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ENGINEERING REPORT:

INTERMODULATION MEASUREMENTS ON COMBINED JAMPRO FM ANTENNA SYSTEM

Prepared for
KAAZ-FM1 106.7 MHz

Lewis Peak, Coalville, Utah

Citicasters Licenses, Inc.

August 2015

INTRODUCTION

Spectrum measurements intended to detect unwanted intermodulation products (spurious emissions) were made on the combined FM Jampro antenna system located at the communications site on Lewis Peak, near Coalville, Utah. These were made between 4 p.m. and 7:00 p.m. on 4 August 2015. The measurements were made with all six booster stations listed below operating into the combined antenna system. KUER-FM2, also licensed on this system, was not operating. 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 ensure that the combiner was operating correctly.

STATIONS

The following stations will operate at this site.

Callsign	Frequency	Power (ERP)
KRCL-FM1	90.9 MHz	0.099 kW
KODJ-FM1	94.1 MHz	1.0 kW
KZHT-FM1	97.1 MHz	1.0 kW
KJMY-FM2	99.5 MHz	1.0 kW
KNRS-FM1	105.7 MHz	1.0 kW
KAAZ-FM1	106.7 MHz	1.0 kW

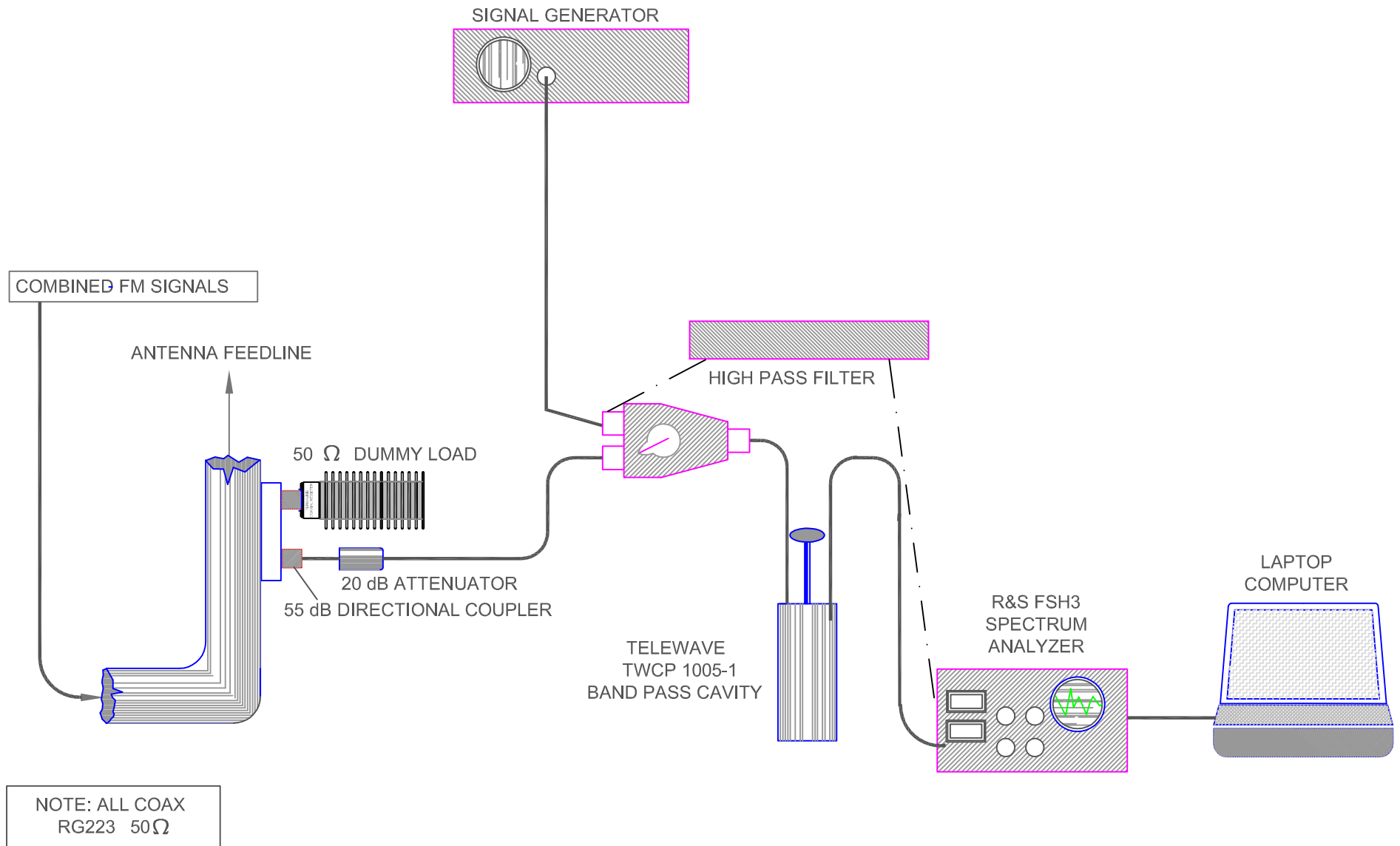
COMBINED ANTENNA MEASUREMENTS PROCEDURE

The measurements were made using a Rohde & Schwarz FSH3 Spectrum Analyzer from the directional coupler sample port (55 dB) in the combined transmission line. A tunable bandpass cavity with 25 dB of attenuation was used to make measurements at levels more than 80 dB below the FM signals. An additional filter and attenuators were used to ensure that the Spectrum Analyzer was not producing any internal intermodulation products. A Signal Generator with a RF switch was used to tune the bandpass cavity to the desired frequency. See Figure 1.

A Telewave TWPC1005-1 bandpass cavity was tuned to the frequency of each of the predicted intermodulation products to ensure that no intermodulation products were being produced in the spectrum analyzer. Measurements were made on each potential intermodulation product frequency from 85 MHz to 130 MHz ($2A \pm B$, $3A \pm B$ and $3A \pm 2B$). Additionally, several highpass filters were used for the measurements above the broadcast band. Frequencies above 130 MHz were swept for any observable intermodulation or harmonic products. For products that were close in frequency to operating transmitters, the specific carriers were turned off to observe these intermodulation products. Measurements were made with full FM modulation under normal programming. Enclosed are example spectral graphs of the measurements of the occupied bandwidth of each station. There were no harmonics or mix products that exceed the requirements as set forth in §73.317.

CONCLUSION

All of the stations at this facility comply with requirements set forth in §73.317.



STATEMENT OF ENGINEER

This Engineering Report, Intermodulation Measurements On Combined FM Antenna System at Lewis Peak, Salt Lake City, Utah, been prepared by me or 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, Alaska and Wyoming.

