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SMPTE ENGINEERING GUIDELINE

Artificial Acoustical Background Noise in Dubbing Stages

1 Scope

1.1 This guideline provides measurement methods and recommended levels for background noise sound pressure levels in dubbing stages. The purpose of adding intentional background noise to dubbing stages is to match the environment of the dubbing stage to the average theater environment, for best translation of the program material from dubbing stage to theater.

1.2 The guideline is intended for application when the background noise is essentially a steady-state sound, without strong time-varying components.

1.3 The background noise may be produced by air-handling systems, by adding noise to the monitoring system, or by a combination of these. An advantage to adding noise electronically is the ability to switch off the noise, for reproduction of the fullest possible dynamic range of the program material, exceeding that of most theaters, so long as the air-handling system noise of the dubbing stage is quieter than most theaters.

2 Normative references

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

ANSI S1.4-1983 (R2001), Specifications for Sound Level Meters

ANSI S1.11-2004, Specifications for Octave-Band and Fractional Octave-Band Analog and Digital Filters

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

3 Test conditions

3.1 Measurements shall conform with ANSI S1.13, and shall be made with a type 1 meter as specified in ANSI S1.4, and a class II octave band filter or class III third-octave band filter in accordance with ANSI S1.11.

3.2 The measurement system shall be set to slow reading.

3.3 The measurement system shall be calibrated immediately before use by means of an acoustical calibrator accurate to within ± 1/2 dB for sound pressure level.

3.4 At high frequencies, room background noise levels can be in the same range as ordinary measurement equipment noise. Therefore, care should be used to ensure that the measured levels are not influenced in any band by noise in the measurement instrument(s) by testing the measurement instrument(s) under all relevant

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conditions, including switch settings of any attenuators or gain controls. Do not report noise levels at or below the capability of the instrumentation in use.

4 Measurements

4.1 Measurements shall be recorded in octave bands over the range from 31.5 Hz to 16 kHz as sound pressure level.

4.1.1 The preferred octave band center frequencies are 31.5, 63, 125, 250, and 500 Hz, and 1, 2, 4, 8, and 16 kHz.

4.1.2 If third-octave band measuring equipment is available rather than octave band or switchable bandwidth equipment, measurements may be made in third-octave bands and converted to octave bands by logarithmic addition of three bands (one at the octave band center and the two surrounding it):

$$\text{Octave band SPL} = 10 \log_{10} \left[10^{\frac{L1}{10}} + 10^{\frac{L2}{10}} + 10^{\frac{L3}{10}} \right]$$

where $L1$ = SPL of first 1/3 octave, $L2$ = SPL of second 1/3 octave, and $L3$ = SPL of third 1/3 octave.

4.2 The measurements to be recorded shall be made by averaging at a sufficient number of locations to produce averages with standard deviations under 2 dB. Usually six locations chosen at random within the seating area at seated ear height at least 4 ft from any wall surface will suffice unless there is an unusual spatial distribution of background noise. If the total range of the measurements in an octave band is less than 4 dB, then arithmetic averaging may be used; if more than 4 dB, then the average must be done logarithmically. Some review rooms may be so small that strong room modes will influence the low-frequency band measurements so that a small standard deviation is unobtainable. In such cases, the low-frequency bands may not be reliably reported and must be neglected.

5 Recommended levels

5.1 Background acoustical noise levels shall be in accord with table 1.

5.2 If the noise is generated electronically and added to the monitoring system, then the use of multiple, uncorrelated noise generators operating into different loudspeakers of the monitoring system is important to promote good spatial distribution of the noise.

Table 1 – Background acoustical noise level

Octave band:	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
dB SPL re 20 µPa:	59	54	45	36	29	23	18	14	10

Annex A (informative)
Additional data

A.1 The spectrum of table 1 produces 34 dB SPL "A" weighted, 57 dB "C" weighted, and meets noise criteria curve NC-25.

A.2 As a guide to whether high levels of vibration are present, measurement of the linear weighting of a type I sound level meter compared with the octave band sound pressure level can provide useful information. If the level of the linear measurement exceeds the logarithmically added sum of the band levels from 31.5 Hz to 16 kHz by more than 3 dB, then vibration which may be detectable by human observers is present.

A.3 As a practical matter, large-diameter microphones are useful for measuring low theater noise levels due to their low self noise. But large-diameter microphones also show relatively strong diffraction effects at high frequencies; therefore, to obtain an adequate spatial average at high frequencies, the microphone should be rotated at least about a line perpendicular to the floor and a line perpendicular to the side walls to obtain the average reading at each location for the high-frequency bands.

A.4 The spectrum was obtained by logarithmic averaging of data measured by the method outlined in this guideline on 35 theaters in the U.S.A. The levels quoted in table 1 and annex A.1 are believed to represent average theater performance at the time of publication of this guideline.