was discussed at great length, and those present agreed that a formal reply should be given to the FCC, indicating the willingness of the SMPTE to participate in the study of this issue. Mr. Allen noted that an ad hoc committee will be formed to review the questions proposed by the FCC.

In discussing the need for additional films, the committee indicated that there is a growing need for a pink-noise film for 16mm, similar to the one being documented for 35mm, which can be developed by this committee.

A successful effort was made to correlate the activity by the international committee with the work of the SMPTE group, specifically in the review of the national draft proposals for universal multifrequency test films.

26 October 1979

I. ALLEN
Chairman

SMPTE Sponsors New Digital Television Tape Recording Study Group

On Friday morning of the annual SMPTE Technical Conference, the organizational meeting of a group to study the possibilities for development of a digital VTR drew an attendance of over 50 people, representing users and design experts from all over the world. The Chairman is William Connolly of CBS in New York, and Marcel Auclair of the Canadian Broadcasting Corporation is Vice-Chairman.

The Charter of the new Study Group, issued by SMPTE New Technology Committee Chairman Fred Remley, is to "provide a forum for the exchange of information on user needs and on technological capabilities of digital television tape recorders. Written reports shall be submitted to the SMPTE Committee on New Technology at least once a year."

Chairman Connolly presented an active program schedule of meetings, tutorial papers, and reports to respond to this Charter. He and other SMPTE officials present stressed that the objective of the group's activities is to define what is needed and what is technically possible in a digital videotape recorder and not to discuss or attempt to define standards. If the consensus of the group is that standardization discussions may prove fruitful, a Working Group would then be formed to address the topic.

In response to Mr. Connolly's request for volunteer members willing to work on specific study assignments, 6 users and 17 design experts came forward. Mr. Connolly would like to see user participation increased. He invites experts from independent broadcast stations, group owners, production houses, and major industrial TV users to call him at CBS, New York, (212) 975-3321, for more information about group membership.

26 October 1979

WILLIAM CONNOLLY
Chairman

Standards & Recommended Practices

Approved SMPTE Recommended Practices

On 24 July 1979 the Executive Committee for Standards Approval, acting on behalf of the Society's Board of Governors, approved three SMPTE Recommended Practices: RP 6-1979, Recorded Carrier Frequencies and Pre-emphasis Characteristics for 2-in Quadruplex Video Magnetic Tape Recording for 525-Line/60-Field Television Systems; RP 23-1979, Reinforcement of 70-mm Positive Splices; and RP 90-1979, Specifications for Magnetic-Type Audio Level and Multifrequency Test Film for 16-mm Sound Reproducers.

Copies of SMPTE Recommended Practices are available from Society Headquarters for $1.50 each.

Working Group on Diagnostic Medical Imaging

A new Working Group on Standardizing Diagnostic Medical Imaging has been formed under the chairmanship of Kenneth Lisk. Primary responsibilities include the initiation of specifications, set-up procedures and test materials for medical diagnostic image display for computed tomography (CT), radiography, ultrasound, nuclear medicine, image-intensified photofluorography, and thermography imaging technology for electronic and film recording systems.

To fulfill these objectives, representation is sought from experts in the field of medical diagnostic imaging and cathode-ray tube and television monitor manufacturers. User-experts will also be appointed to the group to ensure that the engineering approaches and procedures are practical and consumer oriented.

Prospective members may contact the chairman at Eastman Kodak Company, Photography Technology Division, 1700 Dewey Ave., Rochester, NY 14650. — *Alex E. Alden, Manager of Engineering Services*

SMPTE RECOMMENDED PRACTICE — RP 6-1979

Recorded Carrier Frequencies and Pre-emphasis Characteristics for 2-in Quadruplex Video Magnetic Tape Recording for 525-Line/60-Field Television Systems

1. *Scope*

1.1 This practice specifies parameters of the recorded information essential to the interchange of 2-in quadruplex video magnetic tape recording of NTSC color and monochrome signals for 525-line/60-field television systems. The parameters include video pre-emphasis characteristics and recorded carrier frequencies for all recording practices and video pilot specifications for Practice SHBP.

1.2 Practices defined are:

1.2.1 Practice SHBP. This practice is suitable for color and monochrome signals. A video pilot signal is added to the recorded information to be used as a playback reference.

1.2.2 Practice HB. This practice is suitable for color and monochrome signals.

1.2.3 Practice LBM. This practice is suitable only for monochrome signals. (It is considered to be obsolescent and is included for reference purposes only.)

