

**Occupied Bandwidth Measurements
(FCC Rule 73.317)**

KUPL

Common Antenna and Combiner System

Sylvan Tower, Portland, Oregon

April 20, 2011

On April 20th, 2011, Boyd Broadcast Technical Services made measurements of KUPL (98.7 MHz), Portland, Oregon, to show compliance with FCC Rule 73.317. The measurements described here were made following the addition of KUPL to a multi-station combiner and master antenna. All stations at the site were operating with their authorized facilities at the time of the measurements. KUPL is one of five FM broadcast stations operating from this system at the Sylvan tower facility in Portland, Oregon. The other stations are KXL-FM (101.1 MHz), Portland, Oregon, KINK (101.9 MHz), Portland, Oregon, KLTH (106.7 MHz), Lake Oswego, Oregon and KXJM (107.5 MHz), Banks, Oregon.

Other stations operate from this same site. Three non-commercial FM stations are combined into a common antenna at a lower elevation on this same tower. They are KBVM (88.3 MHz), Portland, Oregon, KMHD (89.1 MHz), Gresham, Oregon, and KQAC (89.9 MHz), Portland, Oregon. The site also has a tower immediately adjacent (approximately 60 feet) to the KXJM facility. A low power FM translator is located at the site. It is K240CZ, (95.9 MHz) Tigard, Oregon, and an am station, KUFO, (970 kHz) Portland, Oregon, is also located at the site.

Also co-located at the site, are five television stations. They are KRCW-LP, Channel 5, Portland, Oregon, KNMT, Channel 24, Portland, Oregon, KRCW-TV, Channel 33, Salem, Oregon, KOIN, Channel 40, Portland, Oregon, and KATU, Channel 43, Portland, Oregon.

In addition several other sites are near (within 5 km) the Sylvan site with other FM and TV broadcast transmitters.

All measurements were made at a forward port of a Dielectric directional coupler located in line following the multi-station combining system and prior to the facility's common antenna system. This directional coupler exhibits the usual 6 dB per octave rise in response.

A coaxial attenuator was inserted ahead of the Agilent E4402B spectrum analyzer (Serial Number MY44221068), which was used for the measurements. A total of 10 dB of external attenuation was used to make the reference measurement of KUPL. The amplitude calibration of the instrument was electronically adjusted to account for this attenuation.

This attenuation was removed for all other measurements. This reduction in the amount of attenuation provides the necessary dynamic range for the spectrum analyzer to observe any spurious signals. Also double cavity notch filters, one for each of the five stations were inserted in cascade ahead of the spectrum analyzer to prevent signal overload and subsequent erroneous intermodulation products. The amplitude versus frequency response of these filters is shown on pages three, four and five of this report.

The filters, Model 6367-2, are manufactured by Microwave Filter Company, Inc. The attenuator is a precision device manufactured by Coaxial Dynamics. All cables are constructed of high quality, 100% shielded coaxial cable with premium connectors. Adapter connectors used are also premium quality. A block diagram of the measurement setup is shown on page eleven and photographs of the complete test setup are shown on pages twelve and thirteen.

Signals measured by the Agilent E4402B spectrum analyzer are digitized in the analyzer. Data was collected for a short period using the instrument's peak-hold feature. The data for the reference plot was collected over an approximate 10 minute period. Other measurements were collected for several minutes each. This was done to observe possible short duration signals.

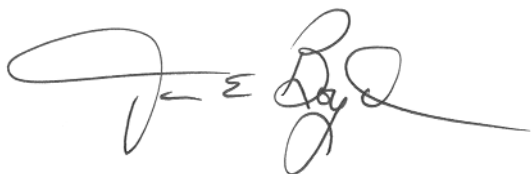
Data from these plots was saved in the analyzer's hard drive, then converted to .GIF files and downloaded into a computer for viewing and analysis (and to provide the plots shown in this report). The Agilent analyzer collected 401 data points over the instrument's selected frequency span for these measurements.

The reference plot for KUPL is shown on page five. With notch filters for the five stations in line to the spectrum analyzer, the FM band and the spectrum from 9 kHz through 1100 MHz was examined. Data plots of the observed spectrum are shown on pages six through ten.

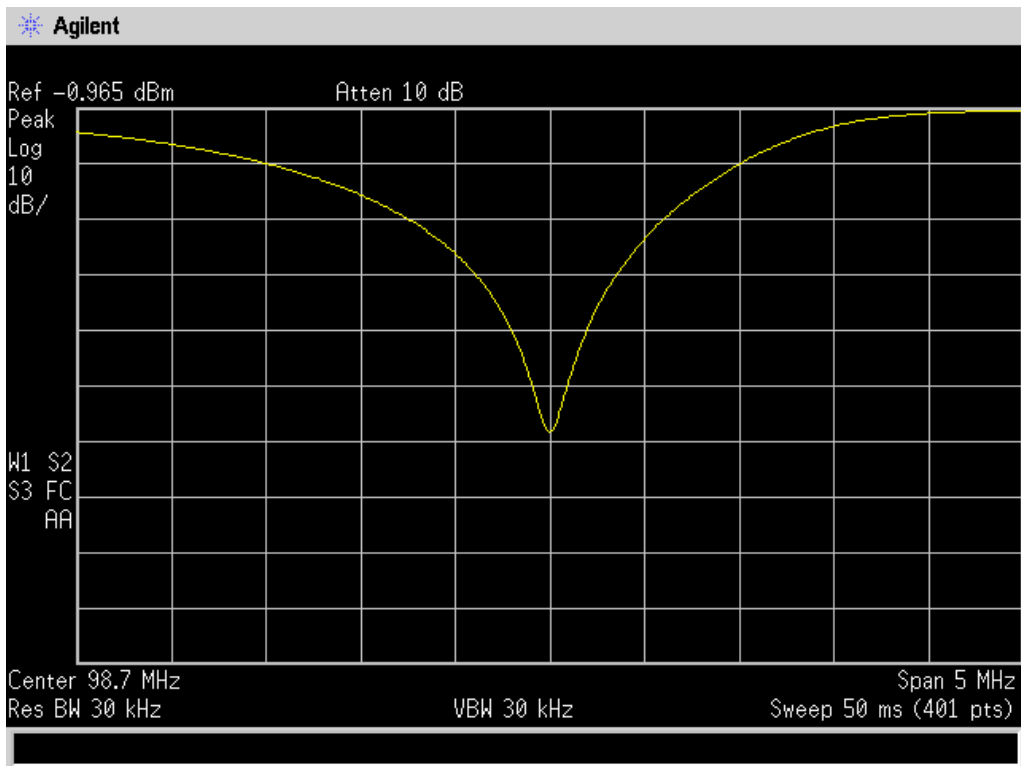
Several signals were discovered. All of these signals were identified, and all were below the FCC limit of -80 dB referenced to the peak carrier level of the station being studied and taking into account the rising response characteristic of the directional coupler. It is believed that most of these signals were coming back down the transmission line from the common antenna and some were perhaps the result of instrument and/or cabling pickup in the room. Some other broadcast stations from nearby sites were also seen at this directional coupler port. **No harmonic emissions or other spurious emissions from KXJM at levels less than 80 dB below the fundamental carrier frequency were observed.** It is believed that KXJM is in full compliance with section 73.317 of the commission's rules. A copy of the pertinent sections of this rule can be found on page fourteen.

