PROPOSED

SMPTE RECOMMENDED PRACTICE — RP 119

Reference Carrier Frequencies, Pre-emphasis Characteristics and Audio and Control Signals for ½-in Type G Helical-Scan Video Tape Recording Cassette Systems

1. *Scope*

This practice specifies the reference frequencies for deviation of the frequency modulated carrier and the associated video preemphasis characteristic for ½-in Type G helical-scan video tape cassette recording of 525/60 monochrome and NTSC color television signals at tape speeds of 40, 20, and/or 13.3 mm/s (1.57, 0.79, and/or 0.52 in/s). In addition, the characteristics of the audio and control signals are specified.

2. *Video Signal*

2.1 FM Recording of Luminance Component

525 Line-60 Field

	Tape Speed 40 mm/s	Tape Speed 20 mm/s and 13.3 mm/s
White clipping level	170 ± 10%	less than 230%
Dark clipping level	No clipping	more than —100%

2.1.3 Modulation Characteristics. FM carrier frequencies corresponding to reference video levels shall be as follows:

	40 mm/s	20 mm/ and 13.3 mm/s	
		Track A	Track B
Reference White Levels (100 IRE Units)	4.8 MHz	4.8 MHz	$4.8 + \frac{1}{2}f_H$
Reference Sync Level (—40 IRE Units)	3.5 ± 0.1 MHz	3.6 ± 0.1 MHz	$3.6 + \frac{1}{2}f_H \pm 0.1$ MHz
Frequency Deviation, White to Sync (140 IRE Units)	1.3 ± 0.1 MHz	1.2 ± 0.1 MHz	$1.2 + \frac{1}{2}f_H \pm 0.1$ MHz

2.1.4 Pre-emphasis. The luminance signal is pre-emphasized prior to frequency modulation. Characteristics of the pre-emphasis network are shown in Table 1.

2.1.1 Low-Pass Filter. The luminance component of the composite video signal shall be separated by a filter system with its amplitude-versus-frequency characteristics as follows: The chrominance component of the composite video signal shall be attenuated by 26 dB or more at the color subcarrier frequency (f_{sc}) and by 15 dB or more within the frequency range of $f_{sc} \pm 0.5$ MHz after passing the filter system.

2.1.2 Clipping. The luminance signal shall be clipped prior to frequency modulation. The clipping levels from the sync tip level are as shown below. The peak-to-peak voltage from sync tip to peak white at low frequency is 100%.

Table 1

Pre-emphasis Characteristics in Decibels
40 mm/s Tape Speed

Frequency	50 kHz	100 kHz	200 kHz	500 kHz	1 MHz	2 MHz	4 MHz
Response	0.3 ± 0.06	1.1 ± 0.2	3.2 ± 0.5	8.3 ± 0.7	11.9 ± 0.8	13.9 ± 0.8	14.6 ± 0.8

20 mm/s and 13.3 mm/s Tape Speed

Frequency	50 kHz	200 kHz	500 kHz	1 MHz	2 MHz	4 MHz
Input Level						
—17	1.9 ± 0.4	7.4 ± 0.8	13.4 ± 1.4	19.1 ± 2.2	22.3 ± 2.4	17.9 ± 2.5
—14	1.9 ± 0.4	7.4 ± 0.8	13.4 ± 1.4	18.3 ± 2.2	20.9 ± 2.5	17.5 ± 2.5
—11	1.9 ± 0.4	7.4 ± 0.8	13.3 ± 1.4	17.0 ± 2.2	19.0 ± 2.5	16.3 ± 2.5
—7	1.9 ± 0.4	7.3 ± 0.8	11.7 ± 1.4	14.1 ± 2.2	15.3 ± 2.5	13.4 ± 2.5
—3	1.9 ± 0.4	7.0 ± 0.8	10.3 ± 1.4	12.1 ± 2.2	12.1 ± 2.5	10.1 ± 2.5

Notes: 1. Input signal is a sine wave insterted after the low-pass filter.

2. Response characteristic is the ratio of peak-to-peak output level at each frequency to the peak-to-peak output level at 10 kHz (in dB).

3. When the input signal is a 100% white signal, the demodulated voltage from sync tip to peak white is 0 dB.

2.1.5 Superimposed DC Voltage at 20 and 13.3 mm/s Record. DC voltage shall be superimposed onto the video signal at the input of the frequency modulator for the Track B record to raise the carrier frequency by $\frac{1}{2}$ f_H above the value for the Track A record, where f_H is the horizontal scanning frequency of the input signal. (Tracks A and B are specified in Proposed American National Standard Dimensions of Video, Audio and Tracking-Control Records for ½-in Type G Video Cassette Systems, V98.34M.)

2.1.6 Recording Level. Recording level for the FM carrier shall be set for maximum playback output at 4.8 MHz and shall be within ± 1 dB over the entire FM carrier bandwidth.

