

BROADCAST COMMUNICATIONS ENGINEERING

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OCCUPIED BANDWIDTH STUDY INTERMODULATION STUDY HARMONIC CONTENT STUDY

**FOR
KSCV, 90.1 MHz
Springfield, MO.**

PERFORMED 1/3/2024

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PURPOSE OF THE TEST:

As outlined in the FCC's Code of Federal Regulations, all FM radio stations employing transmitters manufactured after January 1, 1960 must perform a "one time" check of their transmitter's performance to verify compliance of their emissions within the FM spectrum. The rules applying to these measurements are outlined in sections 73.317 and 73.1590 of the Code of Federal Regulations:

§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 at least 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 from the carrier by more than 600 kHz must be attenuated at least $43 + 10 \log_{10}(\text{Power, in watts})$ dB below the level of the unmodulated carrier, or 80 dB, whichever is the lesser attenuation.

(e) Preemphasis shall not be greater than the impedance-frequency characteristics of a series inductance resistance network having a time constant of 75 microseconds.

§73.1590 Equipment performance measurements.

(a) The licensee of each AM, FM and TV station, except licensees of Class D noncommercial educational FM stations authorized to operate with 10 watts or less output power, must make equipment performance measurements for each main transmitter as follows:

(1) Upon initial installation of a new or replacement main transmitter.

(2) Upon modification of an existing transmitter made under the provisions of §73.1690, Modification of transmission systems, and specified therein.

(3) Installation of AM stereophonic transmission equipment pursuant to §73.128.

(4) Installation of FM subcarrier or stereophonic transmission equipment pursuant to §§73.295, 73.297, 73.593 or 73.597.

(5) Installation of TV stereophonic or subcarrier transmission equipment pursuant to §§73.669 and 73.1690.

(6) Annually, for AM stations, with not more than 14 months between measurements.

(7) **When required by other provisions of the rules or the station license.**

(b) Measurements for spurious and harmonic emissions must be made to show compliance with the transmission system requirements of §73.44 for AM stations, §73.317 for FM stations and §73.687 for TV stations. Measurements must be made under all conditions of modulation expected to be encountered by the station whether transmitting monophonic or stereophonic programs or providing subsidiary communications services.

(NOTE: All Electronic CFR rules updated January 2023

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On January 3, 2024 Broadcast Communications Engineering was contracted to conduct an Occupied Bandwidth Study, an emissions measurement, and an intermodulation study on KSCV FM, 90.1 MHz; Springfield, MO. These measurements were conducted after concerns were raised that KSCV FM may be operating out-of-tolerance within the FCC's limits on spurious emissions and harmonics within the FM band.

This study will prove KSCV achieved and exceeded all requirements of sections §73.317 and §73.1590 by exhibiting the following:

- 1) Occupied Bandwidth is within the limits of section 73.317
- 2) Intermodulation limits are below the limits established in section 73.317
- 3) Harmonic content is below the limits established in section 73.317

Qualifications

Bobby J. Moore of Lebanon, MO conducted all tests and measurements. He has owned and operated Broadcast Communications Engineering since 1994. Bob holds FCC license #PG-17-27327 and is a member of St. Louis SBE Chapter 55. He has conducted these types of tests on dozens of FM and AM facilities throughout the mid-west. Many tests are a matter of record with the FCC in similar matters. He is very qualified to carry out these measurements.

Under the penalty of perjury all findings in this document are true and accurate to the best of my knowledge and ability.

The following equipment was used in performing the measurement:

Anritsu Model MS2721B Spectrum Analyzer; Serial #1018004
RTL-SDR 88-108 Mhz FM Reject Filter
Chris Scott & Associates FM Di-pole antenna

Method of Testing

With the exception of the one field measurement all other measurements were taken at the output of the transmitter. A Bird™ through-line sample was inserted between the output of the transmitter and the transmission line. The sample from the through-line section was connected to the input of a spectrum analyzer. An unfiltered sample was taken when conducting occupied bandwidth measurements and when establishing reference levels. An FM band reject filter was placed in line with the sample when frequencies below 80 Mhz and above 108 Mhz were being measured. All measurements are documented in the following exhibits.

