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Revision of EG 17-1997

SMPTE ENGINEERING GUIDELINE

B-Chain Electroacoustical Response for Preparing Magnetic Masters for Transfer to 16-mm or 35/32-mm Monaural Photographic Film

1 Scope

This guideline specifies the electroacoustical frequency response characteristic of the monitor system when making magnetic masters intended for transfer to 16-mm photographic negative tracks.

2 Definitions

2.1 complete sound reproduction system: Represented diagramatically in figure 1 and used in studio dubbing theaters, laboratory review rooms, and indoor theaters, generally considered to consist of an A- and B-chain.

2.2 preemphasized audio track: An audio rec-ord, either magnetic or photographic, which is intended for playback over normally deemphasized playback systems.

2.3 A-chain (transducer system): That part of a motion-picture audio system shown in figure 1, extending from the transducer to the input terminals of the main fader.

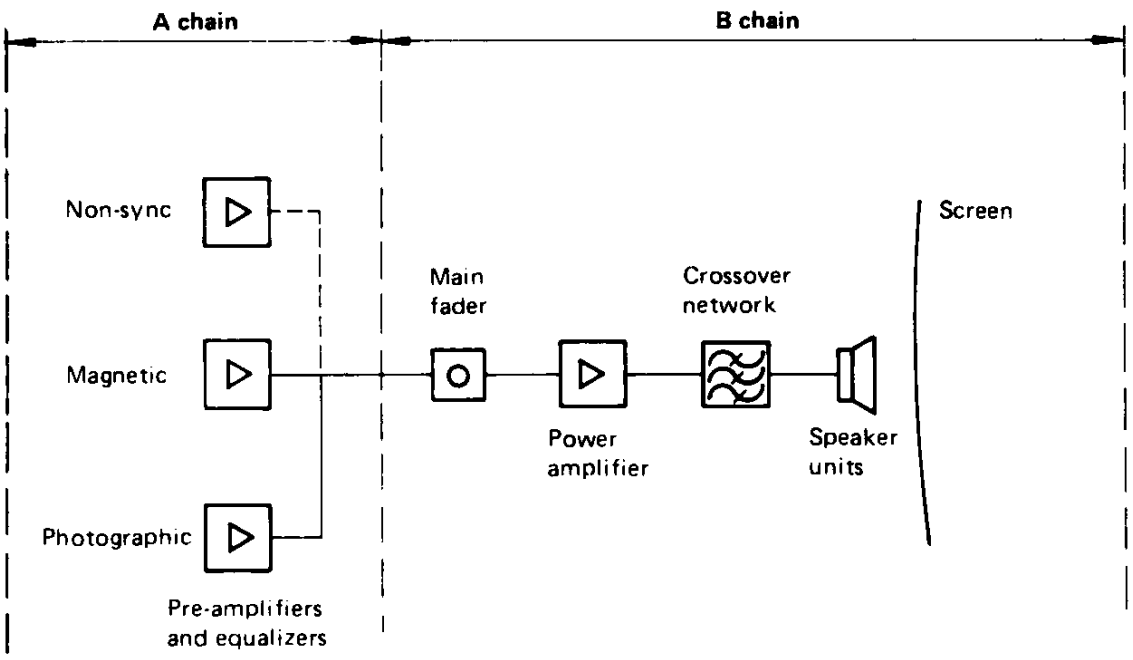

Figure 1 – Complete theatrical sound reproducing system

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2.4 B-chain (final chain): That part of a motion-picture sound reproduction system shown in figure 1, commencing from the input terminals of the main fader and terminating at any position in the listening area of the room or auditorium at which sound-pressure measurements are taken.

2.5 electroacoustical response: The electro-acoustical response of the final chain is the sound-pressure level expressed in decibels with respect to an arbitrary reference pressure over a given frequency range measured at a given position in the listening area when wide-band pink noise is applied to the input terminals of the main fader.

2.6 wide-band pink noise: A continuous spectrum noise having constant energy per constant percentage bandwidth and gaussian probability distribution of instantaneous values, having a bandwidth exceeding the frequency range of interest (typically extending from 31.5 Hz to 12.5 kHz).

3 Method of measurement

3.1 The electroacoustical response shall be measured by generating wide-band pink noise on the monitor at a level of 85 dBC, slow reading. Measure the acoustical output with a calibrated microphone intended for use in the diffuse field together with an audio-frequency real-time spectrum analyzer, covering the spectrum in 1/3-octave bands.

3.2 The electroacoustical response shall be an average of the response measured according to 3.1 at an adequate number of locations in the room where monitoring occurs.

4 Characteristic

4.1 For record monitoring, where magnetic masters are being prepared with preemphasis for making photographic negatives, both the photographic A-chain and the B-chain deemphasis in the monitoring chain are required as shown in table 1 and figure 2.

4.2 Because of the room gain reverberation component and high-frequency attenuation in air (proportional to the signal patch length), the measured frequency response should have a slightly elevated high-frequency response in a small dubbing theater. Table 2 gives approximate correction factors which should be added numerically to the characteristic curve in table 1 and figure 2.