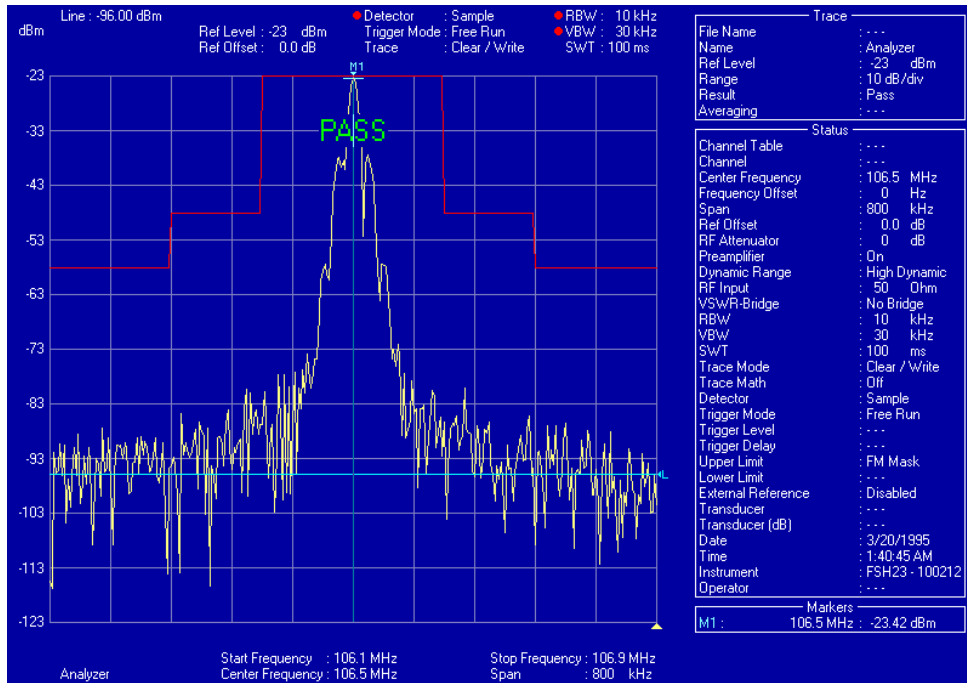
5 August 2015

Stephen S. Lockwood, P.E.