1.2.4 Practice LBC. This practice is suitable for color and monochrome signals. (It is considered to be obsolescent and is included for reference purposes only.)

2. *Recording Chain*

2.1 A recording chain consisting of elements specified by this practice will contain, in order of signal flow, the following elements:

2.1.1 Video processing and signal generating circuits used only for Practice SHBP.

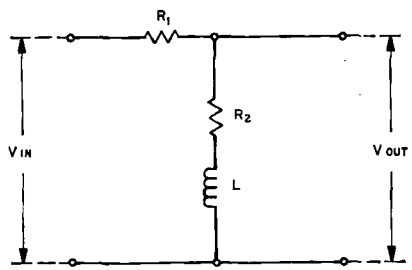
2.1.2 A video pre-emphasis network.

2.1.3 A linear frequency modulator having constant deviation with respect to the modulating video frequencies.

2.1.4 An amplifier of the frequency-modulated carrier to provide alternating-current drive to the pole tips.

3. *Pre-emphasis*

3.1 Pre-emphasis is defined by the frequency and phase characteristics of a network as shown in the figure. Accuracy of pre-emphasis time constants shall be maintained by including source and load impedances (not shown) in the calculation of circuit values.



$$\tau_1 = \frac{L}{R_1 + R_2}$$

$$\tau_2 = \frac{L}{R_2}$$

$$\frac{V\,out}{V\,in} = \left(\frac{j\omega\tau_2 + 1}{j\omega\tau_1 + 1}\right)\left(\frac{\tau_1}{\tau_2}\right)$$

Video Pre-emphasis Characteristic Circuit

Revision of RP 6-1967
Approved 24 July 1979

3.2 Time constant values specifying the pre-emphasis network for each practice are listed in the table below:

	SHBP	HB	LBM	LBC
Time constant τ_1 (nanoseconds)	333.3	240	26.4	31.7
Time constant τ_2 (nanoseconds)	2500	600	132	240
Tolerance	± 0.25%	Not specified	Not specified	Not specified

4. *Recorded Carrier Frequencies*

Carrier frequencies corresponding to reference video levels shall be as indicated in the table below:

	SHBP	HB	LBM	LBC
Peak White (MHz)	10.7	10.0	6.8	6.5
Blanking (MHz)	9.9	7.9	5.0	5.79
Sync Tip (MHz)	9.58	7.06	4.28	5.5
Tolerance (MHz)	± 0.02	± 0.05	± 0.05	± 0.05

5. *Head Current*

5.1 The amplitude vs frequency characteristic of the recording current applied to the head shall produce a recording such that reproduced video, with no reproduce equalization changes, is the same as the following reference recording.

5.2 The reference recording is made with a flat amplitude-vs-frequency current drive to a head with metal pole tips.

6. *Practice SHBP*

6.1 All recordings made using this practice shall have a video pilot signal added to the video information prior to the frequency-modulation process.

6.2 Monochrome television signals shall have a psuedo-burst added to sync tip and horizontal blanking interval for the purpose of identification and pilot generation. (See Sec. 6.6.)

6.3 Unless otherwise indicated, all parameter specifications show relationships among pilot, burst, and video information prior to pre-emphasis. The point of insertion of generated signals into the video information path is not specified.

6.4 Pilot Band Protection Filtering. In order to ensure that no spurious components from the input video signal are recorded in the pilot frequency band, a band-reject filter shall be placed in the video signal path prior to addition of the pilot signal. Attenuation of all components within ± 100 kHz of the pilot frequency shall be 16 dB or greater.

6.5 Pilot specifications:

6.5.1 The pilot frequency shall be exactly 1.5 times the color subcarrier or pseudo-burst frequency of the video information to be recorded.

6.5.2 The pilot phase shall be such that positive- or negative-going zero crossings of pilot coincide with the negative-going zero crossings of the R-Y color component signal. Tolerance of zero crossing coincidence shall be ± 2.3 nanoseconds for color signals. Phase and tolerances are unspecified for monochrome signals.

6.5.3 Amplitude of the pilot is defined by a measurement in the FM spectrum at the output of the modulator to reduce tolerance errors associated with the input video signal.

With no chroma signal present (except burst), the amplitude of the first order pilot sidebands shall be 24 db ± 0.2 dB below the amplitude of the unmodulated carrier. (This pilot amplitude corresponds to a peak-to-peak video pilot level equal to 1/6 of the sync tip to peak white level of a full amplitude video signal.)