All information contained in this report was gathered by James E. Boyd, who has experience making these kinds of measurements and whose qualifications are a matter of record with the Federal Communications Commission.

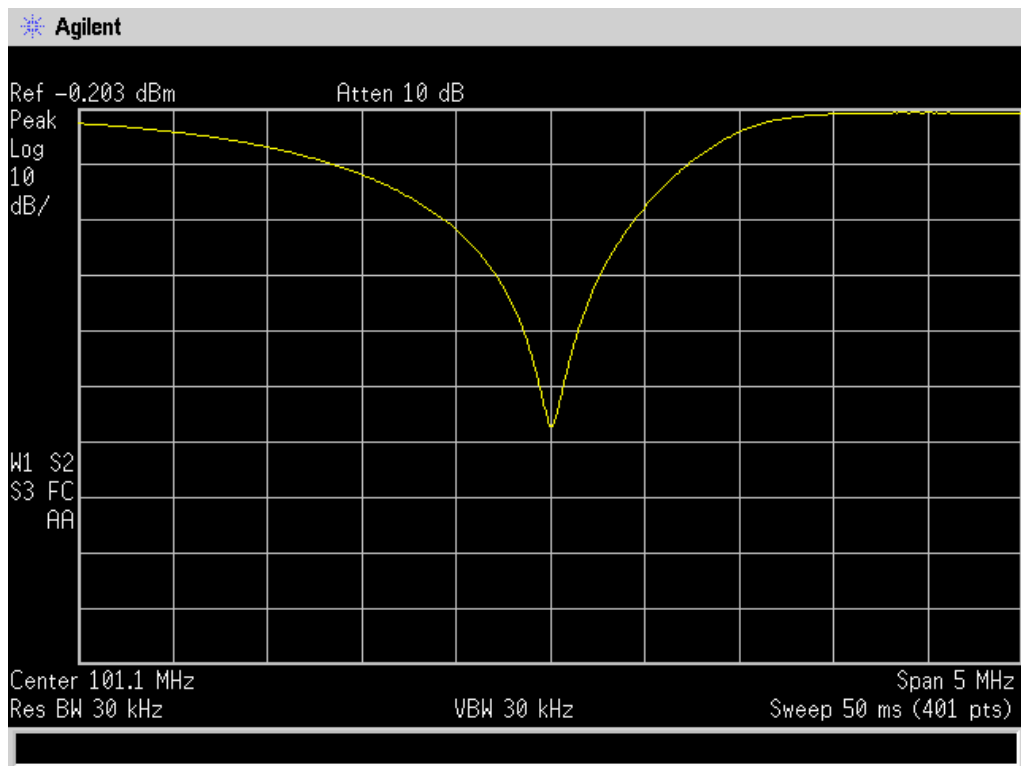
Respectfully Submitted,

A handwritten signature in black ink, appearing to read 'J.E. Boyd', with a long horizontal line extending to the right.