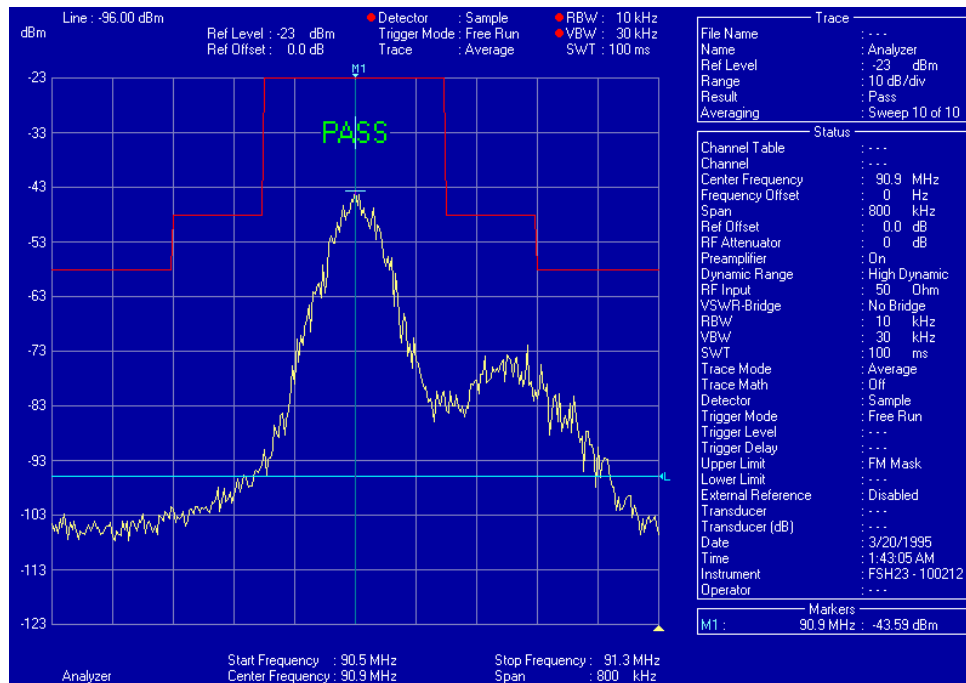


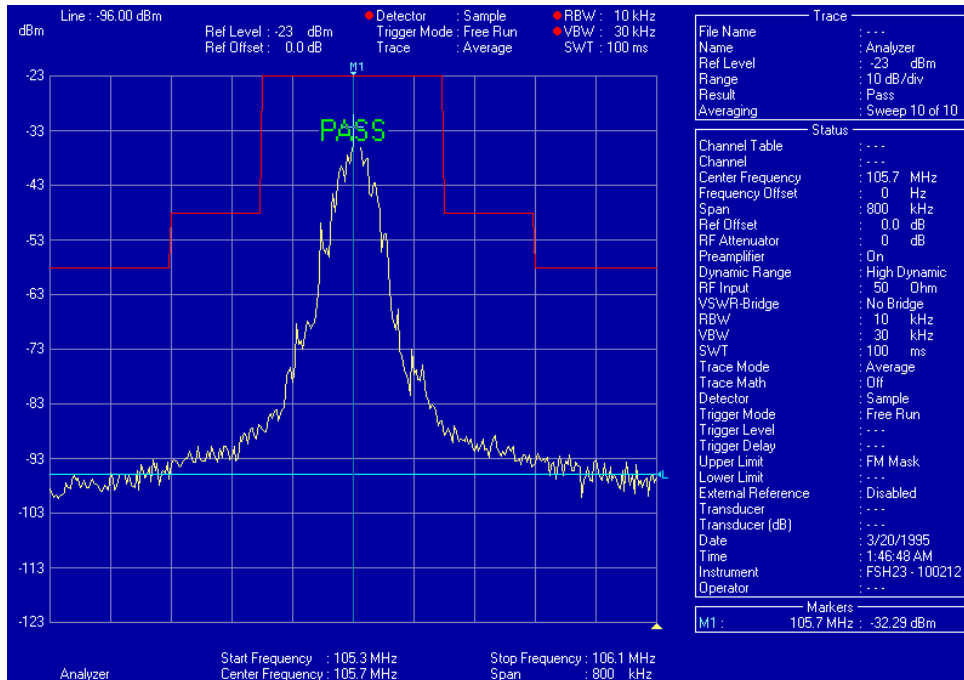
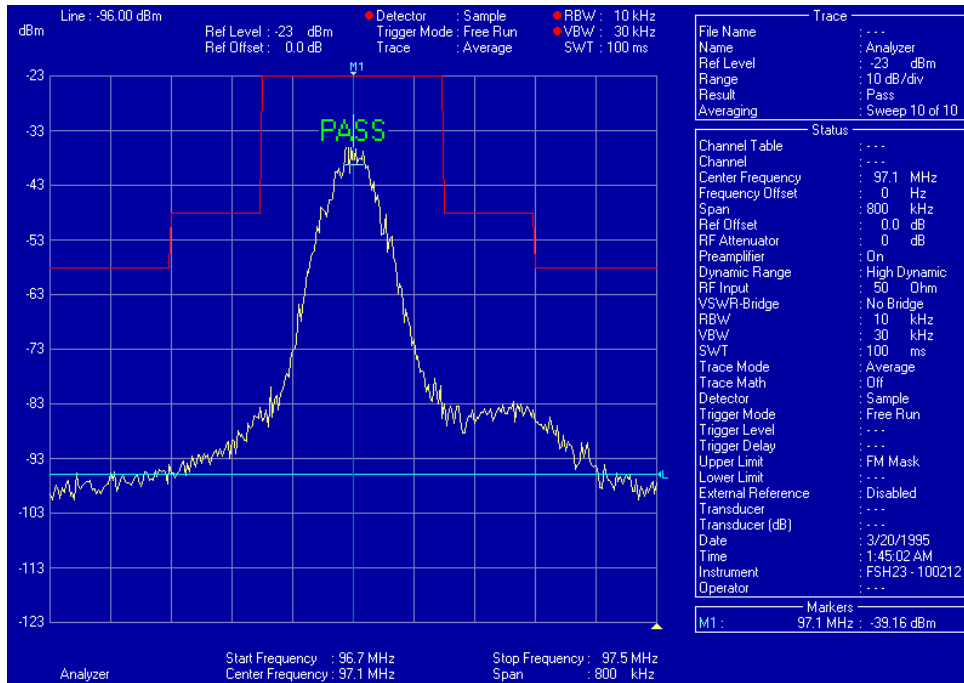
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Latitude: N 40-51-20
Longitude: W 111-28-48
Search Radius: 1 km