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Tests Conducted:

KSCV FM MASK

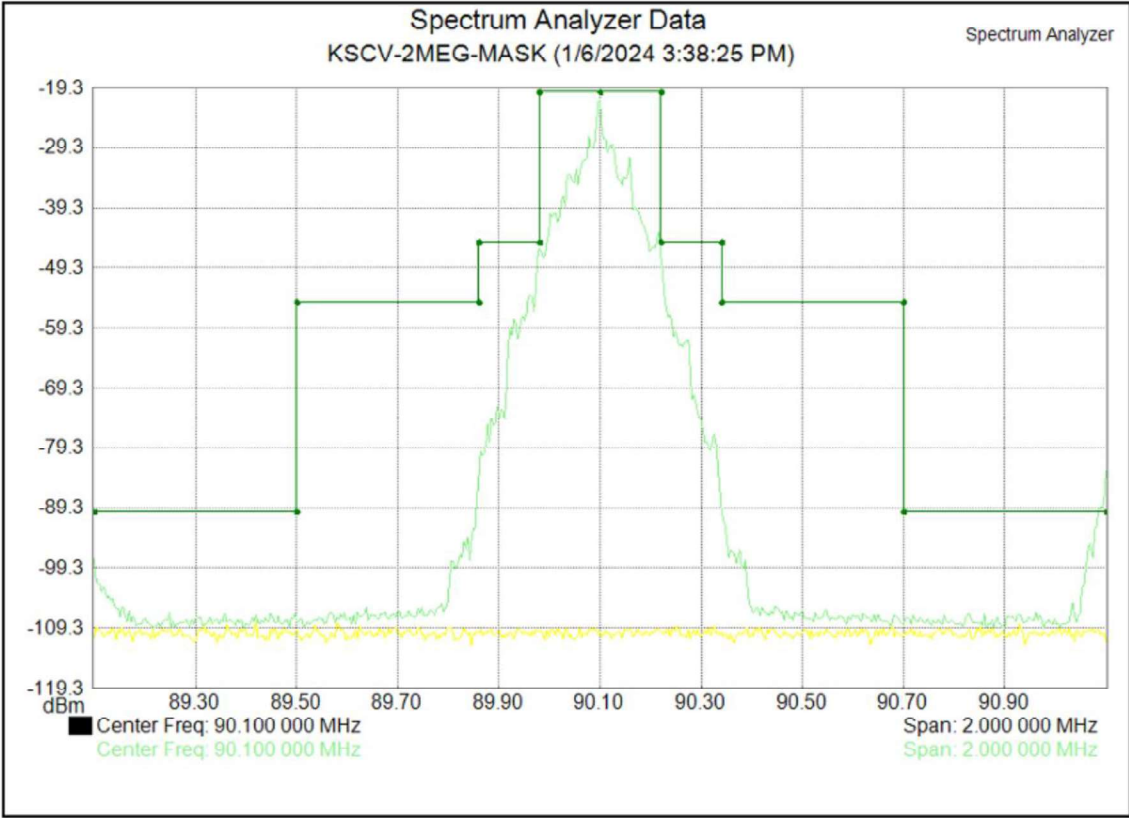


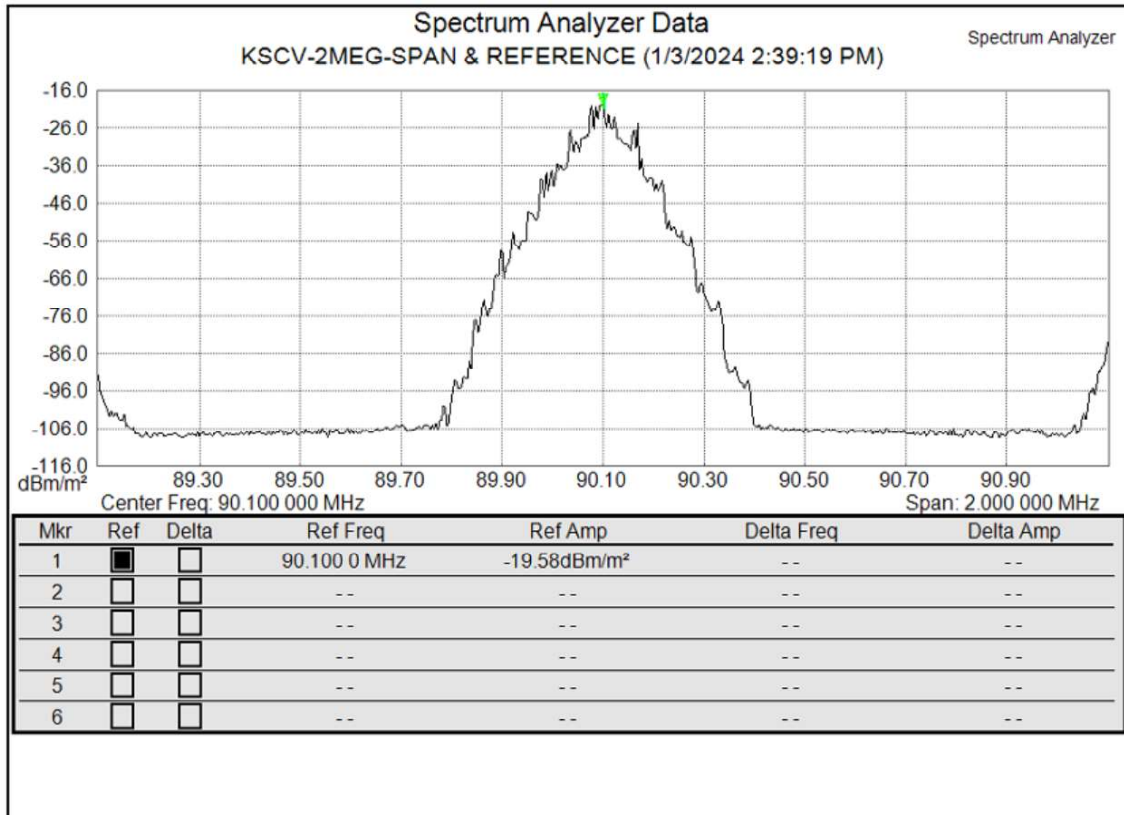
Exhibit demonstrating KSCV FM is operating within the required FM mask.

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KSCV Reference Level



The level of -19.5 dBm is the reference level established for the measurement of all spurious radiation and harmonic content of the KSCV transmitter. Using the formula $43 + 10 \text{ Log}_{10} (\text{Power, in watts}) \text{ dB}$ from CFR 73.317 it is established that all spurious radiation must be **99 db** below the referenced carrier level.

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1st, 2nd, and 3rd Harmonics of the KSCV transmitter