6.5.4 The amplitude of any spurious components shall be at least 30 dB below the pilot level.

6.6 Pseudo-burst specifications for monochrome signal only.

6.6.1 The pseudo-burst shall start 0.4 μs ± 0.2 μs after the 50-percent amplitude point of the leading edge of sync. The start of pseudo-burst is defined by the zero crossing that precedes the first half cycle of subcarrier that is 50-percent or greater of the pseudo-burst amplitude.

6.6.2 The pseudo-burst shall end 7.8 μs ± 0.4 μs after the 50-percent amplitude point of the leading edge of sync. The end of the pseudo-burst is defined by the zero crossing that follows the last half cycle of subcarrier that is 50-percent or greater of pseudo-burst amplitude.

6.6.3 The 10 to 90 percent rise and fall times of pseudo-burst envelope shall be less than 0.5 μs. The leading edge of sync, 10 to 90 percent points, shall contain no burst.

6.6.4 The amplitude of the pseudo-burst shall be 40 IRE units ± 4 IRE units.

6.6.5 The amplitude of any spurious components shall be at least 33 dB below the pseudo-burst level. DC components produced by insertion of the pseudo-burst into the video signal shall be less than ± 1 IRE unit.

6.6.6 The frequency of the pseudo-burst shall be 3.58 MHz ± 0.02 MHz. Rate of change of the frequency of the pseudo-burst shall be less than 1 kHz per second.

SMPTE RECOMMENDED PRACTICE

RP 23-1979

Reinforcement of 70-mm Positive Splices

Introduction

Splices on 70-mm projection prints have, in certain instances, failed during projection. To prevent costly damage to the print, projectionists and others involved in distribution and exhibition have suggested that splices be reinforced.

1. *Scope*

This practice specifies that a transparent material shall be employed to reinforce splices on 70-mm projection prints.

2. *Materials*

Pre- or post-perforated transparent polyester tape with pressure-sensitive adhesive is preferred. Total tape thickness, including adhesive, shall not exceed 0.0026 in (0.066 mm).

3. *Application*

The tape shall be applied to the emulsion side of the film to avoid masking the magnetic sound tracks. For optimum results, the reinforcement should extend to both edges, or just short of both edges, of the film to include the perforation area. Although tape width is not critical, it has been determined that tape 0.750 in (19.05 mm) wide, which includes two perforations on each side of the splice, will adequately reinforce the splice and yet not be objectionable during projection.

4. *General*

Proprietary items are available that fulfill the requirements of this practice.

862 Scarsdale Avenue, Scarsdale, NY 10583, (914) 472-6606

Revision of RP 23-1967
Approved 24 July 1979

SMPTE RECOMMENDED PRACTICE — RP 90-1979

Specifications for Magnetic-Type Audio Level and Multifrequency Test Film for 16-mm Sound Reproducers

1. *Scope*

This practice specifies an audio frequency test film to be used for adjusting the sensitivity and the frequency response of 16-mm motion-picture magnetic sound reproducers operating at 36 ft (11 m) per minute.

2. *Test Film Signal*

2.1 Frequencies. The sound record on the film shall be an original recording which will reproduce at the frequencies specified in Sec. 3 when the linear speed of the film is 24 perforations per second or approximately 36 ft per minute (7.2 in or 18.3 cm per second).

2.2 Distortion. The total harmonic distortion of the recorded signals shall not exceed 1 percent.

2.3 Sound Record. The location and dimensions of the recorded sound record shall be in accordance with American National Standard Position, Dimensions and Reproducing Speed of 200-Mil Magnetic Sound Records on 16-mm Motion-Picture Film, ANSI PH22.97-1975. The sound record may also be recorded so that it extends from one edge of the film to the other, except for 0.005 ± 0.003 in (0.13 ± 0.08 mm) at the sprocket holes and film edges.

2.4 Signal Fluctuation. The signal levels shall not fluctuate more than ± 0.5 dB within the test section lengths.

2.5 Flutter. The weighted peak flutter of the sound record shall not exceed ± 0.07 percent when measured in accordance with American National Standard Method for Measurement of Weighted Peak Flutter of Sound Recording and Reproducing Equipment, ANSI/IEEE Std 193-1971.

2.6 Azimuth. The azimuth of the sound record shall be 90° ± 5′ to the reference edge of the film.

2.7 Signal Identification. Each test section and segment shall be preceded by voice announcements identifying the content. Voice announcements shall be recorded at a level approximately equal to the reference frequency level. (See Sec. 3.1.)