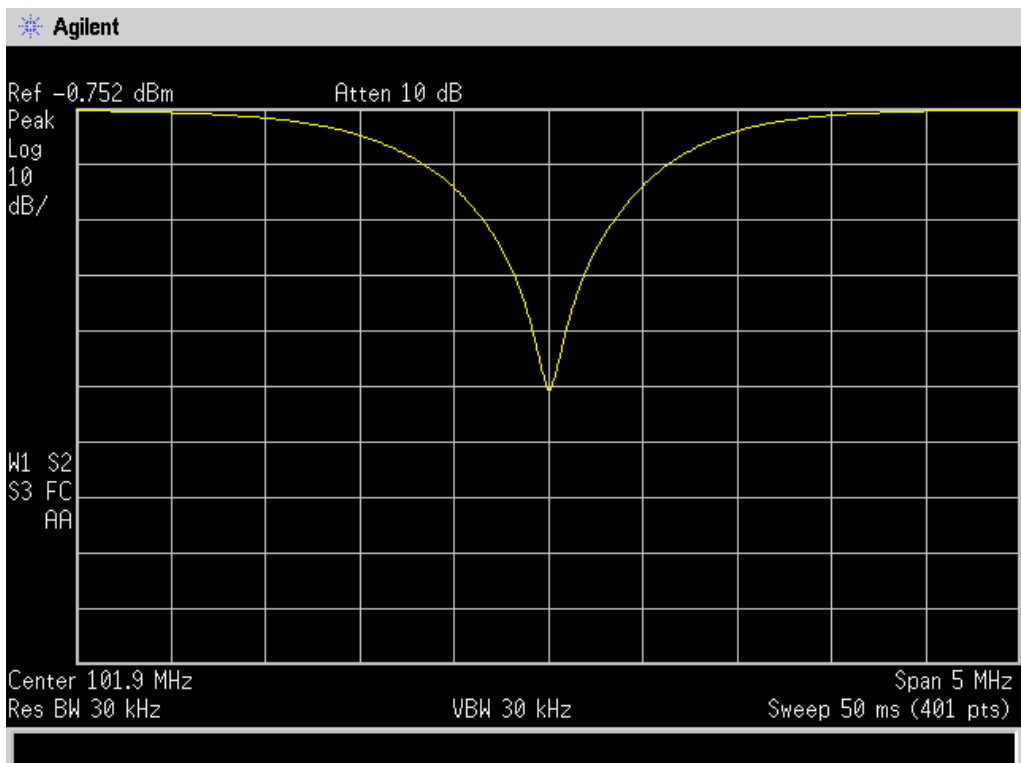
James E. Boyd
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21818 SW Columbia Circle
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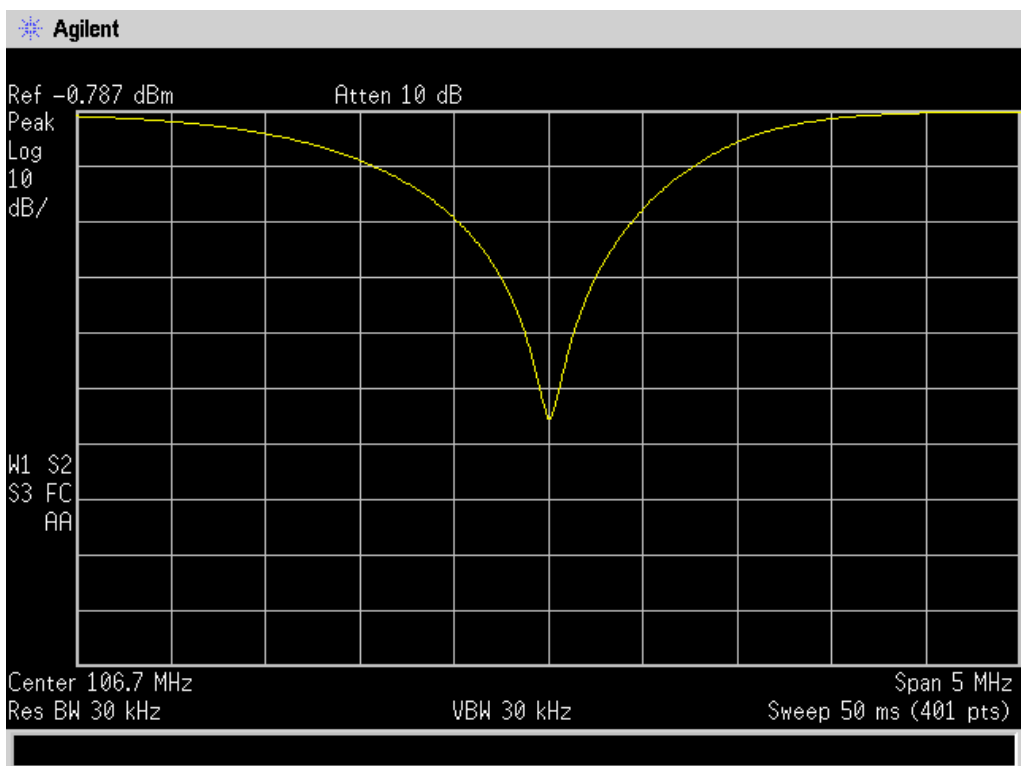
98.7 MHz Notch Filter