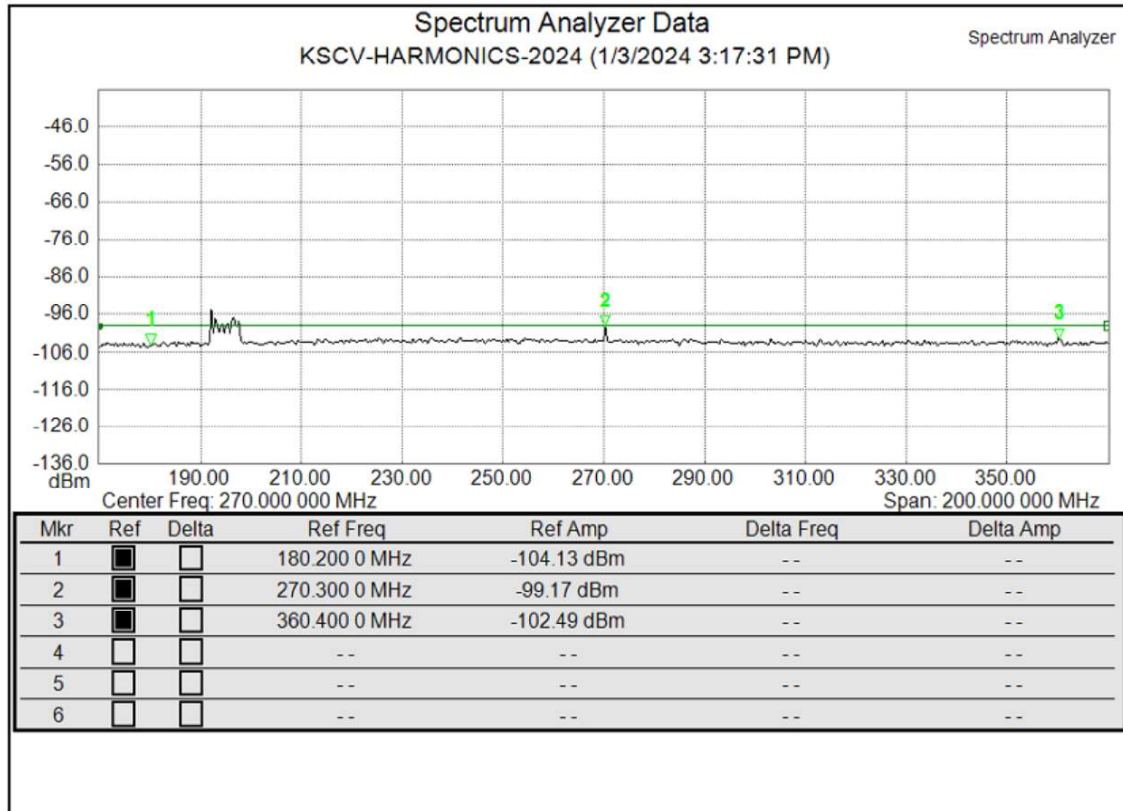


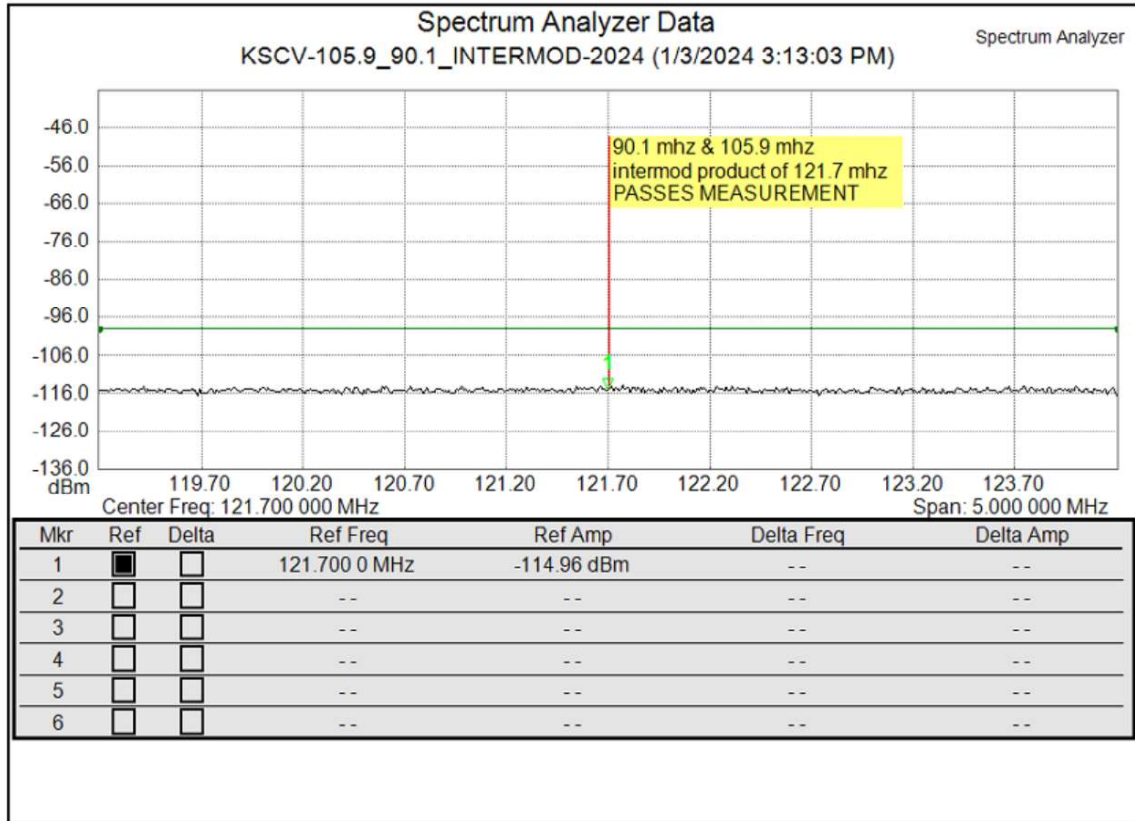
Exhibit demonstrating 1st, 2nd, and 3rd harmonics of the KSCV transmitter.

