Exhibit 12 NRSC Filter

73.128

(c) Effective on December 20, 1994, stereophonic transmissions shall conform to the following additional modulation characteristics:

(1) The audio response of the main (L+R) channel shall conform to the requirements of the ANSI/EIA-549-1988, NRSC-1 AM Preemphasis/Deemphasis and Broadcast Transmission Bandwidth Specifications (NRSC-1).

(2) The left and right channel audio signals shall conform to frequency response limitations dictated by ANSI/EIA-549-1988.

(5) Maximum angular modulation, which occurs on negative peaks of the left or right channel with no signal present on the opposite channel (L(t)=-0.75, R(t)=0, or R(t)=-0.75, L(t)=0) shall not exceed 1.25 radians.

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RESPONSE:

The filter needed to insure the transmitter complies with the Transmission Bandwidth Specifications (NRSC-1) and the limitations dictated by ANSI/EIA-549-1988 will be located in the audio processor which is attached to the transmitter. Each Instruction Manual will have a note to the equipment user as shown below.

NOTICE TO THE EQUIPMENT USER

FCC Rule 73.1590 mandates the licensee of each AM station to make measurements for spurious and harmonic emissions to show compliance with the transmission system requirements of Section 73.44 of the Commission's Rules. It is the broadcast station's responsibility to ensure that the audio signal input to the Broadcast Electronics' model AM-500A, AM-1A, AM-500A, AM-10A, AM-2.5E and AM-5E stereo transmitters conform to the audio standard NRSC-1 (published as ANSI/EIA-549-1988). This is a mandatory requirement to ensure that the equipment complies to Section 73.44 and Section 73.128(c) of the Commission's Rules.

Exhibit 13 Stereo L-R Design

73.128

(3) The stereophonic difference (L-R) information shall be transmitted by varying the phase of the carrier in accordance with the following relationship:

Where:

L(t) = audio signal left channel,
R(t) = audio signal right channel,
m = modulation factor, and
mpeak(L(t) + R(t)) = 1 for 100% amplitude modulation,
mpeak(L(t) - R(t)) = 1 for 100% phase modulation.

(4) The carrier phase shall advance in a positive direction when a left channel signal causes the transmitter envelope to be modulated in a positive direction. The carrier phase shall likewise retard (negative phase change) when a right channel signal causes the transmitter envelope to be modulated in a positive direction. The phase modulation shall be symmetrical for the condition of difference (L-R) channel information sent without the presence of envelope modulation.

(6) A peak phase modulation of +/-0.785 radians under the condition of difference (L-R) channel modulation and the absence of envelope (L+R) modulation and pilot signal shall represent 100% modulation of the difference channel.

(7) The composite signal shall contain a pilot tone for indication of the presence of stereophonic information. The pilot tone shall consist of a 25 Hz tone, with 3% or less total harmonic distortion and a frequency tolerance of +/-0.1 H2, which modulates the carrier phase +/-0.05 radians peak, corresponding to 5% L-R modulation when no other modulation is present. The injection level shall be 5%, with a tolerance of +1, -1%.

(8) The composite signal shall be described by the following expression:

$$E_c = A_c\left[1 + m\sum_{n=1}^{\infty} C_{sn}\cos\left(\omega_{sn}t + \phi_{sn}\right)\right]\cdot\cos\left[\omega_c t + \tan^{-1}\left(\frac{m\sum_{n=1}^{\infty} C_{dn}\cos\left(\omega_{dn}t + \phi_{dn}\right) + 0.05\sin 50\pi t}{1 + m\sum_{n=1}^{\infty} C_{sn}\cos\left(\omega_{sn}t + \phi_{sn}\right)}\right)\right]$$

A = the unmodulated carrier voltage
m = the modulation index
Csn = the magnitude of the nth term of the sum signal
Cdn = the magnitude of the nth term of the difference signal
wsn = the nth order angular velocity of the sum signal
wdn = the nth order angular velocity of the difference signal
wc = the angular velocity of the carrier
fsn = the angle of the nth order term = tan-1 (Bsn / Asn)
fdn = the angle of the nth order term = tan-1 (Bsn / Asn)
Asn and Bsn are the nth sine and cosine coefficients of Csn
Adn and Bdn are the nth sine and cosine coefficients of Cdn

Broadcast Electronics Response

Complies. See simplified schematic Figure 4-5 in the Instruction manual. The Theory of Operation 4-92 through 4-101 has been copied below.