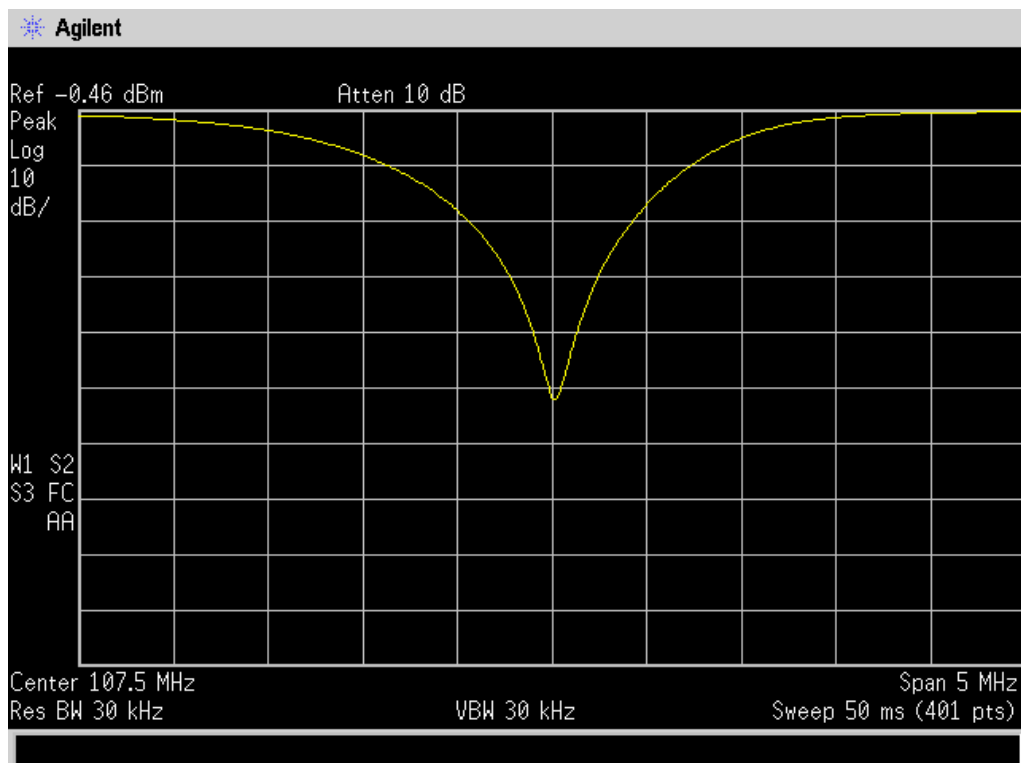
101.1 MHz Notch Filter



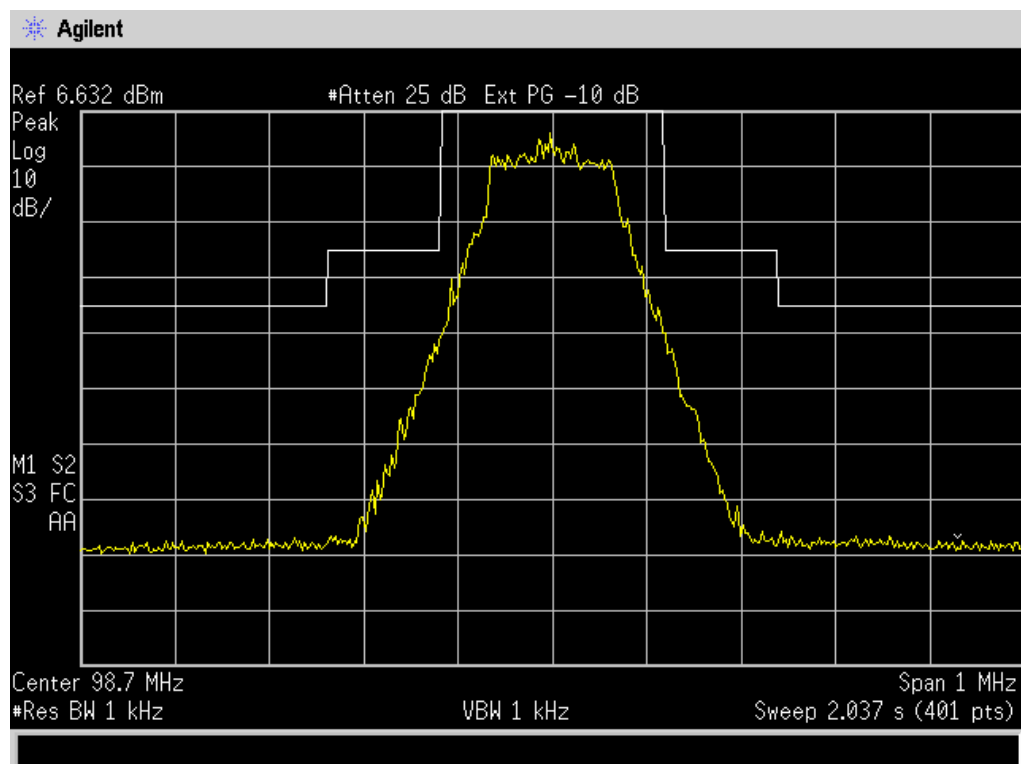
101.9 MHz Notch Filter



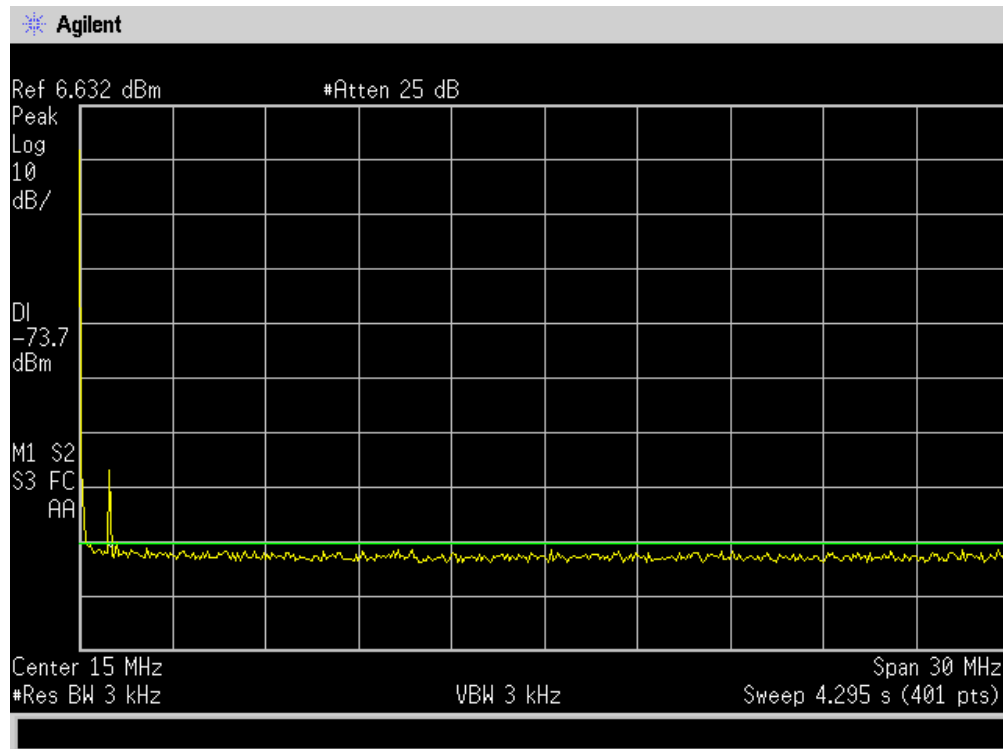
106.7 MHz Notch Filter



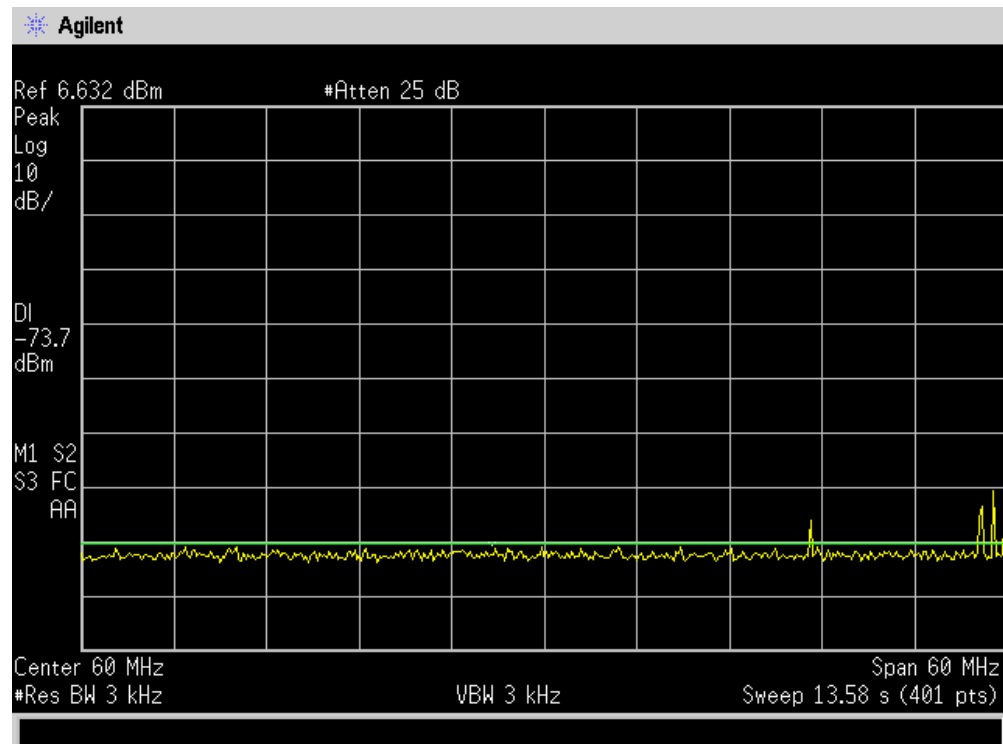