2.2 AM Recording of Chrominance Signal. The chrominance signal shall be down-converted so that its new carrier frequency equals 43.75 times the horizontal synchronizing frequency of the input signal with a tolerance of ± 0.2 kHz.

2.2.1 Phase Inversion of Chrominance Signal on Track A. The down-converted chrominance signal shall be recorded with every other scanning line inverted in phase on Track A while it is recorded without modification on Track B.

2.2.2 Amplitude Modulation Recording. The chrominance signal shall be recorded as an amplitude-modulated carrier. Its record level shall be 7 to 12 dB below the corresponding FM carrier output when a 75% saturation color bar video signal is recorded.

2.2.3 The amplitude of the color burst shall be increased by 6 ± 1 dB prior to recording when a tape speed of 13.3 mm/s is utilized.

3. *Audio Signals*

3.1 Time Constants. Recording pre-emphasis and reproducing de-emphasis time constants shall be as follows:

Tape Speed	High Frequency	Low Frequency
40 mm/s	50 μs	3180 μs
20 mm/s	175 μs	3180 μs
13.3 mm/s	240 μs	3180 μs

3.2 Reference Audio Level. Recorded reference audio levels shall be 125 nWb/m for 40 mm/s, 100 nWb/m for 20 mm/s, and 100 nWb/m for 13.3 mm/s.

3.3 Audio Noise Reduction. An audio noise reduction system may be employed. The encoding characteristics of the noise reduction system shall be as follows:

Frequency Response of Encoding Levels

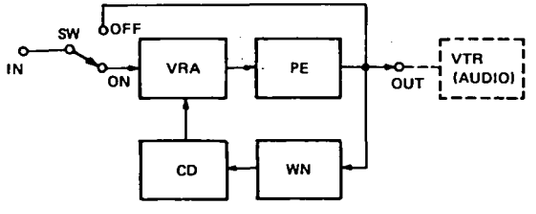
Input Level (dB)	50 (Hz)	100 (Hz)	200 (Hz)	333 (Hz)	500 (Hz)	1000 (Hz)	2000 (Hz)	5000 (Hz)	10000 (Hz)
0	3.2	2.5	2.1	1.8	1.4	0 (dB)	—1.2	—0.6	0
—10	—3.6	—4.0	—4.3	—4.4	—4.4	—4.8	—6.1	—7.7	—7.3
—20	—11.2	—11.5	—11.6	—11.4	—11.2	—10.5	—10.4	—12.0	—13.1
—30	—20.0	—20.1	—20.0	—19.7	—19.1	—17.5	—16.0	—15.8	—16.6
—40	—29.5	—29.5	—29.3	—28.9	—28.1	—25.8	—22.9	—20.8	—18.6

Notes: 1. 0 dB of the input level is the reference audio input level at 333 Hz.

2. 0 dB of the encode level is the recorded reference audio level specified in 3.2.

3. A block diagram of encoding is shown in Fig. 1.

4. The frequency response of decoding levels shall be specified so that the frequency response in recording will be compensated in playback.



VRA : variable response amplifier
PE : pre-emphasis
WN : weighting network
CD : control signal detector

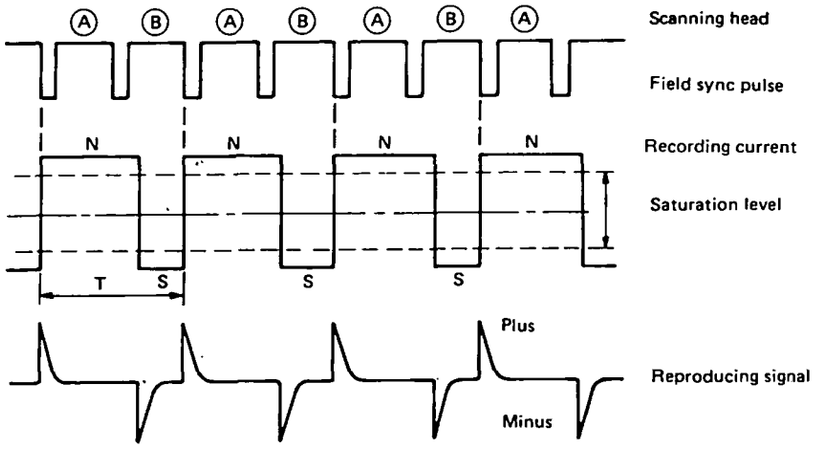
Fig. 1
Encoding System

4. *Control Signal*

4.1 Polarity. A positive-going pulse shall be obtained at the plus terminal of the control head on playback when there is a change from south to north in the polarity of the magnetic tape at reproduction. The reference pulse shall be the positive-going pulse as shown in Fig. 2.

4.2 Recording Signal Phase. A positive-going edge of the recorded control pulse signal shall be in phase with the start of Track A as show in Fig. 2.

4.3 Recording Current Waveform. The rise time shall be less than 200 μs.



T: 33.37 ms

Fig. 2
Control Signal Waveform and Polarity