4-92. **EXCITER CIRCUIT BOARD.** Audio for application to the AM-2.5E/AM-5E transmitter is applied to the exciter circuit board (refer to Figure 4-4). The exciter circuit board is designed to: 1) process left/right channel or monaural audio to generate a Pulse-Width-Modulated (PWM) signal at 122 kHz to 135 kHz and 2) generate an RF signal using a frequency synthesizer, a phase modulator for IPM correction, and an RF driver network.

4-93. Left channel audio is applied to an RFI filter and a defeatable 10 Hz high-pass filter. The 10 Hz high-pass filter is provided to remove low frequency residual products from specific audio processing units. Balanced-to-unbalanced signal conversion is provided by an instrumentation amplifier. The output of the instrumentation amplifier is applied to a defeatable high frequency boost circuit. The high frequency boost circuit is provided to increase high frequency response to compensate for a Bessel filter in the PWM modulator. The output of the high frequency boost circuit is applied to an active PWM filter/equalizer and a mode switching circuit. The output of the PWM filter is routed for application to the stereo circuit board.

4-94. The mode switching circuit is designed to select the left or right channel for mono left or mono right operation. A summing amplifier is provided as a mono support circuit to increase the gain of the circuit 6 dB during mono operations. The output of the summing amplifier is applied to a 24 uS delay and limiter circuit. The delay circuit is provided for stereo equalization. The negative limiter is provided to limit negative modulation from 90% to 100%.

4-95. The output of the 24 uS delay and negative limiter is applied to: 1) a PWM circuit and 2) an IPM comparator and corrector circuit. The PWM circuit is designed to output a square wave signal in which the duty cycle changes in response to the applied audio level. The output of the PWM circuit is applied to a PWM driver circuit. The PWM driver circuit consists of parallel transistor drivers to lower the impedance and improve reliability.

4-96. The transmitter carrier frequency is generated by digitally programmed frequency synthesizer circuit. The frequency synthesizer is designed to output: 1) the carrier frequency to a mono/stereo select circuit, 2) a FcX4 (carrier frequency times four) signal for application to the stereo circuit board, and 3) a 25 Hz pilot signal for application to the stereo circuit board. A mono/stereo select circuit functions as an automatic mono/stereo select switch. If a stereo signal from the internal stereo circuit board or an external stereo generator is present, the exciter will be configured for stereo operation. If the stereo signal is not present, the circuit will configure the exciter for mono operation. The output of the mono/stereo select circuit is applied to the IPM (Incidental Phase Modulation) signal generator and modulator. The IPM signal generator is designed to produce a waveform similar to the signal produced by the RF amplifier circuitry. The IPM generator signal is out-of-phase with the signal generated by the RF power modules. The signal is applied to a modulator circuit which will generate a phase compensated RF signal at the carrier frequency. The phase compensation will effectively cancel the IPM generated in the RF circuitry.

4-97. The output of the IPM circuitry is applied to an RF driver network. The network consists of a high/low side driver and output drive transistors.

4-98. **STEREO CIRCUIT BOARD.** Left/right channel audio and an RF signal at FcX4 (carrier frequency times four) from the exciter circuit board is applied to the stereo circuit board. The stereo circuit board is designed to generate a TTL level RF signal. The circuit board contains identical left/right channel and equalization 1/2 circuitry. Therefore, only the left channel equalization 1 circuit will be discussed.

4-99. Left channel audio from the exciter circuit board is applied to the left channel equalization 1 circuit. The equalization circuit consists of 1) a state variable low-pass filter, 2) an 8 uS group delay section, and 3) a 4 uS group delay section. The circuit is designed to equalize frequencies to produce maximum separation.

4-100. The output of each equalization circuit is routed to an equalization and mono/stereo select circuit. The equalization circuit selects equalization 1 or equalization 2 as determined by the selected antenna pattern. The mono/stereo circuit selects the required signals for stereo, mono left, mono right, or mono L+R operation.

4-101. The output of the equalization and mono/stereo select circuits is applied to a summing amplifier network. The network functions as a matrix to generate the L+R and L-R stereo signals. The output of the summing amplifier network is applied to a digital switching modulator. The modulator accepts: 1) the L+R and L-R signals and 2) four RF out-of-phase signals at the carrier frequency. The modulator outputs two signals: 1) an AM modulated signal containing the L+R information and 2) a double-sideband- suppressed-carrier signal referenced to a 90 degree carrier. The signals are summed and amplified at U37 to produce a quadrature signal. The output of U37 is applied to a fourth order linear phase bandpass filter. The output of the filter is applied to an amplitude limiter circuit. The limiting operation produces the phase modulation (L-R information) component of the C-QUAM signal. The output of the limiter circuit is routed to the exciter circuit board.