107.5 MHz Notch Filter



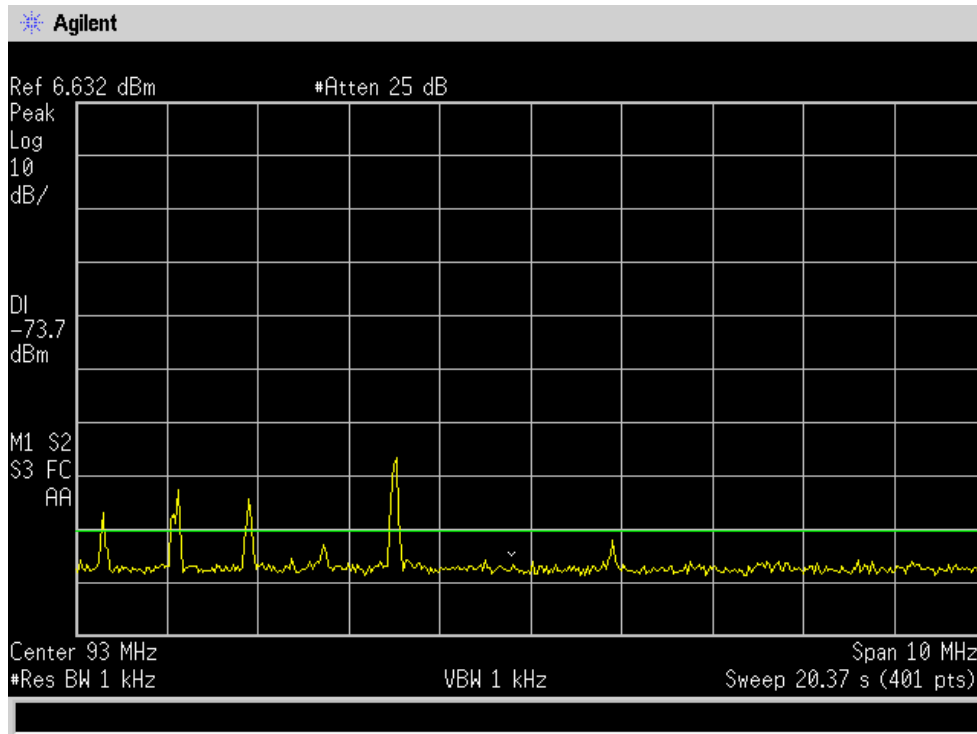
98.7 MHz KUPL Reference Plot and "Mask" Compliance



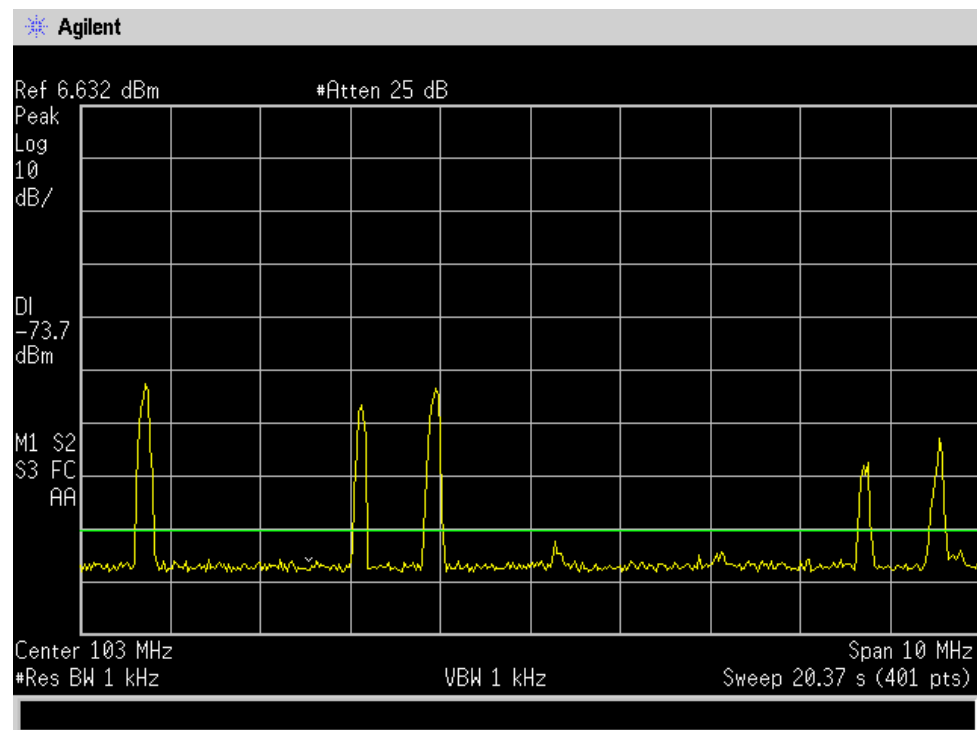
Spectrum from 9 kHz to 30 MHz. Signal near 1 MHz is KUFO, 970 kHz