3. *Test Sections*

3.1 Reference Level. A frequency of 400 Hz ± 2 percent shall be recorded ahead of the Frequency Response Section, having an rms short circuit flux per unit track width of 58.50 ± 10 nanowebers per meter, for a duration of approximately 30 seconds.

3.2 Program Level. A frequency of 400 Hz ± 2 percent shall be recorded at the end of the Frequency Response Section, having an rms short circuit flux per unit track width of 185 ± 10 nanowebers per meter, for a duration of 50 seconds.

3.3 Frequency Response. The following test segment frequencies in hertz ± 2 percent shall be recorded in the order given:

400 reference level / 15 000 / 12 500 / 10 000 / 8000 / 6300 / 5000 / 3150 / 2000 / 1000 / 500 / 315 / 200 / 100 / 50 / 400 program level

3.3.1 Recorded Levels. With constant sine-wave signal applied to the input of the recording system, the relative characteristic in effective values of the short circuit magnetic flux versus frequency shall decrease with increasing frequency proportionately to the impedance of a parallel combination of a capacitance and a resistance having a time constant of $\tau = 70\ \mu s$.

The characteristic defined above is obtained by the following calculation:

$$N \text{ (in decibels)} = -10 \log (1 + 4\pi^2 f^2 \tau^2)$$

where f is the frequency in hertz and τ is the time constant in seconds.

3.3.2 Flux Level Variation. The film flux level at each frequency from 50 Hz through 8 kHz shall be within ± 0.5 dB and each frequency from 10 kHz through 15 kHz shall be within ± 1.0 dB of the value specified in Sec. 3.3.1.

3.3.3 Duration. The duration of frequency response test segments shall be approximately 10 seconds, except for the 15-kHz tone which shall be approximately 30 seconds.

Approved 24 July 1979

FLUX LEVEL AND RELATIVE LEVELS VERSUS FREQUENCY

Frequency (Hz)	Short Circuit Flux (nWb/m)	Relative Level (dB)
400 Reference Level	58.50	0.00
15 000	8.91	— 16.35
12 500	10.63	— 14.82
10 000	13.17	— 12.96
8000	16.24	— 11.14
6300	20.16	— 9.26
5000	24.59	— 7.53
3150	34.76	— 4.52
2000	44.60	— 2.36
1000	54.37	— 0.64
500	58.01	— 0.08
315	58.84	+ 0.05
200	59.17	+ 0.09
100	59.34	+ 0.12
50	59.40	+ 0.13
400 Program Level	185.00	+ 10.00

4. *Film Stock*

4.1 The film stock shall be full-coat, splice-free, of the low-shrinkage, safety type in compliance with American National Standard Specifications for Motion-Picture Safety Film, ANSI PH22.31-1967 (R1973).

4.1.1 Test films made on triacetate base shall be cut and perforated in accordance with long-pitch dimensions specified in American National Standard Dimensions for 16-mm Motion-Picture Film Perforated 1R, ANSI PH22.109-1974.

4.1.2 Test films made on polyester base shall be perforated in accordance with short-pitch dimensions specified in ANSI PH22.109-1974.

4.2 The film stock shall be conditioned for 10 days at 20°C ± 3° (68°F ± 5.4°) at a relative humidity of 50 ± 10 percent prior to recording.

4.3 The film shall be recorded and packaged within the temperature and humidity limits specified in Sec. 4.2. The recorded film shall be packaged in a metal can and sealed either with a low-moisture permeability plastic tape or a fabric tape having a moisture barrier.

5. *Identification*

Each test film shall be identified by a suitable identification marking.

6. *Calibration*

6.1 Flux. The short circuit flux on the test film shall be determined by means of the calibrated short-gap ferromagnetic core reproducer technique. This technique is described in American National Standard Method of Measuring Recorded Flux of Magnetic Sound Records at Medium Wavelengths, ANSI/IEEE Std 347-1972.

6.2 Level. The signal level measurements specified in Sec. 2.4 shall be measured with a standard volume indicator conforming to American National Standard Volume Measurements of Electrical Speech and Program Waves, ANSI/IEEE Std 152-1953 (R1976).

6.3 Full-Width Recording. If the test film is recorded so that the record extends from one edge to the other, the recording shall be monitored and checked for accuracy only over a 200-mil area, as designated by ANSI PH22.97-1975.

NOTE: A signal level test film and a multifrequency test film, made in accordance with this practice on polyester base and recorded from one edge of the film to the other, are available from the Society of Motion Picture and Television Engineers.