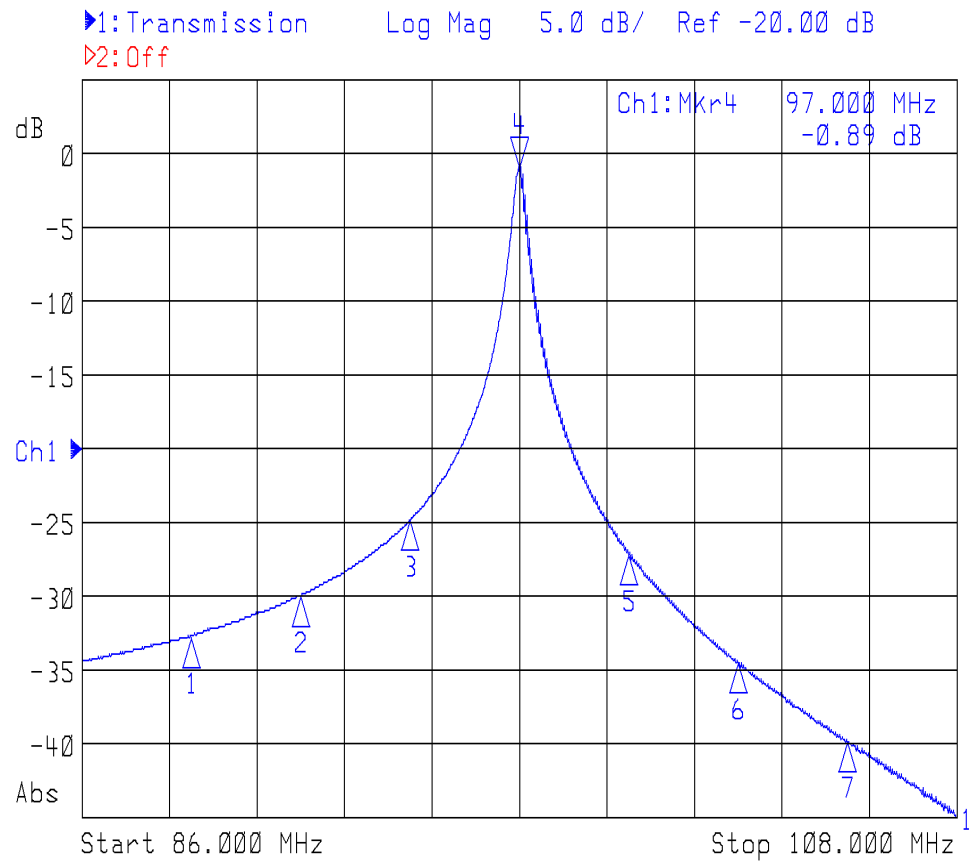
Call Status	City State	FCC File No.	Channel Freq.	ERP(kW) HAAT(m)	Latitude Longitude	Bearing deg-True	Distance kilometers
KUER-FM2PARK LIC	CITY UT	BLFTB00222ADD	211D 90.1	1.000 DA 0.0	40-51-20 111-28-48	0.0	0.00
KRCL-FM1PARK LIC	CITY UT	BLFTB80125ABT	215D 90.9	0.099 DA 0.0	40-51-20 111-28-48	0.0	0.00
KODJ-FM1PARK LIC	CITY UT	BLFTB70920ACA	231D 94.1	1.000 DA 0.0	40-51-20 111-28-48	0.0	0.00
KXRK-FM1PARK LIC	CITY UT	BLFTB50413ABZ	242D 96.3	1.300 DA 0.0	40-51-18 111-28-47	159.0	0.07
KZHT-FM1PARK LIC	CITY UT	BLFTB70920ACD	246D 97.1	1.000 DA 0.0	40-51-20 111-28-48	0.0	0.00
KBZN-FM1PARK LIC	CITY UT	BLFTB970925TI	250D 97.9	0.850 DA 819.0	40-51-18 111-28-47	159.0	0.07
KJMY-FM2PARK LIC	CITY UT	BLFTB70920ACB	258D 99.5	1.000 DA 0.0	40-51-20 111-28-48	0.0	0.00
KEGA-FM7PARK LIC	CITY UT	BLFTB51011ACR	268D 101.5	3.000 DA 0.0	40-51-18 111-28-47	159.0	0.07
KSQN-FM8PARK LIC	CITY UT	BLFTB41122AHY	276D 103.1	3.000 DA 0.0	40-51-18 111-28-47	159.0	0.07
KNRS-FM1PARK LIC	CITY UT	BLFTB20123AMZ	289D 105.7	1.000 DA 0.0	40-51-20 111-28-48	0.0	0.00
KAAZ-FM1PARK LIC	CITY UT	BLFTB70920ACC	293D 106.5	1.000 DA 0.0	40-51-20 111-28-48	0.0	0.00
KAAZ-FM1PARK CP	CITY UT	BPFTB50421AAV	294D 106.7	1.000 DA 0.0	40-51-20 111-28-48	0.0	0.00