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INTERMODULATION STUDY



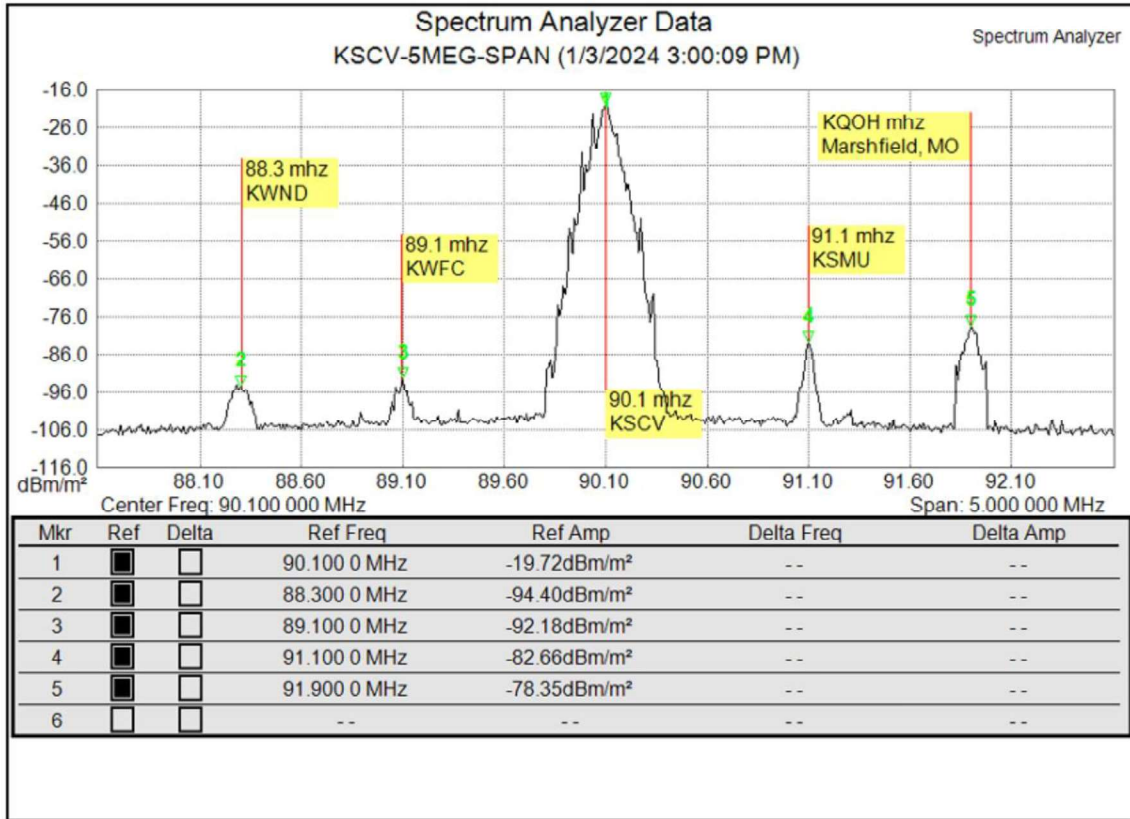
KSCV FM and KGBX FM both operate from the same tower, but on separate antennas. Due to the proximity of the two antennas, it is possible for an intermodulation product to be produced that would exceed the emissions limits of both stations. The first intermodulation product of 90.1 mhz and 105.9 mhz appears at 121.7 mhz. This exhibit demonstrates the first, and strongest intermodulation product to be well below the 80 db requirement for compliance.

