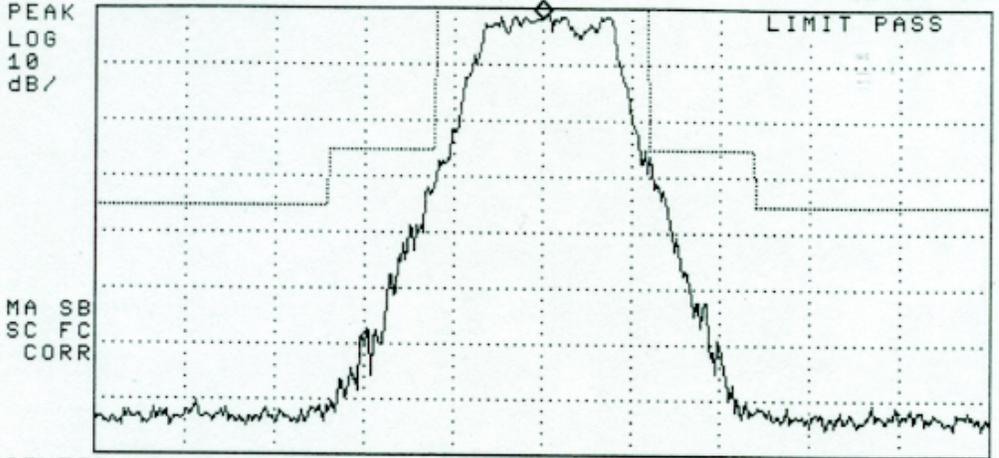
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REF -19.5 dBm AT 10 dB

MKR 101.300 MHz  
-21.36 dBm

PEAK  
LOG  
10  
dB/

MA SB  
SC FC  
CORR



CENTER 101.300 MHz  
RES BW 10 kHz

VBW 10 kHz

SPAN 1.000 MHz  
SWP 30.0 msec

RT

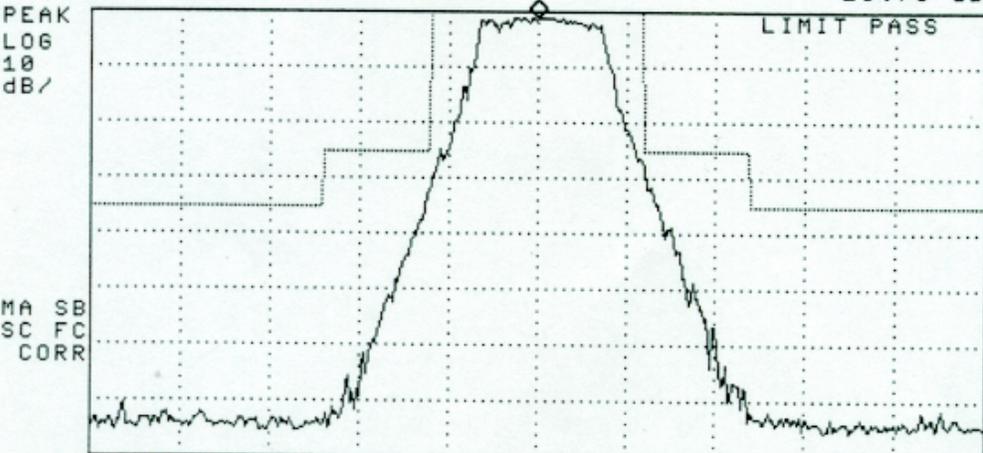
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REF -18.5 dBm AT 10 dB

MKR 102.100 MHz  
-19.76 dBm

PEAK  
LOG  
10  
dB/

MA SB  
SC FC  
CORR



CENTER 102.100 MHz  
RES BW 10 kHz

VBW 10 kHz

SPAN 1.000 MHz  
SWP 30.0 msec

RT

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KDWB AND KEYE  
REFERENCE STATION SIGNALS  
IDS BUILDING MINNEAPOLIS, MN JUNE 2000

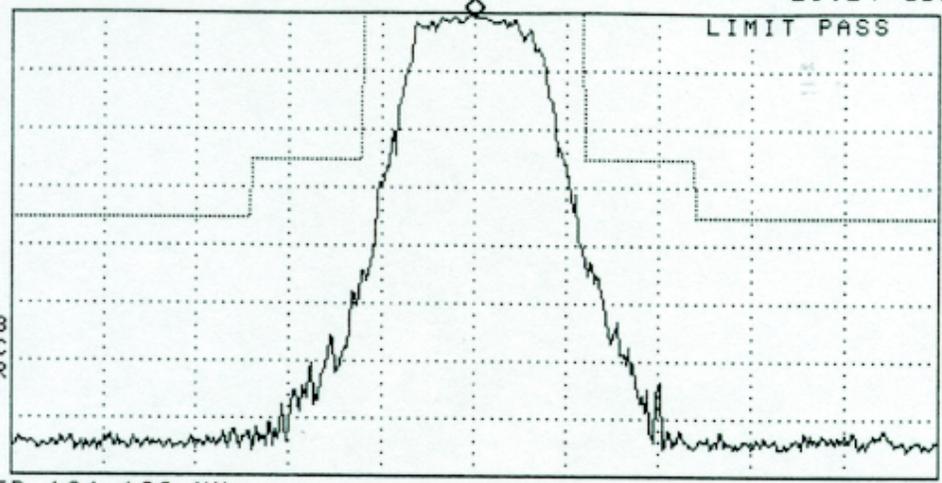
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REF -18.5 dBm AT 10 dB

MKR 104.100 MHz  
-19.14 dBm

PEAK  
LOG  
10  
dB/

MA SB  
SC FC  
CORR



CENTER 104.100 MHz  
RES BW 10 kHz

VBW 10 kHz

SPAN 1.000 MHz  
SWP 30.0 msec

RT

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CONSULTING ENGINEERS

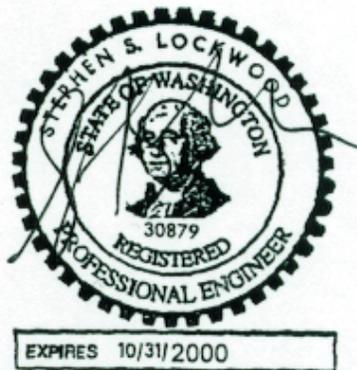
WXPT  
REFERENCE STATION SIGNALS  
IDS BUILDING MINNEAPOLIS, MN JUNE 2000

STATEMENT OF ENGINEER

This Engineering Report, which is part of an application for a license for auxiliary FM stations located on the IDS Building in Minneapolis, Minnesota, been prepared under my direct supervision. All representations contained herein are true to the best of my knowledge. I am an experienced radio engineer whose qualifications are a matter of record with the Federal Communications Commission. I am a partner in the firm of Hatfield and Dawson Consulting Engineers and am Registered as a Professional Engineer in the States of Washington and Alaska.

13 June 2000

Stephen S. Lockwood, P.E.



Hatfield & Dawson Consulting Engineers