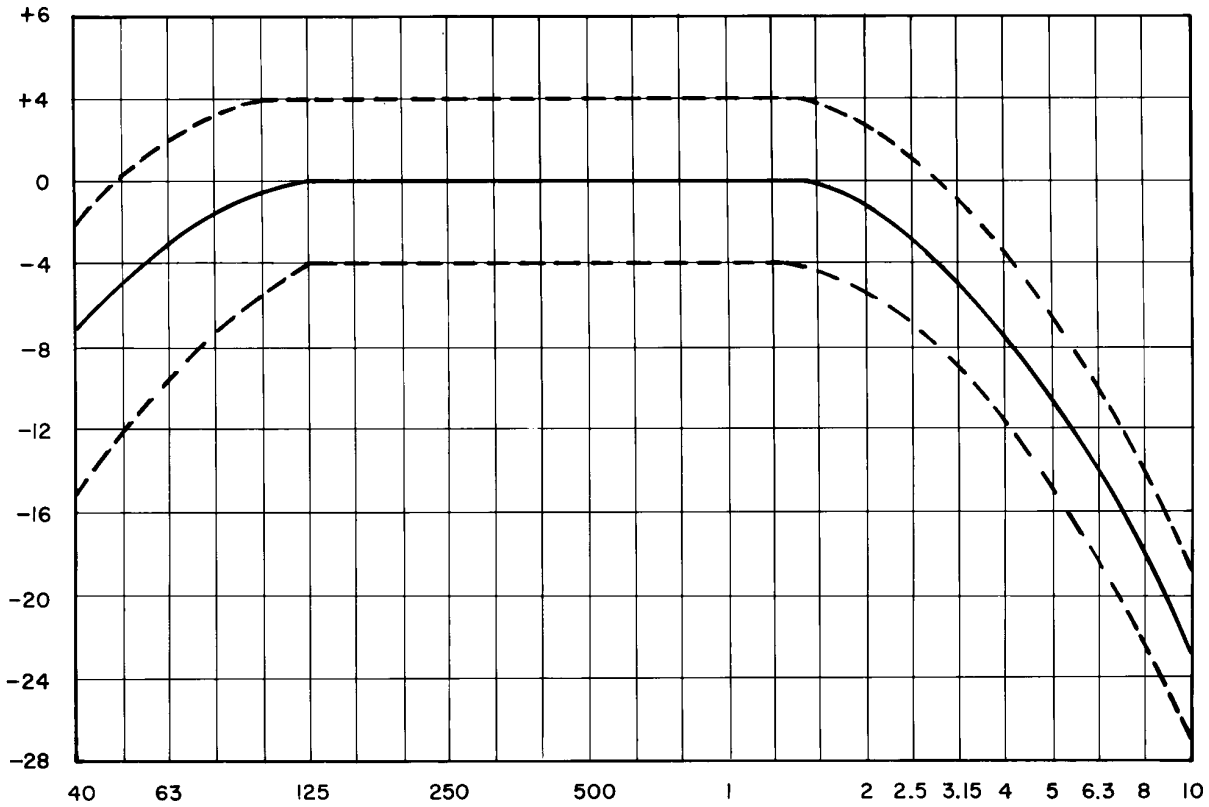

Figure 2 – A- + B-chain characteristic

Table 1 – A- + B-chain electroacoustical response (dB)

Frequency	Preemphasized audio track	Tolerance + dB	Tolerance – dB
40	– 7.0	5	8
63	– 3.0	5	7
125	0	4	4
250	0	4	4
500	0	4	4
1000	0	4	4
2000	– 1.0	4	4
2500	– 3.0	4	4
3150	– 5.0	4	4
4000	– 7.5	4	4
5000	–10.5	4	4
6300	–14.0	4	4
7100	–16.0	4	4
8000	–18.0	4	4
9000	–20.5	4	4
10000	–23.0	4	4

Table 2 – Approximate correction factors for auditorium size, dB

Frequency	Number of seats						
	10	30	150	500	1000	1500	2000
2000	0	0	0	0	0	0	0
4000	1.5	1.0	0.5	0	–0.5	–1.0	–1.5
8000	3.0	2.0	1.0	0	–1.0	–2.0	–3.0

NOTE – For conversion to room volume in cubic feet, a figure of 190 ft^3/seat, the average of many U.S. theaters, may be used.

Annex A (informative)
Additional data

This guideline is not intended to provide a standard for the playback characteristics of the photographic track, due to the fact that 16-mm film is used in such varied facilities. Such screenings are in classrooms where the internal speaker of the projector is used and the sound track has to compete with the projector noise; in churches where the acoustics are often a compromise; in television receivers where the speaker in the TV set has its limitations; or in small screening theaters. It has been found in practice that when using the standard Academy monitor characteristic (as described in this guideline) for preparing monaural masters for photographic tracks, a good quality track is obtained for virtually all screening situations. Generally, 16-mm projectors have manual tone controls which may be adjusted according to the acoustical conditions of the screening. Under good screening conditions, a center positioning of the tone controls will produce a good-sounding track.

It is recommended that a 6- or 7-kHz low-pass filter and a 70-Hz high-pass filter be inserted during the transfer from magnetic film to 16-mm photographic negative to reduce the effects of cross-modulation distortion.

Annex B (informative)
Bibliography

ANSI S1.11-1986 (R1998), Octave-Band and Fractional Octave-Band Analog and Digital Filters, Specifications for

ANSI S1.13-1995 (R1999), Measurement of Sound Pressure Levels in Air

SMPTE 202M-1998, Motion Pictures — B-Chain Electroacoustic Response — Dubbing Theaters, Review Rooms and Indoor Theaters

SMPTE 214M-1999, Motion-Picture Film (35-mm) —Photographic Audio Reproduction Characteristics