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5 MHZ BAND SCAN AT TRANSMITTER'S OUTPUT



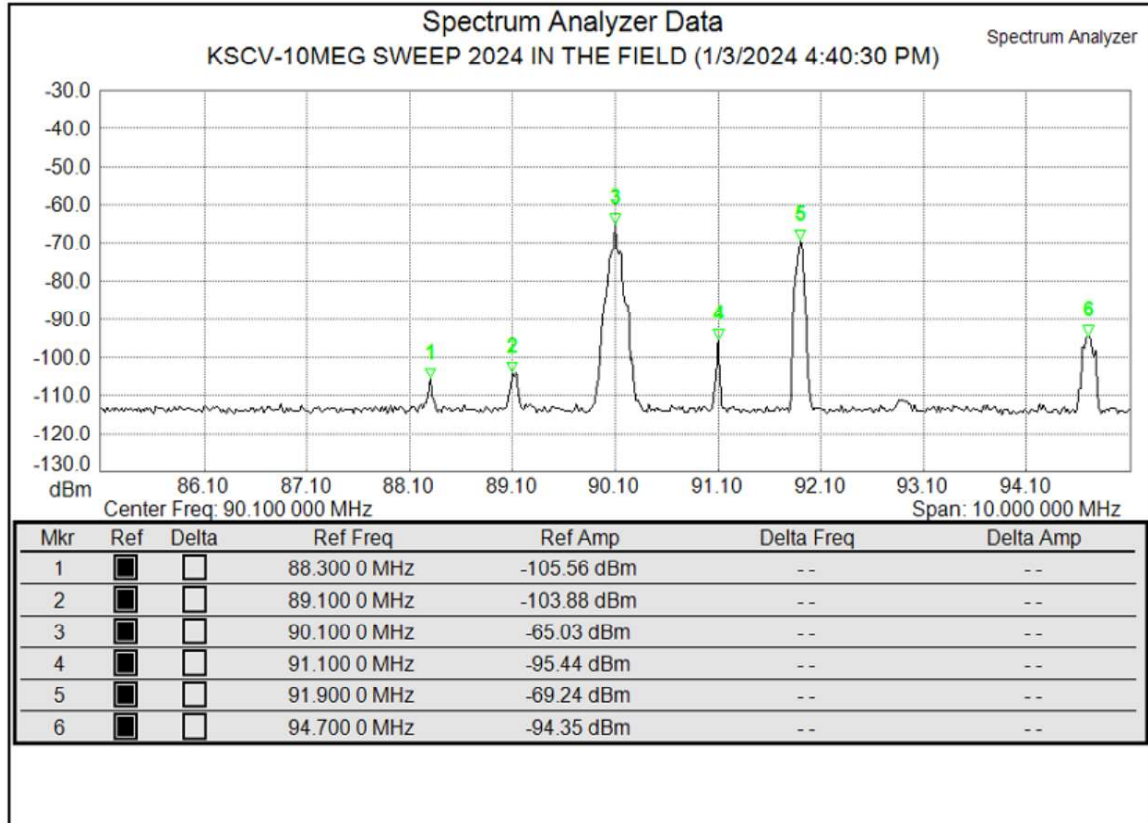
Measured at the transmitter's output, a band scan mhz 5 wide was conducted to exhibit there are no spurious emissions appearing at the output of the transmitter.

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10 MHZ WIDE BAND SCAN IN THE FIELD USING A DIPOLE ANTENNA



Using a Chris Scott & Associates adjustable dipole antenna a final measurement was made in the field .25 km from the KSCV tower. The antenna was adjusted to the middle of the FM band at 100 mhz. This demonstrates there are no spurious emissions coming from KSCV on 90.1 mhz.

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To Whom It May Concern:

Station KSCV, 90.1 MHz

Occupied Bandwidth Study	PASSED
Harmonic Content Study	PASSED
Intermodulation Study	PASSED

It is my finding that KSCV, is compliant with all requirements of CFR sections 73.317 and 73.1590 of the FCC's Rules and Regulations

Bob Moore



Broadcast Communications Engineering
Lebanon, MO