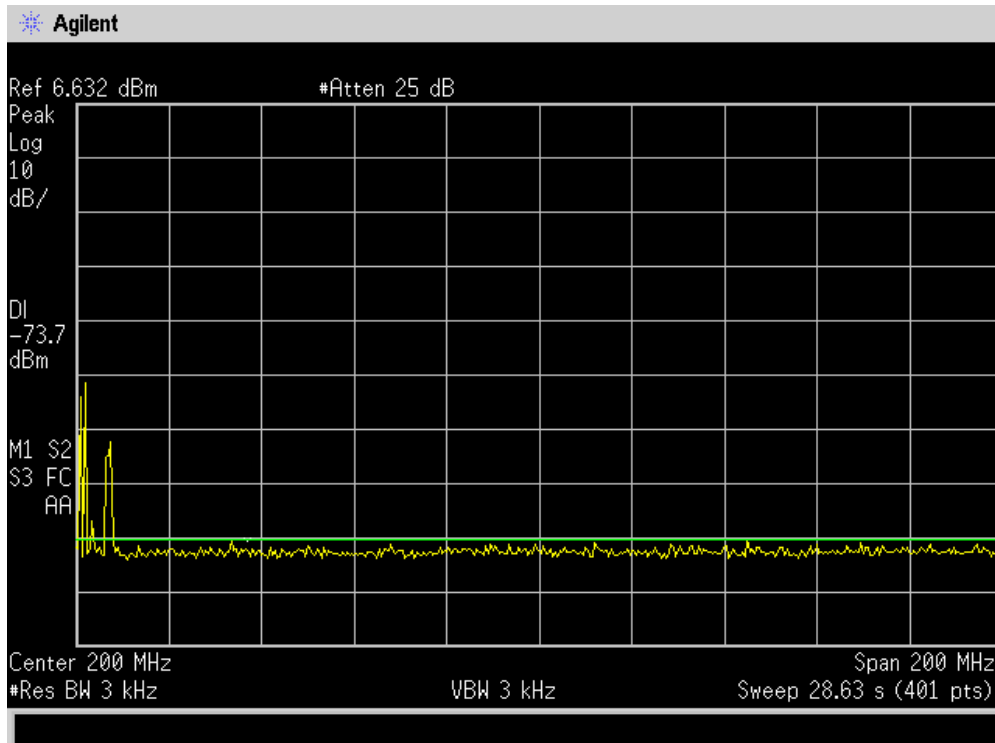
Spectrum from 30 MHz to 90 MHz. Signal just below 78 MHz is KRCW-LP. Signals below 90 MHz are KBVM, KMHD and KQAC.



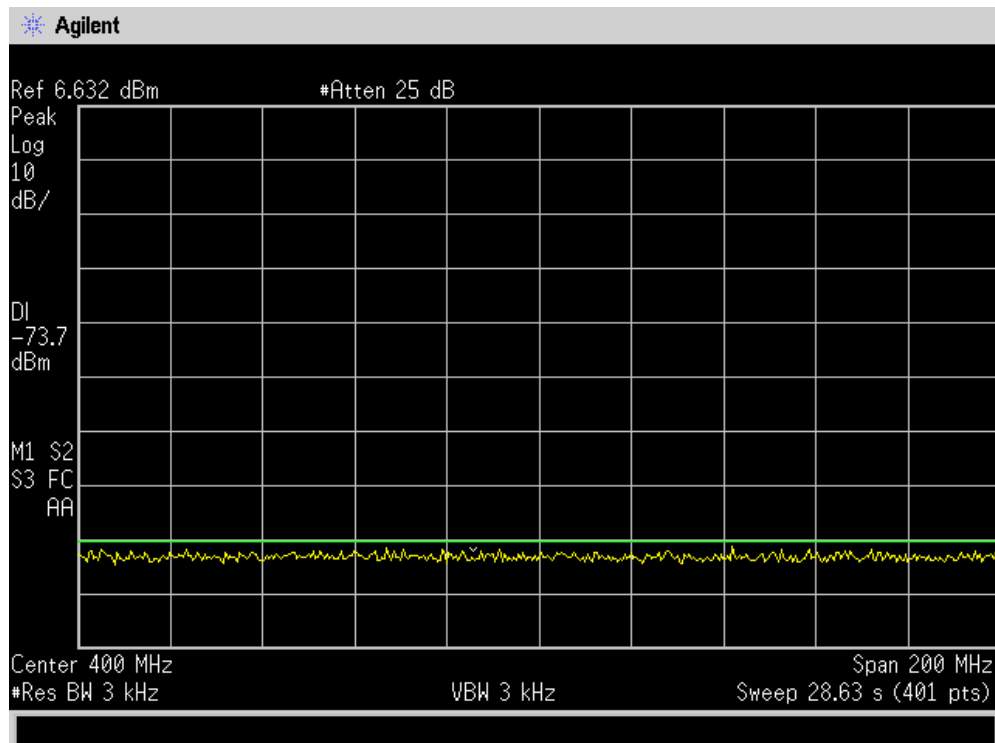
Spectrum from 88 to 98 MHz. Stations visible are KBVM, KMHD, KQAC and KOPB-FM from a nearby site.



