

Use of Audio Magnetic Test Films



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1 Scope

This guideline is intended to describe the usage and practical limitations of audio magnetic test films made to SMPTE specifications.

2 Definitions

2.1 flux level: The absolute short-circuit recorded magnetic flux level in nanowebers per meter (nWb/m).

2.2 frequency response: The amplitude vs frequency characteristic of a circuit or flux given as the frequency-by-frequency deviation in decibels from either zero deviation or from a specified response.

2.3 mechanical adjustments:

2.3.1 azimuth: Rotation of the head about a line perpendicular to the reference edge of the film in the plane of the film. For a single-gap head, azimuth aligns the gap perpendicular to the reference edge of the film. For a multiple gap head, azimuth adjustment brings the best fitting line through the centers of the gaps perpendicular to the reference edge of the film.

2.3.2 height: The position of a head or record along the plane of the film with respect to the reference edge of the film. Adjustment aligns the gap(s) to the center of the recorded area for the corresponding record.

2.3.3 rotation: Rotation of a head around a line parallel to the plane of the film (drawn through the centerline of the head) and perpendicular to the reference edge of the film. Adjustment is made in order to bring the gap(s) into best contact with the oxide surface on the film.

2.3.4 zenith: Rotation of a head around its center which brings the gaps in or out of parallelism with the magnetic oxide surface of the film. Adjustment optimizes contact across the width of the head gaps.

2.4 peak value: The true peak value of the signal, measured by observing an oscilloscope and comparing the peak-to-peak amplitude of the observation to the peak-to-peak amplitude of the reference stated.

2.5 pink noise: A random noise signal having equal amplitude in equal logarithmic frequency intervals over the bandwidth of interest.

2.6 record: The magnetic flux recorded on the film. A record may extend across the whole width of the film, or it may be segmented into tracks which correspond to channels.

3 Uses of the test sections of the films

3.1 General note

An oscilloscope connected in an X-Y mode, with one signal applied to an input to produce vertical deflection and another signal applied to a second input to produce horizontal deflection, provides a method of making a number of useful measurements when used with the various parts of the test film. The resulting displayed pattern is called a Lissajous figure. For the tests as described, the most common type of display is assumed: with two identical inputs for the X and Y axes, and with the oscilloscope gain controls set for equal sensitivity in the two inputs, a line sloping 45° up to the right should be produced.

3.2 Uses of the reference level tone

3.2.1 The reference level tone may be used for setting the preliminary head mounting adjustments such as coarse rotation, azimuth, and zenith (in the case of test films with individual records, the head height as well) by setting the appropriate mechanical adjustments for highest and most level-stable output.

3.2.2 The reference level tone may also be used as a relative channel polarity test by using an X-Y display to check that each of the preamplifier outputs corresponding to the records, compared to a reference channel output, have the same slope, not the opposite slope, which would indicate a polarity reversal in the head or preamplifier wiring.

3.2.3 The reference level tone may also be used for calibration purposes to produce the reference voltage for setting the operating point of level-dependent noise-reduction systems.

3.2.4 An X-Y display of the reference level tone on an oscilloscope may be used for coarse azimuth setting using the following method:

Connect the signals from the preamplifier outputs corresponding to the outside tracks to the X and Y inputs of an oscilloscope. With the sensitivity of the preamplifier channels set to play the film at equal voltages at the oscilloscope connection points, and the sensitivity of the X and Y oscilloscope channels made equal, adjust the azimuth for a 45° diagonal line on the oscilloscope, not an ellipse. (Setting the azimuth coarsely at medium frequencies before making adjustments at the higher frequencies assures that, when the small adjustments are subsequently made for best high-frequency azimuth, they take place on the same peak of the high-frequency cycle without the possibility of displacement by one full cycle which can lead to a false peak.)

3.3 Uses of the azimuth tone

3.3.1 Azimuth tone use

The high-frequency azimuth tone can be used for fine adjustment of playback head rotation, azimuth, and zenith by adjusting the appropriate mechanical controls for highest and most level-stable output.

3.3.2 Multitrack heads

To obtain the best azimuth across a multitrack head, it is useful to sum the outputs of one half of the tracks into one axis of the X-Y display, and the other half to the other axis of the display. Assign the tracks to one half or the other based on the mechanical layout of the head: bisect the head down the center of the film. This method eliminates error due to gap scatter among the individual head gaps.