Unmodulated Carrier

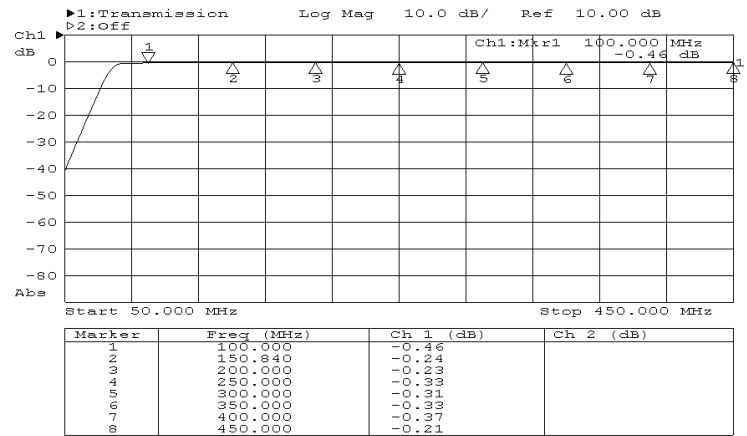




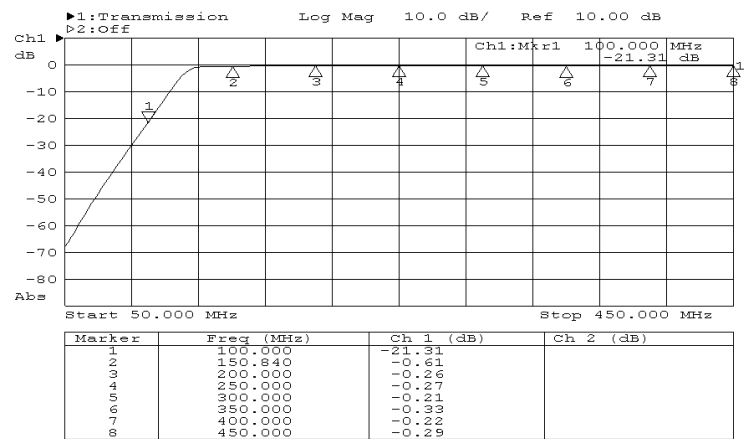


Marker	Freq (MHz)	Ch 1 (dB)	Ch 2 (swr)
1	88.750	-32.69	
2	91.500	-29.97	
3	94.250	-24.83	
4	97.000	-0.89	
5	99.750	-27.08	
6	102.500	-34.47	
7	105.250	-39.79	
8			

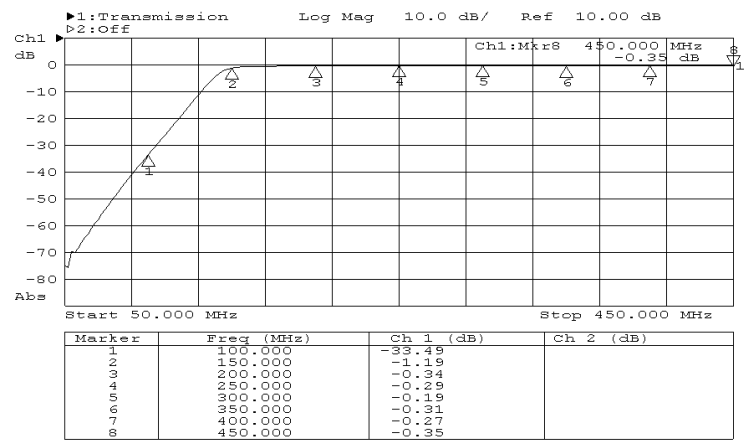
Telewave TWPC1005-1 bandpass cavity filter



Mini-Circuits BHP-100 Highpass Filter



Mini-Circuits BHP-150 Highpass Filter



Mini-Circuits BHP-175 Highpass Filter