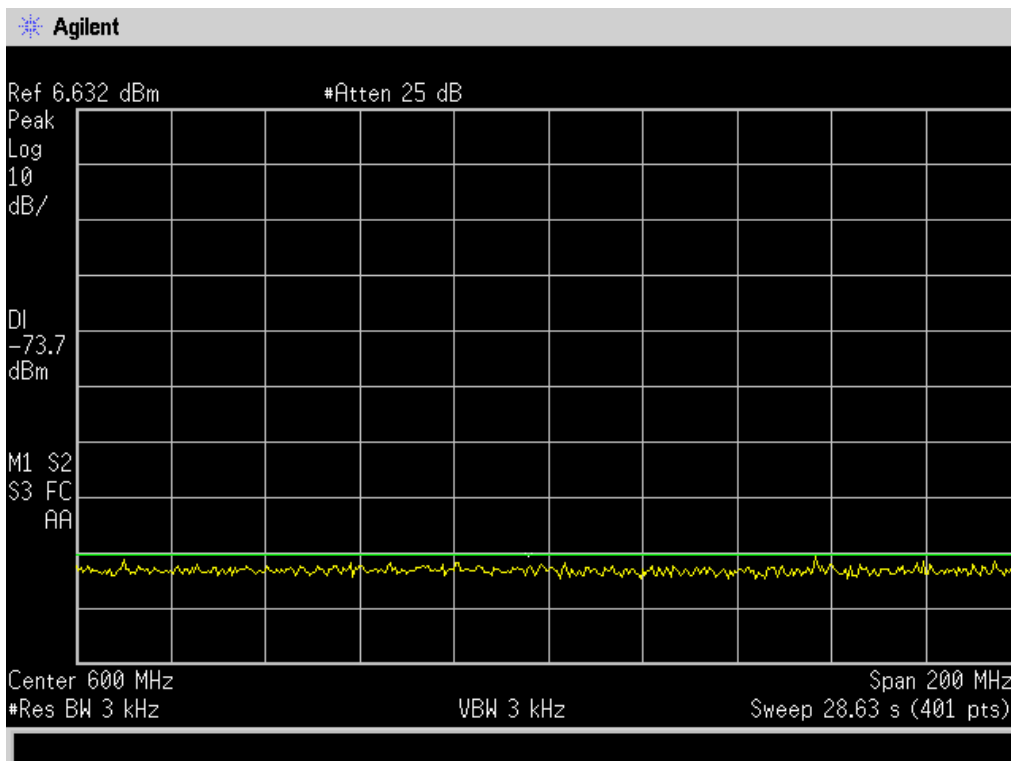
Spectrum from 98 to 108 MHz. Stations visible are KUPL, KXL-FM, KINK, KLTH and KXJM.



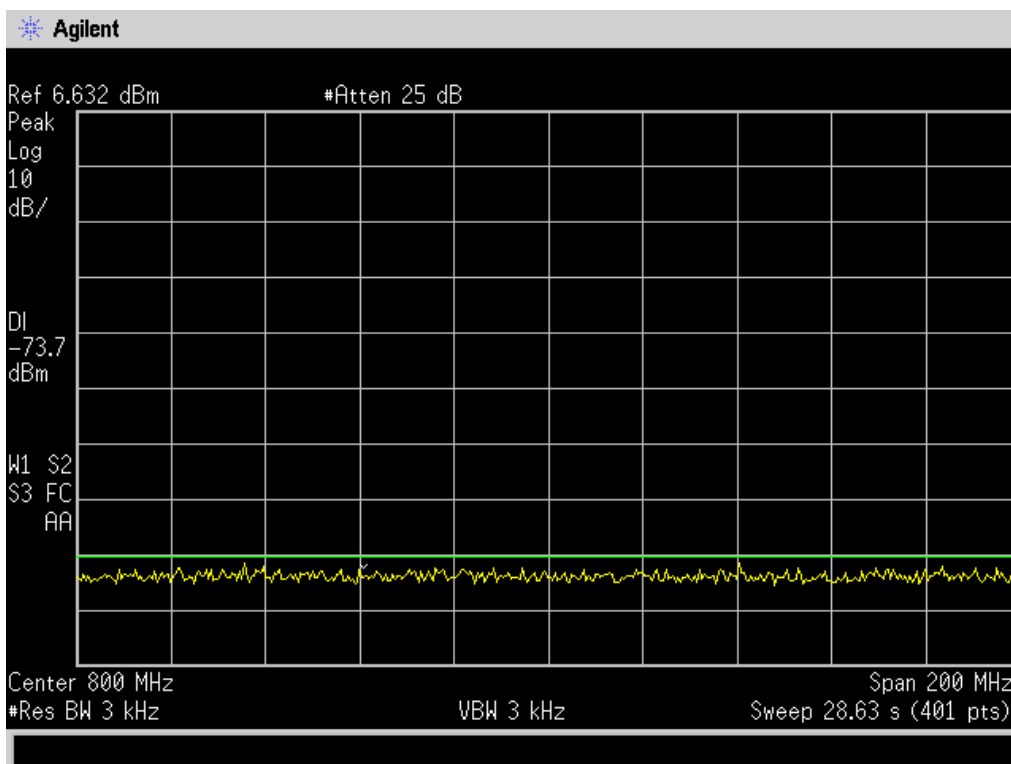
Spectrum from 100 to 300 MHz. Signals at the left are from the upper part of FM broadcast band.



