SMPTE 3-1998
Revision of
ANSI/SMPTE 3-1992

SMPTE STANDARD

for Television Analog Recording —

Frequency Response and Operating Level of Recorders and Reproducers — Audio 1 Record on 2-in Tape Operating at 15 and 7.5 in/s

1 Scope

This standard specifies the frequency response and operating level for recorders and reproducers for audio 1 record for 2-in quadruplex video magnetic tape recording at 15 in/s and 7.5 in/s (381 mm/s and 190.5 mm/s), as defined in ANSI/SMPTE 6. It also specifies the field method of calibration of recorders and reproducers, utilizing the test tapes as defined in ANSI/SMPTE 8 and ANSI/SMPTE 11.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standards indicate below.

ANSI/IEEE 152-1992, Audio Program Level Measurement

ANSI/SMPTE 6-1993, Video Recording — 2-in Quadruplex Tape — Video, Audio and Tracking-Control Records

ANSI/SMPTE 8-1995, Video Recording — Quadruplex Recorders Operating at 15 in/s — Audio Level and Multifrequency Test Tape

ANSI/SMPTE 11-1995, Video Recording — Quadruplex Recorders Operating at 7.5 in/s — Audio Level and Multifrequency Test Tape

3 Operating level

3.1 Recording and reproducing level indicator

The audio recording and reproducing levels of a video magnetic tape recorder shall be monitored and adjusted with a standard volume indicator (vu meter), as specified in ANSI/IEEE 152.

3.2 Recorder operating level

When a tape record is recorded from a sinusoidal voltage having a frequency of 1000 Hz, such that the rms short circuit tape flux per unit track width on the record is 110 nanowebers per meter $\pm$ 3 nWb/m of track width, the recording volume indicator shall be adjusted to deflect to its reference level (0 dB) scale mark.

3.3 Reproducer operating level

When a tape record having an rms sinusoidal flux per width of 110 nWb/m and a frequency of 1000 Hz is reproduced, the reproducing volume indicator shall deflect to its reference level (0 dB) scale mark.

4 Frequency response

4.1 Recorder flux/frequency response

When a tape record is recorded from a constant voltage level applied to the input terminals of the recording system, the short circuit tape flux level on the record versus frequency, $L\phi$ (f), shall be as given by the following equation:

$$L\phi\ (f) \text{ re } 110 \text{ nWb/m} = 0.2 + 10 \log_{10} \{[1 + (F_l/f)^2]/[1 + (f/F_h)^2]\} \text{ [dB]}$$

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where f is the frequency at which the response is being computed; F_l is the low-frequency transition frequency, 80 Hz; and F_h is the high-frequency transition frequency, 4500 Hz. A graph of this equation is shown in figure 1.

4.2 Reproducer flux/frequency response

When a tape record having a short circuit tape flux level versus frequency given in 4.1 is reproduced, the output voltage level of the reproducer versus frequency shall be constant.

5 Field method of calibrating recorders and reproducers

5.1 The practical calibration of a reproducer shall be performed by reproducing the audio level and multifrequency test tape defined in ANSI/SMPTE 8 or ANSI/SMPTE 11. The practical calibration of a recorder shall then be performed by recording on a medium representative of that to be used, and comparing the recording so made with the recording on the test tape.

5.2 The flux/frequency response of a reproducer shall be calibrated by reproducing the frequency response test section of the specified test tape. The reproducing equalizer is adjusted so that output voltage level versus frequency of the reproducer is constant.

5.3 The operating level of a reproducer shall be calibrated by reproducing the audio operating level test section of the specified test tape. The reproducing gain control is adjusted so that the reproducing volume indicator deflects to its reference level (0 dB) scale mark.

5.4 The flux/frequency response of a recorder shall be calibrated by comparing the tape flux recorded by the recorder (with constant input voltage level), to the flux recorded on the frequency response test section of the specified test tape. The recording equalizer is adjusted so that the tape flux level versus frequency of a recorder (including the tape) is the same as that on the test tape.

5.5 The operating level of a recorder shall be calibrated by comparing the tape flux recorded by the recorder when the recording volume indicator deflects to its reference level (0 dB) scale mark, to the recording of the audio operating level test section of the specified test tape. The recording gain control is adjusted so that, when the recording volume indicator deflects to its reference level (0 dB) scale mark, the recorded tape flux is the same as that on the test tape.

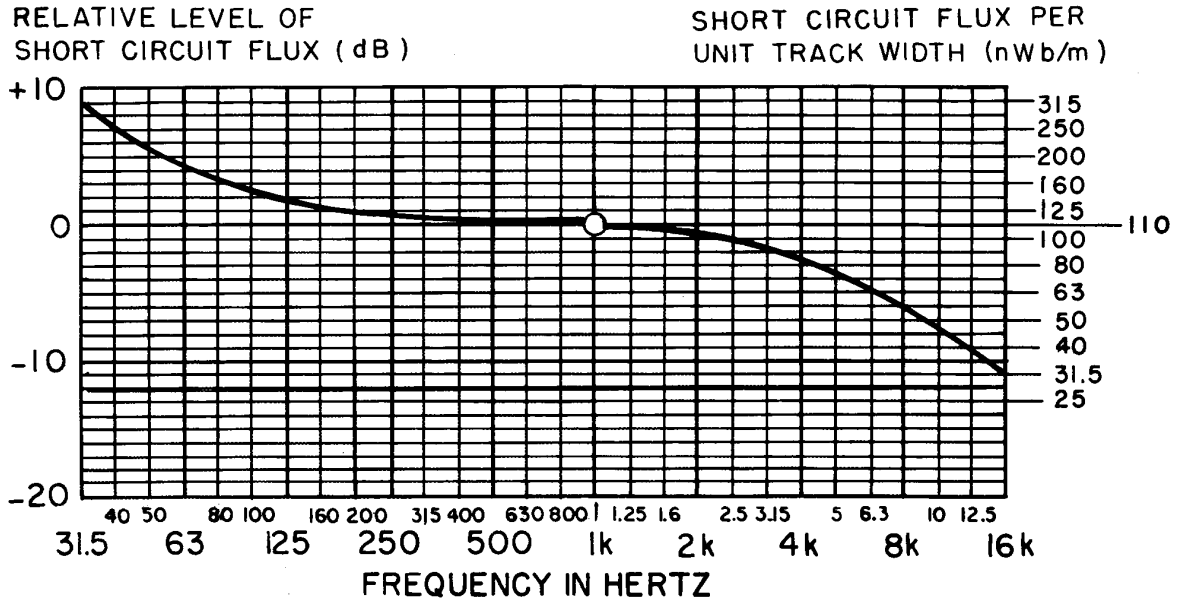

Figure 1 – Flux and flux level vs frequency

Annex A (informative)
Additional data

Previous frequency response standards for recorders and reproducers have been given in terms of a “standard reproducing system,” having an “ideal” reproducing head followed by a standardized RC equalizing network whose time constant was given.

Because an adequate description of the “ideal” head and its interconnection to the following network is quite lengthy, it is simpler to specify the system responses in terms of the basic physical quantity for the recorded signal, the “short circuit tape flux.” The concepts are explained in detail by J. G. McKnight in the paper Flux and flux-frequency measurements and standardization in magnetic recording, J. SMPTE, 78: 457-472; June 1969.

Rather than specifying flux/frequency response in terms of admittances of electrical networks, the equation and graph of the response function have been specifically given. The equation does in fact describe the response of the previously specified RC equalizing network with “time constants” of 2000 microseconds and 35 μm.