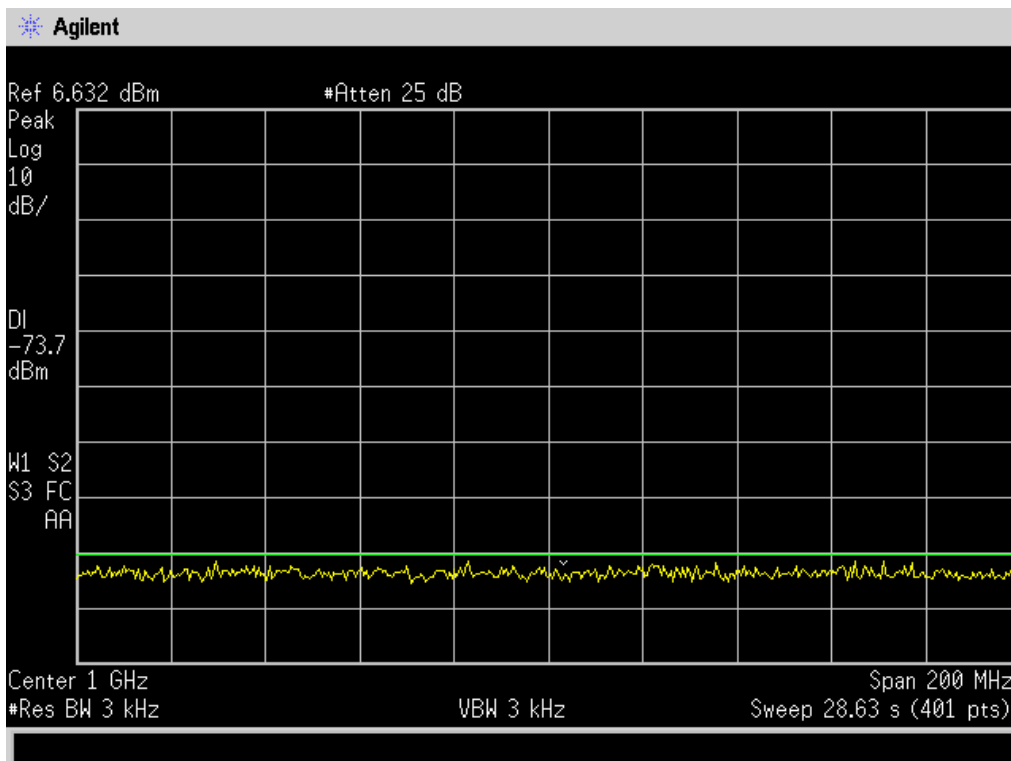
Spectrum from 300 to 500 MHz



Spectrum from 500 to 700 MHz

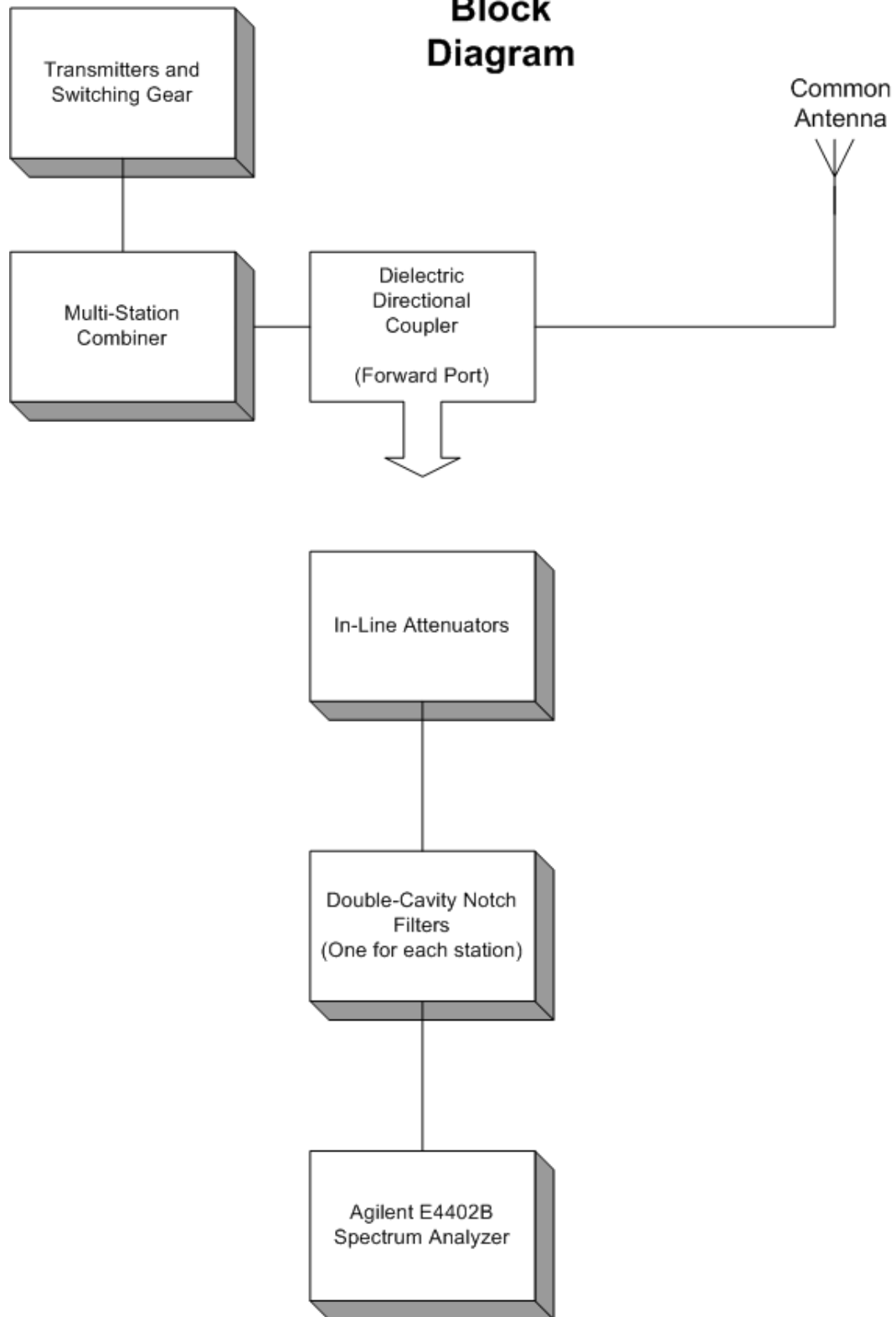


Spectrum from 700 MHz to 900 MHz



Spectrum from 900 MHz to 1.1 GHz

Equipment Block Diagram





Directional Coupler used for measurements



Test Setup

73.317 FM TRANSMISSION SYSTEM REQUIREMENTS

- (a) FM broadcast stations employing transmitters authorized after January 1, 1960, must maintain the bandwidth occupied by their emissions in accordance with the specification detailed below. FM broadcast stations employing transmitters installed or type accepted before January 1, 1960, must achieve the highest degree of compliance with these specifications practicable with their existing equipment. In either case, should harmful interference to other authorized stations occur, the licensee shall correct the problem promptly or cease operation.
- (b) Any emission appearing on a frequency removed from the carrier by between 120 kHz and 240 kHz inclusive must be attenuated 25 dB below the level of the unmodulated carrier. Compliance with this requirement will be deemed to show the occupied bandwidth to be 240 kHz or less.
- (c) Any emission appearing on a frequency removed from the carrier by more than 240 kHz and up to and including 600 kHz must be attenuated at least 35 dB below the level of the unmodulated carrier.
- (d) Any emission appearing on a frequency removed the carrier by more than 600 kHz must be attenuated at $43 + 10\log(\text{Power in watts})$ dB below the level of the unmodulated carrier, or 80 dB, whichever is the lesser attenuation.